WATER REUSE CHALLENGES IN GEORGIA: A GWINNETT COUNTY CASE STUDY

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REFERENCE: Proceedings of the 1997 Georgia Water Resources Conference, held March 20-22, 1997, at The University of Georgea, Kathryn J. Hatcher, Editor, Institute of Ecology, The University of Georgia, Athens, Georgia.

Abstract. Georgia faces, and will continue to face, many difficult water resources challenges related to water quality, water quantity, habitat protection, and allocation of scarce resources. Meeting these challenges requires a comprehensive approach to water resources management. One promising component of this comprehensive approach is water reuse. Gwinnett County is using the concept of water reuse as a building block in planning and implementing its water and wastewater infrastructure.

INTRODUCTION TO WATER REUSE

Water reuse, or the transformation of wastewater into a valuable water resource to meet water supply needs, can take any of several forms (McEwen, 1995): (1) nonpotable reuse (irrigation, dual systems, wetlands replenishment, etc.), (2) unplanned indirect potable reuse (effluent discharges not specifically designed to protect drinking water supplies), (3) planned indirect potable reuse (effluent discharges specifically designed to protect and replenish drinking water supplies), (4) direct potable reuse (effluent returned directly to a drinking water distribution system).

Determining whether any of these forms of water reuse are appropriate for meeting a particular utility's needs is based on the specific characteristics of the utility, the regional water resources, geography, hydrography, climate, soils, water quality, regulatory requirements, public preferences, and other factors. Based on these needs, water reuse can help: preserve and augment water supplies, protect water quality, protect instream habitats, restore instream low flows, promote recreation and stable lake levels, and facilitate permitting and implementation of water resources projects.

Water reuse by definition either replenishes existing water supplies or replaces other water uses. Therefore land application wastewater treatment systems, which irrigate silviculture or agriculture operations that would not otherwise exist or receive irrigation, do not meet the definition of water reuse.

This paper focuses on the application of indirect potable reuse, which consists of treating wastewater to extremely stringent levels, and returning the clean water to existing water supply sources for reuse. Indirect potable reuse is particularly appropriate in cases where there are:

- limited water supplies of good to moderate quality
- high costs for developing additional near or remote water supplies
- stringent requirements for wastewater effluent discharges
- environmental and recreational advantages to replenishing existing sources
- high cost of land for land application.

BACKGROUND

Gwinnett County

Gwinnett County lies on the northeastern edge of metropolitan Atlanta. The area receives almost 50 inches of rainfall per year on average. It has a population of over 450,000, and is ranked as one of the strongest county economies in the nation. Gwinnett County lies in the Piedmont geologic region, which means the topography is hilly and underlain by rock with no significant aquifers underneath. The County is also bisected by the subcontinental divide, with water to the west of the divide flowing to the Chattahoochee River and thence to the Gulf of Mexico, and water to the east of the divide flowing eventually to the Atlantic Ocean. All of Gwinnett County's water is then taken from Lake Lanier, the most heavily recreated Corps of Engineers (COE) lake

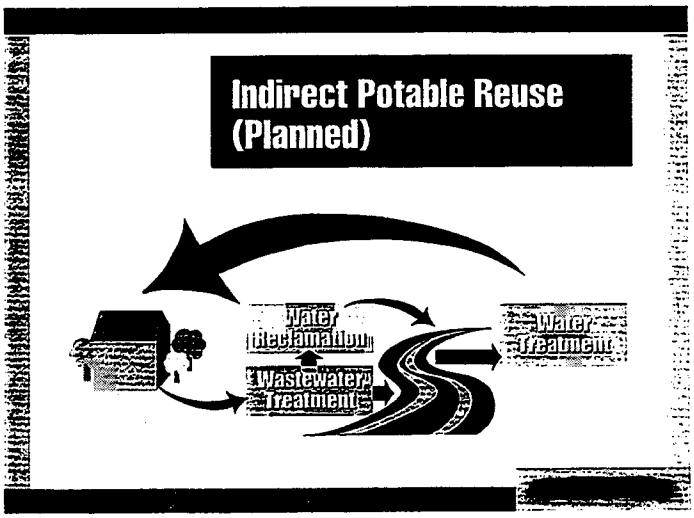

Figure 1. Planned indirect potable reuse.

in the country. Lake Lanier is an impoundment on the Chattahoochee River which flows into the Gulf of Mexico. All but one of the County's existing water reclamation facilities (WRFs) are located in the southern and eastern portion of the County and release into the Atlantic subbasin.

