

SOCIO-ECONOMIC ANALYSIS FOR THE PLUMSTED TOWNSHIP WASTEWATER TREATMENT PLANT
(NJPDES DISCHARGE PERMIT NJ 0226271)

PREPARED BY:

PLUMSTED MUNICIPAL UTILITIES AUTHORITY
121 EVERGREEN ROAD
NEW EGYPT, NJ 08533

VAN CLEEF ENGINEERING
32 BROWER LANE
P.O. BOX 5877
HILLSBOROUGH, NJ 08844

HDR HYDROQUAL
1200 MacArthur Boulevard
Mahwah, NJ 07430

May 30, 2014

1. THE PLUMSTED PROJECT

1.1 Project Background

In 1991, Plumsted Township created by Ordinance the Plumsted Municipal Utilities Authority (PMUA) and charged it with a number of tasks of which the provision of public wastewater and water facilities to New Egypt was central. In September 2009, the Township Committee and the PMUA entered into a Shared Service Agreement whereby the PMUA was authorized to investigate a proposed sewer service area plan as part of the Township's long term effort to stimulate the redevelopment of the state designated New Egypt Town Center (NETC).

Over the years, the PMUA and Plumsted Township have looked at various ways to provide public sewer to the NETC. The options evaluated by the PMUA included groundwater discharge, pumping the wastewater outside Plumsted Township to the Ocean County Utilities Authority northern sewage treatment plant via Jackson Township's MUA's pumping station at Great Adventure or the wastewater treatment facilities at the Joint Base McGuire, Fort Dix, Lakehurst (JBMDL) in Burlington County and surface water discharge to the Crosswicks Creek in Plumsted Township. A "No Build" alternative was also considered. Throughout this process, the PMUA and Township have been in constant contact with and received assistance from various representatives from the New Jersey Department of Environmental Protection (NJDEP) to find a viable solution which addresses the Township's need for a public wastewater system.

After significant effort and at an expense of greater than \$1,000,000 in studies and investigations on the various initiatives listed above, the PMUA and Plumsted Township determined that the only viable solution to address the critical need for wastewater facilities for the NETC was a surface water discharge to the Crosswicks Creek.

1.2 Project Description

The Redevelopment Plan adopted by the Township in 2004, as amended in 2005, provides the mechanism for the Township to realize a coordinated program of redevelopment and rehabilitation in the area of Plumsted Township designated by the State of New Jersey as the New Egypt Town Center (NETC). The original Town Center designation was approved in 1998 and a revised designation was approved in 2010. The purpose of the Redevelopment Plan is to provide a more vibrant, culturally interesting and attractive downtown to serve as a growth center to retail and attract new businesses and shoppers from within Plumsted Township and the surrounding environs. At the heart of the Redevelopment Plan is the need to provide sewer service and to expand water supply service to support the revitalization effort. Among the stated goals and objectives of the Redevelopment Plan for the sewerage of the NETC are to: 1) create a public sewer system within the Town Center to address public health and welfare issues caused by failing, inadequate or improperly designed septic systems and cesspools; and 2) to reverse the significant on-going economic decline of the downtown as the direct result of the absence of public sewer.

The provision of public sewer is required to remove the economic barriers to rehabilitated, new and expanded growth and to improve the environmental quality of Oakford Lake and the Crosswicks Creek. The nexus of the downtown is within the 100 year flood hazard area of Oakford Lake and the Crosswicks Creek. The related shallow depth to groundwater and small lot sizes which affect most of the NETC make it difficult to support and sustain the proper operation of septic systems and cesspools. Approximately 60% of existing septic systems and cesspools pre date 1969 when Ocean County began keeping records. As such, most of the septic systems and cesspools require

significant and costly repair or replacement. Added to this, many of the buildings and sewerage systems were created before current health codes that now require much larger lot sizes. In fact, downtown New Egypt and much of the NETC as it exists today would not have been permitted at anywhere near the existing density if modern health codes and zoning regulations had been in place at that time without a public sewer system. The adoption by the NJDEP in 2013 of more stringent regulations pertaining to cesspools only serves to exacerbate the existing problems. The provision of public sewer will provide an economic boost to the downtown, support and enforce the “Smart Growth” initiative for Plumsted Township by channelling growth to the NETC and will eliminate the costly need for repair or replacement of failing septic systems and cesspools. For these reasons, the provision of public sewer in the NETC continues to be a high priority for Plumsted Township and the PMUA.

To fund the sewer improvements, the Township plans to utilize the Redevelopment Plan to establish a public/private partnership with a designated redeveloper to pay for the capital costs of the sewer infrastructure. A parcel within the NETC has been designated for redevelopment by the Redevelopment Plan. The parcel, referred to as the PRRC or Planned Residential Retirement Community, would be developed for approximately 400 active adult retirement homes. The Township is currently in discussions with Lennar Homes to develop this parcel. The Township has been unsuccessful in two earlier attempts with redevelopers to implement the Redevelopment Plan due to the inability to find a solution to dispose of the wastewater generated from the Town Center and PRRC development. In the absence of the Redevelopment Project to provide the funding for the planned sewer system, the Township would have to publicly finance the sewer infrastructure Improvements through the sale of public bonds. This would pose an even greater hardship on the residents of Plumsted Township which is a transitional aid municipality which requires state aid to offset its budget shortfall.

1.3 Planning Consistency

As noted above, the proposed sewer improvements are within the state designated, approved NETC. The proposed sewer improvements are also consistent with the Plumsted Township Master Plan and Redevelopment Plan. The designated sewer service area is consistent with the sewer service area map adopted by Ocean County and approved by the NJDEP on February 7, 2013 and with the May 2014 Draft Ocean County Wastewater Management Plan (WMP).

2.0 **WASTEWATER MANAGEMENT ALTERNATIVES**

The projected wastewater flow for the NETC is 0.6 million gallons per day (mgd). The initial projected wastewater flow to serve the core downtown area, including the PRRC, is 0.3 mgd. As discussed below, an extensive review of various options to address the wastewater needs of the NETC has been undertaken.

2.1 Groundwater Discharge

A great deal of effort and money has been undertaken in pursuing a groundwater disposal option. In discussions with the NJDEP and the Delaware Valley Basin Commission (DRBC), this option was considered to be the more environmentally friendly option available and was vigorously pursued by the PMUA. After an extensive analysis of potentially suitable sites within the Township, three separate sites were identified and investigated. These sites were identified based on a number of

factors including: available acreage; soils; presence or absence of wetlands; presence or absence of threatened or endangered species and preserved farmland. The three sites identified are referred to as the Tower Road site; the Maple Avenue site; and the Lakewood Road site. A fourth site, the "Search Farm" had previously been looked at by the Centex Corporation (Redeveloper No. 1) for groundwater disposal. Two of the three sites investigated, the Search Farm and the Maple Avenue site, were found to have seasonally high water tables and other limiting conditions which eliminated these sites from consideration. The Tower Road site was eliminated from investigation due to steep slopes and the presence of bog turtles (an endangered species) which were found near the site. The Lakewood Road site was found to have some potential to serve as a groundwater discharge site. However, several issues including the limited disposal capacity (0.25mgd), coupled with public concerns that the GWD field may aggravate flooding issues experienced in a nearby residential subdivision, Green Acres and Preserved Farmland access issues to the site, the higher projected capital costs associated with this alternative as well as its land intensive nature led the PMUA to reject this site and turn to other potential disposal and treatment options.

2.2 Great Adventure Pump Station to OCUA

After exhausting all options for groundwater disposal, the PMUA and Township met with the NJDEP and the DRBC to explore the feasibility of other options for disposing of the projected wastewater. The Great Adventure Option would involve the construction of an approximately nine (9) mile force main from downtown New Egypt to connect to the Jackson Township Municipal Utilities Authority pump station at Six Flags Great Adventure Park in Jackson Township near Route 195. From there, the wastewater would be pumped, thru a series of pump stations, to the Ocean County Utilities Authorities Northern Treatment Facility in Brick Township; a further distance of approximately 25 miles. This option would result in an inter-basin transfer of water from the Delaware River Basin to the Atlantic Basin. While an inter-basin transfer is permitted it is also not encouraged. The DRBC generally opposes this option because of the possible impacts to the Delaware River. An analysis of the construction and operating costs for this option found that this option would result in higher construction costs and the highest cost to operate of any possible option. The Township and PMUA were also concerned with future costs to increase the pumping capacity of the existing pump station at Great Adventure to serve all of Plumsted's designated Town Center and the uncertainty of future operating costs which could be assessed by the OCUA or the Jackson Township Municipal Utilities Authority and not within the PMUA's control.

