BEFORE THE
STATE OF NEW JERSEY
OFFICE OF ADMINISTRATIVE LAW

I/M/O THE PETITION OF SUEZ WATER ARLINGTON HILLS, INC. FOR APPROVAL OF AN INCREASE IN RATES FOR WASTEWATER SERVICE AND OTHER TARIFF CHANGES	))))))	**BPU DOCKET No. WR16060510** **OAL DOCKET No. PUC-09261-2016**

DIRECT TESTIMONY AND EXHIBITS OF

HOWARD J. WOODS, JR., P.E.

ON BEHALF OF THE DIVISION OF RATE COUNSEL

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Suez Water Arlington Hills, Inc.
BPU Docket No. WR16060510
Direct Testimony of Howard J. Woods, Jr., P.E.

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1. STATEMENT OF QUALIFICATIONS

Q. PLEASE STATE YOUR NAME AND ADDRESS.

A. My name is Howard J. Woods, Jr. and my address is 49 Overhill Road, East Brunswick, New Jersey 08816-4211.

Q. BY WHOM ARE YOU EMPLOYED?

A. I am an independent consultant and the New Jersey Division of Rate Counsel ("Rate Counsel") has engaged me in this matter.

Q. PLEASE DESCRIBE YOUR EDUCATIONAL BACKGROUND AND PROFESSIONAL QUALIFICATIONS.

A. I hold a Bachelor of Civil Engineering from Villanova University (1977) and a Master of Civil Engineering with a concentration in water resources engineering also from Villanova University (1985). I am a registered professional engineer in New Jersey, New York, Maryland, Pennsylvania, Delaware and New Mexico. I am also licensed to perform RAM-W^{SM} security assessments of public water systems. I am an active member of the American Society of Civil Engineers, the National Ground Water Association, the American Water Works Association, the Water Environment Federation and the International Water Association.

Q. HAVE YOU PROVIDED TESTIMONY IN UTILITY MATTERS ON PRIOR OCCASIONS?

A. Yes. I have testified in numerous rate setting proceedings and quality of service evaluations in matters before the Public Utility Commissions in New Jersey, New York, Pennsylvania, Connecticut, Delaware and Kentucky. The focus of my testimonies is on matters involving utility operations, planning and engineering.

Q. PLEASE DESCRIBE YOUR PROFESSIONAL EXPERIENCE.

A. A detailed description of my professional experience is provided in Appendix A of this Testimony. In summary, I have over 39 years experience in the planning, design, construction and operation of water and wastewater utility systems. I have worked for a Federal regulatory agency, a large investor-owned water and wastewater utility, a firm engaged in contract operations of municipally owned water and wastewater utilities, and in engineering and operational consulting for the water and wastewater industry. During my career, I have been responsible for all operations functions including regulatory compliance, water production, distribution and maintenance services as well as wastewater collection and treatment.

2. SCOPE AND PURPOSE OF TESTIMONY

Q. MR. WOODS, PLEASE DESCRIBE YOUR AREA OF RESPONSIBILITY IN THIS MATTER.

A. Rate Counsel engaged me to review Suez Water Arlington Hills, Inc.'s ("Company") Petition with specific attention to the following areas:

1. The Company's pro forma operating expenses, particularly those associated with the new wastewater treatment plant; and
2. The Company's capital construction program and the items of work classified as utility plant in service following the close of the Test Year.

Q. WHAT MATERIALS HAVE YOU REVIEWED IN DISCHARGING THIS ASSIGNMENT?

A. I have reviewed the Company's initial filing and responses to discovery requests in this matter. In addition, I have also reviewed various New Jersey Department of Environmental Protection and New Jersey Board of Public Utilities rules and decisions applicable to specific aspects of the Company's proposals.

3. SUMMARY OF FINDINGS AND CONCLUSIONS

Q. HAVE YOU REVIEWED SUEZ WATER ARLINGTON HILLS, INC.'S FILING FOR A RATE ADJUSTMENT?

A. Yes, I have.

Q. WHAT DOES THE COMPANY'S FILING AND THEIR PRE-FILED TESTIMONY REQUEST?

A. The Company's June 14, 2016 filing proposes to increase operating revenues by $1,404,396 or roughly 118% more than adjusted test year revenues at current rates.[1] The Company's filing proposes to implement this rate increase in four phases beginning on March 29, 2017. A residential customer using 3,000 gallons of water per month would experience an increase in sewer charges from $66.11 per month to $144.34 per month after the fourth phase of the rate increase is implemented.

The Company has proposed a Test Year ending April 30, 2016.[2] The Company has requested a post Test Year adjustment to plant in service amounting to $13,568,324 for construction anticipated to be completed by October 31, 2016, a date six months beyond the close of the Test Year.[3] The proposed plant in service additions are reduced by anticipated plant retirements amounting to $3,877,801 and contributions-in-aid-of-construction amounting to a net amount of $1,018,568.

Q. DO YOU BELIEVE THAT THIS RATE INCREASE SHOULD BE GRANTED?

A. No.

[1] Petition; PP. 1 & 2; Para. 3.

[2] Petition; P.5; Para. 7.

[3] Company Exhibit P-4, Schedule 7A.

Q. ARE YOU RECOMMENDING ANY ADJUSTMENTS TO THE COMPANY'S PRO FORMA SALES VOLUME AND OPERATING EXPENSES?

A. Yes. I am recommending an upward adjustment to the Commercial Sales volume. This reflects the use of a five-year average to develop pro forma commercial sales. While I am proposing an increase in the sales volume, I am also proposing a decrease in the projected total plant flow through. The plant flow through is the basis for my adjustments to the Company's pro forma Purchased Power and Sludge Disposal expenses. The Company has constructed a new wastewater treatment facility and as a result, the historical power utilization and sludge generation data cannot be reliably used to establish the pro forma power expense or sludge disposal cost. I am recommending a reduction of $34,851 in purchased power cost and a reduction of $8,517 in sludge disposal expense.

Q. WHAT IS YOUR OPINION REGARDING THE COMPANY'S PROPOSED POST TEST YEAR ADDITION TO PLANT IN SERVICE?

A. The Company has requested a substantial adjustment to rate base to reflect construction that was completed in the six month period following the close of the Test Year. The plant additions closed between May 1 and October 31, 2016 represent a total construction cost of $13,568,324. Of this amount, $12,857,170 was associated with the construction of the new wastewater treatment plant. An additional $505,296 was associated with main extensions to service a new Atkins

development. Only these post Test Year construction items should be reflected in rates as a result of this proceeding. The post Test Year claim should be reduced by $205,858 to remove items that are routine and recurring in nature.

4. COMMERCIAL SALES VOLUME ADJUSTMENT

Q. HAVE YOU REVIEWED THE COMPANY'S TESTIMONY AND WORKPAPERS THAT SUPPORT THE PROPOSED COMMERCIAL SALES VOLUME?

A. Yes. The Company utilized a trend analysis to project commercial sales volume. I have reviewed the projection and believe that a five-year average should be used to develop pro forma commercial sales instead of the linear trend forecast offered by the Company.

Q. WHY DO YOU BELIEVE THAT A FIVE-YEAR AVERAGE SHOULD BE USED INSTEAD OF THE COMPANY'S TREND ANALYSIS?

A. I have shown the historical values of commercial consumption and the number of customers serviced by the Company in Schedule HJW-1. In this schedule, I have also calculated the average use per commercial account. The number of commercial accounts serviced by the Company increased from 21 to 25 in 2010 but the usage for this class of customer also went down at that point. The average use for a commercial account dropped from 922.810 Thousand Gallons per Customer in 2009 to 639.720 Thousand Gallons per Customer in 2010. The average use has remained relatively stable since this change. I analyzed the data for commercial use

for the period including the years 2010 through 2015 using a linear trend analysis. These data are not linear as evidenced by the low correlation coefficient of 0.144 shown in Schedule HJW-1. A linear trend analysis should not be used to forecast pro forma sales with such a poor correlation.

Q. WHAT DO YOU RECOMMEND?

A. Commercial sales should be projected using the five-year average use per commercial account of 681.944 Thousand Gallons per Customer per year. Because there are 25 Commercial Customers, the pro forma Commercial sales volume should be 17,049 Thousand Gallons per Year. The Company has projected pro forma commercial sales at 16,844 Thousand Gallons per Year, so this adjustment represents an increase of 205 Thousand Gallons. I have utilized this increased sales volume to develop the total projected sales and the total projected plant flow though in Schedule HJW-2.

