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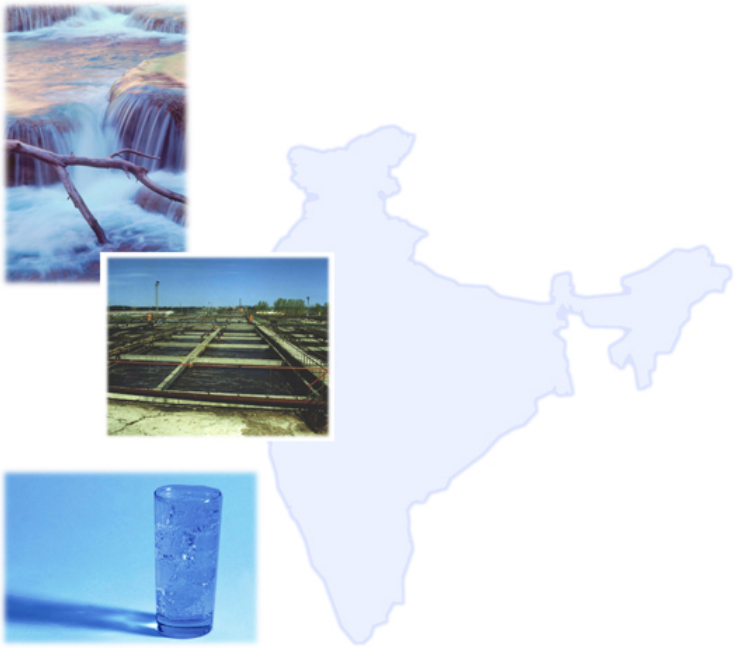

INDIAN WATER SUPPLY & WASTEWATER TREATMENT ORIENTATION VISIT

JUNE 3 - 14, 2003

SPONSORED BY:
U.S. TRADE AND DEVELOPMENT AGENCY

INITIAL REPORT – Volume I

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1. Introduction

This report describes the Indian Water Supply and Wastewater Treatment Orientation Visit undertaken June 3 – 14, 2003. This Orientation Visit (O.V.) was sponsored by the U.S. Trade and Development Agency (USTDA) and implemented under USTDA IQC contract number IQC1D00282, Task Order No. 004 by Princeton Energy Resources International, LLC. (PERI).

1.1 Orientation Visit

In an effort to provide U.S. businesses with the necessary information on business opportunities in water supply and wastewater treatment projects in several provinces in India and introduce the delegates to U.S. developed and manufactured technologies and equipment, operation and maintenance practices, management practices and other related services such as financing of water supply and wastewater projects, USTDA sponsored an O.V. from June 3rd through 14th, 2003 including a one-day business briefing, on-one-one meetings with interested U.S. businesses and technology expositions. The official delegation included four delegates from Rajasthan, one delegate each from Andhra Pradesh, Gujarat, Karnakata, Tamil Nadu, and West Bengal and a Senior Commercial Specialist from the American Embassy, Foreign Commercial Service in New Delhi.

Private meetings were arranged for the delegates with senior executives, financial officers, and technical personnel at Tampa Bay Water, a private water supply company, City of Orlando Wastewater Engineering and Support Bureau, Las Vegas Valley Water District, Southern Nevada Water Authority, City of Phoenix Water Services Department, Dater Infrastructure Finance Authority of Arizona, and Los Angeles Department of Water and Power. During these meetings, technical, operational, planning, management, and financing issues were discussed. In addition, the delegates were provided an opportunity to visit water supply, wastewater treatment, desalination, water flow monitoring and control, and water quality analysis and monitoring facilities. Section 5.1 and Appendix A provide a summary of the issues discussed and the materials presented in these private meetings as well as a description of the facilities operated by these organizations and visited by the delegates.

Several equipment vendors also sponsored the delegates during this O.V. The corporate sponsors included DATAC Technologies LTD., Valmont Water Management Group, Spatial NetWorks, Inc., and Environmental Dynamics Inc. Corporate sponsors were provided an opportunity to introduce their equipment to the delegates, learn about the delegates' projects, and, when possible arrange for site visits to showcase their equipment in operating facilities. Corporate sponsors provided information and materials are presented in Appendix B.

A business briefing in Anaheim, California highlighted water supply and wastewater business opportunities in Rajasthan, Andhra Pradesh, Gujarat, Karnakata, Tamil Nadu, and West Bengal for U.S. industry participants. The delegates presented a detailed description of their projects and a copy of the material presented by the delegates in this business briefing is presented in Appendix C. Representatives of ten U.S. industry participated in this business briefing. The business briefing was

preceded by a technology exposition and was followed by a number of one-on-one meetings. Three equipment vendors, Myron L Company, Environmental Dynamics, Inc. and Valmont Water Management Group exhibited their model equipment and/or presents technical information with regard to their equipment and services during the technology exposition. Information presented by the participants in this exhibition is located in Appendix D. Following the business briefing U.S. industry participants had one-on-one meetings with the delegates.

U.S. firms' participation in the business briefing and technology exposition as well as their sponsorship of the delegates was promoted through e-mail, fax transmittal, and phone calls to the members a number of trade organizations as well as PERI's in-house list of engineering and consulting firms, equipment and technology suppliers, and service providers. A number of trade organization including United States-Asia Environmental Partnership (US-AEP), American Water Works Association (AWWA), Water Environmental Federation (WEF), Association of Water Technologies (AWT), Water and Wastewater Equipment Manufacturers Association (WWEMA) supported PERI's marketing effort. PERI greatly appreciates the support provided by these organizations in marketing this O.V. including the business briefing in Anaheim, California. PERI contacted over 200 firms by e-mail and fax and follow-up phone calls were made in an effort to notify all potential interested persons. A copy of a flyer used to promote this business briefing is included in Appendix E.

Princeton Energy Resources International, LLC, based in Rockville, Maryland, planned, organized, advertised, implemented, and reported the results from this USTDA sponsored O.V. U.S. Foreign Commercial Service personnel in New Delhi and Calcutta supported planning this O.V. and PERI is greatly appreciates their efforts.

1.2 India – An Overview[1]

India is a subcontinent, nearly 2,000 miles from north to south and 1,800 miles from east to west with a 3,800 miles long coastline. Long distances separate India's most populous cities. India is the seventh largest country in the world in area, covering 1,222,559 square miles (slightly more than 2 percent of the earth's total land surface).

India is a multi-ethnic, multi-religious, federal republic that occupies the greater part of South Asia. As a constitutional republic, India consists of 25 states, and 7 union territories. Each states has a substantial degree of control over their own affairs including development of water supply and wastewater treatment projects.

Unlike some other countries, India's pace of agricultural expansion has kept up with the growth in its population. With more than one-sixth of the world's total population, India is the second most populous country in the world after China. The population explosion in India began after the great influenza epidemic of 1918-19. The total population in 1921 within the area defined by the present borders of India was 251 million. In 1947 (at the time that India gained its

[1] Reprinted from USTDA Water Sector Projects Definitional Mission Report

independence), the population was about 340 million. At the 1981 census, it was 683 million; and at the 1991 census, 844 million (an increase of 161 million in just 10 years!). The Indian population is now estimated to be over 1 billion people. Population, in of itself, is a major factor in the criticality of water supply in many regions of India. In some of these areas, population effects are combined with hydrological factors that limit the water supply resources available for growing populations.

India has a well-developed infrastructure and a diversified industrial base with a focus of industry in certain states such as Gujarat and Tamil Nadu. (While these states are heavily industrialized, they are also the states where drought conditions often occur.) In addition, India's pool of scientific and engineering personnel is one of the largest in the world.

1.2.1 Government Structure

At the time of independence, India's leaders used many external sources as the basis for the content of India's constitution. The British model of parliamentary democracy heavily influenced its initial political structure. In addition, a number of principles were adopted from the U.S. Constitution, including the separation of powers among the major branches of government, the establishment of a Supreme Court, and the adoption of a general federal structure that defines the constitutional division of power between the central and state governments. This division of power has helped to establish the states in India as important political structures with strong capabilities when it comes to the control of environmental issues and in the development of water supply and wastewater infrastructure.

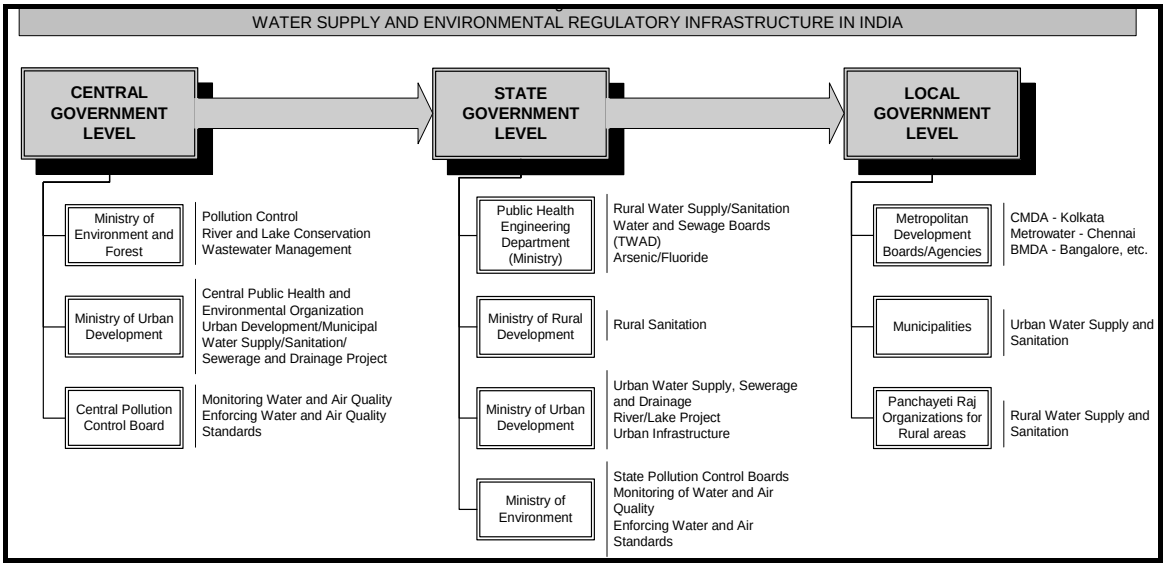
The governmental structure of the states, as defined by the Indian constitution, closely resembles that of the national government. The state's executive branch is composed of a governor and a council of ministers, led by the chief minister. Each Indian state is organized into a number of districts, which are further divided for administrative purposes. Separate from this system are the larger municipalities that are governed by their own elected councils. From the state level down to the village level, government appointees administer the various government departments and agencies. Financial grants from both the central and state levels of government (often made on a matching basis) provide developmental incentives and facilitate the execution of infrastructure and environmental projects such as many of the projects described later in this briefing book.

The main agencies and institutions associated with the water sector in India are the Central Water Commission, the Central Groundwater Board, the ministries of water resources and urban development at the central level in addition to the state governments and municipal corporations. The structure of the water and sewerage sector differs from state to state and from city to city as follows:

- In one kind of structure, the state-level water supply and sewerage board manages all the required capital investment while maintenance activities are the responsibility of local government. An example of this approach is the Tamil Nadu Water Supply and Drainage Board that makes all the investments in their region.

- In the second kind of structure, the larger municipal corporations have the responsibility for making both the capital investment and undertaking operations and maintenance for their infrastructure. An example of such a local body is the Ahmedabad Municipal Corporation in Gujarat.
- Under the third kind of structure, the entire responsibility rests with the state public health and engineering departments, as is the case in the states of Rajasthan.

The agencies and organizations that are involved in the water sector in India along with their fundamental responsibilities are shown below.



