

# Christopher J. Brown, P.E.

Aquifer Storage Recovery Lead

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## Education

- B.S. in Civil Engineering, Temple University, Philadelphia, PA, 1991.
- M.S. in Civil Engineering, Villanova University, PA, 1996.
- Ph.D. Candidate in Civil Engineering, University of Florida, Gainesville, FL. Anticipated graduation in 2005.

## Professional Registration

Professional Engineer: Pennsylvania, 1996 (No. PE-049758-E)

## Distinguishing Qualifications

- Is a U.S. Army Corps of Engineers (COE) senior technical expert on groundwater hydrology, ASR wells, subsurface structures such as coffer dams and hydraulic barrier walls
- Has received numerous awards for his efforts within the COE, including two appointments as Engineer of the Year and one nomination for Federal Engineer of the Year
- Has presented numerous technical papers concerning groundwater modeling, dredging, remediation, groundwater flow in deep mines, and the use of GIS systems to model complex environmental systems.

## Professional Summary

Mr. Brown is a civil engineer practicing in the area of water resources. He is currently employed by the U.S. Army Corps of Engineers (COE), Jacksonville District, where he is recognized as a District senior technical expert on groundwater hydrology, ASR wells, and subsurface structures such as coffer dams and hydraulic barrier walls. With 14 years of experience with the COE, Mr. Brown was appointed as one of the COE lead technical representatives for the proposed Comprehensive Everglades Restoration Program (CERP) in 2001. This program includes more than 330 ASR wells storing partially treated stormwater within the Floridan Aquifer System. As part of this appointment, Mr. Brown has investigated ASR operations, design and performance at multiple sites in South Florida and around the United States. Mr. Brown is a participating author of the soon-to-be published "Pilot Project Design Report for the CERP ASR Pilot Projects."

Mr. Brown holds a B.S. in Civil Engineering from Temple University; an M.S. in Civil Engineering from Villanova University; and is a candidate for a Ph.D. from the University of Florida. The research topic for his dissertation is "A Decision Framework for ASR Projects Located within Carbonate, Brackish Aquifers." As part of his ongoing research efforts, Mr. Brown has been developing new performance metrics that may provide the ASR community with simple planning charts based upon dimensionless parameters. In addition, Mr. Brown has already performed an extensive literature search related to aquifer recharge projects around the world. Additionally, he has evaluated geotechnical engineering related constraints involving

ASR projects in South Florida. Many of these constraints may apply to any sustainable underground storage facility.

## Related Experience

### University of Florida Research Experience

Since September 2002, Mr. Brown has been a graduate researcher at the University of Florida, under the advisement of Kirk Hatfield, Ph.D., Professor of Civil Engineering. Mr. Brown's research topics include ASR Planning, ASR performance metrics, geotechnical constraints related to ASR, and ASR water law in Florida. Papers in preparation include:

- "Planning Considerations for Aquifer Storage and Recovery Well Projects in Florida" - To be submitted to ASCE Journal of Planning
- "Water Law Issues Related to the Proposed Everglades Restoration Aquifer, Storage and Recovery Well Project" - to be submitted to Florida Law Journal or the Water Law Journal
- "Proposed New Performance Metrics to Support ASR Project Planning in Carbonate, Brackish Aquifers" - Abstract to be submitted to the 5<sup>th</sup> International Symposium on Management of Aquifer Recharge (ISMAR 5), Berlin, Germany

### U.S. Army Corps of Engineers Experience

**December 2001 to Present.** Mr. Brown has 14 years of civil engineering experience with the COE and is currently one of the District's senior technical experts on groundwater hydrology, ASR wells, and subsurface structures such as coffer dams and hydraulic barrier walls. His expertise also encompasses well fields, dewatering, groundwater modeling, and impact assessments. Since 2001, he has served as Hydrogeologic Structures Expert in the District's Geotechnical Branch in Jacksonville, FL. His recent project assignments include development of seepage and infiltration model for C-111 recharge basins; evaluation of cis-1,2-dichloroethene (DCE) plume movement at a South Florida Superfund site; modeling of ASR well recovery efficiency for Lake Okeechobee and Hillsboro Canal; evaluation of plugging potential for CERP ASR pilot projects; development of geotechnical design constraints for ASR projects; design and modeling of 8.5 SMA restoration project. Additionally, Mr. Brown is one of the main authors of "Pilot Project Design Report/Environmental Impact Statement for the CERP ASR Pilot Projects," which is scheduled for release to the public by mid-April 2004.

Mr. Brown has served as the Geotechnical Branch representative to various Corps-wide advisory groups, concerning groundwater modeling, groundwater software and hydrogeologic structures. He has represented the District at regional and national conferences and public meetings, and for professional societies and academic institutions. He has provided consulting services to the Hazardous, Toxic and Radioactive Waste (HTRW) Center of Expertise as well as the Groundwater Technical Support Center at the Corps Waterways Experiment Station (WES). As part of these services, he has traveled to other Corps Districts and Department of Defense (DOD) facilities to assist with various hydrogeological-related studies involving subsurface investigations and computer modeling. He has assisted WES and others with the development of procedures and standards for the investigation, analysis, modeling and design of

hydrogeologic structures, including slurry cut-off walls, groundwater injection wells and recharge basins. Additionally, he has taught several courses to the EPA, Fort Dix and the State of Pennsylvania on the use of the DOD Groundwater Modeling System (GMS).

