



ATLANTIC CITY MUNICIPAL UTILITIES AUTHORITY

2009 ANNUAL REPORT

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FEBRUARY 2010

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1.0 INTRODUCTION

1.1 BACKGROUND

The Atlantic City Municipal Utilities Authority (ACMUA) was formed by action of the Board of Commissioners of the City of Atlantic City on September 14, 1978. The Authority was created under the provisions of the New Jersey Municipal and County Utilities Law. On January 22, 1980 the ACMUA acquired the Atlantic City Water Utility and assumed operation and maintenance of the system.

ACMUA provides drinking water to Atlantic City which is located on Absecon Island in Atlantic County. The Atlantic County Department of Regional Planning and Economic Development identifies the size of Atlantic City as 15.7 square miles (10,066 acres).

1.2 OUTSTANDING BOND OBLIGATIONS

The Authority has issued a series of eight (8) Revenue Bonds over the years, as shown in Table 1-1. Five (5) of the original bonds have been retired or refunded. In addition they currently have two (2) New Jersey Environmental Infrastructure Trust Loans that are also listed below.

**Table 1-1
Revenue Bond Information**

Bond Series	Amount	Status
1983	\$ 10,685,000	Retired
1986 (Refunding)	\$ 11,085,000	Retired
1990	\$ 9,265,000	Retired
1993 (Refunding)	\$ 22,725,000	Retired
1999 (Refunding)	\$ 10,500,000	Retired
2002 (Refunding)	\$ 16,890,000	\$9,040,000 balance
June 2005	\$ 3,895,000	Retired
2005 NJEIT Loan	\$ 5,543,215	\$4,978,434 balance
2006 NJEIT Loan	\$ 2,458,103	\$2,212,196 balance
2007 (Refunding)	\$ 8,830,000	\$8,830,000 balance
2009 NJEIT	\$4,300,000	Apx. half will be forgiven, Stimulus

All balances are as of 12/31/09

Section 606 of the Revenue Bond Resolution for the 1986 Bonds requires that a Consulting Engineer make an inspection of the ACMUA's facilities and prepare an Annual Report to the Authority regarding maintenance, repair, and operation of the water system during the ensuing fiscal year, and complete a review of the annual operating

budget for adequacy for the purposes of continued operation and maintenance. This is the Annual Report for 2009.

1.3 WATER RATES

The water service charge for each ACMUA customer is the sum of the customer charge and the excess water rate. There are four major customer categories: Residential, Business/Commercial, Industrial, and Intergovernmental.

The Authority increased the base water rate to \$90.00 per year and excess water rate to \$2.212 per 100 cubic feet on January 1, 2007. A combination of the January 1, 2007 rate increase, growth in Atlantic City, and use of reserves allowed the Authority to maintain water rates in 2008, and similarly no rate increase occurred in 2009. However, the 2009 revenue projections will have a shortfall (apx. \$1,000,000) due to reduced water sales, connections and lower interest rates on invested monies. These shortfalls will be made up in 2010 by reducing costs and a 9 ½ % rate increase. New water rates were approved at the December 23, 2009 Authority meeting, and the base water rate will be \$98.80 per year and excess water rate of \$2.422 per 100 cubic feet starting on January 1, 2010.

The connection fee is recalculated each year in accordance with a formula mandated by State law. Based on the Authority's finances in 2009, the connection fee increased to \$9.6700 per gallon of average daily flow for 2009. The newly adopted connection fee for 2010 is \$10.1302 per gallon of flow, and the adopted flow for single-family dwellings is 225 gpd.

1.4 ACMUA BUDGET

The 2010 budget was adopted by the Authority by resolution at its meeting on December 23, 2009. Details of the budget are reviewed in Section 6.0 of this report.

1.5 ACMUA CUSTOMER BASE

The Authority's average daily water demand generally increased from 1980 through the early 1990's. Following this period, water demands generally decreased. The decreased water demands can be explained by the Authority's leak detection and control program, and the decrease in residential water demand.

In the 1990 Census, when the population of Atlantic City was 37,957, ACMUA had 6,549 residential accounts. In the 2000 Census, the population increased to 40,517, while the number of residential accounts dropped to 6,379. The increase in population may be due to concerted efforts made by the United States Census Bureau to count undocumented residents that were not included in the 1990 census. After 2000 there was also a subsequent increase in residential services with 6,813 in the year 2000 increasing 6,897 residential services in 2006 and 6,978 in 2007, of which there were 6,004 and 6,085 single-family accounts in 2006 and 2007, respectively. Residential per capita water consumption decreased from 104 gpdc in 1990 to 75 gpdc in 2000. The decrease in residential per capita water demand is due to newer more efficient plumbing fixtures replacing older fixtures.

The water usage of non-residential water users remained relatively unchanged from the early 1990's through the year 2000. The stable level of water usage can be explained by the relatively low level of development in Atlantic City during that time period.

In 2001, New Jersey American Water Company (NJAW) started to purchase water from ACMUA. The average daily water sales to NJAW are approximately 1.5 mgd. According to the terms of their contract, NJAW must purchase a minimum average daily flow of 1.5 mgd. Additionally, NJAW is limited to a maximum daily purchase of 5 mgd.

Since the year 2000, several new development projects were completed. These new projects included: an expansion of the Showboat Casino, construction of the Walk Shopping Center, an expansion of the Marina Thermal heating and cooling plant, an expansion of the Tropicana Casino, an expansion of Harrah's Casino, and completion of the Borgata Casino and Water Club. Three (3) hotel towers (Borgata, Harrah's, and Taj Mahal) opened in 2008. These development projects have increased potable water demands.

The new development activity, in conjunction with the bulk water purchase by the New Jersey American Water Company should continue to increase the water demands within the ACMUA service area. Foundation work has begun on a new mega casino and three (3) more casinos are in the planning stage. The Walk outlet shopping area is also completing another stage of its expansion. There were a total of 8,031 water services ranging size from 1-inch to 12-inch in diameter in 2009.

The Authority has developed a Master Plan to guide future expansions of the Authority's water treatment and distribution facilities to meet projected customer base and water supply needs. The supply facilities and planned expansions are presented later in this report.

2.0 EXISTING FACILITIES

2.1 INTRODUCTION

The ACMUA receives its source water from a combination of surface water and groundwater sources. Surface water is supplied by two reservoirs (Kuehnle Pond and Doughty Pond) that operate in series. Groundwater is supplied from a series of wells that supply water from the Kirkwood-Cohansey aquifer system.

The raw water from Doughty Pond and the groundwater from Cohansey wells Nos. 3, 16, 17, 18, 19, 20, 21, 22, 23 and 24 and Kirkwood wells 14A and 25 pass through pretreatment and filtration. A list of the Authority's wells, including each well's present status, is provided in Table 2-1. The water from Well Nos. 3, 14A, and 25 were previously treated separately and pumped to finished water Basin C for chemical addition and storage. These wells are now being sent to the water treatment plant headworks (flow diversion box) and treated with the rest of the water sources.

The Authority changed pretreatment chemicals in 2007. The coagulant was changed from a polymer blend to polyaluminum chloride, and sodium permanganate (oxidant) was also added to augment the continued application of sodium hypochlorite. With these changes the sodium hypochlorite is now being added at a reduced rate. Lime is also added as part of preliminary and final chemical treatment for pH adjustment and to increase alkalinity.

The ACMUA's treatment system is comprised of screening, aeration, coagulation, flocculation, sedimentation, filtration, corrosion control, and disinfection processes. The solids produced during water treatment are thickened on site by gravity thickeners, and residuals are dewatered on covered sand drying beds. The dewatered solids are currently being reused on site in the former Basin A area. Any excess solids will be subsequently hauled off-site for disposal or use as a soil conditioner. This disposal method is covered by a NJDEP Beneficial Use Permit acquired by the Authority in 2007. The Beneficial Use Permit renewal was applied for in 2009 and a draft permit was issued.

2.2 GROUNDWATER

In 2009, approximately 76% of the Authority's source water was obtained from groundwater sources. Through the years, the Authority has utilized 25 wells as its source of groundwater. Due to potential negative influences on water quality, a number of wells have either been abandoned or placed on standby service.

The ACMUA currently utilizes 13 wells located in the Kirkwood-Cohansey aquifer system and 2 wells located in the Atlantic City 800-Foot Sand layer of the Kirkwood Formation. The wells in the Kirkwood-Cohansey aquifer are known as the Cohansey Wells, those in the 800-Foot Sand layer as the Kirkwood Wells.

The allocation permit states the well 14A is rated at 1056 gpm or 1.5 mgd and well 25 at 1089 gpm or 1.56 mgd.