Q. ARE THERE ANY OTHER ISSUES IN THIS MATTER ASSOCIATED WITH THE ALLOCATION OF THE SALES VOLUMES TO DIFFERENT USAGE CLASSES?

A. Yes. Rate Counsel Witness Kalcic is addressing an issue concerning the billing of the new Atkins development apartment complex. The Company's filing presumed these units would be billed at the Residential tariff rates with individual meters. Instead, the several buildings that make up the new apartment complex will be master-metered.. Despite this correction, the total Residential, Commercial and

Apartment sales volume should equal the total sales volume shown in Schedule HJW-2. This is 46,602 Thousand Gallons per Year.

5. PLANT FLOW THROUGH

Q. PLEASE DESCRIBE YOUR ADJUSTMENT TO THE TOTAL PLANT FLOW THROUGH.

A. Schedule HJW-2 shows the Company's calculation of the Unmetered Ratio using data presented in the Company's response to SIR-26. The average Unmetered Ratio, which represents the additional flow above the metered customer water use received at the plant for treatment, is 17.32%. The data used in developing this ratio contain an unadjusted value for registered water use for the year 2012. In SIR-19, the Company identified a need to make an adjustment to registered flow for this year, but that adjustment was not reflected in the workpapers included in SIR-26. The Unmetered Ratio for 2012, as calculated in SIR-26 is significantly higher than the values for Unmetered Ratio for each subsequent year in the calculation. I adjusted the registered flow based on the value for 2012 contained in SIR-19 and recalculated the Unmetered Ratio. This lowers the value of Unmetered Ratio for 2012 from 21.39% to 14.42% and it lowers the four-year average from 17.32% to 15.58%. I used the adjusted four-year average value to calculate the plant flow through.

Q. PLEASE EXPLAIN THE CALCULATION OF PLANT FLOW THROUGH.

A. The projected flow through for the plant is derived by factoring the projected annual water sales value by the Unmetered Ratio value. The Company's calculation for plant flow through is based on a Residential water sales volume of 29,553 Thousand Gallons per Year plus a Commercial water sales value of 16,844 Thousand Gallons per Year. The total sales value used in the Company's calculation was 46,397 Thousand Gallons per Year. I used the same value for Residential water sales as that used in the Company's calculation but I adjusted the Commercial sales value upward to reflect the adjustment I made in Schedule HJW-1. This increases the total water sales value to 46,602 Thousand Gallons per Year. This value is factored to account for the additional flow received at the plant at an Unmetered Ratio of 15.58%. The resulting plant flow through is 53,860 Thousand Gallons per Year, which is 572 Thousand Gallons per Year lower than the value used by the Company.

6. PURCHASED POWER ADJUSTMENT

Q. HAVE YOU REVIEWED THE COMPANY'S PRO FORMA POWER EXPENSE?

A. Yes. Schedule HJW-3 summarizes the actual power consumption and the actual power cost incurred by the Company in operating its wastewater treatment facility in 2013, 2014 and 2015. Schedule HJW-3 also shows the average power consumption per unit of volume processed at the wastewater treatment facility and the average cost of power per kilowatt-hour. All of these values represent the

actual performance of the old wastewater treatment facility that has been replaced and as a result, these values should not be relied upon to estimate pro forma power expense.

The Company provided an engineer's estimate of the annual power consumption for the new wastewater treatment plant in their response to RCR-E-5. The projected power consumption in this estimate was 287,547 kilowatt-hours and this was associated with an estimated plant flow through of 74,542 Thousand Gallons. Based on these values, the average consumption per unit volume of wastewater treated is expected to be 3.8575 kilowatt-hours per Thousand Gallons. In Schedule HJW-2, I calculated the plant flow through to be 53,860 Thousand Gallons. At this plant flow and an average power consumption per unity volume of 3.8575 kilowatt-hours per Thousand Gallons, the pro forma power consumption is 207,766 kilowatt-hours. The unit cost of power, which was provided by the Company in its response to RCR-A-15 is $0.1116 per kilowatt-hour. At this cost rate, the pro forma power expense is $238,187.

Q. HOW DOES THIS COMPARE TO THE COMPANY'S PRO FORMA POWER EXPENSE?

A. The Company's pro forma power expense was $58,038, which is significantly higher than the value calculated using the current power cost rate and the engineer's estimate for power consumption.

Q. WHAT IS YOUR RECOMMENDATION WITH RESPECT TO PURCHASED POWER?

A. Pro forma purchased power should be reduced by $34,851 to an adjusted value of $23,187.

7. WASTE DISPOSAL EXPENSE

Q. HAVE YOU REVIEWED THE COMPANY'S ESTIMATE FOR PRO FORMA WASTE DISPOSAL?

A. Yes. This expense is the cost incurred to remove the treatment plant sludge produced at the site in the course of treating the wastewater collected from the Company's customers. Sludge is hauled offsite for final treatment and disposal. Schedule HJW-4 summarizes the actual expenses incurred by the Company in 2013, 2014 and 2015. The values shown for these years represent the actual performance of the wastewater treatment plant that has now been taken out of service and replaced with a new treatment facility.

Q. CAN THE HISTORIC VALUES FOR SLUDGE PRODUCTION AND WASTE DISPOSAL EXPENSE BE USED TO RELIABLY PROJECT PRO FORMA WASTE DISPOSAL EXPENSE?

A. No. The Company has a new state-of-the-art wastewater treatment facility and the sludge production form this facility will differ from that of the old facility. The Company provided an engineer's estimate of the sludge production for the new facility and this should be used to develop the pro forma waste disposal expense.

Q. WHAT IS YOUR ESTIMATE OF PRO FORMA WASTE DISPOSAL EXPENSE?

A. I used the engineer's estimate for sludge disposal volume and plant throughput to derive a unit sludge production rate of 7.2224 Gallons of sludge produced per Thousand Gallons of Wastewater treated. Applying this production rate to the estimated plant throughput of 53,860 Thousand Gallons per Year from Schedule HJW-2 yields an estimated sludge volume of 389,001 Gallons for the year. The current cost of sludge disposal is $0.092 per Gallon.[4] At this cost rate, the pro forma sludge disposal expense is $35,886.

Q. HOW DOES THIS COMPARE TO THE COMPANY'S PRO FORMA SLUDGE DISPOSAL VALUE?

A. The Company projected sludge disposal expense is $44,403, which is an amount $8,517 higher than what I have calculated.

Q. WHAT IS YOUR RECOMMENDATION REGARDING PRO FORMA SLUDGE DISPOSAL EXPENSE?

A. The Company's expense should be reduced by $8,517 to $35,886.

8. POST TEST YEAR CAPITAL ADDITIONS

Q. HAS THE COMPANY REQUESTED A POST TEST YEAR ADJUSTMENT TO RATE BASE TO REFLECT CONSTRUCTION THAT WILL BE COMPLETED AFTER THE END OF THE TEST YEAR?

A. Yes. Exhibit P-5 identifies the projects that were completed after the close of the Test Year on April 30, 2015 and prior to October 31, 2015. This represents a six-

[4] The current unit cost was provided by the Company in SIR-23.

month period after the close of the Test Year. In Exhibit P-5, the total amount of new construction to be completed and placed in service in this six-month post Test Year period was $13,568,324. Within this amount are expenses totaling $12,857,170 associated with the construction of the new wastewater treatment plant.

Q. HAS THE BOARD PERMITTED THE INCLUSION OF POST TEST YEAR CAPITAL ADDITIONS IN THE PAST?

A. In the past, the Board has recognized inclusion of post-test-year adjustments to rate base when they are known and measurable and major in nature and consequence. In *In re Elizabethtown Water Company Rate Case*, Docket No. WR85040330 (May 23, 1985), the Board stated that the test year to be used in a base rate proceeding must be fully historical prior to the close of record in the proceeding, but that such historical test year data may be adjusted for "known and measurable" changes. Known and measurable changes to the test year must be (1) prudent and major in nature and consequence, (2) carefully quantified through proofs which (3) manifest convincingly reliable data.

