## EXHIBIT R

## FAIR MARKET VALUE APPRAISAL AUS CONSULTANTS

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April 7, 2021
Mr. Kurt Ferguson
Township Manager
Lower Makefield Township
1100 Edgewood Road
Yardley, PA 19067

RE: UVE Market Value Appraisal of Lower Makefield Township's, PA Wastewater Collection System and Purchased Treatment Capacity

Enclosed is AUS Consultants' fair market value appraisal report for Lower Makefield Township's wastewater collection system and purchased treatment capacity (System) as of September 5, 2020 prepared for Lower Makefield Township. The report was prepared based on the 20202021 Uniform Standards of Professional Practices (USPAP) and is intended to meet the criteria established with Title 66 (Public Utilities) of the Pennsylvania Consolidated Statues (PA CS) Paragraph 1329 "Valuation of acquired water and wastewater systems", collectively referred to as Act 12 of the 2016 Pennsylvania legislative session (Act 12). The intended users of this appraisal are Lower Makefield Township, PA, Aqua Pennsylvania Wastewater Inc., and the Pennsylvania Public Utility Commission.

Based on our appraisal the Fair Market Value of Lower Makefield Township's wastewater collection system's property, plant, and equipment and purchased treatment capacity operating as a Pennsylvania rate regulated wastewater utility is $\$ 54,430,591$ determined based on the cost, income, and market approaches to value, as detailed in the following table:

## Lower Makefield Township <br> Bucks County PA <br> Wastewater Collection System and Purchased Treatment Capacity <br> Investor-Owned Utility <br> As of September 17, 2020 <br> Fair Market Value Appraisal

| Appraisal Approach | Investor-owned <br> Utility | Weight | Wtd Valuation <br> Indications |
| :--- | :---: | :---: | :---: |


| Cost Approach |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- |
|  |  |  |  |  |
|  |  |  |  |  |
| Inventory of Assets |  |  |  |  |
| Original Cost (\$OC) | $32,003,924$ |  |  |  |
| Depreciated Original Cost (\$OCLD) | $20,644,920$ |  |  |  |
| Replacement Cost | $96,986,192$ |  |  |  |
| Replacement Cost New (COR) | $\mathbf{5 1 , 4 1 4 , 5 5 5}$ |  |  |  |
| Depreciated Replacement Cost New (CORLD) | $\$$ | $\mathbf{5 1 , 4 1 4 , 5 5 5}$ | $\mathbf{5 0 \%}$ | $\mathbf{2 5 , 7 0 7 , 2 7 8}$ |
| Cost Approach Conclusion |  |  |  |  |

$\left.\begin{array}{|llll|}\hline \text { Income Approach } & & \\ \text { Required Rate Increases: 22\% period 3, 15\% }\end{array}\right)$

| Market Approach |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- |
| Market Comparables (to) | $36,541,509$ |  |  |  |
| OCLD | $43,188,226$ |  |  |  |
| CORLD | $55,755,000$ |  |  |  |
| Customers | $59,838,915$ |  |  |  |
| Cash Flows (EBITDA) | $55,741,285$ |  | $\mathbf{5 , 5 7 4 , 1 2 9}$ |  |
| Market Financials (to) |  | $\mathbf{5 5 , 7 4 1 , 2 8 5}$ | $\mathbf{1 0 \%}$ |  |
| OCLD |  |  | $\mathbf{5 4 , 4 3 0 , 5 9 1}$ |  |

AUS CONSULTANTS

As the purpose of this appraisal was to fulfill the requirements of Act 12 in the establishment of value for rate making of the Lower Makefield Township's wastewater collection system's property, plant and equipment the appraisal's conclusion of $\$ 54,430,591$ is consistent with the purpose of this appraisal. As the cost approach work papers detail our value conclusion by National Association of Regulatory Utility Commissioners' (NARUC) Uniform System of Accounts (USOA) for the wastewater industry account classifications and the installation year of the property this detail can be used to allocate the appraisal conclusion to establish the booked value for future accounting and rate making.

Respectfully Submitted, AUS Consultants, Depreciation \& Valuation April 7, 2021
$B y$ :

| Germe CWeinest | $--\rightarrow-=\square=\square$ |
| :---: | :---: |
| Jerome C. Weinert, ASA, P.E., CDP <br> Principal and Director | David A. Sheffer Principal |
| $\text { uctry. v } \operatorname{com}$ | stratuof |
| Michael J. Diedrich, ASA, P.E., CDP <br> Certified General Appraiser Principal | Elizabeth A. Weinert Associate |

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P.E.: Registered Professional Engineer State of Wisconsin

CDP: Certified Depreciation Professions in the Society of Depreciation Professionals

# Lower Makefield Township's (Pennsylvania) Wastewater Collection System and Purchased Treatment Capacity 

Fair Market Value Appraisal Report As of September 17, 2020<br>for<br>Lower Makefield Township, PA

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Lower Makefield, PA
Yardley, Pennsylvania

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RE: UVE Market Value Appraisal of Lower Makefield Township's Wastewater Collection System and Purchased Treatment Capacity

Enclosed is AUS Consultants' fair market value appraisal report of the Lower Makefield Township's (Pennsylvania) wastewater collection system and Purchased Treatment Capacity (System) as of September 17, 2020 prepared for our client Lower Makefield Township, Pennsylvania. The report was prepared based on the 2020-2021 Uniform Standards of Professional Practices (USPAP) and is intended to meet the criteria established with Title 66 (Public Utilities) of the Pennsylvania Consolidated (PA CS) Statues Section 1329 "Valuation of acquired water and wastewater systems", collectively referred to as Act 12 of the 2016 Pennsylvania legislative session (Act 12). The intended users of this appraisal are Lower Makefield Township, Pennsylvania, Aqua Pennsylvania Wastewater, Inc., and the Pennsylvania Public Utility Commission.

Based on our appraisal, the Fair Market Value of the Lower Makefield Township's (Pennsylvania) wastewater collection system's property, plant, and equipment operating as Pennsylvania rate regulated wastewater utility is $\$ 54,430,591$ determined based on the cost, income, and market approaches to value, as detailed in the following table:

## Lower Makefield Township <br> Bucks County PA <br> Wastewater Collection System and Purchased Treatment Capacity <br> Investor-Owned Utility <br> As of September 17, 2020 <br> Fair Market Value Appraisal

| Appraisal Approach | Investor-owned |  |  | Wtd Valuation Indications |
| :---: | :---: | :---: | :---: | :---: |
| Cost Approach |  |  |  |  |
| Inventory of Assets |  |  |  |  |
| Original Cost (\$OC) |  | 32,00 |  |  |
| Depreciated Original Cost (\$OCLD) |  | 20,64 |  |  |
| Replacement Cost |  |  |  |  |
| Replacement Cost New (COR) |  | 96,98 |  |  |
| Depreciated Replacement Cost New (CORLD) | \$ | 51,41 |  |  |
| Cost Approach Conclusion |  | 51,41 | 50\% | 25,707,27 |


| Income Approach |  |  |  |
| :--- | :--- | :--- | :--- |
|  |  |  |  |
| Required Rate Increases: 22\% period 3, 15\% |  |  |  |
| period 6, 10\% period 9, and 6\% every 3rd year |  |  |  |
| beginning in period 12 (Input 6) | 57,872,959 |  |  |
|  |  |  |  |
| Income Approach Conclusion | $\mathbf{5 7 , 8 7 2 , 9 5 9}$ | $\mathbf{4 0 \%}$ | $\mathbf{2 3 , 1 4 9 , 1 8 4}$ |


| Market Approach |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: |
| Market Comparables (to) |  |  |  |  |
| OCLD |  | 36,541,509 |  |  |
| CORLD |  | 43,188,226 |  |  |
| Customers |  | 55,755,000 |  |  |
| Cash Flows (EBITDA) |  | 59,838,915 |  |  |
| Market Financials (to) |  |  |  |  |
| OCLD |  | 55,741,285 |  |  |
| Market Approach Conclusion |  | 55,741,285 | 10\% | 5,574,129 |
| Appraisal Conclusion | \$ | 54,430,591 | 100\% | 54,430,591 |

As the purpose of this appraisal was to fulfill the requirements of Section 1329 of the PA CS in the establishment of value for rate making of the Lower Makefield Township's wastewater collection system's property, plant and equipment this appraisal's conclusion of $\$ 54,430,591$ is consistent with the purpose of the appraisal. As the cost approach work papers detail our value conclusion by National Association of Regulatory Utility Commissioners' (NARUC) Uniform System of Accounts (USOA) for the wastewater industry account classifications and the installation year of the property, this detail can be used to allocate the appraisal conclusion to establish the booked value for future accounting and rate making.

Respectfully Submitted,
AUS Consultants, Depreciation \& Valuation
April 7, 2021
$B y:$


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APPRAISAL CERTIFICATION<br>for the Fair Market Appraisal of<br>The Lower Makefield Township Pennsylvania's<br>Wastewater Collection System<br>As of September 17, 2020<br>Prepared for<br>Pennsylvania American Water Company

AUS Consultants, Depreciation \& Valuation, certifies that, to the best of its knowledge and belief:

- The statements of fact contained in this report are true and correct.
- Prior to this appraisal during the last three-year period, AUS Consultants has not previously appraised these properties.
- The reported analyses, opinions, and conclusions are limited only by the reported assumptions and limiting conditions, and are our personal, impartial, and unbiased professional analyses, opinions, and conclusions.
- Neither AUS Consultants, Depreciation \& Valuation, nor its professional staff has no present or prospective interest in the property that is the subject of this report and has no personal interest with respect to the parties involved.
- Neither AUS Consultants, Depreciation \& Valuation, nor its professional staff has any bias with respect to the property that is the subject of this report or to the parties involved.
- Our compensation for completing this assignment is not contingent upon the development or reporting of a predetermined value or direction in value that favors the cause of the client, the amount of the value opinion, the attainment of a stipulated result, or the occurrence of a subsequent event directly related to the intended use of this appraisal.
- Our analyses, opinions, and conclusions were developed, and this report has been prepared, in conformity with the Uniform Standards of Professional Appraisal Practice 2020-2021 Edition.
- $\quad$ The signers of this report has not made personal inspections of the property that is the subject of this report.
- $\quad$ No individuals provided significant professional assistance to the persons signing this report. However, Scott Sherer of PFM Financial Advisors, LLC provided assistance in obtaining information and data from the Lower Makefield Township's data room and the Engineer's Assessment report prepared by Ebert Engineering, Inc. which was the inventory starting point of the Cost Approach.

AUS Consultants, Depreciation \& Valuation
April 7, 2021
$B y$ :

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| :--- | :--- |
| Jerome C. Weinert, ASA, <br> P.E., CDP <br> Principal and Director | David A. Sheffer <br> Principal |
| UlU/, Yin |  |
| Michael J. Diedrich, ASA, <br> P.E., CDP <br> Certified General Appraiser <br> Principal | Elizabeth A. Weinert <br> Associate |

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## NARRATIVE REPORT

## EXECUTIVE SUMMARY

The purpose of this value appraisal is the determination of the fair market value of the property plant and equipment of the Lower Makefield Township's wastewater collection system and purchased treatment capacity (System) for our client Lower Makefield Township, Pennsylvania. The report was prepared based on the 2020-2021 Uniform Standards of Professional Practices (USPAP) and is intended to meet the criteria established with Title 66 (Public Utilities) of the Pennsylvania Consolidated Statues Paragraph 1329: "Valuation of acquired water and wastewater systems", collectively referred to as Act 12 of the 2016 Pennsylvania legislative session (Act 12) and the Pennsylvania Public Utility Commission's Final Implementation Order M-2016-2543193 adopted October 27, 2016. The intended users of this appraisal are Lower Makefield Township, Pennsylvania, Aqua Pennsylvania Wastewater, Inc., and the Pennsylvania Public Utility Commission (PA PUC).

The value established in this appraisal was based on the definition of Market Value as:
> "The most probable price, as of a specified date, in cash, or in terms equivalent to cash, or in other precisely revealed terms, for which the specified property rights should sell after reasonable exposure in a competitive market under all conditions requisite to a fair sale, with the buyer and seller each acting prudently, knowledgeably, and for selfinterest, and assuming that neither is under undue duress." The Appraisal of Real Estate, $14^{\text {th }}$ Edition, page 58.

In arriving at our opinion of value of the System's property, plant, and equipment as it is operated as an investor-owned Pennsylvania PUC rate regulated wastewater utility the cost, income, and market approaches to value were considered. Detailed explanations of each approach to value are included below in the section "Appraisal Procedures and Results". The following summarizes the data, analysis and conclusions of each of those valuation approaches.

Cost Approach - The philosophy in the cost approach to value is that the maximum value of a property's tangible assets is established by the cost to acquire or build a similar property. In this appraisal, the cost approach to value was analyzed using reproduction/replacement cost approach.

Reproduction cost and replacement cost are defined as:

Reproduction cost - "Reproduction cost is the estimated cost to construct, as of the effective appraisal date, an exact duplicate or replica of the building [property] being appraised, insofar as possible, using the same materials, construction standards, design, layout, and quality of workmanship and embodying all the deficiencies, super-adequacies, and obsolescence of the subject improvements [property]."

Replacement cost - "Replacement cost is the estimated cost to construct, as of the effective appraisal date, a substitute for the building [property] being appraised using contemporary materials, standards, design and layout. When this cost basis is used, some existing obsolescence in the property may be cured. Replacement cost may be the only alternative if reproduction cost cannot be estimated" ${ }^{2}$

In the wastewater industry the property's reproduction costs and replacement costs are quite similar; therefore, the property's cost new was determined based on its replacement cost new estimated by the trended original cost and the inventory-unit cost methods.

The trended original cost method was utilized in preparing the replacement cost new. "Trending is a method of estimating a property's replacement cost new in which an index or trend factor is applied to the property's historical costs to convert the known historical costs into an indication of current (appraisal date) costs. Simply put, trending reflects the movement of price over time."3 In the trended original cost method, Lower Makefield Township's investment in wastewater collection plant and equipment and purchased capacity is restated to costs reflective of the appraisal date, by the application of cost trends to the property's original investment. AUS Consultants utilized the Engineer's Assessment performed by Ebert Engineering, Inc. (Engineer's Assessment tab) as the starting point of the Cost Approach. Utilizing the Engineer's Assessment AUS Consultants developed the System's original cost less depreciation (OCLD) and replacement cost new less depreciation (CORLD) in property, plant and equipment at September 17, 2020 (Cost Approach tab).

[^0]The cost trends were applied to each of the System's various investment categories (NARUC plant accounts) by original year of placement for that investment. The cost indexes used in these studies were the Handy-Whitman Index of Public Utility Construction Costs for the water industry in the northeastern region of the United States which includes the Commonwealth of Pennsylvania, the AUS General Plant Indexes, and various United States Bureau of Labor Statistics (US BLS) indexes as detailed in the following table:

```
Lower Makefield Township
Bucks County PA
Wastewater Collection System and Purchased Treatment Capacity
Investor-Owned Utility
September 17, 2020
```

Summary of Account Costing and Depreciation Parameters Used in the Depreciation Original Cost and the Depreciated Replacement Cost New Studies


Using the trended original cost method, the System's investment in plant, property and equipment of $\$ 32,003,924$ was determined to have a reproduction cost new of $\$ 96,986,192$ as summarized in the following table:

Lower Makefield Township
Bucks County PA
Wastewater Collection System and Purchased Treatment Capacity
Investor-Owned Utility
As of September 17, 2020
Replacement Cost New (RCN)

\begin{tabular}{|c|c|c|c|c|c|c|c|c|}
\hline (1)
Account \& (2)

Account \& (3) \& \begin{tabular}{c}
(9) <br>
Original Cost <br>
\hline

 \& 

(10) <br>
Costing Parameter
\end{tabular} \& (13) \& (14) Reproduction

Cost New (RCN) \& \begin{tabular}{l}
(15) <br>
Reproduction Cost New (RCN) to Replacement Cost New (COR)

 \& 

(16) <br>
Replacement Cost New (COR)
\end{tabular} <br>

\hline \& \& \& OC \$s \& \& \& RCN \$s \& COR \$s/RCN \$ \& COR \$s <br>
\hline Input \& Input \& Input \& Input \& Input \& Calculation \& Calculation \& Input \& Calculation <br>
\hline Eng Assmnt \& AUS Input \& Lower Makefield Township Asset Detail \& Eng Assmnt \& AUS Input \& \& \& AUS Input \& Col (14) * (15) <br>
\hline NARUC Code \& NARUC Code \& Asset Description \& Original Cost \& Cost Index Table \& Translator \& RCN \& COR/RCN
Factor \& COR <br>
\hline 353.20 \& 353.20 \& Land \& Land Rights \& 646 \& USBLS3 \& 728.00 \& 470,288 \& 1.00 \& 470,288 <br>
\hline 354.20 \& 354.20 \& Stuctures \& Improvements - Pumping \& 2,213,537 \& HWW-115 \& 3.32 \& 7,357,560 \& 1.00 \& 7,357,560 <br>
\hline 354.40 \& 354.40 \& Stuctures \& Improvements - Treatment \& 2,186,739 \& HWW-115 \& 5.68 \& 12,413,422 \& 1.00 \& 12,413,422 <br>
\hline 355.20 \& 355.20 \& Generating Equipment - Pumping \& 292,282 \& USBLS4 \& 2.23 \& 650,289 \& 1.00 \& 650,289 <br>
\hline 361.70 \& 361.70 \& Pump StationPower Protection \& Control Devices \& 506,720 \& USBLS4 \& 1.96 \& 992,809 \& 1.00 \& 992,809 <br>
\hline 361.70 \& 361.70 \& Collection Sewers - Low Pressure \& 354,373 \& HWW-144 \& 1.10 \& 390,125 \& 1.00 \& 390,125 <br>
\hline 361.70 \& 361.70 \& Collection Sewers - Force - Mains \& 837,436 \& HWW-144 \& 2.79 \& 2,333,228 \& 1.00 \& 2,333,228 <br>
\hline 361.70 \& 361.70 \& Collection Sewers - Gravity - Mains \& 22,142,441 \& HWW-144 \& 2.74 \& 60,742,852 \& 1.00 \& 60,742,852 <br>
\hline 361.70 \& 361.70 \& Service Laterals \& 2,286,077 \& HWW-139 \& 3.04 \& 6,940,400 \& 1.00 \& 6,940,400 <br>
\hline 361.70 \& 361.70 \& Flow Measuring Devices \& 308,281 \& HWW-140 \& 2.99 \& 921,966 \& 1.00 \& 921,966 <br>
\hline 361.70 \& 361.70 \& Pumping Equipment \& 875,393 \& HWW-19 \& 4.31 \& 3,773,253 \& 1.00 \& 3,773,253 <br>
\hline \& \& Total Borough of Brentwood Wastewater Utility \& 32,003,924 \& \& \& 96,986,192 \& \& 96,986,192 <br>
\hline Grand \& Grand \& \& \& \& \& \& \& <br>
\hline Total \& Total \& Grand Total \& 32,003,924 \& \& 3.03 \& 96,986,192 \& 1.00 \& 96,986,192 <br>
\hline
\end{tabular}

The replacement cost new of the Land and Land Rights easements and small parcels was determined based on the following:

| Replacement Cost of Easements |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: |
| Activity | Engineer Hours | Legal <br> Hours | Fees <br> Hours |  |
|  |  |  |  |  |
| Determine the facilities for which a |  |  |  |  |
| Easment is need | 1 | 0 | 0 |  |
| Locate the Land owner for the property needing a easement | 1 | 0 | 0 |  |
| Develop a diagram of the Property, the |  |  |  |  |
| facilities, and the easement | 1 | 0 | 0 |  |
| Develop the easement document | 1 | 0.5 | 0 |  |
| Visit the property owner to obtain permission for the easement and sign the |  |  |  |  |
| easment documentation | 3 | 0 | 0 |  |
| Register the easement with the Municipal |  |  |  |  |
| Clerk | 0 | 0.5 | 250 |  |
| Total | 7 | 1 | 250 |  |
| Labor Costs per Hour | \$ 54 | \$ 100 |  |  |
|  |  |  |  | Total Cost |
| Total Cost | 378 | 100 | 250 | 728 |

Replacement Cost New Less Depreciation - The replacement cost described above reflects the cost of new property; however, Lower Makefield Township's wastewater collection system property is not new and has experienced normal depreciation and
potentially functional and/or economic obsolescence. These various forms of depreciation are defined as follows:

Normal depreciation/deterioration, akin to physical deterioration, is "loss in value caused by wear, tear, age and use."4

Functional obsolescence is "the loss in value or usefulness of a property caused by inefficiencies or inadequacies of the property itself, when compared to a more efficient of less costly replacement property that new technology has developed."5

Economic, or external, obsolescence is defined as "a loss in value caused by factors outside a property ${ }^{16}$ and is most often indicated by insufficient earning.

Based on our experience in regard to water and wastewater depreciation studies and our analysis of Lower Makefield Township's wastewater collection system operating performance; we found that the Lower Makefield Township's wastewater utility's property experiences normal depreciation but not any significant functional obsolescence; economic obsolescence is best evaluated after the results of the income and market approaches to values are determined (see Cost Approach Revisited).

The service lives used in the depreciation and functional obsolescence calculations were developed based on the property and its use, AUS Consultants' experience in developing depreciation studies for the water and wastewater industries and depreciation studies filed with PAWC and Aqua America rate cases. With each of their recent rate case filings PAWC and Aqua America have filed depreciation studies in support of their depreciation service lives and associated depreciation expenses contained within their revenue requirements. The depreciation studies were prepared by Gannett Fleming Rate Consultants a recognized firm in the depreciation consulting area.

[^1]AUS Consultants has reviewed the PAWC studies which are summarized in the following table:
Lower Makefield Township
Bucks County PA
Wastewater Collection System and Purchased Treatment Capacity
Investor-Owned Utility
September 17, 2020

Summary of Account Costing and Depreciation Parameters Used in the Depreciation Original Cost and the Depreciated Replacement Cost New
Studies Studies
(1) (2)
Account
Number

353.20 Land \& Land Rights
354.20 Stuctures \& Improvements - Pumping
354.40 Stuctures \& Improvements - Treatment
355.20 Generating Equipment - Pumping
356.20 Pump StationPower Protection \& Control Devices
359.20 Collection Sewers - Low Pressure
360.20 Collection Sewers - Force - Mains
361.20 Collection Sewers - Gravity - Mains
363.20 Service Laterals
363.21 Flow Measuring Devices
371.20 Pumping Equipment

| (4) |  | (5) | (6) |  |
| :---: | :---: | :---: | :---: | :---: |
| (4a) | (4b) |  | (6a) | (6b) |
| Iowa Survivor | Normal |  |  |  |
| / Retirement | Service | Economic | Tax |  |
| Curve | Life | Obsolescence | Depreciation |  |
|  | years | \% of CORLD | Table | Life |
| ZNonDep | 0.00 | 0.00\% | Non-Depr | 0.00 |
| R3.0 | 65.00 | 0.00\% | MACRS | 25.00 |
| R3.0 | 65.00 | 0.00\% | MACRS | 25.00 |
| R3.0 | 35.00 | 0.00\% | MACRS | 25.00 |
| R3.0 | 35.00 | 0.00\% | MACRS | 25.00 |
| R2.5 | 80.00 | 0.00\% | MACRS | 25.00 |
| R3.0 | 75.00 | 0.00\% | MACRS | 25.00 |
| R2.5 | 80.00 | 0.00\% | MACRS | 25.00 |
| R3.0 | 70.00 | 0.00\% | MACRS | 25.00 |
| S2.0 | 30.00 | 0.00\% | MACRS | 25.00 |
| R3.0 | 35.00 | 0.00\% | MACRS | 25.00 |

Normal Depreciation - The extent of the normal depreciation in the property was evaluated using age-life depreciation techniques. In age-life depreciation, the property's depreciation or condition is estimated using the following formulas:

$$
\begin{aligned}
& \text { Depreciation }(\%)=\frac{\text { Age }(\text { years }) \times 100 \%}{\text { Service Life }(\text { years })} \\
& \text { Condition }(\%)=\frac{\text { Remaining Life (years) } \times(100 \%)}{\text { Service Life (years) }} \\
& \text { where: the property's Service Life }=\text { Age }+ \text { Remaining Life and } \\
& \quad \text { Remaining Life }=f(\text { Survival Characteristic, Service Life, and Age) }
\end{aligned}
$$

However, due to the age of some of the assets the extent of the depreciation was limited to $85 \%$ of the asset's original cost and its replacement cost new.

When the above depreciation lives are used to quantify the property's depreciation is applied to the replacement cost new (COR) of \$96,986,192 the resultant COR less normal depreciation (CORLD) was found to be $\$ 51,414,555$ detailed as follows:

```
Lower Makefield Township
Bucks County PA
Wastewater Collection System and Purchased Treatment Capacity
Investor-Owned Utility
As of September 17, 2020
Replacement Cost New less Depreciation (RCNLD)
```

| (18) | (19) | (21) | (22) | (23) | (24) | (28) | (29) | (30) | (31) |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Account | Description | Age at September 17, 2020 Appraisal Date | $\begin{aligned} & \text { Replacement Cost } \\ & \text { New (COR) } \end{aligned}$ | Retirement Dispersion lowa type | Normal Service Life (NSL) | $\begin{aligned} & \text { Normal } \\ & \text { Remaining } \end{aligned}$ Life | Total Life Expectancy | Condition | Preliminary Cost Approach (COR less Normal Depreciation) |
|  |  | years | COR \$s |  | years | years | years | \% of COR | CORLD \$ ${ }^{\text {S }}$ |
| Input | Input | Calculation | Calculation | Input | Input | Calculation | Calculation | Calculation | Calculation |
| Eng Assmnt | Lower Makefield Township Asset Detail |  | $\mathrm{Col}(16)$ | AUS Input | AUS Input |  | $\mathrm{Col}(21)+(28)$ | Col (28) / (29) | Col (22) * (30) |
| Account | Description | Age | RCN | lowa | NL | Rem Life | Total Life | Condition | CORLD |

```
353.20 Land & Land Rights
354.20 Stuctures & Improvements - Pumping
354.40 Stuctures & Improvements - Treatment
355.20 Generating Equipment - Pumping
355.20 Generating Equipment - Pumping
356.20 Pump StationPower Protection & Control Devices
Collection Sewers - Low Pressure
360.20 Collection Sewers - Force - Mains
361.20 Collection Sewers - Gravity - Mains
361.20}\mathrm{ Collection Sewe
363.20 Service Laterals 
371.20 Pumping Equipment
Grand
Mrand Grand Total 
```

| 36.47 | 470,288 | ZNonDep | - | - | - | - | 470,288 |
| ---: | ---: | :--- | :---: | :---: | :---: | :---: | ---: |
| 37.21 | $7,357,560$ | R3.0 | 65.00 | 31.84 | 69.04 | 65.00 | $3,437,713$ |
| 46.01 | $12,413,422$ | R3.0 | 65.00 | 25.03 | 71.04 | 65.00 | $4,426,880$ |
| 35.32 | 650,289 | R3.0 | 35.00 | 10.03 | 45.35 | 35.00 | 175,802 |
| 31.93 | 992,809 | R3.0 | 35.00 | 12.03 | 43.97 | 35.00 | 323,847 |
| 6.34 | 390,125 | R2.5 | 80.00 | 73.89 | 80.23 | 80.00 | 359,342 |
| 34.56 | $2,333,228$ | R3.0 | 75.00 | 43.60 | 78.16 | 75.00 | $1,318,147$ |
| 34.94 | $60,742,852$ | R2.5 | 80.00 | 49.54 | 84.48 | 80.00 | $36,015,322$ |
| 35.17 | $6,940,400$ | R3.0 | 70.00 | 38.28 | 73.45 | 70.00 | $3,663,419$ |
| 33.95 | 921,966 | S2.0 | 30.00 | 7.70 | 41.64 | 30.00 | 206,548 |
| 35.26 | $3,773,253$ | R3.0 | 35.00 | 10.02 | 45.28 | 35.00 | $1,017,249$ |
|  | $96,986,192$ |  |  |  |  |  | $51,414,555$ |
|  |  |  |  |  |  |  |  |
| 36.40 | $96,986,192$ |  | 72.73 | 41.39 | 77.61 | 0.53 | $51,414,555$ |

The preliminary cost approach to value of Lower Makefield Township's wastewater system property was found to be $\$ 51,414,555$.

## Income Approach

The income approach to value establishes the value of the property based on its economic returns. There are two generally accepted procedures in performing an income analysis: the direct capitalization of anticipated income, and the discounted cash flow procedures.

In the direct capitalization approach, anticipated earnings are capitalized directly into value using a market-required capitalization rate. The Lower Makefield Township's wastewater system's operation will be moving from a municipal operation, wherein economic returns are not the primary objective of the operation to a private (investor owned) rate regulated sewer utility operation in which economic returns are one of the
objectives of the operation; therefore, the direct capitalization of earnings approach was not utilized in this appraisal.

In the discounted cash flow (DCF) approach, the property's economic returns are forecast for future periods. The cash flows (debt-free after-tax net cash flows) from operations are discounted to the appraisal date using a market derived discount rate resulting in the DCF approach's income indicator of value. Use of the DCF approach allows the appraiser to address the property's historical operating experience and its migration, in future periods, to an operation as a rate regulated income taxed (local, state, and federal) operation; thus, making the DCF approach preferable in this case.

In preparing this appraisal's DCF analysis (Income Approach tab), first the results from the Lower Makefield Township's wastewater system's operations were evaluated based on an analysis of historical operating performances over the period 2018 through 2019 (Financials tab) resulting in operating statistics such as revenues and their growth, various operating expenses stated as function of their typical drivers (revenues, plant investment, income from operations, etc.). Next, the results of future periods operations were forecast for a period of 20 years based on the migration of the Lower Makefield Township's historical operations over time to operations of the wastewater operation similar to a public investor-owned water/wastewater utility. Finally, the resultant cash flows from future period operations on the System were discounted to the appraisal date using a market derived discount rate for a public investor-owned water/wastewater utility. The following table details the market discount rate developed using the weighted average cost of capital (WACC) of the market debt and equity:


Weighted Cost of Capital (Discount Rate)
(1)
Portio
Capit
AUS $ו$
(2)

Portion of
Capital AUS Input $29 \%$

71\%
100.0\%
(3)
(2a)

Market
Market

| (4) | (4a) | (5) |
| :---: | :---: | :---: |
| Tax Rate | Tax affect on <br> cost of capital | After-tax <br> Market <br> Capital Cost <br> $(2)^{*}(3)^{*}(4 \mathrm{a})$ |
| $28.89 \%$ | $71.11 \%$ | $0.58 \%$ |

The following table presents the results of the discounted cash flow analysis:


Based on the above-described discounted cash flow analysis, the Income Approach to value of the System's property operating as a rate regulated wastewater utility under the regulation of the Pennsylvania Public Utility Commission (PA PUC) was determined to be $\$ 57,872,959$. To ensure that the above-described forecast captured the entire economic returns of the property an additional 40-year period beyond the original 20 year forecast was made. This additional forecast indicated the reasonableness of the initial forecast results.

Market Approach

The market or comparable sales approach to value looks to market sales of comparable properties in order to arrive at value. In this appraisal, the market approach was addressed from a comparable sales approach of Pennsylvania water and wastewater systems and market value to book value ratios based on investor-owned water utilities' financial performance as reported in Value Line Investment Survey (October 9, 2020).

Market Sales - In the comparable sale market approach, the sales of Pennsylvania municipal water and wastewater systems to investor-owned water/wastewater utilities were used to insure comparability. As the purpose of this appraisal is to define the value of Lower Makefield Township's wastewater collection system under Section 1329 of the PA CS the market comparable sales were limited to sales subsequent to the passage of Section 1329 in 2016. The following sales were considered:


In order to arrive at a measure of comparability these system sales were analyzed in relationship of the purchase price to the properties' depreciated original cost (OCLD) and depreciated replacement cost (CORLD) (Market Approach tab).

Financial Market Ratios - In the market approach based on market financial ratios the market data of companies (nine) in the water/wastewater industry as reported in Value Line Investment Surveys (October 2020) were analyzed. In the analysis the companies' stock (market) and debt (book value) per share are compared as a ratio to the book investment value per share.

The following table summarizes both the comparable sales and financial market ratio analysis and the Market Approach conclusion of this appraisal:

Lower Makefield Township
Bucks County PA
Wastewater Collection System and Purchased Treatment Capacity
Investor-Owned Utility
As of September 17, 2020
Comparable Sales Approach
Market Sales Data
Central Tendancy and Reliability Analysis


The market approach conclusion of this appraisal was determined to be $\$ 55,741,285$.
Page 12
AUS CONSULTANTS

Cost Approach Revisited - Before concluding this appraisal's fair market value, the preliminary cost approach conclusion of $\$ 51,414,555$ needs to be reviewed in light of the above-described income and market analyses in order to evaluate if external obsolescence exists in the preliminary replacement cost new less depreciation conclusion. The appraisal literature in regard to developing a cost approach states:


#### Abstract

"The last step in the implementation of the cost approach is to estimate economic obsolescence. Economic obsolescence (sometimes called "external obsolescence") has been previously defined as the loss in value or usefulness of a property caused by factors external to the asset. These factors include increased cost of raw materials, labor, utilities (without an offsetting increase in product price); reduced demand for the product; increased competition; environmental or other regulations; or similar factors.

The difficulty in measuring the full effect of economic obsolescence is one of the weaknesses of the cost approach. Because economic obsolescence is usually a function of outside influences that affect an entire business (i.e., all tangible and intangible assets) rather than individual assets or isolated groups of assets, it is sometimes measured using the income approach or by using the income approach to help identify the existence of economic influences on value. However, the cost approach can be used to measure some forms of economic obsolescence."7


The above-described income approach value conclusion of \$57,872,959 and the market approach conclusion of $\$ 55,741,285$ for the Lower Makefield Township's future wastewater system compared to the preliminary cost approach conclusion of $\$ 51,414,555$ indicates no significant external obsolescence exists in the cost approach conclusion of $\$ 51,414,555$ detailed as follows:

[^2]```
Lower Makefield Township
Bucks County PA
Wastewater Collection System and Purchased Treatment Capacity
Investor-Owned Utility
As of September 17, }202
```


## Fair Market Value

| (36) | (37) | (39) | (40) |  |
| :--- | :--- | :--- | :--- | :--- |
|  |  |  |  |  |
|  |  |  |  |  |

## Value Conclusion

The Fair Market Value of the Lower Makefield Township's wastewater collection system's property, plant and equipment and its operation was determined to be \$54,430,591 as follows:

| Lower Makefield Township |
| :---: |
| Bucks County PA |

Wastewater Collection System and Purchased Treatment Capacity
Investor-Owned Utility
As of September 17, 2020

As the purpose of this appraisal was to fulfill the requirements of Section 1329 of the PA CS in the establishment of value for rate making of the Lower Makefield Township's
property, plant and equipment this appraisal's conclusion of $\$ 54,430,591$ is consistent with the purpose of the appraisal. As the cost approach work papers detail our value conclusion by National Association of Regulatory Utility Commissioners' (NARUC) Uniform System of Accounts (USOA) for the wastewater industry account classifications and the installation year of the property this detail can be used to allocate the appraisal conclusion to establish the booked value for future accounting and rate making.

## PURPOSE AND SCOPE OF WORK

The purpose of this appraisal of the Lower Makefield Township's wastewater collection system and purchased treatment capacity is the determination of the fair market value of the property plant and equipment of wastewater utility. The report was prepared based on the 2020-2021 Uniform Standards of Professional Practices (USPAP) and is intended to meet the criteria established with Title 66 (Public Utilities) of the Pennsylvania Consolidated Statues (PA CS) Paragraph 1329: Valuation of acquired water and wastewater systems, collectively referred to as Act 12 of the 2016 Pennsylvania legislative session (Act 12). The intended users of this appraisal are our client Lower Makefield Township, Pennsylvania, Aqua Pennsylvania Wastewater Inc., and the Pennsylvania Public Utility Commission.

The value established in this appraisal was based on the definition of Market Value as:
> "The most probable price, as of a specified date, in cash, or in terms equivalent to cash, or in other precisely revealed terms, for which the specified property rights should sell after reasonable exposure in a competitive market under all conditions requisite to a fair sale, with the buyer and seller each acting prudently, knowledgeably, and for selfinterest, and assuming that neither is under undue duress." The Appraisal of Real Estate, $14^{\text {th }}$ Edition, page 58.

In conducting this appraisal, we utilized several sources of data:

Annual (year-ending December 31) Lower Makefield Township (Pennsylvania) wastewater collection operational financial statements cover the period 2018 through 2019.

The inventory developed by Ebert Engineering, Inc. (Engineer's Assessment) of the Lower Makefield Township's wastewater system's property at March 22, 2021.

The Handy-Whitman (water industry) Index of Public Utilities Construction Costs for northeastern United States, AUS Consultant General Plant Cost Indexes for
the period 1912 through January 1, 2021, and various cost indexes published by the United States Bureau of Labor Statistics (US BLS).

In preparing this fair market value appraisal of the System's property, plant and equipment, and its operations: the cost, income, and market approaches to value were considered. Primary reliance was placed on the cost approach for the property, plant and equipment, with the income approach and market approaches being utilized to confirm the overall value of the sewer system's operation. A detailed explanation of each approach to value is included below in the section "Appraisal Procedures and Results".

# WATER/WASTEWATER INDUSTRY NATIONALLY AND IN PENNSYLVANIA 

## AND

## LOWER MAKEFIELD TOWNSHIP'S WASTEWATER COLLECTION SYSTEM AND PURCHASED TREATMENT CAPACITY

## Water/wastewater Industry

The water and wastewater industry in the United States consist of both municipal authorities (literally thousands) and private investor-owned companies. Of the investor owned there are nine which are large enough to be tracked by Value Line Investment Surveys, of which, two are major players in the northeast portion of the United States, American Water Works Company, Inc. and Aqua America, Inc. (on February 3, 2020 Aqua's name changed to Essential Utilities, Inc.) American and Aqua have been particularly active in the acquisition of municipal water and wastewater systems.

## Pennsylvania Water / Wastewater Industry

The water and wastewater industry in Pennsylvania also consist of both municipal and investor-owned systems. Over last several years the need for infrastructure improvements has led the Pennsylvania legislature to pass legislation facilitating the acquisition of municipal water and/or wastewater systems to a private investor-owned rate regulated companies such as American Water and Aqua America. This legislation was Act 12 of the Pennsylvania legislator's 2016 legislative session (Act 12). The Act 12 legislation added a section (1329) modifying Title 66 (Public Utilities) of the Pennsylvania Consolidated Statues (PA CS) adding Section 1329: Valuation of acquired water and wastewater systems, collectively referred to as Act 12. This appraisal was developed to meet the valuation criteria established by Section 1329 and the PA PUC's subsequent Implementation Orders in the valuation of acquired water and wastewater systems. Operations ${ }^{8}$

## III. System Description

A large portion of the developed areas within Lower Makefield Township are served by the public sanitary sewage collection system constructed in 1966. This system has subsequently been expanded as the Township has developed and the system now contains 14 pump stations, force mains, gravity sewer, low pressure collection systems, and 8 wastewater metering chambers.

The collected wastewater ultimately is treated at two different treatment plants located in the Borough of Morrisville and the City of Philadelphia. Lower Makefield also utilizes the conveyance facilities of authorities to transport its wastewater for treatment. These include the Borough of Yardley, the Bucks County Water and Sewer Authority, Middletown Township, and the Township of Falls Authority. The
following paragraphs will identify each drainage basin in Lower Makefield Township and describe how the sanitary sewer collection subsystem operates, identify ownership of the sanitary sewer elements, and the ultimate disposal of the wastewater.

The collection subsystem located in the Buck Creek drainage basin and the major portion of the Brock Creek basin discharge flows into the sewage facilities of the Borough of Yardley. These flows are then pumped back into the Township system via Yardley's Pumping Station, and then flow by gravity to Morrisville for treatment by way of the Pennsylvania Canal Interceptor. The flows from the newer developments in the lower portion of the Brock Creek basin are discharged to the Heacock Road Pumping Station. These wastewater flows are pumped to a connection point on the existing Pennsylvania Canal Interceptor at Black Rock Road, which conveys these flows via gravity to the Morrisville Wastewater Treatment Plant.
The entire Silver Lake collection subsystem discharges flow to the Silver Lake Pumping Station constructed on the Yardley Borough boundary. The flow is then pumped to the Pennsylvania Canal Interceptor for treatment at Morrisville.

A portion of the sewers in the Rock Run basin are owned and operated by the Township of Falls Authority. The area containing these sewers is referred to as the "Falls Township Service Area". This area was not included in the assessment.

[^3]Township of Falls has also agreed to accept the flow originating in sewers located in the area known as "Falls Township Contract Area". However, sewer facilities within the Contract Area are both owned and operated by Lower Makefield Township.

The flows from developments in the Mill Creek basin are conveyed via gravity to the Middletown Interceptor (Yerkes Line). These consist mostly of residential subdivisions in the vicinity of Oxford Valley Road and Big Oak Road, and include commercial developments at the southeast corner of these roads. Flows from most of those developments are pumped to the Middletown Interceptor via the Yardley Oaks Pumping Station.

## IV. Historical Growth

The majority of the current sewer system for Lower Makefield Township was built in 1966. There were some developments and their corresponding sewer systems built in the 1950's but most of the gravity lines and the gravity interceptors were built in 1966. The table below shows the growth of the sanitary sewer system over the decades.

| Decade | Number of New <br> Developments | Number of New <br> Pump Stations | Number of New <br> Interceptors |
| :---: | :---: | :---: | :---: |
| $1950-1960$ | 11 | - | - |
| $1960-1970$ | 17 | 3 | - |
| $1970-1980$ | 11 | 2 | 6 |
| $1980-1990$ | 24 | 5 | - |
| $1990-2000$ | 33 | 2 | 1 |
| $2000-2010$ | 23 | 2 | - |
| $2010-2020$ | 6 | - | - |

During the early 1960's when Lower Makefield Township was rapidly expanding their sanitary sewer system, the Falls Township Wastewater Treatment Plant (WWTP) was anticipated to be constructed and was planned to serve areas of the Lower Makefield Township and adjacent to Fairless Hills. Ultimately, the Falls Township WWTP was never constructed. The Morrisville WWTP was also to serve portions of the Lower Makefield Township (watersheds discharging toward the Delaware River). Between
the 1960's and 1970's, the Morrisville WWTP was expanded and began accepting wastewater from portions of Lower Makefield Township and Yardley Borough.

In the 1970's it was still proposed that the Falls Township WWTP would serve additional areas in the Lower Makefield Township. Flows in excess of the plant's capacity would be diverted to the Bristol Township Sewage Treatment plant by a proposed extension to the then existing Neshaminy Interceptor.

From 1970 to 1980, significant sewer expansion occurred as a result of increased development in Lower Makefield Township. The Core Creek Branch of the Neshaminy Interceptor was completed, and the Morrisville WWTP was expanded and upgraded. It was proposed that the Morrisville WWTP begin serving additional areas in Lower Makefield Township, as well as part of the Upper Makefield Township by 1980. After 1980, the Morrisville WWTP would serve the remaining portions of the Lower Makefield Township within the watersheds discharging towards the Delaware River.

From 1980 to 1990, a majority of the pump stations were constructed: Heacock Road Pumping Station, Maplevale PS, Oxford Glen/Yardley Oaks PS, Sherwood PS, and Silver Lakes PS. Additional capacity/upgrades were purchased from the Morrisville WWTP to keep up with increasing number of developments.

From 1990 to 2000, the Township increased development at rates higher than anticipated. The Morrisville WWTP was near its capacity and as a result the Heacock Road Pumping Station was temporarily pumping wastewater from the Lower Makefield portion of the Brock Creek basin to the Bucks County Water and Sewer Authority Core Creek Interceptor. Once the Morrisville WWTP expansions were completed, the WWTP was re-rated from 7.1 MGD to 8.7 MGD and these flows were diverted back to the Morrisville WWTP.

From 2000 to current day, all the wastewater generated in the Township is conveyed to treatment plants located outside the Township: the Morrisville WWTP and the City of Philadelphia Northeast Water Pollution Control Plant.

## APPRAISAL PROCEDURES AND RESULTS

The purpose of this appraisal of the Lower Makefield Township's wastewater collection system and purchased treatment capacity is the determination of the fair market value of the wastewater's property plant and equipment as of September 17, 2020. The report was prepared based on the 2020-2021 Uniform Standards of Professional Practices (USPAP) and is intended to meet the criteria established with Title 66 (Public Utilities) of the Pennsylvania Consolidated Statues (PS CS) Section 1329: Valuation of acquired water and wastewater systems, collectively referred to as Act 12 of the Pennsylvania legislator's 2016 legislative session (Act 12). The intended users of this appraisal are Lower Makefield Township, Pennsylvania, Aqua Pennsylvania Wastewater Inc., and the Pennsylvania Public Utility Commission (PA PUC).

The value established in this appraisal was based on the definition of Market Value as:
> "The most probable price, as of a specified date, in cash, or in terms equivalent to cash, or in other precisely revealed terms, for which the specified property rights should sell after reasonable exposure in a competitive market under all conditions requisite to a fair sale, with the buyer and seller each acting prudently, knowledgeably, and for selfinterest, and assuming that neither is under undue duress." The Appraisal of Real Estate, $14^{\text {th }}$ Edition, page 58.

In conducting this appraisal, we utilized several sources of data:

Annual (year-ending December 31) Lower Makefield Township's wastewater system's operational financial statements cover the period 2018 through 2019.

Ebert Engineering, Inc.'s Engineer's Assessment and inventory of the Lower Makefield Township's wastewater system's property at March 22, 2021.

The Handy-Whitman (water industry) Index of Public Utilities Construction Costs for northeastern United States, AUS Consultant General Plant Cost Indexes for the period 1912 through July 1, 2021, and various cost indexes published by the United States Bureau of Labor Statistics (US BLS).

In preparing this fair market value appraisal of the System's wastewater system's property, plant and equipment, and its operations; the cost, income, and market approaches to value were considered. Primary reliance was placed on the cost approach for the property, plant and equipment, with the income approach and market approaches being utilized to confirm the overall value of the sewer system's operation. Detailed explanation of each approach to value is included below.

Cost Approach (Cost Approach tab) - The philosophy in the cost approach to value is that the maximum value of a property's tangible assets is established by the cost to acquire or build a similar property. In this appraisal, the cost approach to value was analyzed using reproduction/replacement cost approach.

Reproduction cost and replacement cost are defined as:

Reproduction cost - "The estimated cost to construct, at current prices as of the effective date of the appraisal, an exact duplicate or replica of the [property] being appraised, using the same materials, construction standards, design, layout, and quality of workmanship and embodying all the deficiencies, super-adequacies, and obsolescence of the subject [property]."

Replacement cost - "The estimated cost to construct, at current prices as of the effective appraisal date, a substitute for the [property] being appraised using modern materials and current standards, design and layout." ${ }^{10}$

In the wastewater industry the property's reproduction costs and replacement costs are quite similar; therefore, the property's cost new was determined based on its replacement cost new.

The trended original cost method was utilized in preparing the replacement cost new. "Trending is a method of estimating a property's replacement cost new in which an index or trend factor is applied to the property's historical cost to convert the known cost into an indication of current cost. Simply put, trending reflects the movement of price over
${ }^{9}$ The Appraisal of Real Estate, $13^{\text {th }}$ Edition. Page 385
10 ibid
time."11 In the trended original cost method, the System's investment in wastewater plant and equipment is restated to costs reflective of the appraisal date, by the application of cost trends to the property's original investment. AUS Consultants utilized the Engineer's Assessment performed by Ebert Engineering, Inc. (Engineer's Assessment tab) as the starting point of the Cost Approach. Utilizing the Engineer's Assessment of the System's original cost in property, plant and equipment AUS Consultants developed the plant's depreciated original cost (OCLD) and depreciated replacement cost (RCNLD) at September 17, 2020 (Cost Approach tab).

The cost trends are applied to each of the various investment categories (NARUC plant accounts) by original year of placement for that investment. The cost indexes used in these studies were the Handy-Whitman Index of Public Utility Construction Costs for the water industry of the northeastern region of the United States which includes the Commonwealth of Pennsylvania (HW), the AUS Consultants of General Plant Indexes AUS), and various United States Bureau of Labor Statistics (US BLS) indexes. The following table details the costing parameters using in the trending costing procedures:

```
ower Makefield Township
Bucks County PA
Wastewater Collection System and Purchased Treatment Capacity
Investor-Owned Utility
September 17, 2020
```

Summary of Account Costing and Depreciation Parameters Used in the Depreciation Original Cost and the Depreciated Replacement Cost New Studies

| (1) (2) | (3) |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
|  | (3a) | (3b) | (3c) | (3d) | (3e) |
| Account | Costing |  |  |  | Reproduction to Replacement |
| Number Description | Parameters |  |  |  | Cost Factor |
|  | Index Series | Table | Line Reference | Lookup | AUS Input |
| 353.20 Land \& Land Rights | USBLS | PPI | 3.00 | USBLS3 | 1.00 |
| 354.20 Stuctures \& Improvements - Pumping | HW | W-1 | 15.00 | HWW-115 | 1.00 |
| 354.40 Stuctures \& Improvements - Treatment | HW | W-1 | 15.00 | HWW-115 | 1.00 |
| 355.20 Generating Equipment - Pumping | USBLS | PPI | 4.00 | USBLS4 | 1.00 |
| 356.20 Pump StationPower Protection \& Control Devices | USBLS | PPI | 4.00 | USBLS4 | 1.00 |
| 359.20 Collection Sewers - Low Pressure | HW | W-1 | 44.00 | HWW-144 | 1.00 |
| 360.20 Collection Sewers - Force - Mains | HW | W-1 | 44.00 | HWW-144 | 1.00 |
| 361.20 Collection Sewers - Gravity - Mains | HW | W-1 | 44.00 | HWW-144 | 1.00 |
| 363.20 Service Laterals | HW | W-1 | 39.00 | HWW-139 | 1.00 |
| 363.21 Flow Measuring Devices | HW | W-1 | 40.00 | HWW-140 | 1.00 |
| 371.20 Pumping Equipment | HW | W-1 | 9.00 | HWW-19 | 1.00 |

[^4]The following table presents the development of the cost approach for the Low Pressure Collection Mains (Account 359.2) portion of the Lower Makefield Township wastewater service area this example will be used to describe the entire cost approach process:


Using the trended original cost method, Lower Makefield Township's investment in this example of $\$ 354,372.85$ was determined to have a replacement cost new of $\$ 390,125$.

When the trended cost method is applied to each of Lower Makefield Township's investment in plant, property and equipment of $\$ 32,003,924$ was determined to have a replacement cost new of $\$ 96,986,192$ detailed as follows:

Lower Makefield Township
Bucks County PA
Wastewater Collection System and Purchased Treatment Capacity
investor-Owned Utility
As of September 17, 2020
Replacement Cost New (RCN)

\begin{tabular}{|c|c|c|c|c|c|c|c|c|}
\hline (1)
Account \& (2)

Account \& (3) ${ }_{\text {Asset Description }}$ \& \begin{tabular}{c}
(9) <br>
Original Cost <br>
\hline

 \& 

(10) <br>
Costing Parameter
\end{tabular} \& (13) \& (14) Reproduction

Cost New (RCN) \& | (15) |
| :--- |
| Reproduction Cost New (RCN) to Replacement Cost New (COR) | \& (16) Replacement

Cost New (COR <br>
\hline Account \& \& \& oc \$s \& \& \& RCN \$s \& COR \$s/RCN \$s \& COR \$s <br>
\hline Input \& Input \& Input \& Input \& Input \& Calculation \& Calculation \& Input \& Calculation <br>
\hline Eng Assmnt \& AUS Input \& Lower Makefield Township Asset Detail \& Eng Assmnt \& AUS Input \& \& \& AUS Input \& Col (14) * (15) <br>

\hline NARUC Code \& NARUC Code \& Asset Description \& Original Cost \& Cost Index Table \& Translator \& RCN \& $$
\begin{aligned}
& \mathrm{COR} / \mathrm{RCN} \\
& \text { Factor }
\end{aligned}
$$ \& COR <br>

\hline 353.20 \& 353.20 \& Land \& Land Rights \& 646 \& USBLS3 \& 728.00 \& 470,288 \& 1.00 \& 470,288 <br>
\hline 354.20 \& 354.20 \& Stuctures \& Improvements - Pumping \& 2,213,537 \& HWW-115 \& 3.32 \& 7,357,560 \& 1.00 \& 7,357,560 <br>
\hline 354.40 \& 354.40 \& Stuctures \& Improvements - Treatment \& 2,186,739 \& HWW-115 \& 5.68 \& 12,413,422 \& 1.00 \& 12,413,422 <br>
\hline 355.20 \& 355.20 \& Generating Equipment - Pumping \& 292,282 \& USBLS4 \& 2.23 \& 650,289 \& 1.00 \& 650,289 <br>
\hline 361.70 \& 361.70 \& Pump StationPower Protection \& Control Devices \& 506,720 \& USBLS4 \& 1.96 \& 992,809 \& 1.00 \& 992,809 <br>
\hline 361.70 \& 361.70 \& Collection Sewers - Low Pressure \& 354,373 \& HWW-144 \& 1.10 \& 390,125 \& 1.00 \& 390,125 <br>
\hline 361.70 \& 361.70 \& Collection Sewers - Force - Mains \& 837,436 \& HWW-144 \& 2.79 \& 2,333,228 \& 1.00 \& 2,333,228 <br>
\hline 361.70 \& 361.70 \& Collection Sewers - Gravity - Mains \& 22,142,441 \& HWW-144 \& 2.74 \& 60,742,852 \& 1.00 \& 60,742,852 <br>
\hline 361.70 \& 361.70 \& Service Laterals \& 2,286,077 \& HWW-139 \& 3.04 \& 6,940,400 \& 1.00 \& 6,940,400 <br>
\hline 361.70 \& 361.70 \& Flow Measuring Devices \& 308,281 \& HWW-140 \& 2.99 \& 921,966 \& 1.00 \& 921,966 <br>
\hline \multirow[t]{2}{*}{361.70} \& 361.70 \& Pumping Equipment \& 875,393 \& HWW-19 \& 4.31 \& 3,773,253 \& 1.00 \& 3,773,253 <br>
\hline \& \& Total Borough of Brentwood Wastewater Utility \& 32,003,924 \& \& \& 96,986,192 \& \& 96,986,192 <br>
\hline Grand \& Grand \& \& \& \& \& \& \& <br>
\hline Total \& Total \& Grand Total \& 32,003,924 \& \& 3.03 \& 96,986,192 \& 1.00 \& 96,986,192 <br>
\hline
\end{tabular}

The replacement cost new of the Land and Land Rights easements and small parcels was determined based on the following:

| Replacement Cost of Easements |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| Activity | Engineer Hours | Legal <br> Hours | Fees <br> Hours |  |  |
|  |  |  |  |  |  |
| Determine the facilities for which a |  |  |  |  |  |
| Easment is need | 1 | 0 | 0 |  |  |
| Locate the Land owner for the property needing a easement | 1 | 0 | 0 |  |  |
| Develop a diagram of the Property, the facilities, and the easement | 1 | 0 | 0 |  |  |
| Develop the easement document | 1 | 0.5 | 0 |  |  |
| Visit the property owner to obtain permission for the easement and sign the |  |  |  |  |  |
| Register the easement with the Municipal |  |  |  |  |  |
| Clerk | 0 | 0.5 | 250 |  |  |
| Total | 7 | 1 | 250 |  |  |
| Labor Costs per Hour | \$ 54 | \$ 100 |  |  |  |
|  |  |  |  |  | Cost |
| Total Cost | 378 | 100 | 250 | \$ | 728 |

Replacement Cost New less Depreciation - The replacement cost described above reflects the cost of new property; however, the Lower Makefield Township's wastewater system property is not new and has experienced normal depreciation and potentially
functional and or economic obsolescence. These various forms of depreciation are defined as follows:

Normal depreciation/deterioration, akin to physical deterioration, is "loss in value caused by wear, tear, age and use."12

Functional obsolescence is "the loss in value or usefulness of a property caused by inefficiencies or inadequacies of the property itself, when compared to a more efficient of less costly replacement property that new technology has developed." ${ }^{13}$

Economic, or external, obsolescence is defined as "A loss in value caused by factors outside a property"14 and is most often indicated by insufficient earning.

## Wastewater Depreciation Service Life Experience in Pennsylvania

The service lives used in the depreciation and functional obsolescence calculations were developed based on the property and its use, AUS Consultants' experience in developing depreciation studies for the water and wastewater industries and depreciation studies filed with PAWC and Aqua America rate cases. With each of their recent rate case filings PAWC and Aqua America have filed depreciation studies in support of their depreciation service lives and associated depreciation expenses contained within their revenue requirements. The depreciation studies were prepared by Gannett Fleming Rate Consultants a recognized firm in the depreciation consulting area. AUS Consultants has reviewed the PAWC studies which are summarized in the following table:

[^5]

It is of particular importance in the above table the service life extension of the mains plant categories between the 2016 and the 2020 studies. The mains service lives increased as follows:

| Account | Description | Service Life |  |
| :--- | :--- | :---: | :---: |
|  |  | 2016 | 2020 |
| 360.10 | COLLECTION SEWERS - FORCE MAINS | 70 | 75 |
| 361.10 | COLLECTION SEWERS - GRAVITY MAINS | 70 | 80 |

AUS Consultants believe this increase in service lives is attributable to the widespread use of relining older mains instead of replacing mains which are in need of repair. The practice of relining mains with a cured in place plastic liner not only repairs specific main but has the effect of extending the life of the original mains by the length of time which the relining can be expected to last. Most relining vendors warranty their product and procedure for 50 years. Thus, in essence the original main's service life will be extended by 50 plus years at the date the relining occurred. For those mains associated with relining their installation date was established at the date of their relining and their depreciation parameters were established the same as the depreciation parameters of the relining, i.e., R2.5-60 years.

The following table details the lives used in the depreciation portion of the replacement cost new less depreciation analysis:

```
Lower Makefield Township
Bucks County PA
Wastewater Collection System and Purchased Treatment Capacity
Investor-Owned Utility
September 17, }202
```

Summary of Account Costing and Depreciation Parameters Used in the Depreciation Original Cost and the Depreciated Replacement Cost New Studies

| (1) (2) | (4) |  | (5) | (6) |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
|  | (4a) | (4b) |  | (6a) | (6b) |
|  | Iowa Survivor | Normal |  |  |  |
| Account | / Retirement | Service | Economic | Tax |  |
| Number Description | Curve | Life | Obsolescence | Depreciation |  |
|  |  | years | \% of CORLD | Table | Life |
| 353.20 Land \& Land Rights | ZNonDep | 0.00 | 0.00\% | Non-Depr | 0.00 |
| 354.20 Stuctures \& Improvements - Pumping | R3.0 | 65.00 | 0.00\% | MACRS | 25.00 |
| 354.40 Stuctures \& Improvements - Treatment | R3.0 | 65.00 | 0.00\% | MACRS | 25.00 |
| 355.20 Generating Equipment - Pumping | R3.0 | 35.00 | 0.00\% | MACRS | 25.00 |
| 356.20 Pump StationPower Protection \& Control Devices | R3.0 | 35.00 | 0.00\% | MACRS | 25.00 |
| 359.20 Collection Sewers - Low Pressure | R2.5 | 80.00 | 0.00\% | MACRS | 25.00 |
| 360.20 Collection Sewers - Force - Mains | R3.0 | 75.00 | 0.00\% | MACRS | 25.00 |
| 361.20 Collection Sewers - Gravity - Mains | R2.5 | 80.00 | 0.00\% | MACRS | 25.00 |
| 363.20 Service Laterals | R3.0 | 70.00 | 0.00\% | MACRS | 25.00 |
| 363.21 Flow Measuring Devices | S2.0 | 30.00 | 0.00\% | MACRS | 25.00 |
| 371.20 Pumping Equipment | R3.0 | 35.00 | 0.00\% | MACRS | 25.00 |

As the above table demonstrates, the depreciation lives selected for the AUS Consultants appraisal are consistent with the depreciation studies' finding for wastewater plant.

Normal Depreciation - The extent of the depreciation in the property was evaluated using age-life depreciation techniques. In age-life depreciation, the property's depreciation or condition is estimated using the following formulas:

$$
\begin{aligned}
& \text { Depreciation }(\%)=\frac{\text { Age }(\text { years }) \times 100 \%}{\text { Service Life }(\text { years })} \\
& \text { Condition }(\%)=\frac{\text { Remaining Life (years) } \times(100 \%)}{\text { Service Life (years) }} \\
& \text { where: the property's Service Life }=\text { Age }+ \text { Remaining Life } \\
& \text { and Remaining Life }=f(\text { Survival Characteristic, Service Life, Age) }
\end{aligned}
$$

However due to the age of some of the property the extent of the depreciation was limited to $5 \%$ of the assets original cost and its replacement cost new.

When the above depreciation lives are used to quantify the property's depreciation is applied to the replacement cost new of the example Low Pressure Gravity Collection Mains portion of the Lower Makefield Township wastewater service area of $\$ 390,125$, the replacement cost new less depreciation was determined to be $\$ 359,342$ detailed as follows:


When the above depreciation lives are used to quantify the property's depreciation is applied to each of the Lower Makefield Township's investment in plant, property and equipment the replacement cost new (RCN) of \$96,986,192 the resultant RCN less depreciation (RCNLD) was found to be $\$ 51,414,515$ detailed as follows:

```
Lower Makefield Township
Bucks County PA
```

Wastewater Collection System and Purchased Treatment Capacity
Investor-Owned Utility
As of September 17, 2020

Replacement Cost New less Depreciation (RCNLD)

| (18) | (19) | (21) | (22) | (23) | (24) | (28) | (29) | (30) | (31) |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Account | Description | Age at September 17, 2020 Appraisal Date | Replacement Cost New (COR) | Retirement Dispersion lowatype | Normal <br> Service <br> Life (NSL) | Normal Remaining Life | Total Life Expectancy | Condition | Preliminary Cost Approach (COR less Normal Depreciation) |
|  |  | years | COR \$s |  | years | years | years | \% of COR | CORLD \$ ${ }_{\text {S }}$ |
| Input | Input | Calculation | Calculation | Input | Input | Calculation | Calculation | Calculation | Calculation |
| Eng Assmnt | Lower Makefield Township Asset Detail |  | Col (16) | AUS Input | AUS Input |  | $\mathrm{Col}(21)+(28)$ | Col (28) / (29) | Col (22) * (30) |
| Account | Description | Age | RCN | lowa | NL | Rem Life | Total Life | Condition | CORLD |


| 353.20 | Land \& Land Rights |
| :--- | :--- |
| 354.20 | Stuctures \& Improvements - Pumping |
| 354.40 | Stuctures \& Improvements - Treatment |
| 355.20 | Generating Equipment - Pumping |
| 356.20 | Pump StationPower Protection \& Control Devices |
| 359.20 | Collection Sewers - Low Pressure |
| 360.20 | Collection Sewers - Force - Mains |
| 361.20 | Collection Sewers - Gravity - Mains |
| 363.20 | Service Laterals |
| 363.21 | Flow Measuring Devices |
| 371.20 | Pumping Equipment |
|  |  |
| Grand |  |
| Total | Grand Total |


| 36.47 | 470,288 | ZNonDep | - | - | - | - | 470,288 |
| ---: | ---: | :--- | :---: | :---: | :---: | :---: | ---: |
| 37.21 | $7,357,560$ | R3.0 | 65.00 | 31.84 | 69.04 | 65.00 | $3,437,713$ |
| 46.01 | $12,413,422$ | R3.0 | 65.00 | 25.03 | 71.04 | 65.00 | $4,426,880$ |
| 35.32 | 650,289 | R3.0 | 35.00 | 10.03 | 45.35 | 35.00 | 175,802 |
| 31.93 | 992,809 | R3.0 | 35.00 | 12.03 | 43.97 | 35.00 | 323,847 |
| 6.34 | 390,125 | R2.5 | 80.00 | 73.89 | 80.23 | 80.00 | 359,342 |
| 34.56 | $2,333,228$ | R3.0 | 75.00 | 43.60 | 78.16 | 75.00 | $1,318,147$ |
| 34.94 | $60,742,852$ | R2.5 | 80.00 | 49.54 | 84.48 | 80.00 | $36,015,322$ |
| 35.17 | $6,940,400$ | R3.0 | 70.00 | 38.28 | 73.45 | 70.00 | $3,663,419$ |
| 33.95 | 921,966 | S2.0 | 30.00 | 7.70 | 41.64 | 30.00 | 206,548 |
| 35.26 | $3,773,253$ | R3.0 | 35.00 | 10.02 | 45.28 | 35.00 | $1,017,249$ |
|  | $96,986,192$ |  |  |  |  |  | $51,414,555$ |
|  |  |  |  |  |  |  |  |
| 36.40 | $96,986,192$ |  | 72.73 | 41.39 | 77.61 | 0.53 | $51,414,555$ |

The preliminary cost approach to value of the Lower Makefield Township's wastewater utility property was found to be $\$ 51,414,555$.

Income Approach (Income Approach tabs)

The income approach to value establishes the value of the property based on its economic returns. There are two generally accepted procedures in performing an income analysis: the direct capitalization of anticipated income, and the discounted cash flow procedures.

In the direct capitalization approach, anticipated earnings are capitalized directly into value using a market-required capitalization rate. The Lower Makefield Township's wastewater operation will be moving from a municipal operation, wherein economic returns are not the primary objective of the operation to a private (investor owned) rate regulated sewer utility operation in which economic returns are one of the objectives of the operation; therefore, the direct capitalization of earnings approach was not utilized in this appraisal.

In the discounted cash flow (DCF) approach, the property's economic returns are forecast for future periods. The cash flows (debt-free after-tax net cash flows) from operations are discounted to the appraisal date using a market derived discount rate resulting in the DCF approach's income indicator of value. Use of the DCF approach allows the appraiser to address the property's historical operating experience and its migration, in future periods, to an operation as a rate regulated income taxed (local, state and federal) operation; thus, making the DCF approach preferable in this case.

In preparing this appraisal's DCF analysis first the results from the Lower Makefield Township's wastewater utility's operations was evaluated based on an analysis of historical operating performances over the period 2018 through 2019 (Financials tab). In this analysis operating statistics such as revenues and their growth, various operating expenses were stated as function of their typical drivers (revenues, plant investment, income from operations, etc.) were analyzed. Details are provided in Income Approach tab. Using the above-described analyses, the results of future periods operations were forecast based on the migration of the Lower Makefield Townships of historical operations type experience over time to operations of the wastewater operation similar to a public investor-owned water/wastewater utilities. These forecasts are detailed in the Income Approach tab.

In this appraisal, future operating results were forecasted as follows:
Revenues
Operating Expenses
Operating and Maintenance Expense
Depreciation \& Amortization
Total Operating Expenses
Operating Income (Revenues less Operating Expenses)
Taxes
Property
Income (state \& federal)
Total Taxes
After Tax Income (Operating Income less Total Taxes)
Net Cash Flows
Plus: After Tax Income
Plus: Depreciation
Less: Capital Expenditures
Plus/less: Change in Working Capital
Equals: Debt-free after-tax net cash flows

In the above-described table, the depreciation expense (both book and tax) and the capital expenditures were forecast based on the investment in property plant and equipment at the appraisal date and in subsequent periods. The initial investment in the plant and depreciation forecast were based on the criteria established in Section 1329 for the acquisition and subsequent regulation (rate base) of the acquired property by the acquiring investor-owned utility company. The following table details the forecasts of plant investment, book depreciation, tax depreciation forecast, and the resultant net plant investment and rate base as follows:

Plant Investment
Initial Investment/ Beginning Plant Balance
Additions (Capital Expenditures)
Retirements

Ending Plant Balance<br>Depreciation (book)<br>Initial Book Depreciation Reserve / Beginning Book Reserve Balance Book Depreciation \& Amortization<br>Retirements<br>Ending Book Reserve Balance<br>Depreciation (tax)<br>Initial Tax Reserve / Beginning Tax Reserve<br>Tax Depreciation<br>Retirement<br>Ending Tax Reserve Balance

In these forecasts, the initial plant investment was based on the allocated purchase price of $\$ 53,000,000$. Initially, the Cost Approach results are utilized to allocate the purchase price by category of plant (NARUC account). The Cost Approach results also define the property's ages and remaining lives of the various plant investment categories. Using these inputs, the future periods book and tax depreciation can be forecast, as well as the accumulated deferred taxes and resulting rate base.

With a forecast of the future rate base and an estimate of the Pennsylvania Commission's authorized return on rate base, the future return on rate base can be estimated which along with the forecast operating expenses (operating expenses, depreciation, and taxes) the future period revenue requirement forecasts can be made. An estimate of the PA Commission return on rate base is detailed as follows:


Based on a comparison of the forecast revenues and the forecast of the estimated revenue requirement, future period rate increases were forecast. The criteria in making future period rate adjustments was to bring the forecast achieved return in line with the required return. Based on this process the results of future operations were forecast for the next 20 -year period. Period 20 of the forecast was treated in the discounted cash flow as the forecast for period 20 through perpetuity.

Finally, the resultant cash flows from future period operations of the System were discounted to the appraisal date using a market derived discount rate for a public investor-owned water/wastewater utility (Cost of Capital / Required Return tab). The following table details the market discount rate developed using the weighted average cost of capital (WACC) of the market debt and equity:

| Water and Wastewater Cost of Capital |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Third Quarter 2020 (10-1-2020) |  |  |  |  |  |  |  |
| As an Investor-Owned Utility |  |  |  |  |  |  |  |
| Weighted Cost of Capital (Discount Rate) |  |  |  |  |  |  |  |
|  | Portion of Capital AUS Input | Type of Data | Capital Cost <br> AUS Input | Type of Data | Tax Rate | Tax affect on cost of capital | After-tax <br> Market Capital Cost (2)*(3)*(4a) |
| Debt | 29\% | Market | 2.82\% | Market | 28.89\% | 71.11\% | 0.58\% |
| Equity | 71\% | Market | 9.90\% | Market | 0.0\% | 100.00\% | 7.03\% |
| Total Capital r | 100.0\% |  |  |  |  |  | 7.61\% |
| Growth (g) |  |  |  |  |  |  | 1.82\% |
| Rate without Growth: [(1+r)/(1+g)]-1 |  |  |  |  |  |  | 5.68\% |

The market cost of debt was developed based on market returns for utilities debt as reported in the Value Line Investment Survey. The market cost of equity was developed using the capital asset pricing model (CAPM) and the dividend-growth model (DGM). Input to these equity costing models were developed based on Value Line Investment Surveys for the water industry published for October 9, 2020 consisting of the following nine companies:

| Company |  |
| :--- | :--- |
| American States Water (NYSE-AWR) | Consolidated Water Company (NDQ- <br> CWCO) |
| American Water ((NYSE-AWK) | Middlesex Water (NDQ-MSEX) |
| Essential Utilities, Inc. (NYSE-WTRG) | SJW Corporation (NYSE-SJW) |
| California Water (NYSE-CWT) | York Water (NDQ-YORW) |
| In the January 2020 Issue Value Line dropped Connecticut Water (NDQ-CTWS) out <br> of its list of Water Utility Industry companies |  |

The Value Line data was also used to develop the market capital structure used in the WACC determination. The market required return analysis can be found in the Cost of Capital / Required Return tab.

The following table presents the results of the discounted cash flow analysis:


Based on the above-described discounted cash flow analysis, the Income Approach to value of the System's wastewater property and its operations was determined to be $\$ 57,872,959$. To ensure that the above-described forecast captured the entire economic returns of the property an additional 40-year period beyond the original 20-year forecast was made. This additional forecast indicated the reasonableness of the initial forecast results.

## Market Approach (Market Approach tab)

The market or comparable sales approach to value looks to market sales of comparable properties in order to arrive at value. In this appraisal, the market approach was addressed from a comparable sales approach using Pennsylvania water and wastewater
systems and market value to book value ratios based on investor-owned water utilities reported in Value Line Investment Survey.

Market Sales - In the comparable sales market approach the sales of Pennsylvania municipal water and wastewater systems to investor-owned water/wastewater utilities following the passage of Section 1329 were used to insure comparability. The following sales were considered:

## Lower Makefield Township

Bucks County PA
Investor-Owned Utility
As of September 17, 2020
Comparable Sales Approach
Market Sales Data

| RowlD | ApproximateDate | Buyer | City of McKeesport | CountyAllegheny | Type of Facility Wastewater Collection and | Initial Purchase Price | Final Purchase Price ${ }^{1}$ | Number of Total Customers | OCA |  | Average Purchase Price per Customer | AUS Market Value per customer |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  |  |  |  |  |  |  | Market <br> Value per customer | Relationship to the passage of Section 1329 |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |
| 1 | 6/1/2016 | PA American Water |  |  | Treatment | 180,000,000 | 159,000,000 | 21,953 | 7,197 | Post | 7,242.75 | 7,243 |
|  |  |  |  |  | Wastewater |  |  |  |  |  |  |  |
|  |  |  |  |  | Collection and Paid for |  |  |  |  |  |  |  |
| 2 | 8/1/2016 | Aqua PA | New Garden Twp. SA | Chester | and Owned Treatment | 29,500,000 | 29,500,000 | 2,106 | 14,008 | Post | 14,007.60 | 14,008 |
| 3 | 12/1/2017 | Aqua PA | Limerick Township | Montgomery |  | 64,373,000 | 64,373,000 | 5,434 | 11,846 | Post | 9,264 | 11,846 |
|  |  |  |  |  | Wastewater |  |  |  |  |  |  |  |
| 4 | 12/10/2017 | Aqua PA | East Bradford Township | Chester | Collection and paid for treatment Capacity | 5,000,000 | 5,000,000 | 1,248 | 4,006 | Post | 4,006.41 | 4,006 |
|  |  |  |  |  | Water Treatment and |  |  |  |  |  |  |  |
| 5 |  | suez | Mahoning | Carbon | Distribution System Wastewater Collection and | 4,734,800 | 4,734,800 | 2,806 |  | Post |  | 1,687 |
| 6 |  | SUEz | Mahoning | Carbon | Treatment | 4,765,200 | 4,765,200 | 2,806 |  | Post |  | 1,698 |
|  |  |  |  |  | Wastewater |  |  |  |  |  |  |  |
| 7 | 6/1/2018 | Aqua PA | Cheltenham | Montgomery | Collection | 50,250,000 | 50,250,000 | 10,500 |  | Post | 4,785.71 | 4,786 |
|  |  |  |  |  | Water Distribution |  |  |  |  |  |  |  |
| 8 | 11/14/2018 | PA American Water | Steelton | Dauphin | and Treatment Wastewater | 22,500,000 | 21,750,000 | 2,325 |  | Post | 9,354.84 | 9,355 |
| 9 |  | PA American Water | Sadsbury | Chester | Collection | 9,250,000 | 8,600,000 | 998 |  | Post | 8,617.23 | 8,617 |
|  |  |  |  |  | Wastewater |  |  |  |  |  |  |  |
|  |  |  |  |  | Collection and |  |  |  |  |  |  |  |
| 10 | 5/28/2018 | PA American Water | Exeter | Berks | Treatment | 96,000,000 | 96,000,000 | 9,000 |  | Post | 10,666.67 | 10,667 |
|  |  |  |  |  | Wastewater |  |  |  |  |  |  |  |
| 11 | 10/29/2018 | Aqua PA | East Norriton | Montgomery | Collection | 21,000,000 | 21,000,000 | 4,950 |  | Post | 4,242.42 | 4,242 |
|  |  |  |  |  | Wastewater |  |  |  |  |  |  |  |
|  |  |  |  |  | Collection and |  |  |  |  |  |  |  |
| 12 | 9/30/2018 | PA American | Kane | Mckean | Treatment | 17,560,000 | 17,560,000 | 2,006 |  | Post | 8,753.74 | 8,754 |
|  |  |  |  |  | Wastewater |  |  |  |  |  |  |  |
|  |  |  |  |  | Collection and |  |  |  |  |  |  |  |
| 13 | 12/10/2019 | PA American | Royersford | Montgomery | Treatment | 13,000,000 | 13,000,000 | 1,596 |  | Post | 8,145.36 | 8,145 |
|  |  |  |  |  | Water Treatment and |  |  |  |  |  |  |  |
| 14 | 12/17/2019 | PA American | Valley | Chester | Distribution System | 7,325,000 | 7,325,000 | 1,459 |  | Post | 5,020.56 | 5,021 |
| 15 | 12/17/2019 | PA American | Valley | Chester | Collection System | 13,950,000 | 13,950,000 | 1,644 |  | Post | 8,485.40 | 8,485 |
|  |  |  | Delaware County Regional |  | Wastewater |  |  |  |  |  |  |  |
|  |  |  | Water Quality Authority |  | Collection and |  |  |  |  |  |  |  |
| 16 | 12/31/2019 | Aqua PA | (DELCORA) | Delaware | Treatment | 276,500,000 | 276,500,000 | 16,473 |  | Post | 16,785.04 | 16,785 |
|  |  |  |  |  | Wastewater |  |  |  |  |  |  |  |
| 17 | 4/28/2020 | PA American Water | Upper Pottsgrove | Montgomery | Collection | 13,750,000 | 13,750,000 | 1,428 |  | Post | 9,628.85 | 9,629 |
|  |  |  | Notes: |  |  |  |  |  |  |  |  |  |

In order to arrive at a measure of comparability these system sales were analyzed in relationship of the purchase price to the properties' depreciated original cost (OCLD) and depreciated replacement cost (RCNLD) (Market Approach tab).

The following tables details the market sales analyses:

Purchase Price to Original Cost less Depreciation (OCLD)