2.3 Joint Base McGuire-Dix-Lakehurst (JBMDL)

This option would involve the construction of an approximately four (4) mile long force from downtown New Egypt thru North Hanover and New Hanover Townships in Burlington County to the JBMDL pump station located off of Mount Road. The wastewater would be treated at JBMDL's Texas Road Wastewater Treatment Plant which was constructed in 1995 with a treatment capacity of 4.6 mgd. The treated wastewater would be disposed by groundwater discharge at existing recharge basins located on JBMDL. There are twelve (12) existing basins designed for disposal of 4.6 mgd. However, JBMDL operators report that two (2) and possibly three (3) of the twelve (12) recharge basins are not working properly. The functioning capacity of the recharge basins is thought to be approximately 3.3 mgd. The projected immediate and short term of need JBMDL and the three adjacent municipalities of 3.5 MGD exceed the present ability to serve the projected need by approximately 200,000 gallons per day (gpd). In 2007 when the Township and PMUA first approached the JBMDL to explore the viability of this option, senior officials informed the Township there was no excess capacity to service the Townships needs. In 2009, the development of the Joint

Base Regional Wastewater Growth and Management Plan was recommended by the Joint Land Use Study funded by the United States Department of Defence (JLUS) and managed by the Ocean County and Burlington County Planning Departments. In recent meetings and discussions with Assistant Secretary Ferguson of the United States Air Force and Colonel Hodges, the current commander of JBMDL, it appears unlikely that a decision to approve the Township's request to connect to the existing facilities at JBMDL is likely to be made. This is due, in part, to the uncertainty regarding the capacity of the recharge basins and how that may affect the ability of JBMDL to support its present and future mission. In addition, the Township is concerned that the expense related to the repair or replacements of the recharge basins capacity as well as JBMDL's desire to re locate the Texas Road Treatment Facility to allow for other development to support JBMDL's mission will be costly and exceed the ability of Plumsted to afford this option. As such, due to timing and cost issues, it is felt this option is not available.

2.4 No Build Option

The provision of sewer will benefit New Egypt by eliminating a major cause of its years of economic decline. The benefits of a sewer system will also extend to the entire Township. A stronger NETC will increase the Township's overall tax rateable base, improve employment opportunities, provide residents with convenient and expanded retail and service businesses, improve environmental conditions in the downtown and support the Smart Growth initiatives the Township has long sought to achieve. For these reasons, the compelling public need to provide sewers in New Egypt are re-affirmed. The Township and PMUA are also cognizant of the possibility if Plumsted Township does not move forward to provide public sewers that the State of New Jersey may ultimately mandate the provision of sewer in the designated Town Center to address existing degradation of water quality in the Crosswicks Creek and Oakford Lake caused by failing septic systems and cesspools. Further regulations affecting individual discharges are becoming more restrictive. The provision of sewer will eliminate the possibility of future costly repair or replacement.

2.5 Surface Water Discharge

After exhausting all options for wastewater disposal as discussed above, the Township and PMUA concluded a surface water discharge to the Crosswicks Creek was the last and best suited option to provide for the immediate and future need of the NETC for sewer. The Crosswicks Creek is designated a FW2-NT (non-trout) water body. This decision was based, in part, on discussions with the NJDEP and DRBC in November and December of 2010 where the PMUA was told that, in fact, a surface water discharge permit could be permitted although no new surface water discharge permit had been issued by the NJDEP in over ten (10) years. In 2007, the NJDEP had discouraged the Township from considering this option while other more "environmentally friendly" options existed. Based on this new information and with other options exhausted, the PMUA assessed the advantages of a SWD and determined it would allow Plumsted Township to own and operate the system separate from the control of other agencies, the system becomes an asset for the Township and the discharge could meet the existing and future needs of the NETC for wastewater disposal. Another factor considered in favor of this option was the willingness of a landowner to locate the sewage treatment plant on a site located on County Route 537 where it crosses over the Crosswicks Creek. The site is well suited for wastewater treatment and disposal due to its proximity to Route 537 for access and the Crosswicks Creek for discharge. The site is located in an area zoned for commercial/industrial use with only two (2) residential properties located within ¼ mile of the proposed wastewater treatment facility. As discussed in greater detail in Section 3, the level of treatment to be provided prior to discharge has been specified by the NJDEP in their letter dated

January 13, 2014. NJDEP's approval is based on the Anti-Degradation Quality Assurance Plan (QASP) Plan for the Crosswicks Creek which included site specific stream water quality studies completed in fulfillment of NJDEP's requirements for the issuance of a surface water discharge permit.

3.0 ANALYSIS OF ACHIEVABLE TREATMENT LIMITS

3.1 Introduction and Background

The Anti-Degradation Quality Assurance Plan (QASP) to characterize ambient water quality of the Crosswicks Creek at the proposed discharge location was approved by the NJDEP on July 18, 2011. In October 2013, the QASP Final Report was submitted to the NJDEP. On January 13, 2014, the Department approved the QASP study and proposed two (2) sets of permit limitations based on a flow of 0.6 mgd. The limits under the Monthly Average and Daily Maximum correspond to the maximum allowable concentrations that could be allowed with the submittal of an appropriate socio-economic justification. The socio-economic justification would need to address the important social and economic reasons for the lowering or degradation of water quality in the Crosswicks Creek as a result of the proposed discharge. Compliance with the non-degradation limits specified would not require Plumsted to submit an appropriate socio-economic justification.

At its January 21, 2014 meeting, the members of the PMUA, based on information it requested from its engineer (Van Cleef Engineering) opted not to pursue a socio economic justification and to comply with the non-degradation limits specified in the NJDEP's letter of January 13, 2014. To meet the non-degradation limits, it was determined that the addition of Reverse Osmosis (RO) to the proposed Membrane Filtration Treatment (MBR) treatment process would be required, particularly to meet the limits established for Total Dissolved Solids (TDS). It was proposed that fifty (50) % of the effluent be directed to the RO unit and then merged or "blended" with the effluent from the MBR process to achieve the non-degradation limits. However, at a meeting with the NJDEP on March 24, 2014, the Department, in consultation with its Deputy Attorney General, determined that partial treatment of the discharge and re-mixing with the MBR effluent would constitute blending which is not permissible by the USEPA or NJDEP rules. The Department was also concerned with the disposal of the "reject" water from the RO process. The reject water contains high levels of salt and other components which are expensive to dispose of as there are few facilities in New Jersey which would be able to treat and dispose of this material. With the Department's decision, the MUA is left with two options: 1) to fully treat the entire waste stream with RO which would significantly increase the capital but more importantly the costs to operate the treatment system; or 2) to re consider its decision and pursue a socio economic justification to support the lower permit limits included in the Department's January 13, 2014 letter. At its meeting of April 30, 2014, the MUA opted to pursue the socio-economic justification as the only prudent option available. This report is submitted in fulfillment of the Department's request for specific information regarding water quality and socio-economic justification for the lowering of water quality limits specified by the Department.

3.2 Key Parameters to be Addressed in the Socio-Economic Justification

In its letter of January 13, 2014, the NJDEP identified the following parameters to be included in the socio-economic justification based on a flow of 0.6 mgd. These are: Total Dissolved Solids (TDS); Nitrate Nitrogen ($\text{NO}_3\text{-N}$); Ammonia Nitrogen ($\text{NH}_3\text{-N}$); and Copper (Cu). As a result of the March 24, 2014 meeting with NJDEP, the modelling effort was repeated at a flow of 0.3 mgd (the initial flow) for determining effluent limits utilizing WLA protocol and using a 10% safety factor (see Exhibits 1

and 2). As a result, Total Suspended (TSS), Lead (Pb), Nickel (Ni) and Zinc (Zn) are also included in this analysis. A brief description of each follows:

-Total Suspended Solids- The proposed wastewater treatment system is capable of meeting the monthly average limit of 6.01 for TSS and, therefore, no further analysis of this parameter is deemed necessary.

-Total Dissolved Solids (TDS) - TDS is primarily a drinking water concern. It is not a biotic or stream concern. There are no drinking water sources on the Crosswicks Creek. Water containing TDS concentrations below 1,000mg/l is usually acceptable to consumers for drinking water. The DRBC allows a TDS discharge of 1,000mg/l. The NJDEP has indicated that a TDS discharge concentration of 163mg/l would not result in degradation of in stream water quality. This limit cannot be consistently met by the proposed treatment plant. This is not because of inadequate treatment, but rather because an advanced wastewater treatment plant will not remove TDS. In fact, many of the chemicals necessary to optimize the removal of TDS will increase TDS levels. While the proposed treatment facility will typically discharge TDS concentrations less than 500 mg/l, the lowest monthly average TDS concentrations that can be consistently achieved by the proposed discharge is estimated to be 500 mg/l.

- Nitrate Nitrogen (NO₃-N) and Ammonia Nitrogen NH₃-N- These are common by-products of the treatment process. Based on water quality modelling of the Crosswicks Creek, the limiting factor for ammonia in stream concentration is oxygen consumption as ammonia transforms to nitrate. Modelling results for ammonia indicate that monthly average effluent limits of 0.55mg/litre would meet criteria for the 0.6mgd plant or 0.85mg/litre would meet criteria for the 0.3mgd plant. The nitrate limit is not as stringent and a limit of 10 mg/l will far exceed water quality standards for either sized waste water treatment plant. These limits will exceed the non-degradation limits of 0.25 mg/l for ammonia and 0.35 mg/l for nitrate and, therefore, these parameters are included in this socio-economic analysis.

-Copper- Copper is quite often present in wastewater as a result of leaching from copper water pipes in household systems. The surface water standard for copper is 8.6 ug/l. The annual water reports published by New Jersey American Water Company (NJAW), which is the Township's water purveyor, show that copper is present in the potable water supplied to New Egypt at concentrations as high as 353 ug/l. As a comparison, water supplied by NJAW to the area serviced by the Skillman Village Wastewater Treatment Facility, which the Plumsted Facility will be similar to, averages 9.9 ug/l of copper. To meet the anti-degradation criteria, the proposed Plumsted facility would have to reduce copper in the discharge to 2.54 ug/l or more than a 99 percent % reduction. The ability to provide an effluent concentration this low through typical wastewater treatment processes is questionable. The removal of copper and other metals through a chemical reaction and precipitation process is possible but will result in a higher level of TDS discharged to the stream and an expensive metal removal process to operate and maintain with much more sludge generation. The lowest monthly average discharge concentration that can be consistently achieved is about 10-20 ug/l.