**Table 2-1
Present Status of ACMUA Supply Wells**

Well No.	Type of Aquifer	Status	Capacity, MGD	Treatment
Well No. 1	Kirkwood	Sealed	-	-
Well No. 2	Cohansey	Sealed	-	-
Well No. 3	Cohansey	In Seasonal Service	1.50	ACMUA WTP**
Well No. 4	Cohansey	Sealed	-	-
Well No. 5	Cohansey	Sealed	-	-
Well No. 6	Cohansey	Sealed	-	-
Well No. 7	Cohansey	Sealed	-	-
Well No. 8	Cohansey	Sealed	-	-
Well No. 9	Cohansey	Emergency	1.51	-
Well No. 10	Cohansey	Emergency	1.58	-
Well No. 11	Cohansey	Emergency	1.09	-
Well No. 12	Cohansey	In service	1.50	-
Well No. 13	Cohansey	Sealed	-	-
Well No. 14	Kirkwood	Sealed	-	-
Well No. 14A	Kirkwood	In Service	1.52	ACMUA WTP *
Well No. 15	Kirkwood	Sealed	-	-
Well No. 16	Cohansey	In service	1.73	ACMUA WTP
Well No. 17	Cohansey	In service	1.73	ACMUA WTP
Well No. 18	Cohansey	In service	1.73	ACMUA WTP
Well No. 19	Cohansey	In service	1.44	ACMUA WTP
Well No. 20	Cohansey	In service	1.73	ACMUA WTP
Well No. 21	Cohansey	In service	1.73	ACMUA WTP
Well No. 22	Cohansey	In service	1.73	ACMUA WTP
Well No. 23	Cohansey	In service	1.73	ACMUA WTP
Well No. 24	Cohansey	In service	1.73	ACMUA WTP
Well No. 25	Kirkwood	In service	1.56	ACMUA WTP*

* These wells redirected to the headworks (Flow Diversion Box) in 2008.

** GAC was discontinued and water is pumped to Flow Diversion Box for treatment with other water in the ACMUA's Water Treatment Plant in 2008.

The water from the Cohansey wells is conveyed to the ACMUA's Water Treatment Plant located in Pleasantville, New Jersey. The two wells (Well No. 14A and 25) in the Atlantic City 800-Foot Sand aquifer of the Kirkwood formation formerly pumped directly to Basin C, are now directed to the Flow Diversion Box and are treated with the other supply sources in the water treatment plant. While oxidizing and filtering the Kirkwood well water does result in slight increase in energy usage, it does reduce the amount of iron in the finished water produced at the water treatment plant and the Authority has seen a treatment benefit from the increased alkalinity contributed from

these wells to the treated water. The increased alkalinity would also mean a reduction in the amount of lime that is added.

Well No. 3 is located within the grounds of the existing water treatment plant. Well No. 3 in the Cohansey Aquifer has been in service since 2003, after being inactive for 20 years. Well No. 3 is only allowed to be operated from Memorial Day to Labor Day. Well No. 3 is able to produce up to 1,000 gpm, and was pumped to two modular Centaur HSL™ granular activated carbon (GAC) adsorption filters that operated in parallel. However, with the change in chemicals (sodium permanganate and polyaluminum chloride) in 2007/2008, as well as renovations on the Authority's Filter Building (e.g.- filter media replacement) the Authority analyzed and found that the water from Well No. 3 can now be adequately treated in the water treatment plant, and the use of the GAC filters has been discontinued. Well No. 3 water is now sent directly to the Flow Distribution Box where it mixes with other water and subsequent treatment. The GAC units remain onsite for standby or emergency use if necessary.

Well No. 14 was abandoned and subsequently redrilled as Well 14A during a recent improvement project. The re-drill project was necessary because Well 14 had zero output due to sand entrainment. Construction of Well No. 14A was completed in 2005.

Well Nos. 16 through 24 are located on the grounds of the Federal Aviation Administration Technical Center in Egg Harbor Township. Well Nos. 16 through 24 were all constructed in 1984 and all the pumps, controls and appurtenances for each well are located in individual brick buildings. Each well pump is equipped with a 40 hp motor except Well No. 22, where the motor was replaced in 2003 with a 50 hp motor. The ACMUA's new Water Allocation permit received in 2009 increased the allocation for Well Nos. 16 to 24, and allows the Authority to drill a new Kirkwood Well.

Well No. 15 was redrilled and subsequently renamed Well No 25 as requested by the NJDEP. This well is located on the property of ACMUA Water Treatment Plant. The electrical appurtenances are housed in a metal shelter.

Well 19 was redeveloped in 2008 and its production increased from 700 gpm to 1,000 gpm.

Well Nos. 1, 2, 4, 5, 6, 7, 8 and 13 were located on the grounds of the Authority's water treatment plant, or on neighboring land near Holy Spirit High School. These wells were removed from service, sealed, and abandoned as a result of concerns related to the contamination produced by the Prices Pit landfill.

Well Nos. 9, 10, and 11 are located along an unpaved road between the water treatment plant and the Doughty Pond surface water intake. The depths of these wells range from 190 to 195 feet. These wells were removed from service due to their potential to be impacted by the Price's Pit landfill contamination. However, these wells have a greater depth than any of the other wells that were removed from service by the Authority. The well houses are currently boarded up, and there are no usable electrical services.

Well No. 12 is located next to Doughty Pond. This well was on stand-by service, also due to concerns related to potential contamination migration from the Prices Pit landfill. This well was taken out of regular service upon completion of Wells 16 through 24. Note it has been determined that the occasional use of Well 12 will not effect the Prices Pit contamination plume, and a recent modification to the Authority's Water Allocation Permit from NJDEP allows the use of this well for up to 240 days per year, with a maximum of 90 days in a row. Well No. 12 was successfully used in 2008 and 2009 to meet the water supply demands.

2.3 SURFACE WATER

In addition to groundwater, the ACMUA utilizes surface water to supply approximately 24% of the raw water for the treatment plant. The ACMUA utilizes surface water withdrawn from the lower of two reservoirs at the confluence of the North and South Branches of the Absecon Creek. The upper reservoir (Kuehnle Pond) encompasses about 140 acres and provides storage capacity of approximately 0.250 billion gallons of water. The lower reservoir (Doughty Pond) encompasses approximately 250 acres and has a storage capacity of 0.245 billion gallons of water. The water is diverted from Doughty Pond via an intake and gravity feed to the ACMUA Water Treatment Plant.

The New Jersey Department of Environmental Protection's *Status of the Water Supply of Southeastern New Jersey* states that the safe yield of Absecon Creek is 9.3 MGD, and the ACMUA has a daily allocation of 7.0 MGD and a monthly allocation of 217 MG from this creek. The allocation from this stream is further based upon maintaining a minimum flow of 3.2 cfs downstream of the Doughty's Pond Dam. There are no violations of this minimum flow standard on record. The minimum flow is intended to protect water quality within the estuary, and no withdrawals are located downstream of the Authority's intake.

2.4 SURFACE WATER RESERVOIR INTAKE AND TRANSMISSION

Raw water is diverted from the 12-foot deep Doughty Pond Reservoir via a submerged intake and subsequently fed by gravity to the ACMUA Water Treatment Plant. The intake structure at Doughty Pond Reservoir includes an adjustable sluice gate located on the end of a 48-inch pipe that is submerged about 2 feet above the bottom of the reservoir.

Prior to reaching the plant, the surface water is combined with the water withdrawn from Cohansey wells Nos. 12 and 16 thru 24. The combined water flows through a 60-inch cast iron gravity transmission main and then through a screening structure located at the plant.

2.5 FLOW DIVERSION BOX

Surface water flows by gravity from Doughty Pond through a 48-inch transmission main. Groundwater is pumped from wells 16 through 24 into a common 36-inch prestressed concrete header that joins the 48-inch water main just downstream from Doughty Pond. Well 12 is pumped into the 48-inch water main just prior to the intersection of the two mains. The combined water flows through a 60-inch cast iron gravity transmission main to the diversion box at the treatment plant. Recycled water from solids treatment flows into the flow diversion box through a 12-inch reinforced concrete pipe where it blends with the raw water in the 60-inch transmission main. Then the flow is directed to the diversion box and to the low-lift pumps by a cast iron pipe. The flow into and out of diversion box can be isolated by sluice gates.

2.6 SCREENING CHAMBER

The screening chamber is the first unit operation of the water treatment plant. A screen is a device with uniformly sized openings that is used to retain debris found in the influent raw water. The principal role of screening is to remove the debris from the flow stream that could (1) damage subsequent process equipment, and/or (2) reduce overall treatment reliability and effectiveness.

All the raw water conveyed to the treatment plant from the diversion box passes through the screening chamber. Solids in the groundwater and return water from solids handling are too fine to be removed by the screens. Only the raw water from surface reservoirs will usually contain solids of a size capable of being removed by the screens. The screening structure at ACMUA's system includes one mechanically self-cleaning, in-channel, traveling screen (Parkson Model: Aqua Guard A-G-S-T) and one manually-cleaned screen. Currently sodium permanganate is being fed at the Screening Chamber as one of the new pretreatment chemicals (See section 2.8).

2.7 AERATION: IRON REMOVAL

The existing aeration facilities were designed for the oxidation of iron found in the groundwater and in the reservoir water; oxidized iron is subsequently removed by the Flocculation/Sedimentation basins and filters. Aeration is achieved through a forced-air cascading tower. Water from the screening chamber is pumped to an aeration tower by three low lift pumps. All three of the pumps have a rated capacity of 50 ft total dynamic head. Two of the pumps are powered by 150 hp electric motors and one is powered by a 100 hp electric motor. Each of the larger pumps has a rated capacity of 8,333 gpm and the smaller pump has a rated capacity of 5,556 gpm.