Regional Studies

The Chattahoochee River basin is one of the basins being studied in the COE Comprehensive study of the Appalachicola-Chattahoochee-Flint/Alabama-Coosa-Tallapoosa (ACF/ACT) basins under the memorandum of agreement between Georgia, Alabama, Florida, and the COE. This study is scheduled for completion by the end of 1997. The Georgia Environmental Protection Division (EPD) is developing a new dynamic water quality model of the Chattahoochee River below Lake Lanier, and the anticipated completion date is late 1997. In addition, Gwinnett County is cooperating in a regional effort to develop a water quality model of Lake Lanier, which could be complete in late 1997.

The results of each of these studies will affect the availability and quality of water resources in the region.

Water and Wastewater Master Plan

During its water and wastewater master planning process in the early 1990s, Gwinnett County identified the following key issues that characterize its water and wastewater situation (CH2M HILL, March 1993): (1) Water is withdrawn from Chattahoochee Basin, and most wastewater effluent is discharged to other basins, (2) The sole water supply source (Lake Lanier) is high quality and highly demanded for many uses, (3) Sufficient water supplies exist for the short-term, however additional water is needed in the long-term, (4) Additional wastewater capacity is needed in the near-term (by the year 2000), (5) Wastewater is currently treated to the most stringent standards in Georgia. (6) Land costs are high, making land application of effluent very costly as a disposal option (CH2M HILL, 1996).

Given these conditions, Gwinnett's situation closely matched those amenable to indirect potable reuse. The Water and Wastewater Master Plan documented the evaluation of many alternatives for water supply and wastewater disposal. A strategy for indirect potable reuse was developed to meet Gwinnett County's specific needs. The strategy included development of two advanced water reclamation facilities (AWRF) designed for indirect potable reuse: one to serve the northern portion of the county, and another to serve the southern portion of the county.

IMPLEMENTATION

Implementing the Plan

In 1994, the County's efforts to develop a less advanced facility in the southern portion of the county were thwarted by water quality concerns downstream in Jackson Lake, concerns over interbasin transfer, and local neighborhood opposition. The proposed southern facility was planned as an incremental step toward indirect potable reuse.

With the County projecting a wastewater treatment capacity deficit about the year 2000, the County chose to more fully implement the indirect water reuse concept to meet its near-term wastewater treatment needs. The plan would also help reduce interbasin transfer, an issue brought to the forefront by the ACF/ACT Comprehensive Study. This strategy was consistent with the Water and Wastewater Master Plan, and provided the potential to demonstrate the safety and reliability of an indirect potable reuse facility.

Permitting Strategy

In order to meet the time schedule for additional wastewater capacity, the County pursued the only discharge location available at the time of the permit application. EPD would not consider an indirect potable reuse discharge to Lake Lanier, the County's water supply source, prior to the completion of the Lake Lanier modeling study and development of water quality standards for the lake.

A permitting strategy was developed to use an existing wasteload allocation associated with 4 million gallons per day (mgd) of capacity, which Gwinnett had contracted in the City of Atlanta's R. M. Clayton facility. An indirect potable reuse facility with high effluent quality could discharge 20 mgd or more and still considerably reduce the pollutant load to the Chattahoochee River, as compared to the 4mgd allocation.

EPD would not consider a discharge upstream of the County's existing Crooked Creek Water Reclamation Facility (WRF), which releases to the Chattahoochee River downstream of Holcomb Bridge Road, prior to completion of the new dynamic river water quality model. Therefore the County evaluated an expansion and upgrade of the Crooked Creek WRF and corresponding permit modification. However the Crooked Creek WRF is on an extremely small site with neighbors nearby, and would require considerable collection system improvements to bring the additional flows to the facility.

The County then evaluated placing the facility on a site in the northern portion of the County. Such a siting corresponded well with the recommendations in the Master Plan, could better avoid existing neighborhoods, and would serve the projected needs in the northern portion of the County. Although a 20 mile effluent pipeline would be required, it allowed the capacity to be implemented in the time frame required and afforded the opportunity for irrigation along the pipeline route.