1.2.2 Urbanization Trends

Environmental conditions in India have to be seen in the light of the extent and concentration of population and demographic trends experienced in the country. The rapid growth of urban populations due to a general migration from rural areas to urban centers has caused many of the environmental problems in India's major cities. (This is the case in many countries with developing economies.) This rapid growth in urban population has caused severe pollution and major deficiencies in public facilities and services (water, sewerage, transportation, etc.) required by the growing populations.

The population of India has been increasing dramatically over the last 50 years and is now over one billion people with an overall population density of about 290 people per square kilometer. (Some sections of India's major urban areas have a population density of up to 6,500 people per square kilometer.) About half of the population lives below the commonly accepted poverty level and about 40 percent of the urban population live in slums.

As is the case in many developing nations, urbanization in India started with rapid industrialization. Developed nations, such as United States and the countries of the European

Union, have an urban population at over 70% of the total, while the urban population of the developing nations at present is about 44%. In India, the number of urban dwellers has increased dramatically during the 20th century. During the last twenty years, for example, India's urban population has doubled, increasing from 109.1 million to about 217.6 million. The annual rate of growth of urban population in India (3.09%) is distinctly higher than that of the high-income industrial market economies (1.4%). The level and trend of urbanization in Indian cities of various sizes is tabulated below.

Percentage Distribution of Urban Population by Size

Year	Over 100,000	50,000 to 100,000	20,000 to 50,000	10,000 to 20,000	5,000 to 10,000	Under 5,000
1901	26.0	11.3	15.6	20.8	20.1	6.1
1971	57.2	10.9	16.0	10.9	4.5	0.4
1981	60.4	11.6	14.3	9.5	3.6	0.5
1991	65.2	10.9	13.2	7.8	2.6	0.3

Source: Census of India 1991, Provisional population totals: Rural-urban distribution

As presented in this Table, the number of cities with over one million people and their share of urban population have risen significantly in recent decades. In 1971, the number of Indian cities in this category was nine, and their share in urban population was 25.5 percent. By 1991, the number had increased to 23 with a population share of over 32 percent.

The populations of the key Indian cities (including locations where a number of the projects presented in this briefing book are located) include:

City	*Population*
Mumbai	12,572,000
Calcutta	10,916,000
Delhi	8,375,000
Chennai	5,361,000
Hyderabad	4,280,000
Bangalore	4,087,000
Ahmedabad	3,298,000
Pune	*2,485,000*

Source: India. 1991 Census

The demographic trends have created the number of social and environmental problems that the Indian national, state and local governments must address. The following basic facts characterize these problems:

- India is the world's sixth largest and second fastest growing producer of greenhouse gases.
- Delhi, Mumbai and Chennai are three of the world’s ten most polluted cities.
- Two-thirds of city dwellers in India lack basic sewerage service; one-third lack readily available potable water.

- India grows equivalent of another New York City every year in its urban population.
- In the near future, more than half of India's population will be urban dwellers; 1/3 will be slum dwellers and squatters.

The Indian central government has recently adopted a new National Water Policy to address water supply and wastewater treatment issues.

1.2.3 Bilateral Trade between India and the United States

In 1999, the United States trade deficit with India was $5.4 billion or $0.7 billion more than in 1998. The approximate value of U.S. merchandise exports to India was $3.7 billion. U.S. imports from India totaled $9.1 billion in 1999. The pattern of trade between India and the U.S. since 1992 is shown in below. Trade between the U.S. and India grew in 2000 with India exports growing by almost 25% over the level of 1999. Bilateral trade between the U.S. and India stands at about $15 billion.

India/United States Trade Over the Last 7 Years (In US $ millions)

	1992	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**
Exports	3,781	4,551	5,302	5,736	6,169	7,321	8,225	9,083
Imports	1,914	2,761	2,296	3,296	3,318	3,616	3,545	3,707
Turnover	5,695	7,312	7,598	9,032	9,487	10,937	11,770	12,790
India's Net Export	1,866	1,790	3,005	2,440	2,851	3,705	4,680	5,376

The composition of India's exports to the U.S. has changed over the years. There has been a significant increase in the export of diamonds, textiles and ready-made garments, machinery, carpets, footwear and leather products, dyes, iron and steel products, chemicals, edible fruit and nuts and spices, coffee and tea. Six items (textiles and clothing, cut and polished non-industrial diamonds, carpets, shrimps and prawns, footwear and leather goods and cashew nuts) account for about 75% of the total Indian exports to the U.S. There has also been a change in the composition of Indian imports from the U.S. The principal items imported from the U.S. at present are machinery, fertilizers, aircraft and aeronautical equipment, and organic chemicals. In their assessment of the water/wastewater export potential, The U.S. Department of Commerce Foreign Commercial Service (FCS) stated the following:

> *Water pollution is India's worst environmental problem and technologies, products and services addressing this issue account for the largest share (almost 50 percent) of India's environmental market. The water and wastewater treatment market is estimated at a little over USD 1.0 billion and is expected to grow annually at 14 to 15 percent.*

2. Water Supply Concerns In India[2]

Since water supply in India is often a function of surface water bodies, the contamination of those water bodies through discharge of wastewater is a very important factor in the development of water resources throughout the country. It is widely recognized that new environmental laws and regulations aimed at controlling all forms of pollution need to be part of assuring that a commitment to minimizing environmental impacts is established. To that end, India has made meaningful progress that may bode well for the future in controlling pollution and thereby helping to mitigate the effects of that pollution on the water bodies that must serve as source of water.

In recent years, rules and regulations comparable to those in the United States have been enacted in India dealing with various sources of environmental harm. As is the case in many countries, the enforcement of existing laws and regulations is crucial to realizing their effect. Their proper enforcement will help assure that reasonable environmental conditions are reached and maintained. Unfortunately, enforcement often lags when resources are not available to support of the improvements that must be made.

The main factors that have a potential for further improving the general state of environmental management in India include the following:

- Stricter environmental regulations and enforcement by the Central Pollution Control Board (India's version of the EPA), the Ministry of Environment and Forests (MOEF) and the various state pollution control boards. (A roster of relevant environmental laws and regulations are shown below.
- Judicial intervention by the Supreme Court of India directing municipal corporations and other urban local bodies and the industrial sector better manage the environmental impact of their actions and facilities. (This is a very important factor to many recent actions to improve the environment in India.)
- A constitutional amendment (74th Constitutional Amendment Act) empowering local governments in India to make independent decisions on promoting environmental projects.
- A continuing willingness of the central and state governments in India to make financial investments in facilities and practices aimed at improving environmental conditions.
- Emphasis on privatization throughout the country thereby allowing private entrepreneurs to promote environmentally based projects on Build-Own-Operate (BOO) and Build-Own-Operate-Transfer (BOOT) basis. This may help to provide additional needed capital for infrastructure development.

[2] Reprinted from USTDA Sponsored Water Sector Projects Definitional Mission Report

Environmental Legislation in India	
Legislation	***Year***
The Water (Prevention and Control of Pollution) Act	1974
The Water (Prevention and Control of Pollution) Rules	1975
The Water (Prevention and Control of Pollution) Cess Act	1977
The Water (Prevention and Control of Pollution) Cess Rules	1978
The Air (Prevention and Control of Pollution) Act	1981
The Air (Prevention and Control of Pollution) Rules	1982
The Environment (Protection) Act	1986
The Environment (Protection) Rules	1986
The Hazardous Wastes (Management and Handling) Rules	1989
Manufacture, Storage and Import of Hazardous Chemical Rules (Amendment Rules, 1994)	1989
Manufacture, Use, Import, Export and Storage of Hazardous Microorganisms Rules	1989
The Public Liability Insurance Act	1991
The Public Liability Insurance Rules	1991
Environmental (Protection) Rules-"Environmental Statement"	1992
Environmental (Protection) Rules-"Environmental Standards"	1993
Environmental (Protection) Rules-"Environmental-Clearance"	1994
Biomedical Waste Management and Handling Rules	1998
Municipal Solid Waste Management and Handling Rules	1998

Source: Confederation of Indian Industry, New Delhi

Environmental industry all over the world is principally driven by environmental legislation and, most importantly, their degree of enforcement. Because of the above, environmental regulations and their enforcement in India are progressing. In general, the Government of India has been effective in tracking relevant environmental data and formulating legislation. India is one of the few countries in Asia that produces an annual national environmental report from its Central Pollution Control Board. On the policy level, the government of India has been focusing on specific environmental measures. In its Policy Statement for Abatement of Pollution, the government announced four priorities:

- Heavily polluted areas and river stretches
- Pollution prevention at source
- Recognition of the "polluter pays" principle
- Development of best available technical solutions.

The Central Pollution Control Board, which is the main implementing and enforcement agency of the MOEF, establishes national standards. The State Pollution Control Boards are responsible for enforcement of the standards and resulting rules under MOEF supervision. Similar to the

relationship between the USEPA and the various state environmental agencies in the U.S., Indian states, at their discretion, may enact a stricter set of standards than those adopted at the central government level.

The emergence of a strong middle class in India has also led to public pressures on government and industry for environmental improvements. Assisted by environmentally focused industry groups such as the Confederation of Indian Industry (CII), industries are beginning to recognize the importance of environmental compliance as investments. They recognize that they will soon have no choice but to implement proper systems and procedures to allow for environmental conformance. The impact of international pressures such as the ISO 14000 for global trade has also been a factor.

The country's judicial system has played a crucial and extremely important role in the enforcement of environmental legislation. In recent years the courts, through a number of public interest litigations, has caused the relocation or closing of many non-complying industries throughout India. Examples of some of these court actions that demonstrate their role in improving environmental conditions include the following:

- Of 10,000 firms in New Delhi that were issued notices of environmental non-compliance, over 1,500 were required to either close down or relocate.
- Nearly 60 tanneries in Tamil Nadu, over 150 dye factories in Gujarat, and many polluting enterprises in West Bengal, Uttar Pradesh, and Andhra Pradesh states were closed as a result of court action.
- Legal cases have involved a wide variety of industrial sectors, including stone crushers, foundries, slaughterhouses, electroplating, cement, secondary lead, zinc and steel, aqua culture, and farming.
- The Supreme Court has punished Pollution Control Board officials as well as chief executive officers of private companies who have not complied with environmental requirements.

2.1 Environmental Spending in India

India is among the largest recipients of multilateral and bilateral funding for environmental programs. According to the Asian Development Bank, an estimated $1.1 billion of ongoing projects are being funded by various multilateral and bilateral donor agencies in many related sectors, including:

- Forestry
- River pollution control
- Institutional strengthening and capacity building
- Urban and rural infrastructure (sanitation and water supply)

- Energy improvement
- Water resources/drainage.

While much lending activity initially went to agricultural and irrigation projects, the country's environmental and water supply problems and priorities have led to more project funding in water and wastewater infrastructure. For example, the World Bank has a number of large water supply and water resources management projects totaling US $736.6 million in Chennai in the state of Tamil Nadu.

In India, the National River Action Plan (NRAP) is a river pollution control program that is driving many of the country's investments in municipal wastewater treatment. The Government of India initiated the National River Action Program with the aim of establishing adequate wastewater treatment infrastructure in 141 major towns. The total estimated outlay of the NRAP is about US $479 million and is funded fully by the national Government of India. The NRAP covers a total of 141 towns in 14 states located along 19 grossly polluted river stretches. In addition to the NRAP, the GOI has approved projects for other rivers such as the Gomti, Yamuna and Damodar amounting to US $135 million. Sewage treatment plants accounts for 41 percent of estimated cost of NRAP while intercepting and diverting sewage through collection systems account for about another 30 percent of the funds.