-Lead (Pb) Lead is toxic in its soluble form in the aquatic environment. It is found (along with the nickel and zinc) to be present in the solder that is used to fuse plumbing fixtures and connections in household plumbing applications. An amount of these metals will leach into the wastewater flow from the connections due to the varying pH of the water supply. Those households that have their own wells for potable water supply are of a greater concern for leaching potential. The lowest monthly average concentration that can be consistently achieved is about 10 - 20 ug/l.

-Nickel (Ni) – While nickel is somewhat toxic in its soluble form it does not usually cause water quality issues. As mentioned above, its discharge to the wastewater collection system is through the leaching of potable water fixtures found in the typical households and other commercial buildings. The lowest monthly average concentration that can be consistently achieved is about 10-20 ug/l.

-Zinc (Zn) – Zinc also finds its way into the wastewater system by leaching of the plumbing fixtures in residences and commercial buildings. The lowest monthly average concentration that can be consistently achieved is about 25-35 ug/l.

3.3 Discussion

It is predicted in stream water quality will not be degraded due to $\text{NO}_3\text{-N}$ and $\text{NH}_3\text{-N}$ and TSS by the proposed discharge under critical low flow conditions. Utilizing a highly advanced tertiary wastewater treatment plant, such as the one described below, the non-degradation limits of 0.25 mg/l for ammonia and 0.35 mg/l for nitrate and 6.01 for TSS will be met on a consistent basis and will protect from violating in stream criteria for these parameters. There will be times, however, when the discharge may exceed the discharge limits for these parameters and, due to this, Plumsted is requesting somewhat higher limits for these parameters in the socio-economic justification. It is anticipated that the non-degradation limit will be exceeded for TDS as will the monthly average limits for Cu, Ni, Pb and Zn. The addition of RO as discussed herein will allow all of the proposed limits for these parameters to be met but at exorbitantly higher operating and maintenance costs. Under typical stream flow conditions, the proposed plant would have a much smaller effect, or no effect, on in stream water quality and are not anticipated to have any deleterious impacts on the Crosswicks Creek.

4.0 **Description of Proposed Treatment Technology**

As noted above, the proposed discharge from the immediate to short term development of the core downtown area of New Egypt is expected to generate 0.3 mgd of wastewater. At full development of the designated NETC, the anticipated flow is expected to be 0.6 mgd of wastewater. The wastewater characteristics are expected to be those associated with residential wastewater. There is no heavy industrial use existing or planned. The light industrial uses existing or planned within the NETC are associated with warehouses or light industrial.

A wastewater treatment system incorporating Biological Nutrient Removal (BNR) and Advanced Membrane Filtration (MBR) will be utilized for the project. The proposed treatment plant will consist of the following major unit processes:

- Grit/Screening Removal
- Influent Pumping Station
- Fine Screen
- Flow Equalization
- Four Stage Biological Treatment (MBR)
- Ultraviolet Light Disinfection
- Flow Metering
- Post Aeration

Associated equipment will include:

- Sludge Holding Tank
- Chemical Addition for Phosphorous Removal
- Glucose/Methanol Feed System (carbon source to enhance denitrification)
- pH/alkalinity adjustment (to enhance the nitrification process)
- Manual and Automatic Membrane backwash/Cleaning System
- System Controls and Automatic Dialer/Alarm System
- Building (to house process tanks)
- Odor Control System
- Aeration System (for sludge holding tanks)
- Standby Generator and Automatic Transfer Switch

The treatment system will be configured in two separate process trains each capable of handling one-half of the daily design flow. A process flow schematic is shown in Attachment 3. For illustrative information, the flow schematic contains the complete RO system and RO reject concentrator required for advanced TDS and metal removal.

4.1 Anticipated Effluent Quality

The wastewater treatment process described herein is capable of producing a consistently high quality effluent. For the parameters being addressed in this analysis, the following concentrations are felt to be generally attainable from this type of treatment.

- Total Dissolved Solids	≤500 mg/l
- Nitrate Nitrogen	5-10 mg/l
- Ammonia Nitrogen	≤1-1.4 mg/l
- Copper	10-20 ug/l*
- Lead	10-20 ug/l*
- Nickel	10-20 ug/l*
- Zinc	25-35 ug/l*

*This type of treatment process is not specifically designed to remove metals. As a result, it is not possible, without actual data, to specify limits for these parameters and a monitor only requirement for these parameters is requested.

While the proposed treatment technology can typically produce an effluent with concentrations such as those listed above, it may not do so at all times. Therefore, the best achievable monthly average limits that can be expected are as follows:

- Total Dissolved Solids	500 mg/l
- Nitrate Nitrogen	10 mg/l
- Ammonia Nitrogen	1.4mg/l
- Copper	Monitor Only
- Lead	Monitor Only
-Nickel	Monitor Only
- Zinc	Monitor Only

4.2 Additional Treatment Needed to Meet No Measurable Lowering of Water Quality (NMLWQ) Effluent Limits

In the January 13, 2014 letter from NJDEP, the following non-degradation limits or monthly limits were specified based on a flow of 0.6 mgd.

Total Dissolved Solids	163 mg/l
Nitrate Nitrogen	0.35 mg/l
Ammonia Nitrogen	0.25 mg/l
Copper	2.54 ug/l
TSS	6.01 mg/l
Lead	1.52 ug/l
Nickel	0.85 ug/l
Zinc	21.5 ug/l

The wastewater treatment technology the Township proposes to use which is the most advanced, readily available and cost effective technology on the market today, is not capable of meeting the NMLWQ limits for TDS and on a consistent basis the monthly limits for nitrate nitrogen, ammonia nitrogen or the four (4) metals. In order to meet such limits, additional treatment, as discussed below, would need to be added to the proposed treatment plant. The additional treatment technology available would result in exorbitant operation and maintenance costs as discussed herein.

The removal of TDS, $\text{NO}_3\text{-N}$, NH_3 and metals can all be accomplished by RO. RO is a process in which water is separated from dissolved salts in solution by filtering through a semi permeable membrane at a pressure greater than the osmotic pressure caused by the dissolved salts in the wastewater. While the process will remove the included parameters, the process results in a saline waste product ("reject water") that must be disposed of in a suitable fashion. A major drawback and cost associated with RO is the removal and disposal of the saline waste ("reject water") product produced. This waste product can be 15-20% of the plant flow and requires trucking to a suitable disposal facility. There are very few facilities in New Jersey that would be permitted by NJDEP to accept Plumsted's reject water and all are located some distance from Plumsted. For this analysis, the Passaic Valley Sewerage Authority is used as it is the closest facility approved to accept this type of waste. This facility is located approximately 56 miles from Plumsted, a 112 mile round trip. Other major drawbacks of RO are substantially higher capital, operation and maintenance costs, an effluent water quality which is "too clean" and has limited, if any, operating experience in New Jersey. For the purposes of this analysis, RO has been used to develop operation and maintenance cost estimates. While there will also be additional costs for capital improvements for an RO system of approximately \$570,000, these cost are not included in this analysis. As discussed earlier in this Report, the capital costs are expected to be absorbed as a result of the implementation of the Redevelopment Project.

4.3 Operation/Maintenance Costs

In NJDEP's letter of January 13, 2014, if Plumsted were to choose the socio economic justification for the lowering, or degradation, of water quality in the Crosswicks Creek as a result of the proposed discharge, the NJDEP requested that a treatment cost analysis, including a chart that compares the individual user fees for a treatment plant for the following three (3) treatment levels be provided:

- 1) No degradation (no change in water quality above ambient);

- 2) The limitations that are proposed in the Anti-Degradation Study (Best Achievable); and
- 3) The mid-point between one and two.

In order to meet the non-degradation limits included in NJDEP's January 13, 2014 letter, it would be necessary to add RO and the RO concentrator unit process to the proposed treatment plant described in Section 4.0. Based on the meeting with the NJDEP on March 24, 2014, as the federal and state regulations do not permit blending of the wastewater stream, RO cannot be utilized at less than full capacity to achieve a mid-point scenario and, therefore, this comparison, while provided, is not useful. The only way to address a mid-point scenario is by use of chemicals which, in the case of copper and other metals, may address this but will increase the level of TDS in the waste stream. The TDS no degradation limit is not achievable without the use of RO.

To establish the operating costs for RO, the PMUA requested Van Cleef Engineering to prepare estimates for an RO system. Van Cleef engineering prepared these estimates with the assistance of a major wastewater equipment manufacturer, Dynatec Systems. Van Cleef also prepared cost estimates for the transport and disposal of the reject water (see Attachment 4).

Based on the information provided by Van Cleef Engineering, the additional costs to operate an RO process to meet the anti-degradation limits at the initial anticipated flow of 0.3 mgd is estimated to be \$774,000. The estimated additional cost to meet the best achievable limits proposed in the anti-degradation study is estimated to be \$340,000.

The estimated annual user costs for the anti-degradation scenario are significantly higher than for the lower limits that are proposed in the Anti-Degradation Study. The anti-degradation scenario would result in an annual user fee for a typical homeowner of approximately \$1,006 as compared to an annual user fee of approximately \$ 611 for the Best Achievable scenario. These costs do not include a sewer connection fee or other costs to the homeowner to connect to the PMUA sewer infrastructure. By way of comparison, Jackson Township has an annual user fee of approximately \$380, Pemberton Township \$360 and the Borough of Wrightstown \$1,100. The annual user fee for Wrightstown is unusually high as there are only 250 residential connections. If the Borough had 1100 connections as Plumsted anticipates, the average annual user fee would be approximately \$532 (total annual operating expenses of \$585,000/ 1100 connections). The average annual user fee for the Jensen's Deep Run retirement community located within Plumsted Township is approximately \$500. Table 1 summarizes the costs for the No Degradation, Mid-Point and Best Achievable Scenario.

