

# **THE MUNICIPAL AUTHORITY OF THE BOROUGH OF WEST VIEW**

## **REPORT ON FINANCING THE BEAVER COUNTY SOURCE OF WATER SUPPLY PROJECT AND OTHER CAPITAL ADDITIONS**

OCTOBER 2014



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# THE MUNICIPAL AUTHORITY OF THE BOROUGH OF WEST VIEW

## REPORT ON FINANCING THE BEAVER COUNTY SOURCE OF WATER SUPPLY PROJECT AND OTHER CAPITAL ADDITIONS

### INTRODUCTION

The Municipal Authority of the Borough of West View (Authority) authorized proceeding with an engineering study and the preparation of this Report for the primary purpose of serving as the basis for obtaining funding for the construction of the Beaver County Source of Water Supply Project and other capital additions to the existing water system. This Report covers the issuance of Water Revenue Bonds in a principal amount sufficient to fund the estimated project cost of \$105,000,000 and is for the guidance of the Authority Board Members, potential investors and others.

The Authority owns and operates the Joseph A. Berkley Water Treatment Plant, located on Neville Island in the Ohio River, approximately five miles down river from the City of Pittsburgh. The existing water treatment plant has a maximum permitted capacity of 40 million gallons per day (MGD). The need to expand the capacity of the water treatment plant has been documented by Authority management for a number of years. The peak daily water demand of the Authority's customers has risen to near the capacity of the water treatment plant. Future demands will exceed the present water system capacity. The need for additional water treatment plant capacity is apparent.

Much of the growth on the Authority's water distribution system is located in northern Allegheny County and is coupled with the increased water demand from the resale customers in Butler County. Water delivered by the Joseph A. Berkley Water Treatment Plant to the northern portion of the distribution system is first re-pumped at the Bellevue Pump Station and again at the Ronald F. Spray Pump Station located in the Town of McCandless. Any decision to expand capacity would also entail possible upgrades to the booster pumping stations as well as reinforcing the transmission mains to serve the northern portion of the distribution system. Following a review of the capacity expansion options, the Authority decided to move ahead with plans to construct a new water treatment plant and related facilities in Beaver County, Pennsylvania to supplement the output of the current water treatment plant. Collectively, the entire project to construct the new water treatment plant, river intake and raw and finished water transmission mains is known as the Beaver County Source of Water Supply Project.

The total project cost to construct the Beaver County Source of Water Supply Project and related capital additions is estimated at \$105,000,000, as discussed in the following sections of this Report.

## AUTHORITY - ADMINISTRATIVE

The following indicates the members of the Authority Board and terms of office, and also indicates other persons and firms associated with the Authority:

### Members of the Board

<u>Name of Board Member</u>	<u>Term Expires</u>
Dennis A. Watson	December 31, 2015
John R. Henry	December 31, 2018
William J. King	December 31, 2016
Robert J. Malone	December 31, 2017
Joseph J. Nowark	December 31, 2014

### Other Personnel

Joseph A. Dinkel	Executive Director of Operations
Sharon A. Bruno	Director of Administration
Ira Weiss	Interim Solicitor
Becky A. DeStefano	Recording Secretary
Bankson Engineers, Inc.	Consulting Engineers
Goff, Backa & Alfera	Certified Public Accountants
The Bank of New York Mellon Trust Company, N.A.	Trustee

## GENERAL

The Authority was created in 1942 for the purpose of providing public water service to approximately 13,000 customers in twelve municipalities in Allegheny County, Pennsylvania. Today, the Authority provides direct service to over 55,000 customers in 26 municipalities. In addition, water is sold to eight other water systems through master meters on a bulk water basis. Overall, the Authority provides potable water to nearly 200,000 people in Allegheny, Beaver and Butler Counties, Pennsylvania.

## HISTORY

On November 13, 1942, the stock of Pittsburgh Suburban Water Service Company was acquired by the newly created Authority for the sum of \$3,425,000. At the time of acquisition by the Authority, the Pittsburgh Suburban Water Service Company was supplying service to 12,800 customers through 123.42 miles of water main in the Boroughs of McKees Rocks, Bellevue, West View, Avalon, Emsworth, Ben Avon and Ben Avon Heights and the Townships of Stowe, Kilbuck, Kennedy and Neville. A few consumers were also served in the City of Pittsburgh on the edge of McKees Rocks.

The Authority made the following additional acquisitions subsequent to the original acquisition of the Pittsburgh Suburban Water Service Company. In 1946, the Ross Township Authority was acquired. This acquisition included 2,450 consumers and a total of 55.3 miles of water main. Some of the mains acquired from the Ross Township Authority had formerly been owned by the Pittsburgh Suburban Water Service Company, having been sold to the Ross Township Authority in 1942. In addition to the lines acquired from the Pittsburgh Suburban Water Service Company, Ross Township had also constructed several additional miles of main and had completed the construction of a small water treatment plant. In 1948, the Authority acquired the Ben Avon Heights water system. This acquisition included 126 consumers and 3.40 miles of water main. In 1949, the Authority acquired the Kennedy Township water system including 568 consumers and 8.28 miles of water main, and finally, in October of 1951, the Authority acquired the Ingomar Water Company including 71 consumers and 2.38 miles of water main.

On December 21, 1960, the Authority created a rural service area which then was known as the Suburban Service Area. This area was comprised of the northern part of the Town of McCandless, the Townships of Ohio, Pine and Marshall, and the Boroughs of Bradford Woods, Franklin Park and Sewickley Hills. The Cranberry Township Water and Sewer Authority and the Aleppo Township Authority were also served through master meters from the Suburban Service Area mains. The Suburban Service Area was integrated into the basic system in 1984, a uniform rate schedule now being in effect for all Authority customers.