In addition to the NRAP, there is a steady and consistent flow of bilateral and multilateral assistance to support the municipal water and wastewater treatment infrastructure in India. The overall overseas spending in the same five-year plan period is estimated to be US $1.2 billion.

There has been a growing realization that the large investment required to develop additional water resources in India will take much more than what the government can commit through its normal budgetary and financial allocations. As a result, some priority has been given to trying to attract private investment to assist in water sector infrastructure development. Over 25 cities have tried to attract some form of private sector participation in their proposed water and wastewater projects. A few projects such as those in Chennai, Alandur and Tirupur in the state of Tamil Nadu have succeeded in attracting private sector participation.

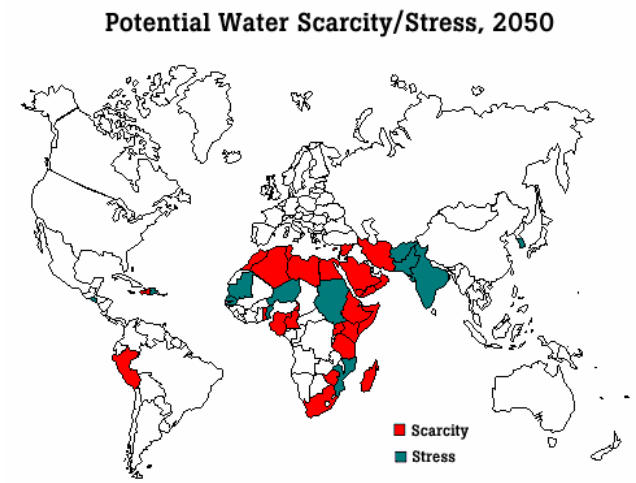
2.2 Water Resource Management

Water has become an extremely precious commodity in many areas of India. It has been in short supply in many cities for a number of years. In addition, increasing pressure of growing populations in cities has increased the demand for water and the development of additional water resources has not kept pace. Many people involved in creating or managing environmental and water supply infrastructure projects in developing countries recognize that sustainable economic development is closely related to managing the human use of and impact upon natural resources including water bodies such as rivers, lakes, groundwater aquifers, etc. that must serve as the source of water.

India's water resources are unevenly distributed with respect to both their geographical and seasonal distribution patterns. In many areas sufficient water resources to support a reasonable

standard of living are becoming increasingly scarce. The largest use of water in India is for irrigation. About 93% of available resources are used for this purpose. However, the recently adopted National Water Policy gives a first priority to the supply and use of water for domestic purposes for the urban and rural population and livestock. Competing uses for limited water resources also arise from industry, thermal/hydropower projects, fisheries and navigation. In addition, minimum flows that are required to be maintained on rivers for dilution of wastewater and other environmental uses further limit the availability of water. The Indian Central Water Commission has estimated that community needs in India will double and the industrial and power requirements will increase at an even greater pace by 2025. Therefore, competing uses of water in the future are likely to limit the water available for agriculture and irrigation, particularly near major cities and in dry regions.

In India, the average annual water availability per capita has declined from 5,236 cubic meters in 1951 to 2,464 cubic meters in 1996 and is expected to go down to 1,920 cubic meters by 2007. All the metropolitan cities in India suffer from water scarcity with supply shortfalls ranging from 30 to 60 percent. Without sustainable water supply for potable/domestic, industrial and agricultural use, sustainable development required to keep up with growing populations cannot occur. India is facing a major water shortage crisis and the conventional belief is that, if the country does not come to grips with this issue, development of all forms will suffer and an extensive proportion of the population will not have sufficient water supply for a reasonable standard of living. This is not unique to India. As shown below, there are many countries throughout the world that are experiencing or will soon experience critical water situations.



2.3 Water Supply And Use Trends

The reasons for the deteriorating situation in the India water supply infrastructure are entrenched in the way the public water supply entities currently function. Existing charges for water in most cities has little relation to the actual cost of production. Water charges were initially set close to the cost of production but over time, due to an inability to increase pricing, the gap between the actual cost of production and the charges widened and results in water charges now being completely out of line with cost. Therefore, water supply has to be subsidized by other revenues of the local government or by the state government. Currently, tariffs are usually set to cover only the O&M costs and not the capital costs associated with replacement or expansion of the system as urban areas have expanded. This has made it difficult for the India water supply infrastructure to keep up with population and development pressures.

In addition, inefficiency in managing water supply systems and leakages are a major problem also leading to loss in revenue. Unaccounted for water in Indian cities are estimated to be in the

range of 20 to 30 per cent of the total supply including leakages and other system losses such as illegal connections.

Water sources that are close to urban centers and which have been the traditional sources of potable, industrial and agricultural use are now either polluted, exhausted or will get exhausted soon. As a source of water, groundwater is also depleting and becoming contaminated. Cities, therefore, are evaluating sources of water that are often far away and very expensive to develop and convey.

Unfortunately, the bodies of water that India must rely on for water supply are in poor condition. India's rivers suffer from high levels of contamination caused by municipal, industrial and agricultural pollutant sources. According to World Health Organization (WHO) standards, 98 percent of sampled water from any one area should be free of coliform bacteria to maintain environmentally safe conditions. By this measure, most of India's surface water resources are highly polluted. Clearly, the water supply crisis in India is strongly linked to the pollution inherent to the country's water bodies. Surface water throughout the country is the major source of water for various purposes. As surface water bodies become more polluted, it is more difficult to treat the water to a reasonable level of purity and more people are exposed to unhealthy conditions associated with their having to use contaminated water as their source.

3. Project Descriptions

3.1 Rajasthan Urban Infrastructure Development Projects (RUIDP)

The Rajasthan Urban Infrastructure Development Project (RUIDP) is a US $362 million infrastructure improvement project that is being implemented in six major cities in the State of Rajasthan, India, with Asian Development Bank assistance. The cities included under the original project are Jaipur (the State Capital), Jodhpur, Kota, Udaipur, Bikaner and Ajmer, and discussions are underway to increase the Project's coverage by including an additional five towns. The major investments under the Project are in the water supply and sewerage sectors that together, will absorb about 60% of the total project cost.

3.1.1 Estimated Project Cost

Works	Approx Cost (US $ M)
Procurement of Equipment, including: Chlorinators, Bulk Flow Water Meters, Domestic Water Meters, Sewer Cleaning Equipment, Heavy Municipal machinery (Bull-Dozers, Excavators, Road Sweepers, Compactors, Hydraulic Platform for Fire-Fighting), etc., under IS (International Shopping) procedures	US $10 M
Water Treatment Plant (WTP) sector	US $10 M
Sewage Treatment Plant (STP) sector	US $20 M
Water and Sewage Pumping Stations	US $10 M
Bisalpur Jaipur Water Supply Project - Phase I	US $144 M

3.1.2 Description

- **Procurement of Chlorinators, Bulk Flow Water Meters, Domestic Water Meters, Sewer Cleaning Equipment**

  Chlorinators are to be procured for the treatment plants and rehabilitation/upgrading of the existing water treatment facilities.

  Bulk flow water meters and domestic water meters are being procured to enhance the efficiency of the distribution systems, minimize the non-revenue water (NRW) losses and improve revenue collection efficiency.

  Sewer cleaning equipment is proposed to be procured to improve the operations and maintenance capacity of the participating cities and municipalities.

- **Latest technologies are to be adopted in:**

  Water Treatment Plant (WTP) sector -- The water treatment plants proposed to be constructed are required to be based on the latest technologies so as to have a cost efficient system of providing safe drinking water.

  Sewage Treatment Plant (STP) sector -- The STPs should incorporate the latest, but tested, technologies. The treatment plant processes should be such that the O&M costs are minimum and the effluent parameters are consistently within the permissible limits and should have energy saving components (power generation from gas obtained in activated sludge process of waste stabilization), etc.

  Water & Sewage Pumping Stations -- The proposed pumping stations, both for water supply and sewage, are to be provided with high efficiency, low maintenance, pumps and motors in order to minimize the operating costs and ensure the long term sustainability of the investments.

3.1.3 Relevant Market Drivers

The project is an Asian Development Bank (ADB) funded project and is governed by the Loan Agreement between the ADB and the Government of India (GOI) and Government of Rajasthan (GOR). All procurement is being done through competitive bidding procedures in accordance with the Loan Agreement and as per ADB's guidelines.

3.1.4 Project Sites

The proposed procurements are for the six principal cities of the State of Rajasthan (the largest state in India). The six cities are:

- Jaipur, the state capital and the largest city in Rajasthan
- Bikaner, the largest city in the northern part of the state
- Jodhpur, located in western Rajasthan
- Ajmer, which is located in the central part of the state
- Kota, which lies in the southeastern part of Rajasthan
- Udaipur, which is the largest city in the southern part of the state

3.1.5 Procurement

Water and/or Waste Water Sector Procurement:

- Procurement of Equipment such as Chlorinators, Bulk Flow Water Meters, Domestic Water Meters, Sewer Cleaning Equipment, etc. under IS (International Shopping) procedures.
  - Adoption of Latest Technologies in: Water Treatment Plant (WTP) sector;
  - Sewage Treatment Plant (STP) sector;
  - Water & Sewage Pumping Stations;
- Bisalpur Jaipur Water Supply Project (estimated cost US $230 M)
- Phase I of this project, which is to be taken up immediately, is estimated to cost US $144 million. Under Phase I the most important components include a 400 mld water treatment plant, 120 km of mild steel pipeline, and mega pumping stations of approx 25,000 KW for the transmission system up to Jaipur City. This will be accompanied by a transfer system within the city, which includes many other pumping stations, booster stations and secondary transmission pipelines, reservoirs and service lines.

  A second phase of the project, valued at approximately $90 million, is expected to be taken up in about Year 2010 to expand the capacity of the water treatment plant and pumping stations up to 600 mld, using technologies and systems that are fully compatible with the Phase I works.

  Procurement for the major portion of these works (the transmission system, valued at about $100 million) is to be done through International Competitive Bidding (ICB) procedures using prequalified contractors who will be recruited under Asian Development Bank Guidelines. Advance notice for the prequalification applications was published in the ADB Business Opportunities in April 2003, and advertisement for prequalification applications is scheduled to be published in national newspapers in May 2003. Contracts will be tendered on a turnkey (design/build/operate and maintain) basis.

3.1.6 Other Sectors Procurement

- Heavy Municipal Machinery -- Bull-Dozers, Excavators, Road Sweepers, Compactors, Hydraulic Platform for Fire-Fighting etc. under IS (International Shopping) procedures.
- Solid Waste Processing Plants -- Latest technologies in Composting or Gas generation.
- GIS - Development of Geographical Information System based on Satellite Imagery/ Aerial Photography.

3.1.7 Technology Overview and Intended Application

All plant and equipment that are to be procured/installed under the RUIDP are to be robust and energy efficient with low maintenance requirements, using proven technologies that have a satisfactory performance record worldwide. All equipment should be suitable for operation in a semi-arid environment under dusty conditions, and with temperatures ranging from 0°C to 48°C. Standard power supplies is 220V/440V with a frequency of 50 cycles per second.

3.1.8 Current Status and Planned Implementation Schedule

The RUIDP started operations in late 2001, and the major portion of the small civil works programs is scheduled to be completed by 31 December 2004. However, those portions of the project, which will be of greatest interest to US suppliers and contractors, are scheduled to commence in mid-2003. As discussed above, the request for pre-qualification applications for the Bisalpur Water Supply Project is scheduled to be published later this month (May 2003). Pre-qualification is expected to be completed by September 2003, and the invitations to bid will be issued immediately thereafter. The design/build contracts are scheduled to start in early 2004, and be completed by mid-2006. Approximately 5 years of operation and maintenance of the facilities after commissioning will be included as a part of the contract packages.