```
Lower Makefield Township
Bucks County PA
Wastewater Collection System and Purchased Treatment Capacity
Investor-Owned Utility
As of September 17, }202
Comparable Sales Approach
```

Market Sales Analysis - PP/OCLD


Purchase Price to Replacement Cost New less Depreciation (CORLD)

Lower Makefield Township
Bucks County PA
Wastewater Collection System and Purchased Treatment Capacity
Investor-Owned Utility
As of September 17, 2020
Comparable Sales Approach
Market Sales Analysis - PP/CORLD


## Purchase Price to Customers

## Lower Makefield Township

Bucks County PA
Wastewater Collection System and Purchased Treatment Capacity Investor-Owned Utility
As of September 17, 2020
Comparable Sales Approach
Market Sales Analysis - PP/Customer

| Property Acquired | System Type | $\begin{gathered} \text { Asset Purchase } \\ \text { Agreement (APA) } \\ \text { Date } \end{gathered}$ | Purchase Price (PP) | Proportion of Purchase Price to Total | \$Customers | Purchase Price to Customers | Variance to Simple Mean | Variance to Wtd Mean | Variance Squared | Frequency Wtd PP/Customer |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| New Garden Wastewater System | Wastewater | 2016.59 | 29,500,000 | 4\% | 2,100 | 14,048 | 5,968 | 2,531 | 6,405,961 | 506.75 |
| McKeesport Wastewater System | Wastewater | 2016.67 | 159,000,000 | 19\% | 20,320 | 7,825 | (255) | $(3,692)$ | 13,630,864 | 1,521.40 |
| Limerick Wastewater System | Wastewater | 2018.57 | 75,100,000 | 9\% | 5,434 | 13,820 | 5,740 | 2,303 | 5,303,809 | 1,269.14 |
| Mahoning Water System | Water | 2017.79 | 4,734,800 | 1\% | 2,806 | 1,687 | $(6,393)$ | $(9,830)$ | 96,628,900 | 9.77 |
| Mahoning Wastewater System | Wastewater | 2017.79 | 4,765,200 | 1\% | 2,806 | 1,698 | $(6,382)$ | $(9,819)$ | 96,412,761 | 9.89 |
| East Bradford Wastewater Collection System | Wastewater | 2017.97 | 5,000,000 | 1\% | 1,248 | 4,006 | $(4,074)$ | $(7,511)$ | 56,415,121 | 24.49 |
| Sadsbury Wastewater Collection System | Wastewater | 2019.19 | 8,600,000 | 1\% | 998 | 8,617 | 537 | $(2,900)$ | 8,410,000 | 90.62 |
| Exeter Wastwater Collection System | Wastewater | 2018.41 | 96,000,000 | 12\% | 9,000 | 10,667 | 2,587 | (850) | 722,500 | 1,252.20 |
| Steelton Water System | Water | 2018.87 | 21,750,000 | 3\% | 2,412 | 9,017 | 937 | $(2,500)$ | 6,250,000 | 239.82 |
| Cheltenham Wastewarer Collection System | Wastewater-collection | 2018.42 | 50,250,000 | 6\% | 10,219 | 4,917 | $(3,163)$ | $(6,600)$ | 43,560,000 | 302.13 |
| East Norriton Wastewater | Wastewater-collection | 2018.76 | 21,000,000 | 3\% | 4,952 | 4,241 | $(3,839)$ | $(7,276)$ | 52,940,176 | 108.91 |
| Kane Wastewater | Wastewater | 2019.75 | 17,560,000 | 2\% | 2,006 | 8,754 | 674 | $(2,763)$ | 7,634,169 | 187.97 |
| Royersford Wastewater | Wastewater | 2019.94 | 13,000,000 | 2\% | 1,596 | 8,145 | 65 | $(3,372)$ | 11,370,384 | 129.48 |
| Valley Water | Water | 2019.96 | 7,325,000 | 1\% | 1,459 | 5,021 | $(3,059)$ | $(6,496)$ | 42,198,016 | 44.97 |
| Valley Wastewater | Wastewater | 2019.96 | 13,950,000 | 2\% | 1,644 | 8,485 | 405 | $(3,032)$ | 9,193,024 | 144.74 |
| Delaware County Regional Water Quality |  |  |  |  |  |  |  |  |  |  |
| Authority (DELCORA) | Wastewater | 2020.00 | 276,500,000 | 34\% | 16,473 | 16,785 | 8,705 | 5,268 | 27,751,824 | 5,675.15 |
| Upper Pottsgrove | Wastewater-collection | 2020.33 | 13,750,000 | 2\% | 1,428 | 9,629 | 1,549 | $(1,888)$ | 3,564,544 | 161.90 |
|  |  |  | 817,785,000 | 100\% | 86,901 | 9,411 |  |  |  | 11,679.33 |
| Simple Mean |  |  |  |  |  | 8080 |  |  |  |  |
| Standard Deviation |  |  |  |  |  | 4113 |  |  |  |  |
| SimpleMedian |  |  |  |  |  | 8,485 |  |  |  |  |
| Simple Mode |  |  |  |  |  | Not Applicable |  |  |  |  |
| Weighted Mean |  |  |  |  |  | 11517 |  |  |  |  |
| Standard Deviation |  |  |  |  |  | 4413 |  |  |  |  |
| Wtd Median |  |  |  |  |  | 9,857 |  |  |  |  |
| Wtd Mode |  |  |  |  |  | 7825 |  |  |  |  |
| Forecast |  | 2019.944064 |  |  |  | 7,251 |  |  |  |  |
|  |  | 2021 |  |  |  | 7,139 |  |  |  |  |

## Purchase Price to Cash Flows (EBITDA)

```
Lower Makefield Township
Bucks County PA
Wastewater Collection System and Purchased Treatment Capacity
Avestor-Owned Utility
As of September 17, 2020
Comparable Sales Approach
Market Sales Analysis - PP/Cash Flow (EBITDA)
```



Financial Market Ratios - In the market approach based on market financial ratios the market data of companies (nine) in the water industry as reported in Value Line Investment Surveys (April 2020) were analyzed. In the analysis the companies' stock (market) and debt (book) per share are compared as a ratio to the book value per share which is detailed in the following table:

Lower Makefield Township
Bucks County PA
Wastewater Collection System and Purchased Treatment Capacity
Investor-Owned Utility
September 17, 2020
Comparable Sales Approach

| Financial Basis ${ }^{1}$ |  |  |  |  |  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | Price per Share | Book value per share | Market to <br> Book <br> Equity <br> Ratio | Debt (Total) \$s millions | Outstanding <br> Shares <br> (millions) | Market Equity (Total) \$s millions | Debt per share | Equity (Total) \$s millions | Total <br> Capital <br> (Debt + <br> Equity) | Market Value per Share (Equity+D ebt) | Book Value per Share (Equity+D ebt) | Market to Book (Total Capital) Ratio |
| American States Water | 74.33 | 17.15 | 4.33 | 330.3 | 36.883874 | 2,741.6 | 8.96 | 632.6 | 962.9 | 83.29 | 26.11 | 3.19 |
| American Water | 144.55 | 35.4 | 4.08 | 10578 | 181.204068 | 26,193.0 | 58.38 | 6,414.6 | 16,992.6 | 202.93 | 93.78 | 2.16 |
| California Water | 43.55 | 15.7 | 2.77 | 1182.3 | 49.398 | 2,151.3 | 23.93 | 775.5 | 1,957.8 | 67.48 | 39.63 | 1.7 |
| Consolidated Water Company | 10.74 | 10.65 | 1.01 | 0.1 | 15.112049 | 162.3 | 0.01 | 160.9 | 161.0 | 10.75 | 10.66 | 1.01 |
| Essential Utilities, Inc. | 39.93 | 19 | 2.1 | 5277.4 | 245.151093 | 9,788.9 | 21.53 | 4,657.9 | 9,935.3 | 61.46 | 40.53 | 1.52 |
| Middlesex Water | 62.37 | 16.15 | 3.86 | 282.7 | 17.464795 | 1,089.3 | 16.19 | 282.1 | 564.8 | 78.56 | 32.34 | 2.43 |
| SJW Corporation | 61.23 | 32.35 | 1.89 | 1338.4 | 28.516705 | 1,746.1 | 46.93 | 922.5 | 2,260.9 | 108.16 | 79.28 | 1.36 |
| York Water | 43.39 | 11.15 | 3.89 | 103.1 | 13.033999 | 565.5 | 7.91 | 145.3 | 248.4 | 51.3 | 19.06 | 2.69 |
| Total Industry |  |  | 3.18 | 19,092.3 |  | 44,438.0 |  | 13,991.4 | 33,083.7 |  |  | 1.92 |
| Summary |  |  |  |  |  |  |  |  |  |  |  |  |
| Minimum |  |  | 1.01 |  |  |  |  |  |  |  |  | 1.01 |
| Mean |  |  | 2.99 |  |  |  |  |  |  |  |  | 2.01 |
| Standard Deviation |  |  | 1.15 |  |  |  |  |  |  |  |  | 0.69 |
| Wtd Mean |  |  | 3.18 |  |  |  |  |  |  |  |  | 1.92 |
| Median |  |  | 3.32 |  |  |  |  |  |  |  |  | 1.93 |
| Maximum |  |  | 4.33 |  |  |  |  |  |  |  |  | 3.19 |
| Conclusion |  |  |  |  |  |  |  |  |  |  |  |  |
| Wtd Mean |  |  | 3.18 |  |  |  |  |  |  |  |  | 1.92 |
| Median |  |  | 3.32 |  |  |  |  |  |  |  |  | 1.93 |
| Use |  |  | 3.18 |  |  |  |  |  |  |  |  | 1.92 |

Note:
Source: Value Line Investment Survey as of 10/01/2020

The following table summarizes both the comparable sales and financial market ratio analysis and the Market Approach conclusion of this appraisal:

## Lower Makefield Township

Bucks County PA
Wastewater Collection System and Purchased Treatment Capacity
Investor-Owned Utility
As of September 17, 2020
Comparable Sales Approach
Market Sales Data
Central Tendancy and Reliability Analysis


5,000 Info

## Lower Makefield Township Customers

Market Value Indication

| Market Sales Analysis - PP/Cash Flows (EBITDA) |  |
| :--- | :---: |
|  | Simple |
| Mean | 19 |
| Standard Deviation | 10.15 |
| Median |  |
| Mode |  |
| Forecast | Not Applicable |
|  |  |


| Type of Utility |  |
| :--- | :--- |
| Water | 13.8 |
| Wastewater | 25.8 |
| Wastewater-collection | 16.11 |
| All | 19.8 |

Conclusion

Lower Makefield Township Cash Flows
11,151 AUS Input Lower Makefield Township OCLD
20,644,920 - oclo 55,741,285

The market approach conclusion of this appraisal was determined to be $\$ 55,741,285$.

Cost Approach Revisited - Before concluding this appraisal's fair market value, the preliminary cost approach conclusion of $\$ 50,945,473$ needs to be evaluated to determine if external obsolescence exists in the preliminary replacement cost new less depreciation conclusion of $\$ 50,945,473$. The appraisal literature regarding developing a cost approach state:

> "The last step in the implementation of the cost approach is to estimate economic obsolescence. Economic obsolescence (sometimes called "external obsolescence") has been previously defined as the loss in value or usefulness of a property caused by factors external to the asset. These factors include increased cost of raw materials, labor, utilities (without an offsetting increase in product price); reduced demand for the product; increased competition; environmental or other regulations; or similar factors.
> The difficulty in measuring the full effect of economic obsolescence is one of the weaknesses of the cost approach. Because economic obsolescence is usually a function of outside influences that affect an entire business (i.e., all tangible and intangible assets) rather than individual assets or isolated groups of assets, it is sometimes measured using the income approach or by using the income approach to help identify the existence of economic influences on value. However, the cost approach can be used to measure some forms of economic obsolescence."15

The above-described income approach value conclusion of \$57,872,959 and the market approach conclusion of $\$ 55,741,285$ for the Lower Makefield Township's future wastewater system compared to the preliminary cost approach conclusion of $\$ 51,414,555$ indicates no significant external obsolescence exists in the cost approach conclusion of $\$ 51,414,555$ detailed as follows:

[^6]```
Lower Makefield Township
Bucks County PA
Wastewater Collection System and Purchased Treatment Capacity
Investor-Owned Utility
As of September 17, }202
```



Therefore, the preliminary cost approach conclusion of $\$ 51,414,555$ can be considered the final cost approach conclusion as follows:
Lower Makefield Township
Bucks County PA
Wastewater Collection System and Purchased Treatment Capacity
Investor-Owned Utility
As of September 17, 2020

## Fair Market Value

| (36) | (37) | (39) | (40) | (41) |
| :---: | :---: | :---: | :---: | :---: |
| Account | Description | Preliminary Cost Approach | Economic Obsolescence | Fair Market Value |
|  |  | CORLD \$s | \% of Preliminary Cost Approach | Appraisal Date Value \$s |
| Input | Input | Calculation | Input <br> AUS Economic Obsolescence | Calculation |
| Eng Assmnt | Eng Assmnt | Col (31) | Analysis | (39) * [1.00-Col (40)] |
| Account | Lescription | Prelim CORLD | EO\% | FMV |
| 353.20 |  | 470,288 | 0.00\% | 470,288 |
| 354.20 | Stuctures \& Improvements - Pumping | 3,437,713 | 0.00\% | 3,437,713 |
| 354.40 | Stuctures \& Improvements - Treatment | 4,426,880 | 0.00\% | 4,426,880 |
| 355.20 | Generating Equipment - Pumping | 175,802 | 0.00\% | 175,802 |
| 356.20 | Pump StationPower Protection \& Control Devices | 323,847 | 0.00\% | 323,847 |
| 359.20 | Collection Sewers - Low Pressure | 359,342 | 0.00\% | 359,342 |
| 360.20 | Collection Sewers - Force - Mains | 1,318,147 | 0.00\% | 1,318,147 |
| 361.20 | Collection Sewers - Gravity - Mains | 36,015,322 | 0.00\% | 36,015,322 |
| 363.20 | Service Laterals | 3,663,419 | 0.00\% | 3,663,419 |
| 363.21 | Flow Measuring Devices | 206,548 | 0.00\% | 206,548 |
| 371.20 | Pumping Equipment | 1,017,249 | 0.00\% | 1,017,249 |
|  |  | 51,414,555 |  | 51,414,555 |
| Grand |  |  |  |  |
| Total | Grand Total | 51,414,555 | 0.00\% | 51,414,555 |

Grand Total
51,414,555
51,414,555

Value Conclusion

The Fair Market Value of the Lower Makefield Township's, Pennsylvania's wastewater property, plant and equipment and its operation were determined to be $\$ 54,430,591$ as follows:

# Lower Makefield Township <br> Bucks County PA <br> Wastewater Collection System and Purchased Treatment Capacity <br> Investor-Owned Utility <br> As of September 17, 2020 

Fair Market Value Appraisal
\(\left.$$
\begin{array}{|lll|}\hline \text { Appraisal Approach } & \begin{array}{c}\text { Investor-owned } \\
\text { Utility }\end{array} & \text { Weight }\end{array}
$$ \begin{array}{c}Wtd Valuation <br>

Indications\end{array}\right]\)| Cost Approach |  |  |  |
| :--- | :--- | :--- | :--- |
|  |  |  |  |
|  |  |  |  |
| Inventory of Assets | $32,003,924$ |  |  |
| Original Cost (\$OC) | $20,644,920$ |  |  |
| Depreciated Original Cost (\$OCLD)     <br> Replacement Cost     <br> Replacement Cost New (COR) $96,986,192$    <br> Depreciated Replacement Cost New (CORLD) $\$$ $51,414,555$   <br> Cost Approach Conclusion $51,414,555$ $\mathbf{5 0 \%}$   |  |  |  |


| Income Approach |  |  |  |
| :--- | :--- | :--- | :--- |
| Required Rate Increases: 22\% period 3, 15\% |  |  |  |
| period 6, 10\% period 9, and 6\% every 3rd year |  |  |  |
| beginning in period 12 (Input 6) | $57,872,959$ |  |  |
| Income Approach Conclusion |  |  |  |


| Market Approach |  |  |  |  |
| :--- | :--- | :--- | :--- | :---: |
| Market Comparables (to) | $36,541,509$ |  |  |  |
| OCLD | $43,188,226$ |  |  |  |
| CORLD | $55,755,000$ |  |  |  |
| Customers | $59,838,915$ |  |  |  |
| Cash Flows (EBITDA) | $55,741,285$ |  |  |  |
| Market Financials (to) |  |  |  |  |
| OCLD | $\mathbf{5 5 , 7 4 1 , 2 8 5}$ | $\mathbf{1 0 \%}$ | $\mathbf{5 , 5 7 4 , 1 2 9}$ |  |
| Market Approach Conclusion |  |  |  |  |
|  |  |  |  |  |
| Appraisal Conclusion | $\mathbf{5 4 , 4 3 0 , 5 9 1}$ | $\mathbf{1 0 0 \%}$ | $\mathbf{5 4 , 4 3 0 , 5 9 1}$ |  |

As the purpose of this appraisal was to fulfill the requirements of Section 1329 of the PA CS in the establishment of value for rate making of the Lower Makefield Township's wastewater collection system's property, plant and equipment this appraisal's conclusion of $\$ 54,430,591$ is consistent with the purpose of the appraisal. As the cost approach work papers detail our value conclusion by National Association of Regulatory Utility Commissioners' (NARUC) Uniform System of Accounts (USOA) for the water industry account classifications and the installation year of the property, this detail can be used to allocate the appraisal conclusion to establish the booked value for future accounting and rate making.

# Compliance with Uniform Standards of Professional Appraisal Practice (USPAP) 2020-2021 Fulfillment of Requirements for a Personal Property Appraisal and Report 

- State the identity of the client and any intended users, by name or type: Lower Makefield Township, PA, Aqua Pennsylvania Wastewater, Inc., and the Pennsylvania Public Utility Commission
- State the intended use of the appraisal

To establish the Fair Market Value of Lower Makefield Township's (PA) Wastewater Collection System and purchased Treatment Capacity (System).

- Describe information sufficient to identify the property, real, personal, and intangible, involved in the appraisal, including the physical and economic property characteristics relevant to the assignment.

The system consists of collection mains and laterals of various sizes and types, pumping structures, improvements and equipment, and purchased treatment capacity. The property is in good condition based on physical inspections and reviews or operating statements. The property is an operating wastewater system the economics of which were analyzed based on seven years of operating financials which were incorporated into the income approach to value analysis in this appraisal.

- State the real property interests appraised

The system's land and land rights agreements necessary to access its property.

- State the type and definition of value and city the source of the definition, including whether the opinion of value is in terms of cash or of financing terms equivalent to cash, or based on non-market financing or financing with unusual conditions or incentives
o Market Value definition:
"The most probable price, as of a specified date, in cash, or in terms equivalent to cash, or in other precisely revealed terms, for which the specified property rights should sell after reasonable exposure in a competitive market under all conditions requisite to a fair sale, with the buyer and seller each acting prudently, knowledgeably, and for selfinterest, and assuming that neither is under undue duress." The Appraisal of Real Estate, $12^{\text {th }}$ Edition, page 22.
- State the effective date of the appraisal and the date of the report The effective date of the appraisal is September 17, 2020 and the appraisal report date is April 7, 2021.
- Describe sufficient information to disclose to the client and any other intended users of the appraisal the scope of work used to develop the appraisal


# Compliance with Uniform Standards of Professional Appraisal Practice (USPAP) 2020-2021 Fulfillment of Requirements for a Personal Property Appraisal and Report 

The appraisal considered all three approaches to value: the cost, income ${ }^{1}$ and market. Briefly the scopes of work for each are as follows:

Cost Approach - The cost approach utilized the trended cost method utilizing the investment inventory developed by Ebert Engineering, Inc. Engineers Assessment. The Handy Whitman Index of Public Utility Construction Costs for the water industry were used in the trending. Depreciation was assessed based on straight line age-life depreciation method based on service life expectation for each of the various account categories.

Income Approach - The income approach utilized the discounted cash flow (DCF) method that facilitates the development of cash flows from operations as the property migrates from municipal operation to a regulated investor-owned operation. The Township's operating experience was analyzed (2018-2019) in order to estimate the initial cash flows. Future customer tariff rates address the rates agreed to by the parties in the Asset Purchase Agreement between the parties. The operations were forecast for 19 periods in the future and a $20^{\text {th }}$ period which is intended to reflect operation beyond that time. The discount rate was developed based on market debt and equity rates at the appraisal date.

Market Approach - The market approach was developed based on market comparable sales of Pennsylvania wastewater properties and market to book ratios developed for the water industry based on information published by Value Line Investment Surveys at the appraisal date.

Valuation Approaches Reconciliation - The appraisal conclusion was based on reconciliation of each of the approaches and the intended purpose of the appraisal.

- Clearly and conspicuously:
o State all extraordinary assumptions and hypothetical conditions.
There were no extraordinary assumptions or hypothetical conditions in this appraisal.
o State that their use might have affected the assignment results
Not applicable.
- Clearly and accurately disclose all assumptions, extraordinary assumptions, hypothetical conditions, and limiting conditions used in the assignment

[^7]
# Compliance with Uniform Standards of Professional Appraisal Practice (USPAP) 2020-2021 Fulfillment of Requirements for a Personal Property Appraisal and Report 

Not applicable.

- Describe the information analyzed, the appraisal procedures followed, and the reasoning that supports the analyses, opinions, and conclusions

See scope of work above.

- State the use of the real estate existing as of the date of value and the use of the real estate reflected in the appraisal - when reporting an opinion of market value, describe the support and rationale for the appraiser's opinion of the highest and best use of the real estate
- State and explain any permitted departures from specific requirements of STANDARD 1 and the reason for excluding any of the usual valuation approaches. The appraisal then becomes a limited appraisal - a limited appraisal report must contain a prominent section that clearly identifies the extent of the appraisal process performed and the departures taken

No departures for Standard 1 were made.

- Include a signed certification in accordance with Standards Rule 2-3

Contained in Narrative Report.

# Compliance with Uniform Standards of Professional Appraisal Practice (USPAP) 2020-2021 Fulfillment of Requirements for a Personal Property Appraisal and Report 

AUS Consultants, Valuation and Depreciation Services Group certify that, to the best of its knowledge and belief:

The statements of fact contained in this report are true and correct.
The reported analyses, opinions, and conclusions are limited only by the reported assumptions and limiting conditions, and are our personal, impartial, and unbiased professional analyses, opinions, and conclusions.

AUS Consultants, Valuation and Depreciation Services Group has not performed an appraisal of the Upper Pottsgrove Township's sanitary wastewater collection system previously in the last three year.

AUS Consultants, Valuation and Depreciation Services Group, nor its professional staff has any present or prospective interest in the property that is the subject of this report and has no interest or bias with respect to the parties involved.

We have no bias with respect to the property that is the subject of this report or to the parties involved with this assignment.

Our engagement in this assignment is not contingent upon developing or reporting predetermined results.

Our compensation for completing this assignment is not contingent upon the development or reporting of a predetermined value or direction in value that favors the cause of the client, the amount of the value opinion, the attainment of a stipulated result, or the occurrence of a subsequent event directly related to the intended use of this appraisal.

Our analyses, opinions, and conclusions were developed, and this report has been prepared, in conformity with the Uniform Standards of Professional Appraisal Practice 2020-2021.

The signers of this report have not made a personal inspection of the property that is the subject of this report.

Individuals providing significant appraisal assistance to the person signing this certification include Scott Shearer of PFM Financial Advisors, LLC who provided access to the information from the Lower Makefield Township data room and the Engineer's Assessment report prepared by Ebert Engineering, Inc. which was the inventory starting point of the Cost Approach.

## Compliance with Uniform Standards of Professional Appraisal Practice (USPAP) 2020-2021 <br> Fulfillment of Requirements for a Personal Property Appraisal and Report

AUS Consultants, Depreciation \& Valuation
By:

| Germe CWeinest | Boc.sother |
| :---: | :---: |
| Jerome C. Weinert, AM, P.E., CDP <br> Principal and Director | David A. Sheffer Principal |
| Uld't. y | sinatuos |
| Michael J. Diedrich, ASA, P.E., CDP <br> Certified General Appraiser Principal | Elizabeth A. Weinert Associate |

ASA: Accredited Senior Appraiser in the Machinery and Equipment (Public Utilities) discipline of the American Society of Appraisers
AMA: Accredited Member Appraiser in the Machinery and Equipment (Public Utilities) discipline of the American Society of Appraisers
P.E.: Registered Professional Engineer State of Wisconsin

CDP: Certified Depreciation Professions in the Society of Depreciation Professionals

## Curriculum Vitae (CV) of Jerome C. Weinert, P.E., CDP, ASA

Mr. Weinert is currently Principal and Director of AUS Consultants, Depreciation and Valuation. He has forty-nine (2021-1972) years' experience in valuation and depreciation consulting and management. AUS, with offices across the country, has provided consulting services to the regulated utility industry nationally for over thirty-nine years. A partial list of services provided includes valuations depreciation studies, rate of return studies, cost of service studies, and rate design.

Prior to joining AUS in 1987, Mr. Weinert was employed by American Appraisal Associates, Inc. (American) for sixteen years in their Regulated Industries Group. He held various positions at American, the last being supervising appraiser. Among his other valuation responsibilities, he directed the firm's utility industry capital recovery studies and AUS Consultant's valuation of communication company assets and businesses.

Mr. Weinert graduated from the Milwaukee School of Engineering with a Bachelor of Science degree in Mechanical Engineering and received a master's in business administration from Marquette University. He is a registered professional engineer (1976) (by examination) in the state of Wisconsin as well as a senior member (1982) of the American Society of Appraisers in the public utility valuation field. This latter designation is obtained by written examination primarily in the areas of utility valuation, depreciation, and the economics of regulated firms. He is also a Certified Depreciation Professional (1997) (CDP) and founding member of the Society of Depreciation Professionals and the Society's 1995 President and sponsor of the Society's Certification and re-certification program as such Mr. Weinert developed these programs and oversaw their initial introduction into the Society. He also worked in conjunction with Society members in the development of the Society's training programs which as of 2003 has become the only such formalized depreciation training program in the North America and is an instructor in several of its courses.

During his professional career related to valuations and depreciation matters Mr. Weinert has testified before various courts and public service commissions on these subjects. He has also assisted numerous utilities in preparing capital recovery plans which specifically address the issues of plant replacement. Mr. Weinert has also presented expert testimony on valuation matters. Mr. Weinert has testified before the Pennsylvania Public Utility Commission on regulatory matters associated with Pennsylvania Section 1329 matters. On matters related to eminent domain issues, Mr. Weinert has presented expert testimony in the Massachusetts Superior Court, the Court of Common Pleas, Fayette County, Ohio, the New Hampshire Public Utilities Commission, the Twentieth Judicial Court (deposition only) in Charlotte County, Florida, the Nineteenth Judicial Circuit Court in St. Lucie County, Florida (deposition only). In regard to ad valorem taxation, Mr. Weinert has presented study results to the New York State Board of Equalization and Assessment (now the New York Office of Real Property Services (NY ORPS)), pertaining to useful life and net salvage values for all types of utility property subject to the Board's mass appraisal model. Mr. Weinert has appeared before the Valuation Adjustment Board in Florida for Duval, Hillsborough, Okeechobee, and Palm Beach counties, the Twelfth Judicial Circuit Sarasota County, Florida, the California Board of Equalization and Assessment, the Arizona Board of Assessment, the Missouri Board of Taxation, the Colorado and Texas Departments of Review, the Massachusetts Tax Appeal Court, the Superior Court of the State of Arizona in the County of Maricopa, the State Tax Appeal Board of the State of Montana, the New York City Tax Commission and the Public Utility Commission of Pennsylvania Section 1329 hearings (8).

Mr. Weinert has appeared before regulatory bodies in Alaska, Arkansas, Illinois, Indiana, Iowa, Missouri, Nevada, Nebraska, North Carolina, Ohio, Oregon, Pennsylvania, and South Carolina in support of ratebase valuation determination and capital recovery. He has presented testimony on depreciation matters before the Canadian Radio-Television and Telecommunications Commission (CRTC) and the United

QUALIFICATIONS 1

States Federal Energy Regulatory Commission (FERC). In terms of water and wastewater acquisitions and applications for regulatory approval of rate base Mr. Weinert has testified for two investor-owned acquisitions of municipal wastewater authorities one representing the municipality and secondly for the acquiring investor-owned utility. He has submitted study results to the State Commissions of Alabama, Alaska, Arkansas, Idaho, Illinois, Indiana, Iowa, Kentucky, Michigan, Minnesota, Mississippi, Missouri, Montana, Nebraska, North Carolina, Oregon, Pennsylvania, South Carolina, Washington, and Wisconsin, and the Federal Communications Commission.

Mr. Weinert has presented papers on valuation and depreciation topics to professional and utility industry trade organizations. He also directed AUS Consultants' semi-annual week-long depreciation training programs (1988-1997). These specialized training courses, offered at basic and advanced levels, teach depreciation study techniques to public utility and public service commission staff specialists. The training includes depreciation theory and concepts and hands-on experience with personal computerbased analytical depreciation programs.

## Appraisal \& Capital Recovery Activities Client List

| Property |  | Study <br> Year | Year <br> Performed | Activity |
| :--- | :--- | :--- | :--- | :--- |
|  |  |  |  |  |
| North America | 2020 | 2021 |  |  |
| California | 2020 | 2021 | Ad Valorem Tax Appraisal |  |
| Florida | 2020 | 2021 | Ad Valorem Tax Appraisal |  |
| North America | 2020 | 2021 | Ad Valorem Tax Appraisal |  |
|  |  |  |  |  |


| Company |
| :--- |
| $\mathbf{2 0 2 1}$ |
| AT\&T Communications |
| AT\&T Communications |
| AT\&T Communications |
| Verizon Business (formerly MCI) |

## 2020

AT\&T Communications AT\&T Communications AT\&T Communications
AT\&T - Indiana Bell Telephone Company Verizon New York, Inc.
Verizon Business (formerly MCI)
East Norriton Township, PA
Pennsylvania American Water Company Pennsylvania American Water Company
Pennsylvania American Water Company
Pennsylvania American Water Company
Lehigh County Authority
Pennsylvania American Water Company

## 2019

AT\&T Communications
AT\&T Communications
AT\&T Communications
AT\&T - Indiana Bell Telephone Company Embarq Florida, Inc.
Verizon Business (formerly MCI)
Cheltenham Township, PA
Pennsylvania American Water Company
Pennsylvania American Water Company

| North America | 2019 | 2020 |
| :--- | :--- | :--- |
| California | 2019 | 2020 |
| Florida | 2019 | 2020 |
| Indiana | 2019 | 2020 |
| New York | 2019 | 2020 |
| North America | 2019 | 2020 |
| East Norriton Wastewater | 2019 | 2020 |
| Kane Wastewater | 2019 | 2020 |
| Royersford Wastewater | 2019 | 2020 |
| Valley Wastewater | 2019 | 2020 |
| Valley Water | 2019 | 2020 |
| Allentown Water \& Sewer | 2020 | 2020 |
| Upper Pottsgrove wastewater2020 | 2020 |  |

Ad Valorem Tax Appraisal Ad Valorem Tax Appraisal Ad Valorem Tax Appraisal Ad Valorem Tax Appraisal Ad Valorem Tax Appraisal Ad Valorem Tax Appraisal Fair Market Value 1329
Fair Market Value 1329
Fair Market Value 1329
Fair Market Value 1329
Fair Market Value 1329

## Financing

Fair Market Value 1329

## 2018

AT\&T Communications
AT\&T Communications
AT\&T Communications
AT\&T - Indiana Bell Telephone Company
Embarq Florida, Inc.
Verizon Business (formerly MCI)
Level 3 Communications, LLC
Level 3 Communications, LLC
CenturyLink Communications, LLC
CenturyLink Communications, LLC
East Bradford Township, PA
Pennsylvania American Water Company
Pennsylvania American Water Company
Appraisal

| North America | 2018 | 2019 |
| :--- | :--- | :--- |
| California | 2018 | 2019 |
| Florida | 2018 | 2019 |
| Indiana | 2018 | 2019 |
| Florida | 2018 | 2019 |
| North America | 2018 | 2019 |
| Cheltenham Wastewater | 2018 | 2019 |
| Steelton Water | 2018 | 2019 |
| Exeter Wastewater | 2018 | 2019 |

Ad Valorem Tax Appraisal Ad Valorem Tax Appraisal Ad Valorem Tax Appraisal Ad Valorem Tax Appraisal Ad Valorem Tax Appraisal Ad Valorem Tax Appraisal Fair Market Value 1329
Fair Market Value 1329
Fair Market Value 1329

| North America | 2017 | 2018 |
| :--- | :--- | :--- |
| California | 2017 | 2018 |
| Florida | 2017 | 2018 |
| Indiana | 2017 | 2018 |
| Florida | 2017 | 2018 |
| North America | 2017 | 2018 |
| North America | 2017 | 2018 |
| California | 2017 | 2018 |
| North America | 2017 | 2018 |
| California | 2017 | 2018 |
| East Bradford Wastewater | 2018 | 2018 |
| Sadsbury Wastewater | 2017 | 2018 |
| Kane Wastewater | 2017 | 2018 |

Ad Valorem Tax Appraisal Ad Valorem Tax Appraisal Ad Valorem Tax Appraisal Ad Valorem Tax Appraisal Ad Valorem Tax Appraisal Ad Valorem Tax Appraisal Ad Valorem Tax Appraisal Ad Valorem Tax Appraisal Ad Valorem Tax Appraisal Ad Valorem Tax Appraisal Fair Market Value 1329 Fair Market Value Appraisal Fair Market Value

## Appraisal \& Capital Recovery Activities Client List

| Company |
| :--- |
|  |
| $\mathbf{2 0 1 7}$ |
| AT\&T Communications |
| AT\&T Communications |
| AT\&T Communications |
| AT\&T - Indiana Bell Telephone Company |
| Embarq Florida, Inc. |
| Verizon Communications |
| Verizon Business (formerly MCI) |
| Level 3 Communications |
| Level 3 Communications |
| Whitpain Township, PA |
| Plymouth Township, PA |
| East Norriton Township, PA |
| Pennsylvania American Water Company |
| Pennsylvania American Water Company |
| Intermountain Gas Company |
|  |
| $\mathbf{2 0 1 6}$ |
| AT\&T Communications |
| AT\&T Communications |
| AT\&T Communications |
| AT\&T - Indiana Bell Telephone Company |
| Embarq Florida, Inc. |
| Verizon Communications |
| Verizon Business (formerly MCI) |
| Level 3 Communications |
| Level 3 Communications |
| New Garden Township, PA |


| Property |  | Study Year | Year Performed | Activity |
| :---: | :---: | :---: | :---: | :---: |
| North America | 2016 |  | 2017 | Ad Valorem Tax Appraisal |
| California | 2016 |  | 2017 | Ad Valorem Tax Appraisal |
| Florida | 2016 |  | 2017 | Ad Valorem Tax Appraisal |
| Indiana | 2016 |  | 2017 | Ad Valorem Tax Appraisal |
| Florida | 2016 |  | 2017 | Ad Valorem Tax Appraisal |
| Florida | 2016 |  | 2017 | Ad Valorem Tax Appraisal |
| North America | 2016 |  | 2017 | Ad Valorem Tax Appraisal |
| North America | 2016 |  | 2017 | Ad Valorem Tax Appraisal |
| California | 2016 |  | 2017 | Ad Valorem Tax Appraisal |
| Whitpain Wastewater | 2016 |  | 2017 | Appraisal for Planning |
| Plymouth Wastewater | 2016 |  | 2017 | Appraisal for Planning |
| East Norriton Wastewater | 2016 |  | 2017 | Appraisal for Planning |
| Sadsbury Wastewater | 2016 |  | 2017 | Fair Market Value Appraisal |
| McKeesport Wastewater | 2016 |  | 2017 | Fair Market Value Appraisal |
| Idaho | 2016 |  | 2017 | Depreciation Study |
| North America | 2015 |  | 2016 | Ad Valorem Tax Appraisal |
| California | 2015 |  | 2016 | Ad Valorem Tax Appraisal |
| Florida | 2015 |  | 2016 | Ad Valorem Tax Appraisal |
| Indiana | 2015 |  | 2016 | Ad Valorem Tax Appraisal |
| Florida | 2015 |  | 2016 | Ad Valorem Tax Appraisal |
| Florida | 2015 |  | 2016 | Ad Valorem Tax Appraisal |
| North America | 2015 |  | 2016 | Ad Valorem Tax Appraisal |
| North America, | 2015 |  | 2016 | Ad Valorem Tax Appraisal |
| California | 2015 |  | 2016 | Ad Valorem Tax Appraisal |
| New Garden Wastewater | 2016 |  | 2016 | Fair Market Value Appraisal |

## 2015

AT\&T Communications
AT\&T Communications
AT\&T Communications
AT\&T - Indiana Bell Telephone Company
Embarq Florida, Inc.
Verizon Communications
Verizon Business (formerly MCI)
Level 3 Communications
Level 3 Communications
Verizon Wireless

| North America | 2014 | 2015 |
| :--- | :--- | :--- |
| California | 2014 | 2015 |
| Florida | 2014 | 2015 |
| Indiana | 2014 | 2015 |
| Florida | 2014 | 2015 |
| Florida | 2014 | 2015 |
| North America | 2014 | 2015 |
| North America, | 2014 | 2015 |
| California | 2014 | 2015 |
| Nationwide | 2014 | 2015 |

## 2014

AT\&T Communications
AT\&T Communications
AT\&T Communications
AT\&T - Indiana Bell Telephone Company
Embarq Florida, Inc.
Verizon Communications
Verizon Business (formerly MCI)
Level 3 Communications

| North America | 2013 | 2014 |
| :--- | :--- | :--- |
| California | 2013 | 2014 |
| Florida | 2013 | 2014 |
| Indiana | 2013 | 2014 |
| Florida | 2013 | 2014 |
| Florida | 2013 | 2014 |
| North America | 2013 | 2014 |
| North America, | 2013 | 2014 |

Ad Valorem Tax Appraisal Ad Valorem Tax Appraisal Ad Valorem Tax Appraisal Ad Valorem Tax Appraisal Ad Valorem Tax Appraisal Ad Valorem Tax Appraisal Ad Valorem Tax Appraisal Ad Valorem Tax Appraisal Ad Valorem Tax Appraisal Ad Valorem Tax Appraisal

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QUALIFICATIONS 4

## Appraisal \& Capital Recovery Activities Client List

Company
Level 3 Communications
Cascade Natural Gas Corporation
Intermountain Gas Company
Virgin Islands Telephone Corporation

## 2013

AT\&T Communications
AT\&T Communications
AT\&T Communications
AT\&T - Indiana Bell Telephone Company
AT\&T - Michigan Bell Telephone Company
Embarq Florida, Inc.
Verizon Communications
Verizon Communications
Verizon Business (formerly MCI)
Level 3 Communications
Sprint Nextel Corporation
Verizon Wireless
Verizon Communications

## 2012

AT\&T Communications
AT\&T Communications
AT\&T Communications
AT\&T - Indiana Bell Telephone Company
AT\&T - Michigan Bell Telephone Company
Embarq Florida, Inc.
Verizon Communications
Verizon Communications
Verizon Business (formerly MCI)
Level 3 Communications
Sprint Nextel Corporation
Verizon Wireless
MetroPCS
Verizon Communications
Verizon Wireless
2011
AT\&T Communications
AT\&T Communications
AT\&T Communications
AT\&T - Indiana Bell Telephone Company
AT\&T - Michigan Bell Telephone Company
Embarq Florida, Inc.
Verizon Communications
Verizon Communications
Verizon Business (formerly MCI)

| Property |
| :--- |
| California |
| Oregon \& Washington |
| Idaho |
| US Virgin Islands |
| Nationwide |


|  | Study <br> Year | Pe |
| :--- | :--- | ---: |
|  |  | 2014 |
| 2013 |  | 2014 |
| 2013 |  | 2014 |
| 2013 |  | 2014 |
| 2013 |  | 2014 |

[^8]| North America | 2012 | 2013 |
| :--- | :--- | :--- |
| California | 2012 | 2013 |
| Florida | 2012 | 2013 |
| Indiana | 2012 | 2013 |
| Michigan | 2012 | 2013 |
| Florida | 2012 | 2013 |
| Florida | 2012 | 2013 |
| New England - Mass | 2012 | 2013 |
| North America | 2012 | 2013 |
| North America, | 2012 | 2013 |
| California |  |  |
| North America | 2012 | 2013 |
| Palm Beach, Florida | 2012 | 2013 |
| New England Mass | $2002-2007$ | 2013 |


| North America | 2011 | 2012 |
| :--- | :--- | :--- |
| California | 2011 | 2012 |
| Florida | 2011 | 2012 |
| Indiana | 2011 | 2012 |
| Michigan | 2011 | 2012 |
| Florida | 2011 | 2012 |
| Florida | 2011 | 2012 |
| New England - Mass | 2011 | 2012 |
| North America | 2011 | 2012 |
| North America, | 2011 | 2012 |
| California |  |  |
| North America | 2011 | 2012 |
| Palm Beach, Florida | 2011 | 2012 |
| Palm Beach, Florida | 2011 | 2012 |
| Florida - revised | 2008 | 2012 |
| Palm Beach, Florida | 2012 | 2012 |

Ad Valorem Tax Appraisal Ad Valorem Tax Appraisal Ad Valorem Tax Appraisal Ad Valorem Tax Appraisal Ad Valorem Tax Appraisal Ad Valorem Tax Appraisal Ad Valorem Tax Appraisal Ad Valorem Tax Appraisal Ad Valorem Tax Appraisal Ad Valorem Tax Appraisal

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## Appraisal \& Capital Recovery Activities Client List



## Appraisal \& Capital Recovery Activities Client List



## Appraisal \& Capital Recovery Activities Client List

Company
Global Crossing
Alaska Communications System, Inc.
(ACS)

Intermountain Gas Company

## 2006

AT\&T Communications
AT\&T Communications
AT\&T Communications
Sprint Florida, Inc.
Sprint Texas, Inc.
Sprint Missouri, Inc.
Sprint North Carolina
Sprint Virginia
Embarq Nevada
Verizon Communications
Verizon Communications
Verizon Communications
Verizon Business (formerly MCI)
Level 3 Communications
Level 3 Communications
Global Crossing
Indianapolis Power \& Light

| Property |  | Study <br> Year |  | Activity |
| :---: | :---: | :---: | :---: | :---: |
| North America | 2006 |  | 2007 | Ad Valorem Tax Appraisal |
| ACS of Alaska | 2006 |  | 2007 | Depreciation Studies |
| ACS of Anchorage |  |  |  |  |
| ACS of Fairbanks |  |  |  |  |
| ACS of the Northland |  |  |  |  |
| ACS Holdings |  |  |  |  |
| Idaho | 2006 |  | 2007 | Depreciation Study |


| Palm Beach Florida | $2000-2003$ | 2006 |
| :--- | :--- | :--- |
| North America | 2005 | 2006 |
| California | 2005 | 2006 |
| Florida | 2005 | 2006 |
| Texas, | 2005 | 2006 |
| Missouri | 2005 | 2006 |
| North Carolina | 2005 | 2006 |
| Virginia | 2005 | 2006 |
| Nevada | 2005 | 2006 |
| Florida | 2005 | 2006 |
| California | 2005 | 2006 |
| Northwest | 2005 | 2006 |
| Massachusetts | $2002-2--5$ | 2006 |
| North America | 2005 | 2006 |
| Arizona | $2002-2006$ | 2006 |
| North America | 2005 | 2006 |
| IPL | 2005 | 2006 |

## 2005

AT\&T Communications
AT\&T Communications
Sprint Florida, Inc.
Sprint PCS
Verizon Communications
Verizon Communications
Verizon Communications
Sprint Communications, LP
Level 3 Communications
Global Crossing
Global Crossing
Indianapolis Power \& Light

| North America | 2004 | 2005 |
| :--- | :--- | :--- |
| California | 2004 | 2005 |
| Florida | 2004 | 2005 |
| North America | 2004 | 2005 |
| Florida | 2004 | 2005 |
| California | 2004 | 2005 |
| Northwest | 2004 | 2005 |
| North America | 2004 | 2005 |
| North America | 2004 | 2005 |
| North America | 2004 | 2005 |
| New York Special |  |  |
| Franchise Property | $2003 \& 2004$ | 2005 |
| IPL | 2004 | 2005 |

## 2004

Sprint Florida, Inc.
Verizon Communications
Verizon Communications
Verizon Communications
Sprint Communications, LP
Level 3 Communications
Global Crossing

| Florida | 2003 | 2004 |
| :--- | :--- | :--- |
| California | 2003 | 2004 |
| Northwest | 2003 | 2004 |
| New England | 2003 | 2004 |
| North America | 2003 | 2004 |
| North America | 2003 | 2004 |
| North America | 2003 | 2004 |

Ad Valorem Tax Appraisal Ad Valorem Tax Appraisal Ad Valorem Tax Appraisal Ad Valorem Tax Appraisal Ad Valorem Tax Appraisal Ad Valorem Tax Appraisal Ad Valorem Tax Appraisal Ad Valorem Tax Appraisal Ad Valorem Tax Appraisal Ad Valorem Tax Appraisal Ad Valorem Tax Appraisal Ad Valorem Tax Appraisal Ad Valorem Tax Appraisal Ad Valorem Tax Appraisal Ad Valorem Tax Appraisal Ad Valorem Tax Appraisal Depreciation Study

Ad Valorem Tax Appraisal Ad Valorem Tax Appraisal Ad Valorem Tax Appraisal Ad Valorem Tax Appraisal Ad Valorem Tax Appraisal Ad Valorem Tax Appraisal Ad Valorem Tax Appraisal Ad Valorem Tax Appraisal Ad Valorem Tax Appraisal Ad Valorem Tax Appraisal

Ad Valorem Tax Appraisal Depreciation Study

Ad Valorem Tax Appraisal Ad Valorem Tax Appraisal Ad Valorem Tax Appraisal Ad Valorem Tax Appraisal Ad Valorem Tax Appraisal Ad Valorem Tax Appraisal Ad Valorem Tax Appraisal

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## Appraisal \& Capital Recovery Activities Client List

Company

## Sprint PCS

AT\&T Communications AT\&T Communications Intermountain Gas Company

## 2003

Sprint Florida, Inc.
Verizon Communications
Verizon Communications
Sprint Communications, LP
Level 3 Communications
Sprint PCS
AT\&T Communications
AT\&T Communications
Global Crossing
Verizon Wireless

2002
Sprint Florida, Inc.
Verizon Communications
Verizon Communications
Sprint Communications, LP
Level 3 Communications
Global Crossing
AT\&T Wireless
Sprint PCS
AT\&T Communications
Intermountain Gas Company
AT\&T Communications

## 2001

Verizon

Sprint Florida, Inc.
Verizon Communications
Sprint Communications, LP
Global Crossing
Sprint PCS
Sprint Corporation
Alaska Communications System, Inc.
(ACS)

2000
Sprint PCS
Telus Communications

| Property |  | Study <br> Year | Year <br> Performed | Activity |  |
| :--- | :--- | :--- | :--- | :--- | :--- |
|  |  |  |  |  |  |
| Cost Indexes | 2003 |  | 2004 |  | Ad Valorem Tax Appraisal |
| North America | 2003 | 2004 |  | Ad Valorem Tax Appraisal |  |
| California | 2003 | 2004 |  | Ad Valorem Tax Appraisal |  |
| Idaho | 2003 | 2004 |  | Depreciation Study |  |


| Florida | 2002 | 2003 |
| :--- | :---: | :---: |
| California | 2002 | 2003 |
| Northwest | 2002 | 2003 |
| North America | 2002 | 2003 |
| North America | 2002 | 2003 |
| Cost Indexes | 2002 | 2003 |
| North America | 2002 | 2003 |
| California | 2002 | 2003 |
| North America | 2002 | 2003 |
| Broward County, FL | 1998 through 2002 | 2003 |


| Florida | 2001 | 2002 |
| :--- | :--- | :--- |
| California | 2001 | 2002 |
| Northwest | 2001 | 2002 |
| North America | 2001 | 2002 |
| North America | 2001 | 2002 |
| North America | 2001 | 2002 |
| Plymouth, MI | 2001 | 2002 |
| Cost Indexes | 2001 | 2002 |
| North America | 2001 | 2002 |
| Idaho | 2001 | 2002 |
| California | 2001 | 2002 |

Ad Valorem Tax Appraisal Ad Valorem Tax Appraisal Ad Valorem Tax Appraisal Ad Valorem Tax Appraisal Ad Valorem Tax Appraisal Ad Valorem Tax Appraisal Ad Valorem Tax Appraisal Ad Valorem Tax Appraisal Ad Valorem Tax Appraisal Depreciation Study Ad Valorem Tax Appraisal

Functional Obsolescence \& Useful Life studies for valuation
Ad Valorem Tax Appraisal Ad Valorem Tax Appraisal
Ad Valorem Tax Appraisal Ad Valorem Tax Appraisal Ad Valorem Tax Appraisal Depreciation Study Depreciation Study
Ad Valorem Tax Appraisal Ad Valorem Tax Appraisal Ad Valorem Tax Appraisal Ad Valorem Tax Appraisal Ad Valorem Tax Appraisal Ad Valorem Tax Appraisal Ad Valorem Tax Appraisal Ad Valorem Tax Appraisal Ad Valorem Tax Appraisal Ad Valorem Tax Appraisal

| Verizon - New York | 2001 | $2001-2$ | Functional Obsolescence <br> \& Useful Life studies for <br> valuation |
| :--- | :--- | :--- | :--- |
| Sprint Florida, Inc. | 2000 | 2001 | Ad Valorem Tax Appraisal |
| California | 2000 | 2001 | Ad Valorem Tax Appraisal |
| North America | 2000 | 2001 | Ad Valorem Tax Appraisal |
| North America | 2000 | 2001 | Ad Valorem Tax Appraisal |
| Cost Indexes | 2000 | 2001 | Ad Valorem Tax Appraisal |
| Centel - Nevada | 2000 | $2001-2$ | Depreciation Study <br> ACS of Alaska |
| Depreciation Study |  |  |  |


| BTS Equipment | 2000 | 2000 | Economic Life Study |
| :--- | :--- | :--- | :--- |
| Telus - Alberta \& British Columbia | 2000 | 2000 | Depreciation |
|  |  | Phase III Price Caps |  |

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## Appraisal \& Capital Recovery Activities Client List

| Company | Property | Year | Performed | Activity |
| :---: | :---: | :---: | :---: | :---: |
| Sprint Florida, Inc. | Florida | 1999 | 2000 | Ad Valorem Tax Appraisal |
| Verizon Communications | California | 1999 | 2000 | Ad Valorem Tax Appraisal |
| Sprint Communications, LP | North America | 1999 | 2000 | Ad Valorem Tax Appraisal |
| 1999 |  |  |  |  |
| Sprint Corporation | Centel - Nevada | 1998 | 1999 | Depreciation Study |
| Intermountain Gas Company | Intermountain Gas Company | 1998 | 1999 | Depreciation Study |
| Sprint Florida, Inc. | Florida | 1998 | 1999 | Ad Valorem Tax Appraisal |
| Sprint Communications, LP | North America | 1998 | 1999 | Ad Valorem Tax Appraisal |
| 1998 |  |  |  |  |
| Frontier Corporation | Frontier Telephone of Rochester | 1998 | 1997 | Valuation depreciation Lives and Net Salvage Parameters |
| Pacific Telecom, Inc. | Telephone Utilities of Washington | 1997 | 1998 | Depreciation Study |
| Sprint Florida, Inc. | Florida | 1997 | 1998 | Ad Valorem Tax Appraisal |
| Verizon Communications | Florida | 1997 | 1998 | Ad Valorem Tax Appraisal |
| Sprint Communications, LP | North America | 1997 | 1998 | Ad Valorem Tax Appraisal |
| Sprint Corporation | United Telephone Company of South Carolina | 1998 | 1998 | Depreciation Expense Universal Service Fund |
| Sprint Corporation | Carolina Telephone and Telegraph and Central Telephone of North Carolina | 1998 | 1998 | Depreciation Expense Universal Service Fund |
| Telus Communications | Telus - Edmonton (TCE) | 1997 | 1998 | Depreciation Study <br> Phase II Price Caps |
| 1997 ( 10 |  |  |  |  |
| Sprint Corporation | Centel - Nevada | 1997 | 1997 | Unbundling/ Inter-connection Depreciation Study |
| Pacific Telecom, Inc. | Telephone Utilities of Oregon | 1996 | 1997 | Depreciation Study |
| Pacific Telecom, Inc. | Telephone Utilities of Alaska1996 And the Northland |  | 1997 | Depreciation Study |
| Telus Communications | Telus - TCI formerly AGT | 1996 | 1997 | Depreciation Study Phase II Price Caps |
| Indianapolis Power \& Light | IPL | 1996 | 1997 | Depreciation Study |
| Sprint Florida, Inc. | Florida | 1996 | 1997 | Ad Valorem Tax Appraisal |
| Verizon Communications | Florida | 1996 | 1997 | Ad Valorem Tax Appraisal |
| Pacific Telecom, Inc. | Eagle Telephone (Colorado) 1996 |  | 1997 | Depreciation Study |

1996

Appraisal \& Capital Recovery Activities Client List
Company

Intermountain Gas Company Sprint Florida, Inc.

Century Telephone
Telus Communications

Johnson County Kansas Office of the Assessor

Milwaukee Metropolitan Sewerage District

## Sprint Corporation

Sprint Corporation
Pacific Telecom,
Pacific Telecom,
Indiana Energy
Columbia Gas Transmission
United Telephone - Midwest
Group
Intermountain Gas Co.
Pacific Telecom, Inc.
Small Telephone Company
Coalition

United Telephone Systems

New York State Division of Equalization and Assessment


QUALIFICATIONS 11

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Page 13

| Utility Industries Capital Recovery Activities Client List |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: |
| Company | Property | Year | Study Performed | Activity |
|  | Telephone Utilities of Washington, Inc. | 1988 | 1989 | Depreciation Study |
| WICOR | Wisconsin Gas Company | 1988 | 1989 | Depreciation Study |
| ALLTEL | ALLTEL - Kentucky, Inc. | 1987 | 1989 | Depreciation Study |
|  | ALLTEL - Ohio, Inc. | 1988 | 1989 | Depreciation Study |
|  | Western Reserve Telephone Company | 1988 | 1989 | Depreciation Study |
| Milwaukee Metropolitan Sewer District | Milwaukee Metropolitan Sewer District | 1988 | 1989 | Depreciation Study |
| United Telephone | United of Ohio | $\begin{aligned} & 1988 \\ & 1988 \end{aligned}$ | $\begin{aligned} & 1989 \\ & 1989 \end{aligned}$ | ELG Support ELG Support |
| Telephone Company | Telephone Company |  |  |  |
| United Telecom | U.S. Sprint | 1988 | 1988 | Useful Life Study |
| Pacific Telecom | Telephone Utilities of Oregon | 1987 | 1988 | Depreciation Study |
|  | Telephone Utilities of Eastern Oregon | 1987 | 1988 | Depreciation Study |
|  | Rose Valley Telephone Company | 1987 | 1988 | Depreciation Study |
| United Telephone | United of Minnesota | 1987 | 1988 | Capital Planning Support |
| Wisconsin Southern Gas | Wisconsin Southern Gas | 1987 | 1988 | Depreciation Study |
| Pacific Telecom | Glacier State Telephone Company | 1986 | 1987 | Depreciation Study |
|  | Sitka Telephone Co. | 1986 | 1987 | Depreciation Study |
|  | Juneau-Douglas Tel Company | 1986 | 1987 | Depreciation Study |
| Pacific Telecom | Telephone Utilities of Alaska | 1986 | 1987 | Depreciation Study |
|  | Alascom | 1986 | 1987 | Depreciation Study |
| Lincoln Telecommunications | Lincoln Telephone and Telegraph Company | 1986 | 1987 | Digital Switching Service Life |
| Northwest Natural Gas | Northwest Natural Gas | 1985 | 1986 | Depreciation Study QUALIFICATIONS 13 |

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## Appraisal \& Capital Recovery Activities Client List

| Company | Property | Year | Study Y Performed | Activity |
| :---: | :---: | :---: | :---: | :---: |
| Corporation | Corporation |  |  |  |
| ALLTEL | Western Reserve Telephone Company | 1984 | 1985 | Depreciation Study |
|  | ALLTEL - Ohio | 1984 | 1985 | Depreciation Study |
|  | ALLTEL - Alabama | 1984 | 1985 | Depreciation Study |
| Gulf Telephone Co. | Gulf Telephone Company | 1984 | 1985 | Depreciation Study |
| United Telephone Systems, Inc. | United of Iowa | 1984 | 1985 | Depreciation Study |
|  | United of Arkansas | 1984 | 1985 | Depreciation Study |
| Pacific Telecom | Telephone Utilities of Washington | 1983 | 1984 | Depreciation Study |
|  | Telephone Utilities of Eastern Oregon | 1983 | 1984 | Depreciation Study |
| Pacific Telecom | Telephone Utilities of Oregon | 1983 | 1984 | Depreciation Study |
|  | Northwestern Telephone Systems, Inc., Oregon | 1983 | 1984 | Depreciation Study |
|  | Rose Valley Telephone Company | 1983 | 1984 | Depreciation Study |
| United Telecommunications | All United Telephone Companies | 1983 | 1984 | Capital Recovery Strategy |
| Lincoln Telecommunications | Lincoln Telephone \& Telegraph Company | 1983 | 1984 | Depreciation Study |
| ALLTEL | ALLTEL - Mississippi | 1982 | 1983 | Depreciation Study |
|  | ALLTEL - Michigan | 1982 | 1983 | Depreciation Study |
| North Carolina Natural Gas Corp. | North Carolina Natural Gas Corporation | 1982 | 1983 | Depreciation Study |
| Mid Continent Telephone (Currently ALLTEL) | Western Reserve Telephone | 1982 | 1983 | Depreciation Study |
|  | Mid Ohio Telephone | 1982 | 1982 | Depreciation Study |
|  | Florence Telephone Company | 1980 | 1981 | Depreciation Study |
|  | Leeds Telephone Co. | 1980 | 1981 | Depreciation Study |
|  |  |  |  | QUALIFIC |

Appraisal \& Capital Recovery Activities Client List

| Company | Property | Study Year | Year Performed | Activity |
| :---: | :---: | :---: | :---: | :---: |
| Telephone Utilities (Currently Pacific Telecom) | Elmore Coosa Tel Company | 1980 | 1981 | Depreciation Study |
|  | Brookville Telephone Company | 1980 | 1981 | Depreciation Study |
|  | Mid-Pennsylvania Telegraph | 1980 | 1981 | Depreciation Study |
|  | Telephone Utilities of Oregon | 1979 | 1980 | Depreciation Study |
|  | Telephone Utilities of Eastern Oregon | 1979 | 1980 | Depreciation Study |
|  | Northwestern Telephone Systems, Inc.-Oregon | 1979 | 1980 | Depreciation Study |
|  | Rose Valley Telephone Company | 1979 | 1980 | Depreciation Study |
| United Telephone Systems, Inc. | United of Ohio | 1979 | 1980 | Depreciation Study |
| Telephone Utilities | Telephone Utilities of Washington | 1978 | 1979 | Depreciation Study |
| United Telephone Systems, Inc. | United of Ohio | 1978 | 1979 | Depreciation Study |
| Rochester Telephone | Rochester Telephone (Indiana) | 1977 | 1978 | Depreciation Study |
| United Telephone Systems, Inc. | United of Ohio | 1977 | 1978 | Depreciation Study |
| Princeton Telephone | Princeton Telephone (Indiana) | 1976 | 1977 | Depreciation Study |
| Northwestern Telephone | Northwestern Telephone (Illinois) | 1975 | 1976 | Depreciation Study |

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Papers and Seminars
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Training Instructor Depreciation Basics Sessions A \& B and Life and Salvage Analysis
Society of Depreciation Professionals \(25^{\text {th }}\) Annual Meeting
Atlanta, GA September 20-22, 2011
Will the Real Cost Approach Please Stand Up?
National Association of Property Tax Representatives Transportation, Energy, \& Communications (NAPTR•TEC)
Scottsdale, Arizona October 25-27, 2010
Issues Affecting Assessment of Regulated Industries
Institute for Professionals in Taxation (IPT) Property Tax Symposium
Austin, Texas October 31 - November 3, 2010
(Valuing) Intangibles
Appraisal for Ad Valorem Taxation, Wichita State University
Wichita, Kansas July 28, 2009
Fair Value Accounting (Appraisal Panelist)
Appraisal for Ad Valorem Taxation, Wichita State University
Wichita, Kansas July 29, 2009
Valuation Issues Valuation of Assets and the Impact of Depreciation
Society of Depreciation Professionals Annual Meeting
Greenville, SC September 21-26, 2008
Obsolescence in the Long-Distance and Local Transport Networks
Technology Futures Inc. Asset Valuation Conference
Austin Texas February 8, 2008
Communications Industry Issues
National Association of Property Tax Representative - Transportation, Energy, \& Communications
New Orleans, LA October 30, 2007
Appraisal Procedures \& Issues in a Changing communications Industry
Florida Chapter International Association of Assessing Officers' Tangible Personal Property Conference
Ocala, Florida January 12, 2006
Valuation of Intangibles
Appraisal for Ad Valorem Taxation, Wichita State University
Wichita, Kansas July 25, 2006
SDP 20 years of History and Beyond
Society of Depreciation Professionals \(20^{\text {th }}\) Annual Meeting
Long Beach, CA September 18, 2006
Valuation in a World with Asset Impairments
Appraisal for Ad Valorem Taxation, Wichita State University
Wichita, Kansas August 1, 2005
```

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| 2004 | Depreciation in the Valuation of Assets |
| :---: | :---: |
|  | Society of Depreciation Professionals' Eighteenth Annual Meeting |
|  | Washington, D.C., September 13, 2004 |
| 2003 | Cost Approach and the Use of Appraisal Guidelines |
|  | Institute for Professionals in Taxation - Property Tax Symposium |
|  | Fort Lauderdale, FL, September 17, 2003 |
|  | Cost Approach - Obsolescence and Depreciation |
|  | Appraisal for Ad Valorem Taxation, Wichita State University |
|  | Wichita, Kansas, July 28, 2003 |
| 2000 | Appraisal Issues Associated with Technological Change in the Wireline Telecommunications Industry |
|  | Appraisal for Ad Valorem Taxation, Wichita State University |
|  | Wichita, Kansas, July 31, 2000 |
|  | The Impact of Advancing Technology and the Changing Regulatory Environment on Obsolescence |
|  | Calculations for Ad Valorem Valuation Purposes |
|  | Journal of Property Tax Management, Spring 2000 |
| 1996 | How to Develop a Reproduction/Replacement Cost New Less Depreciation Approach to Value |
|  | Appraisal for Ad Valorem Taxation, Wichita State University |
|  | Wichita, Kansas, August 4, 1996 |
| 1995 | Valuation Method, Techniques and Strategies (How to Quantify Stranded Investment) (Market, Income, |
|  | \& Cost Approach |
|  | AGA Depreciation Committee Meeting |
|  | Denver, Colorado, August 6-9, 1995, jointly presented with Earl Robinson of AUS Consultants |
| 1994 | Integrating Future Expectations for the Telephone Industry into Historical Depreciation Analysis |
|  | United States Telephone Association (USTA's 1994 Capital Recovery Seminar) |
|  | Scottsdale, Arizona, September 12-13, 1994 |
| 1994 | Capital Recovery: United States versus Canada |
|  | Canadian Telephone Industry's Annual Capital Recovery Seminar |
|  | Edmonton, Alberta, Canada June 14-15, 1994 |
| 1990 | Capital Recovery: Methods, Terminology, Procedures, and Record Keeping |
|  | United States Telephone Association (USTA)'s |
|  | 1990 Non-FCC Subject and Small Company Capital Recovery Seminar |
|  | Minneapolis, Minnesota April 10_11, 1990 |
|  | Integration of Technology Forecasting Into Historical Life Studies |
|  | 29th Iowa State Regulatory Conference |
|  | Ames, Iowa May 15-17, 1990 |
|  | The 1990's and the Second Wave of Major Plant Retirements in the Communications Industry |
|  | NARUC's Seventh Biennial Information Conference |
|  | Columbus, Ohio September 12-14, 1990 |

How Do We Incorporate Change into the Study Filing Procedures? USTA's 1990 Capital Recovery Seminar
Chicago, Illinois October 16_17, 1990
$1989 \quad$ Plant Modernization: Capital Planning and Capital Recovery
Midwest Utilities Conference
Chicago, Illinois September 11_14, 1989
Price Indexes Today: Procedures, Uses, and Misuses
Society of Depreciation Professionals' Third Annual Meeting
New Orleans, Louisiana December 6_7, 1989
Plant Modernization: Capital Planning and Capital Recovery
National Association of Regulatory Utility Commissioners (NARUC)'s Sixth Biennial Regulatory Information Conference
Columbus, Ohio September 14_16, 1988

## Papers and Seminars

Sprint Corporation - West Finance Center
Overland Park, Kansas, August 1997
Rochester Telephone Corporation Rochester, New York, April 1997

Sprint-Florida-Vista United Telecommunications
Altamonte Springs, Florida August 27-29, 1996
Saskatchewan Telecommunications Regina, Saskatchewan, Canada, June 1994

AUS Consultants/Leroy J. Murphy and Associates 1994 Capital Recovery Seminar May 1994

Manitoba Telephone System, Winnipeg, Manitoba, December 1993
Society of Depreciation Professionals Annual Meeting Charleston, South Carolina September 30, 1993

SPRINT - Local Telephone Division Atlanta, Georgia August 11-12, 1993

AUS Consultants/Leroy J. Murphy and Associates 1993 Capital Recovery Seminar Chicago, Illinois May 11-13, 1993

Canadian Telephone Capital Recovery Seminar
Halifax, Nova Scotia April 20-22, 1993
United Telephone, Midwest Group Overland Park, Kansas January 20, 1993

BellSouth Corporation
Birmingham, Alabama November 23, 1992
Sprint - Local Telephone Division Kansas City, Kansas November 18-20, 1992

Society of Depreciation Professionals Annual Meeting San Antonio, Texas September 9-10, 1992

AUS Consultants/Leroy J. Murphy and Associates 1992 Capital Recovery Seminar Chicago, Illinois October 6-8, 1992

Society of Depreciation Professionals Annual Meeting Nashville, Tennessee November 20-22, 1991

ALLTEL Corporation Microcomputer Depreciation Studies System Training Hudson, Ohio October 14-16, 1991

## Capital Recovery Training

| 2016 | Society of Depreciation Professionals <br> Annual Training Charleston, South Carolina, September 18-23, 2016 |
| :---: | :---: |
| 2015 | Society of Depreciation Professionals Annual Training Austin Texas September 2015 |
| 2014 | Society of Depreciation Professionals <br> Annual Training <br> New Orleans, Louisiana September 2014 |
| 2013 | Society of Depreciation Professionals <br> Annual Training <br> Salt Lake City, Utah September 2013 |
| 2012 | Society of Depreciation Professionals <br> Annual Training <br> Minneapolis, Minnesota, September 16-18, 2012 |
| 1991 | United Telecommunications, Inc., Capital Recovery/Microcomputer Depreciation Studies System Training <br> Kansas City, Kansas September 23-25, 1991 |
| 1991 | AUS Consultants/Leroy J. Murphy and Associates 1991 Capital Recovery Seminar Lake Geneva, Wisconsin September 17-19, 1991 |
| 1991 | Rochester Telephone Corporation, Capital Recovery/Microcomputer Depreciation Studies System Training, Rochester, New York September 3-7, 1991 |
| 1991 | Ameritech Services, Microcomputer Depreciation Studies System Training Chicago, Illinois May 16-17, 1991 |
| 1991 | AUS Consultants/Leroy J. Murphy and Associates 1991 Capital Recovery Seminar Washington, D.C. April 9_11, 1991 |
| 1990 | United Telecommunications, Inc., Capital Recovery Seminar Overland Park, Kansas December 1990 |
| 1990 | AUS Consultants/Leroy J. Murphy and Associates 1990 Capital Recovery Seminar Chicago, Illinois September 24_27, 1990 |
| 1990 | AUS Consultants/Leroy J. Murphy and Associates 1990 Capital Recovery Seminar Chicago, Illinois January 29-February 1, 1990 |
| 1990 | United Telecommunications, Inc., Capital Recovery/Microcomputer Depreciation Studies System Training, Chicago, Illinois July 1990 |
| 1989 | United Telecommunications, Inc., Capital Recovery/Microcomputer Depreciation Studies System Training, Chicago, Illinois July 1989 |

## Capital Recovery Training

1989

AUS Consultants/Leroy J. Murphy and Associates 1989 Capital Recovery Seminar Chicago, Illinois March 6_9, 1989

AUS Consultants/Leroy J. Murphy and Associates 1988 Capital Recovery Seminar Chicago, Illinois July 25_28, 1988

United Telecommunications, Inc., Microcomputer Depreciation Studies System Training Kansas City, Kansas January 1988

# The Township of Lower Makefield, Bucks County 

# Wastewater Collection System and Purchased Treatment Capacity 

Appraisal Work Papers<br>As of September 17, 2020

## Valuation Summary

AUS Consultants<br>Suite 201<br>8555 West Forest Home Avenue Greenfield, Wisconsin 53228<br>Office Telephone: 414-529-5755<br>J. Weinert's Cell: 414-698-8371<br>J. Weinert's E-Mail: weinerti@auswest.net

S: \water industry\Lower Makefield Township Sewer Authority \Lower Makefield Report \& Testimony\Lower Makefield Wastewater Colllection System Valuation as of 6-30-2020 - Created 3-11-2021
Lower Makefield Township
Bucks County PA
Wastewater Collection System and Purchased Treatment Capacity
Investor-Owned Utility
As of September 17, 2020

Fair Market Value Appraisal

| Appraisal Approach | Investor-owned <br> Utility | Weight | Wtd Valuation <br> Indications |
| :--- | :---: | :---: | :---: |


| Cost Approach |  |  |
| :--- | :--- | :--- | :--- |
|  |  |  |
|  |  |  |
| Inventory of Assets |  |  |
| Original Cost (\$OC) | $32,003,924$ |  |
| Depreciated Original Cost (\$OCLD) $20,644,920$   <br> Replacement Cost $96,986,192$   <br> Replacement Cost New (COR) $\mathbf{5 1 , 4 1 4 , 5 5 5}$   <br> Depreciated Replacement Cost New (CORLD) $\$$ $\mathbf{5 1 , 4 1 4 , 5 5 5}$ $\mathbf{5 0 \%}$ <br> Cost Approach Conclusion  $\mathbf{2 5 , 7 0 7 , 2 7 8}$  $\mathbf{l}$ |  |  |

