

AMERICAN SOCIETY OF CIVIL ENGINEERS 2009 ASSESSMENT OF GEORGIA'S INFRASTRUCTURE

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Abstract. Maintenance and improvement of Georgia's infrastructure is vital to our economy, safety, environment and quality of life. To help assure that this infrastructure meets the needs of the citizens of Georgia, the Georgia Section of ASCE developed the 2009 Georgia Infrastructure Report Card. It was released in January 2009. As was the case in the previous report card (2003), Georgia's infrastructure once again received an overall grade of "C." Eleven infrastructure categories were assessed: wastewater, drinking water, stormwater, energy, dams, school facilities, transit, bridges, airports, solid waste, and parks. This paper will focus on the condition of Georgia's infrastructure within the following Water Resources categories:

Wastewater "C" – Even though the City of Atlanta invested over \$1 billion upgrading its aging sewer system since 2003, the majority of communities are consistently underfunding maintenance of their collection systems. Utility rate structures need to be adjusted to meet both capital improvement and maintenance costs.

Drinking Water "C+" – While drinking water quality is good, much needs to be done to maintain the distribution system. There are also water supply concerns that were brought to the forefront during the recent drought. Reduced water revenues that resulted from required water conservation measures put the capital improvement programs of many municipalities in jeopardy.

Stormwater "D+" – Some progress was made in the past five years; however, most of the progress was in planning with the development of the Georgia State-wide Water Plan and the Metropolitan North Georgia Water Planning District's Watershed Management Plan. Little has been implemented and most municipalities still do not have a dedicated funding source for maintenance of stormwater infrastructure.

Dams "D" – As of January 2009, one-third of the high-hazard dams in the state, which are dams that could cause the loss of life if they fail, were considered deficient. The Georgia Safe Dams Program was woefully underfunded and understaffed, which resulted in a dam failure analysis backlog of more than 500 dams. This is an area of critical investment need on the state level.

INTRODUCTION

With new grades for the first time since 2003, Georgia's infrastructure has shown very little improvement and once again received a cumulative grade of "C." The Georgia Section of the American Society of Civil Engineers (ASCE) assessed the same 10 infrastructure categories as 2003: wastewater, stormwater, drinking water, energy, dams, school facilities, transit, bridges, airports, and solid waste. One new category was added, parks. This document will focus on the water resources categories of wastewater, stormwater, drinking water, and dams.

Improvements have been made in some categories, including wastewater. Progress has been made in the regional and state-wide planning of water, wastewater, and stormwater with the development of the Georgia Comprehensive State-wide Water Management Plan. However, continued state funding will be critical for the successful implementation of the plan which includes the development of regional water conservation and development plans. Georgia has also significantly underfunded the Safe Dams Program. The large number of deficient high-hazard dams and lack of staff to perform dam failure analyses puts life and property at risk.

GRADING PROCESS OVERVIEW

The 2009 Georgia Infrastructure Report Card was modeled after the national ASCE Report Card for America's Infrastructure. A committee of more than 25 volunteer practicing civil engineers was assembled to collect, review and evaluate data. They then developed grades and recommendations. In most cases, existing data from federal, state and local agencies and organizations were compiled and analyzed. In some cases, new data were collected from phone conversations with experts in the field. The fundamental grading criteria evaluated were condition, capacity, operation and maintenance, funding, future need, public safety and, where possible, resilience. Resilience is the ability to prevent or protect against significant multi-hazard threats and incidents and the ability to quickly recover critical services.

For each infrastructure category, each of the grading

criteria was assigned a weighting factor. In most categories, more weight was placed on condition, capacity, funding and future needs because these are core criteria and better data were usually available for evaluation in these areas. The data were evaluated against objective grading criteria and a grade was assigned. Grades were assigned as follows: A = 90-100%, B = 80-89%, C = 70-79%, D = 51-69% and F = 50% or lower.

The fact sheet for each infrastructure category was peer reviewed by a group of technical experts not involved with the initial preparation. The fact sheets were also reviewed externally by other organizations with experts in the field, other ASCE Sections and ASCE National.

WASTEWATER

The Georgia Section of ASCE has assigned wastewater a grade of “C” due to the aging infrastructure, the number of individuals not served by public sewers (26 percent of households in the metro Atlanta area), the significant financial resources required to upgrade wastewater systems, the lack of current funding sources, and the additional capacity required for growth. The final grade was obtained by applying an equal weight to condition, capacity, operation and maintenance, and public safety, with a slightly higher weight applied to funding and future need. Funding and future need were given a higher weighting because they directly impact the other criteria. There was much uncertainty regarding the possibility of federal funding for wastewater in 2009. In addition, many utilities were struggling with reduced revenues due to water conservation as a result of the recent drought. Meanwhile, the future need for properly maintained systems is still large.