Procurement of the additional equipment described above is scheduled to be taken up through IS procedures towards the end of the initial project period, around mid-2004.

3.1.9 Availability and Type of Financing

Has financing been secured? With what financial entity?	RUIDP is fully funded by the ADB (ADB Loan No. 1647-IND) and Govt. of Rajasthan
Will vendor financing be required?	No vendor financing is envisaged.
Will Ex-Im Bank financing be sought?	Not presently contemplated
Are there other state or national funds being sought?	No

3.1.10 Key Contacts

1. **Rajasthan Urban Infrastructure Development Project**
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   FAX: (91-141) 272-1919
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   Attn:
   Mr. Manoj Sharma, Project Director, RUIDP

Mr. V.D. Meena, Chief Engineer and Addl. Project Director, RUIDP
Mr. N.S. Shekhawat, Superintending Engineer and Dy. Project Director, RUIDP
Mr. R.D. Berlin, Team Leader, PMC, RUIDP (E-mail: lbii_jpr@sancharnet.in)
(The Louis Berger Group, Inc., USA)

For more information, please visit www.rajinfrastructure.gov.in

3.2 Sardar Sarovar Canal Based Drinking Water Project -- Instrumentation and Automation

3.2.1 Estimated Project(s) Cost:

- Total Project Cost: $1.4 billion
- Monitoring and Control System: $25 million

3.2.2 Project Description

The Sardar Sarovar Canal based project involves the transmission and distribution of 3,500 MLD of drinking water to 8,215 villages and 135 urban centers. The total length of the bulk water transmission line will be about 2600 km of mild steel pipeline; the line's diameter will range from 508 mm to 2,100 mm. Presently, 1,015 km of pipeline is functional. The project also includes the design and installation of a monitoring and control system (i.e. SCADA) technology for monitoring water flow rates, water pressure, loss of head, velocity of flow, metering etc. There will be at least 25 main pumping stations and about 30 intermediate pumping stations. The master control facility will be at Gandhinagar with connections to all the pumping stations either through fiber optic cable transmission or VHS/Satellite communication technology.

3.2.3 Relevant Market Drivers

Gujarat is a drought prone state; 75% of the state's area is unsuitable for ground water extraction due to a hard rock terrain and a salinity ingress over 1,600 km of coastline. The per capita availability of fresh water in Saurashtra-Kachchh and North Gujarat is on an average less than 1,000 million cubic meters per year for the 20 million inhabitants in these areas. Over the last 76 years, 26 have been were drought years. A large number of inhabitants in the rural areas relying on ground water are suffering from diseases caused by excessive fluorides in the ground water. The pattern of the monsoon is highly uncertain and there are no perennial rivers in the project area. Over 70% of surface water sources are located in southern part of Gujarat and the northern and western parts of the state do not have reliable surface water sources. Bulk water transfer through canals and pipelines from south Gujarat to these areas is the only solution.

3.2.4 Project Sites

Saurashtra, Kutch, and North Gujarat Region of Gtujarat

3.2.5 Technology Overview and Intended Application

The latest and most appropriate instrumentation and control technologies, including fiber optic cable transmission and VHS/Satellite communication technology, are being considered.

3.2.6 Project Sponsor (Organization) Description

The Gujarat Water Supply and Sewerage Board (GWSSB) is a state level agency set up by the Government of Gujarat under an Act. This agency is responsible for the conception, formulation, design, implementation, and partially operation and maintenance of rural water supply systems in the State. This board has a team of almost 3,000 water supply engineers working all through out the state. This project is a State owned public sector undertaking. The Board's annual turnover is about Rs. 8,000 Million. Presently the Chairman of the Board is an IAS Officer who is also Secretary (Water Supply) to the Government and Mr. Vasavada is the Chief Executive Officer of the Board. The Board has seven Chief Engineers.

3.2.7 Current Status and Planned Implementation Schedule:

The current status of the project is as follows:

- 1,051 km of pipeline has already been completed;
- 216 km are expected to be completed by June 2003;
- 1,421 km have been planned, designed, and are proposed to be implemented in next 2 to 3 years;
- A distribution network covering almost 1,950 villages is under implementation and is planned to be completed between June to December 2003 in a phased manner;
- A second phase of the distribution network for 1,400 villages is also planned and the bidding process has been taken up; and
- Expected project completion date is December of 2007.

GWSSB has requested U. S. Trade and Development Agency (USTDA) funding for a $180,000 feasibility study that would provide a thorough analysis of a proposed central monitoring and control system. The objective of the proposed feasibility study is to ensure that the most recent available technologies and international best practices are incorporated into the system design. The control system will be implemented concurrently with the construction of the transmission and distribution network. USTDA has set aside funding for the feasibility study, which will be competed among qualified U.S. companies. A request for proposals will be issued through FedBizOpps.

3.2.8 Availability and Type of Financing

The State Government will explore funding sources as soon as the feasibility study is concluded.

3.2.9 Opportunities for U. S. Suppliers

- Instrumentation and control system supply including software
- Technology support

3.2.10 Key Contacts

1. **Mr. B J Vasavada**
   Member Secretary and Chief Executive Officer
   Gujarat Water Supply & Sewerage Board
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3.3 Concept Note On KALPASAR Project

The Gulf of Khambhat Development Project (**KALPASAR**) is a multi objective mega project which envisages a construction of a 64.0 km long dam across the Gulf of Khambhat between Ghogha (Bhavnagar District) on the west and Hansot (Bharuch District) on the east bank of the Gulf to provide large benefits of irrigation, reclamation water supply, tidal power generation, road transport navigation etc.

Mr. Eric Wilson an UNDP expert had identified this as a potential tidal power generation project in 1975. This was followed by reconnaissance survey around 1988-89 and then a pre-feasibility report was prepared by M/s Haskonings Consulting Engineers of Netherlands in 1998. A new concept was added to provide sweet water basin to harness the waters of the rivers-Sabarmati, Mahi and Narmada for providing irrigation benefits to draught prone and water short region of Saurashtra. Government of Gujarat reviewed the pre-feasibility report and found that certain vital studies were required to be made first before preparation of the feasibility report. This was also agreed to by M/s Haskoning. Accordingly under the direction of Chief Co-coordinator, Dr. C.C. Patel, 6 specific studies were also carried out through 6 teams of International / National experts including the experts and representatives from Gujarat Government in collaboration with the concerned beneficiary departments. The studies were completed in short time of 6 months in 1999 that were submitted to the then Chief Minister in Gujarat October 1999. A Committee headed by the then Minister of Water Resources that endorsed the project for preparing a Feasibility Report (FR) reviewed the studies and recommendations made thereon. The Government of Gujarat decided to go ahead with preparation of F.R and accorded administrative approval for Rs.84.00 crores for the work. The reports are to be completed in a spell of four years.

In view of the importance of **KALPASAR** Project the Chief Minister kept the portfolio to himself and formed a new department known as **KALPASAR** DEPARTMENT (**PRABHAG**) under the new Secretary to the Government. The Core Group has been reconstituted.

3.3.2 Cost and Benefits of the Project.

The Kalpasar Project envisages the Gulf of Khambhat connecting Ghogha in Bhavnagar district and Hansot in Bharuch district. The dam will be 64 Km. long amongst which 40 Km. will be covered the gulf area and remaining will be dikes in the estuaries. The reservoir formed behind the dam with two components (I) fresh water and (2) tidal water.

The primary objectives of the Kalpasar mega project is to create a fresh water lake by storage of waters of the rivers like Narmada, Mahi, Sabarmati, etc. which would otherwise have flowed waste in to the Gulf.

Gujarat is prone to droughts due to shortage of water or scanty rainfall. The fresh water lake will provide water requirement for irrigation domestic and industrial uses, etc. The benefits of the project as planned are mentioned below:

- Irrigation: 1,054,500 ha new area, 180,000 ha firming up of the existing unreliable irrigation per year, 100,000 ha by reuse and recycling of municipal and industrial effluents; and 100,000 ha through ground water recharge. Saurashtra region that experiences the worst of drought situation would be benefited.
- Land Reclamation: - 119,000 ha land for irrigation, industrial development and residential, recreational and social amenities. Beneficiaries will be peripheral areas of the lake around the Gulf of Cambay.
- Water Supply: Domestic – 900 Mm^3 of water for a population of 36 million, industrial – 500 Mm^3 of water. It would benefit the water scarce areas of the entire State.
- Tidal Power:
  - Single basin-capacity 5880 MW (installed) – energy 12,130 GWh.
  - Double Basin-capacity 1600 MW (installed) – energy 8,078 GWh.

  Western Regional Grid will receive the power and integrate the same to meet the growing demand.
- Road: Reduction in distance between Dahej and Ghogha by 225 Km and providing sizeable relief to existing road network- /serving Saurashtra.
- Navigation: (a) Facilitating inland navigation, along Narmada from sea to Hoshangabad (in Madhya Pradesh) through Kalpasar Lake and (b) Port facility within fresh water lake which is sheltered from sea storm.
- Fisheries Development: Both in fresh as well as salt-water lakes.

The cost of the project was estimated as Rs. 54,000 crores (US $ 12 billion) in 1999. The storage capacity of the dam would increase (largest in the country). The submergence will not create any problems of resettlement, because the FRL of Kalpasar lake is kept almost the same a high tide level. With the large benefits mentioned above, the project will have lasting and positive economic impact on the Gujarat State.

For financing the feasibility studies large funds are required. Preparation of Feasibility Study requires expertise and latest technology for which assistance from U.S. in form of Consultancy services and equipment would help, in no small measure in completing Feasibility Report which is credit-worthy and which can inspire confidence of private entrepreneurs. After the feasibility studies are completed project will come under implementation stage that would have a considerable scope for U.S. services and equipment to be exported.

3.3.3 Key Contacts

1. **B.M.Rao**
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3.4 Haldia Development Authority Projects

- 30 MGD Water Treatment Plant (New)
- 20 MGD Water Supply Project (Existing)
- 10 MGD Water Supply Plant (New)
- 12 MGD HFC Water Supply Project (Old)

3.4.1 Estimated Project(s) Cost

The estimated cost of these projects is $50 million.

3.4.2 Description

- 30 MGD PLANT: This water supply project is envisaged for meeting the future demand of Haldia industrial city. The raw water is to be drawn from river Hooghly at Uluberia point approximately 50 Kms from Haldia and is to be treated at Geonkhali 15 Kms from Haldia. The project report is ready and HAD Board's approval has been obtained for implementation.
- 20 MGD PLANT: This existing plant at Geonkhali (Haldia) is a lifeline to the Haldia's industries and residents. The plant is in good condition and produces approximately 16 MGD treated water, at present. It requires improvement in terms of efficiency, and productivity.
- 10 MGD PLANT: To meet up the immediate requirement, additional capacity of 10 MGD new plant is envisaged at Geonkhali (Haldia), where a 20 MGD water plant is already in operation. The project report is being prepared.
- 12 MGD PLANT: This water plant is currently within the campus of Hindustan Fertilizers Corporation, a Government company, which has been closed recently, is likely to be taken over by HDA. This plant needs thorough renovation, repairs and improvement.

3.4.3 Relevant Market Drivers

- Increased residential and industrial demand
- Board of HDA's approval.
- Government of W.B.'s approval.

3.4.4 Project Site

- Uluberia, Howrah District, W.B.
- Geonkhali & Haldia, W.B.

3.4.5 Procurement

Both India and abroad.

3.4.6 Technology Overview and Intended Application

Treatment Technologies that would allow use of technologies that are available in India in conjunction with imported Technology.

3.4.7 Project Sponsor (Organization) Description

Haldia Development Authority & Urban Development Department in Government of West Bengal.