Q. DO YOU AGREE THAT THE COMPANY'S POST TEST YEAR ADJUSTMENT SHOULD BE ALLOWED?

A. No. Many of the items included in the Company's claim represent routine and recurring construction that this Board has not allowed in post Test Year

adjustments. Schedule HJW-5 identifies two projects that are major in nature and consequence and these projects should be recognized as post Test Year additions to rate base. The two projects are the construction of the new wastewater treatment plant (Line 20 Subtotal Sewer Replacement Project - $12,857,170) and the associated extension of the collection system to service the new Atkins development (Line 21, Fieldstone and Shadow Woods - $505,296). The remaining projects are not major in nature and consequence and should not be included in rates established in this proceeding.

Q. WHAT IS THE TOTAL AMOUNT OF THE QUALIFIED POST TEST YEAR ADDITIONS THAT YOU ARE RECOMMENDING?

A. The total estimated construction cost for the two qualified projects amounts to $13,362,466. This amount should be allowed as a post Test Year addition.

Q. WHAT IS YOUR RECOMMENDATION CONCERNING THE COMPANY'S CLAIMED POST TEST YEAR ADDITION OF $13,568,324 SHOWN IN EXHIBIT P-5?

A. This amount should be reduced by $205,858.

Q. DOES THIS COMPLETE YOUR TESTIMONY AT THIS TIME?

A. Yes it does.

APPENDIX A - Qualifications
Of

Howard J. Woods, Jr., P.E.

HOWARD J. WOODS, JR., P.E.

KEY EXPERIENCE

Mr. Woods has over 39 years experience in water and wastewater utility engineering and operations. In his career he has worked for US EPA, engineering consultants and in numerous senior engineering and operational roles at a large investor-owned utility. His experience is well rounded, covering all aspects of public water and wastewater operations and management including outsourcing, acquisitions, maintenance, water production, filtration, distribution, water quality, wastewater collection and treatment, regulatory compliance and safety.

Mr. Woods managed numerous water and wastewater management contracts. He has assisted clients in outsourcing management activities and transferring ownership of complete utility systems. He has advised clients on alternative contracting approaches and reduced operating costs by renegotiating plant operations contracts. He has helped clients reduce operating expenses and he has provided expert testimony in construction arbitrations, contamination incidents and utility rate and service proceedings.

EDUCATION

Masters of Civil Engineering, Water Resources – Villanova University
Bachelor of Civil Engineering (cum laude) – Villanova University

ACCOMPLISHMENTS

- Directed and managed the procurement process leading to the sale of a municipal wastewater system in Southeastern Pennsylvania. The sale of the Upper Dublin Township Sanitary Sewer System will yield $20,000,000 for a system serving approximately 8,000 connections and having annual revenues of $3,000,000. Advised the Township on alternative outsourcing and contracting approaches, reduced interim operating expenses by 30% prior to the sale by renegotiating the plant operations contract.
- Prepared an analysis of ownership alternatives for Lower Makefield Township's sanitary sewer collection system. Managed a procurement process that lead to the receipt of a $17 million bid for the potential sale of a system serving 10,700 residential and commercial customers.
- Assessed an existing public private partnership contract and future contracting alternatives for the Jersey City Municipal Utilities Authority (JCMUA). Recommended alternative contract terms and assisted JCMUA in negotiating a new ten-year operations agreement saving approximately $3,000,000 per year.
- Assisted Greater Ouachita Water Company, a non-profit Louisiana water and sewer utility, in evaluating operating contract alternatives. Provided assistance in identifying qualified operators to be invited to bid a multi-year full-service operating contract. Assisted in evaluating bids and in contract negotiations.

ACCOMPLISHMENTS (CONT.)

- Completed an independent assessment of ownership and operating alternatives for the Township of Sparta water utility. The study evaluated current operating and financial conditions of the utility and considered two alternative service delivery approaches: contract operation and a sale of the system to an investor-owned utility.
- Completed an assessment of the financial and operating impacts of a proposal by a Pennsylvania municipality to dissolve its municipal water and sewer authority. The authority served multiple political subdivisions and dissolution would have resulted in regulation by the Pennsylvania Public Utility Commission. The additional regulatory burdens identified and limitations on municipal financing capacity resulted in a recommendation to retain authority ownership and operations.
- Completed an analysis of ownership alternatives for the Bristol Township Sewer Department. Reviewed capital needs and financing arrangements, rate structure and system revenues, operational costs and regulatory compliance issues. Assessed potential interest in the acquisition of the system by other municipal and investor-owned entities and assessed the possible impact of a sale on rates and service quality. The study recommended retention of the system by the Township and offered recommendations to reduce costs and improve staffing levels.
- Completed the assessment of a potential water utility acquisition by a Pennsylvania Municipal Authority. Assisted the Authority in developing a bid proposal for the acquisition and assessing the impact on revenue requirement and consumer rates resulting from the acquisition.
- Provided litigation support to Cornwall Borough Municipal Authority in its efforts to prevent Cornwall Borough from dissolving the Authority. Provided expert testimony on the service and financial impacts of dissolving the Authority. Developed capital plans for the Authority and provided expert testimony regarding the need to construct certain fire protection and other distribution improvements.
- Completed an evaluation of the revenue requirement associated with the decommissioning of a wastewater treatment plant and the diversion of wastewater to a regional treatment works for the North Wales Water Authority. Assessed the rate impact to customers of potentially retaining and improving an existing wastewater treatment plant and the rate impact of joining a regional treatment system. The evaluation supported the decision to regionalize the sewage treatment function.
- Assisted the Banco Gubernamental de Fomento para Puerto Rico, Autoridad para el Financiamiento de la Infrastructura de Puerto Rico and PricewaterhouseCoopers in developing a new operating contract for the Puerto Rico Aqueduct and Sewer Authority (PRASA). The contract was developed, bid and awarded in less than six months, cutting the normal procurement time by nearly two-thirds. The value of the contract was $300 million per year.
- Completed an independent assessment of the planning and engineering decision making for a major water treatment plant renovation project undertaken by Aquarion Water Company of Connecticut in Stamford Connecticut. Evaluated process selection decisions, project sizing and regulatory compliance issues and testified before the Connecticut Department of Public Utility Control on the findings of the evaluation.

ACCOMPLISHMENTS (CONT.)

- Completed audits of water production operations and water quality management functions at Aquarion Water Company of Connecticut, Aquarion Water Company of Massachusetts and Aquarion Water Company of New Hampshire. Assessed operational procedures and staffing levels, reviewed risk management plans including emergency response plans and dam safety programs, evaluated programed and preventative maintenance systems and developed recommendations to assist the Company in lowering the cost of service while reducing risk and improving reliability.
- Completed an audit of the watershed and environmental management functions at Aquarion Water Company of Connecticut. Assessed watershed management, monitoring and operational procedures, reviewed compliance tracking systems, reviewed risk management strategies and developed recommendations to assist the Company in reducing risk and improving reliability and watershed protection efforts.
- Completed a management audit of the water distribution function at Aquarion Water Company of Connecticut. Evaluated system monitoring and maintenance practices, assessed the impact of the use of contract maintenance and construction services to reduce Company workforce levels. Developed recommendations to improve the Company's programed and preventative maintenance systems, corrosion control procedures and non-revenue water control programs.
- Completed a management audit of the engineering and planning functions at Aquarion Water Company of Connecticut. Evaluated the Company's planning practices and procedures and developed recommendations to assure the efficient application of capital to the renewal, replacement and expansion of the Company's extensive utility plant assets.
- Assisted Greater Ouachita Water Company, a Louisiana non-profit water and sewer utility, in identifying the cause of water quality complaints resulting from poor color removal filtration processes. Recommended improvements to minimize capital modifications of the chemical feed, filter backwash and spent wash water treatment systems.
- Completed a Comprehensive Technical Assistance (CTA) project for the City of New Brunswick (NJ) Water Utility. The CTA, which was ordered to be completed by the New Jersey Department of Environmental Protection, developed operating procedures to rectify numerous performance limiting factors that contributed to several drinking water quality issues and Safe Drinking Water Act Rules compliance issues. Completion of the CTA allowed a major component of the Consent Order to be satisfied.
- Provided ongoing technical and operations assistance to the Shelter Island Heights Property Owners Corporation related to the operation and maintenance of the community water and sewer utilities. Developed recommendations for asset maintenance and renewal as well as employee safety.
- Completed a Vulnerability Assessment for a municipally-owned public water system in northern New Jersey. Organized, planned and conducted the assessment using the RAM-W^{SM} methodology. Evaluated existing physical protection systems at utility facilities, developed threat assessments and adversary sequence analyses, prepared recommendations to reduce risk.