Table 1: Anti-Degradation Analysis: Increased RO Cost-Benefit Summary for 0.3 mgd Discharge							
	Best Achievable		Mid-Point	Increase in \$/%		No Degradation	Increase in \$ / %
Annual O/M	\$671,594		\$889,000	\$217,406/32%		\$1,106,594	\$435,000/65%
Annual User Fee	\$611		\$809	\$198/32%		\$1,006	\$395/65%

5.0 Socio-Economic Implications

As discussed in Section 1, the proposed wastewater treatment plant will serve important social, environmental and economic purposes consistent with the Township's Master Plan, State Development Guide Plan and the Ocean County Draft Wastewater Management Plan. The proposed system will also enable the Township to meet its COAH obligation that it is not able to do without sewer. Thus, the project clearly advances the Township's, Ocean County and the State's social goal of providing managed, orderly growth within the NETC.

The affordability of the proposed treatment plant to the residents it is intended to serve is a grave concern. If the annual user fee is too high and is not affordable to the population it serves then the municipality may have to forego the construction of the planned wastewater infrastructure. In that case, the Township would not be able to advance the important social, environmental and economic goals it has planned for. In 1996, when the Safe Drinking Water Act was developed, the USEPA established four (4.0) percent of the Median Household Income (MHI) as a benchmark of affordability. MHI is measured as the total annual water and sewer bill divided by the MHI for the service area. The four (4.0) percent benchmark is equally split between water (2%) and sewer (2%). The MHI for Plumsted Township is approximately \$70,000. However, within Plumsted Township there is a disparity of MHI which is based on older and smaller homes and lot sizes in New Egypt as opposed to newer development outside the NETC (see Attachments 5 and 6). In the downtown area of New Egypt proposed to be sewered in the project's 1st and 2nd phases, the MHI is less or approximately \$60,000. Based on the lower MHI for New Egypt, and using 2% as an affordability guideline for wastewater, the USEPA guideline for what is affordable to New Egypt residents is \$1200. It can be argued that USEPA's affordability guideline is subjective and is not easily measured and may vary from one community to the next and, as noted above, even within a municipality. A study undertaken by Kieven in 2010 for 211 communities in the north central United States found the majority of average residential wastewater bills equate to less than 0.5 percent of the MHI (see Attachment 7). In a review of the literature, values tend to be more conservative than USEPA's rule of thumb generally indicating that the average residential wastewater bill should not ideally exceed 0.75 percent of the MHI. Based on the lower MHI for New Egypt, as compared to all of Plumsted, and the average annual user fees for residential customers in Jackson, Pemberton Township, Wrightstown Boro and Jensen's of \$ 443, an average annual rate of \$450 (0.75 percent of MHI) is deemed more appropriate for what residential customers in New Egypt can afford. As noted, the projected average annual rate of \$ 600 (1% Of MHI and \$150 above the average) is already stressing the affordability of the project. Anything much above this will have substantial adverse impacts on the affordability of the project and must be weighed heavily against the downside of the added environmental benefits that may be achieved by meeting the anti- degradation limits. The associated reductions in TDS , Nitrate Nitrogen , Ammonium Nitrogen and metals do not justify the

foregoing of the important social and economic benefits which will result from this project in order to avoid the in stream concentrations of these parameters, particularly since the “Best Achievable” limits for these parameters would ensure the in stream criterion are met. Also lost in this scenario are the benefits of improved water quality to Oakford Lake and the Crosswicks Creek above the proposed discharge location with the elimination of septic and cesspool systems that, if not removed, will continue to adversely impact water quality for decades to come. These improvements are more than likely sufficient to offset the increase associated with these parameters predicted in the Anti-Degradation Study.

6.0 Conclusion

A discharge to surface water has been selected as the most viable and practical, if not the only, solution available to Plumsted Township. This report describes a type of anti-degradation analysis of the receiving stream which was undertaken at the request of the NJDEP. The analysis identified several parameters of concern: TDS, nitrate nitrogen, ammonium nitrogen and metals. The best achievable concentrations for these parameters that can be discharged from a treatment process using readily available, proven technology were evaluated. It was determined that under critical low flow conditions, the in stream concentrations of these parameters would increase due to the discharge, but would still be well below the applicable stream criterion. As a result of this finding, and a demonstration that there are important social and economic justifications for increasing the in stream concentrations the Township has met the anti-degradation policy contained in the Surface Water Quality Standards at N.J.A.C. 7: 1.9 to justify the lowering of water quality in the Crosswicks Creek as a result of the proposed discharge.

Water quality studies conducted as part of this project determined the discharge concentration for each of these parameters that would be necessary to avoid increasing stream concentrations. Next, the additional wastewater treatment process that would be needed to meet the limits for TDS, nitrate nitrogen, ammonium nitrogen and metals were identified. The additional costs to operate and maintain these processes were quantified and their effect on the annual user fees evaluated. It was concluded that annual user fees would increase significantly if anti-degradation limits for the studied parameters were to be achieved.

The socio economic implications of the increased user fees on the residents of New Egypt were evaluated. The conclusion of that analysis was that increased user fees would have a significant adverse impact on the residents in terms of their ability to afford these fees and the likelihood that the viability of the entire project would be impacted as well. Therefore, it is concluded that the exorbitant user fees that would result from meeting the anti-degradation limits or mid-point scenario are not justified given the marginal difference in water quality between those limits and what can be obtained by meeting the “best achievable” limits.

Based on the March 24, 2014 meeting with NJDEP, the modelling effort was repeated for determining effluent limits utilizing WLA protocol and using a 10% safety factor. These results and the requested monthly limits are for both the 0.6 mgd and 0.3 mgd discharge scenarios. If the socio-economic evaluation is accepted by the NJDEP, we would request the following changes to the monthly average allowable limits set forth in the January 13, 2014 letter as follows:

Monthly Average Requested

CBOD ₅	2.0 mg/l (no change necessary)
TSS	6.01 mg/l (no change necessary)
DO	8.0 mg/l (no change necessary)
Ammonia	1.4 mg/l
Nitrate	10 mg/l
Phosphorus	0.1 mg/l (no change necessary)
pH	6.0 s.u. (minimum)
TDS	500 mg/l
Copper	(monitor only)*
Lead*	(monitor only)*
Nickel*	(monitor only)*
Zinc*	(monitor only)*

We feel these requested discharge concentrations have been shown by our socio-economic analysis and extensive studies and modelling to be protective of the stream uses identified for the Crosswicks Creek and are, therefore, reasonable and justified.

* The four metals (4) metals, while of some concern, can be adequately addressed through a monitor only scenario until some real concentrations are obtained. We request the right to conduct a phosphorus study after the WWTP has been constructed and operational. We also request the right to conduct a Water Effects Ratio (WER) study for any of the metals depending upon the data obtained through the NJPDES monitoring process.

Table 17. Water Quality Criteria Waste Load Allocation Analysis
Flow from USGS in Crosswicks Creek, at Rt 537 Bridge near New Egypt, 1990 - 2010

Stream Information-Summer 2011 & 2012 Data		Stream Flows (cfs)		Effluent Information	
Lower 95% Total Hardness (as CaCo3)	59.9	1Q10 (Annual)	5	Hardness-as CaCo3	72
95% Temperature	26.2	7Q10 (Annual)	6	Temperature (Maximum)	25.0
95% pH	7.34	30Q10 (annual)	8	95% Temperature	23.5
		75th percentile	30	maximum pH	8.5
				minimum pH	7.4
Mass Balance Hardness				Discharge Flow (MGD)	
1Q10 (Annual)	61.8			0.6	
7Q10 (Annual)	61.5				