### WATER SERVICE AREA

The present service area is comprised of a wide strip of Allegheny County extending from a point south of the Ohio River, thence northerly to the Allegheny County-Butler County boundary line. The Ohio River divides the service area into the North Shore and South Shore Water Service Territories.

The North Shore Service Territory of the Authority extends from the Ohio River to the Allegheny County-Butler County boundary line. On the east, the service territory is bounded by the City of Pittsburgh and the Townships of Shaler, Hampton and Richland. With the exception of the Sewickley and Edgeworth water systems, the westerly boundary of the existing service territory is essentially the Allegheny County-Beaver County line.

The Authority's service area also includes the area south of the Ohio River, bounded on the east and south by the City of Pittsburgh and on the west by the Township of Robinson and includes the municipalities of Stowe Township, McKees Rocks Borough and Kennedy Township.

The Authority's existing Joseph A. Berkley Water Treatment Plant is located on the upstream tip of Neville Island, about five miles downstream on the Ohio River from the confluence of the Allegheny and Monongahela Rivers. Water transmission mains extend from the water treatment plant in a northerly direction across the main channel of the Ohio River and in a southerly direction across the back channel of the Ohio River.

The North Shore and South Shore Service Territories are both divided into Low and High Service areas. From the Joseph A. Berkley Water Treatment Plant, water is pumped to the Bellevue Reservoir which supplies the entire North Shore Low Service system and to the McKees Rocks Reservoir which supplies the entire South Shore Low Service system. The Bellevue Pump Station, located adjacent to the Bellevue Reservoir, delivers water to the North Shore High Service area including parts of Ross Township, West View Borough, the Town of McCandless, and bulk water sales to the Hampton Township Municipal Authority. The Kennedy Pump Station, situated near the McKees Rocks Reservoir, pumps water to the South Shore High Service system, providing water to parts of Stowe and Kennedy Townships.

At the Ronald F. Spray Pump Station, water is pumped from the North Shore High Service system to the Wexford Tank and the Pine Reservoir to provide water to parts of the Town of McCandless, the Boroughs of Bradford Woods, Franklin Park and Sewickley Hills, the Townships of Kilbuck, Marshall, Ohio and Pine, and to the resale customers of The Municipal Water Authority of Adams Township, Aleppo Township Authority, Ambridge Water Authority, Cranberry Township, Richland Township Municipal Authority and Seven Fields Borough.

The Authority maintains three emergency connections with the Pittsburgh Water and Sewer Authority (PWSA) and in the past has purchased up to 3.0 MGD from PWSA. In 2014, the Authority completed construction of an interconnection with the Municipal Authority of the Township of Robinson (MATR) that enables the Authority to purchase up to 0.72 MGD from MATR.

### JOSEPH A. BERKLEY WATER TREATMENT PLANT

The Ohio River is the Authority's primary source of raw water for the Joseph A. Berkley Water Treatment Plant. Additionally, the Authority maintains a ground water supply consisting of a Ranney horizontal collector well and twelve drilled wells. The ground water supply is available as a backup or an emergency source of supply in the event that a spill or other pollution occurs in the river.

Following withdrawal of the raw water from the Ohio River and/or from the ground water supplies, treatment chemicals, including sodium permanganate, chlorine, polyaluminum chloride, polymer, caustic soda, fluoride and powdered activated carbon, are applied and mixed in a flash mixer. The mixed water is piped to duplicate solids contact clarifiers, each rated for 20 MGD. The settled water is filtered through gravity filters having granular activated carbon filter media. The filtered water is collected in the clearwell where post chlorination is applied. From the clearwell, water flows through the 48-inch diameter ultraviolet reactor which is used as an additional disinfection barrier against contamination from *Cryptosporidium*, *Giardia* and other parasites. Finally, caustic soda is applied to the finished water before being pumped to the Authority's water distribution system.

## CHLORAMINATION

Total trihalomethanes (TTHM) are disinfection byproducts that are formed when chlorine reacts with naturally occurring organics in the water. Disinfection byproducts are contaminants that are regulated by the Pennsylvania Department of Environmental Protection. As the water temperature increases, the rate at which TTHM are formed also increase. In order to control the formation of TTHM, ammonia is added to chlorinated water to form chloramines. Chloramines will not form TTHM.

Ammonia (liquid ammonium sulfate) is added to the water pumped from the Ronald F. Spray Pump Station to form chloramines. The ammonia is generally fed during the months of May through September to control the formation of total trihalomethanes in the northern portions of the Authority's distribution system and to the consecutive bulk water customers in southern Butler County.

## DISTRIBUTION SYSTEM

The size of pipe in the distribution system of the Authority ranges in diameter from one-half to forty-two inches. An approximate summary of the pipe in the system as of October 31, 2013 follows:

Pipe Diameter (Inches)	Pipe Length (Feet)	Pipe Diameter (Inches)	Pipe Length (Feet)
1/2	237	8	1,100,673
3/4	4,600	10	110,457
1	171,239	12	537,470
1-1/4	1,976	14	2,146
1-1/2	648	16	250,785
2	103,741	18	46
2-1/2	178	20	11,456
3	7,161	24	82,375
4	231,788	36	25,311
6	1,514,996	42	645
Subtotal	2,036,564	Subtotal	2,121,364
		TOTAL (feet)	4,157,928
		TOTAL (miles)	787.49



## WATER STORAGE FACILITIES

A tabulation of the existing water storage facilities of the Authority is as follows:

Name	Type of Structure	Location	Capacity (gallons)	Overflow Elevation (feet)
Bellevue Tank	Steel Reservoir	Bellevue Borough	2,350,000	1,181.50
Bellevue Reservoir	Prestressed Concrete Tank	Bellevue Borough	9,450,000	1,182.00
Ross Reservoir	Steel Reservoir	Ross Township	5,000,000	1,339.00
McCandless Tank	Elevated Steel Tank	Town of McCandless	1,500,000	1,340.00
Keating Tank	Elevated Steel Tank	Ross Township	out of service	1,333.23
Franklin Park Reservoir	Prestressed Concrete Tank	Franklin Park Borough	5,000,000	1,339.00
Ronald F. Spray Reservoir	Prestressed Concrete Tank	Town of McCandless	5,640,000	1,340.00
Wexford Tank	Elevated Steel Tank	Pine Township	1,000,000	1,410.00
Pine Reservoir	Prestressed Concrete Tank	Pine Township	4,000,000	1,410.00
McKees Rocks Reservoir	Prestressed Concrete Tank	Stowe Township	5,000,000	1,087.00
Kennedy Tank	Elevated Steel Tank	Kennedy Township	1,000,000	1,277.50
Total Storage Volume			39,940,000	

## WATER PUMPING STATIONS

A tabulation of the existing water pumping stations of the Authority is as follows:

Name	Location
Bellevue Pump Station	Bellevue Borough
Ronald F. Spray Pump Station	Town of McCandless
Franklin Park Booster Pumping Stations (2)	Franklin Park Borough
Reis Run Pump Station	Ross Township
Rochester Road Booster Pumping Station	Ross Township
McKees Rocks Pump Station	McKees Rocks Borough
Kennedy Township Pump Station	Stowe Township

## CUSTOMERS

The following summary indicates the consumers of record served by the Authority by classification as of September 30, 2013.

### CLASSIFICATION

	<u>Active Accounts</u>	<u>Inactive Accounts</u>	<u>Total Accounts</u>
<u>Metered</u>			
Residential	50,819	2,029	52,848
Commercial	3,161	533	3,694
Municipal	166	33	199
Industrial	30	10	40
Resale	12	0	12
<u>Total Metered</u>	<u>54,188</u>	<u>2,605</u>	<u>56,793</u>
<u>Fire Protection</u>			
Private Fire Protection	543		
Public Fire Protection	3,464		
<u>Sprinkler Systems</u>	<u>659</u>		
<u>Total Fire Protection</u>	<u>4,666</u>		
 TOTAL	 58,854		

The following summary indicates the customers served by the Authority, by municipality, as of September 30, 2013.

<u>Municipality</u>	<u>Total Metered Accounts</u>
Adams Township	706
Avalon Borough	1,804
Bellevue Borough	3,219
Ben Avon Borough	795
Ben Avon Heights Borough	151
Bradford Woods Borough	408
Cranberry Township	25
Economy Borough	1
Emsworth Borough	971
Franklin Park Borough	4,464
Kennedy Township	3,361
Kilbuck Township	326
Marshall Township	2,439
McCandless (Town of)	10,427
McKees Rocks Borough	3,179
Ohio Township	1,793
Pine Township	3,506
Pittsburgh (City of)	402
Reserve Township	4
Robinson Township	63
Ross Township	12,309
Sewickley Heights Borough	4
Sewickley Hills Borough	150
Shaler Township	90
Stowe Township	3,271
West View Borough	2,912
<u>Total Customers</u>	<u>56,780</u>

<u>Resale Customers</u>	<u>Metered Accounts</u>
Adams Township Authority	1
Aleppo Township Authority	1
Ambridge Water Authority	1
Cranberry Township	2
Hampton Township Municipal Authority	3
Neville Township	1
Richland Township Authority	1
Seven Fields Borough	2
<u>Total Resale Accounts</u>	<u>12</u>

<u>Total Metered Accounts</u>	<u>56,792</u>
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## RESALE CUSTOMERS

The Authority supplies bulk water to a number of resale customers. A listing of the resale customers and the terms of the Water Service Agreements are summarized as follows:

Resale Customer	Date of Agreement	Terms of Agreement	Expiration Date
The Municipal Water Authority of Adams Township	October 17, 2001	25 Years with 5 Year Renewal	October 2031
Aleppo Township Authority	April 21, 1976	40 Years	April 2016
Allegheny County	January 2006	10 Years with 5 Year Renewal	February 2016
Cranberry Township	May 1, 2014	25 Years with 5 Year Renewal	September 2039
Hampton Shaler Water Authority	May 9, 2001		December 2027
Neville Township	November 11, 1993		Indefinite
The Richland Township Municipal Authority of Allegheny County	June 10, 2009	15 Years with 10 Year Renewal	August 2034
The Municipal Authority of the Township of Robinson	June 12, 2013	Emergency Water Service 20 Years with 5 Year Renewal	June 2038
Seven Fields Borough	February 20, 2002	25 Years with 5 Year Renewal	June 2032
Ambridge Water Authority	December 16, 2004	20 Years with 5 Year Renewal	December 2029

## POPULATION PROJECTIONS

A review of the existing and projected populations was conducted in order to help determine the future needs of the Authority. Population projections for the municipalities served by the Authority were obtained from the Southwestern Pennsylvania Commission, Cycle 9a Forecast. Population projections for the Authority's service area were determined by utilizing the current number of residential service connections, along with the average household size by municipality as provided in the 2010 Census. The following table summarizes the existing and projected populations within the existing service territory:

	Population Served 2013	Projected Population Served 2015	Projected Population Served 2020	Projected Population Served 2025	Projected Population Served 2030	Projected Population Served 2035	Projected Population Served 2040	Change 2013 to 2040
<u>Municipality</u>								
Adams Township, Butler County	1,851	1,989	2,173	2,264	2,325	2,368	2,395	544
Avalon Borough, Allegheny County	3,243	3,215	3,191	3,210	3,257	3,329	3,434	191
Bellevue Borough, Allegheny County	5,739	5,735	5,771	5,865	6,011	6,236	6,487	748
Ben Avon Borough, Allegheny County	1,778	1,771	1,784	1,816	1,872	1,941	2,018	240
Ben Avon Heights Borough, Allegheny County	371	370	374	380	391	407	424	53
Bradford Woods Borough, Allegheny County	981	989	1,012	1,045	1,083	1,125	1,172	191
Cranberry Township, Butler County	14	15	16	18	19	20	21	7
Economy Borough, Beaver County	2	2	2	2	2	2	2	0
Emsworth Borough, Allegheny County	1,917	1,916	1,925	1,955	2,016	2,084	2,159	242
Franklin Park Borough, Allegheny County	12,443	12,979	14,278	15,574	16,878	18,153	19,419	6,976
Kennedy Township, Allegheny County	7,368	7,542	8,005	8,529	9,108	9,714	10,359	2,991
Kilbuck Township, Allegheny County	697	698	710	729	760	798	841	144
Marshall Township, Allegheny County	6,395	6,674	7,334	7,978	8,609	9,214	9,800	3,405
McCandless, Town of, Allegheny County	23,220	23,404	23,953	24,679	25,556	26,508	27,542	4,322
McKees Rocks Borough, Allegheny County	5,971	5,899	5,918	5,991	6,097	6,272	6,485	514
Ohio Township, Allegheny County	4,361	4,601	4,934	5,115	5,253	5,378	5,503	1,142
Pine Township, Allegheny County	9,446	9,946	10,632	10,998	11,277	11,524	11,770	2,324
Pittsburgh City, Allegheny County	778	775	777	789	808	829	851	73
Reserve Township, Allegheny County	9	9	9	9	9	9	9	0
Robinson Township, Allegheny County	141	145	155	166	176	186	196	55
Ross Township, Allegheny County	24,304	24,391	24,701	25,188	25,823	26,528	27,307	3,003
Sewickley Heights Borough, Allegheny County	8	8	8	8	9	9	9	1
Sewickley Hills Borough, Allegheny County	404	408	422	435	455	474	493	89
Shaler Township, Allegheny County	214	215	218	223	230	237	244	30
Stowe Township, Allegheny County	6,347	6,330	6,393	6,517	6,698	6,951	7,260	913
West View Borough, Allegheny County	6,084	6,071	6,092	6,175	6,339	6,549	6,786	702
	124,086	126,097	130,787	135,658	141,061	146,845	152,986	28,900
<u>Resale Areas</u>								
Adams Township, Butler County	6,336	7,519	7,911	8,103	8,245	8,346	8,406	2,070
Aleppo Township, Allegheny County	1,043	1,259	1,314	1,335	1,359	1,384	1,418	375
Cranberry Township, Butler County	24,741	27,616	30,158	32,677	35,137	37,399	39,359	14,618
Hampton Township, Allegheny County	18,343	19,529	20,647	21,785	22,933	24,021	25,081	6,738
Neville Township, Allegheny County	1,084	1,061	1,070	1,097	1,131	1,173	1,233	149
Richland Township, Allegheny County	8,575	9,640	10,648	11,650	12,653	13,627	14,587	6,012
Seven Fields Borough, Butler County	2,887	3,252	3,372	3,440	3,493	3,533	3,557	670
	63,009	69,876	75,120	80,087	84,951	89,483	93,641	30,632
Totals	187,095	195,973	205,907	215,745	226,012	236,328	246,627	59,532

The above analysis shows that population of the existing service territory will increase by 59,532 persons, or about 31.8%, from 2013 to 2040. This figure includes an increase of 14,625 persons in Cranberry Township, 2,614 persons in Adams Township, 3,405 persons in Marshall Township, 6,967 in Franklin Park Borough and 2,324 persons in Pine Township. The analysis shows that the South Shore Service Territory, including the municipalities of Kennedy, McKees Rocks, Pittsburgh, Stowe, and Robinson, will grow by 4,491 persons from 2013 to 2040. Thus, the majority of growth will occur in the northern portions of the service territory.

The foregoing analysis does not consider commercial, municipal, or industrial accounts, or future service territories.

## WATER USAGE

The following table summarizes the Annual Average Daily Flow, the Peak Daily Flow and the Minimum Daily Flow of the treated water pumped from the Joseph A. Berkley Water Treatment Plant during years 2009 through 2013. The table also includes the ratio of the Peak Day to Average Day flow.

Year	Annual Average Daily Flow MGD	Peak Daily Flow MGD	Minimum Daily Flow MGD	Peak Day to Average Ratio
2013	26.57	32.47	19.99	1.22
2012	27.43	38.07	22.03	1.39
2011	25.45	35.88	21.22	1.41
2010	25.36	35.10	21.46	1.38
2009	25.33	31.73	21.02	1.25
Average	26.03	34.65	21.14	1.33

During this five year period, the Authority pumped an average of 26.03 MGD of treated water. The peak daily water produced ranged from a low of 31.73 MGD to a high of 38.07 MGD, with an average for the five year period of 34.65 MGD. The Peak Day to Average Day Ratio varied from 1.22 to 1.41, with an average of 1.33 over the five year period.

Based upon the population projections presented in an earlier section, the number of customers served by the Authority is expected to increase by over 31.8% by the Year 2040. The pumpage for the 2012 year was the highest volume recorded over the last five years and has been used for computing future demand. Applying the projected 31.8% increase in customers to the 2012 average daily pumpage of 27.43 MGD results in a future average daily demand of 36.15 MGD. The peak day to average day ratio for 2012 was 1.39. Applying the peak factor of 1.39 to the future pumping rate results in a future peak day pumping rate of 50.25 MGD.

In-plant water use for filter backwashing adds approximately 2 MGD to the daily water demand. The foregoing shows for the future average treatment rate of approximately 36.15 MGD, the current water treatment plant would be continuously operating at or near capacity. Such a high rate could not be sustained. For the peak future daily withdrawal rate of approximately 50.25 MGD, the current plant would be deficient by over 10 MGD. The need for additional treatment capacity is apparent.