ACCOMPLISHMENTS (CONT.)

- Completed an energy management evaluation for the Elmira (NY) Water Board and provided operator training on energy management strategies. Recommendations from the study allowed the client to reduce energy expenses by 30% through a series of operational modifications.
- Completed an energy management audit of the Pittsburgh Water and Sewer Authority and identified strategies for reducing power consumption. The results of this investigation provided the foundation for the Authority and its contract manager to develop and implement more effective maintenance and operations procedures to reduce energy costs.
- Served as an expert witness in a matter involving the diversion of service by a large commercial customer of Atlantic City Municipal Utilities Authority (ACMUA). Statistically analyzed customer water use and billing records by relating water use variables (e.g. weather, occupancy rates, and restaurant output) to recorded consumption. Identified periods of service diversion and assisted ACMUA in the collection of revenues and penalties due.
- Served as an expert witness in a matter involving excess billing of a large commercial customer of a New Jersey public utility. Statistically analyzed usage patterns over a ten-year period and identified periods of excess billing. Assisted the customer in negotiating a $50,000 settlement of the dispute.
- Provided litigation support in a dispute involving cost of service allocations made by Erie City Water Authority (ECWA) in establishing rates covering a ten-year period beginning in 2004. Prepared an expert report addressing the cost allocation methods used by ECWA and demonstrated that the determination of the ECWA revenue requirement was fair and reasonable and that the allocation methods used to assign costs to various rate classes were done using reasonable professional judgment and standard professional care.
- Provided litigation support in a dispute involving water rates billed by Passaic Valley Water Commission to retail customers in the Borough of Lodi. Reviewed past rate setting practices and related rate covenants in the Lodi water system lease, prepared expert testimony and assisted the Passaic Valley Water Commission in developing rates consistent with the Court's Order.
- Developed a model of the major water resources facilities in the Passaic, Pompton, Ramapo and Hackensack River Basins that allows the calculation of the safe and dependable yield of the Wanaque/Monksville, Point View and Oradell Reservoir systems under varying drought conditions. The model is being used by Passaic Valley Water Commission to evaluate long-term water supply management strategies and to plan for future water supply needs.
- Assisted New York City Department of Environmental Protection in compiling a report on the estimated safe yield of the City water supply reservoir system. A current assessment of safe yield was required by agreement of the Parties to the 1954 US Supreme Court Decree governing the use and export of water from the Delaware River Basin. Provided additional consulting assistance on plans to assure system reliability during planned repairs to the Roundout-West Branch Tunnel, an aqueduct that transports up to 800 million gallons of water per day to the City from the Delaware Basin reservoir system.

ACCOMPLISHMENTS (CONT.)

- Developed an analysis of the costs of the Hickory Log Creek Reservoir and the yield sharing arrangements between the City of Canton and the Cobb County-Marietta Water Authority. Developed recommended methods to assess the impact of US Army Corps of Engineers operating policies on future operating and capital cost allocations.
- Prepared a long-range water supply needs forecast for the Passaic Valley Water Commission. Analyzed water use patterns within the Commission's retail service area and for over two-dozen large contract customers. Produced population forecasts for the service area and individual water demand forecasts for each contract sale-for-resale customer using statistical and numeric forecasting techniques. The forecast projects total annual demand, average day, maximum month and maximum day demands and forms the basis for other ongoing facility and operations planning efforts.
- Prepared a long-range water supply needs forecast for the North Wales Water Authority. Analyzed water use patterns within the Authority's retail service and identified the water supply requirement for the Authority's share in a regional water supply system. Produced customer forecasts for the service area and individual water demand forecasts for large industrial customers and existing and potential wholesale water customers. Applied statistical and numeric forecasting techniques to assess trends in unit water use for each customer class. The forecast projects total annual demand, average day, maximum month and maximum day demands and forms the basis for other ongoing facility and operations planning efforts.
- Developed a Water Allocation Permit renewal and extension application for the Passaic Valley Water Commission. Secured a new 25-year permit for the diversion of surface water from the Pompton and Passaic Rivers. The new water diversion permit for the Commission supports more flexible operations and more efficient source utilization. The Commission serves a retail service population of 325,000 and effectively serves an additional 260,000 people through sale-for-resale connections.
- Prepared a cost of service allocation study for Passaic Valley Water Commission, a regional water system that serves a large urban retail service population and a significant outlying area through direct retail and wholesale water sales. Allocated costs based on standard methodologies to Owner Cities, External Cities Retail and Wholesale classes of service. The Commission has annual revenues in excess of $71 million.
- Prepared a cost of service allocation study for three Pennsylvania Municipal Utilities Authorities considering a joint water supply expansion project. Evaluated and allocated anticipated construction and operating costs for the plant expansion and assigned costs of existing facilities using a commodity-demand allocation method. Developed a recommended tariff design to allow for the fair recovery of prospective costs associated with the expanded facilities.
- Prepared a cost allocation study and tariff design study for Bedminster Municipal Utilities Authority. The study developed an integrated five-year financial plan for the Authority and allocated the revenue requirement among water and sewer services. Rates were developed to allow the Authority to properly recover costs from its various water and sewer customer classes.
- Developed a commercial rates study for Whitemarsh Township Authority that resulted in the modernization of the Authority's commercial rate structure. A system

comprised of 33 different rate costs was replaced with a uniform rate structure including a fixed service charge based on water meter capacity ratios and volumetric changes for the quantity of water actually used.

- Developed a residential rates study for Whitemarsh Township Authority that resulted evaluated the cost and benefits of converting a fixed-rate EDU tariff to a volumetric tariff. Developed recommendations for new rates for the ensuing five-year period.

- Developed an initial tariff study for Branchville Borough. The Borough had constructed a new community sanitary sewer system to replace hundreds of on-lot disposal systems and small, individual wastewater treatment systems located throughout the Borough. Using engineer's estimates of operating costs, developed a total revenue requirement and allocated that revenue requirement to three classes of customer service. Developed an initial rate structure designed to recover the projected full revenue requirement.

- Prepared a cost of service allocation study for Southeast Morris County Municipal Utilities Authority, a regional water system that serves a suburban retail service population and several wholesale water customers. Allocated costs based on standard methodologies to various classes of residential, commercial industrial and wholesale service. Developed a plan to move each service class to full-cost pricing over time.

- Developed a five-year comprehensive business plan for Passaic Valley Water Commission. This plan moved the Commission from an annual operating budget to a five-year budget that links operating costs, capital construction and debt service requirements to customer growth and revenue requirements and rates. The plan was instrumental in obtaining an improved bond rating and positioning the Commission to undertake a major capital improvement program.

- Developed a five-year comprehensive business plan for the North Wales Water Authority. This plan established a rolling five-year operating and capital budget that links operating costs, capital construction and debt service requirements to customer growth and revenue requirements and rates. The plan was instrumental in maintaining current rates while also maintaining the Authority's AA bond rating.

- Served as an expert witness in an arbitration involving a dispute between a New Jersey municipal water department and A.C. Schultes, Inc., a well contractor. Assisted A.C. Schultes in supporting its claim for a contract modification and the recovery of unanticipated expenses. The arbitrator awarded the contractor 100% of its cost claim.

- Served as an expert witness in a matter involving the alleged contamination of a New Jersey municipal water system with heavy metals and organic chemicals. Reviewed over 38,000 discrete water quality sample results, analyzed the operational records of the system and developed a computer model (EPANET2) depicting water flow and water quality changes over a period spanning two decades. Assisted the client in successfully defeating a threatened class action lawsuit at the certification level.

- Served as a mediator involving a dispute between the Long Beach Township Water Department and Don Siegel Construction Co., Inc., a pipeline installation contractor. Assisted the parties in resolving various construction cost claims and in interpreting the contract construction documents. Litigation over the disputes was avoided.

ACCOMPLISHMENTS (CONT.)