3.4.8 Current Status and Planned Implementation Schedule

- 30 MGD: Project report prepared; Exploration for BOT Agency is in progress; Expected Project implementation start date: April 2004
- 20 MGD: Water and energy audit work has been completed. The improvements as suggested are to be taken up. Schedule: December 2003
- 10 MGD: Project report is being prepared. Joint venture arrangement may be acceptable. Expected Schedule: December 2003
- 12 MGD: The formalities of taking over of the plant are under progress; after taking over the plant, necessary repairs, renovation and improvement have to be undertaken. Schedule: January 2004

3.4.9 Availability and Type of Financing

- Internal resources of HDA
- HUDCO Loan
- Budgetary Support from Government
- Joint Venture Investment from Private Agencies

3.4.10 Opportunities for U.S. Suppliers

- Technology and equipment supply
- Open bids

3.4.11 Key Contacts

1. **Mr. A. Subbiah**
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   Haldia, West Bengal.

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3.5 Bangalore Water Supply and Sewerage Board (BWSSB) Projects

	Project 1	Project 2	Project 3	Project 4	Project 5	Project 6
3.5.1 Project/ Procurement Title	Recycling 25 mld of Wastewater project including laying pipeline at Koramangala, Chalagatta Valley to meet non potable requirement of industries to industrial area.	Recycling of wastewater at Hebbal treatment plant for 25 mld capacity and providing necessary pipeline	Topographical surveying, conditional survey of sewers and flow modeling etc., of the entire 3000 Km of sewers in Bangalore	Implementing Cauvery Water Supply Scheme Stage IV phase II to bringing additional 500 mld project includes Production, Conveyance, Distribution, Sewage Conveyance and Treatment	Reduction of Un-accounted for water in the distribution system	Rehabilitation of CWSS Stage I water treatment plant of 135 mld capacity including SCADA and automation.
3.5.2 Cost	$4.5 Million US Dollars	$4.5 Million US Dollars	$2.0 Million US Dollars	$600 Million US Dollars	$100 Million US Dollars	$5 Million US Dollars
3.5.3 Description of the project/ procurement(s)	There are five sewage treatment plants in Bangalore city. Out of these five at one place there is a treatment plant of 163 mld capacity (K & C Valey) with secondary level. Now there is a proposal to install 25 mld capacity recycling plant for reuse of industries	Hebbal sewage treatment plant one of the existing five plants where 60 mld sewage is treated. Now there is a demand for 25 mld recycled water for power project, which is close to this plant. A fully dedicated plant is proposed for Karnataka Power Project to meet its	3000 Rmt., of sewer line of size ranging from 225 to 2000 mm is the network. The system is more than 50 year old. BWSSB intends to complete diagnosis of the sewers by carrying out Topographic survey and CCTV survey to know the condition of sewer and also	Bangalore has 6.0 million population and growing alarming rate. Augmenting water supply is very essential for take up for growing population. Additional 500 mld water from Cauvery source which is 100 Km away has to be pumped in three	Distribution system in the city has more than 40% loss both physical and commercial. There is absolute urgent need to reduce, this UFW (Un-accounted for water) to conserve water and also realize additional revenue to Board. This is the highest priority project for	This is 30 years old water treatment plant. Plant required rehabilitation with Innovative Technology to give highest quality potable water. It needs to be provided with SCADA and automation also.

	Project 1	Project 2	Project 3	Project 4	Project 5	Project 6
	around this plant. The scope of the project includes Design, Build and Operate 25 mld capacity plant suitable for all type of Industries. The secondary effluent of the plant is used for further advance treatment. Bangalore Water Supply and Sewerage Board intend to go for highly advanced technology of membrane technology, which should be of cost effective both in capital and maintenance.	requirement. BWSSB is intends to go for new technology (Membrane).	hydraulic modeling of the flows. Mainly to take up remodeling the sewerage system and also rehabilitation of the sewer. Ultimately for asset Management.	stage to bring to the city. Further sewage generated is conveyed and treated in 8 treatment plants. In addition, storage reservoirs, trunk mains, feeder mains, distribution system also need to be provided.	implementation. BWSSB has already taken up pilot project of 48 crores.	

	Project 1	Project 2	Project 3	Project 4	Project 5	Project 6
3.5.6 Relevant Market Drivers	- This includes Design - Build and Operate (EPC) - Funding from international agencies is essential.	- Design, build and Operate (3-5 Years) - Funding from international agencies is required.	- Consultant is conducting CCTV survey and flow modeling. - USAID/USAEP funding sought.	- Funding from JBIC / World Bank / ADB is sought	- World Bank /JBIC/ADB Funding required	- US Funding or any International /Local funding
3.5.7 Project Site	- Location Bangalore city, capital of Karnataka State. - Bangalore Water Supply and Sewerage Board is fully responsible for procurement and implementation	- Bangalore city, Karnataka State. - BWSSB is fully responsible for procurement	- Bangalore city - BWSSB is fully responsible for procurement	- T.K. Hally (Thorekadanahally) - BWSSB is fully responsible for procurement	- Bangalore city - BWSSB is fully responsible for procurement	- T.K. Hally (Thorekadanahally) - 80 Kms., from Bangalore city
3.5.8 Technology overview and Intended Application	- Zenon/Memcor of similar type of membrane technology is ideally suited. - Reuse water will be used for initial application such as IT industries and other general industrial requirements.	- Zenon/Memcor of similar type of membrane technology is ideally suited. - Reuse water will be used for initial application such as IT industries and other general industrial	CCTV survey, flowing monitoring and also selling of connected equipment etc.	- Project having several components such as a) Water treatment plants b) Pumping machinery c) Pipe fabrication and laying d) Civil construction and reservoirs	- New type of leak detection equipments, software and flow meters and also other gadgets required for implementation.	- Rehabilitation with highly innovative technology with Memcor, tube settlers etc.

	Project 1	Project 2	Project 3	Project 4	Project 5	Project 6
		requirements		e) Instrumentation Sewage treatment plant		
3.5.9 Project Sponsor (Orgn.,) Description	Bangalore Water Supply and Sewerage Board	Bangalore Water Supply and Sewerage Board	Bangalore Water Supply and Sewerage Board	Bangalore Water Supply and Sewerage Board	Bangalore Water Supply and Sewerage Board	Bangalore Water Supply and Sewerage Board
3.5.10 Current Status and Planned Implementation Schedule	BWSSB has already obtained administrative approval for implementation of the project. The project will be implemented with in next 28 months.	Karnataka Power Corporation (Government of Karnataka under taken) made request to be implemented in 36 months.	Administration approval is obtained and likely that a tender will be issued for in 24 months.	Administration approval from Government of Karnataka and Government of India already obtained and planned to implement in next 24 months	Administrative approval obtained by State Government. To be implemented in 60 months.	Administrative approval is under consideration under consideration like to implement in next 28 months.
3.5.11 Availability and Type of Finance	a) Vendor financing is required b) No other funding is sought if necessary local financing can be arranged.	a) Vendor financing is required b) No other funding is sought if necessary local financing can be arranged.	a) Vendor financing is required b) No other funding is sought if necessary local financing can be arranged.	a) Vendor financing is required b) No other funding is sought if necessary local financing can be arranged.	a) Vendor financing is required b) No other funding is sought if necessary local financing can be arranged.	a) Vendor financing is required b) No other funding is sought if necessary local financing can be arranged.
3.5.12 Opportunities for US Suppliers	Best opportunity is to Organize the funding from any financial institution in use and to take up construction along	Best opportunity is to Organize the funding from any financial institution in use and to take up construction		There is tremendous opportunity to supply and construction, which includes pumps, water treatment,	Tremendous opportunities for all type of Leak Detection equipments and Software etc.	Opportunities for water supply firms for Design, Build with in technology.

	Project 1	Project 2	Project 3	Project 4	Project 5	Project 6
	with new process technology	along with new process technology		SCADA, Wastewater treatment etc.		

3.5.13 Key Contacts

1. **Mr. M.N Thippeswamy**
   Chief Engineer
   Bangalore Water Supply And Sewerage Board
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3.6 Lake Pollution Remediation and Wastewater Management System, Vizianagaram

3.6.1 Estimated Project(s) Cost

Up to $5 million in Vizianagaram. Opportunities for replication exist in other parts of the country.

3.6.2 Description

The Pedda Cheruvu Lake, located in Vizianagaram town, is highly polluted and its remediation has been under discussion over the past few years. The Town Development Committee, Chaired by Mr. Kumar, has earmarked $250,000 for the remediation project using conventional activated sludge treatment. After joining the government as the District Collector, Mr. Kumar has proposed the use of an ecofriendly and less energy intensive technology based on the biological degradation of sewage. This project can be replicated in all the lakes in the state if found to be cost effective.

The State government is also considering a major water conversation effort using the latest technologies. Moreover, the Vizianagaram district has been considered under the government's sectoral reforms program and at present a Total Sanitation Program is being carried out in the district to cover all rural households (about 350,000). A Netherlands assisted Drinking Water and Sanitation Project has also recently been sanctioned with an estimated cost of about $7.1 million.

3.6.3 Relevant Market Drivers

- Rules and acts of the Government of India
- State Government rules and acts

3.6.4 Project Sites

Vizianagaram, AP

3.6.4 Project Sponsor (Organization) Description

Government of Andhra Pradesh

3.6.5 Current Status and Planned Implementation Schedule

The above described projects are already approved and scheduled to be started within the next three months.

3.6.6 Availability and Type of Financing

Partial financing is available from the district and state administrations. Other sources of financing including vendor financing are being examined.

3.6.7 Key Contacts

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3.7 Tamilnadu Urban Development Fund (TNUDF) Projects

Underground drainage systems for Ambattur, Pallavaram, Thiruvottiyur, Salem, Tambaram, and Avadi, municipalities

3.7.1 Estimated Project(s) Cost

Total estimated at $35 million

- Ambattur Rs.40 Crores ($5 million)
- Pallavaram Rs.36 Crores ($4.5 million)
- Thiruvottiyur Rs.38 Crores ($4.7 million)
- Salem Rs.105 Crores ($13 million)
- Tambaram Rs.36 Crores ($4.5 million)
- Avadi Rs.25 Crores ($3.1 million)

3.7.2 Description

A brief description of each municipality requiring an underground drainage system is provided below.

- ***Ambattur Municipality***, near Chennai City, includes an area of about 40.36 sq.km and its population, per the1991 census, is 215,454. The population is estimated to grow to 450,000 by 2030. The Ambattur Municipality is divided into 52 wards. The climate is arid and the annual rainfall is on the order of 1,150 mm. Currently, the Tamilnadu Water Supply And Drainage (TWAD) Board, the Tamil Nadu Housing Board (TNHB), and the Chennai Metropolitan Water Supply and Sewerage Board (CMWSSB) supply water to the city. The present supply is of the order of 25 litres per capita per day (lpcd). On completion of Krishna Stage Ii, Ambattur would be provided with 60 mld of water for an ultimate population of 4.50 lakhs, about 120 lpcd.

At present, most of the houses in Ambattur are provided with water borne latrine facilities. The sullage and part of the sewage are let into open roadside drains and are collected within the municipal area. This is detrimental to the health of the people and hence an underground sewerage scheme is necessary for the Municipality.
There are 3,200 individual low cost sanitation units and 42 community latrines in the entire municipality. The total installation cost of the proposed drainage project is about $5 million including installation costs, contingencies and supervision.

- ***Pallavaram Municipality*** is a first grade municipality covering an area of 18 sq.km and with a population of 148,394 as per the 2001 census. It is located about 13 km from the Chennai city limits. It is one of the major municipalities adjoining Chennai City and is classified as a distant urban area. The town consists of residential, commercial, institutional and industrial areas.