The raw water enters the aeration tower from the top and cascades down over staggered PVC slats while an exhaust fan forces air up through the tower from the bottom. The aeration tower trays were cleaned in 2009.

2.8 CHEMICAL FEEDING: PRE-TREATMENT

Sodium hypochlorite is fed after aeration to help control biological growth within the flocculation and sedimentation tanks. This chemical was augmented by sodium permanganate starting in 2007 after pilot and then full-scale tests, which produced superior water quality. In addition, the sodium permanganate also helps to oxidize any remaining iron and manganese that is not oxidized via aeration. The sodium permanganate oxidizes organically bound iron and allows for a faster rate of oxidation than aeration. The change in chemicals has also allowed the sodium hypochlorite to be fed at a reduced rate, which has the benefit of reducing potential levels of THMs (trihalomethanes) and disinfection by products in the finished water.

Sodium permanganate is temporarily stored and fed from a 250 gallon tote located inside the Screen Chamber Building. Sodium permanganate is fed for pre-oxidation prior to aeration and Flocculation/Sedimentation. Further, the Authority had a change in its permit approved by the New Jersey Department of Environmental Protection in 2009 to allow the Authority to feed sodium permanganate on a permanent basis.

The ACMUA used to add the polymer Zeta Lyte 550C/2C into the low-lift pump wetwell. The Zeta Lyte 550C/2C is a primary coagulant and a filter aid that neutralizes the particles found in the surface water which aids in floc formation. The Zeta Lyte polymer was replaced with poly aluminum chloride as the primary chemical in 2007, after pilot and full scale tests produced superior water quality from the Flocculation/Sedimentation unit reducing the turbidity before filters to about 0.3 NTU. Similar to the polymer, polyaluminum chloride, aids the oxidized iron and other matter to agglomerate into floc for removal by sedimentation and filtration. The ACMUA has modified the chemical feed system to accommodate this change on a permanent basis, which was also included in recent NJDEP permit. The poly aluminum chloride storage feed equipment is located in the chemical feed building near the low lift pumps.

Lime is added to the meter pit in front of the low lift pump clearwell to adjust pH. The lime feed facilities were previously repaired and returned to service. The Authority is continuing to make improvements to the pre-lime feed system with its own forces.

2.9 FLOCCULATION

Following aeration, hydraulic flocculation occurs. The flocculation tanks operate in parallel. Each tank is 80 feet long, 21 feet wide and 21.5 feet deep, with an individual volume of 270,000 gallons. At the 2007 average daily flow of 12.16 MGD, the hydraulic detention time is over 60 minutes, with both basins in service. The flocculation process is divided into stages in order to prevent short-circuiting.

2.10 SEDIMENTATION

The ACMUA has utilized high rate sedimentation to remove flocculated solids since 1978. The sedimentation basins were originally equipped with tube settlers; however, these were replaced with stainless steel plate settlers in 2006. Currently, each sedimentation tank is divided into an upper and lower pass by a concrete slab. Flocculated effluent enters the lower pass which runs the entire tank length. The concrete slab ends approximately seven feet from the end of the tank and the flow is redirected to the upper pass and is then sent through the upper pass in the reverse direction of the lower path. The flow path is then directed through newly-installed plate settlers in the upper pass.

2.11 GAC PRESSURE FILTER SYSTEM

Well No. 3 is located on the grounds of the Atlantic City Water Treatment Plant. Well No. 3 is a 207 foot deep Cohansey Aquifer production well. This aquifer production well had been out of service for approximately 20 years prior to 2003. Granular Activated Carbon (GAC) filters were installed and the well was returned to service in the summer of 2003. Well No. 3 is able to produce up to 1,000 gpm. The well water was pumped to two filters directly from Well No. 3, to remove iron and organics from the source water. The modular GAC system consists of two vertical pressure vessels each containing 20,000 pounds of Calgon Centaur HSL granular activated carbon. The catalytic sites of Centaur HSL promote a wide range of chemical reactions such as oxidizing iron to an insoluble form, as well as removal of hydrogen sulfide (H₂S), and organic compounds.

However, the Authority has tested and is able to pump the water from Well #3 (and 14A and 25) directly to the Diversion Box for treatment in the Aeration/Flocculation and Filtration Plant facilities. Processing water through the Filtration Plant provides excellent treatment and is preferred over use of GAC units providing there is available capacity in the Plant. With the re-building of Plant filters, the overall Filtration Plant capacity has increased and the use/need for the GAC units has been eliminated. The GAC units remain onsite for standby or emergency purposes.

2.12 FILTRATION

The existing Filter Building houses a total of six gravity multi-media filters, a pipe gallery for the associated piping and valves, backwash pumps, and instrumentation and control systems. Three filters each straddle the center gallery. Each filter has the dimensions of 30 feet by 18.5 feet, which is equivalent to 555 square feet

The filters were recently reconstructed with a Wheeler underdrain system and new media. The media was replaced with 36" of GAC, 12" of sand, and 12" of gravel. The last of the filter units were re-built in 2009 and all six (6) filters are now substantially complete.

2.13 DISINFECTION

At the ACMUA's treatment plant, sodium hypochlorite is used for chemical disinfection. Sodium hypochlorite is added in the Sedimentation/Flocculation Basins; the in-ground covered finished water storage basins and then in the wetwell for the high service lift pumps for final disinfection. The purpose of chlorination in this final point is to maintain residual disinfectant concentration in the distribution system until the water reaches the customer, as required by regulations.

2.14 CHEMICAL FEED

In order to prevent lead and copper from leaching out of the Authority's distribution piping, calcium polyphosphate is added as a corrosion inhibitor. Calcium polyphosphate is stored and fed in the same location as the residual chlorine.

Fluoride is commonly added to water distribution systems as a means of preventing dental caries. The water fluoridation system was inoperative for a number of years. A project to return the fluoridation system to operation was completed in 2008 and the fluoridation system was placed back in service. The fluoride feed system continues to be problematic and the Authority is continuing to modify and upgrade the system. Fluoride is fed downstream of the high lift pump discharge. The fluoride feed point is downstream of the interconnection with the New Jersey American Water Company. This feed point allows the New Jersey American Water Company to receive water that has not been fluoridated.

Lime is also added to the wetwell of the high service pumps for pH adjustment prior to being conveyed to storage and distribution system.

2.15 WATER TREATMENT PLANT STORAGE FACILITIES AND PUMPING STATIONS

Water from Filtration Plant effluent, (including Well Nos. 3, 14 and 25) is disinfected and stored in Basins B and C. Treated water is also stored in the new 6 million gallon (MG) storage tank. Basin A was recently removed from service and replaced by the new 6 MG tank. The total storage capacity of the ACMUA Pleasantville Treatment Plant with all basins and tanks in service is 9 million gallons.

The cover of Clearwell B was rehabilitated in 2002. Clearwell B has a 2 million gallon capacity where the bottom of basin elevation is -4.68 ft and the height of the basin is 11 ft. Clearwell C was covered with a new floating cover in 2002. Clearwell C has a 1 million capacity where the bottom of basin elevation is -1.56 ft and height of basin is 7.75 ft. The clearwells B and C can be operated either in parallel or in series as needed. However, a normal current operation is for flow to progress in series through Clearwell C then B.

The finished water flows from Clearwells B and/or C to the high service pump station wetwell by gravity. The bottom of this wetwell is at elevation -6.84 and it is 16.3 ft deep. The water is pumped from the sump to two 48-inch transmission mains by seven High Service Lift Pumps. Four of the High Service Lift Pumps are electrically powered; three of these pumps are driven by variable frequency drives. With a project that due to be completed in 2010, all four electric High Service Pumps will have variable frequency drives. Two of the electrically powered pumps have capacities of 10.5 MGD and two of these pumps have capacities of 6 MGD. Three of the High Lift Pumps are powered by diesel engines and each pump has a capacity of 7,600 gpm.

The 6 MG standpipe storage tank has been in service since 2003. This storage tank has a common 24-inch inflow/outflow pipe. The inner diameter of the tank is 91 ft. The bottom of the tank is at 7 ft elevation and it overflows at elevation of 132 ft.

A booster pumping station currently serves the new 6 MG storage tank. This station provides additional water flows and pressure to the transmission mains during periods of high demand. The booster pump station includes two pumps. Each pump has a capacity of 3,200 gpm. The station is now in service.

2.16 SOLIDS HANDLING

There are three sources of solids at ACMUA's water treatment plant: settled solids from the sedimentation basins, waste backwash water from backwashing of filters in the filter building, and the GAC contactors (if used) at Well No. 3.

The solids from ACMUA's treatment plant are handled in two circular thickeners with 70 ft and 40 ft diameters respectively and four covered sludge drying beds.

Currently, waste backwash water from gravity and pressure filters are pumped to the first thickener in a two stage thickening process where waste washwater is combined with the residue which has been pumped from the sedimentation tanks. After a period of settling, the supernatant from the first tank in series, also known as the new thickener, is decanted to the head of the plant. The second tank, the old thickener, can be used in series where it can provide additional settling time, in parallel to provide additional capacity, or to handle a separate residue stream (such as from the sedimentation tanks). The supernatant from the old thickener is also decanted to the head of the plant. The settled solids from the second thickener are mixed with a polymer and then pumped to the sludge drying beds.