	Ambient Concentration (95%)	Est Effluent Concentration ⁽²⁾	Mass Balance Concentration Based on WLA	Surface Water Criteria	WLA	LTA ^{chronic} CV=0.5, n=4	Daily Maximum	Monthly Average	Assimilative Capacity Remaining (%)
Temperature - summer - C ⁽¹⁾	26.2	25.0	26.0	28	25.0			NA	
pH	7.34	7.5	7.4	4.5 - 7.5	7.5			NA	
TSS - mg/L	13.5	6	36	40	180		NA	180	10
TDS - mg/L ⁽³⁾	163	401	449	500	2300		NA	2300	10
CBO ₅ - mg/L		Based on DO Model Projection					NA	1	NA
Total Phosphorus - mg/L	0.13	0.1	0.12	0.1	0.1		NA	0.1	-23
ACUTE	Ambient Concentration (95%)	Est Effluent Concentration ⁽²⁾	Mass Balance Concentration Based on WLA	Surface Water Criteria	WLA	LTA ^{acute} CV=0.5, n=4	Daily Maximum	Monthly Average	Assimilative Capacity Remaining (%)
Ammonia - mg/L	0.25	0.90	0.4	13.8	0.9	0.29	0.90	0.55	97
Nitrate - mg/L				See Human Health					
Copper - ug/L	2.54	12.4	7.74	8.6	36	11.5	35.7	21.8	10
Lead - ug/L ^(4,5)	3.0	2.5	47.15	52.6	285	91.5	284.5	173.8	10
Nickel - ug/L ⁽⁵⁾	2.19	1.4	272.72	304.1	1730	555.3	1727.1	1055.1	10
Silver - ug/L ⁽⁶⁾	0.009	2.0	1.417	1.6	9.0	2.9	9.0	5.5	10
Zinc - ug/L	34.1	35.3	69.47	77.6	260	83.5	259.6	158.6	10
Chlorine Produced Oxidants - ug/L ⁽⁷⁾	10	0	8.4	19	0.0	0.0	0.0	0.0	56
Bis(2-Ethylhexyl Phthalate) - ug/L				See Human Health					
Methylene Chloride - ug/L				See Human Health					
CHRONIC	Ambient Concentration (95%)	Est Effluent Concentration ⁽²⁾	Mass Balance Concentration Based on WLA	Surface Water Criteria	WLA	LTA ^{chronic} CV=0.5, n=4	Daily Maximum	Monthly Average	Assimilative Capacity Remaining (%)
Ammonia - mg/L	0.25	0.9	0.3	4	0.9	0.5	1.5	0.9	91
Nitrate - mg/L				See Human Health					
Copper - ug/L	2.54	12.4	5.4	6.02	24	12.6	39.3	24.0	10
Lead - ug/L ^(4,5)	3.0	2.5	6.7	7.47	31	16.3	50.8	31.0	10
Nickel - ug/L ⁽⁵⁾	2.19	1.4	30.3	33.8	212	111.7	347.5	212.3	10
Silver - ug/L ⁽⁶⁾				No Chronic Criteria					
Zinc - ug/L	34.1	35.3	69.7	77.61	300	158.1	491.7	300.4	10
Chlorine Produced Oxidants - ug/L ⁽⁷⁾	10	0	8.7	11.00	0.0	0.0	0.0	0.0	21
Bis(2-Ethylhexyl Phthalate) - ug/L				See Human Health					
Methylene Chloride - ug/L				See Human Health					
HUMAN HEALTH	Ambient Concentration (95%)	Effluent Concentration	Mass Balance Concentration Based on WLA	Surface Water Criteria	WLA	LTA ^{acute} CV=0.5, n=4	Daily Maximum	Monthly Average	Assimilative Capacity Remaining (%)
Nitrate - mg/L ⁽²⁾	0.35	5.00	9.05	10	290	93.1	289.5	176.9	10
Lead - ug/L ⁽⁸⁾	3.0	2.50	4.5	5.0	53	17.0	52.9	32.3	10
Bis(2-Ethylhexyl Phthalate) - ug/L ^(9,10)	1.51	3.35	1.5	1.2	0.00	0.0	0.0	0.0	-22
Methylene Chloride - ug/L ^(10,11)	0.075	0.59	2.25	2.5	72.5	23.3	72.4	44.2	10

⁽¹⁾ Temperature shall not exceed a maximum of 31C or a 7 day rolling average of daily max not to exceed 28C, unless due to natural conditions. The WLA was calculated using the 95% percentile about the mean of field temperature.

⁽²⁾ Concentrations represent data maximums for acute and chronic, or as indicated in notes 8 and 10 below for human health criteria, except for pH, nitrate, ammonia and phosphorus. Ammonia and nitrate are based on dissolved oxygen modeling. Concentrations for pH are reflective of anticipated treatment level of 7.5 maximum. Also CPO = 0 is anticipated for the UV treatment system.

⁽³⁾ Estimated effluent TDS is based on additional TDs that can be expected from chemical treatment for TP removal with a target of 0.08 mg/L TP - spreadsheet "TDS estimate" of 243.3 plus instream background. No other background TDS is readily available.

⁽⁴⁾ Lead acute and chronic SWQC are listed in NJ rules in the dissolved form while field measures were of total recoverable. Therefore a translator of 0.723 as listed in NJ AC 7:14 Subchapter 13.6c was used to calculate a the total recoverable SWQC. The lead human health SWQC is listed at total recoverable and therefore did not have the translator applied.

⁽⁵⁾ In review of the previous years WCR for Skillman village, it is noted that from 2007 through 2012 effluent nickel was tested 7 times with an average concentration of 2.8 ug/l (peak 4.5 ug/l). There was no significant change in effluent concentrations following upgrade of the facility to the MBR system. Additionally, a check of the 2011 water report from NJ American Water (who provide water to the area served by the Skillman STP) revealed nickel at a concentration of 7.0 ug/l in the public water supply. This represents a removal of approximately 60%. The water supply reports for New Egypt (NJ American Water) show nickel levels of 0.8 ug/l in 2011 and 1.4 ug/l in 2010. Even without utilizing a removal factor in the STP, this level of nickel is lower than the ambient stream water quality. Therefore the antidegradation calculation for nickel using nickel at 1.4 ug/L.

⁽⁶⁾ Silver instream sample measurements were reported as not detect (except one value). However all effluent data is also below the detection limit so using half the detection limit for effluent indicates violation of the antidegradation tests when this is an artifact of detection limits.

⁽⁷⁾ Residual chlorine can result from the chlorination-dechlorination process and can be toxic to fish. The field measured residual chlorine is less than detection. The effluent discharge was set at 0 assuming no CPO in effluent using UV treatment.

⁽⁸⁾ Human health noncarcinogen-uses monthly maximum effluent concentrations for WLA.

⁽⁹⁾ Effluent bis (2 ethyl hexyl phthalate) is known for being difficult to measure because it is used to make plastics and false positives are a problem. The Allentown data was used since no DEHP data was available for Skillman. Allentown data used herein has one high value of 23 ug/L, two other detected values of 3 and 4 ug/L, and the remaining 8 values are less than the detection limit.

⁽¹⁰⁾ Human health carcinogen-uses longterm average which is the average of the available effluent data for WLA.

⁽¹¹⁾ Instream data are below the detection limit of 1 ug/L so use half the detection limit. The Allentown data was used since no methylene chloride data was available for Skillman. Effluent data are also below detection. Therefore violations are an artifact of detection limits.

Table 17. Water Quality Criteria Waste Load Allocation Analysis
Flow from USGS in Crosswicks Creek, at Rt 537 Bridge near New Egypt, 1990 - 2010

Stream Information-Summer 2011 & 2012 Data		Stream Flows (cfs)		Effluent Information	
Lower 95% Total Hardness (as CaCO ₃)	59.9	1Q10 (Annual)	5	Hardness-as CaCO ₃	72
95% Temperature	26.2	7Q10 (Annual)	6	Temperature (Maximum)	25.0
95% pH	7.34	30Q10 (annual)	8	95% Temperature	23.5
		75th percentile	30	maximum pH	8.5
				minimum pH	7.4
Mass Balance Hardness				Discharge Flow (MGD)	
1Q10 (Annual)	60.9			0.3	
7Q10 (Annual)	60.8				

	Ambient Concentration (95%)	Est Effluent Concentration ⁽²⁾	Surface Water Criteria	Target Mass Balance Concentration with 10% MOS	WLA+10% MOS	LTA ⁽³⁾ chronic CV=0.5, not	Daily Maximum	Monthly Average	Assimilative Capacity Remaining (%)
Temperature - summer - C ⁽¹⁾	26.2	25.0	28	26.2	26.4		NA		
pH	7.34	7.5	4.5 - 7.5	7.45	8.0		NA		
TSS - mg/L	13.5	6	40	36	326		NA	326	10
TDS - mg/L ⁽²⁾	163	401	500	450	4160		NA	4160	10
CBOD ₅ - mg/L					1		NA	1	NA
Total Phosphorus - mg/L	0.13	0.1	0.10	0.09	0.1		NA	0.1	10
ACUTE	Ambient Concentration (95%)	Est Effluent Concentration ⁽²⁾	Surface Water Criteria	Target Mass Balance Concentration with 10% MOS	WLA+10% MOS	LTA ⁽³⁾ acute CV=0.5, not	Daily Maximum	Monthly Average	Assimilative Capacity Remaining (%)
Model Based - Ammonia - mg/L	0.25	1.4	13.8		1.4	0.45	1.40	0.85	
WLA Based - Ammonia - mg/L	0.25	1.4	13.8	12	143	45.9	143	87.3	10
Nitrate - mg/L				See Human Health					
Copper - ug/L	2.54	12.4	8.6	8	64.2	20.6	64.1	39.1	10
Lead - ug/L ^(4,5)	3.0	2.5	52.6	47	525	168	524	320	10
Nickel - ug/L ⁽⁵⁾	2.19	1.4	304.1	274	3199	1027	3193	1951	10
Silver - ug/L ⁽⁶⁾	0.009	2.0	1.6	1	16.5	5.3	16.5	10.1	10
Zinc - ug/L	34.1	35.3	77.6	70	455	146	454.2	277	10
Chlorine Produced Oxidants - ug/L ⁽⁷⁾	10	0	19	17	93.6	30.0	93.4	57.1	10
Bis(2-Ethylhexyl Phthalate) - ug/L				See Human Health					
Methylene Chloride - ug/L				See Human Health					
CHRONIC	Ambient Concentration (95%)	Est Effluent Concentration ⁽²⁾	Surface Water Criteria	Target Mass Balance Concentration with 10% MOS	WLA+10% MOS	LTA ⁽³⁾ chronic CV=0.5, not	Daily Maximum	Monthly Average	Assimilative Capacity Remaining (%)
Model Based - Ammonia - mg/L	0.25	1.4	4		1.4	0.7	2.3	1.4	
WLA Based - Ammonia - mg/L	0.25	1.4	4	3	56.3	29.7	92.3	56.4	10
Nitrate - mg/L				See Human Health					
Copper - ug/L	2.54	12.4	6.02	5.4	42.6	22.5	69.9	42.7	10
Lead - ug/L ^(4,5)	3.0	2.5	7.47	7	55.0	29.0	90.1	55.1	10
Nickel - ug/L ⁽⁵⁾	2.19	1.4	33.8	30	396	208.4	648	396	10
Silver - ug/L ⁽⁶⁾				No Chronic Criteria					
Zinc - ug/L	34.1	35.3	77.61	70	532	280.4	872	533	10
Chlorine Produced Oxidants - ug/L ⁽⁷⁾	10	0	11.00	10	8.6	4.5	14.1	8.6	10
Bis(2-Ethylhexyl Phthalate) - ug/L				See Human Health					
Methylene Chloride - ug/L				See Human Health					
HUMAN HEALTH	Ambient Concentration (95%)	Effluent Concentration	Surface Water Criteria	Target Mass Balance Concentration with 10% MOS	WLA+10% MOS	LTA ⁽³⁾ acute CV=0.5, not	Daily Maximum	Monthly Average	Assimilative Capacity Remaining (%)
Nitrate - mg/L ⁽²⁾	0.35	5.00	10.0	9.0	568	182	567	346	10
Lead - ug/L ⁽⁶⁾	3.0	2.50	5.0	4.5	102	32.8	102	62.3	10
Bis(2-Ethylhexyl Phthalate) - ug/L ^(6,10)	1.51	3.35	1.2	1.1	0.0	0.0	0.0	0.0	10
Methylene Chloride - ug/L ^(10,11)	0.075	0.59	2.5	2.3	143	45.9	143	87.1	10