  The Palar River Scheme (owned and operated by TWAD), 50 km from the township, is currently sullies water to the municipality. This system is currently supplying 3.1 mld though it was designed for 5.40 mld.

  Most of the houses in the municipality are provided with an aquaprivy along with a septic. Generated sewage flows into septic tanks and their supernatant overflows causes odor nuisance. Sullage sewage and effluent from the septic tanks flow into open drains. At many places the drains meet obstructions causing stagnation.

- ***Thiruvottiyur Municipality*** has about 43,931 households, 309 large and small industries and about 3,930 shops and commercial complexes. CMWSSB supplies 20 lakh litres of water per day to this municipality. Including local water supply sources, per capita water supply is about 15 lpcd. Any additional supply is to be augmented from the proposed Krishna Water supply scheme.

  The sewerage system is available in 30 wards out of 48 wards. The existing underground drainage system is about 45 km in length and is designed for a population of 1.41 lakhs. A sewerage system is to be yet provided for the remaining 18 wards. The existing sewerage system, divided into 3 zones, collects the sewage in a main pumping station and pumps it to a lagoon located at a distance of 3.1 km.

  Installation of a sewerage system is proposed for an intermediate population of 3.10 lakhs by the year 2017 and an ultimate population of 4.20 lakhs by the year 2032. Most of the industries have indicated that they would treat the sewage collected in their premises and reuse the effluent themselves. Hence, the proposed system is not designed to accept industrial effluents.

  The total cost for improving the existing sewer system and installing a new system for the18 proposed wards is estimated to be about $4.7 million.

- ***Salem*** is the fifth largest city in Tamilnadu with an area of 91.34 sq.km. It is located about 340 km southwest of Madras City. The main occupation of the people is agriculture, weaving and marketing. A considerable number of sago and dyeing units

exists in and around Salem; these industries contribute to the sustained growth of the city.
The area considered for designing a new underground drainage system and sewage treatment facilities is about 20 sq.km that is the erstwhile Salem Corporation with a population of about 4.3 lakhs as per the 2001 census. Presently, Salem does not have an underground drainage system. Both sewage and storm water are discharged into open drains. These open drains are connected to open nullahs that ultimately join the Thirumanimuthar River that passes through the city.

The cost of the proposed underground drainage system including construction contingency (5%), supervision charges (5%), and price contingency (10%) is estimated to be about $13 million (Rs.104.78 Crores) excluding $15 million (Rs.121.35 Crores) for interest during construction.

- ***Tambaram Town*** is a part of the Kancheepuram District of Tamilnadu and is located about 30 km from Chennai the State Capital. The town is easily accessible by a network of good roads and rails. It is located on the National Highway - 45 (South Chennai Grand Southern Trunk Road) and along the Chennai-Tambaram Railway Line.

  The town's population grew by 28.38 percent during the decade 1991-2001 to 137, 609. The town does not have a proper underground sewerage system for systematic collection, transmission, treatment and disposal of sewage.

  The Municipality currently has a water supply of 30 lpcd excluding supply from 135 bore wells, which are catering to non-potable uses.

- ***Avadi Municipality*** covers an area of about 65 sq.km, has 48 wards and its population (year 2001) is about 2 lakhs per the 2001 census. Avadi is known for its combat tanks manufacturing industry. It is situated on western side of the Chennai City on the Chennai-Tiruvallore National Highway (Highway no. 205) running east to west. The city population is densely concentrated on both sides of this highway. A broad gauge railway to Chennai and Arakonam also passes through Avadi.

3.7.3 Availability and Type of Financing

There would be no foreign exchange involved. Though the financial closure is yet to be done, the projects would be financed by grants from the Government and loans from financial institutions such as Tamilnadu Urban Development Fund (TNUDF), a municipal financial intermediary, and Water and Sanitation Pooled Fund (WSPF), the first pooled fund in India.

3.7.4 Key Contacts

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4. Delegation Information

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5. U.S. Industry Participants

5.1 Private Meetings

PERI arranged for the delegates to visit a number of organizations responsible for operation, management, and financing of water supply, wastewater treatment, and desalination facilities. These organizations and the U.S. participants are listed below.

Tampa Bay Water	
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City Of Orlando, Public Works Department, Wastewater Engineering & Support Bureau	
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Water Infrastructure Finance Authority of Arizona	
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Reclamation Water Land Application Project, Near Palmdale Airport	
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A brief summary of the topics discussed and descriptions of sites visited is provided below. Copies of any presentation material or hand-out distributed by the participating U.S. companies are included in Appendix A.

Tampa Bay Water
The Tampa Bay Water (TBW) meeting began with an indoor presentation by Ken Herd, PE, Master Water Plan Program Manager. He discussed procurement options and contractual issues relating to the Tampa Bay Seawater Desalination facility. Ms. Koni Cassini, CPA, Director of Finance, discussed financing related to the desalination facility. General Manager Jerry Maxwell and others were also on hand to discuss procurement options (DBO vs DBOOT) and answer questions. TBW is a special district of the state of Florida. TBW is a wholesale water supply authority providing wholesale water to six local governments: Hillsborough, Pasco, and Pinellas counties and the cities of Tampa, St. Petersburg, and New Port Richey. TWB's sole responsibility is supplying drinking water; TWB does not provide reclaimed water or handle wastewater. The Tampa Bay Seawater Desalination plant uses seawater from Tampa Bay to provide an environmentally friendly, drought-proof, sustainable supply of drinking water. Although it will initially produce water at a rate of 4.2 million gallons a day (mgd), its output will be 25 mgd when at full capacity, making it the largest reverse osmosis seawater desalination facility in North America. The Tampa Bay Seawater Desalination plant is producing the world's least expensive desalinated water. Its average wholesale cost over the next 30 years is projected at just $2.49 per thousand gallons. Co-funding by the Southwest Florida Water Management District through its Partnership Agreement with TBW of up to $85 million for the plant's capital costs has further lowered the 30-year projected average cost to $1.88 per thousand gallons. At this time, TBW security protocols may prevent touring any water supply facility. However, TBW will make a final determination about a tour once the delegates arrive at Silo Bend. If a tour is conducted, TBW anticipates the group would be done by early afternoon.
City of Orlando
The City of Orlando has three wastewater treatment plants that produce reclaimed water. The northeast municipal area, as well as portions of Orange and Seminole counties, are served by the Iron Bridge Water Reclamation Facility. The west service area is served by the Water Conserv II Water Reclamation Facility and the southeast portion of the City is served by the Water Conserv I Water Reclamation Facility. Reclaimed water is highly

treated and can be used for a variety of applications. Most common uses for reclaimed water in Orlando are irrigation of green spaces such as golf courses, apartment complexes, medians, schools, and parks. Each plant has a different method for production of reclaimed water. These projects were discussed and Iron Bridge Regional Water Pollution Control and Water Conserv II facilities were visited.

Iron Bridge Regional Water Pollution Control Facility

In the mid 1970s, while most of the country was trying to upgrade from primary treatment to secondary treatment, the City of Orlando was striving for advanced levels of wastewater treatment, including nutrient removal. The effluent goals were 5 mg/l BOD, 5 mg/l solids, 3 mg/l total nitrogen, and 1 mg/l total phosphorus; stringent levels set to prevent adverse impact to the Little Econlockhatchee River.

After working with seven other local governments, the City applied for and received a grant for a regional wastewater treatment facility from the federal government under its 201 Facility Planning Program. The grant was used to build the Orlando Easterly Iron Bridge Regional WPCF.

The Iron Bridge facility is an award-winning project designed for a capacity of 24 mgd. It is one of the world's largest treatment plants using rotating biological contactors (RBCs) for BOD removal and nitrification. It is also the first facility in the United States to use RBC technology for denitrification. One hundred seventy-one BOD/nitrification RBC units, configured in nineteen trains of nine RBCs, were used.

When it became evident that the submerged RBC portion of the denitrification system could not meet the stringent nutrient levels, a Consent Decree was issued, and the City quickly took action. Bench scale studies and full-scale pilot plant operations determined that the flow between the final clarifier, which included chemical phosphorus removal, and the submerged RBCs had to be reversed. An air stripping mechanism was added to control biological film thickness on the submerged RBCs. Breakpoint chlorination and dechlorination processes were also added to supplement nitrogen removal capabilities. Testing, design, and implementation were accomplished on schedule, enabling the City to meet the EPA deadline.

Because the plant was operating at nearly full capacity from its beginning with no opportunity to increase its existing wasteload allocation, the City began to seek alternative means of tertiary treatment and effluent disposal. In 1984, a 30-acre hyacinth treatment system was devised as an interim solution. The hyacinth treatment system removed an additional 460 pounds of nitrogen and 100 pounds of phosphorus, thereby providing an additional 4 mgd of treatment capacity within the existing wasteload allocation limits of 600 pounds and 200 pounds of nitrogen and phosphorus, respectively.

Studies to determine ways to further reduce nitrogen and phosphorus concentrations in the effluent had identified the use of a wetland treatment system. Work began on a 1,250 acre man-made wetland to provide nutrient removal for 20 mgd of advanced wastewater treatment effluent. The wetland was created in an active cattle pasture, an area which 19th century survey maps indicated had been a natural wetland. Earthen berms were constructed throughout the site to create "cells" for the water to pass through, and 2.1 million aquatic macrophytes were planted, creating the Orlando Easterly Wetlands Reclamation Project. After passing through the wetland, water would be discharged into the environmental sensitive St. Johns River system.

The wetland began receiving flow from the Iron Bridge facility in 1987. Careful, continuous monitoring has documented the project's success. After a hydraulic detention time through the wetland of 30 days, nitrogen concentrations discharged have been consistently maintained below 1.0 mg/l and phosphorus concentrations have been maintained below 0.1 mg/l.

The wetland's success is also evident by the abundance of wildlife in the area. More than 150 plant species are present in the wetland and numerous animal species have made it their home, including more than 140 bird species as well as otters, foxes, deer, and numerous amphibians and reptiles, including alligators. The City designated a portion of the wetland to also function as a park, called the Orlando Wilderness Park. The site offers visitors the chance to enjoy the natural Florida environment. The project has received numerous awards from

regulatory agencies and professional societies as a means to lessen man's impact on the environment and for restoring and protecting natural resources.

In 1988, the City completed expansion work on the Iron Bridge facility, increasing its capacity to 40 mgd through the use of a five-stage Bardenpho™ biological nutrient removal (BNR) process. This expansion not only offered increased capacity, it also decreased operating costs by over $300,000 per year and improved the treatment efficiency and nutrient removal capabilities of the plant. By biologically removing much of the nutrients, the City was able to reduce its alum consumption from approximately 180 mg/l to less than 30 mg/l and totally eliminated the need for methanol.

In this same expansion effort, the City implemented an improved sludge handling and stabilization facility to provide PSRP standards for the full 40 mgd. The system uses gas recovery techniques to maintain the temperature of the digestion process. Currently, the City is studying the feasibility of converting excess gas to electrical energy to supplement the plant's power requirements.

Operation of the RBC technology proved costly due to the requirement for breakpoint chlorination to remove residual ammonia. In 1989, the Clean Water Act amendments provided the mechanism for 100% repair and replacement grants for failed RBCs. Orlando was successful in obtaining a $16.5 million dollar grant under this program, and began construction of a second 12 mgd/BNR plant. Construction was completed this year, making the Iron Bridge Bardenpho™ plant among the largest in the nation.

As a result of these efforts, the water quality of the Little Econlockhatchee River has greatly improved. Monitoring activities in 1990 showed a 74% reduction in total nitrogen, a 91% reduction in total phosphorus, and a 50% improvement in dissolved oxygen since 1980.