There are four covered drying beds, with each bed being 40 ft by 40 ft, and one uncovered drying bed. Each bed is separated by a concrete wall. The dewatered solids are currently stored and/or re-used onsite to fill the area of former Basin A. Any excess solids would subsequently be hauled off-site for disposal or use as soil conditioner, as was the previous practice.

2.17 WATER TRANSMISSION

The potable water produced by the water treatment plant is conveyed to the Absecon Island distribution system by two 48-inch transmission mains (Missouri Avenue Main and Albany Avenue Main). These two mains are the only means of transmitting drinking water to the Atlantic City drinking water distribution system. Both of the mains are cast iron, and are supported on concrete and aluminum pipe cradles, which, are subsequently supported by timber piles, across the tidal marshlands from Pleasantville to Atlantic City. The Missouri Ave. main is 4.8 miles long and has been in service since 1916. The Albany Ave. main is 4.4 miles long and has been in service since 1936. A number of the original transmission main cradles were rehabilitated in 1987. During this rehabilitation, aluminum supports were added to the cradles. The remaining cradles are continuing to be replaced as part of an ongoing project.

The Albany Avenue transmission main crosses above Beach Thorofare on a timber pile bent system supported on timer piles. The condition of this support system was recently evaluated and found to be badly deteriorated, and the crossing is planned for replacement in 2010.

Recent water transmission main upgrades include the addition of a butterfly valve on the Albany Avenue main. This valve allows customers on the mainland side of Beach Thorofare to remain in service in the event of a failure along the Albany Avenue main at Beach Thorofare.

Currently, there are two valve interconnection complexes serving the transmission main system. One interconnection is in the city limits of Atlantic City (behind the Convention Center) and the other interconnection is in Pleasantville (Meadows Valve Complex). These valve complexes allow the ACMUA to remove a section of 48-inch main from service during routine maintenance and emergency situations. With the completion of construction of these two valve complexes in 1999, older valve boxes were abandoned in place. The fittings and the stems of the old valves were removed and replaced with blank plates, and all piping and valves were wrapped with corrosion protective tape.

The Meadows Valve Complex is covered with a fiberglass enclosure. The valve complex is in a remote location through which the transmission main passes, approximately half-way along the pipeline between the water treatment plant and Atlantic City. The hardware needed for remote operation of the valves and actuators is in-place; and the control logic to support remote operation was added as part of the SCADA Upgrade Project that was completed in 2009.

The second valve complex is located behind the Convention Center in an underground vault. The hardware needed for remote operation of the valves and actuators is in-place; however, the control logic will not support this function. In order to operate the interconnection without operations staff being present, the control logic will be updated in the SCADA Upgrade Project that began in late 2006.

A 24" High Density Polyethylene (HDPE) bypass transmission main for the Missouri Avenue interconnection crossing under Beach Thorofare was installed using Horizontal Directional Drilling (HDD) in 2004 near the Convention Center. The original 48" cast iron transmission main resting on the bottom of Beach Thorofare was also lined to restore its service with a new 36" HPDE pipe in 2008.

2.18 WATER STORAGE TANKS

The 1 million gallon (MG) Maryland Avenue storage tank is located at the intersection of North Virginia and Caspian Avenues. This tank is made of steel and has been in service since 1950. It is supported with tubular columns. The bottom elevation of the tank is 90.5 ft and the overflow elevation is located at 125.5 ft. This tank has a common inlet/outlet pipe, which is 16 inches in diameter.

The 2 MG Absecon Boulevard storage tank is located at the intersection of Maryland Avenue and Absecon Boulevard. This tank has been in service since 1999. The tank is made of steel and is of a single pedestal configuration. The overflow is located at an elevation of 125.5 ft. The base elevation is 10.0 ft. This tank has a common inlet/outlet pipe, which has a 16-inch diameter.

2.19 WATER DISTRIBUTION

Almost the entire area of Atlantic City is served by the Authority's distribution system. The distribution system includes approximately 150 miles of distribution piping of various sizes and approximately 1,400 fire hydrants. Most of the distribution system was constructed prior to 1972, and is made of either cast iron or ductile iron pipe. In 2009, there were about 8,031 services ranging in size from 1- inch to 12-inches in diameter.

There is also an emergency interconnection with the City of Ventnor's water distribution system to supply water in either direction (to Atlantic City or to Ventnor).

3.0 WATER DEMAND AND USAGE

3.1 HISTORIC DEMAND

Water delivered to Atlantic City generally falls into three categories:

- Water for which users are charged (billable consumption)
- Water used for fire fighting.
- Unaccounted-for-water, including system leakage, hydrant flushing, and water main breaks.

The water provided in the categories shown above constitutes the average daily demand (ADD). The ADD was calculated based on the total pumpage of the high lift pumps at the water treatment plant. ADD is the total volume of water pumped during the year, divided by 365 days. Maximum daily demand (MDD) is the highest quantity of water delivered in a single day during a given year. The maximum hour rate is the largest quantity of water delivered in a single hour during a given year multiplied by 24 hours. Average daily consumption is the total quantity of water that was measured by meter readings divided by 365 days. Unmetered Atlantic City Government Consumption is an estimate of the quantity of water used by the Atlantic City Government for which no billing records exist. Water usage is from January 1 through December 31, unless otherwise noted.

Table 3-1 shows historical water demand data since 1976. Several trends can be observed from these data.

- The ADD generally increased until 1991. The ADD then decreased until 1997, and then the ADD began increasing again until 2003. Then from 2003 to 2007 the ADD declined slightly every year. The initial decrease (1991 to 1997) was a result of reduced domestic demand (e.g.- billable consumption in 1991 was 10.7 mgd and only averaged 10.0 mgd from 1992 to 2001), from changes in the state plumbing code requiring water conserving fixtures and renovations, and also projects undertaken by the Authority to reduce system leaks. The ADD from 2003 to 2007 also declined slightly although the number of connections went up. This decline was again attributed to remodeling and use of new water conserving fixtures. A decline was also observed in 2009 and is attributed to the unusually wet summer and downturn in the economy which has affected the casino industry in the City.
- Both the MDD and ADD were generally increasing from 2000 to 2004. This can be explained by adding the New Jersey American Water Company as a bulk water consumer, and the development of new casino projects. From 2004

thru 2008 MDD and ADD were more or less stable, and in 2009 there was a slight reduction attributed to the wet summer and downturn in the economy.

- The maximum hour rate is on average 1.7 times the average daily flow rate.

**Table 3-1
Water Demand and Usage**

Year	Average Daily Demand (MGD)	Maximum Daily Demand (MGD)	MDD/ADD	Maximum Hour Rate (MGD)	Average Daily ³ Consumption (Billable) (MGD)	Unmetered AC Govt Consumption (MGD)
1976	9.42	14.23	1.51			
1977	10.55	15.34	1.45			
1978	10.92	15.82	1.45			
1979	11.67	16.88	1.45			
1980	11.84	16.90	1.43		8.00	
1981	11.88	17.56	1.48		7.80	
1982	11.63	14.96	1.29		8.25	
1983*	12.51	20.13	1.61	23.00	8.45	
1984*	12.21	15.48	1.27	22.00	9.25	
1985	12.44	15.62	1.26	20.50	9.26	0.60
1986	12.44	15.80	1.27	20.25 ¹	9.40	0.50
1987	12.25	15.13	1.24	20.25	8.86	0.50
1988	12.88	16.21	1.26	20.00	9.78	0.45
1989	12.20	16.17	1.33	25.20	10.04	0.40
1990	12.36	15.56 ²	1.26	19.75	10.31	0.30
1991	12.73	16.96	1.33	21.00	10.70	0.45
1992	11.72	15.22	1.30	19.00	10.21	0.20
1993	11.31	16.27	1.44	19.50	9.92	0.20
1994	11.54	14.64	1.27	17.50	10.08	0.15
1995	11.80	16.27	1.38	19.75	10.27	0.15
1996	11.28 ⁴	14.94	1.32	17.47	9.68	0.15
1997	12.06	16.63	1.38	19.63	10.06	0.15
1998	12.46	17.23	1.38	19.90	9.97	0.15
1999	12.23	18.315	1.50	21.36	10.09	0.10
2000	11.24	14.362	1.28	17.95	9.34	0.10
2001*	12.22	15.857	1.30	18.89	10.04	0.10
2002	12.66	18.106	1.43	20.04	10.75	0.15
2003	12.97	18.27	1.41	21.00	10.91	0.10
2004	12.94	18.49	1.43	24.73	10.50	0.15
2005	12.86	17.474	1.36	22.44	10.64	0.15
2006	12.52	18.444	1.47	26.52	10.997	0.05 ⁵
2007	12.16	17.333	1.43	21.50	10.68	0.05 ⁵
2008	12.15	17.07	1.41	21.00	10.36	0.05 ⁵
2009	11.68	15.843	1.35	21.50	10.24	0.05 ⁵

* From November 1 of the previous year to October 31 of the listed year.