```
Income Approach
Required Rate Increases: 22% period 3,15%
period 6,10% period 9, and 6% every 3rd year
beginning in period }12\mathrm{ (Input 6) 57,872,959
Income Approach Conclusion
    57,872,959
    40%
    23,149,184
```

| Market Approach |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: |
| Market Comparables (to) |  |  |  |  |
| OCLD |  | 36,541,509 |  |  |
| CORLD |  | 43,188,226 |  |  |
| Customers |  | 55,755,000 |  |  |
| Cash Flows (EBITDA) |  | 59,838,915 |  |  |
| Market Financials (to) |  |  |  |  |
| OCLD |  | 55,741,285 |  |  |
| Market Approach Conclusion |  | 55,741,285 | 10\% | 5,574,129 |
| Appraisal Conclusion | \$ | 54,430,591 | 100\% | 54,430,591 |

# The Township of Lower Makefield, Bucks County Wastewater Collection System and Purchased Treatment Capacity 

Appraisal Work Papers<br>As of September 17, 2020

## Cost Approach

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J. Weinert's E-Mail: weinertj@auswest.net

| Bucks County PA |  |  |
| :---: | :---: | :---: |
| Wastewater Collection System and Purchased Treatment Capacity |  |  |
| Investor-Owned Utility |  |  |
| As of September 17, 2020 |  |  |
|  | Column Reference in OCLD \& RCNLD | Amount in \$s |
| Depreciated Replacement Cost (RCNLD) |  |  |
| Original Cost (OC) | (9) | 32,003,924.18 |
| Replacement Cost New (RCN) | (16) | 96,986,191.55 |
| Replacement Cost New less Depreciation (RCNLD) | (31) | 51,414,555.18 |
| Fair Market Vaue (FMV) | (41) | 51,414,555.18 |
| Depreciated Original Cost (OCLD) |  |  |
| Original Cost (OC) | (46) | 32,003,924.18 |
| Original Cost less Depreciation (OCLD) | (57) | 20,644,920.49 |
| Cost Approach Conclusion |  | 51,414,555 |

# The Township of Lower Makefield, Bucks County <br> Wastewater Collection System and Purchased Treatment Capacity 

Appraisal Work Papers
As of September 17, 2020

## Cost Approach Replacement Cost New

AUS Consultants<br>Suite 201<br>8555 West Forest Home Avenue<br>Greenfield, Wisconsin 53228<br>Office Telephone: 414-529-5755<br>J. Weinert's Cell: 414-698-8371<br>J. Weinert's E-Mail: weinerti@auswest.net

# The Township of Lower Makefield, Bucks County <br> Wastewater Collection System and Purchased Treatment Capacity 

Appraisal Work Papers
As of September 17, 2020

Cost Approach<br>Replacement Cost New less Depreciation

AUS Consultants<br>Suite 201<br>8555 West Forest Home Avenue<br>Greenfield, Wisconsin 53228<br>Office Telephone: 414-529-5755<br>J. Weinert's Cell: 414-698-8371<br>J. Weinert's E-Mail: weinerti@auswest.net

| (18) | (19) | (21) | (22) | (23) | (24) | (28) | (29) | (30) | (31) |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Account | Description | Age at September 17, 2020 Appraisal Date | Replacement Cost New (COR) | Retirement Dispersion lowa type | Normal Service Life (NSL) | Normal Remaining Life | Total Life Expectancy | Condition | Preliminary Cost Approach (COR less Normal Depreciation) |
|  |  | years | COR \$s |  | years | years | years | \% of COR | CORLD Ss |
| input | Input | Calculation | Calculation | Input | Input | Calculation | Calculation | Calculation | Calculation |
| Eng Assmnt | Lower Makefield Township Asset Detail |  | Col (16) | AUS Input | AUS Input |  | $\mathrm{Col}(21)+(28)$ | Coil (28) / (29) | Col (22) * 30 ) |
| Account | Description | Age | RCN | lowa | NL | Rem Life | Total Life | Condition | CORLD |
| 353.20 | Land \& Land Rights | 36.47 | 470,288 | ZNonDep | , | $\checkmark$ | - | - | 470,288 |
| 354.20 | Stuctures \& Improvements - Pumping | 37.21 | 7,357,560 | R3.0 | 65.00 | 31.84 | 69.04 | 65.00 | 3,437,713 |
| 354.40 | Stuctures \& Improvements - Treatment | 46.01 | 12,413,422 | R3,0 | 65.00 | 25.03 | 71.04 | 65.00 | 4,426,880 |
| 355.20 | Generating Equipment - Pumping | 35.32 | 650,289 | R3.0 | 35.00 | 10.03 | 45.35 | 35.00 | 175,802 |
| 356.20 | Pump StationPower Protection \& Control Devices | 31.93 | 992,809 | R3.0 | 35.00 | 12.03 | 43.97 | 35,00 | 323,847 |
| 359.20 | Collection Sewers - Low Pressure | 6.34 | 390,125 | R2.5 | 80.00 | 73.89 | 80.23 | 80.00 | 359,342 |
| 360.20 | Collection Sewers - Force - Mains | 34.56 | 2,333,228 | R3.0 | 75.00 | 43.60 | 78.16 | 75.00 | 1,318,147 |
| 361.20 | Collection Sewers - Gravity - Mains | 34.94 | 60,742,852 | R2.5 | 80.00 | 49.54 | 84.48 | 80.00 | 36,015,322 |
| 363.20 | Service Laterals | 35.17 | 6,940,400 | R3.0 | 70.00 | 38.28 | 73.45 | 70.00 | 3,663,419 |
| 363.21 | Flow Measuring Devices | 33.95 | 921,966 | \$2.0 | 30.00 | 7.70 | 41.64 | 30.00 | 206,548 |
| 371.20 | Pumping Equipment | 35.26 | $3,773,253$ | R3.0 | 35.00 | 10.02 | 45.28 | 35.00 | $1,017,249$ |
|  |  |  | 96,986,192 |  |  |  |  |  | $51,414,555$ |
| Grand |  |  |  |  |  |  |  |  |  |
| Total | Grand Total | 36.40 | 96,986,192 |  | 72.73 | 41.39 | 77.61 | 0.53 | 51,414,555 |
|  |  |  | - |  |  |  |  |  |  |

# The Township of Lower Makefield, Bucks County <br> Wastewater Collection System and Purchased Treatment Capacity 

Appraisal Work Papers

As of September 17, 2020

Cost Approach
Replacement Cost New less Depreciation to Fair Market Value

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J. Weinert's E-Mail: weinerti@auswest.net

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Lower Makefield Township
Bucks County PA
Wastewater Collection System and Purchased Treatment Capacity
Investor-Owned Utility
As of September 17, 2020

## （36） <br> Fair Market Value

 Bucks County PAWasks County PA
Investor－Owned Utillty System and Purchased Treatment Capacity Investor－Owned Utility
As of September 17， 2020



# The Township of Lower Makefield, Bucks County <br> Wastewater Collection System and Purchased Treatment Capacity 

Appraisal Work Papers

As of September 17, 2020

## Original Cost less Depreciation

AUS Consultants<br>Suite 201<br>8555 West Forest Home Avenue<br>Greenfield, Wisconsin 53228<br>Office Telephone: 414-529-5755<br>J. Weinert's Cell: 414-698-8371<br>J. Weinert's E-Mail: weinerti@auswest.net

S: \water industry \Lower Makefield Township Sewer Authority \Lower Makefield Report \& Testin.-_, \Lower Makefield Wastewater Colllection System Valuation as of 6-30-2020-Created 3-11-202.

| (43) | (44) | (46) | (47) | (48) | (49) | (53) | (54) | (55) | (56) | (57) |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Account | Description | Original Costs | Retirement Dispersion lowa-type | Normal <br> Service <br> Life (NSL) | Age at Septembe r17. 2020 Appraisal Date | Normal Remaining Life | Total Life Expectancy | Theoretical Reserve Percent | Theoretical Reserve | Depreciated Original Cost |
| Input | trput | Input | Input | Input | Calculation | Calculation | Calculation | Caiculation | Calculation | Calculation |
| AUS Input | Eng Assmmi | Eng Assmnt | AUS Input | Aus input |  |  | Col (46) $+(53)$ | Col (53)/ (54) | COO (46) ' (55) | Col (46)-(56) |
| Acct | Descrip | Original Cost | lowa | Normal Life | age | Rem Life | Total Life | Theo\% | Theo Reserve | Net Book |
| 353.20 | Land \& Land Rights | 646 | ZNonDep | - | 36.47 | - | - | - | - | 646 |
| 354.20 | Stuctures \& Improvements - Pumping | 2,213,537 | R3.0 | 65.00 | 29.27 | 38.31 | 67.58 | 0.43 | 947,656 | 1,265,881 |
| 354.40 | Stuctures \& Improvements - Treatment | 2,186,739 | R3.0 | 65.00 | 39.24 | 30.12 | 69.36 | 0.56 | 1,227,201 | 959,538 |
| 355.20 | Generating Equipment - Pumping | 292,282 | R3.0 | 35.00 | 28.37 | 12.98 | 41.35 | 0.65 | 189,863 | 102,419 |
| 356.20 | Pump StationPower Protection \& Control Devices | 506,720 | R3.0 | 35.00 | 24.02 | 16.13 | 40.15 | 0.56 | 282,960 | 223,760 |
| 359.20 | Collection Sewers - Low Pressure | 354,373 | R2.5 | 80.00 | 6.23 | 73.99 | 80.22 | 0.08 | 27,485 | 326,888 |
| 360.20 | Collection Sewers - Force - Mains | 837,436 | R3, 0 | 75.00 | 25.12 | 51.47 | 76.59 | 0.32 | 271,268 | 566,168 |
| 361.20 | Collection Sewers - Gravity - Mains | 22,142,441 | R2.5 | 80.00 | 25.91 | 56.87 | 82.78 | 0.31 | 6,836,757 | 15,305,683 |
| 363.20 | Service Laterals | 2,286,077 | R3.0 | 70.00 | 27.23 | 44.80 | 72.04 | 0.37 | 856,045 | 1,430,032 |
| 363.21 | Flow Measuring Devices | 308,281 | S2.0 | 30.00 | 30.41 | 9.01 | 39.42 | 0.73 | 226,501 | 81,780 |
| 371.20 | Pumping Equipment | $875,393$ | R3.0 | 35,00 | 24.22 | 15.91 | 40.13 | 0.56 | 493,266 | 382,127 |
|  |  | $32,003,924$ |  |  |  |  |  |  | 11,359,004 | 20,644,920 |
| Grand |  |  |  |  |  |  |  |  |  |  |
| Total | Grand Total | 32,003,924 |  | 74.25 | 26.90 | 50.32 | 77.21 | 0.35 | 11,359,004 | 20,644,920 |

# The Township of Lower Makefield, Bucks County 

# Wastewater Collection System and Purchased Treatment Capacity 

## Appraisal Work Papers

As of September 17, 2020

Income Approach

AUS Consultants
Suite 201
J. Weinert's E-Mail:
















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Water and Wastewater Cost of Capital Third Quarter 2020 (10-1-2020)

As an Investor-Owned Utility

Weighted Cost of Capital (Discount Rate)

| (1) | (2) | (2a) | (3) | (3a) | (4) | (4a) | (5) |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | Portion of Capital AUS input | Type of Data | Capital Cost <br> Aus input | Type of Data | Tax Rate | Tax affect on cost of capital | After-tax Market Capital Cost (2) $)^{(3)^{*}}{ }^{(43)}$ |
| Debt | 29\% | Market | 2,82\% | Market | 28,89\% | 71.11\% | 0.58\% |
| Equity | 71\% | Market | 9,90\% | Market | 0.0\% | 100.00\% | 7.03\% |
| Total Capital r | 100.0\% |  |  |  |  |  | 7.61\% |
| Growth (g) |  |  |  |  |  |  | 1.82\% |
| Rate without Growth: $[(1+\mathrm{r}) /(1+\mathrm{g})]-1$ |  |  |  |  |  |  | 5.68\% |
| Water and Wastewater Cost of Capital |  |  |  |  |  |  |  |
| Third Quarter 2020 (10-1-2020) |  |  |  |  |  |  |  |
| As an Investor-Owned Utility |  |  |  |  |  |  |  |
| Weighted Cost of Capital (Capitlization Rate) |  |  |  |  |  |  |  |
|  | (2) | (2a) | (3) | (3a) | (4) | (4a) | (5) |
|  | Portion of Capital | Type of Data | Capital Cost | Type of Data | Tax Rate | Tax affect on cost of capital | Market Capital Cost |
|  | AUS Input |  | AuS Input |  |  |  | (2)*(3) |
| Debt | 29\% | Market | 2.82\% | Market | Not Applicable | Not Applicable | 0.82\% |
| Equity | 71\% | Market | 9.90\% | Market | Not Applicable | Not Applicable | 7.03\% |
| Total Capital r | 100.0\% |  |  |  |  |  | 7.85\% |
| Growth (g) |  |  |  |  |  |  | 1.82\% |

Rate without Growth: [(1+r)/(1+g)]-1

Water and Wastewater Cost of Capital
Third Quarter 2020 (10-1-2020)

As an Investor-Owned Utility

Weighted Cost of Capital (Rate of Return on Rate Base)

| (1) | (2) | (2a) | (3) | (3a) | (4) | (4a) | (5) |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | Portion of Capital AUS input | Type of Data | Capital Cost <br> Aus input |  | Tax Rate | Tax affect on cost of capital | Required |
|  |  |  |  |  |  |  | Return on |
|  |  |  |  | Type of Data |  |  | Rate Base |
|  |  |  |  |  |  |  | (2) $(3)$ |
| Debt | 45\% | Embedded | 2.82\% | Embedded | Not Applicable | Not Applicable | 1.27\% |
| Equity | 55\% | Embedded | 9.90\% | Market | Not Applicable | Not Applicable | 5.45\% |
| Total Capital r | 100.0\% |  |  |  |  |  | 6.72\% |
| Growth (g) |  |  |  |  |  | Not Applicable | 0.00\% |
| Rate without Growth: [(1+r)/( $1+\mathrm{g})]-1$ |  |  |  |  |  |  | 6.72\% |

# The Township of Lower Makefield, Bucks County <br> Wastewater Collection System and Purchased Treatment Capacity 

Appraisal Work Papers<br>As of September 17, 2020

Market Approach

## AUS Consultants

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J. Weinert's E-Mail: weinertj@auswest.net
Lower Mahefield Township
Bucks County PA
Wastewater Collection System and Purchased Treatment Capacity
Investor-Owned Utility
As of September 17,2020
Comparable Sales Approach
Market Sales Data

Central Tendancy and Reliability Analysis


Market Value Indication $59,838,5$

| Summary of Market Analyses |  |
| :--- | :--- |
| Indicators |  |
| OCLD |  |
| CORLD | $36,541,509$ |
| Customers | $43,188,226$ |
| Cash Flows | $55,755,000$ |
| Value Line | $59,838,915$ |
|  | $55,741,285$ |
| Mean |  |
| Median | $50,212,987$ |
| Conclusion | $55,741,285$ |
|  | $55,741,285$ |

# The Township of Lower Makefield, Bucks County 

# Wastewater Collection System and Purchased Treatment Capacity 

Appraisal Work Papers

As of September 17, 2020

## Cost Approach

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Office Telephone: 414-529-5755
J. Weinert's Cell: 414-698-8371
J. Weinert's E-Mail: weinertj@auswest.net

S:\water industry\Lower Makefield Township Sewer Authority\Lower Makefield Report \& Testimony\Lower Makefield Wastewater Colllection System Valuation as of 6-30-2020 - Created 3-11-2021

| Bucks County PA |  |  |
| :---: | :---: | :---: |
| Wastewater Collection System and Purchased Treatment Capacity |  |  |
| Investor-Owned Utility |  |  |
| As of September 17, 2020 |  |  |
|  | Column Reference in OCLD \& RCNLD | Amount in \$s |
| Depreciated Replacement Cost (RCNLD) |  |  |
| Original Cost (OC) | (9) | 32,003,924.18 |
| Replacement Cost New (RCN) | (16) | 96,986,191.55 |
| Replacement Cost New less Depreciation (RCNLD) | (31) | 51,414,555.18 |
| Fair Market Vaue (FMV) | (41) | 51,414,555.18 |
| Depreciated Original Cost (OCLD) |  |  |
| Original Cost (OC) | (46) | 32,003,924.18 |
| Original Cost less Depreciation (OCLD) | (57) | 20,644,920.49 |
| Cost Approach Conclusion |  | 51,414,555 |

# The Township of Lower Makefield, Bucks County Wastewater Collection System and Purchased Treatment Capacity 

Appraisal Work Papers

As of September 17, 2020

Cost Approach<br>Replacement Cost New

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J. Weinert's Cell: 414-698-8371
J. Weinert's E-Mail: weinerti@auswest.net



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| ---: | :--- |
| $2,213,537$ | HWW-115 |
| $2,186,739$ | HWW-115 |
| 292,282 | USBLS4 |
| 506,720 | USBLSA |
| 354,373 | HWW-144 |
| 837,436 | HWW-144 |
| $22,142,441$ | HWW-144 |
| $2,286,077$ | HWW-139 |
| 308,281 | HWW-140 |
| 875,393 | HWW-19 |
| $32,003,924$ |  |
|  |  |
| $32,003,924$ |  |

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Reproduction to
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Replacement Cost of Easements

| Activity | Engineer Hours | Legal Hours | Fees <br> Hours |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| Determine the facilities for which a |  |  |  |  |  |
| Easment is need | 1 | 0 | 0 |  |  |
| Locate the Land owner for the property needing a easement | 1 | 0 | 0 |  |  |
| Develop a diagram of the Property, the facilities, and the easement | 1 | 0 | 0 |  |  |
| Develop the easement document | 1 | 0.5 | 0 |  |  |
| Visit the property owner to obtain permission for the easement and sign the easment documentation | 3 | 0 | 0 |  |  |
| Register the easement with the Municipal |  |  |  |  |  |
| Clerk | 0 | 0.5 | 250 |  |  |
| Total | 7 | 1 | 250 |  |  |
| Labor Costs per Hour | \$ 54 | \$ 100 |  |  |  |
|  |  |  |  |  | Cost |
| Total Cost | 378 | 100 | 250 | \$ | 728 |

# The Township of Lower Makefield, Bucks County 

# Wastewater Collection System and Purchased Treatment Capacity 

Appraisal Work Papers

As of September 17, 2020

Cost Approach
Replacement Cost New less Depreciation

AUS Consultants<br>Suite 201<br>8555 West Forest Home Avenue Greenfield, Wisconsin 53228<br>Office Telephone: 414-529-5755<br>J. Weinert's Cell: 414-698-8371<br>J. Weinert's E-Mail: weinerti@auswest.net

Lower Makefield Township Bucks County PA

Wastewater Collection System and Purchased Treatment Capacity Investor-Owned Utility
As of September 17, 2020 Replacement Cost New less Depreciation (RCNLD)

## (19)

(18)

## Account

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Lower Makefield Township
Wastewater Collection System and Purchased Treatment Capacity Investor-Owned Utility
Summary of Account Costing and Depreciation Parameters Used in the Depreciation Original Cost and the Depreciated Replacement Cost New

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# The Township of Lower Makefield, Bucks County <br> Wastewater Collection System and Purchased Treatment Capacity 

Appraisal Work Papers

As of September 17, 2020

Cost Approach
Replacement Cost New less Depreciation to Fair Market Value

AUS Consultants
Suite 201
8555 West Forest Home Avenue
Greenfield, Wisconsin 53228
Office Telephone: 414-529-5755
J. Weinert's Cell: 414-698-8371
J. Weinert's E-Mail: weinerti@auswest.net
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Lower Makefield Township
Bucks County PA
(37) Investor-Owned Utility
As of September 17, 2020 Wastewater Collection

Fair Market Value
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354.2 Site Grading and Clearing
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Lower Makefield Township
Bucks County PA
Wastewater Collection System and Purchased Treatment Capacity
Investor-Owned Utility
As of September 17, 2020
Fair Market Value
Fair Market Value


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As of September 17， 2020
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 354.2 Interior Stairs 1988 354.2 Plumbing and HVAC
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 354.2 Final Grading and Seeding
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Lower Makefield Township
Bucks County PA
Wastewater Collection System and Wastewater Collection System and Purchased Treatment Capacity Investor-Owned Utility
As of September 17, 2020

Fair Market Value
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354.2 Fencing and Gate




354.2 Excavation and Backfill
354.2 Precast Concrete Wet Well

354.2 Precast Concrete Valve Vault 354.2 Site Grading and Clearing
354.2 Erosion and Sedimentation Control
354.2 Driveway
354.2 Fencing and Gate
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354.2 Final Grading and Seeding 354.2 Foundation
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Lower Makefield Township
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Wastewater Collection System and Purchased Treatment Capacity
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Investor-Owned Utility
As of September 17, 2020
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As of September 17, 2020

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 355.245 KW Generator and Pad
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S：water industry Lower Makefield Township Sewer Authority Lower Makefield Report \＆Testimony\Lower Makefield Wastewater Collection System Valuation as of 6 －30－2020－Created 3－11－2021
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| Lower Makefield Township |  |
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Wastewater Collection System and Purchased Treatment Capacity
Investor－Owned Utility
As of September 17， 2020
Fair Market Value
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Lower Makefield Township
Bucks County PA
Wastewater Collection System and Purchased Treatment Capacity
Investor－Owned Utility
As of September 17， 2020
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Wastewater Collection System Investor－Owned Utility
As of September 17， 2020

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356．2 Wiring the Pumps and Controls 356．2 Automatic Transfer Switch
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356．2 Wiring the new Control Building
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 356．2 Site Lighting
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As of September 17, 2020

Fair Market Value
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 361.2 Makefield Crossing (Foley Tract an
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Lower Makefield Township
Bucks County PA
Wastewater Collection System and Purchased Treatment Capacity
Investor-Owned Utilly
As of September 17, 2020
Fair Market Value
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Lower Makefield Township
Bucks County PA
Wastewater Collection System and Purchased Treatment Capacity
Investor-Owned Utility
As of September 17, 2020
Fair Market Value
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Lower Makefield Township
Bucks County PA
Wastewater Collection System and Purchased Treatment Capacity
Investor-Owned Utility
As of September 17, 2020
Fair Market Value
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Bucks County PA
Wastewater Collection Syste Investor-Owned Utility
As of September 17, 2020

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363.2 Makefield Crossing (Foley Tract an.
363.2 Makefield Glen
363.2 Heritage Oaks
363.2 Ashley Estates
363.2 Heacock Meadows Section I
363.2 Makefield Crossing (Foley Tract an
363.2 Makefield Glen
363.2 Heritage Oaks
363.2 Ashley Estates
363.2 Hidden Ponds
363.2 Stewards Fields at Yardley
363.2 Yardley Estates
363.2 Stewards Fields at Yardley
363.2 Yardiey Estates
363.2 County Pointe
363.2 Regency at Yar
363.2 Regency at Yardley II
363.2 Yardiey Corners
363.2 Tanglewood
363.2 Peake Farm
363.2 Oxford Glen Yardley Oaks
363.2 Big Oak Bend
363.2 Big Oak Bend
Stony Hill
363.2 Stony Hill
363.2 Meadowbrook
363.2 Meadowbrook
363.2 Bexely Orchards
363.2 Deerbrook


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Lower Makefield Township
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Wastewater Collection Sys
Investor-Owned Utility
As of September 17, 2020
Fair Market Value
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# The Township of Lower Makefield, Bucks County Wastewater Collection System and Purchased Treatment Capacity 

Appraisal Work Papers<br>As of September 17, 2020

Original Cost less Depreciation

AUS Consultants
Suite 201
8555 West Forest Home Avenue
Greenfield, Wisconsin 53228
Office Telephone: 414-529-5755
J. Weinert's Cell: 414-698-8371
J. Weinert's E-Mail: weinert@@auswest.net

| (43) | (44) | (46) | (47) | (48) | (49) | (53) | (54) | (55) | (56) | (57) |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Account | Description | Original Costs | Retirement Dispersion lowa-type | Normal Service Life (NSL) | Age at Septembe r 17, 2020 Appraisal Date | $\begin{gathered} \text { Normal } \\ \text { Remaining } \\ \text { Life } \end{gathered}$ | Total Life Expectancy | Theoretical Reserve Percent | Theoretical Reserve | Depreciated Original Cost |
| Input | Input | Input | Input | Input | Calculation | Calculation | Calculation | Calculation | Calculation | Calculation |
| AUS Inpul | Eng Assmnt | Eng Assmnt | AUS Input | AuS input |  |  | Col (46) + (53) | Col (53)/ (54) | Col (46) '(56) | Col (46) - ${ }^{(56)}$ |
| Acct | Descrip | Original Cost | lowa | Normal | age | Rem Life | Total Life | Theo\% | Theo Reserve | Net Book |
| 353.20 | Land \& Land Rights | 646 | ZNonDep | - | 36.47 | . | - | - | . | 646 |
| 354.20 | Stuctures \& Improvements - Pumping | 2,213,537 | R3.0 | 65,00 | 29.27 | 38.31 | 67.58 | 0.43 | 947,656 | 1,265,881 |
| 354.40 | Stuctures \& Improvements - Treatment | 2,186,739 | R3.0 | 65.00 | 39.24 | 30.12 | 69.36 | 0.56 | 1,227,201 | 959,538 |
| 355.20 | Generating Equipment - Pumping | 292,282 | R3.0 | 35.00 | 28.37 | 12.98 | 41.35 | 0.65 | 189,863 | 102,419 |
| 356.20 | Pump StationPower Protection \& Control Devices | 506,720 | R3.0 | 35.00 | 24.02 | 16.13 | 40.15 | 0.56 | 282,960 | 223,760 |
| 359.20 | Collection Sewers - Low Pressure | 354,373 | R2.5 | 80.00 | 6.23 | 73.99 | 80.22 | 0.08 | 27,485 | 326,888 |
| 360.20 | Collection Sewers - Force - Mains | 837,436 | R3.0 | 75.00 | 25.12 | 51.47 | 76.59 | 0.32 | 271,268 | 566,168 |
| 361.20 | Collection Sewers - Gravity - Mains | 22,142,441 | R2.5 | 80.00 | 25.91 | 56.87 | 82.78 | 0.31 | 6,836,757 | 15,305,683 |
| 363.20 | Service Laterals | 2,286,077 | R3.0 | 70.00 | 27.23 | 44.80 | 72.04 | 0.37 | 856,045 | 1,430,032 |
| 363.21 | Flow Measuring Devices | 308,281 | 52.0 | 30.00 | 30.41 | 9.01 | 39.42 | 0.73 | 226,501 | 81,780 |
| 371.20 | Pumping Equipment | 875,393 | R3.0 | 35.00 | 24.22 | 15.91 | 40.13 | 0.56 | 493,266 | 382,127 |
|  |  | 32,003,924 |  |  |  |  |  |  | 11,359,004 | 20,644,920 |
| Grand |  |  |  |  |  |  |  |  |  |  |
| Total | Grand Total | 32,003,924 |  | 74.25 | 26.90 | 50.32 | 77.21 | 0.35 | 11,359,004 | 20,644,920 |

S: :Water industrylower Makefield Township Sewer Authority Lower Makefield Report \& TestimonylLower Makefield Wastewater Colliection System valuation as of 6-30-2020-Created 3-11-2021



| $43 \quad 44$ | 45 | 46 | 47 | ${ }^{48}$ | 49 | 50 | 51 | 52 | 53 | 54 | 55 | 56 | 57 | 58 | 59 | 60 | 61 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Lower Makefiodd Township |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Bucks County PA |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Wastowater Colloction System and Purchased Treatment Capacity Investor-Owned Utility |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| As of Soptember 17, 2020 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Determination of the Depreciated Original Cost |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| (43) (44) | (45) | (46) | (47) | (48) | (49) | (50) | (51) | (52) | (53) | (54) | (55) | (56) | (57) | (58) | (59) | (60) | (61) |
| Account Descrpion | $\underset{\text { Yearers }}{\text { Placmers }}$ | Onginal costs | Rotirement Dispersion lowatype | $\begin{aligned} & \text { Normal } \\ & \text { Service Life } \\ & \text { (NSL) } \end{aligned}$ | $\begin{aligned} & \text { Age at } \\ & \text { September } \\ & 17,2020 \\ & \text { Appraisal } \\ & \text { Date } \end{aligned}$ | $\begin{aligned} & \text { Age as \% of } \\ & \mathrm{NSL} \end{aligned}$ | lowa Lookup | Iowa Condition Percent of Percent New | $\begin{gathered} \text { Normal } \\ \text { Remaining } \\ \text { Life } \end{gathered}$ | Total Life Expectancy | Theoresical Resorve Percont | Theoresical Reserve | Depreciated Orignal Cost | OC Weigheod Age | OC Weightod Normal Remaining Lic | oc Weighted Total Life Expectancy | Normal Service LEe (NSL) |
| nat now | naut | noun | now | nan | casouton | Cacoutoon | Custatam | Cucostiom | cascuas | ${ }^{\text {chasamion }}$ | Cuturem | Cracatan | crecution | Cracumon | cracataon | Cutaitan | crovuten |
| aus rawil Ergassmu | Efy Assmot | Eng assmm | nus rout | nus mown | ${ }_{\text {a }}^{\text {a }}$ | Ca (49) (48) | Ca (47) 8 ( 30$)$ | $\begin{aligned} & \text { Loovup lowa } \\ & \text { Curves Life Tabies } \\ & \text { \&f co (S1) } \end{aligned}$ | Cas (4A) ${ }^{\text {[132] }}$ | Ca (46) $\cdot$ [53) | $\left.\mathrm{cou}^{(53)}\right)(50)$ | Ca (146) ${ }^{\text {(15) }}$ | Ca (46) -(5) | Cal $866^{\prime} \cdot(89)$ | C0(146) 133$)$ | Cas (16). 564 | CSA (46) : 889 |
| Act Desora | Yoar | Onginai Cost | 'owa | Nomat Lito | age | Agep | IowaLookup | Iowa Conditan | Rem Lue | Total Lie | Theo\% | Theo Roserve | Not Book | OC mo Age | OC wid Rem Lre | OC mo Total Life | OC wid Nomal Lito |
| 354.2 Bar Screen 354.2 Precast Concrete Valve Vaut | 1978 | 853 | R3.0 | ${ }^{65}$ |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 1978 ( $\begin{gathered}\text { 8,092 } \\ \\ 62.504\end{gathered}$ |  | R3. 0 | ${ }_{65}^{65}$ | 42.5042.50 | 65 R3.006565R3.0665 |  | 0.419310.41931 | 27.2627.26 | 69.7669.76 | 0.669230.80923 |  | $\begin{gathered} 2,381 \\ 2,4,425 \end{gathered}$ | 256,910 |  | -59,497 | 55,437 395.900 |
|  |  |  |  |  |  |  |  | $\begin{aligned} & 38,079 \\ & 38,079 \end{aligned}$ |  |  |  | 2,656,414 |  | 1,703,855 | 4,360,269 | 355,980 4,062,751 |
| 354.2 She Graokg and Clearing | 1978 | 3,046 | R3.0 | 65 | 42.50 |  | 5 R3.0065 |  | 0.41931 | 27.26 | 69.76 | 0.60923 | 1.856 | 1,190 | 129.455 | ${ }^{83.034}$ | 212,489 |  |
| 354.2 Erosion and Sodimentasion Control | 1978 | 1,218 | R3,0 | 65 | 42.50 |  | 65 R3.0065 | 0.41931 | 27.26 | 69.76 | ${ }_{0} 0.60923$ | 742 | 476 | 129,455 51,782 | 83, 314 | 212,49 84,996 | 197,990 79.196 |
| 354.2 Dineway | 1978 | 3,046 | R3.0 | 65 | 42.50 |  | 55 R3.0065 | 0.41931 | 2726 | 69.76 | 0.60923 | ${ }_{1}^{1,856}$ | 1,190 | 129,455 | 83,034 | 212,489 | 797,196 197,990 |
| 354.2 Fencing and Gate | 1978 | 2,071 | R3.0 | 65 | 42.50 |  | 5 R3.0065 | 0.41931 | 27.26 | 69.76 | 0.60923 | 1.262 | 809 | 88,029 | ${ }_{56,463}$ | 14,4,42 | 197999 134,633 |
| $354.2{ }^{*} \mathrm{~K}$ Copper Water Senvice with Yard | 1978 | 487 | R3.0 | 65 | 42.50 |  | 5 R3.0065 | 0.41931 | 27.26 | 69.76 | 0.60923 | 297 | 190 | 20.713 | 13,285 | - ${ }^{14,4,998}$ | 134,633 31,878 |
| 354.2 Final Gracing and Seocing | 1978 | 1,218 | R3,0 | 65 | 42.50 |  | 55 R3.0065 | 0.41931 | 27.26 | 69.76 | 0.60923 | 742 | 476 | 51,782 | 33,214 | 834,996 | 31,878 79,196 |
| 354.2 Control Buiding incuuding Wet Wel at | 1978 | - | R3.0 | 65 | 42.50 |  | 5 R3.0065 | 0.41931 | 2726 | 69.76 | 0.60923 | , | $\bigcirc$ | 51,02 | ${ }^{33,214}$ | 84,996 | 79,196 |
| 354.2 Foundation | 1978 | 3,046 | R3.0 | 65 | 42.50 |  | 5 R3.0065 | 0.41931 | 27.26 | 69.76 | 0.60923 | 1,856 | 1.190 | 129.455 | 83,034 | 21.4 .489 | 197990 |
| 354.2 Control Buiding | 1978 | ${ }^{8.529}$ | R3.0 | 65 | 42.50 |  | 5 R3.0065 | 0.41931 | 27.26 | 69.76 | 0.60923 | 5,196 | 3,333 | 362.474 | 232.495 | 594.969 | 197.990 554.371 |
| 354.2 Plumbing and HVAC | 1978 | 2.071 | R3.0 | 65 | 42.50 |  | 5 R3.0065 | 0.41931 | 27.26 | 69.76 | 0.60823 | 1.262 | 809 | 88,029 |  |  | 554,371 134,633 |
| 354.2 Wel Well and vare vaut | 1978 | $\bigcirc$ | R3.0 | 65 | 42.50 |  | 5 R3.0065 | 0.41931 | 27.26 | 69.76 | 0.60923 | 7.202 | 809 | ${ }^{88,029}$ | 56,463 | 144,492 | 134,633 |
| 354.2 Exavaston and Backifl | 1978 | 30,460 | R3.0 | 65 | 42.50 |  | 5 R3.0065 | 0.41931 | 27.26 | 69.76 | 0.60923 | 18,557 | 11.903 | 1,294,549 | 830.339 | 2.124,888 |  |
| 354.2 Precast Concrete Wet Well | 1978 | 11,575 | R3.0 | ${ }_{65}$ | 42.50 |  | 5 R3.0065 | 0.41931 | 27.26 | 69.76 | 0.80923 | 7.052 | 4.523 | -491,929 | ${ }_{315.529}$ | 2, 8124.8885 | 1,979.8968 |
| 354.2 Preabicicated Steel Dry Woll | 1978 | 15,839 | R3.0 | ${ }_{65}$ | 42.50 |  | 5 R3.0065 | 0.419310.41931 | 27.2627.26 | 699.7669.76 | 0.6.09230.00923 | 9.650 | 6.189 |  | ${ }_{431,76}$ | - $\begin{array}{r}\text { 807,457 } \\ 1,104.942\end{array}$ |  |
| 354.2 sar Screen |  | 1,157 | R3.0 | 6565 | 42.50 | ${ }_{65} \mathrm{R} 3.0065$ |  |  |  |  |  | $\begin{gathered} 705 \\ 51,032 \end{gathered}$ |  | 49,193 |  |  | $\begin{aligned} & 1.029 .547 \\ & 75.236 \end{aligned}$ |
|  |  | 83,765 |  |  |  |  |  | $32,733$ |  |  |  |  | 3,560,009 | $\begin{array}{r} 31,553 \\ 2.233,432 \end{array}$ | $\begin{array}{r} 80,746 \\ 5,843,441 \end{array}$ | $\begin{array}{r} 75,236 \\ 5,444,719 \end{array}$ |
| 354.2 Heacock Road Pump Station* | 1980 | $\begin{aligned} & 244,445 \\ & 244,445 \end{aligned}$ | R3.0 | ${ }_{85}$ | 40.50 | 62 R3.0062 |  |  | 0.44205 | 28.73 | 69.23 | 0.58501 | $\begin{aligned} & 143,002 \\ & 143,002 \end{aligned}$ | $\begin{aligned} & 101,442 \\ & 101,442 \end{aligned}$ | $\begin{aligned} & 9,900,002 \\ & 9,900,002 \end{aligned}$ | $\begin{gathered} 7,022,890 \\ 7,022,890 \end{gathered}$ | 16,922,893 16,922,893 | 15,888,893 $15,888,893$ |
| 354.2 Sne Gradng and Ciearing | 1985 | 4.599 | R3.0 | ${ }_{65}$ | 35.50 |  | 5 R3.0055 | 0.49706 | 32.31 | 67.81 | 0.52352 | 2.402 | 2,186 | 162,901 | 148,262 | 311,163 | 298.269 |
| 354.2 Erosion and Sodimentasion Contul | 1985 | ${ }^{1,835}$ | ${ }^{\text {Ra. }} 0$ | 65 | 35.50 |  | 5 R3.0055 | 0.49706 | 32.31 | 67.81 | 0.52352 | 961 | ${ }_{8} 875$ | 65,160 | 59,305 | 124,465 | 119,307 |
| 354.2 Drieway | 1985 | 2.386 | R3.0 | 65 | 35.50 |  | 5 R3.0055 | 0.49706 | 32.31 | 67.81 | 0.52352 | 1.249 | 1,137 | 84,708 | 7,096 | 161,805 | 155,100 |
| 354.2 Fencing and Gate | 1595 | 3,120 | R9.0 | 65 | 35.50 |  | 5 R3.0055 | 0.49706 | 32.31 | 67.81 | 0.52352 | 1.634 | 1,487 | 110,772 | 100,818 | 211,591 | 202,823 |
| $354.21 * \mathrm{~K}$ Copper Water Senice men Yard | 1985 | 734 | R3.0 | 65 | 35.50 |  | 5 R3.005S | 0.49706 | 32.31 | 67.81 | 0.52352 | 384 | 350 | 26,064 | 23.722 | 49,786 | 202,823 47.723 |
| 356.2 Firal Gracing and Soeding | 1995 | ${ }^{1} / 835$ | R3.0 | 65 | 35.50 |  | 5 R3.0055 | 0.49706 | 32.31 | 67.81 | ${ }^{0.52352}$ | 961 | 380 875 | 65,60 26, | 23, 59,305 | 49,766 124,465 | 47,723 119.307 |
| 354.2 Foundation | 1985 | 1,652 | R3.0 | 65 | 35.50 |  | 5 R3.0055 | 0.49706 | 32.31 | 67.81 |  |  |  |  |  |  |  |
| 354.2 Control Encosure | 1985 | 1.285 | R3.0 | 65 | 35.50 |  | 5 R3.0055 | ${ }_{0} .499706$ | 32.31 | 67.81 | ${ }_{0} 0.52352$ | ${ }_{673}$ | ${ }_{612}$ | ${ }_{4}^{56,644}$ | 53.374 41.513 | 112.019 87,126 | 107.377 83,515 |
| 354.2 USEMCO Control Endosure | 1985 | 4,599 | R3.0 | 65 | 35.50 |  | 5 R3.0055 | 0.49706 | 32.31 | 67.81 | 0.52352 | ${ }_{2}, 402$ | 2,186 | 4, 162,9012 | 148,262 | 87,126 $\times 11,163$ | 83.515 298.289 |
| 354.2 Excavation and Backill | 1985 | 8,994 | R3.0 | ${ }_{65}$ | 35.50 |  | 5 R3.0055 | 0.49706 | 32.31 | 67.81 | 0.52352 | 4,709 | 4,295 | 319,285 | 290.594 | 609,879 | 584,606 |
| 354.2 Precast Concrete Wet Wel | 1985 | 8.280 | ${ }^{\text {R3, }} 0$ | 65 | 35.50 |  | 5 R3.005s | 0.49706 | 32.31 | 67.81 | 0.52352 | 4,324 | 3,936 | 293,221 | 266,872 | 560,093 | 584,606 536,883 |
| 354.2 Pump Host | 1985 |  | R3.0 | 65 | 35.50 |  | 5 R3.0055 | 0.49706 | 32.31 | 67.81 | 0.52352 | 240 | 219 | 16.290 | ${ }^{14,826}$ | 31,116 | S36,883 29.827 |
|  |  |  |  |  |  |  |  |  |  |  |  | 20,004 | 18,935 | 1,410,718 | 1,283,952 | 2,694,671 | 2.583,006 |


| $\bar{\square}$ | $\underline{\text { ® }}$ |  | $\frac{5}{8}$ |
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| 8 | － |  | $\frac{5}{3}$ |
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|  | $90_{8}^{\circ}{ }_{8}^{\circ}$ <br>  |  |  <br>  |  |
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| $43 \quad 44$ | 45 | 46 | 47 | 48 | 49 | so | 51 | 52 | 53 | 54 | 55 | 56 | 57 | 58 | 59 | 60 | 61 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Lower Makeftiold Townshlp |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Wastowator Colloction System and Purchased Troatment CapactiyInvestor-Ownod Utility |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| As of Soptember 17, 2020 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Determination of the Depreciated Original Cost |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| (43) (44) | (45) | ${ }^{(46)}$ | (47) | (48) | (49) | (50) | (51) | (52) | (53) | (54) | (55) | (56) | (57) | (58) | (59) | (60) | (61) |
| Account Doscriplion | Placoment | Onginal Costs | Retirement Dispersion lowa-lype | $\begin{aligned} & \text { Normal } \\ & \text { Servioc Life } \\ & \text { (NSL.) } \end{aligned}$ |  | $\begin{aligned} & \text { Age as \% of } \\ & \text { NSL } \end{aligned}$ | towa Lookup | Iowa Condition Percent of Percent New | $\begin{gathered} \text { Normal } \\ \text { Romaining } \\ \text { LHe } \end{gathered}$ |  | Theoretica Reserve Percen | Theoretical Roserve | Dopreciated Orignal Cost | OC Weightee Age |  | OC Weighted Total Life Expectancy | Normal Service Lte (NSL) |
| nom tom | tout | nat | naut | nam | Casataon | Casazaton | cractuon | Curoseon | Crasum | Cracsaton | Cuavemen | Cataston | axcuen | Cuscuaton | Cutanton | Gracuton | Cusoution |
| mus ravi Evacerm | Enq Asomm | Erqasmme | nus roun | aus nav |  | Ca (49) (148) |  | $\begin{aligned} & \text { Curves Lite Tabies } \\ & \text { (i) co (5t) } \end{aligned}$ |  | ca (46) [(35) | ${ }^{\text {cus (3) }}$ ( $(50)$ | Car (146) (18) | Co (4) - (5) | Ca (46) [499) | Ca (45) 1339 | Cas (46) '(5a) | Cas (46) ${ }^{(184)}$ |
| Acct Dosate | Year | Ongmal Cost | lowa | Normal Life | age | Agep | lowatookup | lowa Condilion | Rem Lhe | Tolal Le | Theo\% | Theo Reserve | Ner Book | OC mad Age | OC wed Rem Live | OC mod Toal Lite | OC wid Normal Lfe |
| 354.2 Wet Well and Dry Well Structure | 1988 | 247,926 | R3.0 | 65 | 32.50 |  | 0 R3.0050 | 0.53792 | 34.96 | 67.46 | 0.48177 | 119.443 | 128,483 | 8,057,601 | 8.667,499 | 16.725,100 | 16,115,201 |
| 354.2 Control Buiding Above Wet Well and | 1988 | 65.750 | R3.0 | 65 | 32.50 |  | R3.0050 | 0.53792 | 34.96 | 67.46 | 0.48177 | 31,676 | 34,074 | 2,136,876 | 2,298,621 | 4,435,496 | 4,273,751 |
| 3542 Interior Stairs | 1988 1988 | 15.272 | ${ }^{83.0}$ | ${ }^{65}$ | 32.50 |  | 0 R3.0050 | 0.53792 | 34.96 | 67.46 | 0.48177 | 7.356 | 7.915 | ${ }^{2966,348}$ | 533,918 | 1,030,266 | -992,696 |
| 354.2 Puumbing and HVAC | 1988 | 16,859 | R3.0 | 65 | 32.50 |  | \% R3.0050 | 0.53792 | 34.96 | 67.46 | 0.48177 | 8.122 | 8.737 | 447,917 | 583,918 590 | 1,137,307 | 1.095,833 |
|  | 1988 | 8,925 | R3.0 | 65 | 32.50 |  | 0 R3.0050 | 0.53792 | 34.96 | 67.46 | 0.48177 | 4.300 | 4,625 | 290,074 | 312,030 | 602,104 | 580,147 |
| 354.2 Ear Screen | 1988 | 5.752 | R3.0 | 65 | 32.50 |  | O R3.0050 | 0.53792 | 34.96 | 67.46 | 0.48177 | 2.771 | 2,981 | 186,936 | 201,086 |  |  |
|  |  | 478,994 |  |  |  |  |  |  |  |  |  | 230,717 | 248,177 | 15,564,062 | 16,742,141 | 32,306,203 | 373,1873 $31,128,123$ |
| 354.2 Constriction | 2021 | 5,000 | R3. 0 | 65 | 0.00 |  | 0 R3.0000 | 1 | 65 | ${ }^{65}$ | 0.00000 | - | 5,000 |  |  |  |  |
| 3354.2 Erosion and Sedimentation Controis | 2021 | 2,500 | R3.0 | 65 | 0.00 |  | 0 R3.0000 | 1 | 65 | 65 | 0.00000 | : | 2.500 | $:$ | 325,000 162,500 | 325,000 162,500 | 325,000 162,500 |
| 354.2 Paved Diveway | 2021 | 15.000 | R3.0 | 65 | 0.00 |  | 0 R3,0000 | 1 | 65 | 65 | 0.00000 | - | 15,000 | : | 975,000 | 975,000 | 975,000 |
| 354.2 Fencing and Gate | 2021 | 15.000 | R3.0 | 65 | 0.00 |  | $0 \mathrm{R3}, 0000$ | 1 | 65 | 65 | 0.00000 | - | 15,000 | . |  |  | 975.000 |
| 354.2 Final Grading, Seothg, and Restorat | 2021 | 5.000 | ค3.0 | 65 | 0.00 |  | ${ }^{0} \mathrm{R3.0000}$ | 1 | ${ }_{65}$ | 65 | 0.00000 | : | 5,000 | : | 325,000 | 335,000 | 985.000 325000 |
| 354.2 Precast Wet Wel wert U6, Hatch, ank | 2021 | 80,000 | R3.0 | 65 | 0.00 |  | 0 R3.0000 | 1 | 65 | 65 | 0.00000 | . | 80,000 | . | 5,200,000 | 5.200,000 | 325.000 5.200 .000 |
| 354.2 Precast Concere Vave Vautilinudin | 2021 | ${ }^{81,220}$ | R3.0 | 65 | 0.00 |  | O R3.0000 | t | 65 | 65 | 0.00000 |  | ${ }_{81,220}$ | . |  | $5.279,300$ |  |
| 354.2 Trast Rack | 2021 | 2.500 | R3.0 | 65 | 0.00 |  | $0 \mathrm{R3.0000}$ | 1 | 65 | ${ }_{65}$ | 0.00000 | - | 2,500 | : | $5.279,300$ 162,500 | 5.279 .300 162,500 | $5,279,300$ 162,500 |
| 354.2 Contual Busioling | 2021 |  | R3.0 | 65 | 0.00 |  | - R3,0000 | 1 | 65 | 65 | 0.00000 | + | 35.000 | . | 2.275,000 | 2,275,000 |  |
|  |  | 241,220 |  |  |  |  |  |  |  |  |  | + | 241.220 | , | 15,679,300 | 15,679,300 | 2575,000 15,79,300 |
| 354.2 She Gradng and Cliearing | 1993 | 10.290 | R3.0 | 65 | 27.50 |  | 2 R 3.0042 | 0.60583 | 39.38 | 86.88 | 0.41118 | 4.231 | 6.059 | 282,978 | 405,225 | 688,203 | 668.858 |
| 354.2 Erosion and Secimentasion Control | 1993 | 2.287 | R3.0 | 65 | 27.50 |  | 2 R3.0042 | 0.60583 | 39.38 | 66.88 | 0.41118 | ${ }^{4} 940$ | 1.346 | ${ }_{6} 62,884$ | -90,250 | 688,203 152.934 | ${ }_{14888,635} 68.858$ |
| 354.2 Drineway | 1993 | 8,461 | R3.0 | 65 | 27.50 |  | 2 R3.0042 | 0.60583 | 39.38 | ${ }^{66.88}$ | 0.41118 | 3,479 | 4.982 | 232.671 | 333,185 | 565.856 | 549,950 |
| 354.2 Fencing and Gate | 1993 | 5.717 | 83.0 | ${ }^{65}$ | 27.50 |  | 2 R3.0042 | ${ }^{0.60563}$ | 39,38 | 66.88 | 0.41118 | 2,351 | 4,366 | 157,210 | 3235,125 225 | 5s5,.86 382,335 | 5471.588 |
| $354.21^{*} \mathrm{~K}$ Copper Water Service will Y Yard | 1993 | 915 | R3.0 | 65 | 27.50 |  | 2 R3.0042 | 0.80583 | 39.38 | ${ }^{66.88}$ |  |  |  |  |  |  |  |
| 354.2 Final Grading and Seeding | 1993 | 3.887 | R3.0 | ${ }_{65}$ | 27.50 |  | $2 \mathrm{P3.0042}$ | 0.60583 | 39.38 | ${ }_{66.88}$ | 0.41118 | 1.598 | 2,289 | -106,903 | 36,020 153,085 | 61,74 259.988 | 599,454 252,880 |
| 354.2 Foundation | 1993 | 5.717 | R3.0 | 65 | 27.50 |  | 2 R 3.0042 | 0.60583 | 39.38 | ${ }^{66.88}$ | 0.41118 | 2.351 | 3.366 | 157,210 | 225,125 | 382.335 | 371,588 |
| 354.2 Control Bulding | 1993 | 16,007 | R3.0 | 65 | 27.50 |  | 2 R 3.0042 | 0.60583 | 39.38 | 66.88 | 0.41118 | 6,582 | 9,425 | 440,188 | 630,350 | 1.070.536 | 1,040,445 |
| 354.2 Plumbing and HVAC | 1993 | 3,887 | R3. 0 | ${ }^{65}$ | 27.50 |  | 2 R 3.0042 | 0.60583 | 39.38 | ${ }_{66.88}$ | 0.41118 | 1.556 | 2.289 | 106.903 | 153,085 | 259.988 | 252.680 |
| 354.2 Exavason and Backil | 1993 | 38,874 | R3. 0 | 65 | 27.50 |  | 2 R 3.0042 | 0.60583 | 39.38 | ${ }_{66.88}$ | 0.41118 | 15,994 | 22.890 | 1.069,029 | 1,530,849 | 2.599.878 | 2.526,795 |
| 354.2 Procast Concrote Wet Well | 1993 | 12.577 | R3.0 | ${ }^{65}$ | 27.50 |  | $2 \mathrm{R3.0042}$ | ${ }^{0.60583}$ | 39.38 | 65.88 | 0.41118 | 5,171 | 7,405 | 1,006,029 345.862 | - 495,275 | 2,599,076 841,137 | $2,526,795$ 817,493 |
| 354.2 Protabicatod Stieel Dry Woll | 1993 | ${ }^{21,724}$ | R3.0 | ${ }^{65}$ | 27.50 |  | 2 R3.0042 | 0.60583 | 39.38 | ${ }^{66.88}$ | 0.41118 | 8.932 | 12.791 | 597.398 | ${ }^{855,475}$ |  | 1,412,033 |
| 354.2 Bar Screen | 1993 | $\begin{array}{r} 2,172 \\ 132.514 \end{array}$ | R3.0 | 65 | 27.50 |  | 2 R3.0042 | 0.60583 | 39.36 | 66.88 | 0.41118 | $\begin{array}{r} 893 \\ 54,487 \end{array}$ | $1,179$ |  | $85.547$ | $145,287$ | 1.412 .203 <br> 8.613 .402 |
|  |  | 132,514 |  |  |  |  |  |  |  |  |  | 54,487 | 78,027 | 3,644,130 | 5,218,394 | 8,862,525 | 8,613,402 |
| 354.2 Stue Grading and Cliearing | 2002 | 7,174 | R3.0 | ${ }_{65}$ | 18.50 |  | 883.0028 | 0.73133 | 47.54 | 66.04 | 0.28013 | 2.010 | 5,164 | 132,717 | 341,047 | 473,764 | 466,303 |
| 354.2 Erosion and Sedimentasion Control | 2002 | 2,870 | R3,0 | 65 | 18.50 |  | 88 R3.0028 | 0.73133 | 4754 | 66,04 | 0.28013 | 804 | 2,066 | 53,087 | 136,419 | 189.506 | 186,521 |
| 354.2 Deneway | 2002 | 7,174 | R9, 0 | 65 | 18.50 |  | $8 \mathrm{R3,0028}$ | 0.73133 | 4754 | 66.04 | 0.28013 | 2.010 | 5,164 | 132,717 | 341.047 | 473,764 | 466,303 |


| $43 \quad 44$ | 45 | 46 | 47 | 48 | 49 | 50 | 51 | 52 | 53 | 54 | 55 | 56 | 57 | 58 | 59 | 60 | 61 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Lower Makeftiold Township |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Bucks County PA |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Wastowator Colloction System and Purchased Troatment Capacity Investor-Owned Utillity |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| As of Soptember 17, 2020 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Delermination of the Deprociatod Original Cost |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| (43) (44) | (45) | (46) | (47) | (48) | (49) | (50) | (51) | (52) | (53) | (54) | (55) | (56) | (57) | (58) | (59) | (60) | (61) |
| Accoum Descapion | Placoment | Onignal Costs | Retirement Dispersion lowa-type | $\begin{aligned} & \text { Normal } \\ & \text { Service Lite } \\ & \text { (NSL) } \end{aligned}$ | Ago at Soptomber 17, 2020 Appraisal Date | $\begin{aligned} & \text { Age as \% of } \\ & \text { NSL } \end{aligned}$ | lowa Lookup | Iowa Condition Percent of Percent New | $\begin{gathered} \text { Normal } \\ \text { Remaining } \\ \text { Life } \end{gathered}$ | $\underset{\text { Expectancy }}{\text { Total Lie }}$ | Theoresical Reserve Percen | Theoratical Resorve | Depreciated Original Cost | OC Weighted Age | OC Weighted Normal Remaining Life | OC Weighted Total Lfe Expectancy | Normal Sorvice Life (NSL) |
| mand man | na | man | nod | naw | Curasaten | cravenom | crecuran | Cuevieon | Cracuenon | crevieos | Cowevaten | craveron | Cracutaon | Curcuen | Crevemen | cuabeon | Cuncution |
| Nus hout Engesomt | Ery Aspme | Eriasume | sus has | aus nat |  | Cal(49)/(48) | ) Cosinf$) \mathrm{s}(5)$ | $\begin{aligned} & \text { Lookug lowa } \\ & \text { Curws Lo Tabies } \\ & \text { g cod (51) } \end{aligned}$ | Co (445) [(52) | Cal $1465 \cdot(133)$ | Cos (3) (154) | Ca (46) 185$)^{\prime}$ | Col (16) -(5) | Ca (46) [48) | C00 (46) ${ }^{(133)}$ | Ca (46) [ 541 | $\left.\mathrm{Ca}(46)^{\prime} \cdot 488\right)$ |
| Acct Doscrip | Year | Ongnal Cost | lowa | Nomal Lele | age | Agep | lowaLookup | lowa Consition | Rem Lite | Total Lie | Tmeo\% | Theo Resorve | Net Book | OC ma Age | OC mad Rem Life | Oc mo Tola L\%o | OC mo Normal Lly |
| 354.2 Fenchng and Gate | 2002 | 4.878 | R3.0 | 65 | 18.50 |  | 28 R3.0028 | 0.73133 | 47.54 | 66.04 | 0.28013 | 1.337 | 3.512 | ${ }^{90.248}$ | 231,912 | 322.159 | 317,086 |
| $354.21 \% \mathrm{~K}$ Copper Water Service with Yard | 2002 | 1,148 | 83,0 | 65 | 18.50 |  | 28 R3.0028 | 0.73133 | 47.54 | 66.04 | 0.28013 | 322 | ${ }_{826}$ | 21,235 | ${ }_{54,568}$ | 325,802 | 377.006 74,608 |
| 354.2 Final Grading and Seeding | 2002 | 2.870 | R3.0 | 65 | 18.50 |  | 28 R3.0028 | 0.73133 | 47.54 | 66.04 | 0.28013 | 804 | 2.066 | 53,087 | 136,419 | 189,506 | 188,521 |
| 354.2 Foundation | 2002 | 7.174 | R3.0 | 65 | 18.50 |  | 28 R3.0028 | 0.73133 | 47.54 | 66.04 | 0.28013 | 2.010 | 5,164 | 132,717 | 341,047 |  |  |
| 354.2 Control Bularing | 2002 | 25.826 | R3. 0 | 65 | 18.50 |  | 88 R3,0028 | 0.73133 | 47.54 | 66.04 | 0.28013 | 7.235 | 18,591 | 477.781 | 1.227,769 | 1.705.550 | 1,678,691 |
| 354.2 Plumbing and HVAC | 2002 | 4.878 | R3.0 | 65 | 18.50 |  | 28 R3.0028 | 0.73133 | 47.54 | 66.04 | 0.28013 | 1.367 | 3.512 | 90.248 | 231.912 | 322,159 | 317.086 |
| 354.2 Exavation and Beckil | 2002 | 48.782 | R3.0 | 65 | 12.50 |  | 28 R3.0028 | 0.73133 | 47.54 | 66.04 | 0.28013 | 13.665 | 35,117 | 902.476 | 2,319,119 | 3.221,595 | 3,170,861 |
| 354.2 Precast Concrete Wet Welt | 2002 | 21,809 | R3.0 | 65 | 18.50 |  | 883.0028 | 0.73133 | 47.54 | 66.04 | 0.28013 | 6.109 | 15,699 | 403,460 | 1.036,783 | 1,440,242 | 1,417.561 |
| 354.2 Pump Hoist | 2002 | 1,148 | R3.0 | 65 | 18.50 |  | 88 R3.0028 | 0.73133 | 47.54 | 68.04 | 0.28013 | 322 | 826 | 21,235 | -54.568 | 1,45,802 | 174,608 |
| 354.2 Bar Screen | 2002 | 2.870 | ${ }^{\text {R3. }}$ O | 65 | 18.50 |  | 283.0028 | 0.73133 | 47.54 | 66.04 | 0.28013 |  |  | 53.087 | 136,419 | 189,506 | ${ }_{186,521}$ |
| 354.2 Procast Concrete Vave Vouit | 2002 | 1.148 139.747 | R3.0 | 65 | 18.50 |  | ${ }^{88}$ R3.0028 | 0.73133 | 47.54 | 66.04 | 0.28013 | -322 | \%26 | 21,235 2595, 328 | 54.5688 | 75,8002 728,922 | 74.608 |
|  |  | 139,747 |  |  |  |  |  |  |  |  |  | 39,147 | 100,600 | 2,565,328 | 6,643,594 | 9,228,922 | 9,083,581 |
| 354.2 See Grading and Cliearing | 2005 | ${ }^{12.092}$ | R3.0 | ${ }^{65}$ | 15.50 |  | 24 R3.0024 | 0.76851 | 49.95 | 65.45 | 0.23682 | 2,884 | 9.228 | 187,425 | 603.991 | 791,415 | 785.974 |
| 354.2 Erosion and Sedimentation Control | 2005 | ${ }^{3.268}$ | R3.0 | 65 | 15.50 |  | 24 R3.0024 | 0.76851 | 49.95 | 65.45 | 0.23682 | 774 | 2.494 | 50,655 | 163,241 | 213.896 | 212,425 |
| 354.2 Driveway | 2005 | 12,092 | ${ }^{83.0}$ | 65 | 15.50 |  | 24 R3.0024 | 0.76851 | 49.95 | 65.45 | 0.23882 | 2.864 | 9.228 | 1877.425 | 603.991 | 791,415 | 785,974 |
| 354.2 Fencing and Gate | ${ }_{2}^{2005}$ | 8,170 | ${ }^{83.0}$ | 65 | ${ }^{15.50}$ |  | 24 R 3.0024 | 0.76851 | 49.95 | 65.45 | 0.23682 | 1.935 | 6.235 | 126,638 | 408.102 | 534.740 | 531.063 |
| 354.21 K Copper Water Service with Yard | ${ }_{2005}$ | 1.307 | ${ }^{83.0}$ | ${ }^{65}$ | ${ }^{15.50}$ |  | 24 R3.0024 | 0.76851 | 49.95 | 65.45 | 0.23682 | 310 | ${ }^{998}$ | 20.262 | ${ }^{65} 2.296$ | ${ }^{85,558}$ | 84,970 |
| 354.2 Firal Graing and Seeding | 2005 | 2.941 | R3.0 | 65 | 15.50 |  | 24 R3.0024 | 0.76851 | 49.95 | 65.45 | 0.23682 | 69 | 2.245 | 45,590 | 146.917 | 192.508 | 191,183 |
| 354.2 Foundation | 2005 | 9.477 | R3.0 | 65 | 15.50 |  | 24 R3.0024 | 0.76851 | 49.95 | 65.45 | 0.23682 | 2,244 | 7,233 | 146,900 | 473,398 | 620,298 | 616,034 |
| 354.2 Control Auiding | ${ }^{2005}$ | 29.413 | ${ }^{\text {R3, }}$ O | ${ }^{65}$ | ${ }^{15.50}$ |  | 24 R3.0024 | 0.76851 | 49.95 | 65.45 | 0.23682 | 6.966 | 22,447 | 455,898 | ${ }^{1,469,167}$ | 1.925.064 | 1,911.828 |
| 354.2 Puumbing and HVAC | 2005 | 5.556 | R3.0 | 65 | 15.50 |  | 24 R3.0024 | 0.76851 | 49.95 | 65.45 | 0.23682 | 1,316 | 4.240 | 88,114 | 277.509 | ${ }^{363.623}$ | ${ }^{361.123}$ |
| 354.2 Excavation and Backs | 2005 | 68,630 | R3.0 | 65 | 15.50 |  | 24 R3.0024 | 0.76851 | 49.95 | 6545 | 0.23682 | 16.253 | 52.377 | 1,063,761 | 3,428.056 | 4,491,816 | 4,460,933 |
| 354.2 Precast Concrete Wet Weil | 2005 | 25.164 | ${ }^{\text {R3. }}$ O | 65 | 15.50 |  | 24 R3.0024 | 0.78851 | 49.95 | 65.45 | 0.23882 | 5.959 | 19.205 | 390.046 | 1.256.954 | 1,646.999 | 1.635,675 |
| 354.2 Pretabricated Stoes Dry Well | 2005 | 35.949 | ${ }^{83.0}$ | ${ }_{65}^{65}$ | 15.50 1550 |  | 24 R3,0024 | 0.76851 | 49.95 | ${ }_{6554}$ | 0.23882 | 8.513 | 27.435 | 557.208 | 1,795.648 | 2,352,856 | 2,336,679 |
| 354.2 Bar Screen | 2005 | $\begin{array}{r} 3,105 \\ 217,164 \end{array}$ | R3.0 | 65 | 15.50 |  | 24 R3.0024 | 0.76851 | 49.95 | 65.45 | 0.23682 | $\begin{array}{r}735 \\ \hline 1,429\end{array}$ | 2,369 165,735 | 48,123 $3,366,044$ | 155,079 10,847,347 | 203,201 $14,213,391$ | 201,804 14,115,665 |
|  |  | 2.213,537 |  |  |  |  |  |  |  |  |  | 947,656 | 1,265,881 | 64,796,977 | 84,793,097 | 149,590,074 | 143,879,891 |
| 354.4 Conernutions to Morrsvile to Purchas | 1966 | 314.714 | R3. 0 | ${ }^{65}$ | 54.50 |  | 4 R3.0094 | 0.28888 | 18.78 | 73.28 | 0.74372 | 234.059 | 80,855 | 17,151.913 | 5.910,329 | 23,062,242 | 20,456,410 |
| 354.4 Construbuons to Morrisvie to Purchas | 1975 | 42.463 | $\mathrm{R}^{\text {P. }} 0$ | 65 | 45.50 |  | \% R3.0070 | 0.38261 | 24.87 | 70.37 | 0.68658 | 27.456 | 15.007 | 1,932,067 | 1.056,055 | 2,988,121 | 2,760.095 |
| 354.4 Consmeutons to Morisivie to Purchas | 1976 | 382.282 | R3. 0 | 65 | 44.50 |  | 8 R3.0068 | 0.3971 | 25.81 | 70.31 | 0.63291 | 241,950 | 140,332 | 17,011.549 | 9.866,698 | 26,878,247 | 24,848,330 |
| 354.4 Connmevibons to Morrsvie to Purchas | 1977 | 65.871 | R3. 0 | 65 | 43.50 |  | 7 R3.0067 | 0.40445 | 26.29 | 69.79 | 0.62330 | 41.057 | 24.814 | 2.865.389 | 1,731,749 | 4,597,137 | 4.281,615 |


| 00s＇zz8 | 00s＇z\％ | 00s＇zz8 | － | Dosez | － | 00000\％ | SE | ${ }_{5}$ | 1 | 0000飞ロ 0 | 000 | ${ }_{5}$ | －¢¢ | Dos＇Ez | 1202 |  |
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| 881＇ne | EEE＇ 188 | 890＇z9 | ¢9\％＇618 | 8991 | ocs＇2 | $9 \mathrm{CLE8} \mathrm{\%}$ | vz\％ | 89 | 12660 | 1010 ＇gy tot | osse | ${ }_{s}$ | －¢¢ | 966＇8 | 5981 | دoruwos namod $\tau$ Sse |
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| Lereze | 980＇696 | zrisot | $\mathrm{EbCO}^{1088}$ | 2018 | 909.4 | 000980 | 92L20 | Sts | sto | เziocy เz！ | 0sz\％ | se | 0¢ | عıLoz | 8251 |  |
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S: Iwater industry LIower Makefield Township Sewer Authority\Lower Makefield Report \& TestimonylLower Makefield Wastewater Colllection System valuation as of 6-30-2020-Created 3.11-2021


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S: \water industry\Lower Makefield Township Sewer Authority\Lower Makefield Report \& Testimony\Lower Makefield Wastewater Colllection System Valuation as of 6-30-2020 - Created 3-11-2021
Summary of Account Costing and Depreciation Parameters Used in the Depreciation Original Cost and the Depreciated Replacement Cost New
Lower Makefield Township
Wastewater Collection System and Purchased Treatment Capacity Investor-Owned Utility
September 17, 2020



Table
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# The Township of Lower Makefield, Bucks County Wastewater Collection System and Purchased Treatment Capacity 

Appraisal Work Papers

As of September 17, 2020

Income Approach

AUS Consultants
Suite 201
8555 West Forest Home Avenue Greenfield, Wisconsin 53228 Office Telephone: 414-529-5755
J. Weinert's Cell: 414-698-8371
J. Weinert's E-Mail:







S: Wwater industryLLower Makefield Township Sewer Authority Lower Makefield Report \& Testimony Lower Makefield Wastewater Colllection System Valuation as of 6-30-2020 - Created 3-11-2021


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# The Township of Lower Makefield, Bucks County 

# Wastewater Collection System and Purchased Treatment Capacity 

Appraisal Work Papers<br>As of September 17, 2020

Income Approach
Cost of Capital / Required Return

AUS Consultants<br>Suite 201<br>8555 West Forest Home Avenue<br>Greenfield, Wisconsin 53228<br>Office Telephone: 414-529-5755<br>J. Weinert's Cell: 414-698-8371<br>J. Weinert's E-Mail: weinerti@auswest.net

## Water and Wastewater Cost of Capital <br> Third Quarter 2020 (10-1-2020) <br> As an Investor-Owned Utility

## Weighted Cost of Capital (Discount Rate)

| (1) | (2) | (2a) | (3) | (3a) | (4) | (4a) | (5) |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | Portion of Capital AUS Input | Type of Data | Capital Cost <br> AUS Input | Type of Data | Tax Rate | Tax affect on cost of capital | After-tax <br> Market Capital Cost (2) ${ }^{*}(3)^{*}(4 a)$ |
| Debt | 29\% | Market | 2.82\% | Market | 28.89\% | 71.11\% | 0.58\% |
| Equity | 71\% | Market | 9.90\% | Market | 0.0\% | 100.00\% | 7.03\% |
| Total Capital r | 100.0\% |  |  |  |  |  | 7.61\% |
| Growth (g) |  |  |  |  |  |  | 1.82\% |
| Rate without Growth: [(1+r)/(1+g)]-1 |  |  |  |  |  |  | 5.68\% |

Water and Wastewater Cost of Capital
Third Quarter 2020 (10-1-2020)
As an Investor-Owned Utility

## Weighted Cost of Capital (Capitlization Rate)

| (1) | (2) | (2a) | (3) | (3a) | (4) | (4a) | (5) |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | Portion of Capital AUS Input | Type of Data | Capital Cost <br> AUS Input | Type of Data | Tax Rate | Tax affect on cost of capital | Market Capital Cost (2) ${ }^{*}(3)$ |
| Debt | 29\% | Market | 2.82\% | Market | Not Applicable | Not Applicable | 0.82\% |
| Equity | 71\% | Market | 9.90\% | Market | Not Applicable | Not Applicable | 7.03\% |
| Total Capital r | 100.0\% |  |  |  |  |  | 7.85\% |
| Growth (g) |  |  |  |  |  |  | 1.82\% |
| Rate without Growth: [(1+r)/(1+g)]-1 |  |  |  |  |  |  | 5.92\% |

## Water and Wastewater Cost of Capital

Third Quarter 2020 (10-1-2020)

As an Investor-Owned Utility
Weighted Cost of Capital (Rate of Return on Rate Base)

S: Iwater industry Lower Makefield Township Sewer Authority Lower Makefield Report \& Testimony \ower Makefield Wastewater Colllection System Valuation as of 6-30-2020-Created 3-11-2021

| $\stackrel{\square}{2}$ |  |  | $$ |  | $\begin{aligned} & \circ \stackrel{0}{0} \\ & \stackrel{\rightharpoonup}{0} \\ & \text { den } \end{aligned}$ |  | $\begin{aligned} & \text { ow } \\ & \stackrel{\pi}{\sigma} \end{aligned}$ |  | 吴怘 |  |  |  |  |  |  | $\stackrel{\square}{8}$ |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| $\stackrel{\text { \％}}{\text { ¢ }}$ |  |  |  |  |  |  |  |  | $\frac{g}{a}$ $\stackrel{a}{3}$ | $\begin{aligned} & \text { ⿳亠口冋口口 } \\ & \stackrel{⿳ 亠 二 口 犬 土 寸 ~}{2} \end{aligned}$ |  | 菏 |  |  |  | $\stackrel{\sim}{\text { \％}}$ |  |



# The Township of Lower Makefield, Bucks County 

# Wastewater Collection System and Purchased Treatment Capacity 

Appraisal Work Papers
As of September 17, 2020

Market Approach

AUS Consultants
Suite 201
8555 West Forest Home Avenue Greenfield, Wisconsin 53228
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J. Weinert's Cell: 414-698-8371
J. Weinert's E-Mail: weinertj@auswest.net

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Lower Makefield Township
Bucks County PA
Wastewater Collection System and Purchased Treatment Capacity
Investor-Owned Utility
As of September 17, 2020
Comparable Sales Approach
Market Sales Data
```

Central Tendancy and Reliability Analysis

Lower Makefield Township Customers
Market Value Indication

| Market Sales Analysis - PP/Cash Flows (EBitDA) |  |
| :--- | :--- |
| Simple |  |
| Mean |  |
| Standard Deviation | 19.84 |
| Median | 10.15 |
| Mode | 16.80 |
| Forecast |  |
|  |  |
| Type of Utility |  |
| Water Applicable |  |
| Wastewater |  |
| Wastewater-collection |  |
| All |  |
|  |  |
| Conclusion |  |
|  |  |
|  |  |
| Lower Makefield Township Cash Flows |  |

Market V

| Summary of Market Analyses <br> Indicators |  |
| :--- | :--- |
| OCLD | $36,541,509$ |
| CORLD | $43,188,226$ |
| Customers | $55,755,000$ |
| Cash Flows | $59,838,915$ |
| Value Line | $55,741,285$ |
|  |  |
| Mean | $50,212,987$ |
| Median | $55,741,285$ |
| Conclusion | $55,741,285$ |

Lower Makefield Township
Bucks County PA
Wastewater Collection System and Purchased Treatment Capacity
Investor-Owned Utility
As of September 17, 2020
Comparable Sales Approach
Market Sales Analysis - PP/OCID

|  |  | Purchase Price (PP) | Proportion of Purchase Price to Total | Depreciated Original Cost (OCLD) (AUS Consultants Determination | Purchase Price to (PP/OCLD) | Variance to Simple Mean | Variance to Wid Mean | Variance <br> Squared |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  |  |  |  |  |  |  |
| New Garden Wastewater System | Wastewater | 29,500,000 | 4\% | 18,567,728 | 1.5888 | -0.3515 | -0.179 | 0.032 |
| Mckeesport Wastewater System | Wastewater | 159,000,000 | 19\% | 101,915,080 | 1.5601 | -0.3802 | -0.2076 | 0.0431 |
| Limerick Wastewater System | Wastewater | 75,100,000 | 9\% | 46,153,867 | 1.6272 | -0.3131 | -0.1405 | 0.0197 |
| Mahoning Water System | Water | 4,734,800 | 1\% | 1,194,489 | 3.9639 | 2.0236 | 2.1962 | 4.8233 |
| Mahoning Wastewater System | Wastewater | 4,765,200 | 1\% | 1,658,678 | 2.8729 | 0.9326 | 1.1052 | 1.2215 |
| East Bradford Wastewater Collection System | Wastewater | 5,000,000 | 1\% | 5,383,591 | 0.9287 | -1.0116 | -0.839 | 0.7039 |
| Sadsbury Wastewater Collection System | Wastewater | 8,600,000 | 1\% | 6,128,876 | 1.4032 | -0.5371 | -0,3645 | 0.1329 |
| Exeter Wastwater Collection System | Wastewater | 96,000,000 | 12\% | 40,057,634 | 2.3965 | 0.4562 | 0.6288 | 0.3954 |
| Steelton Water System | Water | 21,750,000 | 3\% | 14,433,435 | 1.5069 | -0.4334 | -0.2608 | 0.068 |
| Cheltenham Wastewarer Collection System | Wastewater-collection | 50,250,000 | 6\% | 15,784,463 | 3.1835 | 1.2432 | 1.4158 | 2.0045 |
| East Norriton Wastewater | Wastewater-collection | 21,000,000 | 3\% | 8,407,007 | 2.4979 | 0.5576 | 0.7302 | 0.5332 |
| Kane Wastewater | Wastewater | 17,560,000 | 2\% | 12,070,455 | 1.4548 | -0.4855 | -0.3129 | 0.0979 |
| Royersford Wastewater | Wastewater | 13,000,000 | 2\% | 5,173,559 | 2.5128 | 0.5725 | 0.7451 | 0.5552 |
| Valley Water | Water | 7,325,000 | 1\% | 5,370,438 | 1.3639 | -0.5764 | -0.4038 | 0.1631 |
| Valley Wastewater | Wastewater | 13,950,000 | 2\% | 9,214,738 | 1.5139 | -0.4264 | -0.2538 | 0.0644 |
| Delaware County Regional Water Quality Authority |  |  |  |  |  |  |  |  |
| (DELCORA) | Wastewater | 276,500,000 | 34\% | 191,774,486 | 1.4418 | -0.4985 | -0.3259 | 0.1062 |
| Upper Pottsgrove | Wastewater-collection | 13,750,000 | 2\% | 11,769,925 | 1.1682 | -0.7721 | -0.5995 | 0.3594 |
|  |  | 817,785,000 | 100\% | 495,058,449 | 1.6519 |  |  | 11.3237 |
| Simple Mean |  |  |  |  | 1.9403 |  |  |  |
| Standard Deviation |  |  |  |  | 0.7977 |  |  | 3.365071 |
| SimpleMedian |  |  |  |  | 1.5601 |  |  | 16 |
| Simple Mode |  |  |  |  | Not Applicable |  |  | 0.210317 |
| Weighted Mean |  |  |  |  | 1.768 |  |  |  |
| Standard Deviation |  |  |  |  | 0.5409 |  |  |  |
| Wed Median |  |  |  |  | 2.0332 |  |  |  |
| Wtd Mode |  |  |  |  | 1.4418 |  |  |  |

$\quad$ Property Acquired
East Bradford Wastewater Collection System
Upper Pottsgrove
Valley Water
Sadsbury Wastewater Collection System
Delaware County Regional Water Quality Authority
(DELCORA)
Kane Wastewater
Steelton Water System
Valley Wastewater
McKeesport Wastewater System
New Garden Wastewater System
Limerick Wastewater System
Exeter Wastwater Collection System
East Norriton Wastewater
Royersford Wastewater
Mahoning Wastewater System
Cheltenham Wastewarer Collection System
Mahoning Water System


Middle OCLD
Bottomvalue of the range containng the Middle Value
Top value of the range containing the Middle Value
Range containng the middle value
Range from bottom value to middle value
Median Value

| 2.0771 | $45 \%$ |
| :---: | :---: |
| 1.5601 | $64 \%$ |
| $(0.5170)$ | $5 \%$ |
| -0.0439 |  |
| 2.0332 | $50 \%$ |


|  |  | Simple PP/OCLD |
| ---: | ---: | ---: |
|  |  | 2.2782 |
|  |  | 1.7546 |
|  |  | 2.2832 |
|  |  | 1.9403 |
| Purchase Price | OCLD | Wtd PP/OCLD |
| $33,809,800$ | $20,998,362$ | 1.6101 |
| $698,975,200$ | $438,098,692$ | 1.5955 |
| $85,000,000$ | $35,961,395$ | 2.3636 |
| $817,785,000$ | $495,058,449$ | 1.6519 |

$s$ county PA
Wastewater Collection System and Purchased Treatment Capacity
nvestor-Owned Utility
As of September 17, 2020
Comparable Sales Approach
Market Sales Analysis - PP/CORLD



Middle OCLD
Bottomvalue of the range containng the Middle Value
Top value of the range containing the Middle Value
Range containng the middle value
Range from bottom value to middle value
Median Value

| 0.7647 | $45 \%$ |
| :---: | :---: |
| 0.8724 | $54 \%$ |
| 0.1077 | $9 \%$ |
| 0.0184 | $5 \%$ |
| 0.7831 | $50 \%$ |


| Simple Mean | Water |
| :--- | :--- |
|  | Wastewater |
| Wastewater-Collection |  |
| Wed Mean | All |
|  | Water |
|  | Wastewater |
|  | Wastewater-Collection |
|  | All |


|  |  | Simple PP/CORLD |
| ---: | ---: | ---: |
|  |  | 0.6897 |
|  |  | 0.8121 |
|  |  | 0.8386 |
|  |  | 0.7952 |
| Purchase Price | CORLD | Wtd PP/CORLD |
| $33,809,800$ | $44,484,835$ | 0.7600 |
| $698,975,200$ | $863,646,486$ | 0.8093 |
| $85,000,000$ | $95,861,870$ | 0.8867 |
| $817,785,000$ | $1,003,993,191$ | 0.8145 |

```
Lower Makefield Township
Bucks County PA
Wastewater Collection System and Purchased Treatment Capacity
Investor-Owned Utility
As of September 17, 2020
Comparable Sales Approach
Market Sales Analysis - PP/Customer
```



Middle OCLD
Bottomvalue of the range containng the Middle Value
Top value of the range containing the Middle Value
Range containng the middle value
Range from bottom value to middle value
Median Value
$\begin{array}{rr}9,629 & 42 \% \\ 10667 & 53 \% \\ 1,038 & 12 \% \\ 228 & 8 \% \\ 9,857 & 50 \%\end{array}$
$52 \%$
$53 \%$
$12 \%$
$8 \%$
$50 \%$

Simple Mean

Wtd Mean

| Water |  |  | 5,242 |
| :--- | :---: | :---: | :---: |
| Wastewater |  |  | 9,350 |
| Wastewater Collection |  |  | 6,262 |
| All | Purchase Price | Customers | td PP/Customers |
|  | $33,809,800$ | 6,677 | 5,064 |
| Water | $698,975,200$ | 63,625 | 10,986 |
| Wastewater | $85,000,000$ | 16,599 | 5,121 |
| Wastewater-collection | $817,785,000$ | 86,901 | 9,411 |