In recent years Georgia has taken a proactive stance in moving toward planning, advanced treatment and reuse applications. Since 2003, significant progress in the metro Atlanta area has included construction of new wastewater treatment facilities and decommissioning of less efficient facilities; completion of operational changes at two Georgia Power plants to reduce heat load to the Chattahoochee River; construction of Gwinnett County’s F. Wayne Hill water reclamation facility, which will discharge high quality effluent to Lake Lanier; and completion of three combined sewer separation projects in the City of Atlanta. The city of Atlanta has also completed Sanitary Sewer Evaluation Survey (SSES) on more than two-thirds of its sewer system since 2001 and is expected to complete the entire 1,500-mile system by the end of 2011. Rehabilitation of Atlanta’s sewer system has begun and is expected to continue until 2014.

While these improvements are significant, most facilities and maintenance programs only meet the minimum requirements of the Environmental Protection Agency (EPA) and Environmental Protection Division (EPD) of

the Georgia Department of Natural Resources (DNR). Overall, the state is not exceeding minimum requirements, further contributing to the grade of “C”.



Figure 1. F. Wayne Hill Water Resources Center in Gwinnett County

Existing sewer facilities are comprised of two main components: the collection system and treatment facilities (wastewater treatment plants). In general, collection systems appear to be in worse condition than wastewater treatment plants (WWTPs), which receive greater scrutiny during the permitting process due to the regulatory focus on meeting water quality standards. In Georgia, wastewater treatment permits are issued by EPD.

Recommendations for wastewater include:

- **Management of Wastewater Infrastructure:** It is recommended that municipalities consider future WWTP consolidation, return reclaimed water to source basins, upgrade WWTPs to protect water quality and incorporate reuse features, offset direct withdrawals for potable water with alternatives such as non-potable irrigation, and enhance reliability of plants and pump stations.
- **Wastewater Collection System Inspection and Maintenance Program:** Municipalities should ensure availability of adequate collection and conveyance capacity, proper operation of all sewer system components, and reduction or elimination of wastewater overflows, spills and bypasses.
 - **Septic System Inspection and Maintenance Program:** It is important to improve site selection, design and construction requirements; improve and enforce maintenance requirements; establish a decentralized management system; and manage private treatment systems, especially septic systems.
 - **Local Planning:** Planning should address short and long-term issues, consumptive uses and interbasin transfer. Local management plans need to be coordinated with statewide plans.
 - **Regulatory:** Georgia EPD is expected to modify existing permits and future permits with more stringent requirements. EPD will also need to increase the number

of maintenance staff and inspectors and the training they receive.

- **Funding:** To improve system performance, municipalities need to improve their planning efforts for obtaining timely funding from traditional sources of financed loans and user revenue. Increased federal funding could also be obtained through a unified appeal, illustrating the capacity for collaboration among local, regional and state interests. Asset management programs should be implemented at every level.

DRINKING WATER

The average person uses 150 gallons of water per day for uses such as drinking, cooking and bathing. According to the U.S. Census Bureau, the population of Georgia was 6.5 million in 1990. By 2000, the population increased to 8.2 million, and by 2007 it was estimated to be 9.5 million. Georgia's population is forecasted to reach 12 million by 2030. As the Georgia population grows, so does the demand for safe drinking water. This increasing demand for drinking water has been exacerbated by recent droughts. For many parts of the state, the 2007 - 2008 drought is the most severe on record and follows closely on the heels of the 1998 - 2002 drought. In response to this scarcity of water, concerns have heightened among Georgia and its neighboring states, and among regions of the state, that some local water supplies will be inadequate due to water use by others.

The 2009 grade assigned to drinking water is a "C+". In 2003, Georgia drinking water infrastructure received a grade of "B-" based on the large percentage of the population receiving potable drinking water, the planning for additional capacity required by population growth, and the expectation that future needs would be addressed by the state water management plan. Since then, there have been both positive and negative changes. There has been an improvement in the quality of the water as more treatment plants implement the latest treatment technologies. In addition, Georgia adopted the Comprehensive State-wide Water Management Plan. On the other hand, water shortages were severe enough during 2007-2008 that state mandated restrictions were necessary. Georgia residents responded to the drought and conserved water. This led many municipalities to see reductions of more than 20 percent in water revenues. However, this reduction in water use and revenues did not reduce the capital needs for municipalities to maintain and upgrade their water distribution systems.