1 A higher rate of 21.0 MGD was experienced as a direct result of a 12-inch gate valve blowing off the high pressure main beneath the Boardwalk at Virginia Avenue during Casino construction.

- 2 Maximum Daily Demand of 15.61 MGD occurred on January 1, 1990; however, this was a result of a fire service break at Hanson Bus World and is not considered typical.
- 3 Prior to 1984, unmetered Atlantic City Government use was included in billable consumption.
- 4 Venturi meter at the High Service Pumping Station was calibrated in 1996. ADD adjusted for 5% over-registration.
- 5 Unmetered consumption consists of system flushing water and fire flows.

3.2 ABILITY TO MEET DEMANDS

The Authority's existing facilities are capable of meeting the Authority's water demands. The water supply and treatment facilities are currently capable of producing up to 25.0 mgd (—note the plant can produce 22 mgd, and wells 14A and 25 can produce an additional 3 mgd without going through the filter plant). This production capacity exceeds the maximum daily demand for the past 20 years. The maximum recorded hourly demand of 26.52 MGD can be readily met by a combination of the water production and supply facilities and the available storage.

An upgrade to the Authority's sedimentation and filtration facilities was begun in 2006. Completion of these projects increased the Authority's treatment capacity to 25.0 MGD. This quantity of water production exceeds the maximum daily demands projected for 2030 under a high growth scenario in the Master Plan. Thus, the Authority possesses adequate water supply and treatment capacity.

Some portions of the water distribution system are not able to supply desired fire flows. As discussed in the Master Plan, these locations are served by fire hydrants located on undersized mains. The Authority places a high priority on relocating fire hydrants to adequately sized mains and replacing mains where needed. The 2010 Capital Budget contained a five (5) year plan, committing \$1,000,000 per year to transmission/distribution system upgrades.

4.0 OPERATION AND CONDITION OF THE SYSTEM

4.1 WELLS

As noted earlier and listed in Table 2-1, the ACMUA has thirteen (13) wells currently in service with a combined yield of 21.36 mgd. Another three wells (Nos. 9, 10, and 11) with capacity of 4.18 mgd would be available for emergency service if said wells were renovated. Nine of the original twenty-four wells have been sealed due to contamination or loss of production. The circa 1994 SCADA system for the wells was replaced and upgraded as part of a plant wide improvement to the SCADA system that was essentially completed in 2009. Routine maintenance to keep all useable wells in an operable condition should continue as has been the past practice.

4.2 SURFACE WATER RESERVOIR INTAKE AND TRANSMISSION

The surface water intake at Doughty Pond is controlled by a sluice gate that is operated by a 1/2 hp actuator (Limitorque Accutronics MX20). The existing Doughty Pond dam spillway and sluice gate are functional and reported to be in good condition. Currently, plant personnel manually open the sluice gate to increase the flow of reservoir water and close the sluice gate to reduce the amount of reservoir water to the plant.

Recent annual inspections of the Kuehnle Pond Dam revealed that the spillway is deteriorated and not suitable for continued use. As a result of concerns related to the condition of the spillway, the water level within the pond is maintained in a lowered condition. Design of the spillway repair was begun in 2006, and final permit was finally issued by the NJDEP in 2009. Bids are scheduled to be received in February 2010, and construction is expected to begin later in 2010.

4.3 Flow Diversion Box

The walls of the diversion box were raised by 3-1/3 feet in the 1980's to improve plant hydraulics and there is a visible joint and depressions at the joint of the old and new walls. In 2007, the additional wall height was removed and replaced with concrete and the concrete walls of the box were painted with a concrete sealer. No visible leakage or staining of the former crack was observed at the time of the current inspection.

4.4 SCREENING CHAMBER

The raw water screens are operational. The bar screen is no longer able to operate in fully automatic mode; the cleaning cycle must be initiated manually. Plant operations staff report that the manually-cleaned screen rarely requires cleaning. Due to the low volume of screenable materials trapped on the screen, the manual cleaning activation has not been a problem (operated every 4 days). To restore automatic cleaning operation the unit would need new electrical control components. This is an older unit and operating staff is seeking parts. The repair work is planned for 2011.

The overall Screen Chamber Building and concrete floor are in good shape, but some minor water damage was observed on the ceiling. The Screening Chamber also temporarily houses the sodium permanganate 250-gallon tote and chemical feed pumps. The roof was removed to install the 250-gallon tote. Once the new sodium permanganate building (see section 4.6) is constructed and this storage tote removed, the roof of the Screening Chamber roof will be repaired or replaced.

Raw water turbidity is determined by collecting grab samples from the influent channel in the Screening Chamber. A new raw water turbidimeter is planned and recommended for the Screening Chamber, but no schedule has been set for this project.

4.5 AERATION: IRON REMOVAL

The low-lift pumps are used to convey the water to the aeration tower. The low lift pumps, header, and check valves are in good working order. A new variable frequency drive (VFD) was installed for pump no. 1 in 2009. The aeration tower is operable and the trays were cleaned in 2009.

4.6 CHEMICAL FEEDING: PRE-TREATMENT

Pre-treatment chemical feed consists of sodium permanganate, lime, polyaluminum chloride, and sodium hypochlorite. A temporary feed system from a 250-gallon tote has been set up in the Screening Chamber Building for sodium permanganate. A new permanent building for sodium permanganate with containment and capacity to store three (3) 250 gallon totes was designed, permitted by NJDEP, bid, and contract was awarded in 2009. Construction is scheduled to be completed in 2010. The polymer storage and feed pumps have also been changed to a new chemical (polyaluminum chloride). The existing tanks were reused, and the containment area repaired and repainted.

Sodium hypochlorite feed facilities have been maintained, but the amount of sodium hypochlorite added has been substantially reduced with the addition of sodium permanganate. Sodium hypochlorite is stored in the Low Lift Building and added after the aeration tower. There was an issue with the 2,500 gallon flat bottomed sodium hypochlorite storage tank which failed at the bottom seam. Three (3) new 2,500 gallon tanks with conical bottoms were installed in 2009 to replace the existing flat bottomed chemical storage tanks at the Low Lift station.

The pre-lime feed system is operable. The lime silo was partially repainted but the metal doors are corroded, and painting should be completed and doors replaced to maintain silo integrity. New underground lime feed piping was installed in 2008 which replaced the aboveground hoses in use last year. The Authority is looking into upgrading the lime feeder so that it can be controlled by the Treatment Plant SCADA system.

In 2009 a new roof was installed on the Low Lift Station which also houses the pre-treatment chemicals. At the time of inspection a new roll-up door where the poly aluminum chloride chemicals are received was being installed.

4.7 FLOCCULATION

The concrete basins and baffles are in generally good working order. The concrete deterioration, including minor hairline cracks and spalling was repaired in 2007 and 2008. However, there is minor concrete spalling in new areas and annual concrete repairs (as needed) should continue.

4.8 SEDIMENTATION

The tube settlers that were previously in use in the sedimentation tank were a dated technology and many had failed or were clogged. As a result of these deficiencies, a project to replace the failing tube settlers was undertaken and completed in 2007. The newly installed stainless steel plate settler units are performing well.

Overall, the concrete of the sedimentation basins is suitable for continued use, but like the Flocculation basin area repairs to any concrete spall areas should be performed each year.

4.9 GAC PRESSURE FILTER SYSTEM

The GAC pressure filter system was used exclusively to treat water produced by Well No. 3. The adsorption system was operated in a downflow mode. The two (2) units operate in a parallel configuration with well output split between the two (2) contactors. The effluent from the filters was blended with the filter effluent flow from the ACMUA's Pleasantville Filtration Plant and the combined flow is sent to the clearwells.

The Authority has the ability to divert the flow from Well #3 (and 14A and 25) directly to the Diversion box for treatment at the Flocculation/Sedimentation and Filtration Plant. Processing water through the Filtration Plant is preferred over use of GAC units providing there is available capacity in the plant. With the re-building of Plant filters, the overall Filtration plant capacity has increased and the use/need for GAC has been eliminated. Well #3 flow is currently sent to the Diversions Box and water treatment plant for processing with the other raw water from Memorial Day to Labor Day (the time of year when the New Jersey Department of Environmental Protection states the Authority can use Well #3).

The GAC filters will be maintained as a stand-by unit.

4.10 FILTRATION

Filter re-building and upgrading on all six (6) filters was completed in 2009. The work included the construction of a new filter underdrain system and new filter media. At the time of the inspection the filters upgrades were reported to be functioning well. An issue

with the loss of a significant amount of carbon from some of the rebuilt filters was noted in the 2008 Annual Report, the operator reported that this has been resolved in 2009 by changes made to the filter backwash program.

Filter effluent valves are also being replaced, and at the time of inspection replacement of 5 out of 6 effluent valves had been completed. The work on the last filter valve will be completed as soon as an additional fitting (coupling) is received.

The supply to the backwash pumps is taken directly from the filtered water effluent header that feeds the clearwells. Only one filter is backwashed at a time. Backwash frequency varies with production. During peak production in the summer months each of the six filters is typically backwashed daily. During the remainder of the year, each filter is typically backwashed every forty-eight hours; three filters are backwashed each day. During the design of the filter rehabilitation project, it was determined that these pumps were nearing the end of their useful life. The backwash pumps have been replaced under the recently completed filter rehabilitation project.