## DESIGN OF SOURCE OF SUPPLY

Once the need for additional water treatment capacity was established, a number of treatment technologies, as well as locations for a new treatment plant, were investigated.

During the preliminary design stage for the new water treatment facility, the Authority considered a number of treatment options. Pilot studies were conducted on several types of water treatment systems including dissolved air flotation, submerged membrane filtration, plate settler clarification and ozonation. The dissolved air flotation process was found not to be suitable for treating Ohio River water and was eliminated from further consideration. Three manufacturers of submerged membrane filtration systems were piloted. Following an evaluation of the results of the membrane filtration pilot systems, as compared to conventional gravity granular filtration, it was decided that the benefits of conventional gravity filtration outweighed membrane filtration. Membrane filtration was dismissed from further consideration. Ozonation proved to be effective in oxidizing remaining organic matter in the settled water. Reduction of the organic matter in the settled water using ozone would reduce the formation of disinfection byproducts.

An additional evaluation was conducted comparing expansion of the Joseph A. Berkley Water Treatment Plant and new transmission and pumping facilities with the Beaver County Water Treatment Plant and Source of Supply. Room for expansion of the Authority's Treatment Plant on the Neville Island site is quite limited. Further, much of the growth on the distribution system is located in northern Allegheny County and the resale customers in Butler County. Water delivered to the northern portion of the distribution system is re-pumped at the Bellevue Pump Station and again at the Ronald F. Spray Pump Station located in McCandless. Any decision to expand the treatment capacity of the Joseph A. Berkley Water Treatment Plant would also entail upgrades to the booster pumping stations as well as reinforcing the transmission mains to the northern portion of the distribution system.

The Beaver County Source of Water Supply Project is an attractive alternative since it provides a direct route from the Ohio River to the northern portion of the Authority's service area, generally along rural, sparsely developed routes. The alternate plan to extend from Neville Island to the northern reaches of the service area would entail crossing the Ohio River and constructing a water transmission main through highly developed communities plus constructing at least two major pumping stations.

The evaluation found that the Beaver County Source of Water Supply Project was less expensive than expanding the existing Joseph A. Berkley Water Treatment Plant.

### BEAVER COUNTY SOURCE OF WATER SUPPLY PROJECT

The new water treatment facility in Beaver County, Pennsylvania will supplement the Authority's existing 40 MGD allocation from the Ohio River at its Neville Island Intake and Joseph A. Berkley Water Treatment Plant. This major water system addition will include a new River Intake Facility, Raw Water Transmission Main, Water Treatment Plant and Finished Water Transmission Main. Up to 15 MGD will be withdrawn from a new river intake to be situated on the Authority acquired property on the eastern bank of the Ohio River, at approximate River Mile 20, in Baden Borough, Beaver County. From the river intake, raw water will be pumped through a raw water transmission main, approximately 7,600 feet, to a new water treatment facility to be located on a fifteen acre parcel which was purchased by the Authority off of Tevebaugh Hollow Road in Economy Borough, Beaver County.

The treatment processes at the new water treatment plant will include flocculation tanks, inclined plate settlers, conventional gravity filters with granular activated carbon media and ultraviolet disinfection. The water treatment plant facilities will be designed to permit expansion to a 30 MGD capacity in the future. Further, space has been allocated for future additions of onsite generation of sodium hypochlorite and ozone generation facilities.

Treatment chemicals, including sodium permanganate, chlorine, polyaluminum chloride, polymer, caustic soda, fluoride and powdered activated carbon, will be added upstream from an inline static mixer. The mixed water will be piped to two flocculation tanks, followed by two inclined plate settlers. The settled water will be filtered through six gravity filters having granular activated carbon filter media. The filtered water will be piped to two 24-inch diameter ultraviolet (UV) disinfection reactors which will provide a barrier against contamination from Giardia, Cryptosporidium and other parasites. Following UV disinfection, the water will be collected in two clearwells where post chlorination will occur to inactivate any viruses and to provide a residual disinfectant in the finished water. Downstream of the clearwells, caustic soda will be added to adjust the pH for corrosion control. During the months of May through September, ammonium sulfate will be added to the finished water, downstream from the clearwells, to form chloramines in the finished water.

Following treatment, finished water will be pumped in an easterly direction, approximately 46,400 feet, or about 8.8 miles, to the Authority's existing water distribution system located in Allegheny, Butler and Beaver Counties, Pennsylvania.

The Total Project Cost for the Beaver County Source of Water Supply Project is estimated at \$88,225,000, as shown on the following table.



Beaver County Source of Water Supply Project Project Cost Estimate	
Beaver County Water Treatment Plant - General and Mechanical	\$41,300,000
Baden Raw Water Intake - General and Mechanical	\$7,000,000
Beaver County Water Treatment Plant and Baden Raw Water Intake - Plumbing and Fire Protection	\$1,300,000
Beaver County Water Treatment Plant and Baden Raw Water Intake - HVAC	\$2,100,000
Beaver County Water Treatment Plant and Baden Raw Water Intake - Electrical and Instrumentation	\$10,700,000
Raw Water Transmission Main and Water Treatment Plant Drain Line	\$3,500,000
Finished Water Transmission Main	\$15,200,000
Estimated Construction Cost	\$81,100,000
Other Related Project Costs	
Electric Substation - Duquesne Light	\$1,000,000
Tevebaugh Hollow Road Improvements	\$1,000,000
Furniture and Equipment	\$300,000
Engineering - Bidding, Contract Administration and Project Representation	\$1,620,000
Building Officials Inspections	\$30,000
Special Inspections	\$175,000
Construction Contingency	\$3,000,000
Total Related Project Costs	\$7,125,000
Total Project Cost	\$88,225,000

## OTHER CAPITAL ADDITIONS

In addition to the Beaver County Source of Water Supply Project, the Authority has determined that other capital improvement projects are needed and should be undertaken as funds are available. The other capital additions can be classified into projects at the new and existing water treatment plants and water main extensions and are listed as follows:

### Beaver County Water Treatment Plant - Sodium Hypochlorite Generation System

An alternate bid for the Sodium Hypochlorite Generation System will be received by the Authority when the entire plant project is bid. The Authority will determine if the Sodium Hypochlorite Generation System will be awarded, based upon available funding. The cost of the Sodium Hypochlorite Generation System is estimated at \$1,200,000.00.