Addressing infrastructure issues requires significant financial resources to both upgrade aging infrastructure and meet future needs. The cost of these improvements is estimated to be in the billions of dollars. However, the economies of the nation, and Georgia, have declined to the extent that in 2008 the Governor eliminated funding for

new reservoirs as part of across-the-board cutbacks to offset the shortfall between the state budget and incoming revenues. The economy is not expected to significantly improve in the short term, thus leaving future increases in funding of water projects in doubt. According to the U.S. Census Bureau, the population of Georgia is expected to increase 28 percent by 2030. Capacity must stay abreast of population growth if the well-being of the state and its citizens is to be protected.

By applying an equal weight to the condition of the existing drinking water infrastructure, the need for capacity increases and the associated funding requirements, the final grade of "C+" was assigned.

Recommendations for drinking water include:

- **Construction of Water Supply Reservoirs:** Reservoir capacity in north Georgia needs to be expanded to ensure future needs are met. This can be accomplished by the construction of new reservoirs and the expansion of existing reservoirs. In most cases, this can be accomplished by local governments with the assistance of GEFA and other state agencies that can provide technical assistance in reservoir planning, permitting and design. The necessary increase in reservoir capacity can be assisted by the development of a comprehensive wetland mitigation strategy for the state.

- **Management of Drinking Water Infrastructure:** In the future, Georgia municipalities need to consider higher levels of treatment, enhanced system interconnections, implementation of water conservation and reuse plans, and drought and emergency planning. Through asset management programs, water utilities can collect accurate data about their assets to provide a better understanding of their maintenance, rehabilitation and replacement needs. Asset management programs need to be implemented for all drinking water systems.

- **Water Supply Source Protection:** It is necessary to better evaluate water supply sources, provide protection plans and assess needs for higher levels of treatment.

- **Water Conservation Program:** Municipalities must establish water conservation programs. The current conservation measures have shown that significant reductions in water demand can be achieved by such measures.

- **Water System Interconnection:** Construction of interconnections between water systems can increase reliability in times of system failure or drought.

- **Statewide Planning:** Based on projections for increasing demands on water resources, coordinated water planning is an ongoing need. The Comprehensive State-wide Water Management Plan provides the framework to measure water resources, forecast how much water supply will be needed to support future growth and identify regional solutions to water needs. The state legislature needs to continue to fund the implementation of the plan.

- **Regulatory:** The Georgia EPD needs to impose more stringent requirements in order to meet water allocation plans at both the regional and state level.
- **Funding:** In order to make future facility improvements, municipalities need to improve their planning efforts to obtain adequate funding from traditional sources, including ensuring rate structures meet the funding needs. Federal aid could help many municipalities jumpstart their capital improvement programs. However, local water utility rate structures need to be adjusted to encourage water conservation and still provide enough funding for operation, maintenance and capital improvement needs.

STORMWATER

The Georgia Section of ASCE assigned a grade of “D+” in 2003 to stormwater infrastructure mostly because of the lack of asset management and maintenance programs. The same grade was assigned in 2009 as the result of off-setting factors. There are positive factors, such as the new statewide approach to water resources through watershed management that encourages more efficient and effective application of solutions and intergovernmental cooperation. Also, more than 65 percent of Georgia communities have adopted floodplain management regulations. Unfortunately, funding for stormwater programs remains inadequate. While many communities are beginning to inventory and assess stormwater infrastructure, most of Georgia’s communities are still taking a reactive approach to maintaining and upgrading stormwater infrastructure and meeting applicable water quality requirements.

In 2008, 41 percent of the 12,930 river miles, 62 percent of the 341,777 acres of lakes and 60 percent of 854 square miles of estuaries fully met water quality standards. Stream segments in Georgia equaling approximately 7,585 miles (including 1,100 miles of streams in the metro Atlanta area) were listed as impaired and not meeting designated uses. Stormwater runoff from urban areas and nonpoint sources account for 99 percent of the violations.

Georgia has experienced robust population growth and associated changes in land use and natural hydrology have adversely impacted stormwater runoff. Solutions should focus on addressing future requirements. Recommendations for stormwater include:

- **Local Planning and Policies:** Planning should focus on resource protection and reduction of impervious surfaces as local agencies coordinate with statewide plans and organizations.
- **Stormwater Inventory:** Municipalities should inventory their stormwater systems to gather specific location and structural dimensions and condition information

on all stormwater conveyance elements. This will allow for the creation of stormwater management plans, comprehensive master plans, system maps and watershed models.