Filter troughs were replaced as part of the recently completed filter rehabilitation project. Walkways are provided to allow the filter backwash to be viewed. The fiberglass grating is in good condition.

The filter control PLC cabinets and MCC cabinets were replaced as part of the filter rehabilitation project.

4.11 DISINFECTION

Sodium hypochlorite is stored in the Low Lift Building and fed after the aeration tower (see Section 4.6). Sodium hypochlorite is also fed to the wetwell before the high service pumps. Sodium hypochlorite addition at the High Service station provides disinfection of the filtered water from the water treatment plant. The sodium hypochlorite tanks were recently replaced with new 500 gallon conical bottom storage tanks. The containment area was rehabilitated in 2009 and new chemical feed pumps installed.

4.12 CHEMICAL FEED

Calcium polyphosphate is added to control corrosion within the distribution system. The polyphosphate is stored in the high service pump building, and fed to the wetwell before the high service pumps. The storage tank and feed pumps were observed to be in good condition.

A project to return the fluoridation system to operation was completed in 2007 using ACMUA in-house forces and fluoridation was placed back in service in 2008. There are still some operational problems dissolving chemicals in the mix tank, and pump failure issues with the fluoride feed system. The issues were being investigated at the time of inspection by ACMUA and the equipment manufacturer.

The pre-lime system was discussed under section 4.6 of this report. Lime is also added to the pipe header behind the High Service Plant for final pH adjustment. The post-lime system equipment is operating well, however the system is old and showing signs of corrosion. Plans for replacing the post lime feed equipment should be made and scheduled in 2010 or 2011. The lime building roof is in need of repair also.

4.13 WATER TREATMENT PLANT STORAGE FACILITIES AND PUMPING STATIONS

The finished water flows from Basins B and/or C to the high service pump station wetwell by gravity. The bottom of this wetwell is at elevation -6.84 and it is 16.3 ft high. The water is pumped from the clearwell under the High Service Plant to two 48-inch transmission mains by seven High Lift Pumps.

The High Service Pump Station includes four electric motor driven pumps and three diesel engine driven pumps. At time of inspection Pump No. 3 motor was being rebuilt. The building housing the High Service Pumps is in excellent condition, and the pumps that were in operation during our inspection were generally in good working order. In general plant operations staff reports no significant problems with the High Service Pumps themselves; however there are some issues with the VFDs. In 1995, the ACMUA installed variable frequency drives (VFD) on the two (2) 10.5 mgd electric pumps and on one (1) of the 6.0 mgd electric pumps. Several years ago, one (1) of the large (10.5 mgd) VFDs was replaced and parts from the original VFD were scavenged to make the second large VFD operational. At this time, only the newest VFD is fully operational. The ACMUA had designed, bid, and awarded a contract to replace the two (2) oldest VFDs (10.5 and 6.0 mgd) and add a VFD to the fourth (4th) electric pump (6.0 mgd). This contract has been awarded and work should be completed in 2010.

The new 6 MG storage tank is filled by a 36-inch main. The 6 MG storage tank is filled by the system pressure produced by the High Service Pumps. A booster station pumps water out of the 6 MG tank into the 48-inch transmission mains.

The booster pumping station serving the new 6 MG storage tank was recently placed in service; however, some minor construction punch-list items remain unresolved.

4.14 SOLIDS HANDLING

ACMUA's solids handling system has two gravity thickeners that can be operated either in series or in parallel. The 70ft diameter thickener, which is also called the new thickener, was put into service in 2000 and it has a capacity of approximately 285,000 gal. All of the equipment associated with this thickener is operable, and there is no visible damage to the basin concrete, grating, and/or handrails. The sludge collector drive had been experiencing problems because the drive was located at an elevation below the top of the basin wall; this situation caused the drive to become submerged during periods of high water levels in the thickener. A new sludge collector drive was installed in 2009 to correct this problem and it is reported to be working well. The 40 ft diameter thickener, which is also called the old thickener, has a capacity of approximately 100,000 gal.

The new thickener works as a decant system. After a period of settling, the supernatant from the first tank, the new thickener, is decanted by means of three 10" diameter perforated pipes along the inner perimeter of the tank. These pipes are located at 3, 5 and 7 feet above the bottom of the wall and decanting in each pipe is controlled by a valve on each pipe. By opening the valve for the pipe below and closest to water surface, the supernatant is decanted to the head of the plant.

The supernatant from the old thickener is also decanted to the head of the plant. If the old thickener is full, any solids it subsequently receives results in supernatant being recycled to the head of the plant. The pipeline that conveys the supernatant from the thickeners to the head of the plant does not have a flow meter. Therefore, plant personnel are not able to determine the exact amount of flow recirculated through the plant. Currently, plant personnel make an estimation of the amount of flow based on backwash wastewater. The Authority should consider installing a flow meter to accurately track the recirculated flows. The settled solids from the second thickener are sent to the sludge drying beds.

Flows leaving the old thickener pass through a junction box. When flow rates become excessive, this junction box can overflow. The Authority should consider raising the top elevation of the junction box to prevent future overflows.

The sludge drying beds were covered in 2003. At the time of inspection two of the covers had developed sizable rips. The covers were covered under a pro-rated warranty, and the ACMUA is negotiating a price with the manufacture for the repair/replacement of the covers. Air ventilation in the sludge drying beds is provided by means of four electric fans. The ventilation fans were observed to be in good working order during our inspection. The concrete walls appeared to be in good condition, with only minor discoloration. During our inspection, the drying beds were doing a good job of drying the solids, however, plant operations staff report that inadequate dewatering occurs during periods of peak water production. An auxiliary uncovered sludge drying basin between the filter building and the sedimentation basins was in use at the time of the inspection.

4.15 WATER TRANSMISSION

The water transmission mains that convey potable water from the water treatment plant to the distribution system have no reported leaks. Both of the transmission mains are supported on concrete and aluminum pipe cradles, which, are subsequently supported by timber piles. A number of the original transmission main cradles were rehabilitated in 1987. During this rehabilitation, aluminum supports were added to the cradles. The remaining cradles are continuing to be replaced as part of ongoing projects.

The Authority continues to undertake regular improvements to the water transmission mains. The Authority's control system was updated in 2009 as part of the overall SCADA project to allow remote operation of the two valve interconnection complexes,

located in the meadows between Pleasantville and Atlantic City and behind the Convention Center in Atlantic City.

Slip lining of the Missouri Avenue transmission main with HDPE pipe, under Beach Thorofare, was completed in 2008.

The Albany Avenue transmission main across Beach Thorofare is supported on wooden pile bents that were installed in the 1930's. A recent inspection and underwater evaluation found this support system to be in a badly deteriorated condition. ACMUA is proceeding with the replacement of this crossing on an emergency basis. The replacement crossing Repairs are targeted to be completed before Memorial Day (end of May) of 2010.

4.16 WATER STORAGE

The Maryland Avenue tank was repainted in 2002 and is in good condition.

The Absecon Boulevard tank has obvious deterioration of the coating system and some corrosion is evident. This tank is scheduled to be repainted in 2010.

The Authority is currently in the process of developing an Aquifer Storage and Recovery (ASR) well system. Potable water will be diverted into the 800-Foot Sands aquifer via the ASR wells during periods of the year when excess water production capacity is available. The stored water will be subsequently pumped from the aquifer when water demands are high in relation to available water supply. The ASR wells will provide additional storage and peak demand capacity on Absecon Island. An ASR wells was drilled and tested, but no pumps or structures have been installed yet. Note that the output of ASR wells is limited by the Allocation Permit issued by the New Jersey Department of Environmental Protection to the Authority in 2008. If the first ASR well performs as expected, up to four additional ASR wells may be constructed.

4.17 ADMINISTRATION BUILDING/FACILITIES

The Authority's Administrative Office and Maintenance Facilities are located between the two elevated water storage tanks. The administration building and grounds are well maintained. On the south wall of the Administrative building at the Siamese fire connection, a section of the siding has come off at the wall transition (approx. 18-inches above grade) and should be replaced.

The Maintenance facilities and the surrounding storage yard(s) are well maintained and orderly.

4.18 WATER DISTRIBUTION

The water distribution system is constantly being upgraded and repaired. Regular upgrades include: valve maintenance and replacement, fire hydrant maintenance and

replacement, water main replacement, and metering upgrades. The distribution system is in generally good condition.

An analysis of the hydraulic model that was prepared by Schoor DePalma, Inc. in 2004 revealed that a number of fire hydrants cannot adequately provide fire flows. Further analysis determined that the poorly performing fire hydrants were located in areas served by undersized water mains. Replacing undersized mains will be given a priority in selecting future water main improvement projects. The hydraulic model received further upgrades in 2006.

4.19 PROJECTS UNDERTAKEN IN 2009

In 2009, the Authority undertook a number of upgrades to its facilities. The following improvements were ongoing or completed.