⁽¹⁾ Temperature shall not exceed a maximum of 31°C or a 7 day rolling average of daily max not to exceed 28°C, unless due to natural conditions. The WLA was calculated using the 95% percentile about the mean of field temperature. Note Target Mass Balance is set at ambient because 10% MOS is lower than ambient.

⁽²⁾ Concentrations represent data maximums for acute and chronic, or as indicated in notes 8 and 10 below for human health criteria, except for pH, nitrate, ammonia and phosphorus. Ammonia and nitrate are based on dissolved oxygen modeling. Concentrations for pH are reflective of anticipated treatment level of 7.5 maximum. Also CPO = 0 is anticipated for the UV treatment system.

⁽³⁾ Estimated effluent TDS is based on additional TDs that can be expected from chemical treatment for TP removal with a target of 0.08 mg/L TP - spreadsheet "TDS estimate" of 243.3 plus instream background. No other background TDS is readily available.

⁽⁴⁾ Lead acute and chronic SWQC are listed in NJ rules in the dissolved form while field measures were of total recoverable. Therefore a translator of 0.723 as listed in NJ AC 7:14 Subchapter 13.6c was used to calculate a the total recoverable SWQC. The lead human health SWQC is listed at total recoverable and therefore did not have the translator applied.

⁽⁵⁾ In review of the previous years WCR for Skillman village, it is noted that from 2007 through 2012 effluent nickel was tested 7 times with an average concentration of 2.8 ug/l (peak 4.5 ug/l). There was no significant change in effluent concentrations following upgrade of the facility to the MBR system. Additionally, a check of the 2011 water report from NJ American Water (who provide water to the area served by the Skillman STP) revealed nickel at a concentration of 7.0 ug/l in the public water supply. This represents a removal of approximately 60%. The water supply reports for New Egypt (NJ American Water) show nickel levels of 0.8 ug/l in 2011 and 1.4 ug/l in 2010. Even without utilizing a removal factor in the STP, this level of nickel is lower than the ambient stream water quality. Therefore the antidegradation calculation for nickel using nickel at 1.4 ug/l.

⁽⁶⁾ Silver instream sample measurements were reported as not detect (except one value). However all effluent data is also below the detection limit so using half the detection limit for effluent indicates violation of the antidegradation tests when this is an artifact of detection limits.

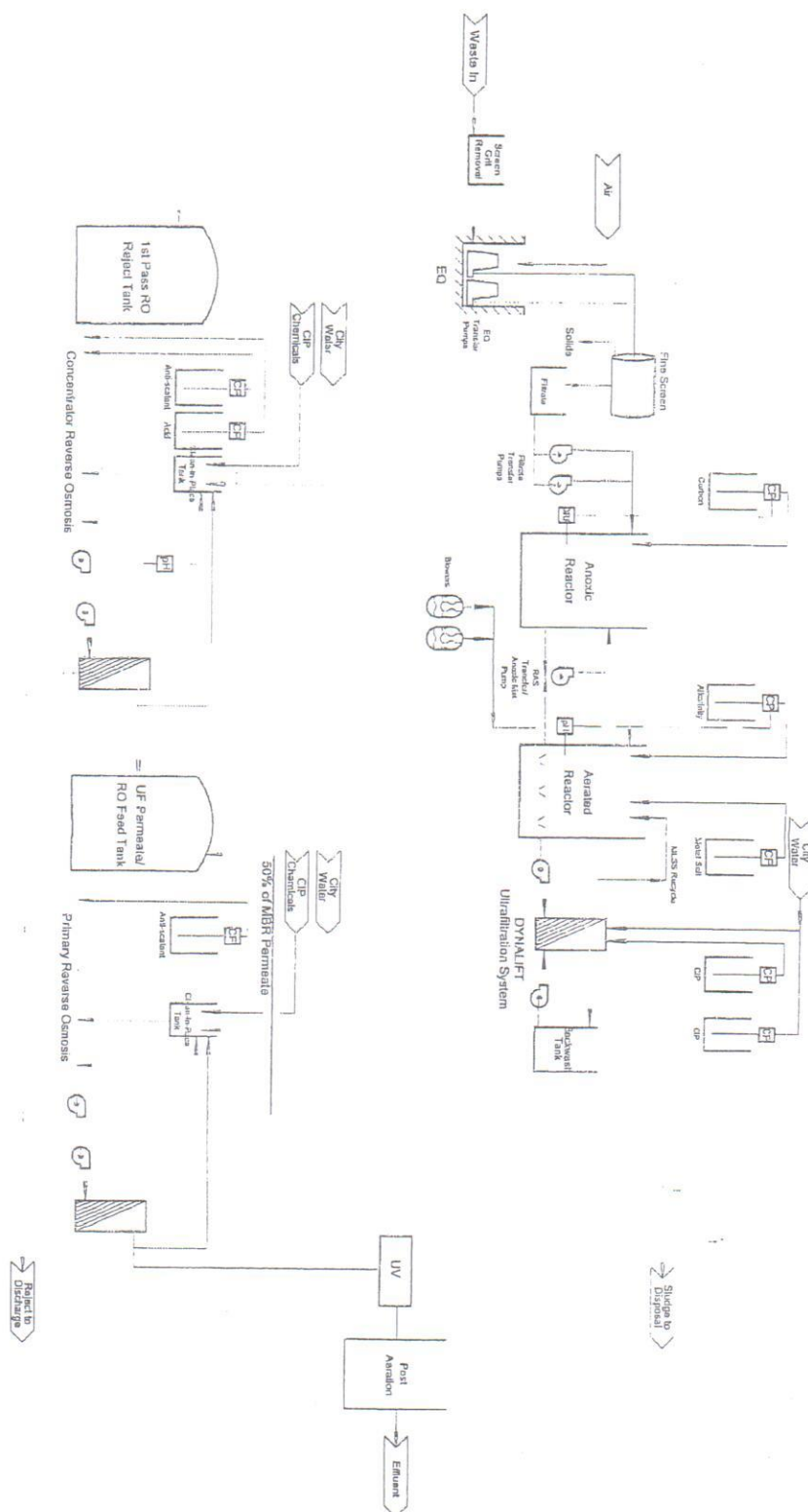
⁽⁷⁾ Residual chlorine can result from the chlorination-dechlorination process and can be toxic to fish. The field measured residual chlorine is less than detection. The effluent discharge was set at 0 assuming no CPO in effluent using UV treatment.

⁽⁸⁾ Human health noncarcinogen-uses monthly maximum effluent concentrations for WLA.

⁽⁹⁾ Effluent bis (2 ethyl hexyl phthalate) is known for being difficult to measure because it is used to make plastics and false positives are a problem. The Allentown data was used since no DEHP data was available for Skillman. Allentown data used herein has one high value of 23 ug/L, two other detected values of 3 and 4 ug/L, and the remaining 8 values are less than the detection limit.

⁽¹⁰⁾ Human health carcinogen-uses longterm average which is the average of the available effluent data for WLA.

⁽¹¹⁾ Instream data are below the detection limit of 1 ug/L so use half the detection limit. The Allentown data was used since no methylene chloride data was available for Skillman. Effluent data are also below detection. Therefore violations are an artifact of detection limits.