Figure 2: Failing Storm Pipe in Troup County

- **Inspection and Maintenance:** Maintenance of Best Management Practices (BMPs) should include regular inspections and, if necessary, removal of accumulated pollutants. The goal is optimization of stormwater systems to function at or near the original specifications. Communities need to regularly inspect and maintain their stormwater infrastructure. Stable funding sources are needed to provide for effective maintenance programs.
- **Education:** State and local governments should increase efforts to inform people of the impacts of individual behavior on water quality and flow regime as well as increase awareness of stormwater infrastructure and the direct connection to streams, rivers and lakes. The Clean Water Campaign, managed by the Atlanta Regional Commission, serves as a model of a collaborative education effort.
- **Watershed Restoration:** Watershed protection can be achieved through BMPs and improved land use strategies. Restoration on a watershed basis is critical since water quality and flow regime are intertwined. Land use management that includes greenspace preservation, alternative development patterns and other innovative land use practices that improve stormwater management should be encouraged.
- **Technology and Information Sharing:** Technology use has facilitated progress in stormwater management. Global Positioned Satellite (GPS) technology has made mapping infrastructure easier and more accurate. Geographical Information System (GIS) is increasingly used as an analytical tool for integrating data, impacts and solutions to water quality, quantity and natural systems challenges. BMPs should be measured for performance of wa-

ter quality objectives. Monitoring will document background conditions and trends from development and BMPs.

- **Regulatory:** Georgia EPD will likely establish more stringent requirements to address specific pollution problems through Total Maximum Daily Load (TMDL) strategies aimed at watershed protection. Enabling statewide legislation for stormwater authorities could lead to stormwater utilities addressing inter-jurisdictional issues in watersheds that cross county and city boundaries.

DAMS

Georgia has few, if any, natural ponds or lakes. Lakes and ponds have been created all over the state by placing dams on streams and rivers. Dams create reservoirs, ponds and lakes that are used for water storage, recreation and flood management. In December 2008 there were 4,883 dams in Georgia, 475 of which were considered by state definition to be high-hazard dams. High-hazard dams include dams of any size that are likely to pose a significant threat to human life or property in case of failure; all other federal and non-federal dams over 25 feet high that impound more than 15 acre-feet; and dams over 6 feet high that impound more than 50 acre-feet. A total of 155 high-hazard dams in Georgia are considered deficient by the Georgia DNR. Four dams failed in the past two years with no significant property damage. The number of high-hazard dams in Georgia has increased from 385 in 2001 to 475 in 2008, an increase of 23 percent.

The Georgia Section of ASCE assigned dams a 2009 grade of “D” because the Georgia DNR classifies 155, or 33 percent, of its 475 high-hazard dams as deficient. Additionally, the Section considered the woefully underfunded and understaffed Georgia Safe Dams Program, the increasing dam failure analysis backlog of more than 500 dams and the shortage of programs to assist dam owners in addressing deficiencies. As the population of the Georgia continues to increase, residents will continue to rely even more heavily on dam structures for water storage, recreation and flood management.

Recommendations for dams at the time of the 2009 Report Card include:

- **Dam Safety Program Staffing:** The state needs to fill the vacant engineering positions in the Georgia Safe Dams Program. Two of the engineering positions are fully funded by the FEMA Dam Safety Program and do not represent a cost to the state of Georgia. In addition to filling vacant positions, additional dam safety staff and funding for the Dam Safety Program are needed to address the increasing number of deficient dams. The additional staff and funding will need to focus on accelerating the repairs of existing deficiencies.

- **Backlog Reduction:** Reduce the backlog of dam inspections by hiring additional qualified inspectors or requiring Category I dam owners to perform inspections utilizing dam inspectors that have been classified by the Georgia Safe Dams Program as “Engineers of Record”. Reduce the backlog of over 500 dam failure analyses by hiring additional staff for the Georgia Safe Dams Program or procuring dam breach hydraulic modeling services from “Engineers of Record”.

- **Regulation and Permitting:** Georgia should consider regulations that require developers who build subdivision lakes to consider and plan for future development that may occur downstream. This will reduce unexpected dam retrofits or forced breaches. In addition, the state needs to modify the Category I dam permitting process to reduce the design plan review and approval timeframe by the Safe Dams Program without compromising safety.



Figure 3. Dam Failure at Outlet Structure

CLOSING NOTES

The 2009 Georgia Infrastructure Report Card is not intended to be a commentary on, nor an evaluation of, the performance of any particular government department, agency or individuals of these groups. In fact, our research found that most agencies have made remarkable progress in fulfilling their ever-expanding responsibilities despite being understaffed and underfunded.

A challenge in producing the Georgia Infrastructure Report Card was to maintain focus on statewide issues and avoid being overly influenced by local needs, especially in the metro Atlanta area. Although in many categories more data were available for the metro Atlanta area, significant efforts were made to make a statewide analysis.

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- Stormwater – JoAnn Macrina
- Dams – Santanu Sinharoy

A full copy of the Report Card, as well as a full list of all contributors and sources, can be found at www.ascega.org.