The permit application, design development report, and environmental information document were submitted to EPD on February 16, 1996. The final NPDES discharge permit was issued by EPD on November 18, 1996.

Permit Limits

The North AWRF discharge permit was based on the transfer of an existing wasteload associated with 4 mgd of

capacity in the city of Atlanta's R.M. Clayton facility. The corresponding ultimate oxygen demand (UOD) of the highly treated North AWRF 20 mgd discharge reduced the associated UOD load to the river by almost 60 percent annually. The total phosphorus load was held constant by using the load associated with 4 mgd at 0.64 mg/L at R.M. Clayton (as of January 1997, per the consent decree), resulting in a concentration at 20 mgd of 0.13 mg/L for the North AWRF.

Because of the extremely advanced treatment levels proposed for the North AWRF, many conventional effluent parameters such as carbonaceous biochemical oxygen demand (CBOD5) and total suspended solids (TSS) could not be reliably measured at the low levels proposed in the permit. Therefore analyses were performed to identify surrogate parameters.

Three years of CBOD5 effluent data were statistically correlated with chemical oxygen demand (COD) and total organic carbon (TOC) data from the Crooked Creek (CC) WRF and the Upper Occoquan Sewage Authority Plant (UOSA) to develop appropriate ratios. The UOSA plant is an advanced facility similar to the North AWRF that has been safely discharging to the drinking water supply of over 1 million residents of metropolitan Washington D.C. for more than 18 years. EPD chose COD as the surrogate parameter for CBOD5 based on its long record, with a COD/CBOD5 ratio of 10:1 (CH2M HILL, May and June 1996).

The proposed TSS level for the North AWRF effluent was 1 mg/L, compared with 30 mg/L for the R.M. Clayton facility. Because of the difficulties in measuring TSS at these low levels, a turbidity limit based on national drinking water standards of 1 NTU was chosen as a surrogate.

The proposed permit limits are shown in Table 1, compared with the existing Crooked Creek WRF limits. The Crooked Creek WRF limits are currently the most stringent in the Chattahoochee River Basin, and the North AWRF limits are far more stringent. These stringent limits were proposed to make the most of the existing 4 mgd wasteload allocation at significantly less stringent treatment levels, and to take a dramatic first step toward indirect water reuse in the region. The proposed limits are also designed to protect and augment water supplies, which are becoming increasingly limited in the region.

Table 1. Permit Limit Comparison

Parameter	North AWRF	CC WRF
Flow (mgd)	20	16
CBOD5 (mg/L)	—	3.4
COD (mg/L)	25	50
TSS (mg/L)	—	10.0
Turbidity (NTU)	1.0	—
NH_3-N (mg/L)	0.5	1.1
Total Phosphorus (mg/L)	0.13	0.75
Fecal coliform (#/100 ml)	23	25

North AWRF Site and Processes

The North AWRF will be located on approximately 700 acres in northern Gwinnett County near the intersection of I-85 and I-985. The large site is bounded on two sides by the interstates, allowing for considerable buffer area between the plant processes and surrounding areas. The facility will include advanced odor control systems and noise abatement systems.

The processes that provide the necessary advanced levels of treatment include primary clarification, secondary treatment, biological nutrient removal, secondary clarification, high-pH lime addition and clarification, recarbonation, granular media filtration, carbon adsorption, and ozonation. (CH2M HILL, February 1996) A 2 mgd demonstration project for promising membrane technologies is also included in the facility.

The processes provide multiple barriers to contaminants, resulting in enhanced reliability of the facility. The facilityalso incorporates reliability components such as dual independent feed power distribution, backup combustion generators, and 60 million gallons of storage capacity. In addition, the design criteria were set such that if any single process or process component were down for repair or maintenance, the entire plant capacity could still be processed.

These reliability aspects of the facility, in addition to the effluent limits, are unusually stringent for wastewater facilities. However demonstration of indirect potable reuse involves not only treatment of wastewater, but also reliable protection of water supplies.

PUBLIC INVOLVEMENT AND EDUCATION

The County pursued an active public process to facilitate permitting and allow the affected public more involvement in the process.