Lower Makefield Township
Bucks County PA
Wastewater Collection System and Purchased Treatment Capacity
Investor-Owned Utility
As of September 17, 2020
Comparable Sales Approach
Market Sales Analysis - PP/Cash Flow (EBITDA)

| Property Acquired | System Type |  |  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | Asset Purchase Agreement (APA) Date | Purchase Price (PP) | Proportion of Purchase Price to Total | Cash Flows (EBITDA) | Purchase Price to Cash Flow | Variance to Simple Mean | Variance to Wtd Mean | Variance <br> Squared | Frequency Wtd PP/Cashflow |
| New Garden Wastewater System | Wastewater | 2016.59 | 29,500,000 | 4\% | 1,409,768 | 20.93 | 1.09 | 3.06 | 9.36 | 0.84 |
| Mckeesport Wastewater System | Wastewater | 2016.67 | 159,000,000 | 22\% | 5,247,843 | 30.30 | 10.46 | 12.43 | 154.50 | 6.57 |
| Limerick Wastewater System | Wastewater Not Included | 2018.57 | 75,100,000 |  |  |  |  |  |  |  |
| Mahoning Water System | Water Not Included | 2017.79 | 4,734,800 |  |  |  |  |  |  |  |
| Mahoning Wastewater System | Wastewater Not Included | 2017.79 | 4,765,200 |  |  |  |  |  |  |  |
| East Bradford Wastewater Collection System | Wastewater | 2017.97 | 5,000,000 | 1\% | 100,053 | 49.97 | 30.13 | 32.10 | 1,030.41 | 0.34 |
| Sadsbury Wastewater Collection System | Wastewater | 2019.19 | 8,600,000 | 1\% | 580,238 | 14.82 | (5.02) | (3.05) | 9.30 | 0.17 |
| Exeter Wastwater Collection System | Wastewater | 2018.41 | 96,000,000 | 13\% | 7,099,396 | 13.52 | (6.32) | (4.35) | 18.92 | 1.77 |
| Steelton Water System | Water | 2018.87 | 21,750,000 | 3\% | 1,568,999 | 13.86 | (5.98) | (4.01) | 16.08 | 0.41 |
| Cheltenham Wastewarer Collection System | Wastewater-collection | 2018.42 | 50,250,000 | 7\% | 5,270,576 | 9.53 | (10.31) | (8.34) | 69.56 | 0.65 |
| East Norriton Wastewater | Wastewater-collection | 2018.76 | 21,000,000 | 3\% | 925,477 | 22.69 | 2.85 | 4.82 | 23.23 | 0.65 |
| Kane Wastewater | Wastewater | 2019.75 | 17,560,000 | 2\% | 680,463 | 25.81 | 5.97 | 7.94 | 63.04 | 0.62 |
| Royersford Wastewater | Wastewater | 2019.94 | 13,000,000 | 2\% | 692,724 | 18.77 | (1.07) | 0.90 | 0.81 | 0.33 |
| Valley Water | Water | 2019.96 | 7,325,000 | 1\% | 520,405 | 14.08 | (5.76) | (3.79) | 14.36 | 0.14 |
| Valley Wastewater | Wastewater | 2019.96 | 13,950,000 | 2\% | 685,766 | 20.34 | 0.50 | 2.47 | 6.10 | 0.39 |
| Delaware County Regional Water Quality |  |  |  |  |  |  |  |  |  |  |
| Authority (DELCORA) | Wastewater | 2020.00 | 276,500,000 | 38\% | 21,782,000 | 12.69 | (7.15) | (5.18) | 26.83 | 4.79 |
| Upper Pottsgrove | Wastewater-collection | 2020.33 | 13,750,000 | 2\% | 1,311,670 | 10.48 | (9.36) | $(7.39)$ | 54.61 | 0.20 |
|  |  |  | 733,185,000 | 100\% | 47,875,378 | 15.31 |  |  |  | 17.87 |
| Simple Mean |  |  |  |  |  | 19.84 |  |  |  |  |
| Standard Deviation |  |  |  |  |  | 10.15 |  |  |  |  |
| simpleMedian |  |  |  |  |  | 16.80 |  |  |  |  |
| Simple Mode |  |  |  |  |  | Not Applicable |  |  |  |  |
| Weighted Mean |  |  |  |  |  | 17.87 |  |  |  |  |
| Standard Deviation |  |  |  |  |  | 7.90 |  |  |  |  |
| Wtd Median |  |  |  |  |  | 12.92 |  |  |  |  |
| Wtd Mode |  |  |  |  |  | 12.69 |  |  |  |  |
| Forecast |  | 2019.944064 |  |  |  | $17.24$ |  |  |  |  |
|  |  | $2021$ |  |  |  | 13.95 |  |  |  |  |


| Property Acquired |  | Asset Purchase |  | Proportion of |  | Variance |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | Agreement <br> (APA) Date | Purchase Price (PP) | Purchase Price to Total | Cash Flows (EBITDA) | Purchase Price to Cash Flow | Variance to Simple Mean | to Wtd <br> Mean | Variance Squared | Frequency Wtd PP/Cashflow | Accumulated Frequency |
| Cheltenham Wastewarer Collection System | Wastewater-collection | 2018.42 | 50,250,000 | 7\% | 5,270,576 | 9.53 | (10.31) | (8.34) | 69.56 | 0.65 | 7\% |
| Upper Portsgrove | Wastewater-collection | 2020.33 | 13,750,000 | 2\% | 1,311,670 | 10.48 | (9.36) | (7.39) | 54.61 | 0.20 | 9\% |
| Delaware County Regional Water Quality |  |  |  |  |  |  |  |  |  |  |  |
| Authority (DELCORA) | Wastewater | 2020.00 | 276,500,000 | 38\% | 21,782,000 | 12.69 | (7.15) | (5.18) | 26.83 | 4.79 | 46\% |
| Exeter Wastwater Collection System | Wastewater | 2018.41 | 96,000,000 | 13\% | 7,099,396 | 13.52 | (6.32) | (4.35) | 18.92 | 1.77 | 60\% |
| Steelton Water System | Water | 2018.87 | 21,750,000 | $3 \%$ | 1,568,999 | 13.86 | (5.98) | (4.01) | 16.08 | 0.41 | 63\% |
| Valley Water | Water | 2019.96 | 7,325,000 | 1\% | 520,405 | 14.08 | (5.76) | (3.79) | 14.36 | 0.14 | 64\% |
| Sadsbury Wastewater Collection System | Wastewater | 2019.19 | 8,600,000 | 1\% | 580,238 | 14.82 | (5.02) | (3.05) | 9.30 | 0.17 | 65\% |
| Royersford Wastewater | Wastewater | 2019.94 | 13,000,000 | 2\% | 692,724 | 18.77 | (1.07) | 0.90 | 0.81 | 0.33 | 66\% |
| Valley Wastewater | Wastewater | 2019.96 | 13,950,000 | 2\% | 685,766 | 20.34 | 0.50 | 2.47 | 6.10 | 0.39 | 68\% |
| New Garden Wastewater System | Wastewater | 2016.59 | 29,500,000 | 4\% | 1,409,768 | 20.93 | 1.09 | 3.06 | 9.36 | 0.84 | 72\% |
| East Norriton Wastewater | Wastewater-collection | 2018.76 | 21,000,000 | 3\% | 925,477 | 22.69 | 2.85 | 4.82 | 23.23 | 0.65 | 75\% |
| Kane Wastewater | Wastewater | 2019.75 | 17,560,000 | 2\% | 680,463 | 25.81 | 5.97 | 7.94 | 63.04 | 0.62 | 78\% |
| McKeesport Wastewater System | Wastewater | 2016.67 | 159,000,000 | 22\% | 5,247,843 | 30.30 | 10.46 | 12.43 | 154.50 | 6.57 | 99\% |
| East Bradford Wastewater Collection System | Wastewater | 2017.97 | 5,000,000 | 1\% | 100,053 | 49.97 | 30.13 | 32.10 | 1,030.41 | 0.34 | 100\% |
| Limerick Wastewater System | Wastewater | 2018.57 | 75,100,000 |  |  |  |  |  |  |  |  |
| Mahoning Water System | Water | 2017.79 | 4,734,800 |  |  |  |  |  |  |  |  |
| Mahoning Wastewater System | Wastewater | 2017.79 | 4,765,200 |  |  |  |  |  |  |  |  |

Middle Cash Flow
Bottomvalue of the range containg the Middle Value
Top value of the range containing the Middle Value
Range containng the middle value
Range from bottom value to middle value
Median Value

| 12.69 | $46 \%$ |
| ---: | ---: |
| 13.52 | $60 \%$ |
| 0.83 | $13 \%$ |
| 0.23 | $4 \%$ |
| 12.92 | $50 \%$ |

[^11]$46 \%$
$60 \%$
$13 \%$
$4 \%$
$50 \%$

|  |  |  | PP/EBITDA |
| :--- | ---: | ---: | ---: |
| Water |  |  | 13.86 |
| Wastewater |  |  | 25.89 |
| Wastewater-Collection |  |  | 16.11 |
| All |  |  | 19.84 |
|  | Purchase Price | EBITDA | Wtd PP/EBBITDA |
| Water | $29,075,000$ | $2,089,404$ | 13.92 |
| Wastewater | $619,110,000$ | $38,278,251$ | 16.17 |
| Wastewater-collection | $85,000,000$ | $7,507,723$ | 11.32 |
| All | $733,185,000$ | $47,875,378$ | 15.31 |

Lower Makefield Township
Bucks County PA
Wastewater Collection System and Purchased Treatment Capacity
Investor-Owned Utility
September 17, 2020
Comparable Sales Approach

Financial Basis ${ }^{1}$

|  | Price per Share | Book value per share | Market to <br> Book <br> Equity <br> Ratio | Debt (Total) \$s millions | Outstanding Shares (millions) | Market Equity (Total) \$s millions | Debt per share | Equity (Total) \$s millions | Total <br> Capital <br> (Debt + <br> Equity) | Market <br> Value per <br> Share <br> (Equity+D <br> ebt) | Book <br> Value per <br> Share <br> (Equity+D <br> ebt) | Market to Book (Total Capital) Ratio |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| American States Water | 74.33 | 17.15 | 4.33 | 330.3 | 36.883874 | 2,741.6 | 8.96 | 632.6 | 962.9 | 83.29 | 26.11 | 3.19 |
| American Water | 144.55 | 35.4 | 4.08 | 10578 | 181.204068 | 26,193.0 | 58.38 | 6,414.6 | 16,992.6 | 202.93 | 93.78 | 2.16 |
| California Water | 43.55 | 15.7 | 2.77 | 1182.3 | 49.398 | 2,151.3 | 23.93 | 775.5 | 1,957.8 | 67.48 | 39.63 | 1.7 |
| Consolidated Water Company | 10.74 | 10.65 | 1.01 | 0.1 | 15.112049 | 162.3 | 0.01 | 160.9 | 161.0 | 10.75 | 10.66 | 1.01 |
| Essential Utilities, Inc. | 39.93 | 19 | 2.1 | 5277.4 | 245.151093 | 9,788.9 | 21.53 | 4,657.9 | 9,935.3 | 61.46 | 40.53 | 1.52 |
| Middlesex Water | 62.37 | 16.15 | 3.86 | 282.7 | 17.464795 | 1,089.3 | 16.19 | 282.1 | 564.8 | 78.56 | 32.34 | 2.43 |
| SJW Corporation | 61.23 | 32.35 | 1.89 | 1338.4 | 28.516705 | 1,746.1 | 46.93 | 922.5 | 2,260.9 | 108.16 | 79.28 | 1.36 |
| York Water | 43.39 | 11.15 | 3.89 | 103.1 | 13.033999 | 565.5 | 7.91 | 145.3 | 248.4 | 51.3 | 19.06 | 2.69 |
| Total Industry |  |  | 3.18 | 19,092.3 |  | 44,438.0 |  | 13,991.4 | 33,083.7 |  |  | 1.92 |
| Summary |  |  |  |  |  |  |  |  |  |  |  |  |
| Minimum |  |  | 1.01 |  |  |  |  |  |  |  |  | 1.01 |
| Mean |  |  | 2.99 |  |  |  |  |  |  |  |  | 2.01 |
| Standard Deviation |  |  | 1.15 |  |  |  |  |  |  |  |  | 0.69 |
| Wtd Mean |  |  | 3.18 |  |  |  |  |  |  |  |  | 1.92 |
| Median |  |  | 3.32 |  |  |  |  |  |  |  |  | 1.93 |
| Maximum |  |  | 4.33 |  |  |  |  |  |  |  |  | 3.19 |
| Conclusion |  |  |  |  |  |  |  |  |  |  |  |  |
| Wtd Mean |  |  | 3.18 |  |  |  |  |  |  |  |  | 1.92 |
| Median |  |  | 3.32 |  |  |  |  |  |  |  |  | 1.93 |
| Use |  |  | 3.18 |  |  |  |  |  |  |  |  | 1.92 |

Note:
|Essential Utilities, Inc. formerly Aqua America
Source: Value Line Investment Survey as of 10/01/2020

# The Township of Lower Makefield, Bucks County Wastewater Collection System and Purchased Treatment Capacity 

Appraisal Work Papers<br>As of September 17, 2020

## Cost Indices

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# The Township of Lower Makefield, Bucks County <br> Wastewater Collection System and Purchased Treatment Capacity 

Appraisal Work Papers
As of September 17, 2020

Handy Whitman Index of Public System Construction Costs
Water Industry - Northeastern United States

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## Bulletin No. 192

1912 to July 1, 2020

## The Handy-Whitman Index ${ }^{\circ}$ of <br> Public Utility Construction Costs" <br> 

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## Trends Of Public Utility Construction Costs

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| South Atlantic Region | B-2 | B-2-1 |
| North Central Region | B-3 | B-3-1 |
| South Central Region | B-4 | B-4-1 |
| Plateau Region | B-5 | B-5-1 |
| Pacific Region | B-6 | B-6-1 |
| Utility Materials | $\mathrm{M}-1$ | $\mathrm{~B}-\mathrm{M}-1$ |

## COST TRENDS OF ELECTRIC UTILITY CONSTRUCTION

| Cost Trend Tables - 1912 to July 1, 2020 |  |  |
| :--- | :---: | :---: |
| North Atlantic Region | E-1 | E-1-1 |
| South Atlaatic Region | E-2 | E-2-1 |
| North Central Region | E-3 | E-3-1 |
| South Central Region | E-4 | E-4-1 |
| Plateau Region | E-5 | E-5-1 |
| Pacific Region | E-6 | E-6-1 |

## COST TRENDS OF GAS UTILITY CONSTRUCTION

| Cost Trend Tables - 1912 to July 1, 2020 |  |  |
| :--- | ---: | ---: |
| North Atlantic Region | G-1 | G-1-1 |
| South Atlantic Region | G-2 | G-2-1 |
| North Central Region | G-3 | G-3-1 |
| South Central Region | G-4 | G-4-1 |
| Plateau Region | G-5 | G-5-1 |
| Pacific Region | G-6 | G-6-1 |

## COST TRENDS OF WATER UTILITY CONSTRUCTION

Cost Trend Tables - 1912 to July 1, 2020

| North Atlantic Region | $\mathrm{W}-1$ | $\mathrm{~W}-1-1$ |
| :--- | :---: | :---: |
| South Atlantic Region | $\mathrm{W}-2$ | $\mathrm{~W}-2-1$ |
| North Central Region | $\mathrm{W}-3$ | $\mathrm{~W}-3-1$ |
| South Central Region | $\mathrm{W}-4$ | $\mathrm{~W}-4-1$ |
| Plateau Region | $\mathrm{W}-5$ | $\mathrm{~W}-5-1$ |
| Pacific Region | $\mathrm{W}-6$ | $\mathrm{~W}-6-1$ |

## Trends of Public Utility <br> Construction Costs

## GEOGRAPHIC REGIONS



## Tradition of Quality

The Handy-Whitman Index of Public Utility Construction Costs has been published continuously since 1924. Formerly the Handy Index, Bulletin Nos. 1 through 15 were developed by William W. Handy of Baltimore who had wide valuation experience in public utilities. He believed that valuation studies should not be confined to rate cases but should be kept alive to the benefit of the utility industry. He began publishing index numbers for electric and gas construction cost trends. Carrying on with the tradition of quality, after Mr. Handy's death, we continued publication for his estate beginning with Bulletin 16. Then, January 1, 1950, Whitman, Requardt and Associates, LLP purchased rights to the publication and have since been the sole publishers.

The name Handy-Whitman Index was adopted for Bulletin No. 53 and succeeding issues to combine the names of Mr. Handy and Ezra B. Whitman, a wellknown valuation engineer. In 1957 an index of water utility construction costs was added. Mr. Whitman was a consultant on the publication of the Index until his death in 1963.

## Whitman, Requardt and Associates, LLP

Ezra B. Whitman, a well-known valuation engineer was one of the founders of our firm. Major Whitman, as he was known from his World War I service, had already made a name for himself. Prior to the founding of the firm in 1915, Major Whitman had been President and Chief Engineer of the Water Board of the City of Baltimore. He designed the first rapid sand filtration plant serving a major city while he was the Baltimore Water Engineer. He was also president of the American Society of Civil Engineers and of the American Institute of Consulting Engineers and a chairman of the Public Service Commission of Maryland.

The Handy-Whitman Index is prepared especially for electric, gas and water utilities and is the only known publication of its kind available to the public. The list of subscribers is international and includes operating utilities, regulatory bodies, valuation engineers, equipment industries, insurance companies and reference libraries.

## Tradition of Quality Continued

Since 1915, Whitman, Requardt and Associates, LLP, has been an independent consulting engineering firm organized to serve government, industry and private enterprise.

The firm has steadily expanded its engineering capabilities, providing complete services for civil, sanitary, structural, mechanical and electrical engineering and architectural projects from job inception through construction management.

Construction cost data from utility projects of all types are available from design and valuation assignments. The staff is composed of specialists in these and related disciplines who bring a diverse professional and academic expertise to each assignment. A full-time staff is maintained specifically for preparing the Handy-Whitman Index.

## Methods of Preparation of Indexes

An index number is a percentage ratio between the cost of an item at any stated time and its cost at a base period, or:

Index Number $=\frac{\text { cost at stated time }}{\text { cost at base period }} \times 100$
Index numbers have been prepared for many items, including wage rates, cost-of-living, material and equipment costs, and financial transactions. In the Handy-Whitman Index, index numbers have been developed for Building Construction, Electric Utility Construction, Gas Utility Construction and Water Utility Construction. Prices of basic materials such as cement, sand, gravel, cast iron pipe, wire, etc., are obtained from publications such as Engineering NewsRecord and checked against prices actually being paid for such materials. Labor cost trends are computed from labor rates obtained from sources such as the Construction Labor Research Council. Prices and cost trends of equipment are obtained from nationally recognized manufacturers, and operating utilities.

Handy-Whitmian Index numbers are developed from wage rates and prices prevailing on January 1 and July 1 each year. The index numbers are generally based on $1973=100$, although those items of recent origin are based on a later year.

The proportions of basic materials, labor, equipment and other cost components used in the Handy-Whitman Index are based on analyses developed during valuation and design assignments and on data furnished by utilities and industrial sources willing to assist with the Index. These data are reviewed continuously, and weightings and components are revised as required. This review assures that the indexes published reflect current construction practice.

## Geographic Regions

To reflect differing cost trends throughout the 48 contiguous states, the index has been divided into six geographical regions of similar characteristics. They are shown on the accompanying map.

## Use of Index Numbers

Handy-Whitman Index numbers have been widely used to trend earlier valuations and original cost records to estimate reproduction cost at prices prevailing at a certain date. The use of indexes for an appropriate property item or. group will provide a reliable guide to changes in cost. Cost trends are given for all the important items of property. The electric and gas groups are arranged by the Federal Energy Regulatory Commission Uniform System of Accounts. The water property accounts are arranged to follow the classification of the National Association of Regulatory Utility Commissioners and the American Water Works Association.

The Handy-Whitman Index will furnish a yardstick for the fluctuations in value of property which will be satisfactory for many purposes. In rate cases, when a more exact determination of value is desired, however, the Index must be used carefully. Average prices and cost trends are used to develop the Index, and any direct application of cost trends without checking with actual local experience may not be accepted without controversy. When local experience is compared with the index and the correlation between the two trends is determined, the result is satisfactory. Costs trended by such a method are used to assist in establishing a rate base.

Indexes in these bulletins are used to trend earlier valuations or original cost records for insurance purposes.

The Handy-Whitman Index has a general application in valuations of all types of property. The building construction cost trends may be used wherever similar items of property are to be compared. Many of the other trends may be used for related items in other industries because of their similarity.

State-of-the-art changes often affect costs independently of inflation. New regulatory and environmental requirements, changes in work rules and improved design standards, for instance, increase construction costs even though the price of wages, materials and equipment may be static. Trended construction costs will not reflect such changes. However, trended costs are a reasonably accurate measure of the cost of reproducing actual plant.

Although every effort is made to maintain accuracy, Whitman, Requardt and Associates, LLP disclaim any
responsibility for the use of these indexes, because local conditions may vary.

No guarantee or warranty of any kind is made in the sale of the Handy-Whitman Index. Published numbers are occasionally subject to change based upon receipt of new or different information. These numbers will be bolded.

Further inquiries on electric, gas and water indexes should be addressed to Whitman, Requardt and Associates, LLP.

## Total Electric Plant and Function

Three indexes are provided for total plant. The first is for all steam generation and the other two for weighted combinations of steam and nuclear, and steam and hydro generation. Indexes are also provided for each function.

Indexes are not maintained for plant accounts $323,324,325,341,345$ and 346 . We believe that indexes for comparable accounts in other functions are sufficiently accurate for these accounts.

The indexes for total nuclear production and total other production incorporate comparable indexes from the steam production function for the accounts not listed.

## Value of Index Numbers

We believe that present-day reproduction cost of any property can be calculated more accurately using index numbers than by repricing a complete inventory.

Trending the controlling items of property in any utility by the index method saves time and effort in arriving at a valuation. Analyzing and determining cost trends for all of the great numbers of articles of plant that represent only a very small proportion of the value of the utility is not necessary. They may be assumed to follow in general the trend of the controlling items, and the fluctuations in value above or below the trends of the controlling items will tend to offset each other and have a very slight effect on the total value.

Comments on Bulletin No. 192
During the twelve-month period ending July 1, 2020, the average index of all geographical regions for Total Gas Plant increased 7.3\%. and the comparable index for Electric Plant-All Steam Generation increased 4.0\%.

November 2020
Whitman, Requardt and Associates, LLP

$$
\begin{gathered}
\text { Cost Trends of } \\
\text { Water Utility } \\
\text { Construction } \\
\text { COST TREND TABLES } \\
1912 \text { to July } 1,2020
\end{gathered}
$$

NORTH ATLANTIC REGION (1973=100)



NORTH ATLANTIC REGION (1973=100)


NORTH ATLANTIC REGION (1973=100)


NORTH ATLANTIC REGION (1973=100)

| Line | CONSTRUCTION AND EQUIPMENT | $\begin{aligned} & \mathrm{N} \\ & \mathrm{~A} \\ & \mathrm{R} \\ & \mathrm{U} \\ & \mathrm{C} \\ & \hline \end{aligned}$ | COST INDEX NUMBERS |  |  |  |  |  |  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  | $\begin{aligned} & 1 \\ & 9 \\ & 6 \\ & 8 \end{aligned}$ | $\begin{aligned} & 1 \\ & 9 \\ & 6 \\ & 9 \end{aligned}$ | $\begin{aligned} & 1 \\ & 9 \\ & 7 \\ & 0 \end{aligned}$ | $\begin{aligned} & 1 \\ & 9 \\ & 7 \\ & 1 \end{aligned}$ | $\begin{aligned} & 1 \\ & 9 \\ & 7 \\ & 2 \\ & \hline \end{aligned}$ | $\begin{aligned} & 1 \\ & 9 \\ & 7 \\ & 3 \\ & \hline \end{aligned}$ | $\begin{array}{r} 1 \\ 9 \\ 7 \\ 4 \\ \hline \end{array}$ | $\begin{aligned} & 1 \\ & 9 \\ & 7 \\ & 5 \\ & \hline \end{aligned}$ | $\begin{aligned} & 1 \\ & 9 \\ & 7 \\ & 6 \\ & \hline \end{aligned}$ | $\begin{aligned} & 1 \\ & 9 \\ & 7 \\ & 7 \\ & \hline \end{aligned}$ | $\begin{aligned} & 1 \\ & 9 \\ & 7 \\ & 8 \\ & \hline \end{aligned}$ | $\begin{aligned} & 1 \\ & 9 \\ & 7 \\ & 9 \\ & \hline \end{aligned}$ | $\begin{aligned} & 1 \\ & 9 \\ & 8 \\ & 0 \\ & \hline \end{aligned}$ | $\begin{array}{r}1 \\ 9 \\ 8 \\ 1 \\ \hline\end{array}$ |
| 1 | Source of Supply Plant |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 2 | Collecting \& Impounding Res. | 305 | 67 | 72 | 78 | 86 | 94 | 100 | 115 | 127 | 133 | 139 | 148 | 164 | 179 | 189 |
| 3 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 4 5 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 6 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 7 | Pumping Plant |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 8 | Structures \& Improvements | 304 | 64 | 69 | 75 | 84 | 92 | 100 | 117 | 127 | 130 | 137 | 148 | 163 | 181 | 191 |
| 9 | Electric Pumping Equipment | 311 | 81 | 84 | 89 | 93 | 96 | 100 | 122 | 155 | 174 | 184 | 192 | 205 | 222 | 245 |
| 10 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 11 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 12 13 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 14 | Water Treatment Plant |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 15 | Structures \& Improvernents | 304 | 64 | 69 | 75 | 84 | 92 | 100 | 117 | 127 | 130 | 137 | 148 | 163 | 181 | 191 |
| 16 | Large Treatment Plant Equip. | 320 | 69 | 73 | 79 | 89 | 96 | 100 | 118 | 134 | 144 | 152 | 162 | 175 | 191 | 208 |
| 17 | Small Treatment Plant Equip. | 320 | 70 | 74 | 80 | 90 | 96 | 100 | 120 | 139 | 150 | 160 | 172 | 186 | 204 | 223 |
| 18 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 19 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 20 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 21 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 22 | Transmission Plant |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 23 | Steel Reservoirs | 330 | 49 | 53 | 75 | 82 | 85 | 100 | 140 | 159 | 171 | 172 | 173 | 178 | 191 | 208 |
| 24 | Elevated Steel Tanks | 330 | 48 | 55 | 71 | 80 | 86 | 100 | 152 | 183 | 182 | 183 | 195 | 206 | 228 | 250 |
| 25 | Concrete Reservoirs | 330 | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 26 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 27 | Cast Iron Mains | 331 | 74 | 78 | 84 | 91 | 96 | 100 | 129 | 137 | 142 | 150 | 158 | 166 | 180 | 196 |
| 28 | Steel Mains | 331 | 69 | 74 | 80 | 88 | 96 | 100 | 113 | 125 | 133 | 141 | 152 | 166 | 180 | 199 |
| 29 | Concrete Cylinder Mains | 331 | 72 | 78 | 80 | 88 | 95 | 100 | 113 | 134 | 138 | 140 | 148 | 162 | 176 | 189 |
| 30 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 31 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 32 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 33 | Distribution Plant |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 34 | Mains-Average All Types | 331 | 77 | 80 | 84 | 94 | 98 | 100 | 110 | 146 | 154 | 162 | 173 | 185 | 202 | 219 |
| 35 | Cast lron Mains | 331 | 82 | 83 | 88 | 97 | 99 | 100 | 143 | 158 | 163 | 167 | 178 | 185 | 202 | 218 |
| 36 | Cement-Asbestos Mains | 331 | 82 | 85 | 88 | 97 | 98 | 100 | 127 | 148 | 159 | 167 | 176 | 202 | 212 | 234 |
| 37 | Steel Mains | 331 | 68 | 72 | 78 | 88 | 97 | 100 | 115 | 128 | 139 | 151 | 164 | 179 | 197 | 212 |
| 38 | PVC Mains | 331 | - | - | - | - | - | - | 25 | 100 | 104 | 108 | 113 | 122 | 132 | 138 |
| 39 | Services Installed | 333 | 66 | 72 | 79 | 89 | 96 | 100 | 115 | 123 | 130 | 139 | 145 | 160 | 175 | 184 |
| 40 | Meters | 334 | 101 | 106 | 108 | 108 | 106 | 100 | 93 | 93 | 98 | 101 | 105 | 108 | 122 | 127 |
| 41 | Meter Installations | 334 | 68 | 73 | 79 | 89 | 97 | 100 | 113 | 120 | 131 | 147 | 152 | 162 | 177 | 189 |
| 42 | Hydrants lnstalled | 335 | 68 | 72 | 80 | 90 | 96 | 100 | 123 | 143 | 157 | 167 | 182 | 194 | 207 | 222 |
| 43 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 44 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 45 | Miscellaneous Items |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 46 | Flocculating Equipment-Installed |  | 69 | 74 | 82 | 93 | 98 | 100 | 139 | 174 | 195 | 218 | 246 | 290 | 350 | 406 |
| 47 | Clarifier Equipment-Installed |  | 68 | 72 | 82 | 93 | 98 | 100 | 140 | 167 | 181 | 199 | 210 | 232 | 272 | 310 |
| 48 | Filter Gallery Piping-Installed |  | 68 | 72 | 78 | 90 | 97 | 100 | 119 | 130 | 136 | 144 | 151 | 158 | 171 | 185 |
| 49 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 50 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 51 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 52 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 53 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 54 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 55 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 56 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

NORTH ATLANTIC REGION (1973=100)


NORTH ATLANTIC REGION (1973=100)


NORTH ATLANTIC REGION (1973=100)

| L$i$$n$$e$ | CONSTRUCTION AND EQUIPMENT | $\begin{aligned} & \mathrm{N} \\ & \mathrm{~A} \\ & \mathrm{R} \\ & \mathrm{U} \\ & \mathrm{C} \end{aligned}$ | COST INDEX NUMBERS |  |  |  |  |  |  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  | 2008 |  | 2009 |  | 2010 |  | 2011 |  | 2012 |  | 2013 |  | 2014 |  |
|  |  |  | Jan. 1 | Jul. 1 | Jan. 1 | Jul. 1 | Jan. 1 | Jul. 1 | Jan. 1 | Jul. 1 | Jan. 1 | Jul. 1 | Jan. 1. | Jul. 1 | Jan. 1 | Jul. 1 |
| 1 | Source of Supply Plant |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 2 | Collecting \& Impounding Res. | 305 | 457 | 466 | 470 | 465 | 475 | 478 | 492 | 495 | 501 | 502 | 507 | 505 | 515 | 517 |
| 3 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 4 5 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 6 | Pumping Plant |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 7 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 8 | Structures \& Improvements | 304 | 516 | 543 | 551 | 536 | 552 | 558 | 571 | 583 | 597 | 600 | 618 | 608 | 621 | 630 |
| 9 | Electric Pumping Equipment | 311 | 640 | 666 | 679 | 688 | 707 | 701 | 708 | 760 | 780 | 785 | 800 | 844 | 856 | 900 |
| 10 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 11 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 12 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 13 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 14 | Water Treatment Plant |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 15 | Structures \& Improvements | 304 | 516 | 543 | 551 | 536 | 552 | 558 | 571 | 583 | 597 | 600 | 618 | 608 | 621 | 630 |
| 16 | Large Treatment Plant Equip. | 320 | 566 | 582 | 614 | 616 | 631 | 638 | 642 | 653 | 669 | 680 | 689 | 697 | 713 | 725 |
| 17 | Small Treatment Plant Equip. | 320 | 602 | 624 | 666 | 669 | 686 | 693 | 706 | 712 | 740 | 754 | 764 | 779 | 800 | 813 |
| 18. |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 19 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 20 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 21 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 22. | Transmission Plant |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 23 | Steel Reservoirs | 330 | 537 | 722 | 722 | 722 | 722 | 722 | 771 | 771 | 795 | 810 | 778 | 780 | 715 | 742 |
| 24 | Elevated Steel Tanks | 330 | 680 | 866 | 866 | 866 | 866 | 867 | 1079 | 1079 | 1059 | 1082 | 1089 | 1099 | 1131 | 1131 |
| 25 | Concrete Reservoirs | 330 | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 26 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 27 | Cast Iron Mains | 331 | 510 | 534 | 578 | 576 | 601 | 601 | 602 | 610 | 634 | 669 | 691 | 684 | 712 | 743 |
| 28 | Steel Mains | 331 | 543 | 606 | 605 | 585 | 593 | 609 | 644 | 658.5 | 711 | 708 | 724 | 704 | 694 | 708 |
| 29 | Concrete Cylinder Mains | 331 | 468 | 475 | 502 | 502 | 494 | 495 | 510 | 517 | 523 | 526 | 547 | 534 | 535 | 547 |
| 30 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 31 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 32 | Distribution Plant |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 33 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 34 | Mains-Average All Types | 331 | 550 | 588 | 624 | 608 | 617 | 623 | 633 | 644 | 669 | 690 | 698 | 693 | 720 | 733 |
| 35 | Cast Iron Mains | 331 | 556 | 579 | 625 | 624 | 647 | 648 | 654 | 660 | 681 | 716 | 733 | 730 | 759 | 781 |
| 36 | Cement-Asbestos Mains | 331 | 621 | 632. | 691 | 678 | 638 | 649 | 658 | 683 | 716 | 721 | 712 | 707 | 704 | 721 |
| 37 | Steel Mains | 331 | 514 | 582 | 595 | 559 | 565 | 575 | 593 | 606 | 633 | 637 | 638 | 631 | 665 | 665 |
| 38 | PVC Mains | 331 | 372 | 374 | 419 | 408 | 353 | 363 | 369 | 389 | 412 | 412 | 391 | 392 | 383 | 383 |
| 39 | Services Installed | 333 | 501 | 511 | 534 | 534 | 545 | 554 | 568 | 574 | 589 | 600 | 602 | 602 | 603 | 605 |
| 40 | Meters | 334 | 373 | 373 | 373 | 373 | 374 | 376 | 379 | 379 | 379 | 379 | 380 | 381 | 381 | 381 |
| 41 | Meter lnstallations | 334 | 572 | 573 | 597 | 598 | 612 | 623 | 635 | 635 | 646 | 673 | 677 | 677 | 688 | 688 |
| 42 | Hydrants Installed | 335 | 693 | 699 | 732 | 731 | 740 | 721 | 730 | 731 | 757 | 758 | 774 | 784 | 807 | 849 |
| 43 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 44 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 45 | Miscellaneous Items |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 46 | Flocculating Equipment-Installed |  | 1187 | 1373 | 1645 | 1645 | 1699 | 1744 | 1823 | -1848 | 1904 | 1973 | 1978 | 2015 | 2041 | 2078 |
| 47 | Clarifier Equipment-Installed |  | 920 | 944 | 997 | 997 | 991 | 1001 | 1056 | 1060 | 1077 | 1102 | 1105 | 1136 | 1154 | 1162 |
| 48 | Filter Gallery Piping-Installed |  | 530 | 543 | 589 | 590 | 613 | 614 | 620 | 620 | 641 | 666 | 677 | 680 | 713 | 728 |
| 49 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 50 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 51 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 52 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 53 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 54 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 55 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 56 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

NORTH ATLANTIC REGION (1973=100)

| Line | CONSTRUCTION AND EQUTPMENT | $\begin{aligned} & \mathrm{N} \\ & \mathrm{~A} \\ & \mathrm{R} \\ & \mathrm{U} \\ & \mathrm{C} \end{aligned}$ | COST INDEX NUMBERS |  |  |  |  |  |  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  | 2015 |  | 2016 |  | 2017 |  | 2018 |  | 2019 |  | 2020 |  | 2021 |  |
|  |  |  | Jan. <br> 1 | Jul. 1 | Jan. 1 | Jul. 1 | Jan. 1 | Jul. <br> 1 | Jan. <br> 1 | Jul. 1 | Jan. 1 | Jul. 1 | Jan. 1 | Jul. 1 | Jan. <br> 1 | Jul. 1 |
| 1 | Source of Supply Plant |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 2 | Collecting \& Impounding Res. | 305 | 526 | 521 | 526 | 532 | 543 | 549 | 559 | 570 | 576 | 575 | 584 | 583 |  |  |
| 3 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 4 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 5 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 7 | Pumping Plant |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 8 | Structures \& Improvements | 304 | 642 | 646 | 655 | 659 | 672 | 671 | 687 | 706 | 717 | 713 | 719 | 730 |  |  |
| 9 | Electric Pumping Equipment | 311 | 928 | 931 | 990 | 1013 | 1052 | 1135 | 1146 | 1216 | 1261 | 1346 | 1374 | 1454 |  |  |
| 10 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 11 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 12 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 13 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 14 | Water Treatment Plant |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 15 | Structures \& Improvements | 304 | 642 | 646 | 655 | 659 | 672 | 671 | 687 | 706 | 717 | 713 | 719 | 730 |  |  |
| 16 | Large Treatment Plant Equip. | 320 | 736 | 737 | 755 | 758 | 774 | 785 | 797 | 812 | 832 | 842 | 871 | 890 |  |  |
| 17. | Small Treatment Plant Equip. | 320 | 832 | 840 | 861 | 864 | 881 | 897 | 911 | 934 | 960 | 975 | 1012 | 1035 |  |  |
| 18 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 19 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 20 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 21 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 22 | Transmission Plant |  |  |  |  |  |  |  |  |  |  | - |  |  |  |  |
| 23 | Steel Reservoirs | 330 | 742 | 742 | 742 | 774 | 784 | 784 | 801 | 820 | 832 | 832 | 836 | 836 |  |  |
| 24 | Elevated Steel Tanks | 330 | 1131 | 1131 | 1131 | 1143 | 1161 | 1161 | 1181 | 1200 | 1244 | 1244 | 1244 | 1244 |  |  |
| 25 | Concrete Reservoirs | 330 | - | - | - | - | - | - | - | - | - | - | - | - |  |  |
| 26 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 27 | Cast Iron Mains | 331 | 733 | 744 | 754 | 759 | 793 | 785 | 810 | 825 | 844 | 858 | 884 | 895 |  |  |
| 28 | Steel Mains | 331 | 712 | 713 | 697 | 705 | 723 | 726 | 733 | 770 | 792 | 785 | 824 | 830 |  |  |
| 29 | Concrete Cylinder Mains | 331 | 562 | 575 | 591 | 592 | 601 | 592 | 620 | 626 | 639 | 641 | 638 | 653 |  |  |
| 30 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 31 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 32 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 33 | Distribution Plant |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 34 | Mains-Average All Types | 331 | 736 | 738 | 747 | 750 | 774 | 772 | 790 | 801 | 819 | 826 | 847 | 850 |  |  |
| 35 | Cast lron Mains | 331 | 780 | 785 | 795 | 797. | 832 | 826 | 855 | 864 | 883 | 894 | 920 | 924 |  |  |
| 36 | Cement-Asbestos Mains | 331 | 724 | 731 | 741 | 743 | 751 | 746 | 763 | 770 | 784 | 793 | 820 | 831 |  |  |
| 37 | Steel Mains | 331 | 673 | 670 | 678 | 681 | 697 | 701 | 704 | 717 | 734 | 736 | 748 | 748 |  |  |
| 38 | PVC Mains | 331 | 387 | 387 | 388 | 388 | 387 | 387 | 397 | 397 | 401 | 401 | 417 | 418 |  |  |
| 39 | Services Installed | 333 | 617 | 616 | 622 | 617 | 638 | 651 | 661 | 667 | 677 | 684 | 706 | 701 |  |  |
| 40 | Meters | 334 | 400 | 400 | 403 | 403 | 404 | 418 | 434 | 434 | 443 | 443 | 459 | 459 |  |  |
| 41 | Meter Installations | 334 | 702 | 702 | 709 | 708.5 | 722 | 733 | 750 | 750 | 765 | 772 | 790 | 797 |  |  |
| 42 | Hydrants Installed | 335 | 877 | 930 | 971 | 972 | 980 | 981 | 1012 | 1024 | 1049 | 1063 | 1101 | 1104 |  |  |
| 43 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 44 | Miscellaneous Items |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 45 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 46 | Flocculating Equipinent-Installed |  | 2167 | 2177 | 2192 | 2192 | 2198 | 2213 | 2223 | 2264 | 2360 | 2360 | 2470 | 2481 |  |  |
| 47 | Clarifier Equipinent-Installed |  | 1184 | 1188 | 1229 | 1272 | 1311 | 1315 | 1369 | 1401 | 1462 | 1462 | 1523 | 1557 |  |  |
| 48 | Filter Gallery Piping-Installed |  | 727 | 728 | 735 | 738 | 772 | 772 | 801 | 808 | 825 | 834 | 868 | 866 |  |  |
| 49 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 50 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 51 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 52 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 53 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 54 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 55 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 56 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

## Cost Trends Of

## Building

 Construction
## COST TREND TABLES

1912 to July 1, 2020

NORTH ATLANTIC REGION (1973-100)


|  | CONSTRUCTION; MATERIAL, AND LABOR | COST INDEX NUMBERS |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| L |  |  |  |  |  |  |  | 1 |  |  |  |  |  |  |  |  |  |
| 1 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| $n$ |  |  | 4 |  | 4 | 4 |  | 5 |  |  |  |  |  |  |  |  | 5 |
| e |  | 4 | 5 | 6 | 7 | 8 | 9 | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| 1 | Building Construction |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 2 | inf, Conc Bldg, Construction | 20 | 20. | 24 | 28 | 32 | 34 | 35 | 37 | 38 | 40 | 42 | 44 | 48 | 52 | 53 | 5 |
| 3 | ck Building Construction | 21 | 21 | 24 | 28 | 32 | 34 | 35 | 37 | 38 | 39 | 41 | 42 | 46 | 49 | 50 | 52 |
| 4 | ed | 20 | 20 | 24. | 30 | 37 | 39 | 41 | 43 | 43 | 47 | 48 | 50 | 59 | 66 | 67 | 67 |
| 5 | if Concrete (Ready-Mix) |  |  |  |  |  |  |  |  | 35 | 37 | 39 | 41 | 43 | 46 | 48 | 50 |
| 7 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 8 | Building Materia |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 9 | a, | 33 | 33 | 35 |  |  |  | 46. | . | 4 | 0 |  | 7 | 60 | 63 | 66 |  |
| 10 | nber for Reinf Concrete | 23 | 23 | 29 | 33 | 8 | , | 7 | 37 | 8 |  | 39 | 42 |  |  |  |  |
| 11 | el Bars for Reinf. Concrete | 28 | , | 30 | 34 | 7 | 43 | 5 | 7 |  | 1 |  | 6 | 61 | 8 | 0 | 72 |
| 12 | \%. Conre | 23 | 27 | 31 | 33 | 8. | 2 | 3 | 7 |  | 48 | 50 | 1 | 52 | 3 | 54 | 5 |
|  | ck |  |  |  |  |  | 6 | 58 |  |  | 63. |  |  |  |  |  |  |
| 14 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 15 | Labor ${ }^{\text {a }}$ |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 16 | g Trades Labor | $\bigcirc$ | 19 | 21 | 23 | 26 | 27 | 28 | 31 | 1 | 3 | 34 |  | 7 | 39 | 41 | 43 |
|  | avy Constr. Trades Labor |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 18 | Or for Reinf Concrete | 15 | 16 | 18 | 2 |  | 25 | 26. | $27$ |  | 30 | 32 | 33. | 35 | 37 | 39 | 41 |
| 19 | mmon Labor | 13 | 14 | 17 | 19 | 21 |  | 24 | , | 27 | 2 | 30 | 31 | 33 | 35 | 37 | 40 |
| 20. | ans | 19 | 19 | 20 | 23 | 25 | 27 |  | 30 |  | 33 | 34 | 35 | 37 | 38 | 41 | 42 |
|  | , |  |  |  |  |  | 26 | 27 | 28 |  |  | 32 | 33 |  | 35 | 39 | 4. |
| 22 |  |  |  |  | 22 | 25 | 27 | 8 | 29. |  |  | 34 | 35 | 37 | 38 | 40. | 41 |
| 23 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |


| $\begin{gathered} \text { L } \\ 1 \\ 1 \\ \mathrm{n} \\ \mathrm{e} \end{gathered}$ | CONSTRUCTION, MATERIAL, AND LABOR | $\left\lvert\, \begin{aligned} & 1 \\ & 9 \\ & 9 \\ & 6 \\ & 0 \end{aligned}\right.$ |  | 1 1 9 6 2 | [ $\begin{aligned} & 1 \\ & 9 \\ & 9 \\ & 6 \\ & 3\end{aligned}$ | 1 9 6 4 | (1) | \|ris | 1 9 6 7 | 1. 1 9 6 8 8 | 1 9 6 9 | 4 1 9 7 0 | (\%) | 1 <br> 9 <br> 7 <br> 2 | 1 9 7 3 | 1 9 7 4 | 9 7 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 1 | Building Construction |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 2 | einf Corc: Bldg Constraction | 55 | 54 | 55 | 55 | 57 | 58 | 59 | 62 | 65 | 70 | 75 | 84 | 91 | 100 | 121 | 134 |
| 3 | Brick Builiding Construction | 53 | 52 | 53 | 54 | 56 | 57 | 59 | 61 | 64 | 68 | 74 | 84 | 91 | 100 | 118 | 127 |
| 4 | uctural Steel Erected | 66 | 62 | 62 | 62 | 63 | 63. | 65 | 66 | 69 | 74 | 77 | 83 | 89 | 100 | 140 | 161 |
| 5 | Reinf. Concrete (Ready-Mix) | 51 | 52 | 53 | 54 | 55 | 57 | 59 | 61 | 64 | 69 | 777 | 88 | 94 | 100 | 111 | 119 |
| 6 | Reinf. Concrete (Plan-Mix) | 49 | 48 | 50 | 51 | 52 | 53 | 56 | 58 | 61 | 66 | 73 | 83. | 91 | 100 | 108 | 115 |
| 7 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 8 | Building Material ${ }^{\text {a }}$, |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 9 | Ready-Mx Concrete | 66 | 66 | 66 | 65 | 64 | 64 | 65. | 65. | 68 | 73 | 82 | 91 | 94 | 100 | 112 | 123 |
| 10 | Lumber for Reinfi Concrete | 47 | 39. | 41 | 40 | 39 | 38 | 41 | 42 | 46 | 53. | 53 | 63 | 75 | 100 | 93 | 91 |
| 11 | Steel Bats for Reinf. Concrete | 72 | 72 | 72 | 72 | 74 | 81 | 82 | 81 | 81 | 81 | 84 | 91 | 91 | 100 | 157 | 156 |
| 12 | Common Brick, | 56 | 56 | 56 | 57 | 58 | 58 | 60 | 62 | 65 | 65 | 68 | 78 | 84 | 100 | 123 | 126 |
| 13 | Concrete Block | 68 | 70 | 70 | 70 | 70 | 67 | 70 | 72 | 75 | 77 | 8.1 | 90 | 98 | 100 | 109 | 113 |
| 14 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 15 | Labor |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 16 | Building Trades Labor | 45 | 46 | 48 | 50 | 52 | 54 | 56 | 59 | 62 | 68 | 76 | 87 | 96 | 100 | 108 | 115 |
| 17. | Heavy Constr. Trades Labor |  | 45 | 47 | 48 | 50 | 53 | 56 | 58. | 61 | 67 | 76 | 86. | 96 | 100 | 107 | 116 |
| 18 | Labor for Reinf. Concrete | 43 | 45 | 47 | 49 | 51 | 53 | 56 | 58 | 62 | 67 | 77 | 88 | 96 | 100 | 108 | 116 |
| 19 | Common Labor | 42 | 44 | 45 | 47. | 49 | 52 | 55 | 58 | 61 | 66 | 75 | 88 | 97 | 100 | 109 | 117 |
| 20 | Electricians | 43 | 45 | 48 | 49. | 51. | 53 | 55 | 57 | 60 | 64 | 72 | 82 | 91 | 100 | 108 | 117 |
| 21 | Pipefitters | 41 | 44 | 45. | 45 | 48. | 50 | 52 | 55 | 57. | 62 | 70 | 85 | 97. | 100 | 107 | 114 |
| 22 | Plumbers | 43 | 44 | 46 | 48 | 49 | 51 | 53 | 56 | 58 | 64 | 71 | 86 | 96 | 100 | 107 | 114 |
| 23 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

NORTH ATLANTIC REGION (1973-100)

|  | CONSTRUCTION, MATERLAL, AND LABOR | COST NDEX NUMBERS |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | $\begin{aligned} & 9 \\ & 9 \\ & 9 \\ & 6 \\ & \hline \end{aligned}$ | $\begin{aligned} & 1 \\ & 9 \\ & 7 \\ & 7 \end{aligned}$ | $\begin{gathered} 1 \\ 9 \\ 7 \\ 8 \end{gathered}$ | $\begin{aligned} & 1 \\ & 9 \\ & 7 \\ & 9 \end{aligned}$ | $\begin{aligned} & 1 \\ & 9 \\ & 8 \\ & 8 \end{aligned}$ | $\left[\begin{array}{l} 1 \\ 9 \\ 8 \\ 1 \end{array}\right.$ | $\left\lvert\, \begin{aligned} & 1 \\ & 9 \\ & 8 \\ & 2 \\ & 2 \end{aligned}\right.$ | $\begin{array}{\|} 1 \\ 9 \\ 8 \\ 3 \end{array}$ | $\begin{gathered} 9 \\ 8 \\ 4 \end{gathered}$ | $\begin{aligned} & 1 \\ & 9 \\ & 8 \\ & 5 \end{aligned}$ | $\left\|\begin{array}{c} 1 \\ 9 \\ 8 \\ 8 \end{array}\right\|$ | $\begin{aligned} & 1 \\ & 9 \\ & 8 \\ & 7 \end{aligned}$ | $\begin{aligned} & 1 \\ & 9 \\ & 8 \\ & 8 \end{aligned}$ | $\left\|\begin{array}{c} 1 \\ 9 \\ 8 \\ 9 \end{array}\right\|$ | [ $\begin{aligned} & 1 \\ & 9 \\ & 9 \\ & 0 \\ & 0\end{aligned}$ |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| e |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | Building Construction |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 2 | P ${ }^{\text {enf }}$ | , | , | 150 | 167 | 184. | 190. | 189 | 196 | 21 | 222 | 229 | 234 | 246 | 58 | 22 | 25 |
|  | ick Building Constructio | 130 | 136 | 148 | 164 | 183 | 192 | 197. | 206 | 217 | 225 | 233 | 239. | 252 | 265 | 271 | 272 |
| 4 | rictural Steel Erected | , | 154 | 170 | 193 | 225 | 227 | 202 | 202 | 225 | 240 | 249 | 255 | 272 | 286 | 286 | 261 |
|  | inf. Concrete (Ready | 124 | 131 | 140 | 154 | 166 | 176 | 191 | 201 | 210 | 220 | 225 | 229 | 238. | 244 | 251 | 260 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | Buildin |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | ReadyMix Concrete | 126 | 133 | 143 | 163 | 185 | 207 | 226 | 2 | 235 | 248 | 245 | 252 | 254 | 244 | 55 | , |
|  |  | 106 | 11 | 130 | 148 | 139 | 138 | 135 | 143 | 14 | 140 | 140 | 146 | 143 | 14 | 147 | 45 |
|  | nc | 145 | 14 | 166 | 206 | 215 | 216 | 203 | 190 | 198 | 202 | 205 | 205 | 227 | 232 | 222 | 199 |
| 12 | Common Brick | 130 | 13 | 159 | 9 | 232 | 247 | 255 | 25 | 25 | 246 | 258 | 270 | 292 | 320 | 320 | 316 |
| 13 | Concrete Block |  | 120 | 13. | 185 | 210 | 228 | 260 | 260. | 26 | 278 | 285 | 287 | 285 | 30 |  | 288 |
| 14 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 15 | \% |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 16. | lding Trades Labor | 122 | 129 | 135 | 143 | 152 | 164 | 184 | 199 | 212 | 221 | 229 | 234 | 245 | 256 | 268 | 285 |
| 17 | Heay Constr Trades Labor | 123 | 131 | 137 | 146 | 155 | 165 | 184 | 19 | 210 | 220 | 229 | 233 | 244 | 25 | 264 | 27 |
| 18 | Sabor for Reinf Concrete | 122 | 130 | 137 | 147 | 15 | 166 | 184 | 198 | 210 | 220 | 227 | 232 | 242 | 25 | 262 | 27 |
| 19 | Commo | 12 | 133 | 14 | 152 | 163 | 172 | 190 | 204 | 214 | 223 | 231 | 234 | 243 | 25 | 265 | 280 |
| 20 | Electif | 12 | 12. | 135 | 4 | 150 | 164 | 186 | 207 | 224 | 234 | 239 | 244 | 261 | 271 | 280 | 29 |
| 21 | Pipefit | 122 | 131 | 135 | 143 | 154 | 170 | 192 | 207 | 21.1 | 228 | 236 | 242 | 248 | 263 | 276 | 290 |
| 22 | Plumb | 122 | 131 | 136 | 14 | 152 | 168. | 191 | 205 | 211 | 226 | 235 | 24. | 242 | 25. | 279 | 294 |
| 23 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| $\pm$ |  | 1 | 1 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | materla |  | 9 | 9 | 9 | 9 | 9 | 9 |  | 0 |  | 0 | 0 |  |  |  |  |
| n | B0R | 9 | 9 | 9 | 9 | . | 9 | 9 | 9 | 0 | 0 | 0 | 0 | 0 |  | 1 |  |
| e |  | 2 | , | 4 | 5. | 6 | 7 |  | 9 | 0 |  | 2 | 3. | 4 |  |  |  |
|  | Buildinig Construction |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 2 | Reinf: Conte Bldge Construction | 262 | 279 | 298 | 305 | 31 | 322 | 324 | 330. | 342 | 354 | 363 | 371 | 403 | 415 | 422 |  |
| 3 | Brick Building Construction | 278 | 290 | 304 | 310 | 315 | 328 | 337 | 345 | 359 | 372 | 383 | 391 | 414 | 425 | 431 |  |
| 4 | Stinctural Steel Erected | 260 | 278 | 305 | 317 | 325 | 334 | 336 | 344 | 360 | 372 | 375 | 385 | 433 | 443 | 452 |  |
| 5 | Reinf. Conerete (Ready Mix) | 268 | 279 | 291 | 296 | 304 | 312 | 320 | 327 | 336 | 350 | 364 | 372 | 389 | 402 | 409 |  |
| 6 | Reinf | 247 | 265 | 28. | 279 | 288 | 298 | 296 | 299 | 304 | 316 | 324 | 32 | 351 | 364 | 373 |  |
| 7 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 8 | Building Mate |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 9 | Ready Mix Concrete | 25 | 262 | 270 | 281 | 295 | 286 | 301 | 307 | 315 | 332 | 350 | 356 | 344 | 351 | 371 |  |
| 10 | Lumber for Reinf Concrete | 150 | 193 | 22. | 196 | 206 | 218 | 186 | 182 | 168 | 179 | 164 | 153 | 182 | 182 | 215 |  |
| 11 | Stee 1 Bars for Reinf. Concrete | 194 | 212 | 234 | 23 | 236 | 250 | 24 | 229 | 225 | 224 | 221 | 243 | 296 | 348 | 36 |  |
| 12 | Common Bick | 315 | 310 | 313 | 315 | 31. | 335 | 369 | 384 | 412 | 426 | 42 | 427 | 420 | 4 | 439 |  |
| 13 | Concrete Block | 288 | 263 | 262 | 258 | 258 | 285 | 306 | 332 | 35 | 365 | 38. | 384 | 394 | 40 | 406 |  |
| 14 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 15 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 16 | Building Trades Labor | 29 | 307 | 318 | 32 | 331 | 344 | 353 | 362 | 376 | 392 | 412 | 24 | 442 | 458 | 458 |  |
| 11. | Heavy Constr Trades Labor | 29. | 300 | 31. | 319 | 325 | 337 | 348 | 358 | 372 | 386 | 402 | 411 | 430 | 446 | 446 |  |
| 18 | Labor for Reinf. Con | 280 | 297 | 308 | 314 | 320 | 333 | 343 | 35 | 366 | 382 | 400 | 40 | 426 | 439 | 439 |  |
| 9 | Common Labor | 293 | 30 | 31 | 315 | 327 | 338 | 349 | 35 | 376 | 389 | 400 | 407 | $42 \cdot$ | 4 | 428 |  |
| ${ }^{20}$ | Electr | 309 | 324 | 33 | 343 | 353 | 365 | 371 | 39 | 40 | 416 | 441 | 454 | 475. | 497 | 497 |  |
| 21 | Pipetr | 305 | 31. | 323 | 335 | 342 | 352 | 361 | 374 | 388 | 409 | 42 | 435 | 470 | 488 | 48 |  |
| 22 | Plumbers | 305 | 320 | 330 | 10 | 348 | 355 | 363 | 368 | 385 | 405 | 425 | 438 | S | 469 | 469 |  |
| , |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

## NORTH ATLANTIC REGION (1973-100)



|  | CONSIRUCTION:MATERIAL, AND labor | 2014] |  | 2015. |  | $2016$ |  | $2017$ |  | 2018, |  | $2019$ |  | 2020 |  | $2021$ |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  | $\begin{array}{r} \text { Ju1. } \\ 1 . \\ \hline 1 . \end{array}$ | $\operatorname{lan}_{1}^{1}$ |  | $\begin{array}{\|c\|} \hline \text { 3an } \\ 1 \\ \hline \end{array}$ |  | 3,333 | Jniv1. | Jan <br> 1 | Jul <br> 1 |  |  | Ian.1.$\vdots$ | $\sqrt{14}$ |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 2 | 1f. Conc Bidg Construction | 546 | 549 | 557 | 549 | 552 | 558 | 569 | 576 | 589 | 611 | 61. | 605 | 617 | 613 |  |  |
| 3 | ck Building Construction | 550 | 552 | 585 | 580 | 586 | 589 | 604 | 608 | 633 | 647 | 647 | 643 | 664 | 662 |  |  |
| 4 | uctural Steel Erected | 561 | 567 | 568 | 555 | 549 | 556. | 561 | 569 | 579 | 617 | 618 | 604 | 609 | 594 |  |  |
| 5 | Reinf Concrete ( Peady Mix) | 541 | 543 | 556 | 554 | 564 | 567 | 581 | 585. | 602 | 609 | 6.1 | 608 | 625 | 629 |  |  |
| $6$ | Reinf Concrete (PantMix) | 482 | 482 | 497 | 490 | 497 | 505 | 519 | 527 | 54 | 561 | 553 | 551 | 565 | 568. |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 8 | Building Material: |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 9 | Ready Mix Concrete | 44 | 452 | 455 | 461 | 471 | 471 | 481 | 485 | 488 | 488 | 489 | 488 | 492 | 514 |  |  |
| 10 | Lumber for Reinf. Concrete | 174 | 170 | 188 | 182 | 178 | 204 | 222 | 240 | 244 | 309 | 255 | 249 | 243 | 259 |  |  |
| 11 | Steel Bars for Reinf. Concrete | 363 | 373 | 368 | 326 | 288 | 307 | 316 | 349 | 342 | 393 | 413 | 381 | 333 | 325 |  |  |
| 12 | onmon Brick | 449 | 4 | 617 | 617 | 618 | 618 | 636 | 637 | 725 | 725 | 709. | 709 | 757 | 757 |  |  |
| 13 | Concrete Block | 444 | 499 | 505 | 485 | 483 | 429 | 427 | 411 | 41 | 443 | 429 | 461 | 462 | 461 |  |  |
| 14 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 15 | Labor |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 16. | Building Trades Labor | 636 | 636 | 646 | 646 | 660 | 660 | 678 | 678 | 696 | 696 | 707 | 707 | 732 | 732 |  |  |
| 17 | Heavy Constr. Trades Labor | 620 | 620 | 640 | 640 | 659 | 659 | 673 | 673 | 696 | 696 | 705 | 705 | 732 | 732 |  |  |
| 18 | Labor for Reinf. Concrete | 616 | 616 | 633 | 633 | 651 | 651 | 666 | 666 | 690 | 690 | 693 | 693 | 723 | 723 |  |  |
| 19. | Common Labor \% | 620 | 620 | 644 | 644 | 661 | 661 | 674 | 674 | 705 | 705 | 712 | 712 | 750 | 750 |  |  |
| 20. | Electricians | 691 | 691 | 702 | 702 | 7 | 724 | 731 | 731 | 753 | 753 | 775 | 775 | 787 | 787 |  |  |
| 21 | Pipefitters | 694 | 694 | 704 | 704 | 717 | 717 | 738 | 738 | 755 | 755 | 768 | 76 | 780 | 780 |  |  |
| 22 | Plumbers | 655 | 655 | 668 | 668 | 674 | 674 | 696 | 696 | 716 | 716 | 734 | 734 | 751 | 751 |  |  |
| 23 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

ALL REGIONS (1973-100)

|  | CONSTRUCTION AND EQUPMENT | COST INDEX NUMBERS |  |  |  |  |  |  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| L |  | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 1 |  | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 |
| n |  | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 2 | 2 | 2 | 2 | 2 |
| e |  | 2 | 3 | 4 | 5 | 6. | 7 | 8 | 9 | 0 | 1 | 2 | 3 | 4 | 5 |
| 1 | Boilers | 6 | 6 | 6 | 7 | 8 | 13 | 17 | 15 | 16 | 14 | 12 | 14 | 15 | 15 |
| 2 | Coal \& Ash Handling Equipment | 12 | 12 | 12 | 12 | 19 | 31 | 29 | 20 | 28 | 24 | 21 | 23 | 23. | 21 |
| 3 | Pumps | 9 | 9 | 9 | 12 | 14 | 16 | 18 | 18 | 18. | 17 | 16 | 16 | 16 | 17 |
| 4 | Steam Pipe | 17 | 17 | 17 | 12 | 18. | 39. | 44 | 35 | 37 | 35 | 34 | 36 | 37 | 37 |
| 5 | Cranes | 6 | 6 | 6 | 7 | 7 | 7 | 7 | 8 | 8 | 9 | 9 | 9 | 9. | 10 |
| 6 | Regulators | 32 | 32 | 32 | 32 | 32 | 39 | 47 | 45 | 49 | 50 | 49 | 50 | 53 | 52 |
| 7 | Switchioards | 20 | 20 | 20 | 20 | 21 | 23 | 26 | 35 | 44 | 49 | 43 | 40 | 43 | 43 |
| 8 | Power Transformers | 23. | 23 | 23 | 23 | 23 | 32 | 41 | 41 | 49 | 48 | 42 | 43 | 46 | 46 |
| 9 | Oil Switches. | 27. | 27 | 27 | 27 | 27 | 30 | 38 | 45 | 49 | 53 | 50 | 50 | 51 | 51 |
| 10 | Motors | 21 | 21 | 21 | 21 | 21 | 28 | 31 | 37 | 42 | 43 | 34 | 29 | 29 | 29 |
| 11 | Line Transformers | 48 | 48 | 48 | 48 | 48 | 51 | 69 | 72 | 77 | 79 | 69 | 67. | 69 | 68 |
| 12 | Meters-Electric | 37 | 37 | 37 | 37 | 37 | 41 | 46 | 51 | 53 | 57 | 53 | 50 | 50 | 48 |
| 13 | Treated Pine Poles | $-$ | - | - | - | , | $\bigcirc$ | $\stackrel{\square}{-1}$ | - | - | , | , | - |  |  |
| 14 | Standard Cross Arms | 7 | 7 | 7 | 7 | 7. | 9 | 10 | 12 | 12 | 11 | 12 | 12 | 12 | 13 |
| 15 | Standard Galv. Steel Guy Wire | 12 | 12 | 12 | 14 | 15 | 19 | 22 | 23 | 22 | 22 | 21 | 21 | 20 | 20 |
| 16 | Fibre Conduit, | - | $\bullet$ | - | - | - | - | 2 |  | - | - | - | - | - |  |
| 17 | Plastic Conduit |  | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 18 | Mercury Luminaires w/Standard | . | - | - | - | - | - | - | - | $\cdots$ | - |  | - | 27 | 26 |
| 19 | Power Wire \& Control Cable | 23 | 23 | 23 | 30 | 36 | 42. | 48 | 51 | 49 | 37 | 29 | 33 | 31 | 34 |
| 20 | Overhead Conductor-Transmission | 28. | 26 | 23 | 25 | 45 | 49 | 54 | 53 | 51 | 31 | 28 | 32 | 31 | 32 |
| 21 | Underground Conductor-Transmission | 15. | 13 | 12 | 12 | 19. | 22 | 25 | 27 | 26 | 21 | 21 | 26 | 23 | 23 |
| 22 | Overhead Conductor-Distribution | 25 | 23 | 20. | 23 | 40. | 43 | 48 | 47 | 45 | 28 | 25 | 28 | 28 | 29 |
| 23 | Underground Conductor-Distribution | 16 | 15 | 14 | 14 | 22. | 25 | 28 | 30 | 29 | 22 | 22 | 28 | 25 | 25 |
| 24 | Service Cable, |  |  |  | $-$ | - | , | - | , | $\checkmark$ | + |  | 4 |  |  |
| 25 | Condensers \& Tubes | 7 | 7 | 7 | 7 | 11 | 13 | 20 | 21 | 21 | 20 | 17 | 17 | 18 | 18 |
| 26 | Turbo-Generators | 9 | 9 | 9 | 9 | 13 | 13 | 17 | 18 | 21 | 23 | 20 | 19 | 19 | 19 |
| 27 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 28 | Gas Compressors | 18 | 18 | 18. | 18 | 18 | 19 | 25 | 25 | 27 | 26 | 25 | 25 | 25. | 25 |
| 29 | Gas Transmission Line Pipe | 23 | 24. | 23 | 24 | 34 | 44 | 44 | 45 | 44 | 43 | 40 | 41 | 43 | 43 |
| 30 | Steel Distribution Pipe | 15 | 16 | 16. | 17 | 24 | 36 | 40 | 36. | 34 | 32 | 28 | 30 | 31 | 31 |
| 31 | Plastic Pipe | - | - | - | - | $\rightarrow$ | - | - | $\stackrel{-}{ }$ | - | - | - | - | - | $\bigcirc$ |
| 32 | Meters-Gas | 17 | 18 | 18 | 18 | 19 | 23. | 33 | 33 | 32 | 33 | 30 | 30 | 28 | 27 |
| 33 | House Regulators | 24. | 25 | 25 | 25 | 26 | 31 | 47 | 46 | 45 | 45 | 41 | 41 | 39 | 37 |
| 34 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 35 | Cast Iron Pipe | 16 | 17 | 16 | 17 | 23 | 40 | 44 | 48 | 53 | 44 | 39 | 45 | 47 | 40. |
| 36 | Cast Iron Fitings | 10 | 10 | 10 | 13 | 13 | 24 | 27. | 25 | 34 | 29 | 25 | 25 | 25 | 27 |
| 37 | Ductile Iron Pipe |  | - | $\bullet$ | 4 | - | - | - | - | - | - | - | - | - | - |
| 38 | Chemical Feeders-Small |  | - | - | - | - | - | - | - | - | - |  | - | - | - |
| 39 | Chemical Feeders-Large | - | $\because$ | - | - | - | - | - | - | - | - | , | - | $-$ |  |
| 40 | Gate Valves | 15 | 15 | 15 | 17 | 17 | 17 | 24 | 24 | 30 | 28 | 25 | 29 | 29 | 27 |
| 41 | Meter Yokes | 24. | 24 | 24 | 24 | 24 | 24 | 29. | 29 | 31 | 31 | 29 | 29 | 29 | 29 |
| 42 | Corporation Stops | 27 | 27. | 27 | 27 | 27 | 27 | 25. | 25 | 25 | 25 | 25 | 25 | 24 | 24 |
| 43 | Curb Stops | 20 | 20. | 20. | 20 | 20 | 20 | 22. | 22 | 22 | 22 | 22 | 22 | 21 | 21 |
| 44 | Hydrants | 23 | 23 | 33 | 23 | 23 | 23 | 23. | 24 | 27 | 27 | 23 | 26 | 27 | 26. |
| 45 | Meters-Water | 23 | 23 | 23 | 23 | 26 | 29 | 35. | 37 | 37 | 37 | 37 | 37 | 37 | 37 |
| 46 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 47 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 48 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 49 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 50 | Construction Equipment |  |  |  | 11. | 15 | 19 | 26 | 28 | 30 | 22 | 19 | 23 | 21 | 22 |
| 51 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 52 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 53 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 54 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 55 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 56 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

ALL REGIONS (1973=100)

|  |  | COST INDEX NUMBERS |  |  |  |  |  |  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| L |  | 1 | 1 |  | 1 |  |  |  |  | 1 |  |  |  |  | 1 |
| - | CONSTRUCTION AND EQUPMENT | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 |
| $n$ |  | 2 | 2 | 2 | 2 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| e |  | 6 | 7. | 8 | 9 | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| 1 | Boilers | 15 | 15 | 14 | 14 | 14 | 14 | 12 | 12 | 15 | 15 | 16 | 18 | 19 | 20 |
| 2 | Coal \& Ash Handling Equipment | 21 | 20 | 20 | 20 | 19 | 17 | 16 | 17 | 20 | 20 | 20 | 21 | 20 | 20 |
| 3 | Pumps | 19 | 19 | 19 | 20 | 20 | 19 | 18 | 18 | 19 | 19 | 19 | 21 | 22 | 22 |
| 4 | Steam Pipe | 37 | 37 | 37 | 36 | 36 | 36 | 35 | 32 | 31 | 31 | 32 | 36 | 35 | 35 |
| 5 | Cranes | 10 | 10 | 11 | 11. | 11 | 11 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 11 |
| 6 | Regulators | 42 | 41 | 40 | 41 | 42 | 43 | 42 | 43 | 48 | 48 | 48 | 52 | 53 | 53 |
| 7 | Switchboards | 44 | 44 | 45 | 48 | 48 | 47 | 43 | 43 | 48 | 48 | 48 | 52 | 53 | 53 |
| 8 | Power Transformers | 46 | 43 | 41 | 42 | 40 | 40 | 39 | 40 | 46 | 47 | 47 | 50 | 52 | 52 |
| 9 | Oil Switches | 51 | 49 | 49 | 51 | 53 | 52 | 51 | 55 | 59 | 59 | 59 | 63 | 65 | 65 |
| 10 | Motors | 29 | 28 | 28 | 29 | 29 | 29 | 29 | 30 | 33 | 32 | 32 | 32 | 32 | 32 |
| 11. | Line Transformers | 63 | 59 | 58 | 62 | 61 | 59 | 57 | 59 | 61 | 62 | 62 | 66 | 67 | 67 |
| 12 | Meters-Electrric | 48 | 48 | 48 | 48 | 48 | 48 | 48 | 50 | 54 | 55 | 55 | 55 | 55 | 55 |
| 13 | Treated Pine Poles | 28 | 27 | 26 | 25 | 24 | 23 | 21 | 22 | 23 | 24 | 23 | 24 | 23 | 23 |
| 14 | Standard Cross Arms | 10 | 9 | 9 | 9 | 9 | 8 | 8 | 9 | 10 | 11 | 11 | 12 | 12 | 12 |
| 15. | Standard Galv, Steel Guy Wire | 18 | 17 | 16 | 16 | 15 | 14 | 14 | 15 | 17 | 17 | 17 | 18 | 19 | 18 |
| 16 | Fibre Conduit | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 17. | Plastic Conduit | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 18 | Mercury Luminaires w/Standard | 26 | 23 | 26 | 27 | 28 | 29 | 29 | 29 | 30 | 30 | 30 | 30 | 30 | 30 |
| 19 | Power Wire \& Control Cable | 33 | 30 | 27 | 29 | 26 | 21 | 19 | 23 | 26 | 27 | 29 | 35 | 29 | 26 |
| 20 | Overhead Conductor-Transmission | 29 | 27 | 32 | 38 | 26 | 22 | 19 | 23 | 28 | 27 | 29 | 32 | 27 | 27 |
| 21 | Underground Conductor-Transmission | 22 | 21 | 23 | 27 | 20 | 19 | 19 | 21 | 23 | 23 | 25 | 27 | 24 | 24 |
| 22 | Overhead Conductor-Distribution | 26 | 24 | 28 | 34 | 23 | 19 | 17 | 20 | 25 | 24 | 26 | 28 | 24 | 24 |
| 23 | Underground Conductor-Distribution | 24 | 22 | 25 | 29 | 22 | 21 | 20 | 22 | 25 | 25 | 27 | 29 | 26 | 26 |
| 24 | Service Cable | - | - | - | - | , | - | -1 | -1 | - | - | - | - | -3 | $\bigcirc$ |
| 25 | Condensers \& Tubes | 18 | 16 | 15 | 19 | 20 | 19 | 18 | 19 | 21 | 24 | 24 | 27 | 27 | 27 |
| 26 | Turbo-Generators | 19 | 19 | 20 | 21 | 22 | 22 | 21 | 22 | 25 | 25 | 26 | 29 | 30 | 30 |
| 27 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 28 | Gas Compressors | 24 | 23 | 24 | 24 | 24 | 24 | 24 | 24 | 24 | 24 | 23 | 23 | 23 | 23 |
| 29 | Gas Transmission Line Pipe | 43 | 43 | 43 | 43 | 43 | 43 | 42 | 35 | 35 | 35 | 34 | 35 | 34 | 34 |
| 30 | Steel Distribution Pipe | 31 | 31 | 31 | 31 | 30 | 29 | 29 | 26 | 29 | 29 | 26 | 28 | 26 | 25 |
| 31 | Plastic Pipe | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 32 | Meters-Gas | 27 | 27 | 27 | 27 | 27 | 26 | 25 | 25 | 25 | 25 | 25 | 26 | 26 | 26 |
| 33 | House Regulators | 37 | 38 | 38 | 38 | 37 | 36 | 34 | 34 | 34 | 34 | 34 | 35 | 37 | 40 |
| 34 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 35 | Cast Iron Pipe | 40 | 34 | 29 | 30 | 30 | 28 | 25 | 30 | 34 | 35 | 36 | 39 | 39 | 38 |
| 36 | Cast Lron Fittings | 27 | 25 | 25 | 25 | 24 | 21 | 19 | 20 | 22 | 23 | 23 | 23 | 24 | 24 |
| 37 | Ductile Iron Pipe | - |  | - | - | - | - | - | - | - | - | - | - | - | - |
| 38 | Chemical Feeders-Small | 18 | 19 | 22 | 22 | 20 | 15 | 17 | 17 | 17 | 17 | 17 | 17 | 17 | 17 |
| 39. | Chemical Feeders-Large | - | - | - | -2 | -1 | - | - | - | - | 12 | 12 | 13 | 13 | 13 |
| 40 | Gate Valves | 26 | 26 | 28 | 28 | 28 | 24 | 23 | 23 | 22 | 22 | 23 | 25 | 26 | 26 |
| 41 | Meter Yokes | 29 | 29 | 29 | 29 | 29 | 29 | 28 | 28 | 28 | 28 | 28 | 28 | 29 | 29 |
| 42 | Corporation Stops | 24 | 24 | 24 | 24 | 24 | 24 | 24 | 22 | 21 | 21 | 21 | 21 | 21 | 21 |
| 43 | Curb Stops | 21 | 21 | 21 | 21 | 21 | 21 | 21 | 21 | 21 | 21 | 21 | 21 | 21 | 21 |
| 44 | Hydrants | 24 | 24 | 25 | 25 | 25 | 23 | 23 | 23 | 20 | 22 | 22 | 24 | 25 | 25 |
| 45 | Meters-Water | 37 | 37 | 37 | 37 | 37 | 37 | 37 | 35 | 26 | 26 | 26 | 31 | 32 | 32 |
| 46 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 47 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 48 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 49 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 50 | Construction Equipment | 21 | 22 | 21 | 22 | 22 | 20 | 19 | 19 | 20 | 21 | 21 | 23. | 23 | 23 |
| 51 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 52 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 53 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 54 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 55 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 56 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