- Developed a review of alternatives for the renovation or replacement of the Ridge Road Reservoir for Perkasie Regional Authority. Analyzed alternatives for reconstructing or replacing an in-ground water distribution reservoir. Developed a scope of services for a site geotechnical evaluation and assessed the potential cost of various renewal strategies.
- Reviewed engineering plans and operational practices in numerous water and wastewater rate adjustment proceedings and quality of service proceedings for the New Jersey Division of Rate Counsel. Assessed utility engineering design and construction plans, developed alternatives to utility proposed projects, and evaluated the utility companies' ability to render safe, adequate and proper water or wastewater service. Provides expert testimony in the following utility rate, franchise expansion and service quality proceedings:
    - Acacia Lumberton Manor Fire Service Complaint
      BPU Docket No. WC01080495
    - Applied Waste Water Management Rates
      BPU Docket No. WR03030222
    - Applied Waste Water Management Base Rates
      BPU Docket No. WR08080550
    - Applied Waste Water Management Franchise
      BPU Docket No. WE03070530
    - Applied Waste Water Management Andover Franchise
      BPU Docket No. WE04111466
    - Applied Waste Water Management Hillsborough Franchise
      BPU Docket No. WE04101349
    - Applied Waste Water Management Oakland Franchise
      BPU Docket No. WE04111467
    - Applied Waste Water Management Union Twp Franchise
      BPU Docket No. WE050414
    - Applied Waste Water Management Tewksbury Franchise
      BPU Docket No. WR08100908
    - Aqua NJ Freehold Franchise Extension Review
      BPU Docket WE09120965
    - Aqua NJ Pine Hill Franchise
      BPU Docket No. WE05070581
    - Aqua NJ Upper Freehold Franchise
      BPU Docket No. WE05100822
    - Aqua NJ Readington Wastewater Franchise
      BPU Docket No. WE07030224
    - Aqua New Jersey Base Rate Case
      BPU Docket No. WR07120955
    - Aqua New Jersey Acquisition of Bloomsbury Water
      BPU Docket WE09050360
    - Aqua New Jersey Acquisition of Harkers Hollow Water
      BPU Docket WM09020119
    - Aqua New Jersey Base Rate Adjustment
      BPU Docket No. WR09121005
    - Aqua New Jersey Base Rate Adjustment
      BPU Docket No. WR11120859

ACCOMPLISHMENTS (CONT.)

- Aqua New Jersey Base Rate Adjustment
  BPU Docket WR14010019
- Aqua New Jersey DSIC Foundational Filing
  BPU Docket No. WR12070685
- Aqua New Jersey Byram Franchise & Acquisition
  BPU Docket No. WE15080957
- Aqua New Jersey Cliffside Park Acquisition
  BPU Docket No. WE16040307
- Aqua New Jersey Acquisition of Oakwood Village
  BPU Docket WM16080739
- Aqua New Jersey Base Rate Adjustments
  BPU Docket No. WR16010089
- Aqua NJ Distribution System Improvement Charge Foundational Filing
  BPU Docket No. WR16010090
- Atlantic City Sewerage Company Base Rate Adjustment
  BPU Docket No. WR09110940
- Atlantic City Sewerage Company Base Rate Adjustment
  BPU Docket WR11040247
- Atlantic City Sewerage Company Base Rate Adjustment
  BPU Docket WR14101263
- Bayonne MUA – United Water NJ/ Kohlberg, Kravis, Roberts Joint Venture Operations & Financing Agreement
  BPU Docket No. WM12080777
- Bayview Water Company Rates
  BPU Docket No. WR01120818
- Camden and United Water Environmental Services, Inc. Management Services Agreement Modifications
  BPU Docket No. WM12050457
- Borough of Haledon Rates
  BPU Docket No. WR01080532
- City of Orange Privatization Review
  BPU Docket No. WO03080614
- Crestwood Village Loan Approval
  BPU Docket No. WF04091042
- Crestwood Village Water Co Base Rates
  BPU Docket No. WR07090706
- Elizabethtown Water Co. v. Clinton Board of Adjustment
  BPU Docket No. WE02050289
- Elizabethtown Water Company Rates
  BPU Docket No. WR03070510
- Elizabethtown Water Company Franklin Franchise
  BPU Docket No. WE05020125
- Elizabethtown Water Company Purchased Water Adjustment Clause
  BPU Docket No. WR04070683
- Environmental Disposal Corporation Main Extension Agreement
  BPU Docket No. WO04091030
- Environmental Disposal Corporation Rates
  BPU Docket No. WR04080760

ACCOMPLISHMENTS (CONT.)

- Environmental Disposal Corporation Rates
  BPU Docket No. WR07090715
- Environmental Disposal Corporation Change in Control
  BPU Docket No. WM15040492
- Fayson Lake Water Company Rates
  BPU Docket No. WR03040278
- Fayson Lake Water Company Base Rates
  BPU Docket No. WR07010027
- Fayson Lake Water Company Base Rates
  BPU Docket WR14050405
- Gordon's Corner Water Company Rates
  BPU Docket No. WR03090714
- Gordons Corner Water Co Base Rate Adjustment
  BPU Docket No. WR10060430
- Gordons Corner Water Co Base Rate Adjustment
  BPU Docket No. WR12090807
- Gordons Corner Water Co Base Rate Adjustment
  BPU Docket WR14040325
- Jensens Deep Run Franchise Transfer
  BPU Docket No. WE10070453
- Lake Valley Water Company Rates
  BPU Docket No. WR04070722
- Mahwah Tank Maintenance Privatization
  BPU Docket No. WO15050548
- Middlesex Water Company Rates
  BPU Docket No. WR03110900
- Middlesex Water Company Rates
  BPU Docket No. WR05050451
- Middlesex Water Company Base Rates
  BPU Docket No. WR07040275
- Middlesex Water Co Transmission Main Prudency Review
  BPU Docket No. WO08020098
- Middlesex Water Company Base Rates
  BPU Docket No. WR09080666
- Middlesex Water Company DSIC Foundational Filing
  BPU Docket No. WR12111021
- Middlesex Water Company Base Rates
  BPU Docket No. WR12010027
- Middlesex Water Co DSIC Foundational Filing
  BPU Docket No. WR14050508
- Middlesex Water Company Base Rate Adjustment
  WR15030391
- Montague Water Company Rates
  BPU Docket No. WR03121034
- Montague Sewer Company Rates
  BPU Docket No. WR03121035
- Montague Sewer Company Rates
  BPU Docket No WR05121056

ACCOMPLISHMENTS (CONT.)

- Montague Water Company Acquisition
  BPU Docket No. WM10060432
- Montague Water & Sewer Company Rates
  BPU Docket No WR12110983
- Mount Holly Water Company Rates
  BPU Docket No. WR03070509
- Mount Olive Villages Water & Sewer Franchise
  BPU Docket No. WE03120970
- Mount Olive Villages Sewer Base Rate Adjustment
  BPU Docket No. WR16050391
- Mount Olive Villages Water Base Rate Adjustment
  BPU Docket No. WR16050390
- New Jersey American Water Company Rates
  BPU Docket No. WR03070511
- New Jersey American Water Company Rates
  BPU Docket No. WR06030257
- New Jersey American Water Acquisition of Mt. Ephraim and Approval of Municipal Consent
  BPU Docket No. WE06060431
- New Jersey American Water Purchased Water Adjustment Clause
  BPU Docket No. WR05110976
- New Jersey American Water Company – Mantua Franchise
  BPU Docket No. WE07060372
- New Jersey American Water Co – Rocky Hill Franchise
  BPU Docket No. WE07020103
- New Jersey American Water Company Rates
  BPU Docket No. WR08010020
- New Jersey American Hopewell Township Franchise
  BPU Docket No. WE07120981
- New Jersey American Water Co/City of Trenton
  Joint Petition for Approval of the Sale of Water System
  BPU Docket No. WE08010063
- New Jersey American Water Company Petition for Approval of a Distribution System Improvement Charge (DSIC)
  BPU Docket No. WO08050358
- New Jersey American Water Co Management Audit
  BPU Docket No. WA09070510
- New Jersey American Water Base Rate Adjustment
  BPU Docket No. WR10040260
- New Jersey American Water Company Franklin Franchise Review
  BPU Docket No. WE11070403
- New Jersey American Water Company Base Rate Adjustment
  BPU Docket No. WR11070460
- New Jersey American Water Company Base Rate Adjustment
  BPU Docket No. WR15010035
- New Jersey Natural Gas Rates
  BPU Docket No. GR07110889
- Oakwood Village Sewer Change in Control
  BPU Docket No. WM07070535

ACCOMPLISHMENTS (CONT.)