The total construction cost for the Iron Bridge facility and its improvements was approximately $124 million.

CONSERV II Project

WATER CONSERV II is the largest water reuse project of its kind in the world. It is also the first reuse project in Florida permitted by the Florida DEP to use reclaimed water to irrigate crops produced for human consumption. Jointly owned by the City of Orlando and Orange County, it has taken a liability (effluent previously discharged to surface water bodies) and turned it into an asset (reclaimed water) that benefits the City, the County, and the agricultural community.

The system encompasses two water reclamation facilities connected by miles of transmission pipeline to a distribution center. From the distribution center, a 49-mile pipeline network distributes the reclaimed water to 76 agricultural and commercial customers. The reclaimed water that not used for irrigation is distributed to Rapid Infiltration Basins (RIBs). The RIB network contains seven sites with 74 RIBs over a total of 2,000 acres; each RIB has one to five cells for a total of 149, and have the capacity to handle 21.70 mg daily.

Both the distribution network and the RIB site network are monitored and controlled from a central computerized control system. In the case of the RIB network, system operations take place through a computerized management system. Known as the Groundwater Operational Control System (GOCS), it allows operations personnel to forecast impacts on the groundwater system of individual or groups of RIBs.

Las Vegas Valley Water District

Las Vegas Valley is one of the fastest growing areas in the United States. This growth, combined with the water-use practices of the last 70 years, has led to significant changes in groundwater levels. In the first half of the century water was pumped from the principal-aquifer system and the near-surface reservoir for the valley's water supply and water levels began to decline. In the second half of the century, imported Colorado River water was used increasingly in the valley. Within the last decade, the principal-aquifer system has been artificially

recharged with water from Lake Mead creating a rise in water levels**.** The Las Vegas Valley Water District operates an AM/FM/GIS system that users to view information about valve, hydrant, and pipeline facilities as well as the District's pump stations, wells, and reservoirs. This system has excellent and copious underground facilities data, as well as extremely high quality aerial photos (six inches per pixel).

The visit to Las Vegas Valley Water District included site tours of a pump station construction site, a water reclamation facility, an operating pump station as well as presentations on:

- Water conservation program;
- Summer watering restrictions;
- Water smart landscaping and other efficient use of water resources.
- Financing

City of Phoenix, Water Services Department

During this visit following facilities and topics were discussed and/or visited:

- Lake Pleasant Wastewater Treatment Plant
- Industrial Pretreatment Program
- Aqua Fria Linear Recharge Project
- Drought Management Plan
- 91st Avenue Wastewater Treatment Plant
- Tres Rios Wetland

Drought impacts municipal water systems much more quickly and seriously than it does agriculture because of the more immediate and continuous demand for water in cities and towns. Population clustering means drought in the urban setting has a greater immediate impact on a larger number of persons. The threat of drought to the people, and to the urban economy, results in extensive media attention and scrutiny of drought plans and responses. The failure to plan for such shortages of water is irresponsible.

A drought contingency plan must clearly establish the criteria for action at each stage of shortage. The plan must have the least negative impact possible on the citizenry and the economy, share hardships equitably among classes of water users and population groups, and seek to maximize all available benefits from the limited supply. To prevent the otherwise inevitable slide from early stages to more restrictive ones, the plan also must have the flexibility to allow water managers to react quickly and to implement appropriate restrictions early, while making allowances for different types of use and the needs of different user classes.

Not all uses of water are the same. Some uses, such as reserves for fire suppression, critical cooling applications, and medical necessity will have to take priority over less universally beneficial applications of the available resource, such as lawn and park irrigation, maintenance of decorative fountains, and cooling of outdoor recreation areas.

Likewise, it makes little sense to curtail the use of treated wastewater for turf irrigation just because of a scarcity of fresh drinking water. Not using effluent for irrigation does not increase the drinking water supply and poses challenges, health concerns, and potential damage if this water is discharged because it is not being beneficially used. If large turf areas such as parks and golf courses are to continue to be watered during a drought, it will be incumbent on the City to aggressively and effectively communicate the reasons for this activity to avoid public outcry over 'preferential treatment' for golf courses and City parks.

Responding to Citizens

The Drought Management Plan is founded on Phoenix Water Services Department standards, and seeks to be sensitive to the needs and desires of the community. It reflects the stated preferences of the citizens of Phoenix on how the department should manage drought. The department standards, stated as goals and principles, are:

Goals and Principles

- To protect public health and safety;
- To provide sufficient water to meet the needs of Phoenix Water Services Department customers;
- To share the impacts and hardships caused by drought equitably and in proportion to the magnitude of the drought; and,
- To minimize disruption of the economy so that jobs are protected and regional economic stability is preserved.

New Project development – Wastewater Treatment Facility

To help the City of Phoenix meets its future need, the City of Phoenix Water Services Department is developing a new water treatment plant project to be built just southeast of Lake Pleasant. The first phase of the Lake Pleasant Water Treatment Plant (LPWTP) is planned to be operational in 2007 and will serve the rapidly developing northern areas of Phoenix.

The LPWTP will have an ultimate capacity of 320 mgd with the capability to serve the water needs of about 300,000 households. This plant will serve the area bounded by Carefree Highway to the south, Seventh Street to the east, and New River Road to the north and east.
The project's plans also call for a raw water pump station and a transmission main from the Waddell Canal, and a finished water transmission main from the LPWTP to the existing distribution system.

The city conducted a study to determine which type of project delivery method should be used for these major facilities. The study determined that the same operator is required for the water treatment plant and the raw water facilities (RWF), so the two project elements were combined. The study also recommended that the city use a Design Build Operate (DBO) delivery method for the LPWTP and RWF and use an optimal Design Bid Build (DBB) delivery method for the design and construction of the finished water transmission main.

Agua Fria Linear Recharge Project

The purpose of the Agua Fria Linear Recharge Project is to investigate and possibly develop reclaimed water recharge along with recreation and habitat areas in the Agua Fria River. Reclaimed water from the 91st Avenue Wastewater Treatment Plant (WWTP) is a valuable resource. Most of it is currently reused for agricultural irrigation and industrial purposes. However, an estimated 13 to 20 billion gallons of this water currently is not used and is discharged into the Salt River.

The Sub-Regional Operating Group (SROG), consisting of the Cities of Glendale, Mesa, Phoenix, Scottsdale, and Tempe owns the 91st Avenue WWTP and SROG has teamed with the Bureau of Reclamation to conduct this study to identify opportunities to reuse the reclaimed water along the Agua Fria River.

The current Agua Fria Linear Recharge Project conceptual plan is based on in-stream recharge. This type of recharge project usually involves discharging water into a dry riverbed or wash and allowing the water to percolate into the bed of the river. This conceptual plan uses the in-stream recharge method but has the option of discharging water into the Agua Fria channel at several locations; this multiple discharge is called linear recharge. The proposed study area for linear recharge extends from Indian School Road to Bell Road along the Agua Fria River.

Water Infrastructure Finance Authority of Arizona
The primary objective for having this meeting was to have an in depth discussion of financing methods for financing water and wastewater projects were discussed. During this meeting the following topics were discussed: • Public Finance in the United State • Environmental Infrastructure Finance • WIFA Overview and Experience The Arizona State Legislature created the Water Infrastructure Finance Authority (WIFA) of Arizona in 1977 to finance locally owned and operated drinking water, wastewater, and water reclamation projects. Similar to other state-level organizations throughout the United States, WIFA receives federal and state government funding to capitalize environmental infrastructure revolving loan funds. In contrast to similar organizations, WIFA leverages its revolving funds by issuing bonds secured by the federal and state contributions. Through Leveraging, issuing bonds, WIFA expands its lending capacity by as much as 400% compared to providing cash funded loans directly from the revolving funds. A twelve member Board of Directors appointed by Arizona's Governor and Legislature overseas WIFA. The Board of Directors awards financial and technical assistance to local units of government and privately owned water facilities in accordance with annual priority lists. The WIFA's mission is to maintain and improve water quality in Arizona by providing financial and technical for basic water infrastructure. WIFA direct its resources to communities with the greatest need to maintain and enhance Arizona's quality of life.
L.A. County Reclamation Water Land Application Project, Near Palmdale Airport
The delegates visited the treatment lagoons, the pump stations and pipelines, and the old infiltration beds. The delegates also observed two land application demonstration sites. One site has been in operation for a couple of seasons; the other site is newer. The new site has a "state of the art" monitoring system. Both land application sites are being used for agricultural production.
Los Angeles Department of Water and Power
During this visit several topics including project financing and water quality monitoring were discussed. Los Angeles Department of water and Power (LADWP) is the largest municipal utility in the United States. It controls its own funds and is responsible for meeting the water and electrical needs within its service area. LADWP provides water and electricity service almost entirely within the city boundary encompassing approximately a population of 3.7 million people and area of 465 square miles.

5.2 Corporate Sponsors

As the result of PERI's marketing efforts several organizations expressed a desire to host the delegates and participate in this O.V. as corporate sponsors. PERI arranged for the corporate sponsors to meet the delegation in an informal and relaxed environment. In these meetings corporate sponsors were able to present their corporate qualifications, as well as equipment and/or services that they may be able to provide for the projects being considered by the delegation. The Corporate Sponsors were provided with a description of the projects and background information on the delegates prior to their meetings. Corporate sponsors were:

Corporate Sponsors	
DATAC Technologies Ltd. Raul Ortega General Sales Manager - Americas 22001 Northpark Drive, Suite 200 Kingwood, Texas 77339 Phone (281) 348-1038 Fax (281) 348-2340 Cell (321) 302-9216 Email - rortega@datac-technologies.com Website - www.datac-technologies.com	**Valmont Water Management Group** Terry Rahe 7150 Supra Drive S.W. Albany, OR 97321 Phone: (541) 812-6612 FAX: (541) 967-7619 E-mail: terryr@cascade-earth.com
Environmental Dynamics Inc. Vikram Pattarkine 5601 Paris Road Columbia, MO 65202 Phone: (573) 474-9456 FAX: (573) 474-6988 E-mail: vikram.pattarkine@wastewater.com	**Spatial NetWorks, Inc.** Anthony Quartararo 18860 US Highway 19N, Suite 153 Clearwater, FL 33764 Phone: (727) 528-0545 E-mail: ajq3@spatialnetwrks.com

Appendix B provides corporate backgrounds as well as description of equipment and services provided by the above-mentioned corporate sponsors.

5.3 Exhibitors

PERI arranged for an exhibition where the delegates and exhibitors could exchange information in an informal and relaxed atmosphere. Breakfast, mid-morning refreshment, and lunch was hosted fro the delegates and exhibitors during this half-a-day exhibition. The exhibition provided an opportunity for detailed discussions and a review of the delegates' project needs and the services and equipment supplied by the exhibitors. Information provided by the exhibitors can be found in Appendix D. The following U.S. firms participated in this exhibition:

Exhibitors	
Environmental Dynamics Inc. Vikram Pattarkine 5601 Paris Road Columbia, MO 65202 Phone: (573) 474-9456 FAX: (573) 474-6988 E-mail**:** vikram.pattarkine@wastewater.com	**Valmont Water Management Group** Terry Rahe 7150 Supra Drive S.W. Albany, OR 97321 Phone: (541) 812-6612 FAX: (541) 967-7619 E-mail: terryr@cascade-earth.com
Myron L Company Mrs. Johnel Morgan 6115 Corte del Cedro Carlsbad, CA 92009 Phone: (760) 438-2021 FAX: (760) 931-9189 E-mail: jmorgan@myronl.com	

5.4 Supporting Organizations

A number of organizations supported this O.V. by providing information and/or by distributing the marketing material to their member firms and promoting participation in this O.V. They included:

- United States-Asia Environmental Partnership (US-AEP)
- U.S. Foreign Commercial Service
- American Water Works Association (AWWA)
- Water Environment Federation (WEF)
- Association of Water Technologies (AWT)
- Water and Wastewater Equipment Manufacturers Association (WWEMA)

PERI greatly appreciates the support provided by the above-mentioned organizations.

