REMARKS BY GEORGIA TECH PRESIDENT G. WAYNE CLOUGH
Georgia's Water Future, April 8, 2003

Thank you, Don Allen. It is a pleasure to be here and have this opportunity to talk with you about Georgia's water future.

Your thinking and discussion this morning has been focused on the State of Georgia. What I would like to do is place that discussion into a larger context of water issues across the nation and around the world, because many of the problems we face in Georgia are a microcosm of what is happening around the world. And I hope to raise some of the more fundamental questions that are important to keep in mind as you discuss Georgia's water future.

By profession I am a civil engineer, and we civil engineers live at the intersection between human society and the natural environment. We plan, design and build the infrastructure society needs, from transportation and energy, to major structures and water/sewer systems. And increasingly, our challenge is to do that in ways that do not destroy the natural environment or deplete essential natural resources faster than they can be replenished.

This is a very important function, but one that is often ignored. Our society is enamored of new technology in computing, consumer electronics, communications and biotechnology, but we have tended to have a blind spot when it comes to the basics society needs for its very life and breath. As a result, we are facing growing problems with our infrastructure and the environment – problems that will come home to roost in the coming decades.

One of the biggest problems, if not THE biggest, will be an adequate supply of clean water. About six months ago, I was part of a large group of the nation's leading engineers, technology experts, and thinkers who gathered at the Woods Hole Oceanographic Institution to discuss the long-term future of engineering and the challenges it will face. As part of that discussion, we voted on 100 potential issues our nation and our world might face in the coming decades. The problem receiving the most votes as the most pressing was the availability of fresh water.

Early last month, lost in the shadow of the news about impending war in Iraq, was news of the World Water Development Report issued by the United Nations – a 600-page report, more than two years in the making, that is the most comprehensive assessment ever of the planet's most essential natural resource – fresh water. The report projects that within the next 20 years virtually every nation in the world will face water supply problems.

By the calculations of the United Nations, the population of the world passed 6 billion in October of 1999. It took all of human history until the early part of the 1800s for the world's population to reach one billion. The most recent billion was added in just 12 years. Fortunately, the next billion is projected to take 14 years instead of 12, and the UN's latest projections are that world population will peak around 2050 at about 9 billion people, then begin to decline.

However, the question remains of how to accommodate the needs of an additional three billion people during the next 50 years, and fresh water is central to that question. Water consumption around the world has been doubling every 20 years – increasing at twice the rate of population growth. We have been depleting our supplies of fresh water faster than Mother Nature can replenish them, and available fresh water per capita has dropped 33 percent since 1970. Water tables are falling in China, India, and the United States, which together produce half of the world's food, and more and more rivers are bled dry before they ever reach the sea.

Presently more than a billion of the world's 6 billion people have no access to clean drinking water, and 2 billion people live in conditions of scarcity. The recent UN report projects that by 2050, 7 billion of the world's 9 billion people could face a scarcity of fresh water.

We Americans tend to think of those problems as being somewhere else – in less sophisticated nations than our own. But Texas, Oklahoma, Kansas, and Colorado have all lost irrigated land during the past two decades because of aquifer depletion. The Colorado River has become so dammed, diverted, and over-exploited that there is very little water left in the riverbed when it reaches the Gulf of California, and the fishery that once existed at its mouth has disappeared. Federal-state agreements designed to restore the Colorado will require significant cutbacks in the water drawn from the river, and Southern California will soon be looking for new sources of millions of gallons of fresh water.

In their book *Blue Gold*, Maude Barlow and Tony Clarke – probably America's foremost water experts – write, "Quite simply, unless we dramatically change our ways, between one-half and two-thirds of humanity will be living with severe fresh water shortages within the next quarter century… The hard news is this: Humanity is depleting, diverting, and polluting the planet's fresh water resources so quickly and relentlessly that every species on earth – including our own – is in mortal danger."

Here in Georgia, we have plentiful supplies of both surface and groundwater, so we tend to think of fresh water as an abundant resource. In reality fresh water comprises only 2.5 percent of the Earth's water, and much of it is frozen in glaciers and ice caps. Less than three-tenths of one percent of the Earth's water is in the lakes and rivers that have served as the main sources of water throughout human history.

The causes of water scarcity are multiple. Not only does a growing population demand more water for its own use, but feeding its increasing numbers has required more and more irrigated farmland. In fact, irrigation accounts for 70 percent of the fresh water used today. However, 8 percent of the world's food is now being grown using one-time water resources that cannot be naturally replenished, and that is likely increase.