- Oakwood Village Sewer System Change in Control
  BPU Docket No. WM15091006
- Parkway Water Company Rates
  BPU Docket No. WR05070634
- Pinelands Water Company Rates
  BPU Docket No. WR03121016
- Pinelands Wastewater Company Rates
  BPU Docket No. WR03121017
- Pinelands Water Company Rates
  BPU Docket No. WR08040282
- Pinelands Wastewater Company Rates
  BPU Docket No. WR08040283
- Pinelands Water Company Rates
  BPU Docket No. WR120807342
- Pinelands Wastewater Company Rates
  BPU Docket No. WR12080735
- Pinelands Water Company Rates
  BPU Docket No. WR15101200
- Pinelands Wastewater Company Rates
  BPU Docket No. WR15101202
- Rahway Operational Services Agreement Review
  BPU Docket No. WO16070678
- Rock GW, LLC Determination of Applicability of Board Regulation
  BPU Docket No. WO08030188
- Rock GW, LLC Determination of Applicability of Board Regulation
  BPU Docket No. WO10100739
- Roxbury Water Company Rates
  BPU Docket No. WR09010090
- Roxciticus Water Company Change in Control
  BPU Docket No. WM15080982
- SB Water & Sewer Company Acquisition
  BPU Docket No. WM16030197
- Seabrook Water Company Franchise
  BPU Docket No. WC02060340
- Seaview Harbor Water Company Change in Control
  BPU Docket No. WM13100957
- Shorelands Water Company Rates
  BPU Docket No. WR04040295
- Shorelands Water Company Base Rates
  BPU Docket No. WR10060394
- Shore Water Company Rates
  BPU Docket No. WR09070575
- South Jersey Water Supply Change in Control
  BPU Docket No. WM07020076
- Suez Water NJ DSIC Foundational Filing
  BPU Docket No. WR13030210
- Suez Water NJ Borstad Water Company Acquisition
  BPU Docket No. WE15111247

ACCOMPLISHMENTS (CONT.)

- Suez Water New Jersey Base Rate Adjustment
  BPU Docket No. WR15101177
- Suez Water Toms River Base Rate Adjustments
  BPU Docket No. WR15020269
- Suez Water NJ – USG Cottonwood Agreement
  BPU Docket No. WR15070856
- United Water Acquisitions Evaluation
  BPU Docket No. WM02060354
- United Water Arlington Hills Franchise
  BPU Docket No. WE07020084
- United Water Arlington Hills Sewerage Base Rates
  BPU Docket No. WR08100929
- United Water New Jersey Base Rates
  BPU Docket No. WR07020135
- United Water New Jersey Base Rates
  BPU Docket No. WR08090710
- United Water New Jersey Base Rates
  BPU Docket No. WR11070428
- United Water New Jersey DSIC Foundational Filing
  BPU Docket No. WR12080724
- United Water New Jersey Management Audit
  BPU Docket: WA05060550
- United Water New Jersey Affiliate Transaction Review – JPI Painting
  BPU Docket No. WO10060410
- United Water New Jersey Affiliate Transaction
  Review – Utility Service Contract
  BPU Docket No. WO10060409
- United Water New Jersey Mt Arlington Franchise
  Extension Review
  BPU Docket No. WE09121006
- United Water New Jersey Vernon Township Franchise
  Extension Review
  BPU Docket WE10110870
- United Water New Jersey Vernon Township Franchise
  Extension Review
  BPU Docket WE11030155
- United Water Great Gorge/Vernon Sewer Base Rates
  BPU Docket No. WR10100785
- United Water Toms River Base Rates
  BPU Docket No. WR080830139
- United Water Toms River Base Rates
  BPU Docket No. WR12090830
- United Water West Milford Sewerage Base Rates
  BPU Docket No. WR08100928

ACCOMPLISHMENTS (CONT.)

- Assisted the New Jersey Division of Rate Counsel in assessing drought conditions effecting water utilities in New Jersey during the 2002 drought. Analyzed proposals for water supply interconnections to mitigate drought impacts, developed position statements regarding pricing alternatives, and provided a critique of State water supply management initiatives prior to and during drought conditions.
- Assisted the New Jersey Division of Rate Counsel in assessing the need for a Distribution System Improvement Charge (DSIC) to allow regulated water utilities to accelerate the recovery of capital investments in water distribution assets (BPU Docket WO10090655). Provided financial analyses of current and prospective distribution renovation programs. Reviewed and commented on draft language for a generic rule making.
- Assisted the Delaware Public Advocate in assessing drought conditions effecting water utilities in northern New Castle County during the 2002 drought (PSC Docket No. 323-02). Reviewed water utility operations prior to and during the drought emergency, assessed the effectiveness of use curtailments, developed recommendations to assure proper, cost-effective resources management for future drought conditions.
- Assisted the Delaware Public Service Commission in a determination of rate base for Artesian Water Company in PSC Docket 08-96. Evaluated selected plant facilities and proposed projects to determine the need to impute revenues for under-utilized facilities in establishing new base rates.
- Assisted the Delaware Public Service Commission in an evaluation of the Initial Tariff filing submitted by Tidewater Environmental Services, Inc. (PSC Docket No. 11-274WW) for wastewater service in a development known as "The Ridings." Evaluated projected operating expenses and rate base claims and developed recommendations that avoided a potential 17.5% rate increase.
- Prepared an assessment of the water supply capacity certification and water conservation plan submitted by United Water Delaware in PSC Docket 09-282 on behalf of the Delaware Public Service Commission. Evaluated the capacity of the sources of supply available to the Company with respect to projected demands and the requirements of the Delaware Water Supply Self-Sufficiency Act of 2003. Assessed the effectiveness of water conservation activities and developed recommendations to improve the efficiency and effectiveness of Company conservation programs.
- Provided expert testimony on behalf of the Delaware Public Advocate in the matter of Inland Bays Preservation Company's request for an increase in wastewater rates before the Delaware Public Service Commission (PSC Docket No. 09-327-WW). Evaluated plant facilities, proposed projects and the allocation of developer contributions in aid of construction to determine rate base. Assessed the level of operating expenses claimed in the filing and recommended adjustments to substantially lower the requested rate increase.

ACCOMPLISHMENTS (CONT.)

- Provided expert testimony on behalf of the Delaware Public Advocate in the matter of Tidewater Environmental Services, Inc.'s request for a base rate adjustment for seven of its regulated wastewater utility systems (PSC Docket No. 11-329WW). Established independent revenue requirements for each system to assure that costs and rates were properly matched for each independent group of customers served by the Company. Recommended an overall rate adjustment that was equivalent to 60% of the initial rate request and was within 12% of the final ordered rates in this matter.
- Provided expert testimony on behalf of the Delaware Public Advocate in the matter of Tidewater Utilities, Inc.'s request for a base rate adjustment for its regulated water systems throughout Delaware (PSC Docket 13-466). Provided testimony on engineering and accounting issues related to the determination of the Company's revenue requirement that resulted in a rate settlement equivalent to twenty percent of the Company's filed rate request.
- Provided expert testimony on behalf of the Township of Newtown before the Pennsylvania Public Utility Commission (PUC Dkt. No. P-2012-2327738) in regard to a dispute between the Township and Newtown Artesian Water Company regarding the siting of a proposed new well. Evaluated current and future water supply needs, water quality and treatment needs and the revenue requirement of the proposed project relative to other alternatives.
- Managed 175 municipal and commercial water and wastewater contracts located in seven states for American Water Services/AmericanAnglian Environmental Technologies. Through these contracts, cost effective water and wastewater service was provided to over one million people. Contracts included the 160 MGD City of Buffalo, NY water system and the 30 MGD Scranton Sewer Authority wastewater operations. Directed an operations staff of 700 employees. Eliminated financial losses while improving safety and quality.
- Directed a marketing and business development staff for AmericanAnglian Environmental Technologies that secured the largest operations and maintenance contract awarded in the US in 1999 and the second best overall performance in the US market. Increased revenues by 28%. Evaluated potential contract operations and design/build projects to identify operating and capital savings on hundreds of potential contracts throughout the United States. Evaluations included Atlanta, Georgia, Scranton, Pennsylvania and Springfield, Massachusetts.
- Managed the operations of 16 water systems for New Jersey-American Water Company, a regulated investor-owned utility serving one million people throughout NJ. Coordinated the activities of a decentralized operations staff of 440 to provide reliable water service, ensure environmental compliance, control costs, manage and maintain system assets, reduce liability, provide site security and maintain a safe work place, and meet financial objectives. Responsible for the maintenance and operation of all source of supply, treatment, filtration and storage facilities, producing and distributing between 100 MGD and 220 MGD, as well as over 4,000 miles of water transmission and distribution facilities.