ALL REGIONS $(1973=100)$


ALL REGIONS $(1973=100)$

| $\begin{gathered} \mathrm{L} \\ \mathrm{~B} \\ \mathrm{e} \end{gathered}$ | CONSTRUCTION AND EQUIPMENT | COST INDEX NUMBERS |  |  |  |  |  |  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
|  |  | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 |
|  |  | 5 | 5 | 5 | 5 | 5 | 5 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 |
|  |  | 4 | 5 | 6 | 7 | 8 | 9 | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 1 | Boilers | 45 | 47 | 54 | 61 | 63 | 65 | 65 | 66 | 66 | 66 | 68 | 70 | 71 | 74 |
| 2 | Coal \& Ash Handling Equipment | 56 | 58 | 68 | 76 | 77 | 79 | 77 | 72 | 72 | 72 | 73. | 73 | 74 | 76 |
| 3 | Pumps , ${ }^{\text {P }}$ | 49 | 50 | 55 | 56 | 56 | 62. | 68 | 68 | 69 | 69 | 70 | 70 | 74 | 77 |
| 4 | Steam Pipe | 56 | 57 | 61 | 67 | 69 | 71 | 71 | 71 | 71 | 71 | 73 | 73 | 73 | 74 |
| 5 | Cranes | 40 | 43 | 45 | 47 | 49 | 52 | 54 | 55 | 55 | 55 | 56 | 56. | 58 | 64 |
| 6 | Regulators | 83 | 85 | 98 | 105 | 108 | 108 | 108 | 96. | 96 | 90 | 87 | 84 | 83 | 84 |
| 7 | Switchboards | 79 | 81 | 96 | 105 | 108 | 106 | 98 | 81. | 78 | 77 | 77 | 78 | 82 | 90 |
| 8 | Power Transformers | 85 | 87 | 100 | 103 | 107 | 103 | 95 | 88 | 84 | 76 | 81 | 84 | 87 | 91 |
| 9 | Oil Switches | 112 | 110 | 115 | 131 | 136 | 132 | 109 | 75 | 74 | 64 | 70 | 82 | 80 | 88 |
| 10 | Motors | 67 | 68 | 79 | 89 | 93 | 96 | 92 | 87 | 86 | 85 | 85 | 87 | 87 | 88 |
| 11. | Line Transformers | 123 | 123 | 127 | 135. | 130 | 125 | 122 | 118 | 107 | 100 | 100. | 101 | 101 | 105 |
| 12 | Meters-Electric | 83 | 79 | 82 | 87 | 89. | 92 | 92 | 91 | 90 | 89 | 89 | 88 | 88 | 89 |
| 13 | Treated Pine Poles | 51 | 51 | 55 | 59 | 60 | 57 | 57 | 56 | 56 | 56 | 56 | 56 | 58 | 61 |
| 14 | Standard Cross Arms | 42 | 42 | 49 | 50 | 47 | 46 | 46 | 44 | 44 | 44 | 44 | 45 | 47 | 46 |
| 15 | Standard Galv. Steel Guy Wire | 54 | 55. | 58 | 62 | 63 | 63 | 63 | 63 | 63 | 63 | 63. | 63 | 63 | 63 |
| 16 | Fibre Conduit | - | - | - | - | - | - | 82 | 86 | 86 | 86 | 86 | 84 | 76 | 71 |
| 17 | Plastic Conduit | 170 | 157 | 159 | 159 | 154 | 154 | 154 | 150 | 146 | 146 | 143 | 139 | 141 | 136 |
| 18. | Mercury Luminaires w/Standard | 59 | 59 | 60 | 66 | 68. | 68 | 68. | 67 | 67 | 66 | 67 | 66 | 72 | 82 |
| 19 | Power Wire \& Control Cable | 71 | 68 | 72 | 65 | 50 | 50 | 40 | 38 | 40 | 40 | 44 | 55 | 67 | 72 |
| 20 | Overhead Conductor-Transmission | 67 | 73 | 80 | 81 | 79. | 72 | 73 | 73 | 74 | 63. | 69 | 73 | 76 | 78 |
| 21 | Underground Conductor-Transmission | 60 | 65 | 72 | 65 | 63 | 65. | 66 | 64 | 63 | 63 | 69 | 77 | 77 | 79 |
| 22 | Overhead Conductor-Distribution. | 59 | 67 | 72 | 63 | 58 | 63 | 64 | 62 | 62 | 62 | 64 | 71 | 75 | 78 |
| 23 | Underground Conductor-Distribution | 64 | 71 | 78 | 69 | 67 | 70 | 71 | 69 | 67 | 68 | 74 | 82 | 83 | 85 |
| 24 | Service Cable, | - | - | 93. | 89 | 74 | 69 | 68 | 69 | 67 | 62 | 66 | 68 | 71 | 74 |
| 25 | Condensers \& Tubes | 44 | 45 | 48 | 53 | 56 | 56 | 56 | 56 | 56 | 57 | 61 | 65 | 71 | 75 |
| 26 | Turbo-Generators | 59 | 61 | 72 | 80 | 84 | 84 | 78 | 72 | 70 | 70 | 70 | 71 | 72 | 73 |
| 27 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 28 | Gas Compressors | 44 | 46 | 49 | 54 | 58 | 61 | 61 | 61. | 61 | 64 | 68 | 73 | 74 | 78 |
| 29 | Gas Transmission Line Pipe | 55 | 56 | 59. | 65 | 67 | 69 | 69 | 69 | 69 | 69 | 71 | 71 | 71 | 72 |
| 30 | Steel Distribution Pipe | 54 | 56 | 60 | 68 | 69 | 71 | 71 | 71 | 71 | 71 | 71 | 71 | 71 | 73 |
| 31 | Plastic Pipe | 154 | 147 | 146 | 142 | 140 | 139 | 137 | 133 | 132 | 132 | 128 | 123 | 126 | 126 |
| 32 | Meters-Gas | 55 | 56 | 63. | 66 | 71 | 71 | 71 | 73 | 79 | 79 | 79 | 79 | 86 | 88 |
| 33 | House Regulators | 74 | 74 | 74 | 76 | 80 | 80 | 80 | 81 | 82 | 82 | 82 | 80 | 80 | 80 |
| 34 35 | Cast Iron Pipe | 79 | 80 | 86 | 91 | 95 | 95 | 95 | 95 | 95 | 95 | 95 | 95 | 95 | 95 |
| 36 |  | 62 | 64. | 67 | 69 | 72 | 74 | 74 | 74 | 73 | 72 | 72 | 72 | 72 | 75 |
| 37 | Ductile Iron Pipe | - | - | - | - | - | - | - | 96 | 96 | 96 | 96 | 96 | 96 | 96 |
| 38 | Chemical Feeders-Small | 40 | 41 | 45 | 48 | 49 | 54 | 60 | 60 | 63. | 63 | 64 | 69 | 73 | 77 |
| 39 | Chemical Feeders-Large | 42 | 44 | 54 | 61 | 68 | 68 | 68. | 68 | 71 | 72 | 71 | 70 | 72 | 79 |
| 40 | Gate Valves | 55 | 51 | 57 | 59 | 58 | 58 | 58 | 59 | 62 | 63 | 62 | 62 | 68 | 72 |
| 41 | Meter Yokes | 51 | 57 | 64 | 61 | 59 | 59. | 62 | 63 | 65 | 65 | 66 | 70 | 75 | 77 |
| 42 | Corporation Stops | 46 | 54 | 59 | 59 | 59 | 60 | 62 | 62 | 65 | 65 | 66 | 71 | 79 | 81 |
| 43 | Curb Stops | 46 | 54 | 59 | 59 | 59 | 60 | 62 | 63 | 65 | 65 | 67 | 71 | 79 | 82 |
| 44 | Hydrants | 55 | 52 | 58 | 59 | 59 | 59 | 59 | 59 | 59 | 59. | 59 | 59 | 61 | 66 |
| 45 | Meters-Water | 67 | 70 | 77 | 78 | 78 | 78 | 78 | 78 | 84 | 87. | 87 | 93 | 101 | 101 |
| 46 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 47 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 48 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 49 50 | Construction Equipment | 49 | 51 | 55 | 59 | 62 | 64 | 65 | 67 | 67 | 68 | 70 | 71 | 73 | 76 |
| 51 | Constracton Equipment |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 52 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
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## ALL REGIONS (1973=100)

| $\begin{gathered} \mathrm{L} \\ \mathrm{i} \\ \mathrm{n} \\ \mathrm{e} \\ \hline \end{gathered}$ | CONSTRUCTION AND EQUIPMENT | COST INDEX NUMBERS |  |  |  |  |  |  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
|  |  | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 |
|  |  | 6 | 6 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 8 | 8 |
|  |  | 8 | 9 | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 0 | 1 |
| 1 | Boilers | 76 | 78 | 83 | 89 | 94 | 100 | 119 | 143 | 159 | 172 | 186 | 203 | 221 | 245 |
| 2 | Coal \& Ash Handling Equipment | 79 | 84 | 88 | 93 | 95 | 100 | 124 | 150 | 154 | 162 | 175 | 192 | 213 | 225 |
| 3 | Pumps , | 78 | 80 | 85 | 89 | 93 | 100 | 127 | 154 | 177 | 183 | 195 | 212 | 235 | 259 |
| 4 | Steam Pipe | 78 | 82 | 86 | 92 | 98 | 100 | 112 | 131 | 143 | 155 | 178 | 206 | 223 | 236 |
| 5 | Cranes | 68 | 72 | 78 | 82 | 88 | 100 | 122 | 139 | 147 | 171 | 186 | 215 | 237 | 267 |
| 6 | Regulators | 84 | 87 | 90 | 92 | 97 | 100 | 128 | 150 | 165 | 170 | 174 | 179 | 189 | 206 |
| 7 | Switchboards | 92 | 93 | 94 | 96 | 97 | 100 | 131 | 196 | 212 | 222 | 234 | 238 | 261 | 295 |
| 8 | Power Transformers | 93 | 95 | 97 | 95. | 93 | 100 | 129 | 157 | 162 | 172 | 182 | 193 | 210 | 223 |
| 9 | Oil Switches | 96 | 92 | 93 | 93 | 95 | 100 | 123 | 140 | 143 | 174 | 186 | 195 | 203 | 229 |
| 10 | Motors | 89 | 94 | 100 | 104 | 100 | 100 | 110 | 155 | 167 | 186 | 186 | 188 | 195 | 210 |
| 11 | Line Transformers | 109 | 106 | 105 | 104 | 100 | 100 | 110 | 133 | 136 | 147 | 158 | 166 | 165 | 194 |
| 12 | Meters-Electric | 92 | 95 | 98 | 101 | 101 | 100 | 107 | 126 | 135 | 140 | 144 | 148 | 144 | 160 |
| 13 | Treated Pine Poles | 62 | 66 | 69 | 73 | 77 | 100 | 150 | 205 | 192 | 190 | 206 | 234 | 265 | 289 |
| 14 | Standard Cross Ams | 44 | 50 | 65 | 60 | 58 | 100 | 162 | 157 | 146 | 155 | 161 | 223 | 244 | 252 |
| 15 | Standard Galv. Steel Guy Wire | 63 | 64 | 72 | 86 | 97 | 100 | 133 | 153 | 151 | 162 | 178 | 205 | 214 | 244 |
| 16 | Fibre Conduit | 72. | 78 | 83 | 82 | 85 | 100 | 119 | 130 | 133 | 149 | 173 | 203 | 218 | 235 |
| 17 | Plastic Conduit | 116 | 105 | 100 | 98 | 100 | 100 | 118 | 133 | 129 | 144 | 161 | 187 | 199 | 190 |
| 18 | Mercury Luminaires w/Standard | 74 | 78 | 94 | 101 | 102 | 100 | 125 | 173 | 194 | 211 | 234 | 263 | 288 | 314 |
| 19 | Power Wire \& Control Cable | 81 | 86 | 84 | 74 | 86 | 100 | 115 | 95 | 97 | 95 | 101 | 109 | 135 | 142 |
| 20 | Overhead Conductor-Transmission | 75 | 84 | 97 | 107 | 103 | 100 | 121 | 167 | 204 | 220 | 189 | 201 | 232 | 250 |
| 21 | Underground Conductor-Transmission | 76 | 82 | 86 | 83 | 89 | 100 | 149 | 142 | 142 | 154 | 148 | 188 | 238 | 259 |
| 22 | Overhead Conductor-Distribution | 75 | 84 | 97 | 107 | 102 | 100 | 121 | 166 | 203 | 220 | 192 | 210 | 246 | 257 |
| 23 | Underground Conductor-Distribution | 76 | 86 | 94 | 92 | 100 | 100 | 135 | 130 | 132 | 140 | 148 | 196 | 231 | 222 |
| 24 | Service Cable | 71 | 77. | 92 | 98 | 99 | 100 | 105 | 124 | 126 | 131 | 149 | 183 | 221 | 217 |
| 25 | Condensers \& Tubes | 80 | 84 | 89 | 94 | 99 | 100 | 109 | 128 | 142 | 157 | 171 | 189 | 209 | 229 |
| 26 | Turbo-Generators | 72 | 75 | 81 | 89 | 96 | 100 | 111 | 131 | 144 | 158 | 170 | 188 | 206 | 230 |
| 27 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 28 | Gas Compressors | 84 | 88 | 91. | 91 | 90 | 100 | 120 | 150 | 161 | 172 | 188 | 213 | 237 | 265 |
| 29. | Gas Transmission Line Pipe | 75 | 80 | 83 | 89 | 98 | 100 | 122 | 145 | 172 | 187 | 212 | 225 | 253 | 290 |
| 30 | Steel Distribution Pipe | 73 | 76 | 82 | 89 | 97 | 100 | 127 | 142 | 155 | 170 | 194 | 213 | 225 | 254 |
| 31 | Plastic Pipe | 123 | 111 | 98 | 96 | 100 | 100 | 112 | 116 | 120 | 125 | 129 | 142 | 152 | 142 |
| 32 | Meters-Gas | 88 | 89 | 94 | 100 | 100 | 100 | 111 | 128 | 131 | 136 | 139 | 143 | 149 | 158 |
| 33. | House Regulators | 81 | 83 | 92 | 98 | 100 | 100 | 106 | 125 | 132 | 136 | 144 | 171 | 201 | 210 |
| 34 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 35 | Cast Iron Pipe | 95 | 95 | 96 | 100 | 100 | 100 | 153 | 178 | 180 | 183 | 195 | 201 | 217 | 235 |
| 36 | Cast Iron Fittings | 77 | 80 | 87 | 99 | 99 | 100 | 144 | 142 | 148 | 152 | 163 | 173. | 194 | 209 |
| 37 | Ductile Iron Pipe | 96 | 96 | 97 | 100 | 100 | 100 | 153 | 182 | 186 | 189 | 201 | 207 | 215 | 228 |
| 38 | Chemical Feeders-Small | 81 | 81. | 86 | 90 | 92 | 100 | 126 | 180 | 209 | 230 | 249 | 257 | 287 | 316 |
| 39 | Chemical Feeders-Large | 80 | 81 | 87 | 92 | 94 | 100 | 125 | 177 | 194 | 195 | 201 | 212 | 232 | 249 |
| 40 | Gate Valves | 74. | 74 | 79 | 91 | 96 | 100 | 127 | 160 | 191 | 197 | 220 | 252 | 270 | 289 |
| 41 | Meter Yokes | 79 | 87 | 93 | 95 | 95 | 100 | 132 | 139 | 160 | 227 | 246 | 262 | 296 | 320 |
| 42 | Corporation Stops | 85 | 90 | 96 | 99 | 99 | 100 | 126 | 133 | 133 | 136 | 139 | 154 | 168 | 178 |
| 43 | Curb Stops | 86 | 90 | 96 | 99 | 99 | 100 | 126 | 133 | 135 | 140 | 146 | 161 | 177 | 187 |
| 44 | Hydrants | 71 | 76 | 84 | 94 | 95 | 100 | 143 | 185 | 214 | 229 | 261 | 279 | 293 | 315 |
| 45 | Meters-Water | 101 | 107 | 108 | 108 | 106 | 100 | 93 | 93 | 98 | 101 | 105 | 108 | 122 | 127 |
| 46 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
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| 49. |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 50 | Construction Equipment | 80 | 84 | 88 | 93 | 95 | 100 | 117 | 141 | 153 | 164 | 178 | 197 | 222 | 246 |
| 51 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 52 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
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ALL REGIONS (1973=100)

| $\begin{gathered} \mathrm{L} \\ \mathrm{i} \\ \mathrm{n} \\ \mathrm{e} \end{gathered}$ | CONSTRUCTION AND EQUIPMENT | COST INDEX NUMBERS |  |  |  |  |  |  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
|  |  | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 |
|  |  | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 9 | 9 | 9 | 9 | 9 | 9 |
|  |  | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 0 | 1 | 2 | 3 | 4 | 5 |
| 1 | Boilers | 264 | 273 | 283 | 292 | 298 | 307 | 330 | 344 | 364 | 380 | 385 | 404 | 413 | 425 |
| 2 | Coal \& Ash Handling Equipment | 224 | 229 | 240 | 246 | 250 | 255 | 270 | 289 | 296 | 300 | 302 | 308 | 318 | 325 |
| 3 | Pumps : | 276 | 281 | 284 | 292 | 296 | 300 | 310 | 327 | 342 | 353 | 361 | 391 | 406 | 419 |
| 4 | Steam Pipe | 254 | 226 | 215 | 215 | 215 | 231 | 271 | 264 | 241 | 229 | 222 | 199 | 199 | 216 |
| 5 | Cranes | 302 | 328 | 344 | 384 | 411 | 423 | 442 | 458 | 474 | 482 | 490 | 537 | 598 | 615 |
| 6 | Regulators | 216 | 225 | 227 | 229 | 231 | 236 | 239 | 248 | 253 | 257 | 257 | 256 | 260 | 241 |
| 7 | Switchboards | 318 | 317 | 319 | 333 | 338 | 343 | 366 | 398 | 429 | 439 | 449 | 499 | 496 | 572 |
| 8 | Power Transformers | 231 | 226 | 229 | 237 | 242 | 253 | 264 | 291 | 327 | 337 | 343 | 360 | 371 | 388 |
| 9 | Oil Switches | 279 | 280 | 275 | 271 | 268 | 273 | 336 | 380 | 402 | 411 | 399 | 358 | 369 | 395 |
| 10 | Motors | 224 | 250 | 260 | 261 | 257 | 266 | 285 | 339 | 365 | 357 | 348 | 376 | 478 | 495 |
| 11 | Line Transformers | 208 | 210 | 211 | 212 | 213. | 211 | 212 | 221 | 224 | 222 | 223 | 226 | 230 | 225 |
| 12 | Meters-Electric | 188 | 201 | 200 | 202 | 207 | 205 | 187 | 175 | 174 | 186 | 190 | 189 | 174 | 169 |
| 13 | Treated Pine Poles | 291 | 280 | 276 | 283 | 289 | 284 | 289 | 300 | 310 | 323 | 332 | 367 | 416 | 445 |
| 14 | Standard Cross Arms | 249 | 240 | 243 | 230 | 228 | 226 | 250 | 291 | 333 | 366 | 381 | 419 | 441 | 464 |
| 15 | Standard Galv Steel Guy Wire | 254 | 236 | 227 | 233 | 233 | 235 | 249 | 253 | 252 | 252 | 251 | 253 | 254 | 255 |
| 16 | Fibre Conduit | 175 | 210 | 231 | 225 | 221 | 225 | 301 | 470 | 379 | 260 | 230 | 198 | 222 | 228 |
| 17. | Plastic Conduit | 158 | 183 | 197 | 189 | 188 | 199 | 280 | 409 | 366 | 316 | 289 | 237 | 251 | 260 |
| 18. | Mercury Luminaires w/Standard | 333 | 326 | 343 | 358 | 352 | 321 | 321 | 334 | 345 | 353 | 361 | 389 | 408 | 430 |
| 19 | Power Wire \& Control Cable, | 132 | 131 | 123 | 107 | 110 | 123 | 137 | 139 | 136 | 130 | 126 | 119 | 121 | 127 |
| 20. | Overhead Conductor-Transmission | 247 | 271 | 246 | 242 | 242 | 218 | 359 | 366 | 355 | 372 | 379 | 334 | 352 | 399 |
| 21 | Underground Conductor-Transmission | 270 | 268 | 256 | 242 | 277 | 281 | 298 | 328 | 405 | 461 | 469 | 477 | 477 | 485 |
| 22 | Overhead Conductor-Distribution | 252 | 266 | 259 | 249 | 244 | 229 | 349 | 366 | 354 | 363 | 366 | 322 | 341 | 386 |
| 23 | Underground Conductor-Distribution | 206 | 201 | 196 | 202 | 216 | 222 | 223 | 243 | 254 | 258 | 259 | 254 | 253 | 263 |
| 24 | Service Cable | 207 | 198 | 229 | 209 | 194 | 201 | 250 | 285 | 271 | 264 | 258 | 227. | 240 | 271 |
| 25 | Condensers \& Tubes | 247 | 256 | 257 | 247 | 222 | 239 | 263 | 268 | 268 | 270 | 270 | 275 | 288 | 308 |
| 26. | Turbo-Generators | 242 | 256 | 266 | 270 | 270 | 274 | 292 | 302 | 306 | 312 | 315 | 325 | 333 | 343 |
| 27. |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 28 | Gas Compressors | 280 | 284 | 295 | 301 | 303 | 307 | 325 | 354 | 371 | 388 | 405 | 438 | 446 | 455 |
| 29 | Gas Transmission Line Pipe | 315 | 271 | 262 | 254 | 265 | 272 | 301 | 298 | 269 | 257 | 250 | 233 | 235 | 243 |
| 30 | Steel Distribution Pipe | 268 | 270 | 282 | 272 | 237 | 250 | 291 | 316 | 318 | 323 | 323 | 327 | 370 | 381 |
| 31 | Plastic Pipe, | 132 | 149 | 157 | 146 | 146 | 159 | 218 | 283 | 285 | 290 | 275 | 230 | 235 | 244 |
| 32 | Meters-Gas | 158 | 146 | 147 | 158 | 166 | 165 | 170 | 177 | 185 | 190 | 190 | 191 | 189 | 190 |
| 33. | House Regulators | 217 | 221 | 230 | 237 | 236 | 243 | 247 | 253 | 269 | 280 | 283 | 297 | 303 | 302 |
| 34 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 35 | Cast Iron Pipe | 234 | 254 | 247 | 265 | 244 | 244 | 266 | 282 | 278 | 275 | 275 | 275 | 278 | 266 |
| 36 | Cast Iron Fiftings | 216 | 232 | 229 | 240 | 259 | 289 | 296 | 317 | 324 | 324 | 324 | 350 | 377 | 370 |
| 37 | Ductile Iron Pipe | 228 | 262 | 249 | 281 | 246 | 246 | 275 | 278 | 271 | 271 | 271 | 271 | 273 | 250 |
| 38 | Chemical Feeders-Small | 341 | 353 | 358 | 366 | 373 | 379 | 398 | 410 | 424 | 430 | 432 | 444 | 453 | 453 |
| 39. | Chemical Feeders-Large | 273 | 286 | 294 | 306 | 324 | 341 | 353 | 379 | 402 | 418 | 423 | 438 | 437 | 477 |
| 40 | Gate Valves , | 321 | 358 | 375 | 395 | 417 | 441 | 468 | 517 | 530 | 540 | 548 | 561 | 524 | 540 |
| 41 | Meter Yokes | 336 | 389 | 389 | 383 | 394 | 399 | 445 | 470 | 478 | 507. | 516 | 551 | 566 | 603 |
| 42 | Corporation Stops | 189 | 200 | 207 | 212 | 220 | 220 | 240 | 254 | 257 | 273 | 279 | 303 | 308 | 318 |
| 43 | Curb Stops | 198 | 210 | 220 | 225 | 233 | 233. | 254 | 270 | 273 | 289 | 296 | 321 | 330 | 348 |
| 44. | Hydrants | 352 | 384 | 385 | 414 | 439 | 456 | 480 | 521 | 558 | 560 | 560 | 559 | 561 | 577 |
| 45 | Meters-Water | 128 | 141 | 148 | 135 | 135 | 137 | 140 | 143 | 152 | 160 | 173 | 195 | 175 | 200 |
| 46 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 47 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 48 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 49 |  |  |  | 273 |  | 280 |  |  |  |  |  |  |  |  |  |
| 50 51 | Construction Equipment | 263 | 269 |  | 276 |  | 286 | 295 | 281 | 298 | 320 | 316 | 324 | 331 | 333 |
| 52. |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 53 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
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## ALL REGIONS (1973=100)



ALL REGIONS (1973=100)

\begin{tabular}{|c|c|c|c|c|c|c|c|c|c|c|c|c|c|c|c|}
\hline \& \multirow[b]{3}{*}{CONSTRUCTION AND EQUPMENT} \& \multicolumn{14}{|c|}{COST INDEX NUMBERS} \\
\hline \& \& \multicolumn{2}{|c|}{2008} \& \multicolumn{2}{|c|}{2009} \& \multicolumn{2}{|c|}{2010} \& \multicolumn{2}{|c|}{2011} \& \multicolumn{2}{|c|}{2012} \& \multicolumn{2}{|c|}{2013} \& \multicolumn{2}{|c|}{2014} \\
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\hline 1 \& Boilers \& 596 \& 616 \& 620 \& 599 \& 608 \& 620 \& 624 \& 634 \& 649 \& 649 \& 669 \& 653 \& 661 \& 665 \\
\hline 2 \& Coal \& Ash Handling Equipment \& 478 \& 537 \& 543 \& 513 \& 499 \& 503 \& 522 \& 536 \& 550 \& 559 \& 562 \& 563 \& 580 \& 581 \\
\hline 3 \& Pumps \& 643 \& 663 \& 673 \& 675 \& 703 \& 704 \& 706 \& 756 \& 781 \& 787 \& 799 \& 846 \& 859 \& 922 \\
\hline 4 \& Steam Pipe \& 324 \& 400 \& 454 \& 413 \& 376 \& 417 \& 419 \& 448 \& 438 \& 455 \& 439 \& 425 \& 429 \& 431 \\
\hline 5 \& Cranes \& 817 \& 899 \& 899 \& 899 \& 899 \& 899 \& 899 \& 899 \& 899 \& 899 \& 899 \& 965 \& 965 \& 1007 \\
\hline 6 \& Regulators \& 401 \& 427 \& 389 \& 390 \& 402 \& 408 \& 410 \& 418 \& 415 \& 428 \& 422 \& 428 \& 441 \& 425 \\
\hline 7 \& Switchboards \& 1791 \& 1954 \& 2077 \& 2218 \& 2373 \& 2504 \& 2616 \& 2757 \& 2879 \& 3034 \& 3173 \& 3319 \& 3471 \& 3594 \\
\hline 8 \& Power Transformers \& 694 \& 725 \& 746 \& 745 \& 780 \& 788 \& 804 \& 814 \& 818 \& 826 \& 815 \& 814 \& 813 \& 816 \\
\hline 9 \& Oil Switches \& 437 \& 455 \& 460 \& 461 \& 469 \& 475 \& 480 \& 483 \& 483 \& 485 \& 485 \& 488 \& 498 \& 500 \\
\hline 10 \& Motors \& 635 \& 674 \& 696 \& 719 \& 717 \& 695 \& 713 \& 770 \& 777 \& 782 \& 804 \& 837 \& 849 \& 851 \\
\hline 11 \& Line Transformers \& 615 \& 505 \& 534 \& 560 \& 588 \& 617 \& 630 \& 650 \& 673 \& 690 \& 737 \& 756 \& 799 \& 819 \\
\hline 12 \& Meters-Electric \& 292 \& 293 \& 295 \& 295 \& 307 \& 307 \& 295 \& 294 \& 288 \& 291 \& 295 \& 298 \& 303 \& 305 \\
\hline 13 \& Treated Pine Poles \& 611 \& 643 \& 653 \& 665 \& 672 \& 686 \& 664 \& 678 \& 687 \& 697 \& 700 \& 700 \& 675 \& 675 \\
\hline 14 \& Standard Cross Arms \& 464 \& 486 \& 518 \& 501 \& 482 \& 465 \& 446 \& 446 \& 452 \& 453 \& 464 \& 466 \& 440 \& 434 \\
\hline 15 \& Standard Galv. Steel Guy Wire \& 351 \& 381 \& 548 \& 536 \& 550 \& 405 \& 405 \& 405 \& 404 \& 423 \& 423 \& 488 \& 458 \& 486 \\
\hline 16 \& Fibre Conduit \& 411 \& 420 \& 468 \& 468 \& 380 \& 380 \& 390 \& 390 \& 419 \& 419 \& 417 \& 417 \& 497 \& 497 \\
\hline 17 \& Plastic Conduit \& 522 \& 526 \& 609 \& 609 \& 463 \& 463 \& 468 \& 468 \& 521 \& 521 \& 477 \& 477 \& 478 \& 478 \\
\hline 18 \& Mercury Luminaires w/Standard \& 839 \& 899 \& 1024 \& 1053 \& 1087 \& 972 \& 990 \& 1034 \& 1052 \& 1079 \& 1061 \& 1077 \& 990 \& 993 \\
\hline 19 \& Power Wire \& Control Cable \& 242 \& 250 \& 228 \& 234 \& 213 \& 220 \& 245 \& 251 \& 268 \& 270 \& 271 \& 270 \& 267 \& 254 \\
\hline 20 \& Overhead Conductor-Transmission \& 860 \& 985 \& 985 \& 553 \& 700 \& 714 \& 675 \& 782 \& 650 \& 659 \& 701 \& 729 \& 729 \& 740 \\
\hline 21 \& Underground Conductor-Transmission \& 877 \& 927 \& 919 \& 929 \& 906 \& 885 \& 973 \& 971 \& 977 \& 1016 \& 1026 \& 1052 \& 1083 \& 1093 \\
\hline 22 \& Overhead Conductor-Distribution \& 793 \& 898 \& 898 \& 539 \& 661 \& 682 \& 672 \& 772 \& 647 \& 656 \& 686 \& 710 \& 716 \& 735 \\
\hline 23 \& Underground Conductor-Distribution \& 499 \& 541 \& 631 \& 609 \& 515 \& 518 \& 563 \& 577 \& 621 \& 647 \& 617 \& 654 \& 631 \& 645 \\
\hline 24 \& Service Cable \& 472 \& 510 \& 51.1 \& 390 \& 430 \& 460 \& 516 \& 579 \& 497 \& 505 \& 502 \& 512 \& 530 \& 562 \\
\hline 25 \& Condensers \& Tubes \& 496 \& 603 \& 516 \& 462 \& 473 \& 525 \& 527 \& 575 \& 580 \& 566 \& 567 \& 528 \& 536 \& 549 \\
\hline 26 \& Turbo-Generators \& 457 \& 538 \& 468 \& 417 \& 439 \& 488 \& 474 \& 501 \& 498 \& 487 \& 564 \& 480 \& 478 \& 483 \\
\hline 27 \& \& \& \& \& \& \& \& \& \& \& \& \& \& \& \\
\hline 28 \& Gas Compressors \& 581 \& 603 \& 621 \& 626 \& 625 \& 631 \& 633 \& 656 \& 662 \& 677 \& 674 \& 692 \& 693 \& 707 \\
\hline 29 \& Gas Transmission Line Pipe \& 502 \& 604 \& 600 \& 510 \& 444 \& 506 \& 510 \& 525 \& 586 \& 616 \& 542 \& 535 \& 626 \& 627 \\
\hline 30 \& Steel Distribution Pipe \& 833 \& 1122 \& 1019 \& 929 \& 911 \& 987 \& 1081 \& 1123 \& 1350 \& 1327 \& 1305 \& 1276 \& 1253 \& 1266 \\
\hline 31 \& Plastic Pipe \& 541 \& 541 \& 644 \& 644 \& 464 \& 464 \& 470 \& 470 \& 535 \& 535 \& 464 \& 464 \& 403 \& 403 \\
\hline 32 \& Meters-Gas \& 241 \& 250 \& 261 \& 252 \& 257 \& 252 \& 252 \& 256 \& 261 \& 271 \& 271 \& 272 \& 341 \& 342 \\
\hline 33 \& House Regulators \& 387 \& 392 \& 412 \& 400 \& 406 \& 414 \& 425 \& 430 \& 432 \& 438 \& 443 \& 443 \& 454 \& 454 \\
\hline 34 \& \& \& \& \& \& \& \& \& \& \& \& \& \& \& \\
\hline 35 \& Cast Iron Pipe \& 421 \& 468 \& 541 \& 541 \& 563 \& 563 \& 550 \& 550 \& 565 \& 676 \& 688 \& 697 \& 770 \& 779 \\
\hline 36 \& Cast Iron Fittings \& 783 \& 837 \& 897 \& 909 \& 986 \& 987 \& 961 \& 961 \& 1091 \& 1120 \& 1148 \& 1168 \& 1230 \& 1395 \\
\hline 37 \& Ductile Iron Pipe \& 363 \& 363 \& 485 \& 485 \& 521 \& 521 \& 500 \& 500 \& 524 \& 524 \& 545 \& 545 \& 575 \& 575 \\
\hline 38 \& Chemical Feeders-Small \& 817 \& 819 \& 831 \& 880 \& 880 \& 880 \& 907 \& 908 \& 1068 \& 1086 \& 1092 \& 1203 \& 1249 \& 1249 \\
\hline 39 \& Chemical Feeders-Large \& 676 \& 683 \& 654 \& 700 \& 700 \& 700 \& 633 \& 715 \& 753 \& 770 \& 774 \& 803 \& 805 \& 805 \\
\hline 40 \& Gate Valves \& 736 \& 736 \& 759 \& 759 \& 736 \& 778 \& 762 \& 762 \& 755 \& 755 \& 770 \& 790 \& 803 \& 824 \\
\hline 41 \& Meter Yokes \& 1169 \& 1169 \& 1202 \& 1202 \& 1202 \& 1241 \& 1241 \& 1241 \& 1323 \& 1594 \& 1594 \& 1594 \& 1594 \& 1594 \\
\hline 42 \& Corporation Stops \& 527 \& 527 \& 527 \& 527 \& 527 \& 542 \& 542 \& 542 \& 542 \& 723 \& 723 \& 723 \& 723 \& 723 \\
\hline 43 \& Curb Stops \& 577 \& 577 \& 577 \& 577 \& 577 \& 582 \& 582 \& 582 \& 582 \& 739 \& 739 \& 739 \& 739 \& 739 \\
\hline 44 \& Hydrants \& 1133 \& 1133 \& 1155 \& 1155 \& 1150 \& 1081 \& 1089 \& 1089 \& 1132 \& 1132 \& 1166 \& 1189 \& 1221 \& 1339 \\
\hline 45 \& Meters-Water \& 373 \& 373 \& 373 \& 373 \& 374 \& 376 \& 379 \& 379 \& 379 \& 379 \& 380 \& 381 \& 381 \& \multirow[t]{12}{*}{381

562} <br>
\hline 46 \& \multirow{11}{*}{Construction Equipment} \& \multirow{11}{*}{474} \& \multirow{11}{*}{483} \& \multirow[t]{11}{*}{499} \& \multirow{11}{*}{502} \& \multirow{11}{*}{502} \& \multirow[t]{11}{*}{501} \& \multirow[t]{11}{*}{505} \& \multirow[t]{11}{*}{516} \& \multirow[t]{11}{*}{8
527} \& \multirow[t]{11}{*}{539} \& \multirow[t]{11}{*}{547} \& \multirow[t]{11}{*}{3
$\square$
552} \& \multirow[t]{11}{*}{554} \& <br>
\hline 47 \& \& \& \& \& \& \& \& \& \& \& \& \& \& \& <br>
\hline 48 \& \& \& \& \& \& \& \& \& \& \& \& \& \& \& <br>
\hline 49 \& \& \& \& \& \& \& \& \& \& \& \& \& \& \& <br>
\hline 50 \& \& \& \& \& \& \& \& \& \& \& \& \& \& \& <br>
\hline 51 \& \& \& \& \& \& \& \& \& \& \& \& \& \& \& <br>
\hline 52 \& \& \& \& \& \& \& \& \& \& \& \& \& \& \& <br>
\hline 53 \& \& \& \& \& \& \& \& \& \& \& \& \& \& \& <br>
\hline 54. \& \& \& \& \& \& \& \& \& \& \& \& \& \& \& <br>
\hline 55
56 \& \& \& \& \& \& \& \& \& \& \& \& \& \& \& <br>
\hline 56 \& \& \& \& \& \& \& \& \& \& \& \& \& \& \& <br>
\hline
\end{tabular}

## UTILITY PLANT MATERIALS

ALL REGIONS (1973=100)

\begin{tabular}{|c|c|c|c|c|c|c|c|c|c|c|c|c|c|c|c|}
\hline \& \multirow[b]{3}{*}{CONSTRUCTION AND EQUIPMENT} \& \multicolumn{14}{|c|}{COST INDEX NUMBERS} <br>
\hline \& \& \multicolumn{2}{|r|}{2015} \& \multicolumn{2}{|l|}{2016} \& \multicolumn{2}{|r|}{2017} \& \multicolumn{2}{|r|}{2018} \& \multicolumn{2}{|r|}{2019} \& \multicolumn{2}{|r|}{2020} \& \multicolumn{2}{|c|}{2021} <br>
\hline i \& \& Jan. \& Jul. \& Jan. \& Jul. \& Jan. \& Jul. \& Jan. \& Jul. \& Jan. \& Jul. \& Jan. \& Jul. \& Jan. \& Jul: <br>
\hline 1 \& Boilers \& 669 \& 691 \& 697 \& 698 \& 700 \& 681 \& 683 \& 707 \& 710 \& 739 \& 738 \& 743 \& \& <br>
\hline 2 \& Coal \& Ash Handling Equipment \& 584 \& 583 \& 582 \& 584 \& 589 \& 595 \& 596 \& 608 \& 620 \& 630 \& 640 \& 664 \& \& <br>
\hline 3 \& Pumps \& 958 \& 963 \& 1043 \& 1076 \& 1120 \& 1244 \& 1248 \& 1345 \& 1401 \& 1492 \& 1526 \& 1639 \& \& <br>
\hline 4 \& Steam Pipe \& 417 \& 416 \& 404 \& 411 \& 421 \& 415 \& 407 \& 462 \& 483 \& 468 \& 481 \& 469 \& \& <br>
\hline 5 \& Cranes \& 1007 \& 1007 \& 1007 \& 1007 \& 1007 \& 1007 \& 1041 \& 1083 \& 1108 \& 1108 \& 1141 \& 1175 \& \& <br>
\hline 6 \& Regulators \& 416 \& 406 \& 396 \& 403 \& 412 \& 416 \& 420 \& 430 \& 436 \& 437 \& 442 \& 436 \& \& <br>
\hline 7 \& Switchboards \& 3757 \& 3760 \& 3931 \& 3930 \& 4109 \& 4300 \& 4461 \& 4629 \& 4847 \& 4852 \& 5080 \& 5367 \& \& <br>
\hline 8 \& Power Transformers \& 812 \& 801 \& 795 \& 798 \& 822 \& 827 \& 868 \& 879 \& 901 \& 901 \& 902 \& 895 \& \& <br>
\hline , \& Oil Switches \& 500 \& 502 \& 502 \& 501 \& 501 \& 503 \& 505 \& 507 \& 511 \& 521 \& 530 \& 533 \& \& <br>
\hline 10 \& Motors \& 859 \& 857 \& 869 \& 869 \& 893 \& 883 \& 910 \& 917 \& 937 \& 1006 \& 1023 \& 1026 \& \& <br>
\hline 11 \& Line Transformers \& 854 \& 856 \& 884 \& 882 \& 918 \& 946 \& 982 \& 1008 \& 1048 \& 1048 \& 1086 \& 1129 \& \& <br>
\hline 12 \& Meters-Electric \& 307 \& 307 \& 307 \& 298 \& 298 \& 298 \& 304 \& 304 \& 306 \& 306 \& 323 \& 323 \& \& <br>
\hline 13 \& Treated Pine Poles \& 670 \& 658 \& 676 \& 678 \& 670 \& 730 \& 665 \& 668 \& 687 \& 693 \& 799 \& 798 \& \& <br>
\hline 14 \& Standard Cross Arms \& 458 \& 448 \& 457 \& 458 \& 456 \& 451 \& 450 \& 450 \& 456 \& 456 \& 508 \& 512 \& \& <br>
\hline 15 \& Standard Galv, Steel Guy Wire \& 486 \& 486 \& 486 \& 486 \& 515 \& 515 \& 515 \& 515 \& 541 \& 541 \& 623 \& 623 \& \& <br>
\hline 16 \& Fibre Conduit \& 475 \& 475 \& 430 \& 430 \& 412 \& 412 \& 511 \& 511 \& 523 \& 523 \& 525 \& 525 \& \& <br>
\hline 17 \& Plastic Conduit \& 479 \& 479 \& 468 \& 468 \& 452 \& 452 \& 514 \& 514 \& 521 \& 521 \& 549 \& 549 \& \& <br>
\hline 18 \& Mercury Luminaires w/Standard \& 981 \& 1018 \& 986 \& 981 \& 998. \& 942 \& 964 \& 1008 \& 1130 \& 1085 \& 1188 \& 1206 \& \& <br>
\hline 19 \& Power Wire \& Control Cable \& 258 \& 253 \& 224 \& 221 \& 225 \& 228 \& 246 \& 253 \& 255 \& 257 \& 261 \& 259 \& \& <br>
\hline 20 \& Overhead Conductor-Transmission \& 743 \& 743 \& 777 \& 777 \& 740 \& 740 \& 838 \& 838 \& 885 \& 885 \& 919 \& 919 \& \& <br>
\hline 21 \& Underground Conductor-Transmission \& 1095 \& 1103 \& 1108 \& 1108 \& 1113 \& 1180 \& 1252 \& 1271 \& 1329 \& 1329 \& 1339 \& 1385 \& \& <br>
\hline 22 \& Overhead Conductor-Distribution \& 747 \& 750 \& 768 \& 768 \& 741 \& 745 \& 785 \& 801 \& 818 \& 834 \& 868 \& 868 \& \& <br>
\hline 23 \& Underground Conductor-Distribution \& 622 \& 637 \& 589 \& 589 \& 539 \& 562 \& 561 \& 572 \& 605 \& 605 \& 622 \& 650 \& \& <br>
\hline 24. \& Service Cable \& 592 \& 600 \& 580 \& 578 \& 580 \& 593 \& 496 \& 544 \& 490 \& 540 \& 567 \& 564 \& \& <br>
\hline 25 \& Condensers \& Tubes \& 547 \& 551 \& 520 \& 535 \& 536 \& 510 \& 516 \& 569 \& 583 \& 574 \& 509 \& 566 \& \& <br>
\hline 26 \& Turbo-Generators \& 485 \& 551 \& 538 \& 561 \& 579 \& 506 \& 507 \& 537 \& 560 \& 548 \& 462 \& 562 \& \& <br>
\hline 27 \& \& \& \& \& \& \& \& \& \& \& \& \& \& \& <br>
\hline 28 \& Gas Compressors \& 713 \& 720 \& 722 \& 727 \& 728 \& 735 \& 747 \& 759 \& 779 \& 783 \& 787 \& 795 \& \& <br>
\hline 29 \& Gas Transmission Line Pipe \& 616 \& 589 \& 535 \& 544 \& 570 \& 601 \& 615 \& 693 \& 716 \& 689 \& 680 \& 639 \& \& <br>
\hline 30 \& Steel Distribution Pipe \& 1243 \& 1189 \& 1088 \& 1116 \& 1175 \& 1247 \& 1218 \& 1382 \& 1432 \& 1394 \& 1590 \& 1555 \& \& <br>
\hline 31. \& Plastic Pipe \& 403 \& 403 \& 403 \& 403 \& 394 \& 394 \& 410 \& 410 \& 413 \& 413 \& 447 \& 447 \& \& <br>
\hline 32 \& Meters-Gas \& 372 \& 372 \& 388 \& 388 \& 442 \& 442 \& 475 \& 477 \& 511 \& 511 \& 489 \& 490 \& \& <br>
\hline 33 \& House Regulators \& 469 \& 469 \& 481 \& 481 \& 487 \& 487 \& 533 \& 533 \& 558 \& 565 \& 559 \& 559 \& \& <br>
\hline 34 \& \& \& \& \& \& \& \& \& \& \& \& \& \& \& <br>
\hline 35 \& Cast Iron Pipe \& 758 \& 748 \& 731 \& 731 \& 809 \& 808 \& 867 \& 868 \& 878 \& 881 \& 912 \& 877 \& \& <br>
\hline 36 \& Cast Iron Fitings \& 1278 \& 1322 \& 1380 \& 1418 \& 1478 \& 1478 \& 1481 \& 1565 \& 1627 \& 1736 \& 1883 \& 1955 \& \& <br>
\hline 37 \& Ductile Iron Pipe \& 579 \& 579 \& 600 \& 600 \& 622 \& 622 \& 715 \& 715 \& 721 \& 721 \& 768 \& 768 \& \& <br>
\hline 38 \& Chemical Feeders-Small \& 1316 \& 1404 \& 1471 \& 1471 \& 1496 \& 1589 \& 1618 \& 1738 \& 1792 \& 1871 \& 2019 \& 2106 \& \& <br>
\hline 39 \& Chemical Feeders-Large \& 805 \& 805 \& 842 \& 842 \& 863 \& 891 \& 900 \& 939 \& 965 \& 990 \& 1080 \& 1140 \& \& <br>
\hline 40 \& Gate Valves \& 814 \& 814 \& 868 \& 868 \& 825 \& 825 \& 771 \& 789 \& 812 \& 832 \& 863 \& 863 \& \& <br>
\hline 41 \& Meter Yokes \& 1594 \& 1594 \& 1594 \& 1594 \& 1594 \& 1706 \& 1706 \& 1706 \& 1706 \& 1768 \& 1768 \& 1821 \& \& <br>
\hline 42 \& Corporation Stops \& 723 \& 723 \& 723 \& 723 \& 723 \& 723 \& 723 \& 723 \& 773 \& 861 \& 861 \& 887 \& \& <br>
\hline 43 \& Curb Stops \& 780 \& 780 \& 780 \& 780 \& 780 \& 780 \& 780 \& 780 \& 835 \& 929 \& 929 \& 957 \& \& <br>
\hline 44 \& Hydrants \& 1418 \& 1591 \& 1694 \& 1694 \& 1681 \& 1681 \& 1735 \& 1759 \& 1803 \& 1830 \& 1886 \& 1886 \& \& <br>
\hline 45 \& Meters-Water \& 400 \& 400 \& 403 \& 403 \& 404 \& 418 \& 434 \& 434 \& 443 \& 443 \& 459 \& 459 \& \& <br>
\hline 46 \& \& \multirow[t]{10}{*}{6

564} \& \multirow[t]{10}{*}{568} \& \multirow[t]{10}{*}{|  |
| ---: |
|  |
| 570 |} \& \multirow[t]{10}{*}{4

574} \& \multirow[t]{10}{*}{4
575} \& \multirow[t]{10}{*}{4
579} \& \multirow[t]{10}{*}{580} \& \multirow[t]{10}{*}{575} \& \multirow[t]{10}{*}{4
6
600} \& \multirow[t]{10}{*}{609} \& \multirow[t]{10}{*}{613} \& \multirow[t]{10}{*}{6
620} \& \& <br>
\hline 47
48 \& \& \& \& \& \& \& \& \& \& \& \& \& \& \& <br>
\hline 48
49 \& \& \& \& \& \& \& \& \& \& \& \& \& \& \& <br>
\hline 49
50 \& \multirow[t]{7}{*}{Construction Equipment} \& \& \& \& \& \& \& \& \& \& \& \& \& \& <br>
\hline 51 \& \& \& \& \& \& \& \& \& \& \& \& \& \& \& <br>
\hline 52 \& \& \& \& \& \& \& \& \& \& \& \& \& \& \& <br>
\hline 53 \& \& \& \& \& \& \& \& \& \& \& \& \& \& \& <br>
\hline 54 \& \& \& \& \& \& \& \& \& \& \& \& \& \& \& <br>
\hline 55 \& \& \& \& \& \& \& \& \& \& \& \& \& \& \& <br>
\hline 56 \& \& \& \& \& \& \& \& \& \& \& \& \& \& \& <br>
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\end{tabular}

# The Township of Lower Makefield, Bucks County Wastewater Collection System and Purchased Treatment Capacity 

Appraisal Work Papers<br>As of September 17, 2020

## Cost Indices

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## AUS Telephone Plant Index

## AUS Telephone Plant Index

## Cost Trend Tables from 1946 to January 1, 2021

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## FOREWORD

The AUS Telephone Plant Index, which follows this foreword was first introduced in 1977 by Associated Utility Services, Inc., and published as part of the Handy-Whitman Index of Public Utility Construction Costs through 1989. In 1990 AUS Consultants, the successor company to Associated Utility Services, Inc., decided to publish the Telephone Plant Index under the name C.A. Turner Utility Reports publication division. In 2005 the index changed its name from C.A. Turner Telephone Plant index to AUS Telephone Plant Index.

The 1990 AUS Telephone Plant Index (TPI) was the first nationally available TPI based on the Federal Communication Commission (FCC) Uniform System of Accounts (USOA) Part 32. The prior published TPI, also prepared by AUS staff, was based on the earlier USOA Part 31 Standards.

## Telephone Plant Index Description

The TPI consists of a separate cost index series for each of six geographic regions shown on the map at page iv. These regions are designated: North Atlantic, South Atlantic, North Central, South Central, Plateau, and Pacific Coast. The regional designation are the same as those used in the prior issues of the cost index and are based on similarity of characteristics among the contiguous 48 states.

Each cost index series within a region consists of one index labeled "Total Plant Account" and up to 31 individual cost index series for the individual plant account identified in the left hand columns.

The Base Year for each cost index is 1973=100. Some plant accounts will not show an index number of 100 at year 1973 due to a subsequent adjustment for FCC Part 31 to Part 32, changes explained later in this foreword. In a few accounts the item described in the account was not included in the index series until after 1973 and the base year is considered the first year of entry.

The index for most plant accounts begins with a single entry in year 1946 and continues with a single number for each year through 1973. Beginning in 1974 there are two index numbers for each year; one for January 1 and one for July 1. These numbers represent the prevailing wages and material prices and weightings at that point in time.

## Index History

An index is a tool for identifying the relative price change of an item, or group of items over an identified period of time. Price indexes have been in use for many years for a variety of reasons. One example is an index developed in the eighteenth century by an Italian named Carli to determine the effect of the discovery of America upon the level of prices in Italy of three commodities between the years 1500 and 1750 . In the current century, numerous organizations, including the United States Bureau of Statistic, have developed a variety of indexes ranging from the cost of basic commodities to manufactured goods and building construction cost.
v.

Interest in telephone utility cost indexes has varied over time depending on the need to develop reproduction cost values for utility properties. Previous uses of cost indexes included such things as the determination trended original cost in fair value rate jurisdictions and current cost pricing for FASB-33 financial accounting disclosures. Due to changes in rate regulation proceedings and financial disclosure requirements, the need in these two specific areas has declined. Other areas in which reproduction cost indexes were utilized included insurance valuations, property tax valuations, retirement accounting and cost forecasting, etc.

Most recently, interest in cost indexes for the telecommunication industry has increased due to the possible implementation of price cap regulation. This form of regulation incorporates the use of changes in price levels by regulators to set rates. Under one proposal, customer tariff prices are adjusted to give consideration to productivity improvements, therefore, the development of the construction cost indexes will have an indirect bearing on the level of the company revenue requirements.

## Index Design

The telephone plant index was designed as a product which could be utilized by any of the various telephone operating companies to develop the reproduction cost of the company's property at the selected test year date. Due to the variation of many design construction specifics from one company to another, it is impossible to produce an index which will exactly mirror the construction cost changes for each company. In circumstances where companies desire a more specific reproduction cost of their property, a custom index should be prepared or, alternately, the company's property should be inventoried and unit priced. Such unit cost work efforts, of course, will be significantly more expensive and time consuming to complete.

As indicated, the telephone plant index is a standard index which is published on a semi-annual basis. The yearly average index is calculated via a 1-2-1 weighting process which is the sum of $25 \%$ of the January index, 50 of the July index, and $25 \%$ of the succeeding year's January index.

In general terms, the telephone plant index was constructed around the FCC Part 32 system of accounts to aid companies in ease of application of the published index. Each embedded property account was reviewed to determine the components which comprise the large segment of the property investment in each account. In this manner, the resulting telephone plant index was a reasonable proxy for determining the reproduction cost of the embedded investment of the independent telephone industry.

With the exception of the General Support Asset Group, the FCC Part 32 based indexes were adjusted for all index years 1987 and prior to compensate for the change in overhead capitalization policies effective with the new regulations. That is, under FCC Part 31 regulation, a greater level of overheads were previously incorporated in the plant in service investments contained on the company's books and records. The adjusted indexes for the years 1946 through 1987, when applied to the company's original costs, will produce the applicable reproduction cost under FCC Part 32 accounting treatment. The index adjustment for Part 31 to Part 32 accounting results in the plant accounts not having an index number of 100 at the 1973 base year.

The AUS Telephone Plant Index was designed around thirty-six component indexes representing the basic components of material and labor which make up the construction of the various telephone plant accounts. The components include such items as Buildings, Switching Equipment, Circuit Equipment, Poles, Cable, Wire Vehicles, Tools, Furniture, Installer Labor and Lineman Labor, etc. The components were composited together into account level indexes based upon material and labor weights derived from a study of independent telephone construction cost experience.

Introduction of new technologies into a reproduction cost index required the review of composite weight included in development of the account level index to reflex the new mix of property.

The goal of the telephone plant index was to produce a product which when utilized together with each companies' books and records would produce a reproduction cost value.

The AUS Telephone Plant Index does not reflect replacement cost inasmuch as it was designed to produce the reproduction cost (the cost in today's dollars to reproduce the company's embedded plant in service).

## Index Functions

The AUS Telephone Plant Index series was initially prepared to address a very specific function. That is, it was designed to enable companies to produce trended original cost values to the historical original cost of plant in service on the companies' books and records. This trended original cost is a general representation of the cost to reconstruct the property in question at the price level of the selected period. If a company desires a more specific estimate of reconstruction, the property specific indexes can be developed giving consideration to the actual history of the company's wages and material cost in comparison to the labor and material costs. For an even more specific cost estimated to rebuild the plant in serve, engineering estimated can be completed based upon the property inventory and the current unit costs for constructing the various plant categories.

In summary, the index was designed to be applied on a vintage and account level basis to determine the reproduction cost of local distribution companies' plant in service, as of the selected price level.

A tool can be utilized correctly only within the boundaries for which the product was originally designed. Uses above and beyond the scope of the original design may or may not produce reliable results. That is, the use of a generalized index to prepare a reproduction cost will provide general results within the range of reasonableness. If more specific or exact results are required, alternative methods or procedures (i.e., custom indexes or specific detail pricing) should be employed.

An effort has been made to carefully construct an index which produces a reasonable proxy of reproduction cost for the telephone plant or local distribution companies giving consideration to the fact that there are variances in material and labor costs, as well as, construction methods and practices from one company to another. Nevertheless, we believe that there is sufficient similarity in the cost trends to make the AUS Telephone Plant Index a useful tool when carefully applied to a company's historical cost base.


| $\begin{gathered} \hline \mathrm{L} \\ \mathrm{I} \\ \mathrm{~N} \\ \mathrm{E} \\ \\ \mathrm{~N} \\ \mathrm{O} \end{gathered}$ | PLANT IN SERVICE DESCRIPTION | $\begin{aligned} & \hline \mathrm{F} \\ & \mathrm{C} \\ & \mathrm{C} \\ & \mathrm{~A} \\ & \mathrm{C} \\ & \mathrm{c} \\ & \mathrm{t} \end{aligned}$ | COST INDEX NUMBER |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | L |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | N |
|  |  |  | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | E |
|  |  |  | 4 | 4 | 4 | 4 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 6 | 6 | N |
|  |  |  | 6 | 7 | 8 | 9 | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 0 | 1 | 0 |
| 1 | Total Plant......................... |  | 85 | 89 | 91 | 91 | 92 | 95 | 96 | 96 | 94 | 94 | 97 | 97 | 96 | 96 | 97 | 96 | 123 |
| 2 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 3 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 4 | Motor Vehicles... | 2112 | 57 | 57 | 63 | 67 | 67 | 70 | 74 | 74 | 74 | 77 | 81 | 84 | 87 | 89 | 88 | 87 | 4 |
| 5 | Aircraft... ............ | 2113 | 56 | 56 | 62 | 66 | 66 | 69 | 73 | 73 | 73 | 75 | 80 | 83 | 86 | 88 | 86 | 86 | 5 |
| 6 | Special Purpose Vehicles.......... | 2114 | 30 | 34 | 38 | 41 | 42 | 46 | 47 | 48 | 49 | 51 | 56 | 60 | 62 | 65 | 66 | 67 | 6 |
| 7 | Gargare Work Equipment......... | 2115 | 36 | 38 | 42 | 44 | 46 | 51 | 51 | 52 | 53 | 56 | 61 | 65 | 67 | 69 | 70 | 70 | 7 |
| 8 | Other Work Equipment........... | 2116 | 50 | 50 | 52 | 54 | 55 | 59 | 59 | 61 | 62 | 64 | 67 | 70 | 71 | 74 | 75 | 77 | 9 |
| 9 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 10 |
| 10 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 11 |
| 11 | Buildings... | 2121 | 24 | 28 | 32 | 34 | 35 | 37 | 38 | 39 | 41 | 42 | 46 | 49 | 50 | 52 | 53 | 52 | 12 |
| 12 | Furniture.. | 2122 | 43 | 43 | 46 | 47 | 50 | 56 | 56 | 57 | 57 | 60 | 64 | 68 | 70 | 70 | 71 | 71 | 12 |
| 13 | Office Equipment.,................ | 2123 | 67 | 67 | 69 | 69 | 70 | 75 | 74 | 76 | 77 | 79 | 82 | 85 | 87 | 88 | 88 | 89 | 13 |
| 14 | General Purpose Computer....... | 2124 | 67 | 67 | 69 | 69 | 70 | 75 | 74 | 76 | 77 | 79 | 82 | 85 | 87 | 88 | 88 | 89 | 14 |
| 15 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 15 |
| 16 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 16 |
| 17 | Analog Electronic Switching..... | 2211 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 17 |
| 18 | Ditgital Electronic Switching..... | 2212 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 18 |
| 19 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 19 |
| 20 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 20 |
| 21 | Electro Mechanical Switching.. | 2215 | 36 | 48 | 49 | 57 | 62 | 64 | 67 | 66 | 64 | 65 | 68 | 70 | 69 | 72 | 70 | 72 | 21 |
| 22 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 22 |
| 23 | Operator Systems................. | 2220 | 37 | 50 | 51 | 59 | 64 | 67 | 69 | 68 | 66 | 67 | 70 | 72 | 71 | 73 | 71 | 74 | 23 |
| 24 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 24 |
| 25 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 25 |
| 26 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 26 |
| 27 | Radio System-Analog.............. | 22311 | 51 | 57 | 62 | 63 | 63 | 66 | 64 | 60 | 58 | 58 | 49 | 49 | 46 | 47 | 36 | 36 | 27 |
| 28 | Radio System-Digital.............. | 22312 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 28 |
| 29 | Circuit Equipment-Analog........ | 22321 | 347 | 392 | 417 | 411 | 410 | 423 | 410 | 401 | 348 | 311 | 319 | 317 | 303 | 299 | 312 | 297 | 29 |
| 30 | Circuit Equipment-Digital........ | 22322 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 30 |
| 31 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 31 |
| 32 | Public Telephone Term Eq...... | 2351 | 148 | 151 | 145 | 145 | 148 | 154 | 143 | 144 | 146 | 158 | 159 | 164 | 164 | 164 | 165 | 165 | 32 |
| 33 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 33 |
| 34 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 34 |
| 35 | Poles.......................... | 2411 | 33 | 37 | 39 | 41 | 42 | 45 | 47 | 49 | 51 | 50 | 54 | 58 | 59 | 59 | 60 | 61 | 35 |
| 36 | Aerial Cable-Metallic... | 24211 | 44 | 47 | 49 | 49 | 51 | 58 | 61 | 64 | 64 | 68 | 74 | 72 | 70 | 71 | 72 | 70 | 36 |
| 37 | Aerial Cable-Fiber................. | 24212 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 37 |
| 38 | Underground Cable-Metallic...... | 24221 | 48 | 52 | 54 | 53 | 55 | 64 | 67 | 71 | 69 | 75 | 82 | 78 | 75 | 76 | 78 | 75 | 38 |
| 39 | Underground Cable-Fiber......... | 24222 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 39 |
| 40 | Buried Cable-Metallic.............. | 24231 | 50 | 54 | 56 | 55 | 57 | 66 | 70 | 74 | 72 | 78 | 85 | 81 | 77 | 78 | 80 | 76 | 40 |
| 41 | Buried Cable-Fiber.................. | 24232 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 41 |
| 42 | Submarine Cable-Metailic........ | 24241 | 43 | 45 | 48 | 48 | 50 | 56 | 59 | 62 | 61 | 65 | 71 | 69 | 68 | 69 | 71 | 70 | 42 |
| 43 | Submarine Cable-Fiber........... | 24241 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 43 |
| 44 | Intra Building Cable-Metallic.... | 24261 | 43 | 47 | 49 | 48 | 50 | 58 | 61 | 64 | 63 | 68 | 74 | 71 | 69 | 70 | 72 | 70 | 44 |
| 45 | Intra Building Cable-Fiber....... | 24262 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 45 |
| 46 | Aerial Wire.......................... | 2431 | 33 | 36 | 38 | 38 | 40 | 45 | 47 | 50 | 50 | 55 | 58 | 57 | 57 | 59 | 61 | 62 | 46 |
| 47 | Conduit Systems.................. | 2441 | 54 | 55 | 57 | 59 | 60 | 63 | 64 | 64 | 65 | 65 | 67 | 69 | 71 | 72 | 73 | 74 | 47 |
| 48 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 48 |
| 49 | Aerial Cable-FTTP (Distribution). | 24213 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 49 |
| 50 | Underground Cable-FTTP (Dist.) | 24223 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 50 |
| 51 | Buried Cable-FTTP (Distribution) | 24233 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 51 |
| 52 | Submarine Cable-FTTP (Dist.)... | 24243 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 52 |
| 53 | Intra Building Cable-FTTP (Dist.) | 24263 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 53 |
| 54 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 54 |

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| L | COST INDEX NUMBERS |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | $\begin{gathered} \mathrm{L} \\ \mathrm{I} \\ \mathrm{~N} \\ \mathrm{E} \\ \\ \mathrm{~N} \\ \mathrm{O} \\ \hline \end{gathered}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| N | 1988 |  | 1989 |  | 1990 |  | 1991 |  | 1992 |  | 1993 |  | 1994 |  | 1995 |  | 1996 |  | 1997 |  | 1998 |  | 1999 |  |  |
| $\begin{aligned} & \mathrm{N} \\ & \mathrm{O} \end{aligned}$ | Jan. <br> 1 | Jul. | Jan. | Jul. 1 | $\begin{array}{\|c} \text { Jan. } \\ 1 \end{array}$ | Jul. 1 | $\left\|\begin{array}{c} \text { Jan. } \\ 1 \end{array}\right\|$ | Jul. 1 | $\left\|\begin{array}{c} \text { Jan } \\ 1 \end{array}\right\|$ | $\begin{array}{\|c} \text { Jul. } \\ 1 \end{array}$ | $\left\|\begin{array}{c} \text { Jan. } \\ 1 \end{array}\right\|$ | $\left\lvert\, \begin{gathered} \text { Jul. } \\ 1 \end{gathered}\right.$ | $\left\lvert\, \begin{gathered} \text { Jan. } \\ 1 \end{gathered}\right.$ | $\begin{gathered} \text { Jul. } \\ 1 \end{gathered}$ | $\left\|\begin{array}{c} \text { Jan. } \\ 1 \end{array}\right\|$ | $\begin{gathered} \text { Jul. } \\ 1 \end{gathered}$ | $\begin{array}{\|c\|} \text { Jan. } \\ 1 \end{array}$ | $\begin{gathered} \text { Jul. } \\ 1 \end{gathered}$ | $\begin{array}{\|c\|} \text { Jan. } \\ 1 \end{array}$ | Jul. 1 | $\begin{array}{\|c\|} \hline \text { Jan. } \\ 1 \end{array}$ | Jul. 1 | $\begin{array}{\|c\|c} \text { Jan. } \\ 1 \end{array}$ | Jul. 1 |  |
| $\begin{aligned} & 1 \\ & 2 \\ & 3 \end{aligned}$ | 150 | 153 | 158 | 165 | 164 | 165 | 167 | 165 | 165 | 165 | 167 | 168 | 169 | 170 | 174 | 178 | 182 | 182 | 184 | 185 | 186 | 184 | 184 | 181 | 1 2 3 |
| 4 | 221 | 222 | 231 | 229 | 236 | 232 | 244 | 241 | 254 | 251 | 258 | 261 | 267 | 271 | 275 | 270 | 279 | 276 | 277 | 271 | 270 | 263 | 273 | 266 | 4 |
| 5 | 234 | 234 | 234 | 240 | 246 | 254 | 261 | 271 | 274 | 284 | 285 | 291 | 297 | 300 | 304 | 312 | 318 | 322 | 326 | 328 | 327 | 328 | 329 | 330 | 5 |
| 6 | 289 | 293 | 298 | 309 | 312 | 319 | 325 | 328 | 333 | 337 | 343 | 348 | 348 | 351 | 353 | 360 | 362 | 368 | 370 | 374 | 377 | 382 | 383 | 388 | 6 |
| 7 | 273 | 279 | 286 | 294 | 298 | 305 | 309 | 316 | 318 | 322 | 324 | 328 | 332 | 336 | 338 | 345 | 349 | 354 | 356 | 359 | 361 | 364 | 366 | 368 | 7 |
| 8 | 206 | 210 | 215 | 218 | 221 | 228 | 230 | 234 | 235 | 240 | 240 | 243 | 244 | 250 | 250 | 254 | 254 | 258 | 258 | 260 | 260 | 262 | 263 | 265 | 8 |
| 9 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 9 |
| 10 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 10 |
| 11 | 242 | 254 | 257 | 268 | 268 | 272 | 272 | 274 | 270 | 279 | 283 | 290 | 295 | 306 | 310 | 310 | 311 | 312 | 323 | 329 | 331 | 338 | 341 | 343 | 11 |
| 12 | 255 | 263 | 269 | 274 | 278 | 284 | 287 | 290 | 291 | 294 | 296 | 299 | 302 | 309 | 309 | 315 | 320 | 322 | 326 | 328 | 330 | 330 | 330 | 333 | 12 |
| 13 | 147 | 149 | 151 | 153 | 154 | 154 | 152 | 153 | 153 | 156 | 154 | 155 | 155 | 155 | 154 | 156 | 155 | 156 | 155 | 157 | 156 | 157 | 156 | 157 | 13 |
| 14 | 45 | 43 | 37 | 31 | 30 | 29 | 26 | 24 | 23 | 21 | 21 | 21 | 21 | 21 | 21 | 20 | 17 | 15 | 14 | 14 | 14 | 14 | 13 | 13 | 14 |
| 15 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 15 |
| 16 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 16 |
| 17 | 204 | 207 | 210 | 212 | 214 | 211 | 212 | 214 | 213 | 213 | 213 | 216 | 215 | 216 | 213 | 212 | 211 | 204 | 204 | 200 | 196 | 194 | 193 | 192 | 17 |
| 18 | 52 | 50 | 45 | 40 | 39 | 38 | 36 | 33 | 32 | 31 | 31 | 31 | 32 | 32 | 32 | 31 | 28 | 27 | 26 | 26 | 26 | 26 | 25 | 25 | 18 |
| 19 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 19 |
| 20 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 20 |
| 21 | 278 | 284 | 289 | 291 | 291 | 292 | 296 | 302 | 303 | 304 | 309 | 317 | 316 | 324 | 329 | 327 | 334 | 333 | 336 | 339 | 331 | 336 | 338 | 342 | 21 |
| 22 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 22 |
| 23 | 213 | 216 | 217 | 218 | 218 | 218 | 220 | 223 | 224 | 224 | 227 | 231 | 231 | 236 | 238 | 236 | 239 | 240 | 239 | 239 | 234 | 237 | 237 | 239 | 23 |
| 24 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 24 |
| 25 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 25 |
| 26 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 26 |
| 27 | 80 | 80 | 81 | 81 | 81 | 82 | 81 | 82 | 84 | 85 | 86 | 87 | 87 | 87 | 89 | 89 | 91 | 91 | 91 | 93 | 94 | 95 | 95 | 96 | 27 |
| 28 | 117 | 117 | 117 | 118 | 118 | 118 | 116 | 116 | 117 | 118 | 119 | 120 | 119 | 120 | 120 | 121 | 121 | 122 | 123 | 125 | 125 | 123 | 123 | 124 | 28 |
| 29 | 140 | 141 | 142 | 144 | 145 | 144 | 145 | 146 | 147 | 147 | 147 | 149 | 150 | 150 | 152 | 149 | 149 | 146 | 146 | 145 | 143 | 143 | 142 | 143 | 29 |
| 30 | 36 | 35 | 35 | 35 | 35 | 34 | 34 | 34 | 37 | 38 | 39 | 39 | 39 | 39 | 37 | 37 | 37 | 38 | 35 | 36 | 36 | 36 | 36 | 35 | 30 |
| 31 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 31 |
| 32 | 205 | 209 | 212 | 214 | 216 | 213 | 213 | 215 | 214 | 214 | 213 | 216 | 215 | 216 | 213 | 212 | 211 | 204 | 204 | 200 | 196 | 195 | 194 | 192 | 32 |
| 33 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 33 |
| 34 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 34 |
| 35 | 278 | 285 | 291 | 295 | 300 | 304 | 310 | 315 | 319 | 327 | 331 | 338 | 352 | 365 | 368 | 369 | 379 | 385 | 400 | 402 | 406 | 413 | 418 | 421 | 35 |
| 36 | 226 | 237 | 257 | 275 | 273 | 277 | 282 | 277 | 279 | 275 | 281 | 282 | 283 | 282 | 294 | 310 | 319 | 323 | 325 | 328 | 333 | 324 | 322 | 314 | 36 |
| 37 | 94 | 87 | 85 | 89 | 89 | 89 | 90 | 90 | 89 | 90 | 89 | 89 | 88 | 87 | 88 | 89 | 90 | 91 | 91 | 92 | 93 | 94 | 94 | 95 | 37 |
| 38 | 210 | 221 | 244 | 265 | 261 | 265 | 270 | 261 | 263 | 256 | 262 | 260 | 260 | 257 | 270 | 289 | 299 | 304 | 305 | 308 | 312 | 299 | 297 | 285 | 38 |
| 39 | 84 | 75 | 73 | 77 | 76 | 76 | 77 | 77 | 76 | 76 | 75 | 74 | 73 | 72 | 72 | 73 | 74 | 75 | 75 | 76 | 76 | 77 | 77 | 77 | 39 |
| 40 | 204 | 215 | 240 | 262 | 257 | 261 | 265 | 256 | 257 | 249 | 256 | 253 | 252 | 249 | 262 | 283 | 293 | 298 | 298 | 301 | 306 | 291 | 288 | 275 | 40 |
| 41 | 82 | 73 | 71 | 75 | 74 | 74 | 75 | 75 | 74 | 74 | 73 | 72 | 71 | 69 | 70 | 71 | 72 | 73 | 73 | 73 | 74 | 74 | 75 | 75 | 41 |
| 42 | 235 | 244 | 260 | 274 | 274 | 277. | 283 | 278 | 282 | 279 | 285 | 286 | 287 | 288 | 298 | 310 | 319 | 324 | 324 | 327 | 332 | 325 | 325 | 319 | 42 |
| 43 | 114 | 107 | 106 | 111 | 111 | 111 | 113 | 113 | 113 | 114 | 113 | 114 | 113 | 113 | 114 | 115 | 118 | 119 | 119 | 120 | 121 | 122 | 123 | 123 | 43 |
| 44 | 227 | 238 | 257 | 275 | 273 | 277 | 282 | 277 | 279 | 275 | 281 | 282 | 282 | 282 | 293 | 309 | 318 | 323 | 324 | 328 | 333 | 324 | 322 | 314 | 44 |
| 45 | 95 | 87. | 85 | 90 | 89 | 89 | 90 | 91 | 90 | 90 | 89 | 89 | 88 | 87 | 88 | 89 | 91 | 92 | 92 | 93 | 94 | 94 | 95 | 95 | 45 |
| 46 | 249 | 261 | 270 | 278 | 279 | 283 | 290 | 291 | 293 | 298 | 302 | 305 | 307 | 312 | 320 | 324 | 329 | 332 | 334 | 337 | 341 | 344 | 342 | 342 | 46 |
| 47 | 269 | 277 | 301 | 309 | 311 | 309 | 316 | 308 | 307 | 310 | 314 | 320 | 325 | 331 | 336 | 340 | 345 | 347 | 350 | 353 | 355 | 358 | 362 | 366 | 47 |
| 48 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 48 |
| 49 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 49 |
| 50 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 50 |
| 51 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 51 |
| 52 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 52 |
| 53 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 53 |
| 54 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 54 |

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AUS TELEPHONE PLANT INDEX
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| L | PLANT IN SERVICE DESCRIPTION | $\bar{F}$ | COST INDEX NUMBERS |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | LINENO |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| N |  | c | 2000 |  | 2001 |  | 2002 |  | 2003 |  | 2004 |  | 2005 |  | 2006 |  | 2007 |  |  |
| N O |  | $\begin{aligned} & \text { A } \\ & \mathrm{c} \\ & \mathrm{c} \\ & \mathrm{t} \\ & \hline \end{aligned}$ | $\begin{array}{\|c} \text { Jan. } \\ 1 \end{array}$ | Jul. 1 | $\begin{array}{\|c\|} \text { Jan } \\ 1 \end{array}$ | Jul. 1 | $\begin{array}{\|c\|c} \text { Jan. } \\ 1 \end{array}$ | Jul. <br> 1 | $\begin{array}{\|c\|c} \text { Jan. } \\ 1 \end{array}$ | Jul. 1 | $\begin{array}{\|c\|c} \text { Jan. } \\ 1 \end{array}$ | $\begin{array}{\|c} \text { Jul. } \\ 1 \end{array}$ | Jan. 1 | Jul. 1 | $\begin{array}{\|c\|c} \text { Jan. } \\ 1 \end{array}$ | Jul. <br> 1 | $\begin{array}{c\|c} \text { Jan. } \\ 1 \end{array}$ | Jul. <br> 1 |  |
| 1 2 3 | Total Plant........................ |  | 182 | 185 | 188 | 190 | 191 | 193 | 194 | 197 | 201 | 206 | 210 | 213 | 227 | 244 | 244 | 249 | 1 2 3 |
| 4 | Motor Vehicles... | 2112 | 275 | 269 | 276 | 266 | 270 | 263 | 264 | 257 | 268 | 266 | 272 | 261 | 262 | 258 | 264 | 257 | 4 |
| 5 | Aircraft. | 2113 | 334 | 343 | 351 | 359 | 362 | 364 | 369 | 377 | 387 | 393 | 408 | 417 | 424 | 438 | 447 | 450 | 5 |
| 6 | Special Purpose Vehicles......... | 2114 | 388 | 392 | 392 | 392 | 392 | 398 | 400 | 404 | 404 | 413 | 428 | 445 | 449 | 462 | 465 | 472 | 6 |
| 7 | Gargare Work Equipment........ | 2115 | 369 | 372 | 373 | 377 | 376 | 376 | 377 | 378 | 379 | 387 | 393 | 403 | 408 | 416 | 422 | 430 | 7 |
| 8 | Other Work Equipment........... | 2116 | 266 | 267 | 268 | 273 | 271 | 272 | 271 | 273 | 273 | 275 | 276 | 278 | 278 | 275 | 278 | 279 | 8 |
| 9 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 9 |
| 10 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 10 |
| 11 | Buildings............................ | 2121 | 353 | 359 | 364 | 374 | 377 | 384 | 385 | 385 | 407 | 412 | 425 | 431 | 441 | 443 | 457 | 472 | 11 |
| 12 | Furniture............................ | 2122 | 335 | 337 | 338 | 341 | 341 | 341 | 344 | 346 | 346 | 350 | 360 | 368 | 372 | 376 | 380 | 386 | 12 |
| 13 | Office Equipment................. | 2123 | 156 | 157 | 157 | 158 | 159 | 158 | 158 | 157 | 159 | 160 | 158 | 162 | 161 | 161 | 160 | 161 | 13 |
| 14 | General Purpose Computer....... | 2124 | 12 | 11 | 9 | 9 | 7 | 7 | 6 | 4.8 | 3.4 | 3.4 | 3.3 | 3.3 | 3.0 | 2.8 | 2.6 | 2.7 | 14 |
| 15 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 15 |
| 16 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 16 |
| 17 | Analog Electronic Switching..... | 2211 | 193 | 193 | 193 | 190 | 189 | 190 | 189 | 190 | 189 | 190 | 190 | 189 | 187 | 193 | 196 | 186 | 17 |
| 18 | Ditgital Electronic Switching..... | 2212 | 25 | 24 | 22 | 23 | 23 | 23 | 21 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 23 | 23 | 18 |
| 19 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 19 |
| 20 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 20 |
| 21 | Electro Mechanical Switching... | 2215 | 344 | 348 | 350 | 358 | 366 | 376 | 379 | 386 | 391 | 395 | 403 | 405 | 414 | 42.1 | 430 | 432 | 21 |
| 22 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 22 |
| 23 | Operator Systems.................. | 2220 | 241 | 242 | 243 | 247 | 251 | 257 | 258 | 261 | 264 | 266 | 271 | 272 | 276 | 282 | 287 | 287 | 23 |
| 24 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 24 |
| 25 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 25 |
| 26 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 26 |
| 27 | Radio System-Analog............. | 22311 | 96 | 96 | 96 | 95 | 95 | 95 | 95 | 95 | 95 | 96 | 95 | 95 | 94 | 97 | 98 | 94 | 27 |
| 28 | Radio System-Digital.............. | 22312 | 125 | 125 | 126 | 127 | 128 | 127 | 125 | 125 | 125 | 126 | 127 | 127 | 128 | 129 | 130 | 130 | 28 |
| 29 | Circuit Equipment-Analog........ | 22321 | 143 | 144 | 144 | 142 | 143 | 143 | 143 | 144 | 143 | 145 | 145 | 145 | 144 | 148 | 150 | 144 | 29 |
| 30 | Circuit Equipment-Digital........ | 22322 | 36 | 36 | 36 | 37 | 37 | 38 | 38 | 39 | 38 | 38 | 39 | 39 | 39 | 40 | 40 | 41 | 30 |
| 31 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 31 |
| 32 | Public Telephone Term Eq...... | 2351 | 193 | 193 | 193 | 191 | 190 | 190 | 190 | 191 | 190 | 191 | 190 | 189 | 187 | 193 | 195 | 186 | 32 |
| 33 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 33 |
| 34 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 34 |
| 35 | Poles. | 2411 | 421 | 429 | 434 | 446 | 451 | 459 | 463 | 472 | 477 | 490 | 495 | 503 | 502 | 521 | 526 | 529 | 35 |
| 36 | Aerial Cable-Metallic.............. | 24211 | 313 | 322 | 328 | 333 | 335 | 338 | 340 | 349 | 357 | 371 | 379 | 386 | 430 | 486 | 477 | 492 | 36 |
| 37 | Aerial Cable-Fiber................. | 24212 | 96 | 98 | 100 | 102 | 104 | 105 | 105 | 108 | 110 | 112 | 114 | 116 | 118 | 119 | 121 | 122 | 37 |
| 38 | Underground Cable-Metallic...... | 24221 | 281 | 289 | 295 | 299 | 298 | 299 | 299 | 307 | 314 | 326 | 334 | 340 | 394 | 461 | 448 | 466 | 38 |
| 39 | Underground Cable-Fiber......... | 24222 | 78 | 80 | 82 | 83 | 84 | 86 | 85 | 87 | 89 | 91 | 92 | 94 | 95 | 96 | 98 | 98 | 39 |
| 40 | Buried Cable-Metallic.............. | 24231 | 271 | 278 | 284 | 287 | 285 | 289 | 286 | 293 | 300 | 312 | 320 | 326 | 383 | 456 | 441 | 460 | 40 |
| 41 | Buried Cable-Fiber................. | 24232 | 76 | 77 | 79 | 80 | 81 | 83 | 82 | 84 | 85 | 87 | 89 | 90 | 91 | 92 | 93 | 94 | 41 |
| 42 | .Submarine Cable-Metallic........ | 24241 | 320 | 327 | 334 | 338 | 341 | 343 | 346 | 353 | 362 | 372 | 379 | 384 | 417 | 459 | 454 | 466 | 42 |
| 43 | Submarine Cable-Fiber.. | 24241 | 125 | 127 | 130 | 132 | 134 | 136 | 136 | 138 | 141 | 144 | 146 | 148 | 149 | 150 | 153 | 154 | 43 |
| 44 | Intra Building Cable-Metallic.... | 24261 | 313 | 322 | 328 | 333 | 335 | 338 | 340 | 349 | 357 | 370 | 378 | 385 | 429 | 483 | 474 | 489 | 44 |
| 45 | Intra Building Cable-Fiber........ | 24262 | 97 | 99 | 101 | 103 | 104 | 106 | 106 | 108 | 110 | 113 | 115 | 117 | 118 | 120 | 121 | 122 | 45 |
| 46 | Aerial Wire. | 2431 | 348 | 355 | 362 | 368 | 372 | 377 | 381 | 391 | 399 | 412 | 419 | 427 | 446 | 466 | 465 | 472 | 46 |
| 47 | Conduit Systems.................. | 2441 | 375 | 380 | 391 | 395 | 403 | 412 | 418 | 422 | 432 | 442 | 453 | 458 | 474 | 478 | 495 | 493 | 47 |
| 48 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 48 |
| 49 | Aerial Cable-FTTP (Distribution). | 24213 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 100 | 97 | 95 | 92 | 89 | 88 | 87 | 49 |
| 50 | Underground Cable-FTTP (Dist.) | 24223 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 100 | 99 | 98 | 98 | 97 | 96 | 96 | 50 |
| 51 | Buried Cable-FTTP (Distribution) | 24233 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 100 | 102 | 105 | 104 | 103 | 103 | 102 | 51 |
| 52 | Submarine Cable-FTTP (Dist.)... | 24243 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 100 | 99 | 98 | 98 | 97 | 96 | 96 | 52 |
| 53 | Intra Building Cable-FTTP (Dist.) | 24263 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 100 | 100 | 100 | 100 | 100 | 101 | 103 | 53 |
| 54 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 54 |