**Plumsted Township MUA
Operational Cost Estimate**

4/2/14

MBR Wastewater Treatment Facility (300,000 GPD)

Generator Fuel

Pumping station generator fuel costs =	975
1 hr/wk exercise x 52 wks x 4 gal/hr x \$4/gal. =	\$832
3/4 Load - 24 hrs/yr x 7 gal/hr x \$4/gal. =	\$672
Total Cost per Year =	\$2,479

Operator Costs

20 hrs/week x 52 weeks/yr x \$80/hr =	\$83,200
Total Cost per Year =	\$83,200

Laboratory Costs

Monthly influent & effluent samples to outside lab. =	\$1,900
Monthly influent & effluent samples - onsite testing =	\$500
Annual sludge testing =	\$200
Annual effluent volatile organics & heavy metals =	\$1,000
Total Cost per Year =	\$3,600

Chemical Costs

Alum for phosphorus removal - 77 lbs/day x 365 days x \$0.3/lb =	\$8,432
MBR cleaning (sodium hypochlorite)	\$3,506
Alkalinity adjustment - \$5/day x 365 days =	\$1,825
Total Cost per Year =	\$13,763

Sludge Removal & Disposal

(4% solids) 1554 gal/day x 365 days/yr x \$0.2/gal =	\$113,442
Total Cost per Year =	\$113,442

Electrical Costs

MBR System	\$68,800
WWTP	15,979
Pumping station	9,500

Membrane Replacement Costs

MBR	28,800
-----	--------

Odor Control

Activated Carbon - 2,000 lb unit x 2/yr x \$2.5/lb =	\$10,000
Total Cost per Year =	\$10,000

Total Operation Costs = \$339,563 Per Year
Per Month



Plumsted Township MUA
Operational Cost Estimate

4/2/2014

MBR Wastewater Treatment Facility (300,000 GPD)
with Supplemental Reverse Osmosis System

Generator Fuel

Pumping station generator fuel costs.=	975
1 hr/wk exercise x 52 wks x 4 gal/hr x \$4/gal.=	\$832
3/4 Load - 24 hrs/yr x 7 gal/hr x \$4/gal.=	\$672
Total Cost per Year =	\$2,479

Operator Costs

20 hrs/week x 52 weeks/yr x \$80/hr =	\$83,200
Total Cost per Year =	\$83,200

Laboratory Costs

Monthly influent & effluent samples to outside lab. =	\$1,900
Monthly influent & effluent samples - onsite testing =	\$500
Annual sludge testing =	\$200
Annual effluent volatile organics & heavy metals =	\$1,000
Total Cost per Year =	\$3,600

Chemical Costs

Alum for phosphorus removal - 77 lbs/day x 365 days x \$0.3/lb =	\$8,432
RO chemical cleaner (acid and caustic)	\$579
RO anti-scalant	\$2,201
MBR cleaning (sodium hypochlorite)	\$3,506
Alkalinity adjustment - \$5/day x 365 days =	\$1,825
Total Cost per Year =	\$16,543

Sludge Removal & Disposal

(4% solids) 1554 gal/day x 365 days/yr x \$0.2/gal =	\$113,442
Total Cost per Year =	\$113,442

Electrical Costs

MBR System	\$68,800
WWTP	15,979
Reverse Osmosis System	24,339
Pumping station	9,500

Membrane Replacement Costs

MBR, RO, RO concentrator	53,900
--------------------------	--------

RO Reject Water Disposal (100% flow treated)

6000 GPD x 365 x \$0.17/gal	372,300
-----------------------------	---------

Odor Control

Activated Carbon - 2,000 lb unit x 2/yr x \$2.5/lb =	\$10,000
Total Cost per Year =	\$10,000

Total Operation Costs = \$774,082 Per Year
Per Month



Local Data Search

Search State, County, City, Zip Code, or Area Code

[USA.com / New Jersey / Ocean County / New Egypt / 08532 / Census Tract 718000 / Block Group 718000-2](#)

Block Group 718000-2

Basic Information

Population and Races

Income and Careers

Housing

Census Tract 718000

New Egypt, NJ

Ocean County

New Jersey State

New York, Northern New Jersey, Long Island Area

Census Block Group 718000-2 in Ocean County, New Jersey

Basic Information Population and Races Income and Careers Housing

Population	870 (2010), see rank
House Units	364, see rank
Race	Whites: 90.3% Hispanics: 8.9% Blacks: 3% Asians: 0.2% Others: 6.4%
Population Density:	1,548.10/sq mi, see rank
Median Household Income:	\$56,528, see rank
Median House Price:	\$227,100, see rank
Time Zone:	Eastern GMT -5:00 with Daylight Saving in the Summer
Land Area:	0.56 sq mi, see rank
Water Area:	0.00 sq mi (0.00%), see rank
State:	New Jersey
Area:	New York-Northern New Jersey-Long Island, NY-NJ-PA
County:	Ocean County
City:	New Egypt
Census Tract:	718000
School District:	Plumsted Township School District

Hot Rankings

[The Richest Block Group Nearby](#)
[House Price Ranking Nearby](#)
[Population Ranking Nearby](#)
[Fastest / Slowest Growing Cities in NJ](#)
[High / Low NJ Cities by Males Employed](#)
[High / Low NJ Cities by Females Employed](#)
[Best / Worst Cities by Crime Rate in NJ](#)
[Richest / Poorest Cities by Income in NJ](#)
[Expensive / Cheapest Homes by City in NJ](#)
[Most / Least Educated Cities in NJ](#)

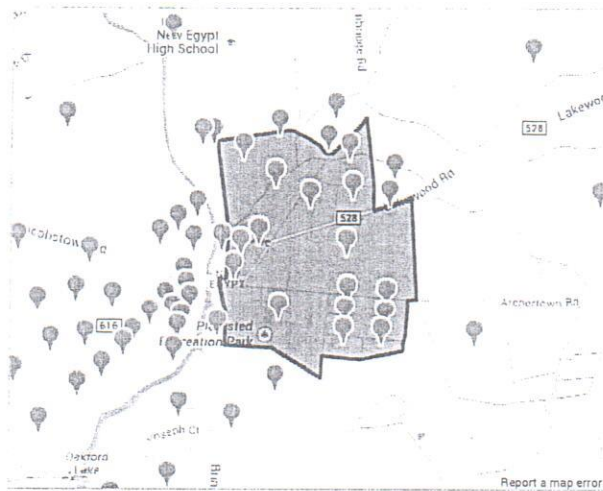
Search for Census Records

[myheritage.com/Census_Records](#)

Super Search: Your 1-stop shop for finding census records online

Block Group 718000-2 Map, Border, and Nearby Locations

Census Blocks Map View. Full data. Click icon to show name.



Show More Locations on the Map

[Census Blocks*](#)
[Census Block Groups*](#)
[Census Tracts*](#)
[Zip Codes](#)
[School Districts](#)
[Cities](#)
[Counties](#)
[Metro Areas](#)
[States](#)

* Census Blocks, Census Block Groups, and Census Tracts are geo areas that are normally smaller than the size of a city. Census Blocks provide block and community level information. They are great for understanding areas within a city.

Block Group 718000-2 Blocks

NJ0297180002000 New Egypt	NJ0297180002001 New Egypt	NJ0297180002002 New Egypt
NJ0297180002003 New Egypt	NJ0297180002004 New Egypt	NJ0297180002005 New Egypt
NJ0297180002006 New Egypt	NJ0297180002007 New Egypt	NJ0297180002008 New Egypt
NJ0297180002009 New Egypt	NJ0297180002010 New Egypt	NJ0297180002011 New Egypt
NJ0297180002012 New Egypt	NJ0297180002013 New Egypt	NJ0297180002014 New Egypt
NJ0297180002015 New Egypt	NJ0297180002016 New Egypt	NJ0297180002017 New Egypt
NJ0297180002018 New Egypt		

*A census block group is a geographic area defined by the United States Census Bureau and used for the census. On average, a census block group has around 1,500 residents. Census block groups, as well as census tracts, are more uniformly distributed in terms of the number of residents than cities or zip codes. Also, the census block group and the census tract demographic data are nearly 100% complete vs. less than 70% coverage of demographic data for cities and zip codes. Therefore census block groups and the census tracts are an excellent way to understand locations in a smaller scale, for example understanding the different areas of a large city. Census block groups are smaller than census tracts and can be further divided into census blocks for understanding locations at the block and community level.

Move to Paulsboro NJ

[postlets.com](#)

Nice Remodel Only \$129k! 3BR 1Bath Stainless Steel, Finished Basement



Local Data Search

Search State, County, City, Zip Code, or Area Code

[USA.com / New Jersey / Ocean County / New Egypt / 08533 / Census Tract 718000 / Block Group 718000-1](#)

Block Group 718000-1

Basic Information

Population and Races

Income and Careers

Housing

Census Tract 718000

New Egypt, NJ

Ocean County

New Jersey State

New York, Northern New Jersey, Long Island Area

Census Block Group 718000-1 in Ocean County, New Jersey

Basic Information	Population and Races	Income and Careers	Housing
Population	1,308 (2010), see rank		
House Units	494, see rank		
Race	Whites: 90.6%, Hispanics: 12.6%, Blacks: 1.8%, Asians: 1.5%, Others: 6.1%		
Population Density:	730.90/sq mi, see rank		
Median Household Income:	\$64,707, see rank		
Median House Price:	\$290,800, see rank		
Time Zone:	Eastern GMT -5:00 with Daylight Saving in the Summer		
Land Area:	1.75 sq mi, see rank		
Water Area:	0.04 sq mi (2.13%), see rank		
State:	New Jersey		
Area:	New York-Northern New Jersey-Long Island, NY-NJ-PA		
County:	Ocean County		
City:	New Egypt		
Census Tract:	718000		
School District:	Plumsted Township School District		

Hot Rankings

[The Richest Block Group Nearby](#)[House Price Ranking Nearby](#)[Population Ranking Nearby](#)[Fastest / Slowest Growing Cities in NJ](#)[High / Low NJ Cities by Males Employed](#)[High / Low NJ Cities by Females Employed](#)[Best / Worst Cities by Crime Rate in NJ](#)[Richest / Poorest Cities by Income in NJ](#)[Expensive / Cheapest Homes by City in NJ](#)[Most / Least Educated Cities in NJ](#)

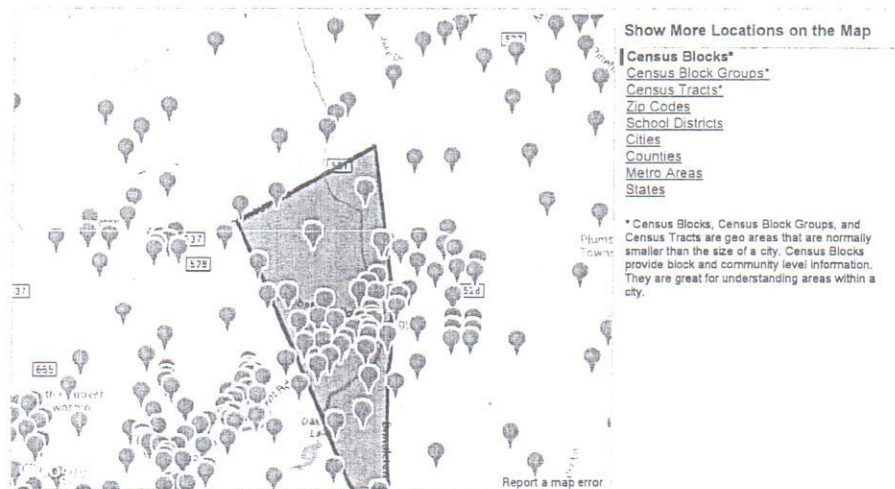
Discover Your Heritage

[myheritage.com/research](#)

Search Billions of Online Records. Top Research Tools. 7-Day Trial.