1. Re-construction of the last Filters continued thru 2009 (all 6 filters re-built are now rebuilt).
2. Installed filter effluent butterfly valves on 5 of the 6 filters.
3. The SCADA Upgrade Project was essentially completed in 2009. Final Punch List items, release of retainage and project close-out remain.
4. The contract for the permanent sodium permanganate (oxidant) and polyaluminum chloride (coagulant) feed system and building was awarded.
5. New roof was installed on the Low Lift pump station building, and new roll up door installed for polyaluminum chloride deliveries.
6. Work continued on the Fluoride Feed System with the change in pump type, and continuing to trouble shoot operation problems. .
7. Purchased and installed 3 new 2,500 gallon plastic tanks for pre-chlorination hypochlorite and 4 new 500 gallon post chlorination conical bottom tanks for chemical storage.
8. Water distribution main (apx. 1,200 feet) were upgraded from 4 inch to 8 inch diameter in Massachusetts Avenue from Madison to Atlantic Avenue. Water distribution mains planned to be replaced in 2010 include: a) Connecticut from Melrose to Baltic, b) Raleigh from Porter to South Blvd., c) Stewart from Richmond to Raleigh, to Porter. and d) Elberon from Filbert to Porter. All of the new lines installed will be 8 inch diameter mains.

4.20 OPERATION AND MAINTENANCE PROGRAMS

4.20.1 PROCEDURES

The Authority continues to develop and improve its operation and maintenance procedures. The Authority's operation and maintenance documentation is regularly updated with the manuals provided following the completion of major projects.

4.20.2 Hydraulic Mapping

Compiling the entire distribution system into a Geographic Information System (GIS) program is continuing. The hydraulic model was updated to include GIS data and the actual location of system users. The hydraulic model is now used to perform hydraulic analyses of the distribution system.

4.20.3 SECURITY

Due to increasing concerns in recent years, the entire water industry has increased its awareness of security related issues. Accordingly, the ACMUA has undertaken a number of security improvements. Some of these improvements include installing new cameras (PTZ) throughout the Authority's facilities, and improving the ability of Authority personnel to conduct regular security patrols. In addition the Authority implemented the use of biometric timecards in 2009. The Authority continues to regularly improve its security practices.

4.21 REGULATORY COMPLIANCE

4.21.1 Lead and Copper Testing

The ACMUA adds a polyphosphate corrosion inhibitor to ensure compliance with the lead and copper rule. Ongoing testing has shown that the Authority complies with the lead and copper rule. As a result of the ongoing compliance, the Authority has received a reduced sampling requirement from the New Jersey Department of Environmental Protection (NJDEP). The next lead/copper sampling is scheduled to be completed in 2011.

4.21.2 Groundwater Under the Influence of Surface Water

The Authority has received a determination from the NJDEP Bureau of Safe Drinking Water (BSDW) that the Authority's groundwater sources are not vulnerable to direct influence of surface water.

4.21.3 Water Conservation Requirements

The Authority submitted an updated water conservation plan to the BSDW on December 13, 2005 in accordance with the Authority's Diversion Rights Permit.

4.21.4 Turbidity Rule

To achieve compliance with the Interim Enhanced Surface Water Treatment Rule (IESWTR) the Authority must produce filtrate with a monthly 95th percentile turbidity limit of 0.3 NTU. The Authority complies with this requirement by routinely producing filtrate with less than 0.1 NTU.

4.21.5 Water Diversion Rights

The Authority received an updated water allocation permit from the NJDEP in 2007. The 2007 permit update did not include the Aquifer Storage Recharge wells located in Atlantic City. A revised Allocation Permit including the ASR well was issued in 2008. A 2009 update to the Water Allocation permit increased the maximum diversion from Wells 16 to 24 and allows the Authority to drill a new Kirkwood Well.

4.21.6 Disinfection By-Products Rule

The Authority regularly undertakes testing to determine compliance with the Disinfection By-Products Rule. Testing undertaken by the Authority indicates that all Disinfection By-Products are within the promulgated limits. The change from pre-chlorination to addition of sodium permanganate will also help with compliance with the Disinfection By-Products rule.

4.21.7 Primary and Secondary Drinking Water Standards

The Authority meets the regulatory schedules for monitoring all Primary and Secondary Drinking Water Standards. Testing indicates that each parameter concentration is either non-detectable or within NJDEP limits.

5.0 PLANNED WORK AND RECOMMENDATIONS

5.1 COORDINATION WITH MASTER PLAN

In 2005, the Authority updated their Master Plan and it was finalized in December of 2005. The Authority's Board of Directors adopted the Master Plan in January 2006.

The Master Plan includes a number of recommendations for operational and capital improvements throughout the year 2030. While the Master Planning Process was not intended to foresee every possible contingency, it does provide a reasonable framework for selecting improvements that the Authority will undertake. The Authority will continue to implement the Master Plan in its decision making process.

5.2 RESERVOIRS AND SURFACE WATER INTAKES

Recent inspections of the Kuehnle Pond Dam revealed that the spillway is deteriorated and not suitable for continued use. Design of the spillway repair was completed 2007, and project has been submitted for NJDEP permitting. A permit was issued in 2009. Bids are scheduled to be received in February 2010, with construction to follow later in 2010.

In order to improve operations and allow the filtration plant to process a larger quantity of higher quality water, the Master Plan recommended consideration be given to constructing new intake structures in the Doughty Pond reservoir that include passive screens. This work is currently not planned or considered critical to the operation of the water treatment plant.

Currently, plant operations staff is unable to directly measure the quantity of source water withdrawn by the surface water intake, and the amount of water recycled from the solids handling units. The Master Plan recommended water meters be added to the treatment facility so that these parameters may be directly measured. This work is not considered critical and is not planned to be undertaken in 2010 due to other emergency repair work.

5.3 WELLS

Periodically redeveloping water supply wells allows water production capacity to be maintained over time. The Authority will evaluate its wells once every two years. During the well evaluation, the pump, motor, and appurtenances will be assessed. Wells will then be rehabilitated as needed. It is generally recommended to redevelop water supply wells once every 5 years.

The transmission main between the Cohansey well field and the surface water intake should also be regularly cleaned to ensure continued hydraulic capacity.

The Authority will continue the process of constructing one ASR well. This well will allow water produced during periods of low water demand to be stored for subsequent use during periods of high demand. Construction of the ASR well has been completed, but the structure, well pump, and piping remain to be completed. The permanent well equipment and facilities have been designed and bids received, and this construction work was awarded in December 2009 contingent upon NJDEP ARRA Stimulus funding being available.

5.4 WATER TREATMENT PLANT

The tube settlers previously in place at the treatment plant were dated technology and some had failed. A project to replace the existing tube settlers with plate settlers was advertised for bidding in 2005 and construction began in 2006. By December 2006, all five of the newly-installed plate settler units were in service. This timeframe is in accordance with the Master Plan.

Pilot testing conducted at ACMUA's Plant demonstrated that with alternative media configurations and a 5.5 gpm/ft² filter-loading rate, filtrate with a turbidity of 0.1 ntu or less can be produced on a consistent basis. Alternative media configurations have the added benefit of allowing the existing filtration plant to treat a maximum average day flow of 22 MGD with one filter out of service. In order to modify the existing filters to achieve these goals, the media bed depth is being increased, and the filter underdrain systems are being replaced. A project to implement these changes and to further rehabilitate the filters was begun in 2006. At the time of the inspection (November 2009), the rehabilitation of all 6 filters was completed. This timeframe is in accordance with the Master Plan.

During peak periods of water production, the current drying beds were becoming inadequate to dewater the removed solids (residuals). As the daily water production increases over time it is likely that inadequate residuals dewatering will become more common. The master plan had called for constructing four additional sludge drying beds to allow residuals to be adequately dewatered. The ACMUA operations staff has been experimenting and evaluating the use of polymers to accelerate dewatering, and has also established an interim outside drying bed for use in the summer (peak water and residuals months). While the additional 4 sludge drying beds were identified in the Master Plan for the 2005-2010 timeframe, based on ACMUA ongoing evaluation of polymers and drying system improvements; new drying beds are not planned for 2010.

Repairs to the previously inoperative fluoride feed system were completed in 2008 and additional modifications in 2009 with the use of in-house forces. The fluoride system was placed back in service in 2008. This timeframe is in accordance with the Master Plan.

The Authority utilizes a SCADA system to help control its water supply, treatment, and distribution facilities. Over time, the current SCADA system has developed a number of deficiencies. In order to improve control of its system, the SCADA system was

upgraded. The upgrade includes replacing instrumentation, computer hardware, and associated programming. Design of the upgrade was completed in 2005. Construction of the upgrade began in 2006, and it was essentially completed in 2009 (final punch list and project close-out remain). This timeframe is in accordance with the Master Plan.