6. Business Briefing Participants

Last Name	First Name	Title	Company
Bharwada	Upen	Vice President – Business Development	Zenon Environmental Inc.
Collins	Roger	President	Fluid Systems Sales
Dhar	Shibu	Consultant	Princeton Energy Resources International, LLC
Khanna	Sanjiv	Senior Commercial Specialist	U.S. Embassy, The American Center
Kumar	Rajat	District Collector and Magistrate	
Mathur	Krishan M.	Superintending Engineer	Rajasthan Urban Infrastructure Development Project
Meena	Vishabmbhar D.	Additional Project Director	Rajasthan Urban Infrastructure Development Project
Morgan	Johnel	International Sales Manager	Myron L Company
Oswald	William	President	Oswald Green, LLC.
Pattarkine	Vikram	Director Process Engineering	Environmental Dynamics Inc.
Rabie	Rocio		Princeton Energy Resources International, LLC
Rahe	Terry	President	Valmont Water Management Group
Rajaraman	Venkataraman	Vice President	Tamilnadu Urban Development Fund
Ramabhadran	Sanjay	Environmental/Water Resources	Lockwood, Andrews & Newnam, Inc.
Rezaiyan	John	Vice President	Princeton Energy Resources International, LLC
Robinson	Kathryn	Director of Sales & Marketing	Myron L Company
Sankaramanchi	Siva K.	Regional Director - AP	ITT/Sanitaire
Sharma	Manoj	Project Director	Rajasthan Urban Infrastructure Development Project
Shekhawat	Narendra S.	Dy. Project Director	Rajasthan Urban Infrastructure Development Project

Last Name	First Name	Title	Company
Sheldon	Roy	Vice President & Director	ITT Fluid Technology and Motion & Flow Control
Shuster	Doug	Country Manager - South Asia	U.S. Trade and Development Agency
Subbiah	Alagirisamy	Chief Executive Officer	Haldia Development Authority
Thippeswamy	Matada N.	Chief Engineer	Bangalore Water Supply & Sewerage
Vasavada	Bhupendra J.	Member Secretary and Chief Executive Officer	Gujarat Water Supply & Sewerage Board

7. O.V. Itinerary

Day 1 – Tuesday
June 3, 2003

10:53 pm	Arrive in Tampa, Florida Northwest Airline FLT 440 from Minneapolis St. Pl.
	Transportation: Minibus from Airport to Hotel
	Hotel: Radisson Riverwalk 200 North Ashley Drive Tampa, Florida 33602 Phone: 813-226-4411

Day 2 – Wednesday
June 4, 2003

9:15 am	Introduction to O.V.
9:30 am	Depart Hotel
10:00 am	Indoor presentation at Tampa Bay Water: - Tampa bypass Canal Supply - South Central Hills Intertie - Brackish Water Desalination project - Gulf Coast Desalination Project - Tampa Bay Seawater Desalination project Near by site visits for Bypass canal supply North Central Inter-tie canal
12:00 pm	Lunch
2:00 pm	Desalination Plants Site Visit - Gulf Coast Desalination Plant - Tampa Bay Desalination Project
7:00 pm	Dinner Hosted by: Anthony Quartararo Spatial NetWorks, Inc. 18860 US Highway 19N, Suite 153 Clearwater, FL 33764 Phone: (727) 528-0545 E-mail: ajq3@spatialnetwrks.com
Night	Tampa

Day 3 – Thursday
June 5, 2003

8:00 am	Depart for Orlando
10:00 am	Meeting at City of Orlando Wastewater Engineering & Support Bureau 5100 L.B. McLeod Road Orlando FL 32811
12:00 pm	Lunch
2:00 pm	Project Financing Presentation by the Municipal Financial Experts
4:00 pm	Check in to Hotel: Orlando Hotel: Radisson Inn Lake Buena Vista 8686 Palm Parkway Orlando, Fl 32836 407-239-7400
Evening	Free
Night	Orlando Hotel: Radisson Inn Lake Buena Vista

Day 4 – Friday
June 6, 2003

9:00 am	Depart Hotel for CONSEV II Project site (25 miles)– World's largest reclaimed water treatment facility. First will meet at the main office and then go to the project site.
9:30 am	City of Orlando (First meet Wastewater Engineering & Support Bureau 5100 L.B. McLeod Road Orlando FL 32811
12:00 pm	Lunch
5:00 pm	Return to Hotel
7:00 pm	Dinner hosted by: Raul Ortega General Sales Manager - Americas 22001 Northpark Drive, Suite 200 Kingwood, Texas 77339
Night	Orlando, Florida

Day 5 – Saturday June 7, 2003	
Morning	Free
5:30 pm	Depart for Airport
10:02 pm	Arrival at Las Vegas Airport Hotel: Crown Plaza 4255 S. Paradise Road Las Vegas, NV 89109 800-330-9802
Day 6 – Sunday June 8, 2003	Rest and Relaxation
Day 7 – Monday June 9, 2003	Las Vegas
9:00 am	Depart Hotel for meeting at Las Vegas Valley Water District 1001 South Valley View Boulevard Las Vegas, Nevada 89153
9:30 am	Las Vegas Valley Water District Indoor presentation on: • LVVWD Water Waste Policies; • Waste Ordinances; • Water Use Restrictions • Project Financing and Municipal Bond Issue
12:00 pm	Lunch
2:00 pm	Project Site Visits: • Major Water Pipeline Construction Site Visit • Water Quality Analysis and Monitoring Laboratory • Wastewater Treatment Facility
Evening	Free
Night	Las Vegas
Day 8 – Tuesday June 10, 2003	Las Vegas/Phoenix
9:30 am	Depart Hotel for the airport

12:30 pm	Arrive at Phoenix Airport, Main terminal Transportation will be provided
2:30 pm	Meeting at City of Phoenix, Water Service Department 200 West Washington Street 9th Floor Phoenix, AZ 85003-1611 Discussion topics: • Agua Fria Linear Recharge Project; The purpose of the Agua Fria Linear Recharge Project is to investigate and possibly develop reclaimed water recharge along with recreation and habitat areas in the Agua Fria River. Reclaimed water from the 91st Avenue Wastewater Treatment Plant (WWTP) is a valuable resource. Most of it is currently reused for agricultural irrigation and industrial purposes. However, an estimated 13 to 20 billion gallons of this water currently is not used and is discharged to the Salt River
5:00 pm	Check in to Hotel: Crown Plaza Hotel 2532 W. Peoria Ave. Phoenix, AZ 85029 602-943-2341
Evening	Free
Night	Phoenix
Day 9 **June 11, 2003**	Phoenix, Arizona
9:00 am	Depart Hotel for meeting at City of Phoenix, Water Service Department 200 West Washington Street 9th Floor Phoenix, AZ 85003-1611 Review and/or visit: • Drought Management Plan • Lake Pleasant Water Treatment Plant • Sewer Services • Storm Water Contamination Prevention • Water and Wastewater Facts • 91st Avenue Wastewater Treatment Plant; • Raw Water Pump Station site visit • Water Quality Testing Laboratory

12:00 pm	Lunch
2:00 pm	Water Infrastructure Finance Authority of Arizona Mr. Greg Swart Executive Director WIFA 1110 West Washington, Suite 290
4:00 pm	Depart for the Airport
8:30 pm Night	Arrive at Los Angeles, Terminal 1 Transportation will be provided to Hotel: Radisson Hotel Maingate 1850 South Harbor Blvd. Anaheim, CA 92802 714-750-2801
Day 10 – Thursday June 12, 2003	Technology Exhibition, Business Briefings and meetings (Los Angeles)
8:3 0 am – 12:00 pm	Breakfast & Technology Exhibition
12:00 pm - 1:15 pm	Lunch
12:45 pm – 4:00 pm	***Business Briefings***
1:45 pm –1:15 pm	Registration
1:15 pm – 1:25 pm	Welcome, Introduction and Working with USTDA Mr. Douglas Shuster, Country Manager
1:25 pm – 1:45 pm	RUIDP Projects Mr. M. Sharma, Project Director, RUIDP, Rajasthan
1:45 pm – 2:05 pm	GWSSB Projects Mr. B.J. Vasavada, Member Secretary, GWSSB, Gujarat
2:05 pm – 2:25 pm	Haldia Development Authority Projects Mr. A. Subbiah, CEO, Haldia Development Authority, West Bengal
2:25 pm – 2:40 pm	Coffee Break
2:40 pm – 3:00 pm	BWSSB Projects Mr. M. N. Thippeswamy, Chief Engineer, BWSSB, Bangalore, Karnakata
3:00 pm – 3:20 pm	Vizianagaram Projects Mr. R. Kumar, District Collector and Magistrate, Vizianagaram, Andhra Pradesh
3:20 pm – 3:40 pm	TNUDF Projects Mr. R. Venkatraman, Deputy Managing Director, TNUDF, Tamil Nadu

3:40 pm – 4:00 pm	Chennai Projects Mr. L. N. Vijayaraghavan, Secretary, Municipal Administration and Water Supply, Chennai, Tamil Nadu
4:00 pm – 6:00 pm	One-on-one meetings
7:00 pm	Dinner hosted by: Vikram Pattarkine Environmental Dynamics Inc. 5601 Paris Road Columbia, MO 65202
Night	Anaheim

Day 11 – Friday
June 13, 2003

7:30 am	Depart Hotel for L.A. County Reclamation Water Land Application Project, Near Palmdale Airport Mr. Terry Rahe will accompany the delegation from the hotel to the site.
12:00 pm	Lunch
2:00 pm	Los Angeles Department of Water & Power 111 N. Hope Street Los Angeles, CA 90012 Topic of discussions: a) Los Angeles Aqueduct and Water Projects b) Water Shortage and Water Conservation Program c) Municipal Bond Issuing for Project Financing
7:00 pm	Dinner hosted by: Terry Rahe Valmont Water Management Group 7150 Supra Drive S.W. Albany, OR 97321
Night	Anaheim

Day 12 – Saturday
June 14, 2003

5:30 am	Depart hotel for Airport

Appendix A
Private Meeting Information Packages

Tampa Bay Water

City of Orlando

Las Vegas Valley Water District

City of Phoenix, Water Services Department

Water Infrastructure Finance Authority of Arizona

L.A. County Reclamation Water Land Application Project, Near Palmdale Airport
(Presentation material not available for distribution)

Los Angeles Department of Water and Power
(Presentation material not available for distribution)

Appendix B
Corporate Sponsors' Information Packages

DATAC Technologies Ltd.

Valmont Water Management Group

Spatial NetWorks, Inc.

Environmental Dynamics Inc. (See Appendix D)

Appendix C
Delegates' Presentation Material

Rajasthan Urban Infrastructure Development Projects (RUIDP)

Gujarat Water Supply & Sewerage Board (GWSSB)

Haldia Development Authority Project

Bangalore Water Supply and Sewerage Board (BWSSB) Projects

Tamilnadu Urban Development Fund (TNUDF) Projects

Appendix D
Exhibitors' Information Packages

Environmental Dynamics, Inc.

Myron L Company

Valmont Water Management Group (See Appendix B)

Appendix E
O.V. Promotional Flyer

Appendix F
Photos from the Indian Delegation's Visit to TREJ RIOJ