Other contributors to the problem are the pollution that has come from increased population and industrialization; harmful water management policies, including an over-use of dams; and global warming, which causes both droughts and severe storms that pollute surface water.

The world's increasing urbanization has also magnified the problem. Not only do cities gather a critical mass of people and industries that require large amounts of water, but urbanization

creates a permanent loss of water. Surface water disappears as wetlands, ponds and lakes are filled in to make way for buildings, streets and parking facilities. And, instead of being absorbed into the earth to replenish aquifers, rainwater flows off of impervious surfaces like roofs and pavements into storm sewers that carry it away. As a result, the underground water table drops.

We have a good example right here in Georgia. Savannah draws its water from the Floridan Aquifer, and the city's concentration of impervious surfaces prevents rainwater from renourishing it, so that a large cone-shaped depression has developed in the water table under the city. Savannah's proximity to the coast makes the depression particularly worrisome, because it provides an opportunity for salt water to infiltrate the aquifer. Once it is invaded by seawater, an aquifer is lost to use.

The UN World Water Development Report was issued in preparation for the third World Water Forum, held in Kyoto, Japan, the week of March 17th, with delegates from more than 100 nations and thousands of other interested parties. While that forum provided few solutions, it did help to bring several important underlying issues into clearer focus.

First, fresh water resources around the world are unevenly distributed, and political boundaries have usually been established with no regard to natural resources like water. As the planet's store of fresh water continues to shrink, what are now low-level conflicts in places like the Middle East have the potential to escalate into outright wars. In fact, some predict that the world's next great wars will be about water resources.

We've had a taste of that here in Georgia with the "tri-state water wars," but this is just a trifle compared to the potential for conflict around the world. More than 260 of the world's river basins are shared by two or more nations. These areas account for 40 percent of the world's population. When one country seeks to dam up, siphon off, or pollute that shared resource, the other nations who use it may rise up in protest.

For example, look at the Middle East. We tend to think of oil as being the flashpoint in Iraq. But if Turkey dams the Euphrates River for irrigation, as it plans to do, Iraq will lose 80 to 90 percent of its allotment of water from the Euphrates. Controlling access to water is also an important factor in Israel's occupation of the West Bank. Israel takes more than 80 percent of the West Bank's water for its own consumption, leaving the Palestinians who live there with less than 20 percent.

However, others see water as a possible agent for solving conflict. Over the past 50 years, about 400 treaties for surface water use have been signed. UN water resources chief Manuel Dengo says, "If you are sharing water with your neighbor and using the same pipeline, you are really connected." But signing treaties that prevent water wars will require the world to face the problem squarely.

A second underlying issue is captured in the title of the Barlow and Clarke book I quoted a moment ago – "blue gold." As fresh water grows scarce around the world, its value has been increasing, and private corporations are increasingly viewing it as a way to turn a profit. The question that emerged quite dramatically in Kyoto is whether to view water as a resource that is

essential to all forms of life, or as an economic commodity to be sold on the market to the highest bidder. More than a thousand participants left Kyoto in protest of what they perceived to be a strong advocacy of privatization of water resources. They fear privatization will make water yet another commodity that divides the rich from the poor.

Atlanta found its experience with private provider to be problematic enough, but in Cochabamba, Bolivia, a private provider raised rates as much as 300 percent. Tens of thousands of residents rioted, forcing company executives to flee the city and Bolivia to cancel the contract.

The task of solving water supply problems, whether internationally or here in the Southeast is usually allocated to politicians and policy makers. But both environmental conferences like the one in Kyoto and inter-state water discussions here in our own backyard clearly indicate the difficulty of political solutions. Political solutions inevitably call for someone to make a sacrifice, and nobody wants to volunteer. This is where engineers can step up to the public policy table and provide data and technology that can help to move the discussion forward.

For example, Georgia Tech civil engineering professor Aris Georgakakos is developing a science-based technological water management system for the Nile River basin. His system gathers scientific data from satellites, radars and on-site sensors about rainfall, river flow and stage hydrographs, soil moisture distribution and changes, and water loss through evaporation and transpiration by plants. The data is fed into a computer program that simulates the response of the river and its reservoirs to different decisions relative to inputs, water withdrawals, and power demands.

This data presents a whole-basin view of the river and establishes a scientific basis for policy decisions. It clarifies the results, ramifications and trade-offs of decisions about water. The water management system was first set up in Egypt and is now under discussion by the other major countries through which the Nile flows – Ethiopia, Kenya, Sudan, Tanzania, Uganda and Zaire. It is also being used as a prototype for other river basins in China, Greece, and Brazil.