ACCOMPLISHMENTS (CONT.)

- Directed a team of engineering, legal, public relations and financial professionals that planned, designed, permitted and constructed a $192,000,000 water treatment plant and pipeline system for New Jersey-American Water Company. The intake, constructed in environmentally sensitive areas and the state of the art water filtration plant can be expanded to produce 100 MGD. The project is the principal source of surface water for nearly one million people in southern New Jersey and it was built to allow new regulatory controls on ground water use to go into effect. The project was completed within budget and on schedule.
- Developed the financial model and contract language that allowed water lines to be extended to over 3,000 homes with contaminated private wells in Atlantic County, New Jersey. This program provided the financial assurances needed to construct several miles of water mains, eliminate federal tax liability and reduce costs by 34%.
- Initiated and directed the first study of desalination for public water supply purposes in NJ for the City of Cape May. This project evaluated two desalination technologies and demonstrated that reverse osmosis could be used effectively to treat brackish water at a competitive cost. A full-scale plant has since been placed in service.
- Developed long-range regional water supply plan for Monmouth County, New Jersey, a county that was adding as many as 1,000 water utility customers per year and seriously stressing the water supply. The plan evaluated alternative sources of water, conservation and regional reservoir development. The recommendations avoided $30,000,000 in capital construction while ensuring a safe supply of water for a 15-year planning period. Negotiated supply sharing operating agreements with the New Jersey Water Supply Authority to implement the plan.
- Directed a staff of engineers and consultants in preparing comprehensive plans for 60 water systems located throughout the United States. Communities served by these systems include: Pittsburgh, Pennsylvania and its surrounding suburbs; Charleston, West Virginia; Richmond, Indiana; E. Saint Louis, Illinois and Monterey, California. Evaluated alternatives and identified the least costly means of providing safe water service for each system. Assessed operations strategies to identify external threats to the reliability and efficiency of these systems. Identified specific capital facility needs and operations strategies for five, ten and fifteen year planning horizons, defined the long term role of each system in prompting regional water supply development, and assessed the impact of future State and Federal water quality regulations on system operations and needs.
- Developed a formula for allocating ground water to 30 water suppliers in southern New Jersey for the New Jersey Department of Environmental Protection and negotiated an implementation agreement with effected suppliers. The New Jersey Legislature adopted the formula in the Water Supply Management Act Amendments of 1992. The allocation formula protects a regional aquifer from over-pumping.
- Developed a plan to convey storm water through a sixty-foot high railroad embankment in Prince Georges County, Maryland. Evaluated alternative methods and selected one that allowed an existing culvert to be modified to carry higher flow rates. Saved over $500,000 in construction costs. The Washington Suburban Sanitary Commission and Prince Georges County adopted the design as a standard in their storm water design manual.

ACCOMPLISHMENTS (CONT.)

- Negotiated Lakewood, New Jersey's first three-year water and wastewater labor agreement in the face of an impending strike, departing from prior history of year-to-year contract agreements.
- Provided expert testimony in judicial proceedings involving utility rate adjustments before the New Jersey Board of Public Utilities, the Connecticut Department of Public Utility Control and the New York Public Service Commission. Testified on environmental and operations topics including: rate setting strategies, source of supply improvements, water resources management, treatment to mitigate contamination, staffing levels and operating practices. Testified as to the least costly means of operating and maintaining water and wastewater facilities.
- Served as a gubernatorial appointee to the New Jersey Water Supply Advisory Council under Governors Florio and Whitman. Advised the NJ Department of Environmental Protection on a variety of water resources management issues.
- Coordinated the response to an outbreak of giardiasis for the US Environmental Protection Agency. The outbreak affected 20% of the people served by a municipal water system in north-central Pennsylvania. Specified immediate control measures, short-term treatment techniques and long-term treatment improvements to resolve the immediate problem and prevent a recurrence.

AWARDS

John J. Gallen Memorial Award presented by the Villanova University College of Engineering (1988) in recognition of many significant achievements in the field of water supply and distribution, effective leadership in developing regional water supply systems and contributions in the development of comprehensive plans for water supply systems.

George Warren Fuller Award presented by the American Water Works Association (2013) for distinguished service to the water supply field in commemoration of the sound engineering skill, brilliant diplomatic talent and constructive leadership which characterized the life of George Warren Fuller.

REPRESENTATIVE CLIENTS

- A.C. Schultes, Inc.
- Aquarion Water Company of Connecticut
- Aquarion Water Company of Massachusetts
- Atlantic City Municipal Utilities Authority
- Bethlehem Water Authority
- BOC Gases
- Bucks County Water & Sewer Authority
- Camco Management
- Cedar Grove Township
- Consumers New Jersey Water Company
- Delaware Public Advocate
- Delaware Public Service Commission
- D. R. Horton – New Jersey
- Elmira Water Board
- Erie City Water Authority
- Greater Ouachita Water Company
- Harris Defense Group
- Jersey City Municipal Utilities Authority
- Lower Makefield Township
- New Jersey-American Water Company
- New Jersey Division of Rate Counsel
- New Jersey Water Supply Authority
- New York City Department of Environmental Protection
- North Penn Water Authority
- North Wales Water Authority
- Passaic Valley Water Commission
- Perkasie Borough
- Perkasie Borough Authority
- Pricewaterhouse Coopers, LLP
- Sussex Shores Water Company
- Township of Sparta (NJ)
- U.S. Water, LLC
- Upper Dublin Township

PROFESSIONAL QUALIFICATIONS

Registered Professional Engineer in Delaware (2004), Maryland (1982), New Jersey (1984), New Mexico (1987), New York (1984) and Pennsylvania (1983).

Licensed to complete RAM-W vulnerability assessments (2002).

PROFESSIONAL ASSOCIATIONS

American Society of Civil Engineers, American Water Works Association (Trustee of New Jersey Section), American Water Resource Management Association, International Water Association, National Ground Water Association, National Fire Protection Association, Water Environment Federation, Tau Beta Pi.

PROFESSIONAL HISTORY

HOWARD J. WOODS, JR. & ASSOCIATES, LLC **2000 - Present**
General Manager

AMERICAN WATER WORKS COMPANY **1983 - 2000**

American Water Services, Inc.
Senior Vice President - Operations 1999 - 2000

American Anglian Environmental Tech., L.P.
Senior Vice President - Business Development 1998 - 1999

American Water Works Service Co.
Vice President - Special Projects 1997 - 1998

New Jersey-American Water Co., Inc.
Vice President - Operations 1989 - 1997

American Water Works Service Co.
Engineering Manager 1988 - 1989
System Director of Planning 1986 - 1988
Division Manager of Operations 1984 - 1986
Division Director of Engineering 1983 - 1984

JOHNSON, MIRMIRAN & THOMPSON **1981 - 1983**
Project Engineer

U.S. ENVIRONMENTAL PROTECTION AGENCY **1977 - 1981**
Environmental Engineer

CONTACT INFORMATION

Howard J. Woods, Jr., P.E.
Howard J. Woods, Jr. & Associates, L.L.C.
49 Overhill Road, East Brunswick, NJ 08816-4211
Phone: 267-254-5667
E-mail: howard@howardwoods.com

APPENDIX B - Schedules

HJW-1: Adjustment to Projected Commercial Use

HJW-2: Projected Flow Adjustment

HJW-3: Purchased Power Adjustment

HJW-4: Waste Disposal Expense Adjustment

HJW-5: Analysis of Post Test Year Additions

Schedule HJW-1: Adjustment to Projected Commercial Use

Year	No. of Meters	Consumption (ThGal)	Usage Per Meter
12/31/06	21	19,073	908.238
12/31/07	21	19,664	936.381
12/31/08	21	18,482	880.095
12/31/09	21	19,379	922.810
12/31/10	25	15,993	639.720
12/31/11	25	17,820	712.800
12/31/12	25	17,099	683.960
12/31/13	25	17,143	685.720
12/31/14	25	16,416	656.640
12/31/15	25	16,765	670.600
12/31/16	25	16,844	681.944

Linear Trend Analysis Using 2010 through 2015

0	-0.000964336	714.8843478
0	0.019852735	823.1114284
0.144176432	30.33221639	#N/A
0.252697701	3	#N/A
464.9856793	2760.130054	#N/A
#N/A	#N/A	#N/A

Non-Linear relationship for data from 2010 through 2015 when the Company served 25 accounts. Prior data for 21 accounts showed significantly higher average use per customer and total use and was disregarded in this analysis.