**May 1999 - December 2001.** Prior to his position as Hydrogeologic Structures Expert, Mr. Brown served in the District's Soils Section as Senior Geotechnical Engineer. In that role, he was responsible for the investigation, analysis and design of various projects undertaken by the Jacksonville District. He continues to provide expertise on these projects in his current role as Hydrogeologic Structures Expert. Projects in which he has been involved encompass navigation, flood control, shore protection, environmental restoration, water supply, and support to other agencies such as the U.S. Environmental Protection Agency (EPA). Mr. Brown was directly responsible for the geotechnical and hydrogeological features of numerous complex projects, including: rehabilitation of the Canaveral Harbor S. Jetty; installation of groundwater monitoring wells; geotechnical design of pump station S-9A; seepage modeling along the L-31N canal; 3D MODFLOW modeling of Hillsboro Impoundment; dike design for Fort Myers Beach navigation project; and others.

For two additional projects, the 8.5 Square Mile Area GRR report and the ASR Pilot Projects, Mr. Brown served as Engineering Division Project Engineer. Each project required state-of-the-art analysis techniques such as finite-difference/finite-element computer groundwater modeling. A first-of-kind project for the COE, the ASR Programs' goal is to install approximately 330 large diameter deep wells for storing large amounts of excess stormwater. The 8.5 Square Mile Area studies required detailed computer modeling utilizing the MODBRANCH code. Approximately 160 CPU hours of computer modeling and post-processing was completed in only three months' time.

For both projects, Mr. Brown is responsible for technical details as well as coordination with, leadership of, and schedule and budget of the design team. Both projects were extremely complex, requiring a high degree of specialized experience far exceeding his responsibilities and expertise as senior geotechnical engineer. To demonstrate this point, Mr. Brown applied concepts and theories and adapted them to "real-world" situations, particularly when working with hydrogeologic structures. In addition to the highly technical tasks involved, Mr. Brown led a team of engineers, biologists, geologists, planners and others in order to complete the projects on schedule. His thorough knowledge of hydrogeologic structures such as deep wells, hydraulic barrier systems, ASR, seepage basins and other structures has allowed for Mr. Brown's extensive and invaluable involvement with the CERP project, particularly as it relates to groundwater flow and transport.

As part of his duties as a senior geotechnical engineer, Mr. Brown has acted as reviewer of most hydrogeologic work produced by the Branch, including seepage modeling, well installation and aquifer testing. He has also reviewed work completed by architectural and engineering (A/E) consultants in order to ensure technical integrity. He frequently provides direction, consultation, and submittal review for less-experienced staff as well as for staff in other Divisions, including the Construction Division. Additionally, he routinely leads group discussions concerning hydrogeologic-related projects of a unique nature. He is also required

to provide recommendations where existing guidance is not adequate or literature is incomplete.

**November 1994 to May 1999.** Mr. Brown served as Senior Geotechnical Engineer with the Philadelphia District of the COE, and was involved in various District projects of a complex nature. Projects included the Bridgeport Rental & Oil Services (BROS) Superfund remediation project, Fort Dix Groundwater Model, Delaware Main Channel Study, and the C&D Canal Deepening Study. For the Fort Dix study, Mr. Brown prepared a regional hydrogeologic conceptualization report for a 200-square-mile study area to be modeled using the FEMWATER computer code. For the C&D Deepening study, he was responsible for a complete geotechnical appendix that included saltwater intrusion modeling using Seep2D and FEMWATER. During his tenure at the Philadelphia District, he received several performance awards, quality step increases, a teamwork award, and the award for "Engineer of the Year" for 1998. He was also nominated for Federal Engineer of the Year in 1997. He has presented numerous technical papers concerning groundwater modeling, dredging, remediation, groundwater flow in deep mines, and the use of GIS systems to model complex environmental systems. These papers were published in research journals and magazines.

**July 1993 to November 1994.** As a junior grade engineer for the Philadelphia District, Engineering Division, Geotechnical Section, Mr. Brown performed similar duties as he did as a Senior Geotechnical Engineer, but with a lesser degree of complexity. Projects included the reconstruction of the F.E. Walter Dam Access Road, layout and design of a new helicopter runway for the Coast Guard, and geotechnical design for the BROS Superfund site.

**July 1992 to July 1993.** As a junior grade engineer, Mr. Brown performed similar duties as above but generally assisted other more senior engineers.

**July 1991 to July 1992.** As a junior grade engineer, Mr. Brown performed study management of civil works projects including navigation and flood control. Prepare budgets and schedules and guide work overseeing study team.

## Awards

Mr. Brown has received performance awards every year with the COE. Additionally, he received the COE Jacksonville District Engineer of the Year in 2002; Geotechnical Branch Engineer of the Year in 2000; COE Philadelphia District Engineer of the year in 1998; Player of the Month in 1999; Teamwork award in 1996; and numerous monetary awards.

## Publications

Brown, Christopher J., 1998. *Hydrogeologic Conceptual Model of Lipari Landfill Superfund Site* in Conference Proceedings for Annual Corps of Engineers Groundwater Meeting in Albuquerque, New Mexico. Waterways Experiment Station, Vicksburg, MS.

Brown, Christopher J. and Stevens, Glendon, 1999. *Mind over Mine* in Proceedings of Annual Meeting of the Northeast Section of the Geological Society of America (GSA). King of Prussia, PA.

Ulrich, Cheryl P., Brown, Christopher J., & Gonzalez, Martin, 2001. *Solving the 8.5 Square Mile Area – Lynchpin of Everglades Restoration* in Conference Proceedings for Decision Support Systems For Water Resources Management, Snowbird, Utah. American Water Resources Association, page 185.