### Joseph A. Berkley Water Treatment Plant Improvements and Renovations

#### Davis Island Well Improvement Project

The Authority owns a horizontal collector well on Davis Island, a small island in the Ohio River, just up river from Neville Island. The ground water supply is available as a backup supply in the event that a spill or other pollution occurs in the Ohio River. The improvement project would replace the existing pumps in the collector well with new submersible style pumps. The estimated cost is \$1,250,000.

#### Variable Frequency Drive High Service Pump Number 3

By retrofitting the second motor on High Service Pump Number 3 at the Joseph A. Berkley Water Treatment Plant with a variable frequency drive (VFD), the pump may be operated without throttling the discharge valve, thus eliminating the high energy loss. The VFD will greatly reduce the electric energy consumed at the water treatment plant. The project will include an addition to the treatment plant building to accommodate VFDs which may be installed in the future to operate the other high service pumps and replacement of the pump discharge check valve. The cost estimate for the VFD project is \$2,500,000.

#### Replacement of South Shore Pump Number 1

The Authority has authorized the study to replace South Shore Pump Number 1 at the Joseph A. Berkley Water Treatment Plant. The 8 MGD pump is driven by a 700 horsepower motor and is equipped with an eddy current coupling which is used to control the output of the pump. The eddy current coupling is old, its internal parts are worn, and replacement parts are unavailable. A preliminary estimate to replace the pump and motor and to install a variable frequency drive is \$800,000.

### Replacement of North Shore Pump Number 1

The Authority has authorized the study to replace North Shore Pump Number 1 at the Joseph A. Berkley Water Treatment Plant. North Shore Pump Number 1 has a capacity of 15 MGD and is driven by a 1,500 horsepower motor. Similar to South Shore Pump Number 1, the pump is equipped with an eddy current coupling. The eddy current coupling is old, its internal parts are worn, and replacement parts are unavailable. A preliminary estimate to replace the pump and motor and to install a variable frequency drive is \$1,000,000.

### Renovation of the Clarifiers

The clarifiers at the Joseph A. Berkley Water Treatment Plant have been in continuous service since the water treatment plant went on line, except for short periods to allow annual cleaning and repairs and for emergency repairs undertaken in 2014. Each clarifier has a capacity of 20 MGD. Only one clarifier can be taken out of service at a time. Repairs to the metal components and concrete walls of the clarifiers are needed but the clarifiers cannot be taken out of service for the period of time needed to effect the repairs.

Once the Authority's new water treatment plant in Beaver County is placed on line, one clarifier at a time can be taken out of service for a complete restoration.

The cost to rehabilitate the two Joseph A. Berkley Water Treatment Plant clarifiers is estimated at \$2,500,000.

### Water Main Extensions

The future water main extensions, which hydraulic modeling has demonstrated will strengthen the Authority's distribution system, are listed as follows:

#### Mount Pleasant Road and Dean Road Water Transmission Main

This 16-inch diameter water transmission main is proposed along Mount Pleasant Road and Dean Road in Pine Township, beginning at a connection to the 16-inch diameter main at Bakerstown-Warrendale Road. This water transmission main will provide another feed for Cranberry Township and Seven Fields Borough. The cost for 3,450 feet of 16-inch diameter water main is estimated at \$730,000.

#### Warrendale-Bayne Road Water Line Extension (S.R. 19 to Northgate Drive)

This 12-inch diameter water main is proposed along Warrendale-Bayne Road, from S.R. 19 to Northgate Drive, in Marshall Township to provide another loop in the distribution system. The cost for 2,200 feet of 12-inch diameter water main is estimated at \$330,000.

### Warrendale-Bayne Road Water Line Extension (Brush Creek Road to Wheatland Road)

A 16-inch diameter water main is proposed along Warrendale-Bayne Road, from Brush Creek Road to Wheatland Road in Marshall Township to provide another loop in the distribution system and an important link across Interstate 79. The cost for 2,600 feet of 16-inch diameter water main is estimated at \$600,000.

### Brush Creek Road Water Main Extension

This 16-inch diameter water main is proposed along Brush Creek Road, beginning at the current southern end of the 16-inch diameter main on Brush Creek Road to the Innovation Drive along Warrendale-Bayne Road in Marshall Township. This water main will provide an important loop in the distribution system. The cost for 4,500 feet of 16-inch diameter water main is estimated at \$760,000.

### Mingo Road Water Line Extension (S.R. 910 to end of main on Mingo Road)

This 16-inch diameter water main is proposed along Mingo Road from S.R. 910 to the southern end of the existing main on Mingo Road in Marshall Township to provide another loop in the distribution system. This extension will provide an important link in the distribution system when the new source of supply is constructed. The cost for 5,500 feet of 16-inch diameter water main is estimated at \$1,300,000.

### Mingo Road Water Line Extension (Warrendale-Bayne Road to Valley Road)

A 16-inch diameter water main is proposed along Mingo Road, from Warrendale-Bayne Road to Valley Road in Marshall Township to provide another loop in the distribution system. This extension will provide an important link in the distribution system when the new source of supply is constructed. The cost for 4,400 feet of 16-inch diameter water main is estimated at \$900,000.

### Wexford Run Road Water Line Extension

This 12-inch diameter water main is proposed along Wexford Run Road in Franklin Park Borough to complete a loop in the distribution system between S.R. 910 and Brandt School Road. The cost for 4,000 feet of 12-inch diameter water main is estimated at \$500,000.