Stakeholders were identified early in the process and contacted regarding the project. Three public meetings were held (November 1995, December 1995, January 1996) to inform the public about the project prior to submitting the permit application. The meetings were conducted in an open house format, allowing the attendees to browse from display table to display table and ask questions of the County staff and consultants.

A 24 hour North AWRF info-line was implemented, providing an update and overview of the project and allowing callers to leave their requests, comments, and suggestions. A dedicated FAX line was also implemented. Information packets were developed to send to all callers. The news media were contacted and provided information on the project. Information packets were provided to 400 Gwinnett County high school seniors for a class titled "Science, Technology, and Society."

Three stakeholder conferences were held in late winter and spring to develop the North AWRF Citzens' Advisory Board (CAB). The purpose of the CAB is to facilitate communications between the groups and individuals interested in the project and the County. At the professionally facilitated conferences, the attendees selected their representatives to the CAB. The CAB is composed of a representative and an alternate from the following groups: Gwinnett County homeowners, neighbors of the facility, environmental interests, business interests, and local and regional governments.

The CAB was formally chartered by County ordinance in June 1996. It meets monthly to receive updates on project progress, and provide input to the County and project team. The CAB was also provided with a budget to select its own consultant to keep up with the technical aspects of the project, and provide overviews to the CAB that meet their information needs.

Efforts to address stakeholder concerns continued on through the public hearing. Background materials were prepared ahead of time for use by county staff in response to questions. An informational video was prepared and screened during the public information portion of the meeting. Proactively working with stakeholders paid dividend. The response to the draft permit was overwhelmingly positive.

Perhaps the most visible stakeholder in the permitting process was the Upper Chattahoochee Riverkeeper, a nonprofit environmental organization whose charter is to protect the Upper Chattahooche River. The Riverkeeper was first contacted concerning the project in the summer of 1995. The County kept the Riverkeeper updated on the project throughout the permitting process, providing information on the permit limits, treatment processes, pretreatment requirements, discharge location, and other information.

Prior to and during the public hearing, and in written comments, the Riverkeeper raised concerns regarding protection of downstream drinking water supplies, water conservation, and nonpoint source pollution. However the Riverkeeper also stated that they would not oppose the project if the County worked with them, and praised the stringent levels of treatment proposed.

Gwinnett County worked cooperatively with the Riverkeeper to develop more frequent testing for prio-rity pollutants, and added testing for total analytes to the permit. The County also agreed to develop a Best Management Practices manual for storm water pollu- tion control, to coordinate with the County's storm water ordinance, and to evaluate the use of conserving rate structures during the process of performing its rate study.

CONCLUSIONS

The planning and permitting process for the North AWRF provided valuable information for future permitting activities in the region. The lessons learned include: (1) the linkage to water reuse can facilitate the permitting of water resources projects, (2) water reuse provides water quality, instream habitat, instream flow, and recreational benefits, (3) water reuse preserves and augments potable water supplies, (4) for utilities in urban or suburban areas that handle significant wastewater volumes, indirect potable reuse systems are more cost effective than land application disposal system, and (5) public involvement and education, including involvement of key stakeholders, is critical to successful implementation.

ACKNOWLEDGMENTS

The author gratefully acknowledges the support and cooperation of George Heckman and Frank Stephens of the Gwinnett County Department of Public Utilities, and the Gwinnett County Board of Commissioners.

LITERATURE CITED

CH2M HILL, March 1993. Gwinnett County Water and Wastewater Master Plan, Gwinnett County Department of Public Utilities. Atlanta, Georgia.

CH2M HILL, February 1996. North Advanced Water Reclamation Facility Design Development Report, Gwinnett County Department of Public Utilities. Atlanta, Georgia.

CH2M HILL, February 1996. North Advanced Water Reclamation Facility Environmental Information Document, Gwinnett County Department of Public Utilities. Atlanta, Georgia.

CH2M HILL, 1996. Technical Memorandum No. 19-1 Land Application Alternatives Evaluation for the Proposed North Advanced Water Reclamation Facility. No. 19-2 North AWRF Monitoring issues and Alternate Parameters. No. 19-2a Addendum to North AWRF. Gwinnett County Department of Public Utilities. Atlanta, Georgia.

McEwen, Brock, 1995. Indirect Potable Reuse of Reclaimed Water. CH2M HILL, Denver, Colorado.