Block Group 718000-1 Map, Border, and Nearby Locations

Census Blocks Map View. Full data. Click icon to show name.



Block Group 718000-1 Blocks

NJ0297180001000 New Egypt	NJ0297180001001 New Egypt	NJ0297180001002 New Egypt
NJ0297180001005 New Egypt	NJ0297180001006 New Egypt	NJ0297180001007 New Egypt
NJ0297180001008 New Egypt	NJ0297180001010 New Egypt	NJ0297180001011 New Egypt
NJ0297180001012 New Egypt	NJ0297180001013 New Egypt	NJ0297180001014 New Egypt
NJ0297180001015 New Egypt	NJ0297180001016 New Egypt	NJ0297180001017 New Egypt
NJ0297180001018 New Egypt	NJ0297180001019 New Egypt	NJ0297180001020 New Egypt
NJ0297180001021 New Egypt	NJ0297180001022 New Egypt	NJ0297180001023 New Egypt
NJ0297180001024 New Egypt	NJ0297180001025 New Egypt	NJ0297180001026 New Egypt
NJ0297180001027 New Egypt	NJ0297180001028 New Egypt	NJ0297180001029 New Egypt
NJ0297180001030 New Egypt	NJ0297180001031 New Egypt	NJ0297180001032 New Egypt
NJ0297180001034 New Egypt	NJ0297180001036 New Egypt	NJ0297180001037 New Egypt
NJ0297180001038 New Egypt	NJ0297180001040 New Egypt	

*A census block group is a geographic area defined by the United States Census Bureau and used for the census. On average, a census block group has around 1,500 residents. Census block groups, as well as census tracts, are more uniformly distributed in terms of the number of residents than cities or zip codes. Also, the census block group and the census tract demographic data are nearly 100% complete vs. less than 70% coverage of demographic data for cities and zip codes. Therefore census block groups and the census tracts are an excellent way to understand locations in a smaller scale, for example understanding the different areas of a large city. Census block groups are smaller than census tracts and can be further divided into census blocks for understanding locations at the block and community level.

The Source

UTILITY ENTERPRISE MANAGEMENT

AE2S NEXUS
The Financial Link

November 2010

Other Articles in this Issue:

[Federal Government
Funded at FY2010 Level
through December 3rd](#)

[Hidden Risks](#)

Subscribe to
The Source

Email:

Links:

[The Source Home Page](#)

[Previous Issues of The
Source](#)

[Construction Cost Trends](#)

[AE2S Nexus](#)

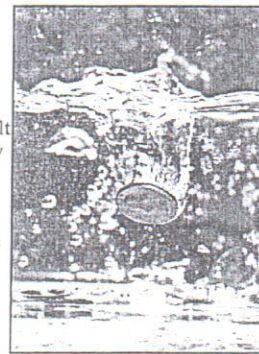
[AE2S](#)

Assessing Affordability



By [Miranda Kleven](#)

Water is a basic human need. As a result, the cost of an average level of residential water service cannot be fairly compared to the cost of non-essential items such as cable TV, soda pop, and other discretionary items when determining whether the cost is "affordable". Affordability means different things to different communities and varies from one user class to the next within each community. It is entirely subjective and wholly difficult to define. However, affordability is important to utility managers and policy makers, and it is useful to have some index by which to measure and quantify "affordability" when making decisions such as ability to fund a project or as justification when applying for funding assistance. In this article, we will discuss the Environmental Protection Agency's (EPA's) use of affordability indices and other common industry rules of thumb that can be used to generally gauge affordability.



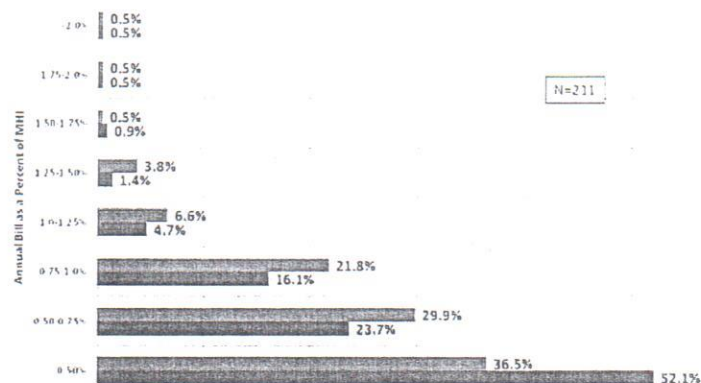
EPA's "Affordability" Criterion

When the 1996 Safe Drinking Water Act was developed, the EPA established affordability criteria for water and wastewater treatment systems. These indices, although subjective, were developed as a means by which to determine whether treatment techniques to be installed to meet regulatory requirements would place an undue burden on users, therefore becoming "unaffordable" and justifying the implementation of point-of-use devices. For water and wastewater, EPA established a four (4.0) percent benchmark of affordability, measured as total annual water and sewer bill divided by median household income (MHI) for the service area. The four percent benchmark translates to levels of two (2.0) percent each for the individual water bill and individual wastewater bill. In a sense, this is an indication of "worst case scenario", under which a utility would be compelled to consider foregoing treatment plant improvements because they are cost prohibitive.

It is important to understand the proper application of the four percent benchmark. The measure is based on a comparison of water and wastewater system revenues to MHI in the utility's services area, not on individual household income. EPA has noted that it is not accurate to interpret the affordability benchmark as a cap for each household. It is not EPA's intent to give the idea that any individual household should not pay more than four percent of its income for water and wastewater services, as all households will not use the same amount of water and will not have the same household income.

Given this guideline, we were interested in a general assessment of how annual water and wastewater bills in our region measured against the MHI. Based on information obtained from the 2010 AE2S North Central Region Utility Rate Survey, the graphic below was developed to illustrate the spread of total water and wastewater bills as a percentage of MHI. Based on precedent set by the Census Bureau to estimate annual MHI, the 2000 MHI was adjusted to 2009 based on the Consumer Price Index - Research Series from December 1999 to December 2009.

Comparison of Residential Water and Sewer Bill as Percent of Median Household Income (MHI)





The graphic above indicates that for 211 communities from across Minnesota, Montana, North Dakota, South Dakota, and Wyoming the majority of average residential water and wastewater bills equate to less than 0.75 percent of the MHI for water and 0.5 percent of the MHI for wastewater. The highest values reported as a percent of MHI were 2.03 percent for a water bill and 2.09 percent for a wastewater bill. Again, it should be stressed that affordability is a subjective term. EPA's four percent benchmark for affordability when considering treatment techniques to meet regulatory requirements may not be appropriate when reviewing water rates for general affordability. As such, the graphic above does not necessarily indicate that the majority of water and wastewater rates in the north central region are "affordable".

Industry Rules of Thumb

In addition to EPA's subjective guidelines, there are general rules of thumb found in the literature. Values in the literature tend to be more conservative, generally indicating that the average residential water or wastewater bill should ideally not exceed 0.75 percent of the MHI or 1.5 percent of the MHI for combined water and sewer bills. Using this index, we can surmise from the graphic above that there are likely many systems in our region facing the challenge of maintaining affordable water and wastewater rates.

Conclusion

In summary, affordable water and wastewater rates are extremely important to systems throughout our region. Unfortunately, affordability is not easily measured and varies from one community to the next. While there are general indices by which affordability can be gauged, they should be used with care and with consideration of other factors such as general financial management indicators, system debt, and socioeconomic conditions. Some efforts that can be undertaken to mitigate affordability concerns include reviewing your rate structure for potential modifications, such as "lifeline" rates, offering payment flexibility, or implementing a customer assistance program.

Sources:

2006-2008 American Community Survey, 3-Year Estimates, US Census Bureau <http://factfinder.census.gov/>

"Future Investment in Drinking Water and Wastewater Infrastructure", November 2002. Office of the United States Congress, Congressional Budget Office.

"Water Rates Affordability and Affordability Programs", Environmental Finance Center, www.efc.unc.edu.

U.S. Census Bureau, Current Population Survey, Annual Social and Economic Supplements.
<http://www.census.gov/hhes/www/income/index.html>.

If you have any questions concerning the content of this newsletter, please contact Heather Syverson at 701-364-9111 or Heather.Syverson@ae2s.com.
Copyright © 2010