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| L | COST INDEX NUMBERS |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | $\begin{gathered} \mathrm{L} \\ \mathrm{I} \\ \mathrm{~N} \\ \mathrm{E} \\ \mathrm{~N} \\ \mathrm{O} \end{gathered}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| N | 2008 |  | 2009 |  | 2010 |  | 2011 |  | 2012 |  | 2013 |  | 2014 |  | 2015 |  | 2016 |  | 2017 |  | 2018 |  |  |
| $\begin{aligned} & \mathrm{N} \\ & \mathrm{O} \\ & \hline \end{aligned}$ | Jan. <br> 1 | Jul. 1 | $\begin{gathered} \text { Jan. } \\ 1 \end{gathered}$ | Jul. <br> 1 | Jan. 1 | Jul. $1$ | Jan. <br> 1 | Jul. <br> 1 | $\begin{gathered} \text { Jan. } \\ 1 \end{gathered}$ | Jul. <br> 1 | Jan. <br> I | $\begin{gathered} \text { Jul. } \\ 1 \end{gathered}$ | $\begin{gathered} \text { Jan. } \\ 1 \end{gathered}$ | Jul. <br> 1 | $\begin{array}{\|c} \mathrm{Jan} . \\ 1 \end{array}$ | Jul. <br> 1 | Jan. <br> 1 | Jul. 1 | Jan. 1 | Jul. 1 | Jan. | Jul. |  |
| $\begin{aligned} & 1 \\ & 2 \\ & 3 \end{aligned}$ | 251 | 256 | 245 | 248 | 258 | 260 | 279 | 282 | 282 | 282 | 285 | 283 | 284 | 285 | 289 | 287 | 283 | 282 | 288 | 290 | 298 | 304 | 1 2 3 |
| 4 | 263 | 257 | 272 | 273 | 274 | 269 | 272 | 273 | 280 | 279 | 286 | 282 | 291 | 287 | 291 | 295 | 299 | 298 | 305 | 301 | 307 | 304 | 4 |
| 5 | 461 | 471 | 495 | 480 | 485 | 490 | 497 | 502 | 514 | 520 | 523 | 528 | 532 | 537 | 541 | 543 | 543 | 547 | 548 | 553 | 557 | 562 | 5 |
| 6 | 476 | 485 | 499 | 504 | 503 | 503 | 507 | 518 | 529 | 541 | 548 | 555 | 557 | 564 | 566 | 570 | 572 | 576 | 577 | 581 | 583 | 578 | 6 |
| 7 | 435 | 445 | 457 | 457 | 456 | 458 | 462 | 474 | 479 | 485 | 489 | 494 | 497 | 503 | 505 | 509 | 510 | 513 | 514 | 519 | 522 | 533 | 7 |
| 8 | 281 | 286 | 290 | 286 | 286 | 288 | 288 | 290 | 291 | 294 | 295 | 296 | 304 | 307 | 309 | 315 | 318 | 322 | 322 | 324 | 327 | 330 | 8 |
| 9 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 9 |
| 10 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 10 |
| 11 | 492 | 497 | 506 | 494 | 506 | 507 | 521 | 518 | 530 | 532 | 542 | 539 | 550 | 552 | 585 | 580 | 586 | 589 | 604 | 608 | 633 | 647 | 11 |
| 12 | 389 | 402 | 417 | 415 | 418 | 420 | 415 | 429 | 433 | 437 | 433 | 437 | 439 | 450 | 449 | 454 | 454 | 455 | 457 | 461 | 464 | 482 | 12 |
| 13 | 162 | 171 | 184 | 171 | 169 | 169 | 170 | 171 | 173 | 173 | 164 | 165 | 166 | 166 | 171 | 172 | 172 | 172 | 173 | 171 | 171 | 169 | 13 |
| 14 | 2.7 | 2.6 | 2.6 | 2.1 | 2.01 | 1.98 | 1.97 | 1.49 | 0.82 | 0.66 | 0.67 | 0.50 | 0.57 | 0.60 | 0.55 | 0.63 | 0.64 | 0.65 | 0.73 | 0.71 | 0.67 | 0.64 | 14 |
| 15 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 15 |
| 16 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 16 |
| 17 | 180 | 179 | 178 | 178 | 177 | 177 | 174 | 175 | 174 | 174 | 174 | 175 | 176 | 176 | 176 | 176 | 177 | 177 | 177 | 179 | 177 | 179 | 17 |
| 18 | 24 | 24 | 25 | 25 | 25 | 25 | 25 | 25 | 26 | 26 | 26 | 27 | 27 | 27 | 27 | 28 | 28 | 28 | 28 | 29 | 29 | 29 | 18 |
| 19 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 19 |
| 20 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 20 |
| 21 | 439 | 445 | 456 | 458 | 460 | 469 | 474 | 481 | 486 | 478 | 484 | 491 | 497 | 495 | 499 | 499 | 496 | 497 | 502 | 502 | 509 | 506 | 21 |
| 22 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 22 |
| 23 | 288 | 292 | 297 | 299 | 300 | 305 | 307 | 311 | 313 | 309 | 312 | 317 | 320 | 319 | 322 | 322 | 320 | 321 | 324 | 325 | 328 | 327 | 23 |
| 24 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 24 |
| 25 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 25 |
| 26 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 26 |
| . 27 | 91 | 90 | 90 | 90 | 89 | 89 | 88 | 89 | 88 | 88 | 88 | 88 | 89 | 89 | 89 | 89 | 89 | 89 | 89 | 90 | 90 | 90 | 27 |
| - 28 | 131 | 132 | 134 | 134 | 135 | 137 | 138 | 138 | 137 | 138 | 138 | 138 | 138 | 138 | 139 | 140 | 140 | 140 | 140 | 141 | 141 | 142 | 28 |
| 29 | 140 | 139 | 139 | 139 | 138 | 138 | 137 | 138 | 137 | 137 | 137 | 138 | 139 | 139 | 140 | 140 | 141 | 141 | 141 | 142 | 142 | 143 | 29 |
| 30 | 41 | 41 | 41 | 41 | 40 | 40 | 40 | 41 | 41 | 42 | 42 | 42 | 43 | 43 | 44 | 44 | 44 | 45 | 45 | 45 | 46 | 46 | 30 |
| 31 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 31 |
| 32 | 180 | 179 | 177 | 178 | 177 | 177 | 174 | 175 | 173 | 174 | 173 | 174 | 175 | 175 | 176 | 176 | 177 | 177 | 177 | 179 | 177 | 179 | 32 |
| 33 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 33 |
| 34 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 34 |
| 35 | 537 | 547 | 554 | 563 | 570 | 578 | 576 | 587 | 594 | 600 | 603 | 607 | 605 | 616 | 620 | 621 | 629 | 633 | 634 | 652 | 643 | 652 | 35 |
| 36 | 494 | 507 | 461 | 473 | 506 | 509 | 573 | 582 | 577 | 576 | 582 | 572 | 573 | 573 | 578 | 570 | 555 | 551 | 566 | 568 | 590 | 604 | 36 |
| 37 | 123 | 124 | 126 | 127 | 128 | 130 | 131 | 133 | 135 | 136 | 137 | 138 | 140 | 142 | 143 | 144 | 146 | 148 | 149 | 151 | 153 | 155 | 37 |
| 38 | 465 | 481 | 421 | 435 | 475 | 476 | 555 | 562 | 554 | 552 | 556 | 544 | 542 | 540 | 544 | 533 | 513 | 506 | 523 | 524 | 548 | 563 | 38 |
| 39 | 100 | 100 | 102 | 103 | 103 | 105 | 106 | 108 | 109 | 110 | 111 | 112 | 113 | 114 | 116 | 116 | 118 | 119 | 120 | 122 | 123 | 125 | 39 |
| 40 | 459 | 475 | 410 | 425 | 467 | 467 | 553 | 560 | 550 | 547 | 552 | 538 | 536 | 533 | 537 | 524 | 501 | 493 | 511 | 511 | 537 | 552 | 40 |
| 41 | 95 | 96 | 97 | 98 | 99 | 100 | 101 | 103 | 104 | 105 | 106 | 107 | 108 | 109 | 111 | 111 | 113 | 114 | 115 | 116 | 118 | 120 | 41 |
| 42 | 468 | 479 | 447 | 458 | 484 | 486 | 535 | 541 | 539 | 540 | 545 | 539 | 541 | 542 | 547 | 544 | 534 | 532 | 546 | 548 | 566 | 578 | 42 |
| 43 | 155 | 157 | 159 | 161 | 163 | 164 | 166 | 168 | 170 | 172 | 173 | 174 | 177 | 179 | 181 | 183 | 185 | 187 | 189 | 191 | 194 | 196 | 43 |
| 44 | 491 | 504 | 459 | 471 | 504 | 507 | 570 | 578 | 573 | 573 | 578 | 569 | 569 | 570 | 575 | 567 | 553 | 549 | 564 | 566 | 588 | 602 | 44 |
| 45 | 124 | 125 | 127 | 128 | 129 | 131 | 132 | 134 | 135 | 137 | 138 | 139 | 141 | 142 | 144 | 145 | 147 | 148 | 150 | 152 | 154 | 156 | 45 |
| 46 | 475 | 488 | 469 | 478 | 496 | 501 | 519 | 528 | 525 | 527 | 531 | 530 | 533 | 538 | 543 | 543 | 540 | 541 | 551 | 556 | 569 | 580 | 46 |
| 47. | 502 | 507 | 525 | 530 | 516 | 521 | 526 | 532 | 545 | 550 | 549 | 552 | 559 | 565 | 571 | 577 | 581 | 586 | 591 | 596 | 611 | 618 | 47 |
| 48 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 48 |
| 49 | 82 | 77 | 75 | 73 | 65 | 58 | 55 | 53 | 52 | 50 | 50 | 50 | 50 | 50 | 50 | 49 | 50 | 49 | 49 | 50 | 49 | 50 | 49 |
| 50 | 94 | 92 | 89 | 87 | 83 | 80 | 75 | 70 | 66 | 62 | 58 | 54 | 54 | 54 | 53 | 53 | 54 | 54 | 54 | 55 | 54.3 | 55.3 | 50 |
| 51 | 92 | 82 | 78 | 74 | 71 | 68 | 66 | 63 | 61 | 59 | 57 | 54 | 54 | 55 | 54 | 54 | 54 | 53 | 53 | 54 | 52.7 | 53.7 | 51 |
| 52 | 94 | 92 | 89 | 87 | 83 | 80 | 75 | 70 | 66 | 62 | 58 | 54 | 54 | 54 | 53 | 53 | 54 | 54 | 54 | 55 | 54.3 | 55.3 | 52 |
| 53 | 104 | 105 | 90 | 75 | 68 | 61 | 54 | 47 | 43 | 39 | 39 | 39 | 39 | 39 | 38 | 38 | 39 | 44 | 44 | 44 | 43.7 | 44.7 | 53 |
| 54 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 54 |

AUS TELEPHONE PLANT INDEX
NORTH ATLANTIC REGION 1973-100

| L | PLANT IN SERVICE DESCRIPTION | F | COST INDEX NUMBERS |  |  |  |  |  |  |  |  |  |  |  |  |  | $\begin{gathered} \hline \mathrm{L} \\ \mathrm{I} \\ \mathrm{~N} \\ \mathrm{E} \\ \\ \mathrm{~N} \\ \mathrm{O} \\ \hline \end{gathered}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| N |  | c | 2019 |  | 2020 |  | 2021 |  | 2022 |  | 2023 |  | 2024 |  | 2025 |  |  |
| $\begin{aligned} & \mathrm{N} \\ & \mathrm{o} \\ & \hline \end{aligned}$ |  | A c c t | Jan. <br> 1 | Jul. 1 | Jan. 1 | Jul. <br> 1 | Jan. 1 | Jul. 1 | Jan. 1 | Jul. 1 | Jan. 1 | Jul. 1 | Jan. 1 | Jul. 1 | Jan. 1 | Jul. 1 |  |
| 1 | Total Plant......................... |  | 304 | 305 | 308 | 310 | 318 |  |  |  |  |  |  |  |  |  | 1 |
| 2 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 2 |
| 3 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 3 |
| 4 | Motor Vehicles. | 2112 | 309 | 305 | 308 | 304 | 310 |  |  |  |  |  |  |  |  |  | 4 |
| 5 | Aircraft.............................. | 2113 | 567 | 574 | 575 | 581 | 583 |  |  |  |  |  |  |  |  |  | 5 |
| 6 | Special Purpose Vehicles.......... | 2114 | 602 | 612 | 616 | 622 | 623 |  |  |  |  |  |  |  |  |  | 6 |
| 7 | Gargare Work Equipment........ | 2115 | 541 | 550 | 550 | 555 | 556 |  |  |  |  |  |  |  |  |  | 7 |
| 8 | Other Work Equipment........... | 2116 | 333 | 335 | 336 | 340 | 343 |  |  |  |  |  |  |  |  |  | 8 |
| 9 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 9 |
| 10 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 10 |
| 11 | Buildings............................ | 2121 | 647 | 643 | 664 | 662 | 662 |  |  |  |  |  |  |  |  |  | 11 |
| 12 | Furniture............................. | 2122 | 491 | 497 | 503 | 512 | 513 |  |  |  |  |  |  |  |  |  | 12 |
| 13 | Office Equipment................. | 2123 | 170 | 172 | 171 | 170 | . 169 |  |  |  |  |  |  |  |  |  | 13 |
| 14 | General Purpose Computer...... | 2124 | 0.60 | 0.60 | 0.51 | 0.51 | 0.34 |  |  |  |  |  |  |  |  |  | 14 |
| 15 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 15 |
| 16 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 16 |
| 17 | Analog Electronic Switching..... | 2211 | 179 | 179 | 181 | 180 | 180 |  |  |  |  |  |  |  |  |  | 17 |
| 18 | Ditgital Electronic Switching..... | 2212 | 29 | 29 | 30 | 30 | 30 |  |  |  |  |  |  |  |  |  | 18 |
| 19 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 19 |
| 20 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 20 |
| 21 | Electro Mechanical Switching.... | 2215 | 513 | 517 | 518 | 528 | 529 |  |  |  |  |  |  |  |  |  | 21 |
| 22 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 22 |
| 23 | Operator Systems. | 2220 | 331 | 334 | 335 | 340 | 341 |  |  |  |  |  |  |  |  |  | 23 |
| 24 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 24 |
| 25 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 25 |
| 26 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 26 |
| 27 | Radio System-Analog............. | 22311 | 90 | 90 | 91 | 91 | 91 |  |  |  |  |  |  |  |  |  | 27 |
| 28 | Radio System-Digital............... | 22312 | 143 | 144 | 146 | 147 | 147 |  |  |  |  |  |  |  |  |  | 28 |
| 29 | Circuit Equipment-Analog........ | 22321 | 143 | 144 | 145 | 145 | 145 |  |  |  |  |  |  |  |  |  | 29 |
| 30 | Circuit Equipment-Digital........ | 22322 | 47 | 47 | 48 | 48 | 49 |  |  |  |  |  |  |  |  |  | 30 |
| 31 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 31 |
| 32 | Public Telephone Term Eq...... | 2351 | 179 | 180 | 181 | 181 | 181 |  |  |  |  |  |  |  |  |  | 32 |
| 33 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 33 |
| 34 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 34 |
| 35 | Poles................................ | 2411 | 661 | 671 | 699 | 710 | 715 |  |  |  |  |  |  |  |  |  | 35 |
| . 36 | Aerial Cable-Metallic.............. | 24211 | 601 | 603 | 605 | 608 | 634 |  |  |  |  |  |  |  |  |  | 36 |
| 37 | Aerial Cable-Fiber................. | 24212 | 157 | 158 | 160 | 162 | 164 |  |  |  |  |  |  |  |  |  | 37 |
| 38 | Underground Cable-Metallic...... | 24221 | 558 | 557 | 558 | 559 | 590 |  |  |  |  |  |  |  |  |  | 38 |
| 39 | Underground Cable-Fiber........ | 24222 | 126 | 128 | 129 | 130 | 132 |  |  |  |  |  |  |  |  |  | 39 |
| 40 | Buried Cable-Metallic.............. | 24231 | 545 | 544 | 544 | 545 | 577 |  |  |  |  |  |  |  |  |  | 40 |
| 41 | Buried Cable-Fiber................. | 24232 | 121 | 122 | 123 | 125 | 126 |  |  |  |  |  |  |  |  |  | 41 |
| 42 | Submarine Cable-Metallic........ | 24241 | 578 | 580 | 583 | 587 | 608 |  |  |  |  |  |  |  |  |  | 42 |
| 43 | Submarine Cable-Fiber........... | 24241 | 199 | 200 | 203 | 205 | 207 |  |  |  |  |  |  |  |  |  | 43 |
| 44 | Intra Building Cable-Metallic.... | 24261 | 599 | 601 | 603 | 606 | 632 |  |  |  |  |  |  |  |  |  | 44 |
| 45 | Intra Building Cable-Fiber........ | 24262 | 158 | 159 | 161 | 163 | 165 |  |  |  |  |  |  |  |  |  | 45 |
| 46 | Aerial Wire.......................... | 2431 | 583 | 587 | 592 | 597 | 612 |  |  |  |  |  |  |  |  |  | 46 |
| 47 | Conduit Systems.................. | 2441 | 626 | 631 | 642 | 648 | 655 |  |  |  |  |  |  |  |  |  | 47 |
| 48 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 48 |
| 49 | Aerial Cable-FTTP (Distribution). | 24213 | 50.5 | 50 | 50 | 50 | 50 |  |  |  |  |  |  |  |  |  | 49 |
| 50 | Underground Cable-FTTP (Dist.) | 24223 | 55.8 | 55.1 | 55.1 | 55.1 | 55.1 |  |  |  |  |  |  |  |  |  | 50 |
| 51 | Buried Cable-FTTP (Distribution) | 24233 | 54.2 | 53.7 | 53.7 | 53.7 | 53.7 |  |  |  |  |  |  |  |  |  | 51 |
| 52 | Submarine Cable-FTTP (Dist.)... | 24243 | 55.8 | 55.1 | 55.1 | 55.1 | 55.1 |  |  |  |  |  |  |  |  |  | 52 |
| 53 | Intra Building Cable-FTTP (Dist.) | 24263 | 45.2 | 44.7 | 44.7 | 44.7 | 44.7 |  |  |  |  |  |  |  |  |  | 53 |
| 54 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 54 |

# The Township of Lower Makefield, Bucks County Wastewater Collection System and Purchased Treatment Capacity 

Appraisal Work Papers

As of September 17, 2020

Cost Indices<br>United States Bureau of Labor Statistics - General Inf Cost Indexes

AUS Consultants
Suite 201
8555 West Forest Home Avenue
Greenfield, Wisconsin 53228
Office Telephone: 414-529-5755
J. Weinert's Cell: 414-698-8371
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ail: weinertj@auswest.net

## S:ICost IndicesIBLS IndexesIBLS Indexes

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Bureau of Labor Statistics Indexes


S:ICost IndicesIBLS Indexes\BLS Indexes
AUS Consultants
Bureau of Labor Statistics Indexes

| Index | Table | Region | Year | Begin Date | End <br> Date | CPI 1 | $2{ }^{3}$ |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  |  |  |  |  | $\begin{array}{ll}\text { Communic Technical } \\ \text { Equipment Labor } \\ \text { pcu3342 } & \text { ecu11122I } \\ & \text { linked } \\ & \text { CIU20154 }\end{array}$ |  |
|  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |
| Earliest Year |  | Region |  |  |  | 1913 | 1986 | 1985 |
| Index | Table |  |  |  |  | 1 | 2 | 3 |
| BLS | BLS | All | 1952 | 1/1/1952 | 12/31/1952 | 27 | 23 | 16 |
| BLS | BLS | All | 1953 | 1/1/1953 | 12/31/1953 | 27 | 23 | 16 |
| BLS | BLS | All | 1954 | 1/1/1954 | 12/31/1954 | 27 | 23 | 16 |
| BLS | BLS | All | 1955 | 1/1/1955 | 12/31/1955 | 27 | 23 | 16 |
| BLS | BLS | All | 1956 | 1/1/1956 | 12/31/1956 | 27 | 23 | 16 |
| BLS | BLS | All | 1957 | 1/1/1957 | 12/31/1957 | 28 | 24 | 17 |
| BLS | BLS | All | 1958 | 1/1/1958 | 12/31/1958 | 29 | 25 | 18 |
| BLS | BLS | All | 1959 | 1/1/1959 | 12/31/1959 | 29 | 25 | 18 |
| BLS | BLS | All | 1960 | 1/1/1960 | 12/31/1960 | 30 | 26 | 19 |
| BLS | BLS | All | 1961 | 1/1/1961 | 12/31/1961 | 30 | 26 | 19 |
| BLS | BLS | All | 1962 | 1/1/1962 | 12/31/1962 | 30 | 26 | 19 |
| BLS | BLS | All | 1963 | 1/1/1963 | 12/31/1963 | 31 | 27 | 20 |
| BLS | BLS | All | 1964 | 1/1/1964 | 12/31/1964 | 31 | 27 | 20 |
| BLS | BLS | All | 1965 | 1/1/1965 | 12/31/1965 | 32 | 28 | 21 |
| BLS | BLS | All | 1966 | 1/1/1966 | 12/31/1966 | 32 | 28 | 21 |
| BLS | BLS | All | 1967 | 1/1/1967 | 12/31/1967 | 33 | 29 | 22 |
| BLS | BLS | All | 1968 | 1/1/1968 | 12/31/1968 | 35 | 31 | 23 |
| BLS | BLS | All | 1969 | 1/1/1969 | 12/31/1969 | 37 | 33 | 24 |
| BLS | BLS | All | 1970 | 1/1/1970 | 12/31/1970 | 39 | 35 | 25 |
| BLS | BLS | All | 1971 | 1/1/1971 | 12/31/1971 | 41 | 37 | 26 |
| BLS | BLS | All | 1972 | 1/1/1972 | 12/31/1972 | 42 | 38 | 27 |
| BLS | BLS | All | 1973 | 1/1/1973 | 12/31/1973 | 44 | 40 | 28 |
| BLS | BLS | All | 1974 | 1/1/1974 | 12/31/1974 | 49 | 44 | 31 |
| BLS | BLS | All | 1975 | 1/1/1975 | 12/31/1975 | 54 | 49 | 34 |
| BLS | BLS | All | 1976 | 1/1/1976 | 12/31/1976 | 57 | 52 | 36 |
| BLS | BLS | All | 1977 | 1/1/1977 | 12/31/1977 | 61 | 56 | 38 |
| BLS | BLS | All | 1978 | 1/1/1978 | 12/31/1978 | 65 | 60 | 40 |
| BLS | BLS | All | 1979 | 1/1/1979 | 12/31/1979 | 73 | 67 | 45 |
| BLS | BLS | All | 1980 | 1/1/1980 | 12/31/1980 | 82 | 75 | 50 |
| BLS | BLS | All | 1981 | 1/1/1981 | 12/31/1981 | 91 | 83 | 55 |
| BLS | BLS | All | 1982 | 1/1/1982 | 12/31/1982 | 97 | 89 | 59 |
| BLS | BLS | All | 1983 | 1/1/1983 | 12/31/1983 | 100 | 92 | 61 |
| BLS | BLS | All | 1984 | 1/1/1984 | 12/31/1984 | 104 | 96 | 63 |
| BLS | BLS | All | 1985 | 1/1/1985 | 12/31/1985 | 108 | 100 | 65 |
| BLS | BLS | All | 1986 | 1/1/1986 | 12/31/1986 | 110 | 102 | 66 |
| BLS | BLS | All | 1987 | 1/1/1987 | 12/31/1987 | 114 | 104 | 69 |
| BLS | BLS | All | 1988 | 1/1/1988 | 12/31/1988 | 118 | 104 | 72 |
| BLS | BLS | All | 1989 | 1/1/1989 | 12/31/1989 | 124 | 106 | 76 |
| BLS | BLS | All | 1990 | 1/1/1990 | 12/31/1990 | 131 | 108 | 80 |

S:ICost Indices $\operatorname{BLS}$ IndexesIBLS Indexes
AUS Consultants
Bureau of Labor Statistics Indexes

| Index | Table | Region | Year | Begin Date | End <br> Date | CPI $\quad 1$ | Communic Technical Equipment Labor pcu3342 ecu11122 linked CIU20154 |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  |  |  |  |  |  |  |
| Earliest Year |  |  |  |  |  | 1913 | 1986 | 1985 |
| Index | Table | Region |  |  |  | 1 | 2 | 3 |
| BLS | BLS | All | 1991 | 1/1/1991 | 12/31/1991 | 136 | 109 | 84 |
| BLS | BLS | All | 1992 | 1/1/1992 | 12/31/1992 | 140 | 110 | 88 |
| BLS | BLS | All | 1993 | 1/1/1993 | 12/31/1993 | 145 | 112 | 92 |
| BLS | BLS | All | 1994 | 1/1/1994 | 12/31/1994 | 148 | 113 | 95 |
| BLS | BLS | All | 1995 | 1/1/1995 | 12/31/1995 | 152 | 114 | 97 |
| BLS | BLS | All | 1996 | 1/1/1996 | 12/31/1996 | 157 | 115 | 100 |
| BLS | BLS | All | 1997 | 1/1/1997 | 12/31/1997 | 161 | 116 | 102 |
| BLS | BLS | All | 1998 | 1/1/1998 | 12/31/1998 | 163 | 115 | 106 |
| BLS | BLS | All | 1999 | 1/1/1999 | 12/31/1999 | 167 | 113 | 109 |
| BLS | BLS | All | 2000 | 1/1/2000 | 12/31/2000 | 172 | 110 | 114 |
| BLS | BLS | All | 2001 | 1/1/2001 | 12/31/2001 | 177 | 109 | 119 |
| BLS | BLS | All | 2002 | 1/1/2002 | 12/31/2002 | 180 | 105 | 123 |
| BLS | BLS | All | 2003 | 1/1/2003 | 12/31/2003 | 184 | 102 | 127 |
| BLS | BLS | All | 2004 | 1/1/2004 | 12/31/2004 | 189 | 98 | 132 |
| BLS | BLS | All | 2005 | 1/1/2005 | 12/31/2005 | 195 | 97 | 135 |
| BLS | BLS | All | 2006 | 1/1/2006 | 12/31/2006 | 202 | 97 | 139 |
| BLS | BLS | All | 2007 | 1/1/2007 | 12/31/2007 | 207 | 96 | 146 |
| BLS | BLS | All | 2008 | 1/1/2008 | 12/31/2008 | 215 | 97 | 152 |
| BLS | BLS | All | 2009 | 1/1/2009 | 12/31/2009 | 215 | 97 | 155 |
| BLS | BLS | All | 2010 | 1/1/2010 | 12/31/2010 | 218 | 97 | 157 |
| BLS | BLS | All | 2011 | 1/1/2011 | 12/31/2011 | 225 | 96 | 161 |
| BLS | BLS | All | 2012 | 1/1/2012 | 12/31/2012 | 230 | 96 | 164 |
| BLS | BLS | All | 2013 | 1/1/2013 | 12/31/2013 | 233 | 95 | 167 |
| BLS | BLS | All | 2014 | 1/1/2014 | 12/31/2014 | 237 | 96 | 170 |
| BLS | BLS | All | 2015 | 1/1/2015 | 12/31/2015 | 237 | 96 | 173 |
| BLS | BLS | All | 2016 | 1/1/2016 | 12/31/2016 | 240 | 95 | 176 |
| BLS | BLS | All | 2017 | 1/1/2017 | 12/31/2017 | 245.1 | 94 | 179 |
| BLS | BLS | All | 2018 | 1/1/2018 | 12/31/2018 | 251.1 | 93 | 183 |
| BLS | BLS | All | 2019 | 1/1/2019 | 12/31/2019 | 255.7 | 93 | 187 |
| BLS | BLS | All | 2020 | 1/1/2020 | 12/31/2020 | 258.8 | 94 | 191 |
| BLS | BLS | All | 2021 | 1/1/2021 | 12/31/2021 | 261.6 | 94 | 192 |

# The Township of Lower Makefield, Bucks County <br> Wastewater Collection System and Purchased Treatment Capacity 

## Appraisal Work Papers

As of September 17, 2020

## Engineering News Record Construction Cost Index <br> General Construction - National

## AUS Consultants

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## Construction Cost Index History - As of January 2021

HOW ENR BUILDS THE INDEX: 200 hours of common labor at the 20-city average of common labor rates, plus 25 cwt of standard structural steel shapes at the mill price prior to 1996 and the fabricated 20-city price from 1996, plus 1.128 tons of portland cement at the 20 -city price, plus 1,088 board ft of $2 \times 4$ lumber at the 20 -city price.

View the ANNUAL AVERAGE FOR ENR'S CONSTRUCTION COST INDEX.

ENR'S CONSTRUCTION COST INDEX HISTORY (1908-2021)

| YEAR | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC | AVG. |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- |
| $\mathbf{2 0 2 1}$ | 11627.94 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| $\mathbf{2 0 2 0}$ | 11392 | 11396 | 11397 | 11412 | 11418 | 11436 | 11439 | 11455 | 11499 | 11539 | 11579 | 11626 |  |  |  |
| $\mathbf{2 0 1 9}$ | 11206 | 11213 | 11228 | 11228 | 11230 | 11268 | 11293 | 11311 | 11311 | 11326 | 11381 | 11381 | 11281 |  |  |
| $\mathbf{2 0 1 8}$ | 10878 | 10889 | 10959 | 10971 | 11013 | 11069 | 11116 | 11124 | 11170 | 11183 | 11184 | 11186 | 11062 |  |  |
| $\mathbf{2 0 1 7}$ | 10542 | 10559 | 10667 | 10678 | 10692 | 10703 | 10789 | 10826 | 10823 | 10817 | 10870 | 10873 | 10737 |  |  |
| $\mathbf{2 0 1 6}$ | 10132 | 10181 | 10242 | 10279 | 10315 | 10337 | 10379 | 10385 | 10403 | 10434 | 10442 | 10530 | 10338 |  |  |
| $\mathbf{2 0 1 5}$ | 9972 | 9962 | 9972 | 9992 | 9975 | 10039 | 10037 | 10039 | 10065 | 10128 | 10092 | 10152 | 10035 |  |  |
| $\mathbf{2 0 1 4}$ | 9664 | 9681 | 9702 | 9750 | 9796 | 9800 | 9835 | 9846 | 9870 | 9886 | 9912 | 9936 | 9806 |  |  |
| $\mathbf{2 0 1 3}$ | 9437 | 9453 | 9456 | 9484 | 9516 | 9542 | 9552 | 9545 | 9552 | 9689 | 9666 | 9668 | 9547 |  |  |
| $\mathbf{2 0 1 2}$ | 9176 | 9198 | 9268 | 9273 | 9290 | 9291 | 9324 | 9351 | 9341 | 9376 | 9398 | 9412 | 9308 |  |  |


| YEAR | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC | AVG. |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 2011 | 8938 | 8998 | 9011 | 9027 | 9035 | 9053 | 9080 | 9088 | 9116 | 9147 | 9173 | 9172 | 9070 |
| 2010 | 8660 | 8672 | 8671 | 8677 | 8761 | 8805 | 8844 | 8837 | 8836 | 8921 | 8951 | 8952 | 87 |
| 2009 | 8549 | 8533 | 8534 | 8528 | 8574 | 8578 | 8566 | 8564 | 8586 | 8596 | 8592 | 8641 | 8570 |
| 2008 | 8090 | 8094 | 8109 | 8112 | 8141 | 8185 | 8293 | 8362 | 8557 | 8623 | 8602 | 8551 | 8310 |
| 2007 | 7880 | 7880 | 7856 | 7865 | 7942 | 7939 | 7959 | 8007 | 8050 | 8045 | 8092 | 8089 | 7966 |
| 2006 | 7660 | 7689 | 7692 | 7695 | 7691 | 7700 | 7721 | 7722 | 7763 | 7883 | 7911 | 7888 | 7751 |
| 2005 | 7297 | 7298 | 7309 | 7355 | 7398 | 7415 | 7422 | 7479 | 7540 | 7563 | 7630 | 7647 | 7446 |
| 2004 | 6825 | 6862 | 6957 | 7017 | 7065 | 7109 | 7126 | 7188 | 7298 | 7314 | 7312 | 7308 | 7115 |
| 2003 | 6581 | 6640 | 6627 | 6635 | 6642 | 6694 | 6695 | 6733 | 6741 | 6771 | 6794 | 6782 | 6694 |
| 2002 | 6462 | 6462 | 6502 | 6480 | 6512 | 6532 | 6605 | 6592 | 6589 | 6579 | 6578 | 6563 | 6538 |
| 2001 | 6281 | 6272 | 6279 | 6286 | 6288 | 6318 | 6404 | 6389 | 6391 | 6397 | 6410 | 6390 | 6343 |
| 2000 | 6130 | 6160 | 6202 | 6201 | 6233 | 6238 | 6225 | 6233 | 6224 | 6259 | 6266 | 6283 | 6221 |
| 1999 | 6000 | 5992 | 5986 | 6008 | 6006 | 6039 | 6076 | 6091 | 6128 | 6134 | 6127 | 6127 | 60 , |
| 1998 | 5852 | 5874 | 5875 | 5883 | 5881 | 5895 | 5921 | 5929 | 5963 | 5986 | 5995 | 5991 | 5920 |
| 1997 | 5765 | 5769 | 5759 | 5799 | 5837 | 5860 | 5863 | 5854 | 5851 | 5848 | 5838 | 5858 | 5826 |
| 1996 | 5523 | 5532 | 5537 | 5550 | 5572 | 5597 | 5617 | 5652 | 5683 | 5719 | 5740 | 5744 | 5620 |
| 1995 | 5443 | 5444 | 5435 | 5432 | 5433 | 5432 | 5484 | 5506 | 5491 | 5511 | 5519 | 5524 | 5471 |
| 1994 | 5336 | 5371 | 5381 | 5405 | 5405 | 5408 | 5409 | 5424 | 5437 | 5437 | 5439 | 5439 | 5408 |
| 1993 | 5071 | 5070 | 5106 | 5167 | 5262 | 5260 | 5252 | 5230 | 5255 | 5264 | 5278 | 5310 | 5210 |
| 1992 | 4888 | 4884 | 4927 | 4946 | 4965 | 4973 | 4992 | 5032 | 5042 | 5052 | 5058 | 5059 | 4985 |
| 1991 | 4777 | 4773 | 4772 | 4766 | 4801 | 4818 | 4854 | 4892 | 4891 | 4892 | 4896 | 4889 | 4835 |
| 1990 | 4680 | 4685 | 4691 | 4693 | 4707 | 4732 | 4734 | 4752 | 4774 | 4771 | 4787 | 4777 | 4732 |

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## Construction Cost Index History - Annual Average

ANNUAL AVERAGE For ENR'S CONSTRUCTION COST INDEX

| YEAR | AVG | YEAR | AVG | YEAR | AVG | YEAR | AVG |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- |
| 1989 | 4615 | 1988 | 4519 | 1987 | 4406 | 1986 | 4295 |
| 1985 | 4195 | 1984 | 4146 | 1983 | 4066 | 1982 | 3825 |
| 1981 | 3535 | 1980 | 3237 | 1979 | 3003 | 1978 | 2776 |
| 1977 | 2576 | 1976 | 2401 | 1975 | 2212 | 1974 | 2020 |
| 1973 | 1895 | 1972 | 1753 | 1971 | 1581 | 1970 | 1381 |
| 1969 | 1269 | 1968 | 1155 | 1967 | 1074 | 1966 | 1019 |
| 1965 | 971 | 1964 | 936 | 1963 | 901 | 1962 | 872 |
| 1961 | 847 | 1960 | 824 | 1959 | 797 | 1958 | 759 |
| 1957 | 724 | 1956 | 692 | 1955 | 660 | 1954 | 628 |
| 1953 | 600 | 1952 | 569 | 1951 | 543 | 1950 | 510 |
| 1949 | 477 | 1948 | 461 | 1947 | 413 | 1946 | 346 |
| 1945 | 308 | 1944 | 299 | 1943 | 290 | 1942 | 276 |
| 1941 | 258 | 1940 | 242 | 1939 | 236 | 1938 | 236 |


| YEAR | AVG | YEAR | AVG | YEAR | AVG | YEAR | AVG |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- |
| 1937 | 235 | 1936 | 206 | 1935 | 196 | 1934 | 198 |
| 13 | 170 | 1932 | 157 | 1931 | 181 | 1930 | 203 |
| 1929 | 207 | 1928 | 207 | 1927 | 206 | 1926 | 208 |
| 1925 | 207 | 1924 | 215 | 1923 | 214 | 1922 | 174 |
| 1921 | 202 | 1920 | 251 | 1919 | 198 | 1918 | 189 |
| 1917 | 181 | 1916 | 130 | 1915 | 93 | 1914 | 89 |
| 1913 | 100 | 1912 | 91 | 1911 | 93 | 1910 | 96 |
| 1909 | 91 | 1908 | 97 |  |  |  |  |

## The latest news and

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## Historical Indices

## Historical Indices

- Construction Cost Index History

200 hours of common labor at the 20 -city average of common labor rates, plus 25 cwt of standard structural steel shapes at the mill price prior to 1996 and the fabricated 20 -city price from 1996, plus 1.128 tons of portland cement at the 20 -city price, plus 1,088 board- ft of $2 \times 4$ lumber at the 20 -city price.

- Building Cost Index History
68.38 hours of skilled labor at the 20 -city average of bricklayers, carpenters and structural ironworkers rates, plus 25 cwt of standard structural steel shapes at the mill price prior to 1996 and the fabricated 20 -city price from 1996, plus 1.128 tons of portland cement at the 20 -city price, plus 1,088 board- ft of $2 \times 4$ lumber at the 20 city price.
- Materials Price Index

The Materials Cost Index is the materials component of ENR's building and construction cost indexes. It tracks the weighted price movement of structural steel, portland cement and 2 X 4 lumber.

- Skilled Labor Index

The Skilled Labor Index is the labor component of ENR's Building Cost Index and tracks union wages, plus fringe benefits, for carpenters, bricklayers and iron workers.

- Common Labor Index.

The Common Labor Index is the labor component of ENR's Construction Cost Index and tracks the union wage, plus fringe benefits, for laborers.

## Cost Index History Tables

The building and construction cost indexes for ENR's individual cities use the same components and weighting as those for the 20 -city national indexes. The city indexes use local prices for portland cement and $2 \times 4$ lumber and the national average price for structural steel. The city's BCI uses local union wages, plus fringes, for carpenters, bricklayers and iron workers. The city's CCI uses the same union wages for laborers.

ENR Cost Indexes in 20 Cities 1978-2021

- Atlanta, GA
- Baltimore, MD
- Birmingham, AL
- Boston, MA
- Chicago, IL
- Cincinnati, OH
- Cleveland, OH
- Dallas, TX
- Denver, CO
- Detroit, MI
- Kansas City,MO
- Los Angeles, CA
- Minneapolis, MN
- New Orleans, LA
- New York, NY
- Philadelphia, PA
- Pittsburgh, PA
- San Francisco, CA
- Seattle,WA
- St. Louis, MO


## ENR Cost Indexes in Canadian Cities 1978-2012

- Montreal
- Toronto

To find more recent cost index data, go to this webpage (link below) and click on the link for the year you need, and then navigate to the month you need.
http://www.enr.com/economics/current_costs

## The latest news and information

## DEPRECIATION AND FUNCTIONAL OBSOLESCENCE

An important step in the appraisal of property using the cost approach is the determination of the depreciation or condition of the property. Depreciation in this appraisal was segregated into normal (mostly physical) depreciation and functional obsolescence. The normal depreciation was determined based on the age of the property and its normal service life; while functional obsolescence was based on the impact on the property's remaining life caused by factors such as changing technology, service requirements, and competition.

Depreciation - The depreciation was determined based on the property's age and it normal service life using the following formula:

$$
\begin{aligned}
& \text { Condition }=\frac{\text { Remaining Life }}{\text { Age }+ \text { Remaining Life }} \\
& \text { or } \\
& \text { Depreciation }=\frac{\text { Age }}{\text { Age }+ \text { Remaining Life }} \\
& \text { Where: Remaining Life }=f(\text { Age, Survival Characteristic, Normal Service life })
\end{aligned}
$$

Functional Obsolescence - The obsolescence inherent in the property was determined using the above described normal service life in comparison to the property's service life is adjusted for functional factors. The obsolescence was quantified base on the difference between the property's normal service life and its functional service life. The following formula was used to calculate the obsolescence:

$$
\text { Obsolescence }=\frac{\text { Normal Service Life }- \text { Functional Service Life }}{\text { Normal Service Life }}
$$

Service Lives - (normal versus functional) - The service life of property is that period of time in which it provides the service to which it was designed and placed into service. In most industrial properties there is a difference between a property's normal or physical life and its functional life. A piece of equipment may physically last for an extended
period; however, as that property ages changing technology, improvements or enhancement in similar equipment, functional and or service requirements change resulting in decreased utility of the existing equipment, and therefore decrease in value to it owner, this additional deterioration over that defined by the equipment's normal life is functional obsolescence.

## Wastewater Depreciation Service Life Experience in Pennsylvania

The service lives used in the depreciation and functional obsolescence calculations were developed based on the property and its use, AUS Consultants' experience in developing depreciation studies for the water and wastewater industries and depreciation studies filed with recent PAWC and Aqua America rate cases. With each of their rate case filings PAWC and Aqua America have filed depreciation studies in support of their depreciation service lives and associated depreciation expenses contained within their revenue requirements. The depreciation studies were prepared by Gannett Fleming Rate Consultants a recognized firm in the depreciation consulting area. AUS Consultants has reviewed the studies which are summarized in the following table:

| Summary of Aqua \& PAWC Depreciation Studies Prepared for Rate Case |  |  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Account Account oescriplion | $\begin{gathered} \text { Aqua } \\ 3312019 \end{gathered}$ | Iowa cures |  | Serice Lhe |  |  | Remaling Lue |  |  |
|  |  | $\begin{gathered} \text { Pawc } \\ 123312016 \end{gathered}$ | $\begin{gathered} \text { pawc } \\ 123312019 \end{gathered}$ | ${ }_{3}^{\text {Aquar }}$ | $\underset{\substack{\text { Pawc } \\ 12312016}}{ }$ | $\begin{gathered} \text { Pavc } \\ 12312019 \end{gathered}$ | $\begin{gathered} \text { Aqua } \\ 3312019 \end{gathered}$ | $\begin{gathered} \text { pawc } \\ 123312016 \end{gathered}$ | $\underset{\substack{\text { pawc } \\ 12312019}}{ }$ |
|  |  |  |  |  | years | years |  | years | years |
| 354.20 Structures and improvements - Collection | so. 5 | R3 | R3 | 55 | 45 | 45 | 35 | 39.1 | 33.3 |
| 354.30 Structures and improvements - Spp | S1.0 | R2.5 | so | 60 | 50 | 55 | 43.6 | 45.2 | 32.6 |
| 354.40 STRUCTURES AND IMPROVEMENTS - TDP | R2.0 | R2 | so | 50 | 65 | 55 | 28.4 | 56.6 | 31.7 |
| 354.70 STRUCTURES AND IMPROVEMENTS - GENERAL | ез.0 | S1 | S1 | 50 | 35 | 35 | 16.8 | 33.3 | 23.2 |
| 355.00 POWER GENERATION EQUIPMENT |  | R2.5 | S0.5 |  | 35 | 35 |  | 29.7 | 19.3 |
| 360.10 COLLECTION SEWERS - Force mains | R2.5 | S2 | R3 | 75 | 70 | 75 | 52.4 | 53.1 | 52.5 |
| 361.10 COLLECTION SEWERS - GRAVITY MAINS | R2. 5 | R2.5 | R2.5 | 75 | 70 | 80 | 50.1 | 56.9 | 54.8 |
| 361.20 manholes |  | S1.5 | S2.5 |  | 50 | 50 |  | 41.3 | 32.2 |
| 363.00 SERVICES | R4.0 | R3 | R3 | 70 | 38 | 47 | 53.2 | 22.9 | 30.2 |
| 364.00 FLOW MEASURING DEVICES |  | L3 | L2.5 |  | 20 | 15 |  | 13.3 | 5.1 |
| 365.00 flow measuring installations |  | S1.5 | S2 |  | 30 | 25 |  | 23.1 | 10.8 |
| 370.00 RECEIVING WELLS |  | R3 | R3 |  | 50 | 50 |  | 42.7 | 33.7 |
| 371.00 PUMPING EQUIPMENT | L0.5 | so | s0.5 | 25 | 40 | 30 | 13.6 | 35.5 | 18.2 |
| 380.00 treatment equipment | 50.0 | 5-R2 | S1.5 | 40 | 45 | 35 | 21.2 | 37.1 | 20.1 |
| 381.00 PLANt SEWERS | R1.5 | R3 | R3 | 40 | 50 | 50 | 9.5 | 43.1 | 32.7 |
| 382.00 OUTFALL SEWER LINES | R2.5 | R3 | R3 | 40 | 50 | 50 | 6.6 | 37.8 | 28.3 |
| 389.10 Other Plant and miscellaneous equipment - Intangibles |  | 52.5 | S2.5 |  | 20 | 20 |  | 13.6 | 11.3 |
| 389.60 Other plant And miscellaneous Equipment - CPS | เз.0 | sQ | sa | 20 | 20 | 5 | 10.5 | 12.3 | 3.5 |
| 390.00 OfFICE FURNITURE AND EQUIPMENT | sa.o | 14 | sQ | 20 | 15 | 20 | - | 9.5 | 10.1 |
| 391.00 transportation equipment |  | sa | 14 |  | 25 | 14 |  | 19,9 | 9.8 |
| 392.00 STORES EQUIPMENT |  | sQ | sQ |  | 20 | 25 |  | 16.4 | 17.2 |
| 393.00 TOOLS, SHOP AND GARAGE EQUIPMENT |  | sQ | sQ |  | 15 | 20 |  | 11,3 | 15.4 |
| 394.00 LABORATORY EQUIPMENT | sa.o | เ2.5 | sQ | 25 | 16 | 15 | - | 8.7 | 10.4 |
| 395.00 POWER OPERATED EQUIPMENT |  | sQ | R2 |  | 15 | 22 |  | 10.3 | 13.2 |
| 396.00 COMMUNICATION EQUIPMENT |  | sQ | sa |  | 15 | 15 |  | 9.6 | 6.9 |
| 397.00 MISCELLANEOUS EQUIPMENT |  |  | sQ |  |  | 15 |  |  | 12.8 |
| 398.00 OTHER TANGIBLE PLANT |  |  | sQ |  |  | 25 |  |  | 21.5 |

AUS Consultants believe this increase in service lives is attributable to the widespread use of relining older mains instead of replacing mains which are in need of repair. The practice of relining mains with a cured in place plastic liner not only repairs specific main but has the affect of extending the life of the original main by the length of time which the relining can be expected to last. Most relining vendors warranty their product and procedure for 50 years. Thus, in essence the original mains' service life will be extended by 50 plus years at the date the relining occurred. For those mains associated with relining their installation date was established at the date of their relining and their depreciation parameters were established the same as the depreciation parameters of the relining, i.e., R2.5-60 years.

The following table presents the depreciation parameters (lowa-type survivor curve and service life) used in the cost approach in calculating the deprecation of the property:

| Summary of Account Costing and Depreciation Parameters Used in the Depreciation Original Cost and the Depreciated |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| Replacement Cost New Studies |  |  |  |  |  |
| (2) | (4) |  | (5) | (6) |  |
|  | (4a) | (4b) |  | (6a) | (6b) |
|  | lowa |  |  |  |  |
|  | Survivor / | Normal |  |  |  |
|  | Retirement | Service | Economic | Tax |  |
| Description | Curve | Life | Obsolescence | Depreciation |  |
|  |  | years | \% of CORLD | Table | Life |
| 354.00 Stuctures \& Improvements | R3.0 | 65.00 | 0.00\% | MACRS | 25.00 |
| 355.00 Power Generation Equipment |  |  |  |  |  |
| 360.00 Collection Mains - Force | R2.0 | 75.00 | 0.00\% | MACRS | 25.00 |
| 361.00 Collection Mains - Gravity | R2.5 | 80.00 | 0.00\% | MACRS | 25.00 |
| Collection Mains - Gravity - Relining | R2.5 | 60.00 | 0.00\% | MACRS | 25.00 |
| 361.10 Manholes | S2.0 | 75.00 | 0.00\% | MACRS | 25.00 |
| 363.00 Service Laterals | R3.0 | 45.00 | 0.00\% | MACRS | 25.00 |
| 364.00 Flow Measuring Devices | L2.5 | 25.00 | 0.00\% | MACRS | 25.00 |
| 365.00 Flow Measuring Installations | S2.0 | 30.00 | 0.00\% | MACRS | 25.00 |
| 371.00 Pumping Equipment | R3.0 | 35.00 | 0.00\% | MACRS | 25.00 |
| 380.00 Treatment and Disposal Equipment | R2.0 | 45.00 | 0.00\% | MACRS | 25.00 |
| 381.00 Plant Sewers | R3.0 | 45.00 | 0.00\% | MACRS | 25.00 |
| 389.00 Other Plant \& Misc Equip | R3.0 | 45.00 | 0.00\% | MACRS | 25.00 |
| 391.00 Office Furniture and Equipment | R3.0 | 20.00 |  |  |  |
| 391.00 Transportation Equipment | R3.0 | 15.00 | 0.00\% | MACRS | 10.00 |
| 392.00 Stores Equipment | R3.0 | 35.00 | 0.00\% | MACRS | 25.00 |
| 393.00 Tools, Shop, \& Garage Equipment | R3.0 | 25.00 | 0.00\% | MACRS | 25.00 |
| 394.00 Laboratory Equipment | R3.0 | 20.00 | 0.00\% | MACRS | 20.00 |
| 395.00 Power Operated Equipment | R3.0 | 15.00 | 0.00\% | MACRS | 15.00 |
| 396.00 Communications Equipment | R3.0 | 15.00 | 0.00\% | MACRS | 12.00 |
| 397.00 Miscellaneous Equipment | R3.0 | 20.00 | 0.00\% | MACRS | 20.00 |
| 352.00 Franchises | Non-Depr | 0.00 | 0.00\% | Non-Depr | 0.00 |
| 353.00 Land \& Land Rights | Non-Depr | 0.00 | 0.00\% | Non-Depr | 0.00 |

As the above table demonstrates the depreciation lives selected for the AUS Consultants appraisal are consistent with the industry depreciation studies' finding for wastewater plant. However due to the age of some of the property the extend of the depreciation was limited to $85 \%$ of the assets original cost and its replacement cost new.

## Iowa Survivor Curves

The lowa Survivor Curves recommended in the McKeesport appraisal are used to determine the remaining life of the property, and therefore its condition, recognizing the properties' service life and age. The lowa Survivor Curves allows the appraiser to recognize the property being studied (mains, treatment and pumping plant equipment etc placed in a particular year, say1985) is part of a larger group of property, i.e., all the property i.e., mains, treatment and pumping plant equipment, etc. As such, the service lives which we refer to in our appraisal are an average service lives for the group, i.e., the average life of all mains, treatment and pumping plant equipment, etc. The lowa Survivor curve allows the appraiser to calculate the remaining life, and therefore condition, of a subset of the group (the mains placed in 1985) based on the groups': (1) Iowa Survivor Curve, (2) Service Life and the (3) age of property at the appraisal date. An lowa Survivor Curves depicts how property from a group survives and retires about that groups' average life.


The above figure depicts a typical lowa-type survivor curve, an S3.0 lowa-type survivor curve. In this case the survivor curve has been generalized to a service life of $100 \%$ of the property's average life, in this generalized form the survivor curve statistics can be utilized with any individual service life in the age-life service life and depreciation calculations. There are four characteristics displayed in the above chart depicting the manner in which property survives and retires about the group's average life, those characteristics are: the retirement frequency (blue), the percent surviving (red), the percent condition (brown) and the percent depreciated (green). The retirement frequency represents the retirement of individual property items about the group's average service life. As can be seen the retirements are distributes about the group's average life with some items retiring before the average life and some items retiring at or after the group's service life. The group's survivor curve is developed from subtracting the retirements as they occur as the property ages. The depreciation curve depicts how much of the property group's life has been consumed; while the condition curve depict
how much of the property group's life remains. The condition and depreciation curves are complementary in that condition equals $100 \%$ minus depreciation and vice versa.

The theory of lowa Survivor Curves was presented in the 1920s and 30s by Robley Winfrey based on research at lowa State University (then the lowa Engineering Experiment Station). Winfrey's research was first published in Bulletin 103 - Life Characteristics of Physical Property and Bulletin 125-Statistical Analysis of Industrial Property Retirements. (Incidentally, both publications are out of print, I have a copy of Bulletin 125 but not Bulletin 103, I'm still trying to get a copy of that piece of depreciation literature.). Bulletin 125 was updated in 1967 by Professor Harold Cowles of lowa State University's Department of Industrial Engineering. In conducting his research, Winfrey collected data on industrial property survival and retirement from various sources and analyzed that data as a function of property's age at retirement and ultimately the property groups' service life when all the property in the group was fully retired.

Winfrey discovered the industrial property's survival and retirement fits three basic patterns with relationship to the property's average life:


Symmetrically moded (S-type lowa Survivor Curves) (green) - The S-type lowa Survivor Curve is one wherein the property's retirements are symmetrically distributed about the mode. Mode in statistics is defined as the highest frequency, in this case retirement frequency. Thus an S-type lowa curve is like a normal curve; however, its shape is not identical to a normal distribution function.

Right moded (R-type lowa Curves) (brown) - the R-type lowa curve has its mode skewed to the right of the property's average life; therefore, the retirements tend to be distributed later in the property's life and there are less retirements earlier in the property's life.

Left moded (L-type lowa Curve) (red) - The L-type lowa curve has its mode skewed to the left of the property's average life; therefore, the retirements tend to be distributed earlier in the property's life and there are less retirements later in the property's life.

In the utility industry, the plant, i.e., mains, treatment and pumping plant equipment tends to have a R-type survival/retirement dispersion as it is designed to provide service over extended periods, requiring little maintenance, and it designers have significant experience in designing and placing such property.

In conjunction with the above described R-, S-, and L-type survival/retirement patterns, Winfrey determine that there were several patterns of the manner in which the retirements' peakedness occur around the average life. In this case, Winfrey described the peakedness of the property retirements with peakedness enumerations of $0,1,2,3$, 4,5 , and 6 . The low peakedness numbers 0 and 1 represent low levels of retirements being distributed over the property entire life, while high peakedness numbers, 5 and 6 represent retirement patterns where the majority or all the retirement occur tightly grouped around the property's average life. Peakedness numbers 2, 3, and 4 are middle of the road, so to speak, in terms of peakedness.


Origin moded (O-type) survivor curve (blue) - Harold Cowles in his 1967 update of Bulletin 125 introduced the O-type survivor curve with the mode of the curve at the origin or at age equal to zero (0) years. This class of lowa curves was over looked by Winfrey possibly because it made little intuitive sense that industrial retirement of property would have their maximum retirement frequency at age equal to zero. However, Cowles felt for completeness they should be included. O-type survivor curves do reflect the survival pattern of intangible assets.
lowa-type survivor curves are parametric, as opposed to formalistic, in that they were derived from empirical survival/retirement data which Winfrey collected. There are lowa curve equations are presented in Bulletin 125; however in most cases users reference standardized lowa Survivor Curve tables. The lowa-type survivor curves used in this appraisal have been generalized to a service life of $100 \%$ of the property's average life. By generalizing the service life to $100 \%$ of average life these tables can be used to generate survival and retirement statistics for property of any service life.

It should be apparent that lowa-types survivor curves are valid for any type property as the curves only depict how that property survives and retires about the average life of a group of similar property.

## Generalized Iowa-type Survivor Curves

As was discussed earlier, most users of the lowa-type survivor curves use standardized tables of lowa curves. The most usable form of these standardized tables are tables which have been generalized to a standard life of $100 \%$ of the property's average life. Based on these generalized tables the user can determine the property's remaining life by knowing the lowa-type survivor curve (mode and peakedness characteristics), the property's (group's) service life, and the specific property's (for which the remaining life is desired) age. The following table reflects how the remaining life, as well as its condition, is determined:

| Year | Study Date | Age | Iowa Curve | Service Life | $\begin{gathered} \text { Age \% of } \\ \text { ASL } \end{gathered}$ | Iowa Lookup | Iowa Condition | Remaining Life | Total Life | Condition |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  |  | ASL |  |  |  |  |  |  |
|  |  | years |  | years | \% |  |  | years | years | \% |
|  |  |  |  |  |  |  |  |  |  |  |
| Input |  | Calc | Input | Input | Calc | Calc | lookup | Calc | Calc | Calc |
|  |  |  |  |  |  |  |  |  |  |  |
| 1970 | 2006 | 35.5 | R3.0 | 25 | 142 | R3.0142 | 0.066388 | 1.7 | 37.2 | 4.47\% |
| 1980 | 2006 | 25.5 | R3.0 | 25 | 102 | R3.0102 | 0.192543 | 4.8 | 30.3 | 15.88\% |
| 1990 | 2006 | 15.5 | R3.0 | 25 | 62 | R3.0062 | 0.442050 | 11.1 | 26.6 | 41.62\% |
| 2000 | 2006 | 5.5 | R3.0 | 25 | 22 | R3.0022 | 0.787294 | 19.7 | 25.2 | 78.16\% |
| 2004 | 2006 | 1.5 | R3.0 | 25 | 6 | R3.0006 | 0.941117 | 23.5 | 25.0 | 94.01\% |
| 2005 | 2006 | 0.5 | R3.0 | 25 | 2 | R3.0002 | 0.980320 | 24.5 | 25.0 | 98.00\% |

The above table was develop with reference to the standardized lowa Survivor curves contained and represent a R3.0 25 year lowa curve and life table. The standardized lowa Curves are located in tab database. In order to reference the proper line of the lowa Curve data the user looks up that data by reference to the property's age as percent of the service life (age \% of ASL column) and the lowa Survivor curve (lowa Curve column), combining these two criteria the lowa Lookup column will get the user to the proper lowa Curve data.

In the above calculation the lowa-type survivor curve is R3, the service life of the group is 25 years, and its age is defined by property's accounting records which specifies the investment in property by account (A group in service life terms) and by the year of installation of that property. The age is dependent upon the appraisal year (study date) and the year of placement. It is customary to assume that the property placed in any particular placement year was placed continuously during that year and therefore its age is best represented as if that investment was placed in the middle of the year, i.e., July 1 ; hence, the adoption of the "mid-year" convention where all property is treated as if placed the mid-year.

## Service Life and Survival/retirement pattern

The service life and survival/retirement pattern are determined by an analysis of historical survival and retirement experience of the company's property. This historical experience must be adjusted for factor which are known to be impacting the property's
service life but may not exhibited their effect on the property's retirement. Here it is important that a distinction is made between industrial property's physical service life and its functional service life. While physically a type of property may be deployed and remain in use for many years, over those years factors of changing technology, consumers demand and patterns, and even regulation, lessen the property functional life when compared to its physical life. In an industry such as the communications industry, function obsolescence is the primary driver of depreciation.

The following table details the impact of the above-described lives on the condition calculations:

| Year | Study Date | Age | Iowa Curve | Service Life | $\begin{gathered} \text { Age \% of } \\ \text { ASL } \end{gathered}$ | Iowa Lookup | Iowa Condition | Remaining Life | Total Life | Condition |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  |  | ASL |  |  |  |  |  |  |
|  |  | years |  | years | \% |  |  | years | years | \% |
|  |  |  |  |  |  |  |  |  |  |  |
| Input |  | Calc | Input | Input | Calc | Calc | lookup | Calc | Calc | Calc |
|  |  |  |  |  |  |  |  |  |  |  |
| 1970 | 2006 | 35.5 | R3.0 | 30 | 118 | R3. 0118 | 0.131771 | 4.0 | 39.5 | 10.02\% |
| 1979 | 2006 | 26.5 | R3.0 | 30 | 88 | R3.0088 | 0.264919 | 7.9 | 34.4 | 23.07\% |
| 1981 | 2006 | 24.5 | R3.0 | 25 | 98 | R3.0098 | 0.211333 | 5.3 | 29.8 | 17.74\% |
| 1989 | 2006 | 16.5 | R3.0 | 25 | 66 | R3.0066 | 0.411848 | 10.3 | 26.8 | 38.42\% |
| 1990 | 2006 | 15.5 | R3.0 | 20 | 78 | R3.0078 | 0.327281 | 6.5 | 22.0 | 29.69\% |
| 2000 | 2006 | 5.5 | R3.0 | 20 | 28 | R3.0028 | 0.731331 | 14.6 | 20.1 | 72.67\% |
| 2004 | 2006 | 1.5 | R3.0 | 20 | 8 | R3.0008 | 0.921605 | 18.4 | 19.9 | 92.47\% |
| 2005 | 2006 | 0.5 | R3.0 | 20 | 3 | R3.0003 | 0.970499 | 19.4 | 19.9 | 97.49\% |

# Statistical Analyses of Industrial Property Retirements by <br> Robley Niufrey 



Búlutin 125 REvisto

ENGINEERING RESEARCH INSTITUTE Iowa State University - Ames, Iowa

## IOWA CURVES

lowa-type survivor curves are based on a set of empirical data collected (mainly in the 1930s) for the purpose of statistically predicting future service expectancy (remaining service) for physical properties.

The techniques used and methods applied are exactly analogous to those used by the insurance industry for the purpose of predicting human mortality (life expectancy) when determining appropriate insurance premium rates. The only distinction to be made is that the life insurance companies are investigating the life or longevity characteristics of human beings and the studies which developed the lowa-type survivor curves were developed to predict the longevity or service life experience for physical, inanimate objects. The seminal statistical analyses for industrial property were conducted under the auspices of the lowa Research Station now known as lowa State University and were published in Statistical Analyses of Industrial Property Retirements, Bulletin 125, Engineering Research Institute, Iowa State University.

From the preface to the revised 1967 edition of Bulletin 125:
"With the original publication of Bulletin 125 by the lowa Engineering Experiment Station in 1935 (now known as the Engineering Research Institute), a significant contribution was made to the practice of industrial property life estimation. This was in the form, first, of a single volume, readily available, which presented in considerable detail the procedures for statistically analyzing historical property retirement data. Secondly, but no less significant, was the presentation of a set of 18 generalized density functions descriptive of industrial property retirement dispersion, mathematically described in terms of the Pearson frequency curve family, but with parameters established empirically from the analysis of a wide range of actual retirement experience.

These curves, the cumulative form of which are commonly referred to as the lowatype Survivor Curves, have been used extensively since their introduction and, at the present time, the set is accepted as the standard of industrial property retirement dispersion. Because of the very simple mnemonic coding system which suggests the varying statistical characteristics involved, the lowa Curves have also become widely used and recognized in the identification or classification of retirement dispersions, even for patterns derived in terms of analytical techniques not using the Curves."

The tables which follow this discussion are the ones used to estimate the remaining life of investment at particular age for an account with a particular service life.

# Statistical Analyses of Industrial Property Retirements 

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lowa State l'miversity. Imes. law:


8. The service life of a mit is that period of time (or service) extending irom the date of its installation to the date of its retirement from service. While the serviee llfe of physical property is usually arpressed in years it may also be expressed in tarms of units of production (serews, wheels, cars, pounds, miles, car-miles), time units of leas than a year (moatha, houra, minutea), of combinations of physical units or serrices ahd time (lamp-hours, tom-years).
9. The probable service life of an individual unit is that period of time crtending from ite date of installation to the foreensted date when it probably will be retired from sarvice.
10. The espectancy of life of an individunl unit is that period of time extending from the ohearvation age (umally the present) to the furceasted date whon the unit probably will be retired from service. Age plus expcetaney always cquale prohable life
11. The average saroice life of a group of individual units is the quotient oblained hy dividing the sum of the scrvice lives of all the units by the number of umits. The average service life (in years) is equal to the area uniler the survivor curve in percent-yeara (or unityenra) dividerl hy 100 prreont (or the tofal number of unita).
12. The probuble atrerage serrice lifa of a group of individual units is the average of the probable sarvice lives of the units of the group.
18. The expectuncy of life of a group of individual units is that period of time extending from the ofrorvation age (usually the prasent) to the arerage of the forcensted dntes when the units probably will be rotired. The observation are plus the expectancy always. equals the probable average service ithe
vice ilfe and probable averabe eerrice illa alwaye must be celimated
stace thay ara forments of uneompleted cerrice.
14. Marimum lifa or maximuem age is the age of the lact unit of a given pruup to be retired from sarrice; it in almo the age at which the survivor curro ham a zoro ordinate, or zorso parcent surviving.
15. Property units which are taken out of service for any reason whatmwure are calleri retircmenta. Rotisementa may include originial units (unitx of tho initial installation) as well as "second-generation" unity, that in, replacemonts (or renewaln) which ware installed to take the place of the original units as thoy were removed.
16. Rrplucements are the unita put in earried to replace retirementis
17. Rrururuh are replacements "in kind" which have exactly the same life charneteristics as the retiremente.
18. Installutions are now mits placed in service, not as replacement units, but as additions to the property.
20. Survisurals, replacements, and installations are placements.
20. Survitur curves show the number of units of a given group
which are surviving in service at given ages. The ordinates to the curve give at any particular age the percentage (or the actual nombor) of the original namber which are yet surviving in service. The abscissa is measured in years or other suitable service unit. The original survivar curve is the curve drawn through the points calculated from the original data without adjustment. Since this origival survivor curve is generally irregular it is smoothed to produce a smoothed survivor curve, sometimes roferred to an an adjusted curvo. Survivor curvas have in some publications been referred to an morRelity curves. However, the term survivor curve is used in this report because the curves referred to show the percent surviving, not the percont retired, and because the term mortality suggeats homan beinga and not inanimate objects.
21. A stub survivor curve is an incomplete survivor curve; that is, one which does not extend to zero percent surviving becanse of a lack of retirament data on the longer-lived unita
22. A probable-life curve showe the probable average life of the survivors at any age from zero to maximum lifo.
28. If the percent surviving is read at the beginning of each successive age-intervil and the differences in these successive readinga plotted at ages corresponding to the midpoints of the intervals, the romilting points form a frequency curve, or distribution curve. Since the ordinates indicste the percuntage of the units retired daring each interval, the curve shows in what manner the retirements are diftribated over the period from zero age to maximum life.
24. The point on the frequency curve having the highest ordinate is called the mode. The year in which the mode oecurs is called the
25. A maximum-life cycle is a period of time corresponding in length to the maximum life of the unita. An industrial property may continue to be operated through several maximum-life cycles of some of the unita of which it is composed.
28. An average-life cycle is a period of time corresponding in length to the average life.
27. If a property is continued in service for a long time and mainlained with a comstant number of like units of substantially the same potential avernge life, it will reach a normal condítion or stabilized. condilion, after which the average age of the units in service and the annual renewals will be constant year nfter yoar.
28. Normal renewals are the annual renewals after the proparty group has reached a atabilized condition. Normal renewals, in per. cent of the original number of units, are equal to 100 percent divided by the average life.
29. Generalized curves are those whose ordinates arc expressed in percent of the total number of unita and whose abscissas (age) are er. pressed in percent of average life.
30. Type curves are those theoretical curves derived by the methods described in this report from a study of actual retirements. They depict typical survivor and frequency curves for industrial property. process of determining probable sured with type survivor curves in the

## MORTALITY TABLER

and Curves of human aeings arrived at life tables for haman he, life insurance companies have Prom these life tables the norman beings of different nationalitics. people at different uges can normal death rate and life expectancy for premiums and reserves. Lifo tables can as a basis for life insurance etatistiea for any desired number of can be prepared from the vital returns. By means of mathomer of jears in combination with carsus to remove uny slight irregularitien formulas a life table is adjusted
Table 1 is the United States life table may exist in tho original data. deaths for the 10 years from 1901 to 1010 . Unike indurus, based upon units whose average lives are contivio. Unilke induytrial property forces, the human average life and distributiong affeted by many to age change very little over severnl gencrations of deaths aecording ever, varies considerably for different rnces os is ithe life carve, howThe deatha at different ages are shown for the United Sill in Fig. 2 . frequency carves in Fig. 3 . are shown for the United States by the This reference to the Un similarity between the life characteristice tables is made to show the trial propertiea. The essential difererences of human beings and indusings experience a heavy infant mortality are three. First, human befrequency carve, one mode oceurring lity which results in a bi-modal othar between ages 75 and 76. Second theen ages 0 and 1, and the 75-i6 occure at a much ereater pecond, the mode at the agc-interval ually found with physical prop percentage of average life than is uscurves for industrial equipmont vemployed in industry. Third, the human mortality curves vary vary in shape over wide limits while enive in Fig. 3 is ono that hary relutively littlo. The Makehamized the same group of lives as the lower cumothed. (It does not reprement

## aNALYzing retirement data

The foregoing section discussed the life tables for humans and the accompanying curves. Similar analysea can be made of the lochavine of the physical equipment employed in industry when sufficient information is available. The processes employed for analyzing the retirements of industrial property are not so easily handled as are those cmployed for mortality datu of human beings, nor are the results usunily as uniform because of the small number of units olserved and the more numerous, less uniform causes of retirement of industrial

SURVIVOR, PROBABLE INIFE AND FREQUENCX CURVES FOR THE RIGRT-MODAL IOWA TYPE CURVES


CHART NO. 8
SURVIVOR, PROBABLE LIF'E AND FREQUENCY CURVES
FOR THE SYMMEIRICAL IOWA TYPE CURVES


SURVIVOR, PROBABLE LIFE AND FREQUENCY CURVES FOR THE LEFT-MODAL IOWA TYPE CURVES


## SURVIVOR, PROBABLE LIFE AND FREQUENCY CURVES FOR THE ORIGIN-MODAL TYPE CURVES



## lowa-type Retirement - Survival Tables

Percent Retired, Surviving, Condition, and Depreciation Reserve as a function of Age as a Percent of Average Service Life

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Lookup | Curve | Age \% | \% Ret | \% Surv | \% Cond | Depr Resy |
| R2.0000 | R2.0 | 0 | 0.0948315 | 100.0000000 | 100.0000000 | 0.0000000 |
| R2.0001 | R2.0 | 1 | 0.0981016 | 99.9051685 | 99.0944462 |  |
| R2.0002 | R2.0 | 2 | 0.1014623 | 99.8070669 | 98.1913567 | 1.8086433 |
| R2.0003 | R2.0 | 3 | 0.1049099 | 99.7056046 | 97.2907686 | 2.7092314 |
| R2.0004 | R2.0 | 4 | 0.1084509 | 99.6006947 | 96.3927202 | 3.6072798 |
| R2.0005 | R2.0 | 5 | 0.1120825 | 99.4922438 | 95.4972458 | 4.5027542 |
| R2.0006 | R2.0 | 6 | 0.1158104 | 99.3801613 | 94.6043863 | 5.3956137 |
| R2.0007 | R2.0 | 7 | 0.1196318 | 99.2643509 | 93.7141762 | 6.2858238 |
| R2.0008 | R2.0 | 8 | 0.1235532 | 99.1447191 | 92.8266525 | 7.1733475 |
| R2.0009 | R2.0 | 9 | 0.1275731 | 99.0211659 | 91.9418526 | 8.0581474 |
| R2.0010 | R2.0 | 10 | 0.1316938 | 98.8935928 | 91.0598126 | 8.9401874 |
| R2.0011 | R2.0 | 11 | 0.1359167 | 98.7618990 | 90.1805687 | 9.8194313 |
| R2.0012 | R2.0 | 12 | 0.1402454 | 98.6259823 | 89.3041592 | 10.6958408 |
| R2.0013 | R2.0 | 13 | 0.1446791 | 98.4857369 | 88.4306173 | 11.5693827 |
| R2.0014 | R2.0 | 14 | 0.1492214 | 98.3410578 | 87.5599813 | 2.4400187 |
| R2.0015 | R2.0 | 15 | 0.1538735 | 98.1918364 | 86.6922846 | 13.3077154 |
| R2.0016 | R2.0 | 16 | 0.1586370 | 98.0379629 | 85.8275662 | 14.1724338 |
| R2.0017 | R2.0 | 17 | 0.1635142 | 97.8793259 | 84.9658604 | 15.0341396 |
| R2.0018 | R2.0 | 18 | 0.1685056 | 97.7158117 | 84.1072016 | 5.8927984 |
| R2.0019 | R2.0 | 19 | 0.1736164 | 97.5473061 | 83.2516279 | 16.7483721 |
| R2.0020 | R2.0 | 20 | 0.1788426 | 97.3736897 | 82.3991718 | 17.6008282 |
| R2.0021 | R2.0 | 21 | 0.1841926 | 97.1948471 | 81.5498714 | 286 |
| R2.0022 | R2.0 | 22 | 0.1896649 | 97.0108545 | 80.7037592 | 19.2962408 |
| R2.0023 | R2.0 | 23 | 0.1952619 | 96.8209896 | 79.8608723 | 20.1391277 |
| R2.0024 | R2.0 | 24 | 0.2009860 | 96.6257277 | 79.0212450 | 20.9787550 |
| R2.0025 | R2.0 | 25 | 0.2068376 | 96.4247417 | 78.1849127 | 1.8150873 |
| R2.0026 | R2.0 | 26 | 0.2128210 | 96.2179041 | 77.3519096 | 22.6480904 |
| R2.0027 | R2.0 | 27 | 0.2189369 | 96.0050831 | 76.5222740 | 23.4777260 |
| R2.0028 | R2.0 | 28 | 0.2251892 | 95.7861462 | 75.6960373 | 24.3039627 |
| R2.0029 | R2.0 | 29 | 0.2315760 | 95.5609570 | 74.8732357 | 25.1267643 |
| R2.0030 | R2.0 | 30 | 0.2381039 | 95.3293810 | 74.0539045 | 25.9460955 |
| R2.0031 | R2.0 | 31 | 0.2447710 | 95.0912771 | 73.2380800 | 26.7619200 |
| R2.0032 | R2.0 | 32 | 0.2515831 | 94.8465061 | 72.4257956 | 27.5742044 |
| R2.0033 | R2.0 | 33 | 0.2585392 | 94.5949230 | 71.6170883 | 28.3829117 |
| R2.0034 | R2.0 | 34 | 0.2656450 | 94.3363838 | 70.8119927 | 29.1880073 |
| R2.0035 | R2.0 | 35 | 0.2728977 | 94.0707388 | 70.0105457 | 29.9894543 |
| R2.0036 | R2.0 | 36 | 0.2803049 | 93.7978411 | 69.2127819 | 30.7872181 |
| R2.0037 | R2.0 | 37 | 0.2878657 | 93.5175362 | 68.4187384 | 31.5812616 |
| R2.0038 | R2.0 | 38 | 0.2955808 | 93.2296705 | 67.6284504 | 32.3715496 |
| R2.0039 | R2.0 | 39 | 0.3034544 | 92.9340897 | 66.8419552 | 33.1580448 |
| R2.0040 | R2.0 | 40 | 0.3114920 | 92.6306353 | 66.0592899 | 33.9407101 |
| R2.0041 | R2.0 | 41 | 0.3196878 | 92.3191433 | 65.2808571 | 34.7191429 |
| R2.0042 | R2.0 | 42 | 0.3280507 | 91.9994555 | 64.5055971 | 35.4944029 |
| R2. 0043 | R2.0 | 43 | 0.3365783 | 91.6714048 | 63.7346439 | 36.2653561 |
| R2.0044 | R2.0 | 44 | 0.3452769 | 91.3348265 | 62.9676700 | 37.0323300 |

## lowa-type Retirement - Survival Tables

Percent Retired, Surviving, Condition, and Depreciation Reserve as a function of Age as a Percent of Average Service Life