Five Year (2011-2015) Average Use (ThG/Yr)	681.944
Customers	25
Annual Commercial Use	17,049
Company Estimated Commercial Use	16,844
Rate Counsel Adjustment (ThGal/Yr)	205

Notes:
(1) Historical customers and use from SIR-19.
(2) Company estimated Commercial Use from SIR-19.

Schedule HJW-2: Projected Flow Adjustment

Year	Total Plant Flow (ThGal/Yr)	Registered Flow Per SIR-26 (ThGal/Yr)	Unmetered Ratio (%)	Registered Flow Per SIR-19 (ThGal/Yr)	Unmetered Ratio (%)
2012	41,134	33,885	21.39%	35,949	14.42%
2013	41,680	36,287	14.86%	36,287	14.86%
2014	39,980	34,965	14.34%	34,965	14.34%
2015	42,157	35,523	18.68%	35,523	18.68%
Average			17.32%		15.58%

	Company Projection	Rate Counsel Projection
Forecast Residential Use	29,553	29,553
Annual Commercial Use	16,844	17,049
Projected Consumption (ThGal/Yr)	46,397	46,602
Projected Flow (ThGal/Yr)	54,432	53,860
Rate Counsel Adjustment (ThGal/Yr)		(572)

Notes:
(1) Total Plant Flow from SIR-26.
(2) Forecast Residential Use from SIR-19.
(3) Company projected Commercial Use from SIR-19. Rate Counsel projected Commercial Use from Schedule HJW-1.

Schedule HJW-3: Purchased Power Adjustment

Year	Purchased Power ($/Yr)	Power Consumption (kWh/Yr)	Flow (ThGal/Yr)	Power Consumption per Unit of Flow (kWh/ThGal)	Average Cost of Power ($/kWh)
2013	$ 29,464	230,861	41,680	5.5389	$ 0.1276
2014	$ 31,048	278,198	39,980	6.9584	$ 0.1116
2015	$ 50,319	313,616	42,157	7.4392	$ 0.1604
Average		274,225		6.6455	$ 0.1332

Power Consumption for New Plant		287,547	kWh/Yr
Projected Flow FromRCR-E-23.		74,542	ThGal/Yr
Power Consumption Per Unit of Flow		3.8575	kWh/ThGal
Adjusted Projected Flow From HJW-2.		53,860	ThGal/Yr
Adjusted Power Consumption		207,766	kWh/Yr
Current Unit Price for Power	$	0.1116	$/kWh
Projected Power Cost	$	23,187	$/Yr
Company Pro Forma Power	$	58,038	$/Yr
Rate Counsel Adjustment	**$**	**(34,851)**	$/Yr

Notes:
(1) New plant power consumption from RCR-E-5
(2) Historical costs and use from SIR-21, RCR-E-6 and RCR-E-7.
(3) Current unit prices for power from RCR-A-15.

Schedule HJW-4: Waste Disposal Expense Adjustment

Year	Sludge Produced (Gal)	Wasterwater Flow (ThGal/Yr)	Sludge Removed Per Unit of Flow (Gal/ThGal)	Total Expense ($/Yr)	Average Cost per Gallon ($/Gal)
2013	362,500	41,680	8.6972	$ 30,806	$ 0.085
2014	380,000	39,980	9.5048	$ 37,123	$ 0.098
2015	351,000	42,157	8.3260	$ 32,380	$ 0.092

Projected Sludge Volume (Gal/Yr)	538,375	Gal
Projected Flow From RCR-E-23	74,542	ThGal/Yr
Sludge Removed Per Unit Flow	7.2224	Gal/ThGal
Adjusted Projected Flow From HJW-2	53,860	ThGal/Yr
Adjusted Sludge Production	389,001	Gal

Current Cost of Disposal	$ 0.092	
Projected Sludge Removal Cost	$ 35,886	
Company Pro Forma Disposal Cost	$ 44,403	
Rate Counsel Adjustment	**$ (8,517)**	

Notes:
(1) Projected Sludge Volume from RCR-E-13.
(2) Current sludge disposal unit price from SIR-23.
(3) Company Pro Forma Waste Disposal Cost from SIR-23.

Schedule HJW-5: Analysis of Post Test Year Additions

SUEZ Water Arlington Hills Inc.
Construction Program

10/31/16

Line No.	Description (project name)	Project Number	In Service Date	Account Number	Additions	Retirement	Cost to Remove	Major in Nature and Consequence?	Post Test Year Addition Consistent With Inre: Elizabethtown	Retirements	Cost of Removal
		(1)	(2)	(3)	(4)	(5)	(6)				
	Sewer Treatment Plant										
1	Sewer Plant Replacement			320	-	312	-				
2	Sewer Plant Replacement	C15R520	10/31/16	331	714,287	167,225	-				
3	Sewer Plant Replacement	C15R520	10/31/16	340	8,214,303	2,597,661	400,000				
4	Sewer Plant Replacement	C15R520	10/31/16	341	357,144	-	-				
5	Sewer Plant Replacement	C15R520	10/31/16	342	1,428,574	15,646	-				
6	Sewer Plant Replacement	C15R520	10/31/16	343	571,430	45,236	-				
7	Sewer Plant Replacement			344	-	103,307	-				
8	Sewer Plant Replacement			347	-	273,051	-				
9	Sewer Plant Replacement	C15R520	10/31/16	348	857,145	-	-				
10	Sewer Plant Replacement			349	-	98,295	-				
11	Sewer Plant Replacement			350	-	89,988	-				
12	Sewer Plant Replacement			352	-	44,280	-				
13	Sewer Plant Replacement	C15R520	10/31/16	353	714,287	-	-				
14	Sewer Plant Replacement			390	-	344,238	-				
15	Sewer Plant Replacement			391	-	20,690	-				
16	Sewer Plant Replacement			394	-	29,185	-				
17	Sewer Plant Replacement			395	-	11,903	-				
18	Sewer Plant Replacement			397	-	11,295	-				
19	Sewer Plant Replacement			398	-	15,196	-				
20	Subtotal				$ 12,857,170	$ 3,867,508	$ 400,000	YES	$ 12,857,170	$ 3,867,508	$ 400,000
21	Fieldstone and Shadow Woods	C15R520	10/31/16	321	505,296	0	0	Yes	$ 505,296	$ -	$ -
22	Replace Sewer Laterals	C16N501	10/31/16	320	3,074	154	307	NO	$ -		
23	Replace Short Mains & Manholes	C16P501	10/31/16	321	131,750	6,588	13,175	NO	$ -		
24	Replace Pumps	C16R500	10/31/16	331	13,175	659	1,318	NO	$ -		
25	Replace Treatment Equipment	C16R510	10/31/16	347	18,333	917	1,833	NO	$ -		
26	Misc. Facilities Improvements	C16R505	10/31/16	390	21,958	1,098	2,196	NO	$ -		
27	Control Equipment Imps	C16R530	10/31/16	391	17,567	878	1,757	NO	$ -		
28	**Total Construction**				**$ 13,568,324**	**$ 3,877,801**	**$ 420,586**		$ 13,362,466	$ 3,867,508	$ 400,000
	Contribution										
29	Atkins contribution		10/31/16		(1,445,296)	426,728			(1,445,296)	426,728	-
30	**Total Contributions**				**$ (1,445,296)**	**$ 426,728**	**$ -**		$ (1,445,296)	$ 426,728	$ -
31	**Rate Counsel Adjustments to UPIS**								**$ (205,858)**		