### Red Mud Hollow Road/Mount Nebo Road

This 12-inch diameter water main is proposed along Red Mud Hollow Road and Mount Nebo Road in Ohio Township and Sewickley Hills Borough to complete a loop in the distribution system between McGee Road and Mount Nebo Road. The cost for 9,850 feet of 12-inch diameter water main is estimated at \$1,280,000.

Rochester Road and Wexford-Bayne Road Water Line Extension

A 16-inch diameter water main is proposed along Rochester Road and Wexford-Bayne Road in Franklin Park Borough to complete the water main on the two roads, thereby providing an important loop in the distribution system on the western side of Interstate 79. The cost for 5,000 feet of 16-inch diameter water main is estimated at \$1,125,000.

The total estimated cost of the Beaver County Source of Water Supply Project and the other Capital Additions amounts to \$105,000,000 and is summarized in the following table:

<u>Beaver County Source of Water Supply Project and Other Capital Additions</u>	
	<u>Estimated Cost</u>
Beaver County Source of Water Supply Project	\$88,225,000
Beaver County Water Treatment Plant - Sodium Hypochlorite Generation System	\$1,200,000
<u>Joseph A. Berkley Water Treatment Plant Improvements</u>	
Davis Island Well Improvement Project	\$1,250,000
Variable Frequency Drive High Service Pump Number 3	\$2,500,000
Replacement of South Shore Pump Number 1	\$800,000
Replacement of North Shore Pump Number 1	\$1,000,000
Renovation of Clarifiers	\$2,500,000
<b>Total Joseph A. Berkley Water Treatment Plant Improvements</b>	<b>\$8,050,000</b>
<u>Water Main Extensions</u>	
Mount Pleasant Road and Dean Road Water Transmission Main	\$730,000
Warrendale-Bayne Road Water Line Extension (S.R. 19 to Northgate Drive)	\$330,000
Warrendale-Bayne Road Water Line Extension (Brush Creek Road to Wheatland Road)	\$600,000
Brush Creek Road Water Main Extension	\$760,000
Mingo Road Water Line Extension (S.R. 910 to end of main on Mingo Road)	\$1,300,000
Mingo Road Water Line Extension (Warrendale-Bayne Road to Valley Road)	\$900,000
Wexford Run Road Water Line Extension	\$500,000
Red Mud Hollow Road - Mt Nebo Road Water Line Extension	\$1,280,000
Rochester Road and Wexford-Bayne Road Water Line Extension	\$1,125,000
<b>Total Water Main Extensions</b>	<b>\$7,525,000</b>
<b>TOTAL IMPROVEMENTS</b>	<b>\$105,000,000</b>

## REVENUES AND EXPENSES

### General

The feasibility of any issuance of Authority revenue bonds is determined by the ability of the utility system to meet the annual debt service requirements from revenues which are obtained from services rendered. In this instance, this means that revenues obtained from water sales must be sufficient to pay all costs of operating the water system, meet all debt service costs, and provide sufficient funds for the Authority's on-going program of capital improvements.

The Trust Indenture of the Authority requires that net operating income must be at least 120 percent of the annual average debt service requirements of all outstanding bonds. The Trust Indenture also requires that the Authority include in its annual budget the amount of ten percent of gross operating revenues for an on-going program of capital expenditures. This amount, pledged for the Authority's capital improvement program, presently guarantees that the coverage on debt service will never be less than 120 percent.

## OPERATING REVENUES

In order to generate sufficient funds to finance the Series of 2014 Bonds, the Authority will need to increase the rates that it charges for water service. The rate increases, beginning in 2015, will be determined by the Authority's Rate Consultant. For the purpose of this Report, increases in the Total Revenues will be required in the amounts of 7.5% in 2015, 17.5% in 2016, 10% in 2017 and 3% in 2018.

## ISSUANCE OF BONDS

### General

As indicated earlier, proceeds from the series of bonds discussed herein will be issued under the terms of an Indenture which will be supplemental to the Authority's existing Trust Indenture. The purpose of this issue is to obtain sufficient funds in the amount of \$105,000,000 for the purpose of constructing the new Beaver County Source of Supply Project and other capital additions.

## Total Debt Service Requirements

The following tabulation sets forth the debt service requirements for both the existing Series of 2009, 2012 and 2013 Bond debt service and the proposed Series of 2014 Bond debt service:

Period Ending	2009 Debt Service	2012 Debt Service	2013 Debt Service	Current DSRF Earnings	2014 Debt Service	2014 DSRF Earnings	Proposed Aggregate Debt Service
12/31/2014	\$925,850.00	\$507,100.00	\$1,481,100.00	(\$15,060.00)			\$2,898,990.00
12/31/2015	\$936,081.25	\$507,100.00	\$1,479,650.00	(\$15,060.00)	\$1,264,862.50	(\$51,209.94)	\$4,121,423.81
12/31/2016	\$929,005.00	\$507,100.00	\$1,477,150.00	(\$15,060.00)	\$5,059,450.00	(\$53,591.79)	\$7,904,053.21
12/31/2017	\$1,380,262.50	\$1,207,100.00	\$2,955,750.00	(\$2,646,060.00)	\$5,059,450.00	(\$53,591.79)	\$7,902,910.71
12/31/2018		\$2,839,100.00			\$5,119,450.00	(\$53,591.79)	\$7,904,958.21
12/31/2019		\$2,839,700.00			\$5,122,650.00	(\$53,591.79)	\$7,908,758.21
12/31/2020		\$2,836,500.00			\$5,125,700.00	(\$53,591.79)	\$7,908,608.21
12/31/2021		\$2,839,500.00			\$5,123,600.00	(\$53,591.79)	\$7,909,508.21
12/31/2022		\$1,818,300.00			\$6,146,500.00	(\$53,591.79)	\$7,911,208.21
12/31/2023					\$7,962,700.00	(\$53,591.79)	\$7,909,108.21
12/31/2024					\$7,959,500.00	(\$53,591.79)	\$7,905,908.21
12/31/2025					\$7,961,000.00	(\$53,591.79)	\$7,907,408.21
12/31/2026					\$7,959,750.00	(\$53,591.79)	\$7,906,158.21
12/31/2027					\$7,960,500.00	(\$53,591.79)	\$7,906,908.21
12/31/2028					\$7,962,750.00	(\$53,591.79)	\$7,909,158.21
12/31/2029					\$7,961,000.00	(\$53,591.79)	\$7,907,408.21
12/31/2030					\$7,960,000.00	(\$53,591.79)	\$7,906,408.21
12/31/2031					\$7,959,250.00	(\$53,591.79)	\$7,905,658.21
12/31/2032					\$7,963,250.00	(\$53,591.79)	\$7,909,658.21
12/31/2033					\$7,961,250.00	(\$53,591.79)	\$7,907,658.21
12/31/2034					\$7,963,000.00	(\$53,591.79)	\$7,909,408.21
12/31/2035					\$7,962,750.00	(\$53,591.79)	\$7,909,158.21
12/31/2036					\$7,960,000.00	(\$53,591.79)	\$7,906,408.21
12/31/2037					\$7,959,250.00	(\$53,591.79)	\$7,905,658.21
12/31/2038					\$7,959,750.00	(\$53,591.79)	\$7,906,158.21
12/31/2039					\$7,960,750.00	(\$53,591.79)	\$7,907,158.21
12/31/2040					\$7,961,500.00	(\$53,591.79)	\$7,907,908.21
12/31/2041					\$7,961,250.00	(\$53,591.79)	\$7,907,658.21
12/31/2042					\$7,959,250.00	(\$2,557,815.97)	\$5,401,434.03
12/31/2043					\$4,194,750.00	(\$4,228,308.00)	(\$33,558.00)
TOTALS	\$4,171,198.75	\$15,901,500.00	\$7,393,650.00	(\$2,691,240.00)	\$201,434,862.50	(\$8,230,720.45)	\$217,979,250.80

## Summary of Financial Operations

Data set forth earlier in this Report has established the annual debt service requirements, following the issuance of the 2014 Series of bonds, in a principal amount sufficient to fund the estimated project cost of \$105,000,000. Based on the data presented, the following summary tabulates the expected financial operations of the Authority for the next several years:

	Budget 2015	Budget 2016	Budget 2017	Budget 2018	Budget 2019
TOTAL OPERATING REVENUES	\$29,911,500.00	\$35,026,100.00	\$38,460,300.00	\$39,282,100.00	\$40,059,800.00
TOTAL OPERATING EXPENSES	\$22,169,400.00	\$22,834,600.00	\$26,281,700.00	\$27,070,400.00	\$27,882,500.00
NET REVENUES	\$7,742,100.00	\$12,191,500.00	\$12,178,600.00	\$12,211,700.00	\$12,177,300.00
DEBT SERVICE	\$4,121,423.81	\$7,904,053.21	\$7,902,910.71	\$7,904,958.21	\$7,908,758.21
BALANCE	\$3,620,676.19	\$4,287,446.79	\$4,275,689.29	\$4,306,741.79	\$4,268,541.79
CAPITAL EXPENDITURES FUND	\$2,991,150.00	\$3,502,610.00	\$3,846,030.00	\$3,928,210.00	\$4,005,980.00
SURPLUS	\$629,526.19	\$784,836.79	\$429,659.29	\$378,531.79	\$262,561.79
COVERAGE	1.88	1.54	1.54	1.54	1.54

Notes:

1. 2015 Budget Revenues are based upon a 7.5% increase in revenues.
2. 2016 Budget Revenues are based upon a 17.5% increase in revenues.
3. 2017 Budget Revenues are based upon a 10% increase in revenues.
4. 2018 Budget Revenues are based upon a 3% increase in revenues.
5. The actual rate increases necessary to generate the required revenues will be developed by the Authority's Rate Consultant.
6. 2017 will be the first year of operation of the Beaver County Water Treatment Plant. Increases in Pumping and Purification System Expenses have been made.
7. Debt service coverage will remain above the required 120 percent.



## CONCLUSIONS AND RECOMMENDATIONS

The following conclusions and recommendations are set forth based on the data presented in the body of this Report:

1. The Authority, since the time of its incorporation in 1942, has become one of the largest public water supply agencies in the Western Pennsylvania area. As such, the Authority's public water supply system serves a major area of Allegheny County and parts of Beaver and Butler Counties. Improvements to this extensive system must be undertaken as needed to adequately serve areas wherein new growth is occurring.
2. The need to expand the capacity of Joseph A. Berkley Water Treatment Plant has been documented by Authority management for a number of years. Following many years of research, analyses and preparation, the Authority has decided to pursue the development a new source of water supply located in Beaver County.
3. Rate increases necessary to generate additional revenues will be necessary to finance the debt service for the new bond issue. The budgeted revenues, with the appropriate increases, will be sufficient for the next five years to provide satisfactory coverage of the debt service.
4. Issuance of bonds in an amount sufficient to fund the estimated project cost of \$105,000,000 for the construction of the Beaver County Source of Supply and other capital additions is feasible. Proceeding with this program is in the best interests of the Authority.

We commend the Authority Board and Management for their long-term thinking in recognizing that future adequate water service is a vital need. Further, we thank the Authority Management and Staff for their assistance afforded to us during the preparation of this Report. We hope that this study will be adequate for the needs of all persons associated with the project.

Respectfully submitted,

BANKSON ENGINEERS, INC.

Randy L. Krause, P.E.

RLK:cfs