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Lookup | Curve | Age \% | \% Ret | \% Surv | \% Cond | \% Depr Resv |
| R2.0045 | R2.0 | 45 | 0.3541450 | 90.9895496 | 62.2047148 | 37.7952852 |
| R2.0046 | R2.0 | 46 | 0.3631840 | 90.6354046 | 61.4458170 | 38.5541830 |
| R2.0047 | R2.0 | 47 | 0.3723984 | 90.2722206 | 60.6910148 | 39.3089852 |
| R2.0048 | R2.0 | 48 | 0.3817892 | 89.8998222 | 59.9403491 | 40.0596509 |
| R2.0049 | R2.0 | 49 | 0.3913574 | 89.5180330 | 59.1938582 | 40.8061418 |
| R2.0050 | R2.0 | 50 | 0.4011030 | 89.1266756 | 58.4515839 | 41.5484161 |
| R2.0051 | R2.0 | 51 | 0.4110289 | 88.7255726 | 57.7135668 | 42.2864332 |
| R2.0052 | R2.0 | 52 | 0.4211368 | 88.3145437 | 56.9798470 | 43.0201530 |
| R2.0053 | R2.0 | 53 | 0.4314261 | 87.8934069 | 56.2504678 | 43.7495322 |
| R2.0054 | R2.0 | 54 | 0.4419002 | 87.4619808 | 55.5254688 | 44.4745312 |
| R2.0055 | R2.0 | 55 | 0.4525547 | 87.0200806 | 54.8048959 | 45.1951041 |
| R2.0056 | R2.0 | 56 | 0.4633961 | 86.5675259 | 54.0887899 | 45.9112101 |
| R2.0057 | R2.0 | 57 | 0.4744196 | 86.1041298 | 53.3771148 | 46.6228852 |
| R2.0058 | R2.0 | 58 | 0.4856272 | 85.6297102 | 52.6701531 | 47.3298469 |
| R2.0059 | R2.0 | 59 | 0.4970178 | 85.1440830 | 51.9677110 | 48.0322890 |
| R2.0060 | R2.0 | 60 | 0.5085907 | 84.6470652 | 51.2699108 | 48.7300892 |
| R2.0061 | R2.0 | 61 | 0.5203457 | 84.1384745 | 50.5767999 | 49.4232001 |
| R2.0062 | R2.0 | 62 | 0.5322781 | 83.6181288 | 49.8884211 | 50.1115789 |
| R2.0063 | R2.0 | 63 | 0.5443878 | 83.0858507 | 49.2042208 | 50.7957792 |
| R2.0064 | R2.0 | 64 | 0.5566711 | 82.5414629 | 48.5260449 | 51.4739551 |
| R2.0065 | R2.0 | 65 | 0.5691252 | 81.9847918 | 47.8521390 | 52.1478610 |
| R2.0066 | R2.0 | 66 | 0.5817490 | 81.4156666 | 47.1831479 | 52.8168521 |
| R2.0067 | R2.0 | 67 | 0.5945339 | 80.8339176 | 46.5191188 | 53.4808812 |
| R2.0068 | R2.0 | 68 | 0.6074762 | 80.2393837 | 45.8600979 | 54.1399021 |
| R2.0069 | R2.0 | 69 | 0.6205731 | 79.6319075 | 45.2061300 | 54.7938700 |
| R2.0070 | R2.0 | 70 | 0.6338167 | 79.0113344 | 44.5572619 | 55.4427381 |
| R2.0071 | R2.0 | 71 | 0.6471968 | 78.3775177 | 43.9135399 | 56.0864601 |
| R2.0072 | R2.0 | 72 | 0.6607103 | 77.7303209 | 43.2750101 | 56.7249899 |
| R2.0073 | R2.0 | 73 | 0.6743469 | 77.0696106 | 42.6417151 | 57.3582848 |
| R2.0074 | R2.0 | 74 | 0.6880913 | 76.3952637 | 42.0137038 | 57.9862962 |
| R2.0075 | R2.0 | 75 | 0.7019453 | 75.7071724 | 41.3910160 | 58.6089840 |
| R2.0076 | R2.0 | 76 | 0.7158861 | 75.0052271 | 40.7736988 | 59.2263012 |
| R2.0077 | R2.0 | 77 | 0.7299071 | 74.2893410 | 40.1617951 | 59.8382049 |
| R2.0078 | R2.0 | 78 | 0.7439918 | 73.5594339 | 39.5553460 | 60.4446540 |
| R2.0079 | R2.0 | 79 | 0.7581263 | 72.8154421 | 38.9543939 | 61.0456061 |
| R2.0080 | R2.0 | 80 | 0.7722978 | 72.0573158 | 38.3589792 | 61.6410208 |
| R2.0081 | R2.0 | 81 | 0.7864914 | 71.2850180 | 37.7691412 | 62.2308588 |
| R2.0082 | R2.0 | 82 | 0.8006802 | 70.4985266 | 37.1849198 | 62.8150802 |
| R2.0083 | R2.0 | 83 | 0.8148537 | 69.6978464 | 36.6063528 | 63.3936472 |
| R2.0084 | R2.0 | 84 | 0.8289880 | 68.8829927 | 36.0334740 | 63.9665260 |
| R2.0085 | R2.0 | 85 | 0.8430577 | 68.0540047 | 35.4663181 | 64.5336819 |
| R2.0086 | R2.0 | 86 | 0.8570489 | 67.2109470 | 34.9049168 | 65.0950832 |
| R2.0087 | R2.0 | 87 | 0.8709355 | 66.3538981 | 34.3493028 | 65.6506972 |
| R2.0088 | R2.0 | 88 | 0.8846855 | 65.4829626 | 33.7995038 | 66.2004962 |
| R2.0089 | R2.0 | 88 | 0.8982801 | 64.5982771 | 33.2555461 | 66.7444539 |

## lowa-type Retirement - Survival Tables

Percent Retired, Surviving, Condition, and Depreciation Reserve as a function of Age as a Percent of Average Service Life

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| okup |  | \% | \% Ret | Surv | Cond | pr Resv |
| R2.0090 | R2.0 | 90 | 0.9116889 | 63.6999970 | 32.7174568 | 67.2825432 |
| R2.0091 | R2.0 | 91 | 0.9248881 | 62.7883081 | 32.1852560 | 67.8147440 |
| R2.0092 | R2.0 | 92 | 0.9378390 | 61.8634200 | 31.6589661 | 68.3410339 |
| R2.0093 | R2.0 | 93 | 0.9505158 | 60.9255810 | 31.1386020 | 68.8613980 |
| R2.0094 | R2.0 | 94 | 0.9628930 | 59.9750652 | 30.6241779 | 69.3758221 |
| R2.0095 | R2.0 | 95 | 0.9749274 | 59.0121722 | 30.1157100 | 69.8842900 |
| R2.0096 | R2.0 | 96 | 0.9865956 | 58.0372448 | 29.6132040 | 70.3867960 |
| R2.0097 | R2.0 | 97 | 0.9978571 | 57.0506492 | 29.1166680 | 70.8833320 |
| R2.0098 | R2.0 | 98 | 1.0086742 | 56.0527921 | 28.6261051 | 71.3738949 |
| R2.0099 | R2.0 | 99 | 1.0190200 | 55.0441179 | 28.1415110 | 71.8584890 |
| R2.0100 | R2.0 | 100 | 1.0288558 | 54.0250979 | 27.6628840 | 72.3371160 |
| R2.0101 | R2.0 | 101 | 1.0381442 | 52.9962421 | 27.1902180 | 72.8097820 |
| R2.0102 | R2.0 | 102 | 1.0468449 | 51.9580979 | 26.7234991 | 73.2765009 |
| R2.0103 | R2.0 | 103 | 1.0549312 | 50.9112530 | 26.2627111 | 73.7372889 |
| R2.0104 | R2.0 | 104 | 1.0623607 | 49.8563218 | 25.8078351 | 74.1921649 |
| R2.0105 | R2.0 | 105 | 1.0691033 | 48.7939611 | 25.3588469 | 74.6411531 |
| R2.0106 | R2.0 | 106 | 1.0751200 | 47.7248578 | 24.9157200 | 75.0842800 |
| R2.0107 | R2.0 | 107 | 1.0803718 | 46.6497378 | 24.4784200 | 75.5215800 |
| R2.0108 | R2.0 | 108 | 1.0848422 | 45.5693660 | 24.0469079 | 75.9530921 |
| R2.0109 | R2.0 | 109 | 1.0884819 | 44.4845238 | 23.6211450 | 76.3788550 |
| R2.0110 | R2.0 | 110 | 1.0912700 | 43.3960419 | 23.2010810 | 76.7989190 |
| R2.0111 | R2.0 | 111 | 1.0931697 | 42.3047719 | 22.7866659 | 77.2133341 |
| R2.0112 | R2.0 | 112 | 1.0941701 | 41.2116022 | 22.3778369 | 77.6221631 |
| R2.0113 | R2.0 | 113 | 1.0942240 | 40.1174321 | 21.9745369 | 78.0254631 |
| R2.0114 | R2.0 | 114 | 1.0933342 | 39.0232081 | 21.5766909 | 78.4233091 |
| R2.0115 | R2.0 | 115 | 1.0914621 | 37.9298739 | 21.1842289 | 78.8157711 |
| R2.0116 | R2.0 | 116 | 1.0885978 | 36.8384118 | 20.7970691 | 79.2029309 |
| R2.0117 | R2.0 | 117 | 1.0847301 | 35.7498140 | 20.4151239 | 79.5848761 |
| R2.0118 | R2.0 | 118 | 1.0798369 | 34.6650839 | 20.0383019 | 79.9616981 |
| R2.0119 | R2.0 | 119 | 1.0739369 | 33.5852470 | 19.6665001 | 80.3334999 |
| R2.0120 | R2.0 | 120 | 1.0669980 | 32.5113101 | 19.2996221 | 80.7003779 |
| R2.0121 | R2.0 | 121 | 1.0590372 | 31.4443121 | 18.9375479 | 81.0624521 |
| R2.0122 | R2.0 | 122 | 1.0501070 | 30.3852749 | 18.5801630 | 81.4198370 |
| R2.0123 | R2.0 | 123 | 1.0400660 | 29.3351679 | 18.2273769 | 81.7726231 |
| R2.0124 | R2.0 | 124 | 1.0290709 | 28.2951019 | 17.8789959 | 82.1210041 |
| R2.0125 | R2.0 | 125 | 1.0170991 | 27.2660310 | 17.5349121 | 82.4650879 |
| R2.0126 | R2.0 | 126 | 1.0041568 | 26.2489319 | 17.1949849 | 82.8050151 |
| R2.0127 | R2.0 | 127 | 0.9902881 | 25.2447751 | 16.8590529 | 83.1409471 |
| R2.0128 | R2.0 | 128 | 0.9755079 | 24.2544870 | 16.5269830 | 83.4730170 |
| R2.0129 | R2.0 | 129 | 0.9598532 | 23.2789791 | 16.1985951 | 83.8014049 |
| R2.0130 | R2.0 | 130 | 0.9433670 | 22.3191259 | 15.8737270 | 84.1262730 |
| R2.0131 | R2.0 | 131 | 0.9260879 | 21.3757589 | 15.5522090 | 84.4477910 |
| R2.0132 | R2.0 | 132 | 0.9080550 | 20.4496710 | 15.2338660 | 84.7661340 |
| R2.0133 | R2.0 | 133 | 0.8893190 | 19.5416160 | 14.9185150 | 85.0814850 |
| R2.0134 | R2.0 | 134 | 0.8699369 | 18.6522970 | 14.6059730 | 85.3940270 |

Iowa-type Retirement - Survival Tables
Percent Retired, Surviving, Condition, and Depreciation Reserve as a function of Age as a Percent of Average Service Life

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Lookup |  | \% | \% Ret | \% Surv | \% Cond | V |
| R2.0135 | R2.0 | 135 | 0.8499541 | 17.7823601 | 14.2960570 | 85.7039430 |
| R2.0136 | R2.0 | 136 | 0.8294290 | 16.9324060 | 13.9885750 | 86.0114250 |
| R2.0137 | R2.0 | 137 | 0.8084200 | 16.1029770 | 13.6833420 | 86.3166580 |
| R2.0138 | R2.0 | 138 | 0.7869870 | 15.2945570 | 13.3801709 | 86.6198291 |
| R2.0139 | R2.0 | 139 | 0.7651829 | 14.5075700 | 13.0788760 | 86.9211240 |
| R2.0140 | R2.0 | 140 | 0.7430681 | 13.7423871 | 12.7792740 | 7.2207260 |
| R2.0141 | R2.0 | 141 | 0.7207081 | 12.9993190 | 12.4811831 | 87.5188169 |
| R2.0142 | R2.0 | 142 | 0.6981599 | 12.2786109 | 12.1844341 | 87.8155659 |
| R2.0143 | R2.0 | 143 | 0.6754730 | 11.5804510 | 11.8888620 | 88.1111380 |
| R2.0144 | R2.0 | 144 | 0.6527110 | 10.9049780 | 11.5943070 | 88.4056930 |
| R2.0145 | R2.0 | 145 | 0.6299220 | 10.2522670 | 11.3006270 | 88.6993730 |
| R2.0146 | R2.0 | 146 | 0.6071579 | 9.6223450 | 11.0076849 | 88.9923151 |
| R2.0147 | R2.0 | 147 | 0.5844650 | 9.0151870 | 10.7153600 | 89.2846400 |
| R2.0148 | R2.0 | 148 | 0.5618890 | 8.4307220 | 10.4235460 | 89.5764540 |
| R2.0149 | R2.0 | 149 | 0.5394630 | 7.8688330 | 10.1321560 | 89.8678440 |
| R2.0150 | R2.0 | 150 | 0.5172310 | 7.3293700 | 9.8411110 | O. 1588891 |
| R2.0151 | R2.0 | 151 | 0.4952170 | 6.8121390 | 9.5503610 | 90.4496390 |
| R2.0152 | R2.0 | 152 | 0.4734520 | 6.3169220 | 9.2598670 | 90.7401331 |
| R2.0153 | R2.0 | 153 | 0.4519570 | 5.8434700 | 8.9696111 | 91.0303890 |
| R2.0154 | R2.0 | 154 | 0.4307510 | 5.3915130 | 8.6795980 | 1.3204020 |
| R2.0155 | R2.0 | 155 | 0.4098480 | 4.9607620 | 8.3898460 | 91.6101540 |
| R2.0158 | R2.0 | 156 | 0.3892590 | 4.5509140 | 8.1003940 | 91.8996060 |
| R2.0157 | R2.0 | 157 | 0.3689940 | 4.1616550 | 7.8112940 | 2.1887060 |
| R2.0158 | R2.0 | 158 | 0.3490550 | 3.7926610 | 7.5226200 | 92.4773800 |
| R2.0159 | R2.0 | 159 | 0.3294490 | 3.4436060 | 7.2344580 | 92.7655420 |
| R2.0160 | R2.0 | 160 | 0.3101780 | 3.1141570 | 6.9468990 | 93.0531010 |
| R2.0161 | R2.0 | 161 | 0.2912410 | 2.8039790 | 6.6600590 | 93.3399410 |
| R2.0162 | R2.0 | 162 | 0.2726440 | 2.5127380 | 6.3740460 | 93.6259540 |
| R2.0163 | R2.0 | 163 | 0.2543900 | 2.2400940 | 6.0889820 | 93.9110180 |
| R2.0164 | R2.0 | 164 | 0.2364840 | 1.9857040 | 5.8049920 | 94.1950080 |
| R2.0165 | R2.0 | 165 | 0.2189350 | 1.7492200 | 5.5221940 | 94.4778060 |
| R2.0166 | R2.0 | 166 | 0.2017570 | 1.5302850 | 5.2407130 | 94.7592870 |
| R2.0167 | R2.0 | 167 | 0.1849660 | 1.3285280 | 4.9606590 | 5.0393410 |
| R2.0168 | R2.0 | 168 | 0.1685830 | 1.1435620 | 4.6821490 | 95.3178510 |
| R2.0169 | R2.0 | 169 | 0.1526310 | 0.9749790 | 4.4052860 | 95.5947140 |
| R2.0170 | R2.0 | 170 | 0.1371620 | 0.8223480 | 4.1301220 | 5.8698780 |
| R2.0171 | R2.0 | 171 | 0.1221950 | 0.6851860 | 3.8568020 | 96.1431980 |
| R2.0172 | R2.0 | 172 | 0.1077830 | 0.5629910 | 3.5853840 | 96.4146160 |
| R2.0173 | R2.0 | 173 | 0.0939780 | 0.4552080 | 3.3159460 | 96.6840540 |
| R2.0174 | R2.0 | 174 | 0.0808330 | 0.3612300 | 3.0485230 | 96.9514770 |
| R2.0175 | R2.0 | 175 | 0.0684150 | 0.2803970 | 2.7832120 | 97.2167880 |
| R2.0176 | R2.0 | 176 | 0.0567860 | 0.2119820 | 2.5201260 | 97.4798740 |
| R2.0177 | R2.0 | 177 | 0.0460210 | 0.1551960 | 2.2592980 | 97.7407020 |
| R2.0178 | R2.0 | 178 | 0.0381913 | 0.1091750 | 2.0008840 | 97.9991160 |
| R2.0179 | R2.0 | 179 | 0.0273739 | 0.0729837 | 1.7451020 | 98.2548980 |

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lowa-type Retirement - Survival Tables
Percent Retired, Surviving, Condition, and Depreciation Reserve as a function of Age as a Percent of Average Service Life

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Lookup | Curve | Age \% | \% Ret | \% Surv | \% Cond | \% Depr Resv |
| R2.5000 | R2.5 | 0 | 0.0551548 | 100.0000000 | 100.0000000 | 0.0000000 |
| R2. 5001 | R2.5 | 1 | 0.0574713 | 99.9448452 | 99.0549097 | 0.9450903 |
| R2. 5002 | R2.5 | 2 | 0.0598783 | 99.8873739 | 98.1116142 | 1.8883858 |
| R2. 5003 | R2.5 | 3 | 0.0623808 | 99.8274956 | 97.1701632 | 2.8298368 |
| R2. 5004 | R2.5 | 4 | 0.0649805 | 99.7651148 | 96.2306089 | 3.7693911 |
| R2.5005 | R2.5 |  | 0.0676823 | 99.7001343 | 95.2930031 | 4.7069969 |
| R2. 5006 | R2.5 | 6 | 0.0704880 | 99.6324520 | 94.3573971 | 5.6426029 |
| R2. 5007 | R2.5 | 7 | 0.0734014 | 99.5619640 | 93.4238472 | 6.5761528 |
| R2.5008 | R2.5 | 8 | 0.0764256 | 99.4885626 | 92.4924040 | 7.5075960 |
| R2.5009 | R2.5 |  | 0.0795669 | 99.4121370 | 91.5631256 | 8.4368744 |
| R2.5010 | R2.5 | 10 | 0.0828257 | 99.3325701 | 90.6360693 | 9.3639307 |
| R2.5011 | R2.5 | 11 | 0.0862064 | 99.2497444 | 89.7112904 | 10.2887096 |
| R2.5012 | R2.5 | 12 | 0.0897122 | 99.1635380 | 88.7888441 | 11.2111559 |
| R2. 5013 | R2.5 | 13 | 0.0933485 | 99.0738258 | 87.8687897 | 12.1312103 |
| R2.5014 | R2.5 | 14 | 0.0971183 | 98.9804773 | 86.9511881 | 13.0488119 |
| R2.5015 | R2.5 | 15 | 0.1010247 | 98.8833590 | 86.0360956 | 13.9639044 |
| R2.5016 | R2.5 | 16 | 0.1050710 | 98.7823343 | 85.1235743 | 14.8764257 |
| R2. 5017 | R2.5 | 17 | 0.1092635 | 98.6772633 | 84.2136803 | 15.7863197 |
| R2.5018 | R2.5 | 18 | 0.1136026 | 98.5679998 | 83.3064766 | 16.6935234 |
| R2. 5019 | R2.5 | 19 | 0.1180954 | 98.4543972 | 82.4020252 | 17.5979748 |
| R2.5020 | R2.5 | 20 | 0.1227426 | 98.3363018 | 81.5003834 | 18.4996166 |
| R2.5021 | R2.5 | 21 | 0.1275521 | 98.2135592 | 80.6016140 | 19.3983860 |
| R2.5022 | R2.5 | 22 | 0.1325226 | 98.0860071 | 79.7057791 | 20.2942209 |
| R2.5023 | R2.5 | 23 | 0.1376619 | 97.9534845 | 78.8129368 | 21.1870632 |
| R2.5024 | R2.5 | 24 | 0.1429729 | 97.8158226 | 77.9231520 | 22.0768480 |
| R2.5025 | R2.5 | 25 | 0.1484576 | 97.6728497 | 77.0364828 | 22.9635172 |
| R2.5026 | R2.5 | 26 | 0.1541233 | 97.5243921 | 76.1529923 | 23.8470077 |
| R2.5027 | R2.5 | 27 | 0.1599703 | 97.3702688 | 75.2727404 | 24.7272596 |
| R2.5028 | R2.5 | 28 | 0.1660032 | 97.2102985 | 74.3957863 | 25.6042137 |
| R2.5029 | R2.5 | 29 | 0.1722278 | 97.0442953 | 73.5221920 | 26.4778080 |
| R2.5030 | R2.5 | 30 | 0.1786452 | 96.8720675 | 72.6520176 | 27.3479824 |
| R2.5031 | R2.5 | 31 | 0.1852608 | 96.6934223 | 71.7853222 | 28.2146778 |
| R2.5032 | R2.5 | 32 | 0.1920747 | 96.5081615 | 70.9221630 | 29.0778370 |
| R2.5033 | R2.5 | 33 | 0.1990958 | 96.3160868 | 70.0626001 | 29.9373999 |
| R2.5034 | R2. 5 | 34 | 0.2063245 | 96.1169910 | 69.2066917 | 30.7933083 |
| R2.5035 | R2.5 | 35 | 0.2137642 | 95.9106665 | 68.3544951 | 31.6455049 |
| R2.5036 | R2.5 | 36 | 0.2214194 | 95.6969023 | 67.5060663 | 32.4939337 |
| R2.5037 | R2.5 | 37 | 0.2292928 | 95.4754829 | 66.6614609 | 33.3385391 |
| R2.5038 | R2.5 | 38 | 0.2373877 | 95.2461901 | 65.8207359 | 34.1792641 |
| R2.5039 | R2.5 | 39 | 0.2457084 | 95.0088024 | 64.9839459 | 35.0160541 |
| R2.5040 | R2.5 | 40 | 0.2542592 | 94.7630940 | 64.1511440 | 35.8488560 |
| R2.5041 | R2.5 | 41 | 0.2630376 | 94.5088348 | 63.3223858 | 36.6776142 |
| R2.5042 | R2.5 | 42 | 0.2720566 | 94.2457972 | 62.4977222 | 37.5022778 |
| R2.5043 | R2.5 | 43 | 0.2813111 | 93.9737406 | 61.6772060 | 38.3227940 |
| R2.5044 | R2.5 | 44 | 0.2908077 | 93.6924295 | 60.8608909 | 39.1391091 |

## lowa-type Retirement - Survival Tables

Percent Retired, Surviving, Condition, and Depreciation Reserve
as a function of Age as a Percent of Average Service Life

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| okup | , | Age \% | \% Ret | \% Surv | \% Cond | Depr Resv |
| R2.5045 | R2.5 | 45 | 0.3005543 | 93.4016218 | 60.0488248 | 39.9511752 |
| R2. 5046 | R2.5 | 46 | 0.3105459 | 93.1010675 | 59.2410641 | 40.7589359 |
| R2.5047 | R2.5 | 47 | 0.3207922 | 92.7905216 | 58.4376559 | 41.5623441 |
| R2. 5048 | R2.5 | 48 | 0.3312959 | 92.4697294 | 57.6386509 | 42.3613491 |
| R2. 5049 | R2.5 | 49 | 0.3420601 | 92.1384335 | 56.8441010 | 43.1558990 |
| R2. 5050 | R2. 5 | 50 | 0.3530903 | 91.7963734 | 56.0540552 | 43.9459448 |
| R2.5051 | R2.5 | 51 | 0.3643885 | 91.4432831 | 55.2685661 | 44.7314339 |
| R2.5052 | R2.5 | 52 | 0.3759584 | 91.0788946 | 54.4876838 | 45.5123162 |
| R2.5053 | R2.5 | 53 | 0.3878079 | 90.7029362 | 53.7114601 | 46.2885399 |
| R2.5054 | R2.5 | 54 | 0.3999405 | 90.3151283 | 52.9399471 | 47.0600529 |
| R2. 5055 | R2.5 | 55 | 0.4123592 | 89.9151878 | 52.1731982 | 47.8268018 |
| R2.5056 | R2.5 | 56 | 0.4250708 | 89.5028286 | 51.4112682 | 48.5887318 |
| R2. 5057 | R2.5 | 57 | 0.4380798 | 89.0777578 | 50.6542120 | 49.3457880 |
| R2.5058 | R2.5 | 58 | 0.4513912 | 88.6396780 | 49.9020872 | 50.0979128 |
| R2. 5059 | R2.5 | 59 | 0.4650126 | 88.1882868 | 49.1549511 | 50.8450489 |
| R2.5060 | R2.5 | 60 | 0.4789476 | 87.7232742 | 48.4128661 | 51.5871339 |
| R2.5061 | R2.5 | 61 | 0.4932022 | 87.2443266 | 47.6758952 | 52.3241048 |
| R2.5062 | R2.5 | 62 | 0.5077830 | 86.7511244 | 46.9441018 | 53.0558982 |
| R2.5063 | R2.5 | 63 | 0.5226945 | 86.2433414 | 46.2175550 | 53.7824450 |
| R2.5064 | R2.5 | 64 | 0.5379439 | 85.7206469 | 45.4963250 | 54.5036750 |
| R2.5065 | R2.5 | 65 | 0.5535354 | 85.1827030 | 44.7804852 | 55.2195148 |
| R2.5066 | R2.5 | 66 | 0.5694743 | 84.6291676 | 44.0701108 | 55.9298892 |
| R2.5067 | R2.5 | 67 | 0.5857687 | 84.0596933 | 43.3652830 | 56.6347170 |
| R2.5068 | R2.5 | 68 | 0.6024160 | 83.4739246 | 42.6660848 | 57.3339152 |
| R2. 5069 | R2.5 | 69 | 0.6194267 | 82.8715086 | 41.9726019 | 58.0273981 |
| R2.5070 | R2.5 | 70 | 0.6368008 | 82.2520819 | 41.2849250 | 58.7150750 |
| R2.5071 | R2.5 | 71 | 0.6545391 | 81.6152811 | 40.6031480 | 59.3968520 |
| R2.5072 | R2. 5 | 72 | 0.6726418 | 80.9607420 | 39.9273682 | 60.0726318 |
| R2.5073 | R2.5 | 73 | 0.6911087 | 80.2881002 | 39.2576852 | 60.7423148 |
| R2.5074 | R2.5 | 74 | 0.7099390 | 79.5969915 | 38.5942020 | 61.4057980 |
| R2.5075 | R2.5 | 75 | 0.7291259 | 78.8870525 | 37.9370279 | 62.0629721 |
| R2.5076 | R2.5 | 76 | 0.7486620 | 78.1579266 | 37.2862740 | 62.7137260 |
| R2.5077 | R2.5 | 77 | 0.7685376 | 77.4092646 | 36.6420512 | 63.3579488 |
| R2.5078 | R2.5 | 78 | 0.7887430 | 76.6407270 | 36.0044770 | 63.9955230 |
| R2.5079 | R2. 5 | 79 | 0.8092565 | 75.8519840 | 35.3736682 | 64.6263318 |
| R2.5080 | R2.5 | 80 | 0.8300667 | 75.0427275 | 34.7497439 | 65.2502561 |
| R2.5081 | R2.5 | 81 | 0.8511477 | 74.2126608 | 34.1328259 | 65.8671741 |
| R2.5082 | R2.5 | 82 | 0.8724718 | 73.3615131 | 33.5230379 | 66.4769621 |
| R2.5083 | R2.5 | 83 | 0.8940096 | 72.4890413 | 32.9204998 | 67.0795002 |
| R2.5084 | R2.5 | 84 | 0.9157238 | 71.5950317 | 32.3253360 | 67.6746640 |
| R2.5085 | R2.5 | 85 | 0.9375753 | 70.6793079 | 31.7376659 | 68.2623341 |
| R2.5086 | R2.5 | 86 | 0.9595194 | 69.7417326 | 31.1576109 | 68.8423891 |
| R2.5087 | R2.5 | 87 | 0.9815073 | 68.7822132 | 30.5852881 | 69.4147119 |
| R2.5088 | R2.5 | 88 | 1.0034790 | 67.8007059 | 30.0208130 | 69.9791870 |
| R2.5089 | R2. 5 | 89 | 1.0253773 | 66.7972269 | 29.4642980 | 70.5357020 |

database

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## lowa-type Retirement - Survival Tables

Percent Retired, Surviving, Condition, and Depreciation Reserve as a function of Age as a Percent of Average Service Life

|  | 2 | 3 | 4 | 5 | 6 | 7 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Lookup | Curv | Age \% | \% Ret | \% Surv | \% Cond | \% Depr Resv |
| R2.5090 | R2.5 | 90 | 1.0471344 | 65.7718496 | 28.9158480 | 71.0841520 |
| R2.5091 | R2.5 | 91 | 1.0686831 | 64.7247152 | 28.3755679 | 71.6244321 |
| R2.5092 | R2.5 | 92 | 1.0899420 | 63.6560321 | 27.8435540 | 72.1564460 |
| R2. 5093 | R2.5 | 93 | 1.1108289 | 62.5660901 | 27.3198969 | 72.6801031 |
| R2. 5094 | R2.5 | 94 | 1.1312651 | 61.4552612 | 26.8046770 | 73.1953230 |
| R2.5095 | R2.5 | 95 | 1.1511522 | 60.3239961 | 26.2979729 | 73.7020271 |
| R2.5096 | R2.5 | 96 | 1.1704039 | 59.1728439 | 25.7998481 | 74.2001519 |
| R2. 5097 | R2.5 | 97 | 1.1889191 | 58.0024400 | 25.3103621 | 74.6896379 |
| R2.5098 | R2.5 | 98 | 1.2065949 | 56.8135209 | 24.8295610 | 75.1704390 |
| R2.5099 | R2.5 | 99 | 1.2233358 | 55.6069260 | 24.3574791 | 75.6425209 |
| R2.5100 | R2.5 | 100 | 1.2390403 | 54.3835902 | 23.8941431 | 76.1058569 |
| R2.5101 | R2.5 | 101 | 1.2536021 | 53.1445499 | 23.4395671 | 76.5604329 |
| R2.5102 | R2.5 | 102 | 1.2669158 | 51.8909478 | 22.9937501 | 77.0062499 |
| R2.5103 | R2.5 | 103 | 1.2788939 | 50.6240320 | 22.5566781 | 77.4433219 |
| R2.5104 | R2.5 | 104 | 1.2894273 | 49.3451381 | 22.1283281 | 77.8716719 |
| R2.5105 | R2.5 | 105 | 1.2984328 | 48.0557108 | 21.7086580 | 78.2913420 |
| R2.5106 | R2.5 | 106 | 1.3058210 | 46.7572780 | 21.2976141 | 78.7023859 |
| R2.5107 | R2.5 | 107 | 1.3115058 | 45.4514570 | 20.8951299 | 79.1048701 |
| R2.5108 | R2.5 | 108 | 1.3154220 | 44.1399512 | 20.5011189 | 79.4988811 |
| R2.5109 | R2.5 | 109 | 1.3175020 | 42.8245292 | 20.1154850 | 79.8845150 |
| R2.5110 | R2.5 | 110 | 1.3176890 | 41.5070272 | 19.7381129 | 80.2618871 |
| R2.5111 | R2.5 | 11 | 1.3159404 | 40.1893382 | 19.3688741 | 80.6311259 |
| R2.5112 | R2.5 | 112 | 1.3122248 | 38.8733978 | 19.0076220 | 80.9923780 |
| R2.5113 | R2.5 | 113 | 1.3065191 | 37.5611730 | 18.6541979 | 81.3458021 |
| R2.5114 | R2.5 | 14 | 1.2988228 | 36.2546539 | 18.3084259 | 81.6915741 |
| R2.5115 | R2.5 | 115 | 1.2891360 | 34.9558311 | 17.9701180 | 82.0298820 |
| R2.5116 | R2.5 | 116 | 1.2774830 | 33.6666951 | 17.6390679 | 82.3609321 |
| R2.5117 | R2.5 | 117 | 1.2638931 | 32.3892121 | 17.3150611 | 82.6849389 |
| R2.5118 | R2.5 | 118 | 1.2484150 | 31.1253190 | 16.9978631 | 83.0021369 |
| R2.5119 | R2.5 | 119 | 1.2311139 | 29.8769040 | 16.6872311 | 83.3127689 |
| R2.5120 | R2.5 | 120 | 1.2120590 | 28.6457901 | 16.3829119 | 83.6170881 |
| R2.5121 | R2.5 | 121 | 1.1913381 | 27.4337311 | 16.0846400 | 83.9153600 |
| R2.5122 | R2.5 | 122 | 1.1690731 | 26.2423930 | 15.7921439 | 84.2078561 |
| R2.5123 | R2.5 | 123 | 1.1452968 | 25.0733199 | 15.5051580 | 84.4948420 |
| R2.5124 | R2.5 | 124 | 1.1201971 | 23.9280231 | 15.2233681 | 84.7766319 |
| R2.5125 | R2.5 | 125 | 1.0938761 | 22.8078260 | 14.9465010 | 85.0534990 |
| R2.5126 | R2.5 | 126 | 1.0664589 | 21.7139499 | 14.6742671 | 85.3257329 |
| R2.5127 | R2.5 | 127 | 1.0380819 | 20.6474910 | 14.4063790 | 85.5936210 |
| R2.5128 | R2.5 | 128 | 1.0088780 | 19.6094091 | 14.1425540 | 85.8574460 |
| R2.5129 | R2.5 | 129 | 0.9789822 | 18.6005311 | 13.8825150 | 86.1174850 |
| R2.5130 | R2.5 | 130 | 0.9485328 | 17.6215489 | 13.6259940 | 86.3740060 |
| R2.5131 | R2.5 | 131 | 0.9176611 | 16.6730161 | 13.3727360 | 86.6272640 |
| R2.5132 | R2.5 | 132 | 0.8864870 | 15.7553550 | 13.1224999 | 86.8775001 |
| R2.5133 | R2.5 | 133 | 0.8551400 | 14.8688680 | 12.8750581 | 87.1249419 |
| R2.5134 | R2.5 | 134 | 0.8237340 | 14.0137280 | 12.6302040 | 87.369796 |

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Iowa-type Retirement - Survival Tables
Percent Retired, Surviving, Condition, and Depreciation Reserve as a function of Age as a Percent of Average Service Life

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| okup | Curv | Age \% | \% Ret | \% Surv | \% Cond | \% Depr Resv |
| R2.5135 | R2.5 | 135 | 0.7923711 | 13.1899940 | 12.3877521 | 87.6122479 |
| R2. 5136 | R2.5 | 136 | 0.7611500 | 12.3976229 | 12.1475360 | 87.8524640 |
| R2.5137 | R2.5 | 137 | 0.7301579 | 11.6364729 | 11.9094091 | 88.0905909 |
| R2.5138 | R2.5 | 138 | 0.6994760 | 10.9063150 | 11.6732490 | 88.3267510 |
| R2.5139 | R2.5 | 139 | 0.6691670 | 10.2068390 | 11.4389530 | 88.5610470 |
| R2.5140 | R2.5 | 140 | 0.6392890 | 9.5376720 | 11.2064340 | 88.7935660 |
| R2.5141 | R2.5 | 141 | 0.6098980 | 8.8983830 | 10.9756200 | 89.0243800 |
| R2. 5142 | R2.5 | 142 | 0.5810320 | 8.2884851 | 10.7464550 | 89.2535450 |
| R2.5143 | R2.5 | 143 | 0.5527210 | 7.7074530 | 10.5188921 | 89.4811079 |
| R2.5144 | R2.5 | 144 | 0.5249980 | 7.1547320 | 10.2928760 | 89.7071240 |
| R2.5145 | R2.5 | 145 | 0.4978830 | 6.6297340 | 10.0683579 | 89.9316421 |
| R2.5146 | R2.5 | 146 | 0.4713970 | 6.1318510 | 9.8452730 | 90.1547270 |
| R2.5147 | R2.5 | 147 | 0.4455530 | 5.6604540 | 9.6235380 | 90.3764620 |
| R2.5148 | R2.5 | 148 | 0.4203759 | 5.2149010 | 9.4030380 | 90.5969620 |
| R2.5149 | R2.5 | 149 | 0.3958700 | 4.7945250 | 9.1836420 | 90.8163580 |
| R2.5150 | R2.5 | 150 | 0.3720580 | 4.3986550 | 8.9651520 | 91.0348480 |
| R2.5151 | R2. 5 | 151 | 0.3489550 | 4.0265970 | 8.7473331 | 91.2526670 |
| R2.5152 | R2.5 | 152 | 0.3265810 | 3.6776420 | 8.5298860 | 91.4701140 |
| R2.5153 | R2.5 | 153 | 0.3049580 | 3.3510610 | 8.3124470 | 91.6875531 |
| R2.5154 | R2.5 | 154 | 0.2841100 | 3.0461030 | 8.0945830 | 91.9054170 |
| R2.5155 | R2. 5 | 155 | 0.2640620 | 2.7619930 | 7.8757930 | 92.1242070 |
| R2.5156 | R2.5 | 156 | 0.2448380 | 2.4979310 | 7.6555050 | 92.3444950 |
| R2.5157 | R2.5 | 157 | 0.2264680 | 2.2530930 | 7.4330760 | 92.5669240 |
| R2.5158 | R2. 5 | 158 | 0.2089740 | 2.0266250 | 7.2078220 | 92.7921780 |
| R2.5159 | R2.5 | 159 | 0.1923820 | 1.8176510 | 6.9790150 | 93.0209850 |
| R2.5160 | R2.5 | 160 | 0.1767130 | 1.6252690 | 6.7459320 | 93.2540680 |
| R2.5161 | R2.5 | 161 | 0.1619790 | 1.4485560 | 6.5078890 | 93.4921110 |
| R2.5162 | R2.5 | 162 | 0.1481900 | 1.2865770 | 6.2642780 | 93.7357220 |
| R2.5163 | R2.5 | 163 | 0.1353470 | 1.1383870 | 6.0146450 | 93.9853550 |
| R2.5164 | R2.5 | 164 | 0.1234370 | 1.0030400 | 5.7587730 | 94.2412270 |
| R2.5165 | R2.5 | 165 | 0.1124400 | 0.8796030 | 5.4967510 | 94.5032490 |
| R2.5166 | R2.5 | 166 | 0.1023100 | 0.7671630 | 5.2291050 | 94.7708950 |
| R2.5167 | R2.5 | 167 | 0.0929890 | 0.6648530 | 4.9568360 | 95.0431640 |
| R2.5168 | R2.5 | 168 | 0.0843740 | 0.5718640 | 4.6815480 | 95.3184520 |
| R2.5169 | R2.5 | 169 | 0.0763160 | 0.4874900 | 4.4052840 | 95.5947160 |
| R2.5170 | R2.5 | 170 | 0.0685810 | 0.4111740 | 4.1301250 | 95.8698750 |
| R2.5171 | R2. 5 | 171 | 0.0610970 | 0.3425930 | 3.8568110 | 96.1431890 |
| R2.5172 | R2.5 | 172 | 0.0538920 | 0.2814960 | 3.5853870 | 96.4146130 |
| R2.5173 | R2.5 | 173 | 0.0469890 | 0.2276040 | 3.3159430 | 96.6840570 |
| R2.5174 | R2.5 | 174 | 0.0404160 | 0.1806150 | 3.0485420 | 96.9514580 |
| R2.5175 | R2. 5 | 175 | 0.0342080 | 0.1401990 | 2.7832260 | 97.2167740 |
| R2.5176 | R2.5 | 176 | 0.0283930 | 0.1059910 | 2.5201240 | 97.4798760 |
| R2.5177 | R2.5 | 177 | 0.0230100 | 0.0775980 | 2.2592850 | 97.7407150 |
| R2.5178 | R2.5 | 178 | 0.0181160 | 0.0545880 | 2.0008610 | 97.9991390 |
| R2.5179 | R2.5 | 179 | 0.0136670 | 0.0364720 | 1.7451220 | 98.2548780 |

lowa-type Retirement - Survival Tables
Percent Retired, Surviving, Condition, and Depreciation Reserve as a function of Age as a Percent of Average Service Life

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| ---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Lookup | Curve | Age \% | \% Ret | \% Surv | \% Cond | \% Depr Resv |
| R2.5180 | R2.5 | 180 | 0.0098240 | 0.0228050 | 1.4924140 | 98.5075860 |
| R2.5181 | R2.5 | 181 | 0.0065460 | 0.0129810 | 1.2434710 | 98.7565290 |
| R2.5182 | R2.5 | 182 | 0.0038930 | 0.0064350 | 0.9997670 | 99.0002330 |
| R2.5183 | R2.5 | 183 | 0.0019010 | 0.0025420 | 0.7651460 | 99.2348540 |
| R2.5184 | R2.5 | 184 | 0.0006080 | 0.0006410 | 0.5514820 | 99.4485180 |
| R2.5185 | R2.5 | 185 | 0.0000330 | 0.0000330 | 0.5000000 | 99.5000000 |
| R2.5186 | R2.5 | 186 | 0.0000000 | 0.000000 | 0.0000000 | 100.0000000 |

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lowa-type Retirement - Survival Tables
Percent Retired, Surviving, Condition, and Depreciation Reserve as a function of Age as a Percent of Average Service Life

| 1 | 2 | 3 | 4 | 5 | 6 |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Lookup | Curve Age \% |  | \% Ret | \% Surv | \% Cond | v |
| R3.0000 | R3.0 | 0 | 0.0154791 | 100.0000000 | 100.0000000 | SV |
| R3. 0001 | R3.0 | 1 | 0.0168400 | 99.9845209 | 99.0154038 | 0.9845962 |
| R3.0002 | 2 R3.0 | 2 | 0.0182953 | 99.9676809 | 98.0319996 | 1.9680004 |
| R3. 0003 | 3 R 3.0 | 3 | 0.0198507 | 99.9493856 | 97.0498524 | 2.9501476 |
| R3.0004 | R3.0 | 4 | 0.0215111 | 99.9295349 | 96.0690317 | 3.9309683 |
| R3.0005 | 5 R3.0 | 5 | 0.0232811 | 99.9080238 | 95.0896082 | 4.9103918 |
| R3.0006 | 7 R3.0 | 6 | 0.0251655 | 99.8847427 | 94.1116552 | 5.8883448 |
| R3.0007 | 7 R3.0 | 7 | 0.0271702 | 99.8595772 | 93.1352463 | 6.8647537 |
| R3.0008 | R3.0 | 8 | 0.0292997 | 99.8324070 | 92.1604576 | 7.8395424 |
| R3.0009 | R3.0 | 9 | 0.0315600 | 99.8031073 | 91.1873674 | 8.8126326 |
| R3.0010 | R3.0 | 10 | 0.0339584 | 99.7715473 | 90.2160540 | . 7839460 |
| R3.0011 | R3.0 | 11 | 0.0364952 | 99.7375889 | 89.2465992 | 10.7534008 |
| R3.0012 | R3.0 | 12 | 0.0391798 | 99.7010937 | 88.2790852 | 11.7209148 |
| R3.0013 | R3.0 | 13 | 0.0420189 | 99.6619139 | 87.3135939 | 2.6864061 |
| R3.0015 | R3.0 R3.0 | 14 | 0.0450144 | 99.6198950 | 86.3502102 | 13.6497898 |
| R3.0016 | R3.0 | 15 | 0.0481758 | 99.5748806 | 85.3890209 | 14.6109791 |
| R3.0017 | R3.0 | 16 | 0.0515060 | 99.5267048 | 84.4301109 | 15.5698891 |
| R3.0018 | R3.0 | 18 | 0.0586996 | 99.4751988 | 83.4735680 | 16.5264320 |
| R3.0019 | R3.0 | 19 | 0.0625744 | 99.4201870 99.3614874 | 82.5194798 | 17.4805202 18.4320660 |
| R3.0020 | R3.0 | 20 | 0.0666428 | 99.2989130 | 80.6190205 | 18.4320660 19.3809795 |
| R3.0021 | R3.0 | 21 | 0.0709104 | 99.2322702 | 79.6728268 | 20.3271732 |
| R3.0022 | R3.0 | 22 | 0.0753794 | 99.1613598 | 78.7294426 | 21.2705574 |
| R3.0023 | R3.0 | 23 | 0.0800638 | 99.0859804 | 77.7889566 | 2.2110434 |
| R3.0024 | R3.0 | 24 | 0.0849600 | 99.0059166 | 76.8514566 | 23.1485434 |
| R3.0025 | R3.0 | 25 | 0.0900774 | 98.9209566 | 75.9170332 | 24.0829668 |
| R3.0026 | R3.0 | 26 | 0.0954256 | 98.8308792 | 74.9857712 | 25.0142288 |
| R3.0027 | R3.0 | 27 | 0.1010027 | 98.7354536 | 74.0577602 | 25.9422398 |
| R3.0028 | R3.0 | 28 | 0.1068191 | 98.6344509 | 73.1330843 | 26.8669157 |
| R3.0029 | R3.0 | 29 | 0.1128788 | 98.5276318 | 72.2118292 | 27.7881708 |
| R3. 0030 | R3.0 | 30 | 0.1191874 | 98.4147530 | 71.2940807 | 8.7059193 |
| R3.0031 | R3.0 | 31 | 0.1257477 | 98.2955656 | 70.3799210 | 28.6200790 |
| R3.0032 | R3.0 | 32 | 0.1325683 | 98.1698179 | 69.4694319 | 30.5305681 |
| R3.0033 | R3.0 | 33 | 0.1396523 | 98.0372496 | 68.5626936 | 31.4373064 |
| R3.0034 | R3.0 | 34 | 0.1470041 | 97.8975973 | 67.6597862 | 32.3402138 |
| R3.0035 | R3.0 | 35 | 0.1546307 | 97.7505932 | 66.7607861 | 33.2392139 |
| R3.0036 R3.0037 | R3.0 | 36 | 0.1625337 | 97.5959625 | 65.8657694 | 34.1342306 |
| R3.0037 | R3.0 | 37 | 0.1707211 | 97.4334288 | 64.9748087 | 35.0251913 |
| R3.0038 | R3.0 | 38 | 0.1791944 | 97.2627077 | 64.0879793 | 35.9120207 |
| R3.0039 R3 | R3.0 | 39 | 0.1879616 | 97.0835133 | 63.2053480 | 36.7946520 |
| R3.0040 R | R3.0 | 40 | 0.1970244 | 96.8955517 | 62.3269858 | 37.6730142 |
| R3.0041 R | R3.0 | 41 | 0.2063894 | 96.6985273 | 61.4529600 | 38.5470400 |
| R3.0042 R | R3.0 | 42 | 0.2160606 | 96.4921379 | 60.5833340 | 39.4166660 |
| R3.0043 R | R3.0 | 43 | 0.2260437 | 96.2760773 | 59.7181711 | 40.2818289 |
| R3.0044 R | R3.0 | 44 | 0.2363405 | 96.0500336 | 58.8575339 | 41.14246 |

C:IDepreciationllowacurves
lowa-type Retirement - Survival Tables
Percent Retired, Surviving, Condition, and Depreciation Reserve as a function of Age as a Percent of Average Service Life

| Curve Age \% |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  | \% Ret | \% Surv |  | 7 |
| R3.0045 | 5 R3.0 | 45 | 0.2469616 | 95.8136931 | \%8.0014839 | Depr Resv 419985161 |
| R3.0046 | 6 R3.0 | 46 | 0.2579089 | 95.5667315 | 57.1500778 | 42.84999222 |
| R3.0047 | 7 R3.0 | 47 | 0.2691869 | 95.3088226 | 55.15003778 | 42.8499222 43.6966262 |
| R3.0048 | 8 R3.0 | 48 | 0.2808028 | 95.0396357 | 55.4614301 | 43.6966262 44.5385699 |
| R3.0049 | R3.0 | 49 | 0.2927637 | 94.7588329 | 54.6243000 | 45.3757000 |
| R3.0050 | R3.0 R3.0 | 50 | 0.3050775 | 94.4660692 | 53.7920389 | 46.2079611 |
| R3.0052 | R3.0 R3.0 | 51 52 | 0.3177452 0.3307829 | 94.1609917 | 52.9647021 | 47.0352979 |
| R3.0053 | R3.0 | 53 | 0.3441897 | 832465 | 52.1423440 | 47.8576560 |
| R3.0054 | R3.0 | 54 | 0.3579797 | 93.1682739 | 51.3250179 | 48.6749821 |
| R3.0055 | R3.0 | 55 | 0.3721629 | 92.8102942 | 49.7056861 | 49.4872198 50.2943139 |
| R3.0056 | R3.0 | 56 | 0.3867464 | 92.4381313 | $48.90379+0$ | 50.2943139 |
| R3.0057 | R3.0 | 57 | 0.4017400 | 92.0513849 | 48.1071558 | 51.8928442 |
| R3.0058 | R3.0 | 58 | 0.4171553 | 91.6496449 | 47.3158379 | 52.6841621 |
| R3.0060 | R3.0 | 59 | 0.4330063 | 91.2324896 | 46.5299010 | 53.4700990 |
| R3.0061 | R3.0 | 61 | 0.4660597 | 析 | 02 | 54.2505898 |
| R3.0062 | R3.0 | 62 | 0.4832878 | 89.8841190 | 10 | 55.0255690 |
| R3.0063 | R3.0 | 63 | 0.5010013 | 89.4008312 | 44.2050362 43.4412990 | 55.7949638 56.5587010 |
| R3.0064 | R3.0 | 64 | 0.5192156 | 88.8998299 | 42.6832981 | 56.5587010 57.3167019 |
| R3.0065 | R3.0 | 65 | 0.5379458 | 88.3806143 | 41.9311161 | 8.0688839 |
| R3.0066 | R3.0 | 66 | 0.5572013 | 87.8426685 | 41.1848378 | 58.8151622 |
| R3.0067 | R3.0 | 67 | 0.5770016 | 87.2854672 | 40.4445572 | 59.5554428 |
| R3.0069 | R3.0 | 68 | 0.5973559 | 86.7084656 | 39.7103682 | 60.2896318 |
| R3.0070 | R3.0 | 70 | 0.6182804 | 86.1111097 | 38.9823709 | 61.0176291 |
| R3.0071 | R3.0 | 71 | 0.6618805 |  | 38.2606740 | 61.7393260 |
| R3.0072 | R3.0 | 72 | 0.6845751 | 84.1911631 | 37.5453868 | 62.4546132 |
| R3.0073 | R3.0 | 73 | 0.7078676 | 83.5065880 | 36.1345072 | 63.1633758 <br> 63.8654928 |
| R3.0074 | R3.0 | 74 | 0.7317868 | 82.7987204 | 35.4391561 | 64.5608439 |
| R3.0075 | R3.0 | 75 | 0.7563066 | 82.0669336 | 34.7507062 | 65.2492938 |
| R3.0076 | R3.0 | 76 | 0.7814388 | 81.3106270 | 34.0692878 | 65.9307122 |
| R3.0077 R3.0078 | R3.0 | 77 | 0.8071690 | 80.5291882 | 33.3950372 | 66.6049628 |
| R3.0079 | R3. R3. | 78 | 0.8334932 | 79.7220192 | 32.7280932 | 67.2719068 |
| R3.0080 | R3.0 R3.0 | 79 80 | 0.860387 0.887835 | 78.8885260 | 32.0685968 | 67.9314032 |
| R3.0081 | R3.0 | 81 | 0.9158049 | 78.0281382 77.1403027 | . 4166920 | 68.5833080 |
| R3.0082 | R3.0 | 82 | 0.9442616 | 76.224497 | . 7725229 | 69.2274771 |
| R3.0083 | R3.0 | 83 | 0.9731655 | 75.2802362 | 30.1362350 | 69.8637650 |
| R3.0084 R3 | R3.0 | 84 | 1.0024595 | 74.3070707 | 29.5079711 | 70.4920289 |
| R3.0085 R | R3.0 | 85 | 1.0320921 | 73.3046112 | 28.2760870 | 71.1121249 |
| R3.0086 R | R3.0 | 86 | 1.0619917 | 72.2725191 | 27.6727450 | 71.7239130 72.3272550 |
| R3.0087 R | R3.0 | 87 | 1.0920782 | 71.2105274 | 27.0779829 | 72.9220171 |
| R3.0088 R | R3.0 | 88 | 1.1222725 | 70.1184492 | 26.4919291 | 73.5080709 |
| R3.0089 R | R3.0 | 89 | 1.1524744 | 68.9961767 | 25.9147060 | 74.0852940 |

## C.IDepreciationllowacurves

## lowa-type Retirement - Survival Tables

Percent Retired, Surviving, Condition, and Depreciation Reserve
as a function of Age as a Percent of Average Service Life

| $1$ |  | $3$ | 4 |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Lookup | up Curve | Age \% | \% Ret | \% Surv | \% Cond | \% Depr Resv |
| R3.0090 | 0 R3.0 | 90 | 1.1825809 | 67.8437023 | 25.3464310 | \% Depr Resv 74.6535690 |
| R3.0091 | 1 R3.0 | 91 | 1.2124787 | 66.6611214 | 24.7872109 | 74.6535690 75.2127891 |
| R3.0092 | 2 R3.0 | 92 | 1.2420444 | 65.4486427 | 24.7872109 24.2371471 | 75.2127891 75.7628529 |
| R3.0093 R3.0094 | R3.0 <br> R3.0 | 93 | 1.2711425 | 64.2065983 | 23.6963310 | 76.3036690 |
| R3.0095 | 5 R3.0 | 95 | 1.2996359 | 62.9354558 | 23.1648400 | 76.8351600 |
| R3.0096 | R 2.0 | 96 | 1.3542113 | 60.3084421 | 22.6427441 | 7.3572559 |
| R3.0097 | 7 R3.0 | 97 | 1.3799820 | 58.9542308 | 22.1301019 | 77.8698981 |
| R3.0098 | R3.0 | 98 | 1.4045148 | 58.9542308 57.5742488 | 1.6269579 | 78.3730421 |
| R3. 0099 | R3.0 | 99 | 1.4276528 | 56.1697340 | 21.1333439 | 78.8666561 |
| R3.0100 | R3.0 | 100 | 1.4492231 | 54.7420812 | - | 230 |
| R3.0101 | R3.0 | 101 | 1.4690599 | 53.292858 | 20.1747630 | 79.8252370 |
| R3.0102 | R3.0 | 102 | 1.4869881 | 51.8237982 | 19.7097900 | 80.2902100 |
| R3. 0103 | R3.0 | 103 | 1.5028572 | 50.3368101 |  | 56660 |
| R3.0104 | R3.0 | 104 | 1.5164928 | 48.8339529 | 18.8083510 | 81.1916490 |
| R3.0105 | R3.0 | 105 | 1.5277629 |  | 18.3717880 | 81.6282120 |
| R3.0106 | R3.0 | 106 | 1.5365224 | 45.7896972 | 17.9445670 | . 5754330 |
| R3.0107 | R3.0 | 107 | 1.5426388 | 44.2531748 | 1178 | 4733989 |
| R3.0108 | R3.0 | 108 | 1.5460029 | 42.71053 |  | 82.8822160 |
| R3.0109 | R3.0 | 109 | 1.5465211 | 41.1645331 | 16.7179930 16.3270869 | 83.2820070 |
| R3.0110 | R3.0 | 110 | 1.5441080 | 39.6180120 | 15.9449101 | 83.6729131 84.0550899 |
| R3.0111 | R3.0 | 111 | 1.5387101 | 38.0739040 | 15.5712870 | 84.4287130 |
| R3.0112 | R3.0 | 112 | 1.5302810 | 36.5351939 | 15.2060260 | 84.7939740 |
| R3.0113 | R3.0 | 113 | 1.5188141 | 35.0049129 | 89180 | 85.1510820 |
| R3.0114 | R3.0 | 114 | 1.5043109 | 33.4860988 | 14.4997360 | 85.5002640 |
| R3.0115 R3.0116 | R3.0 R3.0 | 115 116 | 1.4868099 | 31.9817879 | 14.1582340 | 85.8417660 |
| R3.0117 | R3.0 | 117 |  | 30. | 13.8241530 | 86.1758470 |
| R3.0118 | R3.0 | 18 | 1.4169929 | 27.58 | 13.4972171 | 86.5027829 |
| R3.0119 | R3.0 | 119 | 1.3882911 |  | 13.1771280 | 86.8228720 |
| R3.0120 | R3.0 | 120 | 1.3571188 | 24.7802 | 12.8635780 | 87.1364220 |
| R3.0121 | R3.0 | 21 | 1.3236401 | 23.4231501 |  | 87.4437640 |
| R3.0122 | R3. 0 | 122 | 1.2880390 | 22.0995100 | 12.2547650 | 7.7452350 |
| R3.0123 | R3.0 | 123 | 1.2505269 | 20.8114710 |  | 88.0411890 |
| R3.0124 | R3.0 | 124 | 1.2113230 | 19.560944 | 11.6680059 | 88.3319941 |
| R3.0125 | R3.0 | 125 | 1.1706541 | 18.3496211 | 11.10033 | 88.6180260 |
| R3.0126 | R3.0 | 126 | 1.1287601 | 17.1789670 | 10.8226880 | 89.1773120 |
| R3.0127 | R3.0 | 127 | 1.0858769 | 16.0502069 | 10.5486490 | 89.1773120 |
| R3.0128 | R3.0 | 128 | 1.0422470 | 14.9643300 | 10.2778220 | 89.7221780 |
| R3.0129 | R3.0 | 129 | 0.9981119 | 13.9220830 | 10.0098190 | 89.9901810 |
| R3.0130 | R3.0 | 130 | 0.9536992 | 12.9239711 | 9.7442570 | 90.2557430 |
| R3.0131 R | R3.0 | 131 | 0.9092329 | 11.9702719 | 9.4807680 | 90.5192320 |
| R3.0132 R | R3.0 | 132 | 0.8649200 | 11.0610390 | 9.2190000 | 90.7810000 |
| R3.0133 R | R3.0 | 133 | 0.8209611 | 10.1961190 | 8.9586190 | 91.0413810 |
| R3.0134 R | R3.0 | 134 | 0.7775309 | 9.3751580 | 8.6993200 | 91.3006800 |

C:IDepreciationllowacurves
lowa-type Retirement - Survival Tables
Percent Retired, Surviving, Condition, and Depreciation Reserve as a function of Age as a Percent of Average Service Life

| 1 |  | 3 | 4 | 5 | 6 |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Lookup | Curve | Age \% | \% Ret | \% Surv | \% Cond | \% Depr R |
| R3.0135 | R3.0 | 135 | 0.7347881 | 8.5976270 | 8.4408310 |  |
| R3.0136 | R3.0 | 136 | 0.6928700 | 7.8628390 | 8.1829081 |  |
| R3.0137 | R3.0 | 137 | 0.6518970 | 7.1699690 | 7.9253460 | 92.0746540 |
| R3.0138 | R3.0 | 138 | 0.6119650 | 6.5180720 | 7.6679810 | 92.3320190 |
| R3.0139 | R3.0 | 139 | 0.5731500 | 5.9061070 | 7.4106960 | 2.5893040 |
| R3.0140 | R3.0 | 140 | 0.5355110 | 5.3329570 | 7.1534120 | 92.8465880 |
| R3. 0141 | R3.0 | 141 | 0.4990880 | 4.7974460 | 6.8960930 | 93.1039070 |
| R3.0142 | R3.0 | 142 | 0.4639030 | 4.2983580 | 6.6387510 | 93.3612490 |
| R3.0143 | R3.0 | 143 | 0.4299690 | 3.8344550 | 6.3814340 | 3.61856 |
| R3.0144 | R3.0 | 144 | 0.3972850 | 3.4044860 | 6.1242290 | 93.8757710 |
| R3.0145 | R3.0 | 145 | 0.3658450 | 3.0072010 | 5.8672540 | 94.1327460 |
| R3.0146 | R3.0 | 146 | 0.3356360 | 2.6413560 | 5.6106530 | 4.3893470 |
| R3.0147 | R3.0 | 147 | 0.3066410 | 2.3057200 | 5.3545910 | 94.6454090 |
| R3.0148 | R3.0 | 148 | 0.2788620 | 1.9990790 | 5.0992460 | 94.9007540 |
| R3.0149 | R3.0 | 149 | 0.2522770 | 1.7202170 | 4.8448220 | 80 |
| R3.0150 | R3.0 | 150 | 0.2268850 | 1.4679400 | 4.591516 | 95.4084840 |
| R3.0151 | R3.0 | 151 | 0.2026930 | 1.2410550 | 4.3395140 | 5.6604860 |
| R3.0152 | R3.0 | 152 | 0.1797100 | 1.0383620 | 4.0890000 | 5.9110000 |
| R3.0153 | R3.0 | 153 | 0.1579600 | 0.8586520 | 3.8401530 | 6.1598470 |
| R3.0154 | R3.0 | 154 | 0.1374690 | 0.7006920 | 3.5931400 | 96.4068600 |
| R3.0155 | R3.0 | 155 | 0.1182750 | 0.5632230 | 3.3480970 | 96.6519030 |
| R3.0156 | R3.0 | 156 | 0.1004170 | 0.4449480 | 3.1051630 | 96.8948370 |
| R3.0157 | R3.0 | 157 | 0.0839420 | 0.3445310 | 2.8644800 | 97.1355200 |
| R3.0158 | R3.0 | 158 | 0.0688930 | 0.2605890 | 2.6261500 | 97.3738500 |
| R3.0159 | R3.0 | 159 | 0.0553160 | 0.1916960 | 2.3902580 | 97.6097420 |
| R3.0160 | R3.0 | 160 | 0.0432485 | 0.1363800 | 2.1569580 | 97.8430420 |
| R3.0161 | R3.0 | 161 | 0.0327163 | 0.0931315 | 1.9263620 | 98.0736380 |
| R3.0162 | R3.0 | 162 | 0.0237359 | 0.0604152 | 1.6987790 | 98.3012210 |
| R3.0163 | R3.0 | 163 | 0.0163033 | 0.0366793 | 1.4745100 | 98.5254900 |
| R3.0164 | R3.0 | 164 | 0.0103913 | 0.0203760 | 1.2542690 | 98.7457310 |
| R3. 0165 | R3.0 | 165 | 0.0059434 | 0.0099847 | 0392430 | 98.9607570 |
| R3.0166 | R3.0 | 166 | 0.0028646 | 0.0040413 | 0.8322900 | 99.1677100 |
| R3.0167 | R3.0 | 167 | 0.0010104 | 0.0011767 | 0.6413070 | 99.3586930 |
| R3.0168 | R3.0 | 168 | 0.0001662 | 0.0001662 | 0.4999820 | 99.5000180 |
| R3. 0169 | R3.0 | 169 | 0.0000000 | 0.0000000 | 0.0000000 | 100.0000000 |

## lowa-type Retirement - Survival Tables

Percent Retired, Surviving, Condition, and Depreciation Reserve as a function of Age as a Percent of Average Service Life

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Lookup | Curv | Age \% | \% Ret | \% Surv | \% Cond | \% Depr Resv |
| R4.0000 | R4.0 | 0 | 0.0008278 | 100.0000000 | 100.0000000 | 0.0000000 |
| R4.0001 | R4.0 | 1 | 0.0009632 | 99.9991722 | 99.0013161 | 0.9986839 |
| R4.0002 | R4.0 | 2 | 0.0011139 | 99.9982090 | 98.0022631 | 1.9977369 |
| R4.0003 | R4.0 | 3 | 0.0012894 | 99.9970951 | 97.0033197 | 2.9966803 |
| R4.0004 | R4.0 | 4 | 0.0014858 | 99.9958057 | 96.0045939 | 3.9954061 |
| R4.0005 | R4.0 | 5 | 0.0017109 | 99.9943199 | 95.0060129 | 4.9939871 |
| R4.0006 | R4.0 | 6 | 0.0019645 | 99.9926090 | 94.0076304 | 5.9923696 |
| R4.0007 | R4.0 | 7 | 0.0022536 | 99.9906445 | 93.0094681 | 6.9905319 |
| R4.0008 | R4.0 | 8 | 0.0025768 | 99.9883909 | 92.0115519 | 7.9884481 |
| R4.0009 | R4.0 | 9 | 0.0029430 | 99.9858141 | 91.0139113 | 8.9860887 |
| R4.0010 | R4.0 | 10 | 0.0033541 | 99.9828711 | 90.0165749 | 9.9834251 |
| R4.0011 | R4.0 | 11 | 0.0038157 | 99.9795170 | 89.0195789 | 10.9804211 |
| R4.0012 | R4.0 | 12 | 0.0043325 | 99.9757013 | 88.0229569 | 11.9770431 |
| R4.0013 | R4.0 | 13 | 0.0049095 | 99.9713688 | 87.0267496 | 12.9732504 |
| R4.0014 | R4.0 | 14 | 0.0055561 | 99.9664593 | 86.0310001 | 13.9689999 |
| R4.0015 | R4.0 | 15 | 0.0062743 | 99.9609032 | 85.0357533 | 14.9642467 |
| R4.0016 | R4.0 | 16 | 0.0070753 | 99.9546289 | 84.0410605 | 15.9589395 |
| R4.0017 | R4.0 | 17 | 0.0079612 | 99.9475536 | 83.0469732 | 16.9530268 |
| R4.0018 | R4.0 | 18 | 0.0089484 | 99.9395924 | 82.0535498 | 17.9464502 |
| R4.0019 | R4.0 | 19 | 0.0100383 | 99.9306440 | 81.0608521 | 18.9391479 |
| R4.0020 | R4.0 | 20 | 0.0112429 | 99.9206057 | 80.0689449 | 19.9310551 |
| R4.0021 | R4.0 | 21 | 0.0125732 | 99.9093828 | 79.0778990 | 20.9221010 |
| R4.0022 | R4.0 | 22 | 0.0140372 | 99.8967896 | 78.0877886 | 21.9122114 |
| R4.0023 | R4.0 | 23 | 0.0156517 | 99.8827524 | 77.0986939 | 22.9013061 |
| R4.0024 | R4.0 | 24 | 0.0174217 | 99.8671007 | 76.1106977 | 23.8893023 |
| R4.0025 | R4.0 | 25 | 0.0193634 | 99.8496790 | 75.1238899 | 24.8761101 |
| R4.0026 | R4.0 | 26 | 0.0214911 | 99.8303156 | 74.1383648 | 25.8616352 |
| R4.0027 | R4.0 | 27 | 0.0238161 | 39.8088245 | 73.1542208 | 26.8457794 |
| R4.0028 | R4.0 | 28 | 0.0263578 | 99.7850084 | 72.1715622 | 27.8284378 |
| R4.0029 | R4.0 | 29 | 0.0291262 | 99.7586508 | 71.1904984 | 28.8095016 |
| R4.0030 | R4.0 | 30 | 0.0321426 | 99.7295246 | 70.2111445 | 29.7888555 |
| R4.0031 | R4.0 | 31 | 0.0354223 | 99.6973820 | 69.2336187 | 30.7663813 |
| R4.0032 | R4.0 | 32 | 0.0389815 | 99.6619597 | 68.2580481 | 31.7419519 |
| R4.0033 | R4.0 | 33 | 0.0428438 | 99.6229782 | 67.2845621 | 32.7154379 |
| R4.0034 | R4.0 | 34 | 0.0470247 | 99.5801344 | 66.3132954 | 33.6867046 |
| R4.0035 | R4.0 | 35 | 0.0515423 | 99.5331097 | 65.3443880 | 34.6556120 |
| R4.0036 | R4.0 | 36 | 0.0564251 | 99.4815674 | 64.3779860 | 35.6220140 |
| R4.0037 | R4.0 | 37 | 0.0616894 | 99.4251423 | 63.4142370 | 36.5857630 |
| R4.0038 | R4.0 | 38 | 0.0673580 | 99.3634529 | 62.4532971 | 37.5467029 |
| R4.0039 | R4.0 | 39 | 0.0734539 | 99.2960949 | 61.4953232 | 38.5046768 |
| R4.0040 | R4.0 | 40 | 0.0800018 | 99.2226410 | 60.5404782 | 39.4595218 |
| R4.0041 | R4.0 | 41 | 0.0870266 | 99.1426392 | 59.5889268 | 40.4110732 |
| R4.0042 | R4.0 | 42 | 0.0945492 | 99.0556126 | 58.6408401 | 41.3591599 |
| R4.0043 | R4.0 | 43 | 0.1025982 | 98.9610634 | 57.6963892 | 42.3036108 |
| R4.0044 | R4.0 | 44 | 0.1111975 | 98.8584652 | 56.7557492 | 43.2442508 |

## lowa-type Retirement - Survival Tables

Percent Retired, Surviving, Condition, and Depreciation Reserve as a function of Age as a Percent of Average Service Life

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Lookup | Curve Age \% |  | \% Ret | \% Sur | \% Cond | \% Depr Resv |
| R4.0045 | R4.0 | 45 | 0.1203727 | 98.7472677 | 55.8190970 | 30 |
| R4.0046 | R4.0 | 46 | 0.1301480 | 98.6268950 | 54.8866129 | 45.1133871 |
| R4.0047 | R4.0 | 47 | 0.1405506 | 98.4967470 | 53.9584770 | 46.0415230 |
| R4.0048 | R4.0 | 48 | 0.1516085 | 98.3561964 | 53.0348692 | 46.9651308 |
| R4.0049 | R4.0 | 49 | 0.1633424 | 98.2045879 | 52.1159720 | 47.8840280 |
| R4.0050 | R4.0 | 50 | 0.1757803 | 98.0412455 | 51.2019682 | 48.7980318 |
| R4.0051 | R4.0 | 51 | 0.1889468 | 97.8654652 | 50.2930360 | 49.7069640 |
| R4.0052 | R4.0 | 52 | 0.2028656 | 97.6765184 | 49.3893561 | 50.6106439 |
| R4.0053 | R4.0 | 53 | 0.2175588 | 97.4736528 | 48.4911060 | 51.5088940 |
| R4.0054 | R4.0 | 54 | 0.2326536 | 97.2560940 | 47.5984602 | 52.4015398 |
| R4.0055 | R4.0 | 55 | 0.2497578 | 97.0234404 | 46.7115922 | 53.2884078 |
| R4.0056 | R4.0 | 56 | 0.2665119 | 96.7736826 | 45.8306670 | 54.1693330 |
| R4.0057 | R4.0 | 57 | 0.2845173 | 96.5071707 | 44.9558511 | 55.0441489 |
| R4.0058 | R4.0 | 58 | 0.3034000 | 96.2226534 | 44.0873008 | 55.9126992 |
| R4.0059 | R4.0 | 59 | 0.3231707 | 95.9192534 | 43.2251711 | 56.7748289 |
| R4.0060 | R4.0 | 60 | 0.3438416 | 95.5960827 | 42.3696070 | 57.6303930 |
| R4.0061 | R4.0 | 61 | 0.3654260 | 95.2522411 | 41.5207481 | 58.4792519 |
| R4.0062 | R4.0 | 62 | 0.3879290 | 94.8868151 | 40.6787262 | 59.3212738 |
| R4.0063 | R4.0 | 63 | 0.4113550 | 94.4988861 | 39.8436651 | 60.1563349 |
| R4.0064 | R4.0 | 64 | 0.4357090 | 94.0875311 | 39.0156770 | 60.9843230 |
| R4.0065 | R4.0 | 65 | 0.4609852 | 93.6518221 | 38.1948690 | 61.8051310 |
| R4.0066 | R4.0 | 66 | 0.4871807 | 93.1908369 | 37.3813329 | 62.6186671 |
| R4.0067 | R4.0 | 67 | 0.5142860 | 92.7036562 | 36.5751538 | 63.4248462 |
| R4.0068 | R4.0 | 68 | 0.5422850 | 92.1893702 | 35.7764020 | 64.2235980 |
| R4.0069 | R4.0 | 69 | 0.5711651 | 91.6470852 | 34.9851360 | 65.0148640 |
| R4.0070 | R4.0 | 70 | 0.6009006 | 91.0759201 | 34.2014031 | 65.7985969 |
| R4.0071 | R4.0 | 71 | 0.6314631 | 90.4750195 | 33.4252348 | 66.5747652 |
| R4.0072 | R4.0 | 72 | 0.6628237 | 89.8435564 | 32.6566491 | 67.3433509 |
| R4.0073 | R4.0 | 73 | 0.6949434 | 89.1807327 | 31.8956490 | 68.1043510 |
| R4.0074 | R4.0 | 74 | 0.7277765 | 88.4857893 | 31.1422219 | 68.8577781 |
| R4.0075 | R4.0 | 75 | 0.7612782 | 87.7580128 | 30.3963370 | 69.6036630 |
| R4.0076 | R4.0 | 76 | 0.7953930 | 86.9967346 | 29.6579499 | 70.3420501 |
| R4.0077 | R4.0 | 77 | 0.8300562 | 86.2013416 | 28.9269941 | 71.0730059 |
| R4.0078 | R4.0 | 78 | 0.8652038 | 85.3712854 | 28.2033880 | 71.7966120 |
| R4.0079 | R4.0 | 79 | 0.9007626 | 84.5060816 | 27.4870250 | 72.5129750 |
| R4.0080 | R4.0 | 80 | 0.9366550 | 83.6053190 | 26.7777820 | 73.2222180 |
| R4.0081 | R4.0 | 81 | 0.9727898 | 82.6686640 | 26.0755160 | 73.9244840 |
| R4.0082 | R4.0 | 82 | 1.0092020 | 81.6958742 | 25.3800550 | 74.6199450 |
| R4.0083 | R4.0 | 83 | 1.0464849 | 80.6866722 | 24.6912470 | 75.3087530 |
| R4.0084 | R4.0 | 84 | 1.0855894 | 79.6401873 | 24.0091240 | 75.9908760 |
| R4.0085 | R4.0 | 85 | 1.1274805 | 78.5545979 | 23.3340089 | 76.6659911 |
| R4.0086 | R4.0 | 86 | 1.1729546 | 77.4271174 | 22.6665139 | 77.3334861 |
| R4.0087 | R4.0 | 87 | 1.2225552 | 76.2541628 | 22.0074830 | 77.9925170 |
| R4.0088 | R4.0 | 88 | 1.2765531 | 75.0316076 | 21.3579230 | 78.6420770 |
| R4.0089 | R4.0 | 89 | 1.3349047 | 73.7550545 | 20.7189319 | 79.28 |

## lowa-type Retirement - Survival Tables

## Percent Retired, Surviving, Condition, and Depreciation Reserve as a function of Age as a Percent of Average Service Life

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Lookup | Curve | \% | \% Ret | \% Surv | \% Cond | \% Depr Resv |
| R4.0090 | R4.0 | 90 | 1.3973417 | 72.4201498 | 20.0916240 | 79.9083760 |
| R4.0091 | R4.0 | 91 | 1.4632540 | 71.0228081 | 19.4770801 | 80.5229199 |
| R4.0092 | R4.0 | 92 | 1.5318708 | 69.5595541 | 18.8762820 | 81.1237180 |
| R4.0093 | R4.0 | 93 | 1.6022349 | 68.0276833 | 18.2900851 | 81.7099149 |
| R4.0094 | R4.0 | 94 | 1.6732702 | 66.4254484 | 17.7191961 | 82.2808039 |
| R4.0095 | R4.0 | 95 | 1.7437983 | 64.7521782 | 17.1641600 | 82.8358400 |
| R4.0096 | R4.0 | 96 | 1.8126111 | 63.0083799 | 16.6253510 | 83.3746490 |
| R4.0097 | R4.0 | 97 | 1.8785019 | 61.1957688 | 16.1029799 | 83.8970201 |
| R4.0098 | R4.0 | 98 | 1.9403057 | 59.3172669 | 15.5971090 | 84.4028910 |
| R4.0099 | R4.0 | 99 | 1.9969244 | 57.3769612 | 15.1076440 | 84.8923560 |
| R4.0100 | R4.0 | 100 | 2.0473556 | 55.3800368 | 14.6343750 | 85.3656250 |
| R4.0101 | R4.0 | 101 | 2.0907240 | 53.3326812 | 14.1769710 | 85.8230290 |
| R4.0102 | R4.0 | 102 | 2.1262794 | 51.2419572 | 13.7350060 | 86.2649940 |
| R4.0103 | R4.0 | 103 | 2.1534547 | 49.1156778 | 13.3079650 | 86.6920350 |
| R4.0104 | R4.0 | 104 | 2.1718040 | 46.9622231 | 12.8952750 | 87.1047250 |
| R4.0105 | R4.0 | 105 | 2.1810722 | 44.7904191 | 12.4962990 | 87.5037010 |
| R4.0106 | R4.0 | 106 | 2.1811419 | 42.6093469 | 12.1103610 | 87.8896390 |
| R4.0107 | R4.0 | 107 | 2.1720638 | 40.4282050 | 11.7367520 | 88.2632480 |
| R4.0108 | R4.0 | 108 | 2.1540241 | 38.2561412 | 11.3747400 | 88.6252600 |
| R4.0109 | R4.0 | 109 | 2.1273389 | 36.1021171 | 11.0235781 | 88.9764219 |
| R4.0110 | R4.0 | 110 | 2.0924511 | 33.9747782 | 10.6825140 | 89.3174860 |
| R4.0111 | R4.0 | 111 | 2.0498882 | 31.8823271 | 10.3507971 | 89.6492029 |
| R4.0112 | R4.0 | 112 | 2.0002858 | 29.8324389 | 10.0276790 | 89.9723210 |
| R4.0113 | R4.0 | 113 | 1.9443300 | 27.8321531 | 9.7124300 | 90.2875700 |
| R4.0114 | R4.0 | 114 | 1.8827472 | 25.8878231 | 9.4043380 | 90.5956620 |
| R4.0115 | R4.0 | 115 | 1.8162958 | 24.0050759 | 9.1027160 | 90.8972840 |
| R4.0116 | R4.0 | 116 | 1.7457612 | 22.1887801 | 8.8069040 | 91.1930960 |
| R4.0117 | R4.0 | 117 | 1.6718969 | 20.4430189 | 8.5162840 | 91.4837160 |
| R4.0118 | R4.0 | 118 | 1.5954540 | 18.7711220 | 8.2302750 | 91.7697250 |
| R4.0119 | R4.0 | 119 | 1.5171400 | 17.1756680 | 7.9483430 | 92.0516570 |
| R4.0120 | R4.0 | 120 | 1.4376240 | 15.6585280 | 7.8700060 | 92.3299940 |
| R4.0121 | R4.0 | 121 | 1.3575180 | 14.2209040 | 7.3948390 | 92.6051610 |
| R4.0122 | R4.0 | 122 | 1.2773730 | 12.8633860 | 7.1224760 | 92.8775240 |
| R4.0123 | R4.0 | 123 | 1.1976880 | 11.5860130 | 6.8526120 | 93.1473880 |
| R4.0124 | R4.0 | 124 | 1.1188790 | 10.3883250 | 6.5850130 | 93.4149870 |
| R4.0125 | R4.0 | 125 | 1.0413181 | 9.2694460 | 6.3195140 | 93.6804860 |
| R4.0126 | R4.0 | 126 | 0.9653040 | 8.2281280 | 6.0560060 | 93.9439940 |
| R4.0127 | R4.0 | 127 | 0.8910890 | 7.2628240 | 5.7944580 | 94.2055420 |
| R4.0128 | R4.0 | 128 | 0.8188760 | 6.3717350 | 5.5348880 | 94.4651120 |
| R4.0129 | R4.0 | 129 | 0.7488360 | 5.5528590 | 5.2773810 | 94.7226190 |
| R4.0130 | R4.0 | 130 | 0.6811100 | 4.8040230 | 5.0220640 | 94.9779360 |
| R4.0131 | R4.0 | 131 | 0.6158200 | 4.1229130 | 4.7691140 | 95.2308860 |
| R4.0132 | R4.0 | 132 | 0.5530780 | 3.5070930 | 4.5187400 | 95.4812600 |
| R4.0133 | R4.0 | 133 | 0.4930080 | 2.9540150 | 4.2715210 | 95.7284790 |
| R4.0134 | R4.0 | 134 | 0.4357350 | 2.4610070 | 4.0273490 | 95.9726510 |