I thought of Aris Georgakakos' system when I read in the newspaper last Tuesday that the governors of Georgia, Alabama and Florida were planning a tri-state water summit on April 21st. Alabama worries that Georgia is taking too much water before the rivers reach the state line. Florida worries that water use by both Georgia and Alabama will reduce the flow of fresh water to the Gulf, upsetting the delicate balance of the estuaries. Georgia says Alabama and Florida should stop worrying – even with the drought of the past four years, there was still enough water. And Atlanta could point to all the rainwater that runs off into the river from the city's impervious surfaces instead of soaking into the ground.

There are also disagreements within Georgia itself, with other areas of Georgia concerned about Atlanta's withdrawals from the Coosa and Chattahoochee Rivers, and northwest Georgia opposing the prospect of an inter-basin transfer from Lake Allatoona to Lake Lanier. There is also a court suit aimed at halting the construction of reservoirs planned for northwest Georgia and metro Atlanta.

Maybe we need a system like Dr. Georgakakos has created for the Nile to collect scientific data and integrate it in a computer model that simulates the behavior of entire river basins, so that we would know whether there is enough water and what the ramifications of our decisions would be.

Another contribution technology can make is to recycle wastewater. “Toilet to tap recycling” does not sound very appealing to most people, although, in fact, it already happens. Atlanta dumps its treated wastewater back into the Chattahoochee, and it comes out of the faucet in Columbus.

Some cities use treated wastewater to water golf courses and parks, conserving municipal drinking water that would otherwise have been used for those purposes. Tampa Bay, for example, is developing a $28 million system to pipe treated wastewater to neighborhoods and businesses for watering. Several Texas cities have reclaimed water systems that supply treated wastewater for flushing toilets and air conditioning in office complexes. Georgia has hundreds of golf courses, and each uses about 50 million gallons of water a year. This might be a future use for recycled stormwater or wastewater.

Here in Atlanta, I recently chaired the Mayor’s Clean Water Advisory Panel, a group of composed not of politicians, but of national experts in areas like water and sewer systems, urban infrastructure, and environmental issues. The panel’s task was to review the city’s sewer improvement plan and provide advice for further improving Atlanta’s storm and wastewater systems, which are about 20 years behind where they should be.

The panel’s creation was triggered by the need to overhaul the outdated sewer system to prevent overflows of sewage into the Chattahoochee River. But the recommendations that were adopted go beyond merely preventing overflows of sewage to create a long-term water management plan that gives Atlanta the ability to capture and treat most of the stormwater that the city has been losing. The city’s Clean Water Atlanta plan also calls for continuous monitoring of the city’s streams and rivers to document water quality and identify sources of pollution.

Desalinization is another contribution that technology can make to the problem of water scarcity. The United States already has 1,200 plants that remove salt from brackish groundwater, making it drinkable, but they tend to serve small communities. However, recent technological advances are making the desalinization process cost-efficient for larger communities.

Around Tampa Bay in Florida, pumping groundwater for 2 million people has lowered the water table and begun drying up wetlands that are critical to the bay’s ecological health. The Southwest Florida Water Management District has ordered the community to cut in half the water it is drawing from 11 of its 12 well-fields. Tampa Bay is now building a desalinization plant that will provide 25 million gallons of drinkable water a day.

Southern California, which needs to develop new water sources to replace the Colorado River, is reviewing plans for several desalinization plants that combined would produce 120 million gallons of drinkable water per day.

We are not used to thinking of water as a scarce resource. After all, Georgia is not a desert. But our state grew rapidly during the 90s – more than 26 percent, just over double the national growth rate. From 1970 to 1995, water use in the South doubled. Many of our industries – from carpet mills to power plants, from textile factories to breweries – are dependent on water. Some are beginning to hold back on expansion plans until they can be assured of adequate access to water in the future.

The list of questions about who controls water and how it should be managed has been growing. As we look to Georgia's water future, we can paint a dim picture in which a precious resource grows increasingly scarce through pollution, neglect, and failed political policies. Or we can paint a much more optimistic picture in which improved technology and infrastructure helps us make effective use of this resource and provide a basis for sound policy decisions and agreements with our neighbors.

Obviously the second picture is the one we all want to achieve, and an important component in working toward it is to continue to gather at meetings like this forum and lay questions and information and ideas on the table for discussion.