The Authority possesses a large physical plant. Over time, various components wear out and require maintenance and/or replacement. The Authority conducts various renovations on an ongoing basis. During our inspections, a number of current deficiencies were identified. Correcting these deficiencies as soon as practical is in accordance with the Master Plan. The deficiencies are identified below:

- Permanent enclosure and feed system for sodium permanganate including storage and feed pumps needs to be provided. The existing storage and feed system is temporarily inside the screen chamber to avoid freezing. In 2009 the design, bidding, and award of a construction contract was accomplished for new permanent facilities with 30 days storage and containment. Construction is scheduled for 2010.
- VFDs at the High Service Pump Station should be repaired/replaced. This work is under contract and is scheduled for 2010.
- Steel doors are corroded on several buildings (including the pretreatment lime silo, lime house interior doors, finished water building) and should be replaced with fiberglass doors.
- The automatic controls for the rotating raw water screen are inoperable and should be repaired/replaced.
- Preliminary Treatment Lime storage silo is corroding and needs to be repainted on the upper half of the silo, and doors replaced.
- The Lime Building roof needs to be replaced and lime equipment to be refurbished/replaced.

As equipment ages, it will require periodic maintenance and rehabilitation due to normal wear-and-tear. In accordance with the Master Plan, equipment should be regularly evaluated and maintained or rehabilitated as required. Components that should be regularly evaluated include:

- Chemical Feed Pumps
- Chemical Feed Tanks
- Low Lift Pumps
- High Service Pumps

- High Service Pump VFD's
- Gravity Thickener Drives
- Pre and Post Lime Feed Systems
- Storage Tanks and Basins

The 2 million gallon elevated storage tank at Absecon Boulevard is in need of re-painting and painting is planned for 2010.

5.5 TRANSMISSION MAINS

Potable water is conveyed from the water treatment plant to the distribution system on Absecon Island through two 48-inch mostly above-ground transmission mains. ACMUA staff recently noted that one of these 48-inch mains (Albany Avenue) pile support system over the Beach Thorofare showed signs of severe deterioration. A detailed above and underwater inspection confirmed the severity of deterioration. Accordingly the ACMUA is proceeding with the emergency replacement of this critical 48 inch crossing. The replacement work will place this pipe under Beach Thorofare using Horizontal Directional Drilling. This emergency repair work is to be completed before the summer of 2010. This work is critical to meeting peak water supply demands and is consistent with the intent of the master plan to decrease vulnerability and provide additional protection.

All of the water that the Authority supplies to Absecon Island is conveyed through these two mains. These mains are in plain sight and thereby vulnerable to either malicious or accidental damage. The proposed replacement will be buried at the crossing and this reduces risks.

The Master Plan also identified that constructing an additional transmission main would provide protection to the Authority's water transmission system against damage to the existing mains. As discussed in the Master Plan, further studies may be undertaken to further define the environmental, regulatory, and constructability issues associated with constructing an additional transmission main between the water treatment plant and Absecon Island. Though it is unlikely that construction of a third main will be economically feasible, the Master Plan recommended that this evaluation process should begin in the 2005-2010 planning period. The overall evaluation is not scheduled.

The transmission mains are supported by cradles that have deteriorated over time. The Authority awarded contracts in 2009 to replace 510 cradles, representing 100% of the cradles known to be in need of repair.

5.6 DISTRIBUTION SYSTEM

The ACMUA has several miles of 4" water mains in Atlantic City. Fire service to the residential neighborhoods in Atlantic City is connected off many of these mains. These 4" mains are undersized based on current design standards, especially for fire flow conditions. The Authority is pursuing the replacement of undersized and poorly performing mains each year as economically feasible. Replacements are focused primarily on 4-inch mains; however, larger mains should also be replaced as needed. Regularly replacing and upgrading the distribution system is consistent with the Master Plan.

The ACMUA awarded a design Contract in 2008 to create a five (5) year plan, beginning in 2009, for the replacement of water mains with the ACMUA spending approximately \$800,000 per year. The mains to be replaced will be selected using outputs from the ACMUA's hydraulic model that will maximize the MUA's investment for providing adequate fire flows in Atlantic City. The water mains replaced in 2009 were listed in Section 4.18. A new water main on Winchester from Annapolis to Richmond is planned for 2010.

Also the existing water distribution system model should be updated regularly to reflect changes within the distribution system. Regular updates should include verification that model calibration makes sense. The impact of water distribution system upgrades should be assessed by the hydraulic model prior to implementation.

In accordance with the Master Plan, fire hydrants, valves, and meters will be systematically replaced throughout the distribution system on an ongoing basis, independent of the water main replacement program. Priority should be given to: input from the Atlantic City Fire Department, leaking hydrants, leaking valves, and hydrants and valves with other known maintenance problems.

5.7 SECURITY

The Authority will continue to regularly evaluate and improve its security practices.

6.0 REVIEW OF 2010 BUDGET

6.1 REVENUE AND EXPENDITURES BUDGET

The 2010 budget of the ACMUA is in compliance with the requirements of the New Jersey Department of Community Affairs.

6.2 ANTICIPATED REVENUES

Revenues of \$ 13,861,257.00 are anticipated to be produced from the following sources:

Service Charges	\$ 13,584,766.00
Connection Fees	----
Other Operating Revenues	<u>\$ 82,460.00</u>
Total Operating Revenues	\$ 13,667,226.00
Interest on Investments & Deposits	<u>\$ 194,031.00</u>
Total Anticipated Revenues	\$13,861,257.00

These revenues represent a decrease of 1.23 percent from the 2009 levels due primarily to the decrease in anticipated interest on Investments & Deposits due to lower interest rates.

6.3 BUDGETED APPROPRIATIONS

Appropriations of \$ 14,034,217.00 have been budgeted in the following areas:

Operating Appropriations

Administration	
Salary and Wages	\$ 1,000,178.00
Fringe Benefits	\$ 531,873.00
Other Expenses	<u>\$ 595,575.00</u>
Total Administration	\$ 2,127,626.00
Cost of Providing Services	
Salary and Wages	\$ 3,928,555.00
Fringe Benefits	\$ 2,124,548.00
Other Expenses	<u>\$ 3,079,942.00</u>
Total Cost of Providing Services	\$ 9,133,045.00
Total Principal Payments on Debt Service	
In Lieu of Depreciation	<u>\$ 1,777,192.00</u>
Total Operating Appropriations	\$ 13,037,863.00

Non- Operating Appropriations

Total Interest Payments on Debt	\$ 816,363.00
Renewal and Replacement Reserve(s)	\$ 2,031.00
Other Reserves	<u>\$ 5,000.00</u>
Total Non-Operating Appropriations	\$ 823,394.00
Total Operating & Non- Operating Appropriations & Deficit	\$ 13,861,257.00

6.4 CAPITAL BUDGET

The ACMUA Capital Budget addresses how improvements to the Authority's infrastructure will be funded over the next six years. The anticipated project amounts are based upon the recommendations in this report and the Master Plan. The projected annual costs are:

<u>Year</u>	<u>Estimated Total Cost</u>
2010	\$ 14,992,215.00
2011	\$ 3,655,000.00
2012	\$ 3,680,000.00
2013	\$ 3,705,000.00
2014	\$ 3,730,000.00
<u>2015</u>	<u>\$ 3,605,000.00</u>
Total	\$ 33,367,215.00

Sources of funding for the 2010 Capital Budget are as follows:

Unrestricted Retained Earnings	\$ 10,364,245.00
Renewal and Replacement Reserve	\$ 134,970.00
Debt Authorization	\$ 4,493,000.00
Other Income	<u>\$ 0.00</u>
Total for 2009	\$ 14,992,215.00

Sources for Capital Funding for the Capital Budget for 2011 to 2015 are as follows:

Unrestricted Retained Earnings	\$ 4,750,000.00
Renewal and Replacement Reserve	\$10,875,000.00
Debt Authorization	<u>\$ 2,750,000.00</u>
Total for 2011 to 2015	\$ 18,375,000.00
Total for 2010 to 2015	\$ 33,367,215.00

Analysis of the budget shows that there are sufficient funds to cover all operating expenses and a combination of authorized/new debt, reserve funding, and proposed rate increase (9 ½ %) is required to fund the proposed 2010 capital projects.

7.0 SUMMARY

The ACMUA continues to provide safe, adequate, and reliable service to its customers in order to meet their domestic, commercial, and fire protection needs. The Authority possesses the needed system capacity to satisfy current and projected potable water demands.

The Authority continuously improves its facilities. A variety of projects to improve the Authority's facilities will be undertaken in 2010. Improvement projects scheduled for 2010 include:

- Construction of permanent chemical storage and feed facilities for sodium permanganate.
- Repair/Replacement of High Lift VFDs
- Repair/Replacement of the Residuals Drying Bed Covers.
- Re-roofing of the Lime Building
- Various minor repairs (such as replacing doors, painting, patching leaks, and grading roads) at the water treatment plant will continue
- Rehabilitation of the Kuehnle Pond Dam spillway.
- Installing the ASR well pump equipment, piping and building (contingent upon ARRA funding).
- Emergency Replacement of the Albany Avenue transmission main crossing over Beach Thorofare.
- Painting of the Absecon Boulevard water storage tank
- Water main replacement in 2010 to include: a) Connecticut from Melrose to Baltic, b) Raleigh from Porter to South Blvd., c) Stewart from Richmond to Raleigh, to Porter. and d) Elberon from Filbert to Porter.
- Fire hydrants, valves, and meters will be systematically replaced throughout the distribution system on an ongoing basis.



ATLANTIC CITY MUNICIPAL UTILITIES AUTHORITY

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FEBRUARY 2010