## Iowa-type Retirement - Survival Tables

Percent Retired, Surviving, Condition, and Depreciation Reserve
as a function of Age as a Percent of Average Service Life

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Lookup | Curve | \% | \% Ret | \% Surv | \% Cond | \% Depr Resv |
| R4.0135 | R4.0 | 135 | 0.3814000 | 2.0252720 | 3.7864600 | 2135400 |
| R4.0136 | R4.0 | 136 | 0.3301680 | 1.6438720 | 3.5490210 | 96.4509790 |
| R4.0137 | R4.0 | 137 | 0.2822160 | 1.3137040 | 3.3315155 | 66.6848450 |
| R4.0138 | R4.0 | 138 | 0.2377380 | 1.0314880 | 3.0849780 | 96.9150220 |
| R4.0139 | R4.0 | 139 | 0.1969280 | 0.7937500 | 2.8585810 | 97.1414190 |
| R4.0140 | R4.0 | 140 | 0.1599700 | 0.5968220 | 2.6360510 | . 3639490 |
| R4.0141 | R4.0 | 141 | 0.1270220 | 0.4368520 | 2.4174760 | 97.5825240 |
| R4.0142 | R4.0 | 142 | 0.0981870 | 0.3098300 | 2.2029340 | 97.7970660 |
| R4.0143 | R4.0 | 143 | 0.0734960 | 0.2116430 | 1.9925030 | 98.0074970 |
| R4.0144 | R4.0 | 144 | 0.0529003 | 0.1381470 | 1.7862840 | 8.2137160 |
| R4.0145 | R4.0 | 145 | 0.0362607 | 0.0852467 | 1.5844010 | 98.4155990 |
| R4.0146 | R4.0 | 146 | 0.0233463 | 0.0489860 | 1.3870900 | 98.6129100 |
| R4.0147 | R4.0 | 147 | 0.0138307 | 0.0256397 | 1.1948260 | 8.8051740 |
| R4.0148 | R4.0 | 148 | 0.0072948 | 0.0118090 | 1.0086400 | 98.9913600 |
| R4.0149 | R4.0 | 149 | 0.0032339 | 0.0045142 | 0.8306070 | 99.1693930 |
| R4.0150 | R4.0 | 150 | 0.0010741 | 0.0012803 | 0.6657290 | 99.3342710 |
| R4.0151 | R4.0 | 151 | 0.0002001 | 0.0002061 | 0.5292780 | 99.4707220 |
| R4.0152 | R4.0 | 152 | 0.0000060 | 0.0000060 | 0.5000830 | 99.4999170 |
| R4.0153 | R4.0 | 153 | 0.0000000 | 0.0000000 | 0.0000000 | 100.0000000 |

## lowa-type Retirement - Survival Tables

Percent Retired, Surviving, Condition, and Depreciation Reserve as a function of Age as a Percent of Average Service Life

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Lookup | Curve | Age \% | \% Ret | \% Surv | \% Cond | Depr Resv |
| S3.0000 | S3.0 | 0 | 0.0000000 | 100.0000000 | 100.0000000 | 0.0000000 |
| S3.0001 | S3.0 | 1 | 0.0000000 | 100.0000000 | 99.0000000 | 1.0000000 |
| S3.0002 | S3.0 | 2 | 0.0000000 | 100.0000000 | 98.0000000 | 2.0000000 |
| S3.0003 | S3.0 | 3 | 0.0000000 | 100.0000000 | 97.0000000 | 3.0000000 |
| S3.0004 | S3.0 | 4 | 0.0000000 | 100.0000000 | 96.0000000 | 4.0000000 |
| S3.0005 | S3.0 | 5 | 0.0000000 | 100.0000000 | 95.0000000 | 5.0000000 |
| S3.0006 | S3.0 | 6 | 0.0000009 | 100.0000000 | 94.0000000 | 6.0000000 |
| S3.0007 | S3.0 | 7 | 0.0000029 | 99.9999991 | 93.0000010 | 6.9999990 |
| S3.0008 | S3.0 | 8 | 0.0000057 | 99.9999962 | 92.0000038 | 7.9999962 |
| S3.0009 | S3.0 | 9 | 0.0000124 | 99.9999905 | 91.0000086 | 8.9999914 |
| S3.0010 | S3.0 | 10 | 0.0000229 | 99.9999781 | 90.0000200 | 9.9999800 |
| S3.0011 | S3.0 | 11 | 0.0000410 | 99.9999552 | 89.0000401 | 10.9999599 |
| S3.0012 | S3.0 | 12 | 0.0000706 | 99.9999142 | 88.0000773 | 11.9999227 |
| S3.0013 | S3.0 | 13 | 0.0001154 | 99.9998436 | 87.0001392 | 12.9998608 |
| S3.0014 | S3.0 | 14 | 0.0001821 | 99.9997282 | 86.0002394 | 13.9997606 |
| S3.0015 | S3.0 | 15 | 0.0002785 | 99.9995461 | 85.0003939 | 14.9996061 |
| S3. 0016 | S3.0 | 16 | 0.0004120 | 99.9992676 | 84.0006294 | 15.9993706 |
| S3.0017 | S3.0 | 17 | 0.0005932 | 99.9988556 | 83.0009728 | 16.9990272 |
| S3.0018 | S3.0 | 18 | 0.0008402 | 99.9982624 | 82.0014629 | 17.9985371 |
| S3.0019 | S3.0 | 19 | 0.0011616 | 99.9974222 | 81.0021467 | 18.9978533 |
| S3.0020 | S3.0 | 20 | 0.0015783 | 99.9962606 | 80.0030832 | 19.9969168 |
| S3.0021 | S3.0 | 21 | 0.0021086 | 99.9946823 | 79.0043373 | 20.9956627 |
| S3.0022 | S3.0 | 22 | 0.0027761 | 99.9925737 | 78.0059929 | 21.9940071 |
| S3.0023 | S3.0 | 23 | 0.0036030 | 99.9897976 | 77.0081453 | 22.9918547 |
| S3.0024 | S3.0 | 24 | 0.0046177 | 99.9861946 | 76.0109024 | 23.9890976 |
| S3.0025 | S3.0 | 25 | 0.0058498 | 99.9815769 | 75.0143890 | 24.9856110 |
| S3.0026 | S3.0 | 26 | 0.0073300 | 99.9757271 | 74.0187492 | 25.9812508 |
| S3.0027 | S3.0 | 27 | 0.0090951 | 99.9683971 | 73.0241404 | 26.9758596 |
| S3.0028 | S3.0 | 28 | 0.0111771 | 99.9593020 | 72.0307388 | 27.9692612 |
| S3.0029 | S3.0 | 29 | 0.0136185 | 99.9481249 | 71.0387383 | 28.9612617 |
| S3.0030 | S3.0 | 30 | 0.0164585 | 99.9345064 | 70.0483513 | 29.9516487 |
| S3.0031 | S3.0 | 31 | 0.0197382 | 99.9180479 | 69.0598068 | 30.9401932 |
| S3.0032 | S3.0 | 32 | 0.0235014 | 99.8983097 | 68.0733528 | 31.9266472 |
| S3.0033 | S3.0 | 33 | 0.0277939 | 99.8748083 | 67.0892544 | 32.9107456 |
| S3.0034 | S3.0 | 34 | 0.0326624 | 99.8470144 | 66.1077900 | 33.8922100 |
| S3.0035 | S3.0 | 35 | 0.0381479 | 99.8143520 | 65.1292582 | 34.8707418 |
| S3.0036 | S3.0 | 36 | 0.0443048 | 99.7762041 | 64.1539688 | 35.8460312 |
| S3.0037 | S3.0 | 37 | 0.0511732 | 99.7318993 | 63.1822462 | 36.8177538 |
| S3.0038 | S3.0 | 38 | 0.0588046 | 99.6807261 | 62.2144260 | 37.7855740 |
| S3.0039 | S3.0 | 39 | 0.0672397 | 99.6219215 | 61.2508540 | 38.7491460 |
| S3.0040 | S3.0 | 40 | 0.0765267 | 99.5546818 | 60.2918859 | 39.7081141 |
| S3.0041 | S3.0 | 41 | 0.0867071 | 99.4781551 | 59.3378830 | 40.6621170 |
| S3.0042 | S3.0 | 42 | 0.0978231 | 99.3914480 | 58.3892121 | 41.6107879 |
| S3.0043 | S3.0 | 43 | 0.1099110 | 99.2936249 | 57.4462428 | 42.5537572 |
| S3.0044 | S3.0 | 44 | 0.1230097 | 99.1837139 | 56.5093489 | 43.49065 |

S:|Depreciation\owacurves.xis
lowa-type Retirement - Survival Tables
Percent Retired, Surviving, Condition, and Depreciation Reserve as a function of Age as a Percent of Average Service Life

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Lookup | Curve Age \% |  | \% Ret | \% Surv | \% Cond | \% Depr Resv |
| S3.0045 | S3.0 | 45 | 0.1371507 | 99.0607042 | 55.5788989 | 44.4211011 |
| S3.0046 | S3.0 | 46 | 0.1523667 | 98.9235535 | 54.6552620 | 45.3447380 |
| S3.0047 | S3.0 | 47 | 0.1686792 | 98.7711868 | 53.7388029 | 46.2611971 |
| S3.0048 | S3.0 | 48 | 0.1861134 | 98.6025076 | 52.8298788 | 47.1701212 |
| S3.0049 | S3.0 | 49 | 0.2046880 | 98.4163942 | 51.9288392 | 48.0711608 |
| S3.0050 | S3.0 | 50 | 0.2244149 | 98.2117062 | 51.0360251 | 48.9639749 |
| S3.0051 | S3.0 | 51 | 0.2453012 | 97.9872913 | 50.1517639 | 49.8482361 |
| S3.0052 | S3.0 | 52 | 0.2673512 | 97.7419901 | 49.2763739 | 50.7236261 |
| S3.0053 | S3.0 | 53 | 0.2905626 | 97.4746389 | 48.4101572 | 51.5898428 |
| S3.0054 | S3.0 | 54 | 0.3149290 | 97.1840763 | 47.5534000 | 52.4466000 |
| S3.0055 | S3.0 | 55 | 0.3404341 | 96.8691473 | 46.7063732 | 53.2936268 |
| S3.0056 | S3.0 | 56 | 0.3670616 | 96.5287132 | 45.8693328 | 54.1306672 |
| S3.0057 | S3.0 | 57 | 0.3947830 | 96.1616516 | 45.0425129 | 54.9574871 |
| S3.0058 | S3.0 | 58 | 0.4235687 | 95.7668686 | 44.2261319 | 55.7738681 |
| S3.0059 | S3.0 | 59 | 0.4533825 | 95.3432999 | 43.4203882 | 56.5796118 |
| S3.0060 | S3.0 | 60 | 0.4841824 | 94.8899174 | 42.6254621 | 57.3745379 |
| S3.0061 | S3.0 | 61 | 0.5159149 | 94.4057350 | 41.8415122 | 58.1584878 |
| S3.0062 | S3.0 | 62 | 0.5485287 | 93.8898201 | 41.0686789 | 58.9313211 |
| S3.0063 | S3.0 | 63 | 0.5819635 | 93.3412914 | 40.3070850 | 59.6929150 |
| S3.0064 | S3.0 | 64 | 0.6161499 | 92.7593279 | 39.5568309 | 60.4431691 |
| S3.0065 | S3.0 | 65 | 0.6510201 | 92.1431780 | 38.8179989 | 61.1820011 |
| S3.0066 | S3.0 | 66 | 0.6864967 | 91.4921579 | 38.0906539 | 61.9093461 |
| S3.0067 | S3.0 | 67 | 0.7224970 | 90.8056612 | 37.3748412 | 62.6251588 |
| S3.0068 | S3.0 | 68 | 0.7589350 | 90.0831642 | 36.6705899 | 63.3294101 |
| S3.0069 | S3.0 | 69 | 0.7957239 | 89.3242292 | 35.9779110 | 64.0220890 |
| S3.0070 | S3.0 | 70 | 0.8327675 | 88.5285053 | 35.2967982 | 64.7032018 |
| S3.0071 | S3.0 | 71 | 0.8699665 | 87.6957378 | 34.6272311 | 65.3727689 |
| S3.0072 | S3.0 | 72 | 0.9072227 | 86.8257713 | 33.9691749 | 66.0308251 |
| S3.0073 | S3.0 | 73 | 0.9444323 | 85.9185486 | 33.3225799 | 66.6774201 |
| S3.0074 | S3.0 | 74 | 0.9814892 | 84.9741163 | 32.6873822 | 67.3126178 |
| S3.0075 | S3.0 | 75 | 1.0182848 | 83.9926271 | 32.0635042 | 67.9364958 |
| S3.0076 | S3.0 | 76 | 1.0547151 | 82.9743423 | 31.4508619 | 68.5491381 |
| S3.0077 | S3.0 | 77 | 1.0906649 | 81.9196272 | 30.8493540 | 69.1506460 |
| S3.0078 | S3.0 | 78 | 1.1260299 | 80.8289623 | 30.2588730 | 69.7411270 |
| S3.0079 | S3.0 | 79 | 1.1606951 | 79.7029324 | 29.6793010 | 70.3206990 |
| S3.0080 | S3.0 | 80 | 1.1945553 | 78.5422373 | 29.1105120 | 70.8894880 |
| S3.0081 | S3.0 | 81 | 1.2275000 | 77.3476820 | 28.5523710 | 71.4476290 |
| S3.0082 | S3.0 | 82 | 1.2594261 | 76.1201820 | 28.0047390 | 71.9952610 |
| S3.0083 | S3.0 | 83 | 1.2902269 | 74.8607559 | 27.4674680 | 72.5325320 |
| S3.0084 | S3.0 | 84 | 1.3198013 | 73.5705290 | 26.9404030 | 73.0595970 |
| S3.0085 | S3.0 | 85 | 1.3480530 | 72.2507277 | 26.4233890 | 73.5766110 |
| S3.0086 | S3.0 | 86 | 1.3748846 | 70.9026747 | 25.9162619 | 74.0837381 |
| S3.0087 | S3.0 | 87 | 1.4002104 | 69.5277901 | 25.4188600 | 74.5811400 |
| S3.0088 | S3.0 | 88 | 1.4239378 | 68.1275797 | 24.9310110 | 75.0689890 |
| S3.0089 | S3.0 | 89 | 1.4459896 | 66.7036419 | 24.4525449 | 75.5474551 |

## Iowa-type Retirement - Survival Tables

Percent Retired, Surviving, Condition, and Depreciation Reserve as a function of Age as a Percent of Average Service Life

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Lookup | Curve | \% | \% Ret | \% Surv | \% Cond | \% Depr Resv |
| S3.0090 | S3.0 | 90 | 1.4662924 | 65.2576523 | 23.9832900 | 76.0167100 |
| S3.0091 | S3.0 | 91 | 1.4847698 | 63.7913599 | 23.5230711 | 76.4769289 |
| S3.0092 | S3.0 | 92 | 1.5013619 | 62.3065901 | 23.0717111 | 76.9282889 |
| S3.0093 | S3.0 | 93 | 1.5160102 | 60.8052282 | 22.6290381 | 77.3709619 |
| S3.0094 | S3.0 | 94 | 1.5286632 | 59.2892180 | 22.1948710 | 77.8051290 |
| S3. 0095 | S3.0 | 95 | 1.5392757 | 57.7605548 | 21.7690370 | 78.2309630 |
| S3.0096 | S3.0 | 96 | 1.5478119 | 56.2212791 | 21.3513601 | 78.6486399 |
| S3.0097 | S3.0 | 97 | 1.5542393 | 54.6734672 | 20.9416640 | 79.0583360 |
| S3.0098 | S3.0 | 98 | 1.5585370 | 53.1192279 | 20.5397761 | 79.4602239 |
| S3.0099 | S3.0 | 99 | 1.5606909 | 51.5606909 | 20.1455231 | 79.8544769 |
| S3.0100 | S3.0 | 100 | 1.5606909 | 50.0000000 | 19.7587349 | 80.2412651 |
| S3.0101 | S3.0 | 101 | 1.5585370 | 48.4393091 | 19.3792419 | 80.6207581 |
| S3.0102 | S3.0 | 102 | 1.5542393 | 46.8807721 | 19.0068769 | 80.9931231 |
| S3.0103 | S3.0 | 103 | 1.5478119 | 45.3265328 | 18.6414750 | 81.3585250 |
| S3.0104 | S3.0 | 104 | 1.5392757 | 43.7787209 | 18.2828729 | 81.7171271 |
| S3.0105 | S3.0 | 105 | 1.5286631 | 42.2394452 | 17.9309101 | 82.0690899 |
| S3.0106 | S3.0 | 106 | 1.5160103 | 40.7107821 | 17.5854299 | 82.4145701 |
| S3.0107 | S3.0 | 107 | 1.5013619 | 39.1947718 | 17.2462750 | 82.7537250 |
| S3.0108 | S3.0 | 108 | 1.4847698 | 37.6934099 | 16.9132950 | 83.0867050 |
| S3.0109 | S3.0 | 109 | 1.4662919 | 36.2086401 | 16.5863359 | 83.4136641 |
| S3.0110 | S3.0 | 110 | 1.4459901 | 34.7423482 | 16.2652550 | 83.7347450 |
| S3.0111 | S3.0 | 111 | 1.4239380 | 33.2963581 | 15.9499090 | 84.0500910 |
| S3.0112 | S3.0 | 112 | 1.4002102 | 31.8724201 | 15.6401500 | 84.3598500 |
| S3.0113 | S3.0 | 113 | 1.3748848 | 30.4722099 | 15.3358450 | 84.6641550 |
| S3.0114 | S3.0 | 114 | 1.3480530 | 29.0973251 | 15.0368600 | 84.9631400 |
| S3.0115 | S3.0 | 115 | 1.3198011 | 27.7492721 | 14.7430561 | 85.2569439 |
| S3.0116 | S3.0 | 116 | 1.2902269 | 26.4294710 | 14.4543080 | 85.5456920 |
| S3.0117 | S3.0 | 117 | 1.2594261 | 25.1392441 | 14.1704850 | 85.8295150 |
| S3.0118 | S3.0 | 118 | 1.2275000 | 23.8798180 | 13.8914710 | 86.1085290 |
| S3.0119 | S3.0 | 119 | 1.1945550 | 22.6523180 | 13.6171401 | 86.3828599 |
| S3.0120 | S3.0 | 120 | 1.1606951 | 21.4577630 | 13.3473700 | 86.6526300 |
| S3.0121 | S3.0 | 121 | 1.1260300 | 20.2970679 | 13.0820510 | 86.9179490 |
| S3.0122 | S3.0 | 122 | 1.0906648 | 19.1710379 | 12.8210681 | 87.1789319 |
| S3.0123 | S3.0 | 123 | 1.0547152 | 18.0803731 | 12.5643160 | 87.4356840 |
| S3.0124 | S3.0 | 124 | 1.0182848 | 17.0256579 | 12.3116800 | 87.6883200 |
| S3.0125 | S3.0 | 125 | 0.9814891 | 16.0073731 | 12.0630680 | 87.9369320 |
| S3.0126 | S3.0 | 126 | 0.9444329 | 15.0258840 | 11.8183630 | 88.1816370 |
| S3.0127 | S3.0 | 127 | 0.9072221 | 14.0814511 | 11.5774790 | 88.4225210 |
| S3.0128 | S3.0 | 128 | 0.8699670 | 13.1742290 | 11.3403140 | 88.6596860 |
| S3.0129 | S3.0 | 129 | 0.8327670 | 12.3042620 | 11.1067700 | 88.8932300 |
| S3.0130 | S3.0 | 130 | 0.7957240 | 11.4714950 | 10.8767610 | 89.1232390 |
| S3.0131 | S3.0 | 131 | 0.7589350 | 10.6757710 | 10.6501980 | 89.3498020 |
| S3.0132 | S3.0 | 132 | 0.7224970 | 9.9168360 | 10.4270001 | 89.5729999 |
| S3.0133 | S3.0 | 133 | 0.6864971 | 9.1943390 | 10.2070690 | 89.7929310 |
| S3.0134 | S3.0 | 134 | 0.6510199 | 8.5078420 | 9.9903250 | 90.009675 |

## lowa-type Retirement - Survival Tables

Percent Retired, Surviving, Condition, and Depreciation Reserve as a function of Age as a Percent of Average Service Life

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Lookup | Curve | Age \% | \% Ret | \% Surv | \% Cond | \% Depr Resv |
| S3.0135 | S3.0 | 135 | 0.6161500 | 7.8568220 | 9.7766990 | 90.2233011 |
| S3.0136 | S3.0 | 136 | 0.5819630 | 7.2406720 | 9.5661089 | 90.4338911 |
| S3.0137 | S3.0 | 137 | 0.5485290 | 6.6587090 | 9.3584729 | 90.6415271 |
| S3.0138 | S3.0 | 138 | 0.5159150 | 6.1101800 | 9.1537210 | 90.8462790 |
| S3.0139 | S3.0 | 139 | 0.4841820 | 5.5942650 | 8.9517880 | 91.0482121 |
| S3.0140 | S3.0 | 140 | 0.4533830 | 5.1100830 | 8.7525981 | 91.2474020 |
| S3.0141 | S3.0 | 141 | 0.4235690 | 4.6567000 | 8.5560840 | 91.4439160 |
| S3.0142 | S3.0 | 142 | 0.3947830 | 4.2331310 | 8.3621800 | 91.6378200 |
| S3.0143 | S3.0 | 143 | 0.3670610 | 3.8383480 | 8.1708230 | 91.8291770 |
| S3.0144 | S3.0 | 144 | 0.3404340 | 3.4712870 | 7.9819520 | 92.0180480 |
| S3.0145 | S3.0 | 145 | 0.3149290 | 3.1308530 | 7.7955040 | 92.2044960 |
| S3.0146 | S3.0 | 146 | 0.2905630 | 2.8159240 | 7.6114220 | 92.3885780 |
| S3.0147 | S3.0 | 147 | 0.2673510 | 2.5253610 | 7.4296480 | 92.5703520 |
| S3.0148 | S3.0 | 148 | 0.2453010 | 2.2580100 | 7.2501270 | 92.7498730 |
| S3.0149 | S3.0 | 149 | 0.2244150 | 2.0127090 | 7.0728060 | 92.9271940 |
| S3.0150 | S3.0 | 150 | 0.2046880 | 1.7882940 | 6.8976320 | 93.1023680 |
| S3.0151 | S3.0 | 151 | 0.1861140 | 1.5836060 | 6.7245530 | 93.2754470 |
| S3.0152 | S3.0 | 152 | 0.1686790 | 1.3974920 | 6.5535220 | 93.4464780 |
| S3.0153 | S3.0 | 153 | 0.1523660 | 1.2288130 | 6.3844900 | 93.6155100 |
| S3.0154 | S3.0 | 154 | 0.1371510 | 1.0764470 | 6.2174110 | 93.7825890 |
| S3.0155 | S3.0 | 155 | 0.1230100 | 0.9392960 | 6.0522380 | 93.9477620 |
| S3.0156 | S3.0 | 156 | 0.1099110 | 0.8162860 | 5.8889290 | 94.1110710 |
| S3.0157 | S3.0 | 157 | 0.0978230 | 0.7063750 | 5.7274410 | 94.2725590 |
| S3.0158 | S3.0 | 158 | 0.0867070 | 0.6085520 | 5.5677320 | 94.4322680 |
| S3.0159 | S3.0 | 159 | 0.0765270 | 0.5218450 | 5.4097620 | 94.5902380 |
| S3.0160 | S3.0 | 160 | 0.0672400 | 0.4453180 | 5.2534920 | 94.7465080 |
| S3.0161 | S3.0 | 161 | 0.0588040 | 0.3780780 | 5.0988860 | 94.9011140 |
| S3.0162 | S3.0 | 162 | 0.0511730 | 0.3192740 | 4.9459060 | 95.0540940 |
| S3.0163 | S3.0 | 163 | 0.0443050 | 0.2681010 | 4.7945200 | 95.2054800 |
| S3.0164 | S3.0 | 164 | 0.0381480 | 0.2237960 | 4.6446910 | 95.3553090 |
| S3.0165 | S3.0 | 165 | 0.0326620 | 0.1856480 | 4.4963870 | 95.5036130 |
| S3.0166 | S3.0 | 166 | 0.0277940 | 0.1529860 | 4.3495800 | 95.6504200 |
| S3.0167 | S3.0 | 167 | 0.0235020 | 0.1251920 | 4.2042330 | 95.7957670 |
| S3.0168 | S3.0 | 168 | 0.0197375 | 0.1016900 | 4.0603190 | 95.9396810 |
| S3.0169 | S3.0 | 169 | 0.0164582 | 0.0819525 | 3.9178100 | 96.0821900 |
| S3.0170 | S3.0 | 170 | 0.0136189 | 0.0654943 | 3.7766790 | 96.2233210 |
| S3.0171 | S3.0 | 171 | 0.0111777 | 0.0518754 | 3.6369070 | 96.3630930 |
| S3.0172 | S3.0 | 172 | 0.0090944 | 0.0406977 | 3.4984640 | 96.5015360 |
| S3.0173 | S3.0 | 173 | 0.0073307 | 0.0316033 | 3.3613300 | 96.6386700 |
| S3.0174 | S3.0 | 174 | 0.0058498 | 0.0242726 | 3.2254840 | 96.7745160 |
| S3.0175 | S3.0 | 175 | 0.0046178 | 0.0184228 | 3.0909090 | 96.9090910 |
| S3.0176 | S3.0 | 176 | 0.0036030 | 0.0138050 | 2.9575850 | 97.0424150 |
| S3.0177 | S3.0 | 177 | 0.0027755 | 0.0102020 | 2.8255000 | 97.1745000 |
| S3.0178 | S3.0 | 178 | 0.0021089 | 0.0074265 | 2.6946400 | 97.3053600 |
| S3.0179 | S3.0 | 179 | 0.0015783 | 0.0053176 | 2.5649990 | 97.4350010 |

database
lowa-type Retirement - Survival Tables
Percent Retired, Surviving, Condition, and Depreciation Reserve as a function of Age as a Percent of Average Service Life

| 1 | 2 | 3 | 4 | 5 | 6 |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Lookup | Curve Age \% | \% Ret | \% Surv | \% Cond | \% Depr Resv |  |
| S3.0180 | S3.0 | 180 | 0.0011617 | 0.0037393 | 2.4365660 | 97.5634340 |
| S3.0181 | S3.0 | 181 | 0.0008396 | 0.0025776 | 2.3093440 | 97.6906560 |
| S3.0182 | S3.0 | 182 | 0.0005946 | 0.0017381 | 2.1833410 | 97.8166590 |
| S3.0183 | S3.0 | 183 | 0.0004116 | 0.0011435 | 2.0585660 | 97.9414340 |
| S3.0184 | S3.0 | 184 | 0.0002778 | 0.0007319 | 1.9350420 | 98.0649580 |
| S3.0185 | S3.0 | 185 | 0.0001821 | 0.0004541 | 1.8128020 | 98.1871980 |
| S3.0186 | S3.0 | 186 | 0.0001156 | 0.0002720 | 1.6918880 | 98.3081120 |
| S3.0187 | S3.0 | 187 | 0.0000706 | 0.0001564 | 1.5723710 | 98.4276290 |
| S3.0188 | S3.0 | 188 | 0.0000413 | 0.0000858 | 1.4543500 | 98.5456500 |
| S3.0189 | S3.0 | 189 | 0.0000229 | 0.0000446 | 1.3379620 | 98.6620380 |
| S3.0190 | S3.0 | 190 | 0.0000119 | 0.0000217 | 1.2234140 | 98.7765860 |
| S3.0191 | S3.0 | 191 | 0.0000058 | 0.0000097 | 1.1110030 | 98.8889970 |
| S3.0192 | S3.0 | 192 | 0.0000025 | 0.0000040 | 1.0011880 | 98.9988120 |
| S3.0193 | S3.0 | 193 | 0.0000010 | 0.0000014 | 0.8946340 | 99.1053660 |
| S3.0194 | S3.0 | 194 | 0.0000003 | 0.0000004 | 0.7925260 | 99.2074740 |
| S3.0195 | S3.0 | 195 | 0.0000001 | 0.0000001 | 0.6968450 | 99.3031550 |
| S3.0196 | S3.0 | 196 | 0.0000000 | 0.0000000 | 0.6112800 | 99.3887200 |
| S3.0197 | S3.0 | 197 | 0.0000000 | 0.0000000 | 0.5431250 | 99.4568750 |
| S3.0198 | S3.0 | 198 | 0.0000000 | 0.0000000 | 0.5056800 | 99.4943200 |
| S3.0199 | S3.0 | 199 | 0.0000000 | 0.0000000 | 0.5000000 | 99.5000000 |
| S3.0200 | S3.0 | 200 | 0.0000000 | 0.0000000 | 0.0000000 | 100.0000000 |

database

PENNSYLVANIA-AMERICAN WATER COMPANY

2020 GENERAL BASE RATE CASE
R-2020-3019369 (WATER)
R-2020-3019371 (WASTEWATER)

EXHIBIT NO. 11-C, 11-D
DEPRECIATION STUDY

WATER OPERATIONS EXCLUDING STEELTON AS OF DECEMBER 31, 2021, 2022

# EXHIBIT NO. 11-C - DEPRECIATION STUDY 

## WATER OPERATIONS EXCLUDING STEELTON

AS OF DECEMBER 31, 2021

# PENNSYLVANIA-AMERICAN WATER COMPANY MECHANICSBURG, PENNSYLVANIA 

## WATER OPERATIONS EXCLUDING STEELTON

## 2021 DEPRECIATION STUDY

CALCULATED ANNUAL DEPRECIATION ACCRUALS RELATED TO WATER PLANT<br>AS OF DECEMBER 31, 2021

# PENNSYLVANIA-AMERICAN WATER COMPANY 

Mechanicsburg, Pennsylvania

# WATER OPERATIONS EXCLUDING STEELTON 

2021 DEPRECIATION STUDY

CALCULATED ANNUAL DEPRECIATION ACCRUALS
RELATED TO WATER PLANT AS OF DECEMBER 31, 2021

# GANNETT FLEMING VALUATION AND RATE CONSULTANTS, LLC Camp Hill, Pennsylvania 

## Excellence Delivered As Promised

April 22, 2020

Pennsylvania-American Water Company 852 Wesley Drive<br>Mechanicsburg, PA 17055

Attention: Ashley E. Everette Director, Rates and Regulatory

Ladies and Gentlemen:

Pursuant to your request, we have determined the annual depreciation accruals applicable to water plant as of December 31, 2021. The results of our study at December 31, 2020 are presented in our report titled "2020 Depreciation Study - Calculated Annual Depreciation Accruals Related to Water Plant as of December 31, 2020". The same methods, procedures and estimates are used in both studies.

Summaries of the original cost, annual accruals, book depreciation reserve and amortization of net salvage are presented in Tables 1 through 5, beginning on page $1-3$ of the attached report.

Respectfully submitted,
GANNETT FLEMING VALUATION AND RATE CONSULTANTS, LLC


JOHN J. SPANOS
President

JJS:mle
066548.100

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## PART I. RESULTS OF STUDY

# PENNSYLVANIA-AMERICAN WATER COMPANY WATER OPERATIONS EXCLUDING STEELTON DEPRECIATION STUDY 

RESULTS OF STUDY

## DESCRIPTION OF SUMMARY TABULATIONS

Tables 1 through 5 presented on pages 3 through 13 summarize the results of the depreciation study as of December 31, 2021. Table 1 sets forth the development of the net original cost by account as of December 31, 2021. Table 2 sets forth, by depreciable group, the estimated survivor curve, original cost, book depreciation reserve as of December 31, 2021, future book accruals, calculated annual accrual amount and rate, and composite remaining life for plant in service. Table 3 presents the bringforward of the book reserve to December 31, 2021. Table 4 sets forth the calculation of the depreciation accruals for the twelve months ended December 31, 2021. Table 5 presents the annual amortization of experienced and estimated net salvage based on the period 2017 through 2021.

## DESCRIPTION OF DETAILED TABULATIONS

The supporting data for the depreciation calculations are presented in account sequence in the section beginning on page II-8. The original cost, calculated accrued depreciation, allocated book reserve, future accruals, remaining life and annual accrual are shown for each vintage of each account or subaccount. The amounts of regular retirements, gross salvage and cost of removal are set forth by account for the years 2017 through 2021, beginning on pages III-2 through III-6.

| NET ORIGINAL COST <br> AS OF |
| ---: |
| DECMEBER 31, 2021 |
| $(6)$ |
|  |
|  |
| $766,405.12$ |
| $2,404,599.20$ |
| $1,453,020.77$ |
| $4,624,025.09$ |
|  |
|  |
| $4,315,318.23$ |
| $15,412.25$ |
| $3,508,143.01$ |
| $2,001,789.51$ |
| $1,762,423.06$ |
| $5,288,947.81$ |
| $5,260,832.58$ |
| $22,152,866.45$ |





 | $\begin{array}{c}\text { CONTRIBUTIONS } \\ \text { IN AID OF } \\ \text { CONSTRUCTION }\end{array}$ |
| :---: |
| $(4)$ |

| 85 | 88 | 88 - $8 \%$ | N | 8 | $\bar{n}$ |
| :---: | :---: | :---: | :---: | :---: | :---: |
| へ-8 | $8 \stackrel{0}{81}$ | $\cdots$ | ¢ | ¢ | $\stackrel{\rightharpoonup}{\Sigma}$ |
| \% | 8 |  | N | N | 8 |

## TOTAL INTANGIBLE PLANT

NONDEPRECIABLE PLANT
303.20 POWER AND PUMPING LAND 303.40 TRANSMISSION AND DISTRIBUTION LAND AND RIGHTS OF WA $\begin{array}{ll}303.50 & \text { DISTRIBUTION RESERVOIRS AND STANDPIPE LAND } \\ 303.51 & \text { TRANSMISSION AND DISTRIBUTION - LAND } \\ 303.52 & \text { TRANSMISSION AND DISTRIBUTION - RIGHTS OF WAY }\end{array}$ 303.61 OFFICE LAND
TOTAL NONDEPRECIABLE PLANT
303.14 WATER RIGHTS - HIBERNIA $\begin{array}{ll}303.14 & \text { WATER RIGHTS - HIBERNIA } \\ \text { 303.35 } & \text { WASTE HANDLING AND TREATMENT LAND } \\ 303.99 & \text { COMPREHENSIVE PLANNING STUDIES }\end{array}$ $\begin{array}{ll}303.99 & \text { COMPREHENSIVE PLANNING STUDIES } \\ 304.15 & \text { OTHER WATER SOURCE STRUCTURES } \\ 304.20 & \text { POWER AND PUMPING STRUCTURES }\end{array}$
304.36 WASTE HANDLING AND TREATMENT STRUCTURES
304.38 WASTE HANDLING AND TREATMENT STRUCTURES PAINTING
304.39 PURIFICATIN BUILDINGS - TANK PAINTING
$\begin{array}{ll}304.39 & \text { PURIFICATION BUILDINGS - TANK PAINTING } \\ \text { 304.61 } & \text { OFFICE BUILDINGS } \\ 304.62 & \text { STORES, SHOP AND GARAGE BUILDINGS }\end{array}$
304.63 MISCELLANEOUS STRUCTURES AND IMPROVEMENTS
$\begin{array}{ll}304.63 & \text { MISCELLANEOUS STRUCTURES AND IMPROVEMENTS } \\ 305.00 & \text { COLLECTING AND IMPOUNDING RESERVOIRS } \\ 306.00 & \text { LAKE, RIVER AND OTHER INTAKES } \\ 307.00 & \text { WELLS AND SPRINGS } \\ 310.00 & \text { POWER GENERATION EQUIPMENT } \\ 311.20 & \text { PUMPING EQUIPMENT - ELECTRIC PUMPING EQUIPMENT } \\ 311.50 & \text { PUMPING EQUIPMENT - OTHER } \\ 311.52 & \text { PUMPING EQUIPMENT - SOURCE OF SUPPLY } \\ 311.53 & \text { PUMPING EQUIPMENT - WATER TREATMENT }\end{array}$
$\begin{array}{ll}304.63 & \text { MISCELLANEOUS STRUCTURES AND IMPROVEMENTS } \\ 305.00 & \text { COLLECTING AND IMPOUNDING RESERVOIRS } \\ 306.00 & \text { LAKE, RIVER AND OTHER INTAKES } \\ 307.00 & \text { WELLS AND SPRINGS } \\ 310.00 & \text { POWER GENERATION EQUIPMENT } \\ 311.20 & \text { PUMPING EQUIPMENT - ELECTRIC PUMPING EQUIPMENT } \\ 311.50 & \text { PUMPING EQUIPMENT - OTHER } \\ 311.52 & \text { PUMPING EQUIPMENT - SOURCE OF SUPPLY } \\ 311.53 & \text { PUMPING EQUIPMENT - WATER TREATMENT }\end{array}$
$\begin{array}{ll}304.63 & \text { MISCELLANEOUS STRUCTURES AND IMPROVEMENTS } \\ 305.00 & \text { COLLECTING AND IMPOUNDING RESERVOIRS } \\ 306.00 & \text { LAKE, RIVER AND OTHER INTAKES } \\ 307.00 & \text { WELLS AND SPRINGS } \\ 310.00 & \text { POWER GENERATION EQUIPMENT } \\ 311.20 & \text { PUMPING EQUIPMENT - ELECTRIC PUMPING EQUIPMENT } \\ 311.50 & \text { PUMPING EQUIPMENT - OTHER } \\ 311.52 & \text { PUMPING EQUIPMENT - SOURCE OF SUPPLY } \\ 311.53 & \text { PUMPING EQUIPMENT - WATER TREATMENT }\end{array}$
$\begin{array}{ll}311.52 & \text { PUMPING EQUIPMENT - SOURCE OF SUPPLY } \\ 311.53 & \text { PUMPING EQUIPMENT - WATER TREATMENT }\end{array}$
PUMPING EQUIPMENT - TRANSMISSION AND DISTRIBUTION
PURIFICATION SYSTEM - LARGE STRUCTURES
PURIFICATION SYSTEM - LARGE STRUCTURES PAINT
PURIFICATION SYSTEM - CHEMICAL TREATMENT
WASTE HANDLING AND TREATMENT - EQUIPMENT
DISTRIBUTION RESERVOIRS AND STANDPIPES

|  |  <br>  <br>  <br>  |
| :---: | :---: |



 | 8 |
| :--- |
| 8 |
| 0 |
| 0 |
| N |
| B |



|  | E |  | $\begin{aligned} & \mathrm{B} \\ & \dot{\mathbf{~}} \end{aligned}$ | $\frac{8}{\square}$ | 8 <br>  <br> 8 <br> \% <br> \% |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |

PENNSYLVANIA-AMERICAN WATER COMPANY
WATER OPERATIONS EXCLUDING STEELTON
TABLE 1. DEVELOPMENT OF NET ORIGINAL COST AS OF DECEMBER 31, 2021


TABLE 2. SUMM ARY OF ESTIMATED SURVIVOR CURVES, ORIGINAL COST, BOOK RESERVE AND
CALCULATED ANNUAL DEPRECIATION ACCRUALS RELATED TO UTILITY PLANT AS OF DECEMBER 31, 2021

| SURVIVOR CURVE | NET ORIGINAL COST AS OF DECEMBER 31, 2021 | $\begin{aligned} & \text { BOOK } \\ & \text { RESERVE } \end{aligned}$ | FUTURE ACCRUALS | ANNUAL Accrual AMOUNT |
| :---: | :---: | :---: | :---: | :---: |
| ${ }^{(2)}$ | (3) | (4) | (5) | (6) |
| $\begin{gathered} 55-\mathrm{So.5} \\ 45-\mathrm{R} 3 \end{gathered}$ | $\begin{array}{r} 48,973,108.70 \\ 6,138,205.16 \\ \hline \end{array}$ | $\begin{array}{r} 11,428,586 \\ 3,952,462 \\ \hline \end{array}$ | $37,544,523$ $2,185,743$ | $\begin{array}{r} 1,323,667 \\ \quad 82,351 \\ \hline \end{array}$ |
|  | 55,111,313.86 | 15,381,048 | 39,730,266 | 1,406,018 |
| 35-S0.5 | 4.132,815.74 | 2,198,599 | 1,934,217 | 86,804 |
|  | 569,350,742.07 | 151,776,676 | 417,574,069 | 13,479,606 |
| $\begin{aligned} & \text { 125-R2 } \\ & 75-\mathrm{R} 3 \end{aligned}$ | $\begin{array}{r} 128,044,777.60 \\ 7,624,311.12 \\ \hline \end{array}$ | $\begin{array}{r} 18,481,585 \\ 2,729,327 \\ \hline \end{array}$ | $\begin{array}{r} 109,563,192 \\ 4,894,984 \\ \hline \end{array}$ | $\begin{array}{r} 1,809,335 \\ 215,147 \\ \hline \end{array}$ |
|  | 135,669,088.72 | 21,210,912 | 114,458,176 | 2,024,482 |
| $\begin{gathered} 55-\mathrm{S} 1 \\ 50-\mathrm{So.5} \end{gathered}$ | $\begin{array}{r} 14,029.064 .70 \\ 4,186,722.38 \\ \hline \end{array}$ | $\begin{aligned} & 4,448,923 \\ & 1,524,770 \\ & \hline \end{aligned}$ | $\begin{aligned} & 9,580,142 \\ & 2,661,952 \\ & \hline \end{aligned}$ | $\begin{aligned} & 336,818 \\ & 110,315 \\ & \hline \end{aligned}$ |
|  | 18,215,787.08 | 5,973,693 | 12,242,094 | 447,133 |
| 55-S0 | 10,623,182.73 | 3,343,133 | 7,280,050 | 246,499 |
|  | 19,809,562.50 | 5,157,558 | 14,652,004 | 541,291 |
| 42-50 | 23,758,420.92 | 4,483,984 | 19,274,437 | 769,961 |
| 42-S0 | 2,389,457. 83 | 559,308 | 1,830,150 | 74,670 |
| 42-50 | 14,212,241.21 | 2,191,102 | 12,021,139 | 477,564 |
| 42-50 | 46,865,937.19 | 18,885,547 | 27,980,390 | 1,331,345 |
|  | 94,013,767.78 | 28,245,757 | 65,768,011 | 2,850,998 |
| $\begin{gathered} 60-\mathrm{SO.5} \\ 55-\mathrm{R} 3 \end{gathered}$ | $\begin{array}{r} 255,675,564.06 \\ 21,689,328.04 \\ \hline \end{array}$ | $\begin{array}{r} 73,452,571 \\ 3,259,936 \\ \hline \end{array}$ | $\begin{array}{r} 182,222,993 \\ 18,429,392 \\ \hline \end{array}$ | $\begin{array}{r} 7,332,914 \\ 451,433 \\ \hline \end{array}$ |
|  | 277,364,892.10 | 76,712,507 | 200,652,385 | 7,784,347 |
| 10-SQ | 103,245.73 | 103,246 | 0 | 0 |
| 10-SQ | 3,522,542.77 | 3,513,661 | 8,882 | 2,537 |
| 36-R0. 5 | 84,703,323.42 | 32,767,124 | 51,936,199 | 2,724,881 |
| FULLY ACCRUED | 8,167.87 | 8,168 | 0 | - |
| ${ }^{7-12}$ | 8,601,165.21 | 6,864,049 | 1,737.116 | 577,102 |
| 30-R3 | 14,969.798.93 | 10,336,097 | 4,633,702 | 255,895 |
|  | 389,273,136.03 | 130,304,852 | 258,968,284 | 11,344,762 |


|  | DEPRECIABLE GROUP |
| :---: | :---: |
|  | (1) |
| 304.62 | STORES, SHOP AND GARAGE BUILDINGS LARGE STRUCTURES OTHER STRUCTURES |
|  | TOTAL ACCOUNT 304.62 |
| 304.63 | MISCELLANEOUS STRUCTURES AND IMPROVEMENTS |
|  | TOTAL ACCOUNT 304 |
| 305.00 | COLLECTING AND IMPOUNDING RESERVOIRS LARGE RESERVOIRS OTHER RESERVOIRS |
|  | TOTAL ACCOUNT 305 |
| 306.00 | LAKE, RIVER AND OTHER INTAKES LARGE INTAKES OTHER INTAKES |
|  | TOTAL ACCOUNT 306 |
| 307.00 | WELLS AND SPRINGS |
| 310.00 | POWER GENERATION EQUIPMENT |
|  | PUMPING EQUIPMENT |
| 311.20 | ELECTRIC |
| 311.50 | OTHER |
| 311.52 | SOURCE OF SUPPLY |
| 311.53 | WATER TREATMENT |
| 311.54 | TRANSMISSION AND DISTRIBUTION |
|  | TOTAL ACCOUNT 311 |
| 320.10 | PURIFICATION SYSTEM |
|  | LARGE STRUCTURES |
|  | LARGE STRUCTURES |
|  | OTHER STRUCTURES |
|  | TOTAL ACCOUNT 320.1 |
| 320.18 | LARGE STRUCTURES PAINT |
| 320.19 | LARGE STRUCTURES PAINT |
| 320.20 | CHEMICAL TREATMENT |
| 320.29 | CHEMICAL TREATMENT PAINT |
| 320.30 | granular activated carbon |
| 320.37 | WASTE HANDLING AND TREATMENT - EQUIPMENT |

TABLE 2. SUMMARY OF ESTIMATED SURVIVOR CURVES, ORIGINAL COST, BOOK RESERVE
CALCULATED ANNUAL DEPRECIATION ACCRUALS RELATED TO UTILITY PLANT AS OF DECEMBER 31, 2021

|  |  <br>  | $\stackrel{\infty}{N}$ | $\stackrel{N}{N} \stackrel{N}{\mathrm{~N}} \stackrel{\mathrm{~N}}{\mathrm{~F}}$ |  | $\hat{N}$ | $\stackrel{N}{m}_{\infty}^{\infty} \underset{\sim}{\infty} \underset{\sim}{m} \underset{\sim}{\sigma}$ | $\stackrel{\infty}{\infty}$ | $\bar{m} \underset{\sim}{\underset{\sim}{N}} \stackrel{\bullet}{\circ} \stackrel{\varphi}{r}$ | $\stackrel{N}{\underset{\sim}{\sim}} \underset{\underset{\sim}{*}}{\underset{\sim}{\nabla}}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | $\underset{\sim}{\underset{\sim}{i}}$ | Ọ © | © No <br>  | $\begin{aligned} & \overline{\hat{\omega}} \\ & \underset{\sim}{n} \end{aligned}$ |  | $\begin{aligned} & \hat{\mathrm{O}} \\ & \stackrel{\mathrm{o}}{2} \end{aligned}$ |  |  |


| TABLE 2. SunCALCULATED ANDEPRECIABLE GROUP(1) |  | PENN <br> WATE <br> Y OF ESTIM EPRECIATIO | NIA-AMERICAN WATER RATIONS EXCLUDING ST <br> SURVIVOR CURVES, ORI RUALS RELATED TO UT | PANY <br> TON <br> L COST, BOO <br> PLANT AS O | ESERVE AND ECEMBER 31, | ANNUAL ACCRUAL AMOUNT |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | CURVE <br> SURVIVOR | NET ORIGINAL COST AS OF DECEMBER 31, 2021 | $\begin{aligned} & \text { BOOK } \\ & \text { RESERVE } \end{aligned}$ | FUTURE ACCRUALS |  |
|  | (1) | (2) | (3) | (4) | (5) | (6) |
| 330.00 | DISTRIBUTION RESERVOIRS AND STANDPIPES | 65-S0.5 | 114,750.102.23 | 37,604,850 | 77,145,252 | 2,040,752 |
| 330.10 | ELEVATED TANKS AND STANDPIPES | 65-S0.5 | 14,100,477.17 | 1,396,944 | 12,703,533 | 302,304 |
| 330.20 | GROUND LEVEL FACILITIES | 65-S0.5 | 18,929,725.89 | 1,478,786 | 17,450,940 | 411,613 |
| 330.30 | BELOW GRADE FACILITIES | 65-S0.5 | 818,672.56 | 134,722 | 683,951 | 16,514 |
| 330.40 | CLEARWELL | 65-S0.5 | 12,806,094.73 | 2,241,101 | 10,564,994 | 256,016 |
| 330.58 | DISTRIBUTION RESERVOIRS AND STANDPIPES - PAINTING | 10-SQ | 2,211,111.35 | 2,124,822 | 86,289 | 24,654 |
| 330.59 | DISTRIBUTION RESERVOIRS AND STANDPIPES - PAINTING | 10-SQ | 34,570,376.62 | 22,983,972 | 11,586,405 | 2,403,686 |
|  | TOTAL ACCOUNT 330 |  | 198,186,560.55 | 67,965,197 | 130,221,364 | 5,455,539 |
| 331.00 | MAINS AND ACCESSORIES | 110-R2 | 2,799,921,328.82 | 327,632,397 | 2,472,288,932 | 33,559,667 |
| 333.00 | SERVICES | 70-R2.5 | 631,916,771.52 | 153,302,150 | 478,614,622 | 10,466, 170 |
| 334.00 | METERS AND METER INSTALLATIONS | 21-L1 | 206,255,053.90 | 85,792,067 | 120,462,987 | 10,770,670 |
| 335.00 | FIRE HYDRANTS | 75-R2.5 | 122,785,610.66 | 21,454,868 | 101,330,743 | 1,959,904 |
| 340.00 | OFFICE FURNITURE AND EQUIPMENT |  |  |  |  |  |
|  | FURNITURE | 20-SQ | 7,475,864.68 | 1,347,541 | 6,128,324 | 386,093 |
|  | COMPUTERS AND PERIPHERAL EQUIPMENT | 5-SQ | 24,511,435.46 | 5,940,437 | 18,570,998 | 5,214,238 |
|  | COMPUTER SOFTWARE | 5-SQ | 45,994,769.94 | 21,924,860 | 24,069,910 | 8,444,686 |
|  | COMPUTER SOFTWARE - BUSINESS TRANSFORMATION | 10-SQ | 62,990,459.09 | 52,072,253 | 10,918,206 | 8,099,503 |
|  | OTHER OFFICE EQUIPMENT | 10-SQ | 7,290.67 | 1,744 | - 5,547 | 740 |
|  | TOTAL ACCOUNT 340 |  | 140,979,819.84 | 81,286,835 | 59,692,985 | 22,145,260 |
| 341.00 | TRANSPORATION EQUIPMENT |  |  |  |  |  |
|  | NOT CLASSIFIED | 7-L3 | 349.00 | 349 | 0 | 0 |
|  | LIGHT DUTY TRUCKS | 7-L3 | 28,802,310.96 | 17,540,380 | 11,261,931 | 2,978,791 |
|  | EQUIPMENT | 7-L3 | 23,205,811,64 | 13,407,514 | 9,798,298 | 2,686,946 |
|  | AUTOS | 7-L3 | 3,874,730.49 | 2,379,267 | 1,495,463 | 347,892 |
|  | OTHER | 7-L3 | 10,439,225.68 | 5,565,457 | 4,873,769 | 1,261,319 |
|  | TOTAL ACCOUNT 341 |  | 66,322,427.77 | 38,892,967 | 27,429,461 | 7,274,948 |
| 342.00 | STORES EQUIPMENT | 20-SQ | 448,033.65 | 97,064 | 350,970 | 26,762 |
| 343.00 | TOOLS AND WORK EQUIPMENT | 20-SQ | 32,097,137.82 | 7,101,221 | 24,995,917 | 1,893,452 |
| 344.00 | LABORATORY EQUIPMENT | 20-L0.5 | 2,606,821.35 | 1,152,886 | 1,453,935 | 152,376 |
| 345.00 | POWER OPERATED EQUIPMENT | 19-S0.5 | 2,405,805.64 | 1,655,168 | 750,638 | 98,401 |
| 346.00 | COMUNICATION EQUIPMENT |  |  |  |  |  |
|  | EQUIPMENT | 15-SQ | 3,459,420.00 | 476,123 | 2,983,297 | 226,521 |
|  | NON-TELEPHONE | 15-SQ | 6,770,729.39 | 1,148,483 | 5,622,246 | 452,423 |
|  | REMOTE CONTROL AND INSTRUMENTATION | 10-SQ | 2,790,901.75 | 1,618,957 | 1,171,945 | 256,489 |
|  | TELEPHONE | 10-SQ | 188,390.60 | $121.502$ | 66,889 | 17.853 |
|  | TOTAL ACCOUNT 346 |  | 13,209,441.74 | 3,365,065 | 9,844,377 | 953,286 |



 PENNSYLVANIA-AMERICAN WATER COMPANY
WATER OPERATIONS EXCLUDING STEELTON
TABLE 2. SUMMARY OF ESTIMATED SURVIVOR CURVES, ORIGINAL COST, BOOK RESERVE AND
CALCULATED ANNUAL DEPRECIATION ACCRUALS RELATED TO UTILITY PLANT AS OF DECEMBER 31, 2021



| NET ORIGINAL COST |
| ---: |
| AS OF |
| DECEMBER 31, 2021 |
| $(3)$ |
| $11,604,345.21$ |
| $793,796.73$ |
| $\mathbf{5 , 4 7 8 , 2 9 6 , 1 3 1 . 1 4}$ |
|  |
| $\mathbf{5 , 5 0 5 , 0 7 3 , 0 2 2 . 6 8}$ |




II




|  |  |  |  | $\begin{aligned} & \text { O O } \\ & \text { O } \\ & \text { NN } \end{aligned}$ | $\begin{aligned} & \text { O} \\ & 0 \\ & 0 \\ & 0 \\ & 0 \end{aligned}$ | $\begin{aligned} & 8 \\ & 0 \\ & 0 \\ & \text { io } \end{aligned}$ |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  |  |  | 10 8 8 8 8 8 | N O N |  |




|  |  <br>  <br> ■ <br>  |
| :---: | :---: |




TABLE 4. CALCULATION OF DEPRECIATION ACCRUALS FOR THE TWELVE MONTHS ENDED DECEMBER 31, 2021

| AMORTIZATION |
| :---: |
| OF NET |
| SALVAGE |
| $(6)$ |




 $, 942,822$.
$155,025$.
$, 710,061$.
$, 248,707$.
$, 487,362$.
$, 583,861$.
$, 668,886$
$65,958$.
$119,362$.



| $\begin{array}{c}\text { ACCRUAL } \\ \text { RATE }\end{array}$ |
| :--- |
| $(4)$ |




 $119,362.95$
$3,412,787.39$











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$N$
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0
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$\infty$

PENNSYLVANIA－AMERICAN WATER COMPANY
WATER OPERATIONS EXCLUDING STEELTON
TABLE 4．CALCULATION OF DEPRECIATION ACCRUALS FOR THE TWELVE MONTHS ENDED DECEMBER 31， 2021
 PENNSYLVANIA－AMERICAN WATER COMPANY
WATER OPERATIONS EXCLUDING STEELTON

| PROJECTED |
| :--- |
| DEPRECIATION |
| ACCRUALS |
| （7）＝（5）＋（6） |



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| $\mathbf{N}$ |
| $\mathbf{N}$ |
| $\mathbf{N}$ |
| $\mathbf{N}$ | | ACCRUAL |
| :---: |
| RATE |
| $(4)$ |

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7.86
1.21
1.66
5.51
1.60
5.31
21.66
21.25
16.42
10.15
0.00
11.00
11.93
8.40
11.54
6.04
5.99
6.50
4.67
6.19
6.62
9.44
5.68
7.24
4.03

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$12,806,094.73$
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$12,806,094.73$
$2,211,111.35$
2，211，111．35



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$09^{\circ} 92$ G $^{\prime} 09 Z^{\prime} เ \downarrow$ $\stackrel{n}{1}$
PENNSYLVANIA-AMERICAN WATER COMPANY
WATER OPERATIONS EXCLUDING STEELTON
table 5. AMORTIZATION OF EXPERIENGED AND ESTIMATED NET SALVAGE



## PENNSYLVANIA-AMERICAN WATER COMPANY MECHANICSBURG, PENNSYLVANIA

## WASTEWATER SSS OPERATIONS EXCLUDING SADSBURY AND EXETER

## 2022 DEPRECIATION STUDY

## CALCULATED ANNUAL DEPRECIATION ACCRUALS RELATED TO WASTEWATER PLANT AS OF DECEMBER 31, 2022

Prepared by:

# PENNSYLVANIA-AMERICAN WATER COMPANY <br> Mechanicsburg, Pennsylvania 

# WASTEWATER SSS OPERATIONS EXCLUDING SADSBURY AND EXETER 

## 2022 DEPRECIATION STUDY

## CALCULATED ANNUAL DEPRECIATION ACCRUALS <br> RELATED TO WASTEWATER PLANT <br> AS OF DECEMBER 31, 2022

Excellence Delivered As Promised

April 22, 2020

Pennsylvania-American Water Company
852 Wesley Drive
Mechanicsburg, PA 17055
Attention Ashley E. Everette
Director, Rates \& Regulatory
Ladies and Gentlemen:
Pursuant to your request, we have determined the annual depreciation accruals applicable to wastewater plant as of December 31, 2022. The results of our study at December 31, 2020 are presented in our report titled "2020 Depreciation Study Calculated Annual Depreciation Accruals Related to Wastewater Plant as of December 31,2020 ". The same methods, procedures and estimates are used in both studies.

Summaries of the original cost, annual accruals, book depreciation reserve and amortization of net salvage are presented in Tables 1 through 5, beginning on page I-3 of the attached report.

Respectfully submitted,
GANNETT FLEMING VALUATION AND RATE CONSULTANTS, LLC


JOHN J. SPANOS
President
JJS:mle
066548.100

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## PART I. RESULTS OF STUDY

# PENNSYLVANIA-AMERICAN WATER COMPANY <br> WASTEWATER SSS OPERATIONS EXCLUDING SADSBURY AND EXETER 

## DEPRECIATION STUDY

## PART I. RESULTS OF STUDY

## SUMMARY OF RESULTS

Tables 1 through 5 presented on pages I-3 through I-7 summarize the results of the depreciation study as of December 31, 2022. Table 1 sets forth the development of the net original cost by account as of December 31, 2022. Table 2 sets forth, by depreciable group, the estimated survivor curve, original cost, book depreciation reserve as of December 31, 2022, future book accruals, calculated annual accrual amount and rate, and composite remaining life for plant in service. Table 3 presents the bringforward of the book reserve to December 31, 2022. Table 4 sets forth the calculation of the depreciation accruals for the twelve months ended December 31, 2022. Table 5 presents the annual amortization of experienced and estimated net salvage based on the period 2018 through 2022.

## DESCRIPTION OF DETAILED TABULATIONS

The supporting data for the depreciation calculations are presented in account sequence in the section beginning on page II-7. The original cost, calculated accrued depreciation, allocated book reserve, future accruals, remaining life and annual accrual are shown for each vintage of each account or subaccount. The amounts of regular retirements, gross salvage and cost of removal are set forth by account for the years 2018 through 2022, beginning on pages III-2 through III-4.

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PENNSYLVANIA－AMERICAN WATER COMPANY
WASTEWATER SSS OPERATIONS EXCLUDING SADSBURY AND EXETER
table 1．DEVELOPMENT OF NET ORIGINAL COST AS OF DECEMBER 31， 2022

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| 354．20 STRUCTURES AND IMPROVEMENTS－COLLECTION354．30 STRUCTURES AND IMPROVEMENTS－SPP354．40 STRUCTURES AND IMPROVEMENTS－TDP354．70 STRUCTURES AND IMPROEMENTS－GENERAL355．00 POWER GENERATION EQUIPMENT360．10 COLLECTION SEWERS－FORCE MAINS361．10 COLLECTION SEWERS－GRAVITY MAINS361．20 MANHOLES363．00 SERVICES364．00 FLOW MEASURING DEVICES365．00 FLOW MEASURING INSTALLATIONS370．00 RECEIVING WELLS371．00 PUMPING EQUIPMENT380．00 TREATMENT EQUIPMENT381．00 PLANT SEWERS382．00 OUTFALL SEWER LINES389．10 OTHER PLANT AND MISCELLANEOUS EQUIPMENT－INTANGIBLE389．60 OTHER PLANT AND MISCELLANEOUS EQUIPMENT－CPS390．00 OFFIEE FURNITURE AND EQUPMENT391．00 TRANSPORTATION EQUIPMENT392．00 STORES EQUIPMENT393．00 TOOLS，SHOP AND GARAGE EQUIPMENT394．00 LABORATORY EQUIPMENT395．00 POWER OPERATED EQUUPMENT396．00 COMMMUNICATION EQUIPMENT397．00 MISCELANEOUS EQUIPMENT |  |  |  |  |
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352．10 FRANCHISES
353．20 LAND AND LAND RIGHTS－COLLECTION
353．30 LAND AND LAND RIGHTS－SPP 353．30 LAND AND LAND RIGHTS－SPP
353．40 LAND AND LAND RIGHTS－TDP

[^12]PENNSYLVANIA-AMERICAN WATER COMPANY
WASTEWATER SSS OPERATIONS EXCLUDING SADSBURY AND EXETER
TABLE 2. SUMMARY OF ESTIMATED SURVIVOR CURVE, ORIGINAL COST, BOOK RESERVE, AND
CALCULATED ANNUAL DEPRECIATION ACCRUALS RELATED TO WASTEWATER PLANT AS OF DECEMBER 31, 2022



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AMORTIZATION OF NET SALVAGE TOTAL UTILITY PLANT

DEPRECIABLE PLANT
DEPRECIABLE GROUP

[^13]

NONDEPRECIABLE PLANT
FRANCHISES LAND AND LAND RIGHTS - SPP

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TABLE 3. BRINGFORWARD TO DECEMBER 31, 2022, OF BOOK RESERVE AS OF DECEMBER 31, 2021


PENNSYLVANIA-AMERICAN WATER COMPANY
WASTEWATER SSS OPERATIONS EXCLUDING SADSBURY AND EXETER
TABLE 4. CALCULATION OF DEPRECIATION ACCRUALS FOR THE TWELVE MONTHS ENDED DECEMBER 31, 2022

|  |  엉 <br>  |
| :---: | :---: |


| ACCOUNT | NET ORIGINAL COST AS OF $12 / 31 / 2021$ | NET ORIGINAL COST AS OF $12 / 31 / 2022$ | ACCRUAL RATE | DEPRECIATION ACCRUALS | AMORTIZATION OF NET SALVAGE |
| :---: | :---: | :---: | :---: | :---: | :---: |
| (1) | (2) | (3) | (4) | (5)* | (6) |
| 354.20 | 1,350,155.77 | 1,372,711.27 | 2.84 | 38,574 | 24,518 |
| 354.30 | 14,958,113.65 | 15,253,684.27 | 2.01 | 302,788 | 22,859 |
| 354.40 | 52,285,165.25 | 53,189,589.53 | 2.41 | 1,267,886 | 4,570 |
| 354.70 | 3,102,005.24 | 3,153,826.87 | 2.01 | 62,724 | 25,313 |
| 355.00 | 4,036,071.90 | 4,036,071.90 | 1.63 | 65,788 | 3,040 |
| 360.10 | 38,161,242.14 | 39,166,371.54 | 1.75 | 673,706 | 85,581 |
| 361.10 | 99,296,640.99 | 106,666,373.56 | 1.60 | 1,633,382 | 366,173 |
| 361.20 | 12,812,001.40 | 13,269,957.20 | 2.63 | 342,146 | 75,344 |
| 363.00 | 18,663,546.11 | 20,832,794.90 | 2.55 | 500,757 | 104,210 |
| 364.00 | 356,424.84 | 356,424.84 | 11.98 | 42,700 | 48 |
| 365.00 | 14,938.00 | 14,938.00 | 8.02 | 1,198 |  |
| 370.00 | 143,419.77 | 143,419.77 | 2.26 | 3,241 |  |
| 371.00 | 13,154,873.34 | 13,307,400.98 | 4.71 | 619,894 | 33,028 |
| 380.00 | 64,581,620.12 | 65,707,706.74 | 3.67 | 2,371,867 | 62,116 |
| 381.00 | 6,182,348.11 | 6,182,348.11 | 2.29 | 141,576 |  |
| 382.00 | 604,388.91 | 604,388.91 | 2.13 | 12,873 | 317 |
| 389.10 | 582,205.16 | 582,205.16 | 5.48 | 31,905 | 401 |
| 389.60 | 1,655,000.00 | 1,707,500.00 | 20.97 | 351,045 |  |
| 390.00 | 168,706.08 | 168,706.08 | 7.76 | 13,092 | 171 |
| 391.00 | 2,554,774.18 | 3,034,840.81 | 7.83 | 213,813 | 5,084 |
| 392.00 | 107,351.44 | 107,351.44 | 3.98 | 4,273 |  |
| 393.00 | 1,199,614.28 | 1,505,097.79 | 5.29 | 71,382 | 452 |
| 394.00 | 628,336.51 | 729,305.71 | 6.14 | 41,616 | 1,357 |
| 395.00 | 787,628.77 | 907,645.43 | 4.17 | 34,678 | 470 |
| 396.00 | 1,669,700.06 | 1,744,213.66 | 6.33 | 107,931 | 5,749 |
| 397.00 | 496,492.71 | 632,593.59 | 4.84 | 26,200 | 2,306 |
| 398.00 | 14,231.50 | 14,231.50 | 3.93 | 559 | 250 |
| TOTAL | 339,566,996.23 | 354,391,699.56 |  | 8,977,592 | 823,357 |

* Total accruals shown are based on average monthly balances.



# PennsyIvania American Water Company 

# Valley Township, Chester County, Pennsylvania 

Water System<br>Appraisal Work Papers<br>As of December 17, 2019

## PAWC General Rate Cases Depreciation Studies <br> Water and Wastewater 2017

AUS Consultants
Suite 201
8555 West Forest Home Avenue
Greenfield, Wisconsin 53228
Office Telephone: 414-529-5755
J. Weinert's Cell: 414-698-8371
J. Weinert's E-Mail: weinertioauswestnet

# PENNSYLVANIA-AMERICAN WATER COMPANY 

## 2017 GENERAL BASE RATE CASE

 R-2017-2595853
## EXHIBIT NO. 11-C - DEPRECIATION STUDY

## WATER OPERATIONS AS OF

DECEMBER 31, 2018

# PENNSYLVANIA-AMERICAN WATER COMPANY 

 HERSHEY, PENNSYLVANIA
## 2018 DEPRECIATION STUDY

## CALCULATED ANNUAL DEPRECIATION ACCRUALS RELATED TO WATER PLANT <br> AS OF DECEMBER 31, 2018

Prepared by:

# PENNSYLVANIA-AMERICAN WATER COMPANY 

Hershey, Pennsylvania

2018 DEPRECIATION STUDY

## CALCULATED ANNUAL DEPRECIATION ACCRUALS RELATED TO WATER PLANT AS OF DECEMBER 31, 2018

# GANNETT FLEMING VALUATION AND RATE CONSULTANTS, LLC <br> Camp Hill, Pennsylvania 

# Gannett Fleming 

Excellence Delivered As Promised

April 21, 2017

Pennsylvania-American Water Company 800 West Hersheypark Drive Hershey, PA 17033

Attention: Mr. John R. Cox
Manager of Rates and Regulations
Gentlemen:
Pursuant to your request, we have determined the annual depreciation accruals applicable to water plant as of December 31,2018. The results of our study at December 31, 2013 are presented in our report titled "2017 Depreciation Study - Calculated Annual Depreciation Accruals Related to Water Plant as of December 31, 2017". The same methods, procedures and estimates are used in both studies.

Summaries of the original cost, annual accruals, book depreciation reserve and amortization of net salvage are presented in Tables 1 through 5, beginning on page I-3 of the attached report.

Respectfully submitted,
GANNETT FLEMING VALUATION
AND RATE CONSULTANTS, LLC


JOHN J. SPANOS
Sr. Vice President

JJS:mlw
062027.100

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## PART I. RESULTS OF STUDY

# PENNSYLVANIA-AMERICAN WATER COMPANY 

DEPRECIATION STUDY

RESULTS OF STUDY

## DESCRIPTION OF SUMMARY TABULATIONS

Tables 1 through 5 presented on pages 3 through 10 summarize the results of the depreciation study as of December 31, 2018. Table 1 sets forth the development of the net original cost by account as of December 31, 2018. Table 2 sets forth, by depreciable group, the estimated survivor curve, original cost, book depreciation reserve as of December 31, 2018, future book accruals, calculated annual accrual amount and rate, and composite remaining life for plant in service. Table 3 presents the bringforward of the book reserve to December 31, 2018. Table 4 sets forth the calculation of the depreciation accruals for the twelve months ended December 31, 2018. Table 5 presents the annual amortization of experienced and estimated net salvage based on the period 2014 through 2018.

## DESCRIPTION OF DETAILED TABULATIONS

The supporting data for the depreciation calculations are presented in account sequence in the section beginning on page II-2. The original cost, calculated accrued depreciation, allocated book reserve, future accruals, remaining life and annual accrual are shown for each vintage of each account or subaccount. The amounts of regular retirements, gross salvage and cost of removal are set forth by account for the years 2014 through 2018, beginning on pages III-2 through III-5.
PENNSYLVANIA-AMERICAN WATER COMPANY
table 1. development of net original cost as of december 31, 2018



|  |  |  |
| :---: | :---: | :---: |



| CONTRIBUTIONS |
| :---: |
| IN AID OF |
| CONSTRUCTION |
| $(4)$ |


$\frac{$|  CUSTOMER  |
| :---: |
|  ADVANCES  |}{$(3)$}




0.00
0.00



 $\begin{array}{r}3,576,428.03 \\ 15,412.25 \\ 4,578,480.03 \\ 2,389,882.77 \\ 1,762,423.06 \\ 5,28,94.81 \\ 3,918,422.99 \\ \hline\end{array}$ $1,942,822.51$
$155,025.17$
$9,920,726.11$
$34,442,969.90$
$107,320,207.30$
$274,724,337.33$
$11,733,221.74$
$65,958.42$
$134,806.79$
$40,019,986.62$
$55,222,287.14$
$4,933,374.39$
$134,357,766.90$
$20,005,870.35$
$11,241,893.43$
$18,152,052.81$
$21,282,287.19$
$1,634,152.00$
$8,509,617.14$
$47,732,222.90$
$8,693,988.14$




PENNSYLVANIA－AMERICAN WATER COMPANY
TABLE 1．DEVELOPMENT OF NET ORIGINAL COST AS OF DECEMBER 31， 2018

| CONTRIBUTIONS <br> IN AID OF <br> CONSTRUCTION |
| ---: |
| $(4)$ |
| $27,162.27$ |
| $42,367.00$ |


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| :---: | :---: | :---: | :---: | :---: |



$\frac{\text { DEPRCIABLE GROUP }}{(1)}$
（1）
$\begin{array}{ll}320.10 & \text { PURIFICATION SYSTEM－LARGE STRUCTURES } \\ 320.18 & \text { PURIFICATION SYSTEM－LARGE STRUCTURES PAINT }\end{array}$
 PURIFICATION SYSTEM－LARGE STRUCTURES PAINT PURIFICATION SYSTEM－CHEM．TREATMENT PAINT GRANULAR ACTIVATED CARBON
$2,905,114.51$

$\stackrel{8}{-1}$

$$
00 \text { ט }
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$81,810,993.14$
$1,753,981.88$
$305,369.35$



8
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PENNSYLVANIA－AMERICAN WATER COMPANY


|  |  |  |  | $\begin{aligned} & \stackrel{\varrho}{N} \\ & \stackrel{y}{j} \\ & \underset{\sim}{j} \end{aligned}$ |  |  | $\begin{aligned} & \dot{\tilde{y}} \\ & \underset{\sim}{む} \end{aligned}$ |  |  |  |  |  |  |  |
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|  |  | $\begin{aligned} & \stackrel{\circ}{\circ} \\ & \stackrel{\rightharpoonup}{\sigma} \\ & \stackrel{\rightharpoonup}{\mathbf{N}} \\ & \stackrel{\rightharpoonup}{\mathbf{\sigma}} \end{aligned}$ |  |  |  |  |  |  | 雨 |  |  |  | 等 |  |





| 320.10 | PURIFICATION SYSTEM PURIFICATION STRUCTURES LARGE STRUCTURES OTHER OTHER STRUCTURES |
| :---: | :---: |
|  | TOTAL ACCOUNT 320.1 |
| 320.18 | LaRGe Structures paint |
| 32019 | Large structures paint |
| 320.20 | Chemical treatment |
| 32029 | CHEMICAL TREATMENT PAINT |
|  | TOTAL PURIFICATION SYSTEM |
| 320.30320 | GRanular activated carbon |
|  | WASTE HANDLING AND TREATMENT－EQUIPMENT |
|  | TOTAL ACCOUNT 320 |
| 330.00 | DISTRIBUTION RESERVOIRS AND STANDPIPES |
| 330.10 | Elevated tanks and standpipes |
| 330.20 | GROUND LEVEL FACLITIES |
| ${ }^{330.30}$ | below grade facilities |
| 330.40 | CLEARWELL |
| 330.58 | DISTRIBUTION RESERVOIRS AND STANDPIPES－Painting |
| 330.59 | DISTRIBUTION RESERVOIRS AND STANDPIPES－PAINTING |
|  | TOTAL ACCOUNT 330 |

## PENNSYLVANIA－AMERICAN WATER COMPANY



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|  |  |  －लio | $\stackrel{\text { ® }}{\ddagger}$ |  | $\underset{\sim}{5}$ |  |  | $\stackrel{\stackrel{\rightharpoonup}{6}}{\square}$ | $\stackrel{\sim}{\text { \％}}$ |



|  |  |  |  |  | $\begin{aligned} & \stackrel{\otimes}{0} \\ & \stackrel{0}{0} \\ & \stackrel{0}{0} \\ & \stackrel{\rightharpoonup}{0} \\ & \hline \end{aligned}$ |  |  |  |  | $\stackrel{\text { ¢ }}{\square}$ | 砣 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | 部宮㐫品 Ti $\stackrel{-}{\circ} \dot{\sim} \dot{\sim}$ | $\begin{aligned} & \overline{6} \\ & \stackrel{\rightharpoonup}{8} \\ & \stackrel{8}{8} \end{aligned}$ |  <br>  |  |  |  |  | 品筞 | － | 5 80 0 0 0 0 |
|  | ～웅N <br> ヘio <br>  <br> 守荷宫 |  |  |  <br>  <br>  <br> $\stackrel{\text { ® }}{\square}$ |  |  |  |  |  | ¢ | \％ |



TABLE 3. BRINGFORWARD TO DECEMBER 31, 2018, OF BOOK RESERVE AS OF DECEMBER 31, 2017

|  |  <br>  <br>  |
| :---: | :---: |


TABLE 4. CALCULATION OF DEPRECIATION ACCRUALS FOR THE TWELVE MONTHS ENDED DECEMBER 31, 2018
$\begin{array}{r}119,678 \\ 0 \\ 1,364,360 \\ 630,306 \\ 2,294,131 \\ 5,060,596 \\ 321,490 \\ 463,808 \\ 827,212 \\ 84,774 \\ 1,841,311 \\ 362,121 \\ 218,938 \\ 459,831 \\ 1,580,172 \\ 6,175,354 \\ 577,398 \\ 493,505 \\ 4,247,686 \\ 27,309,171 \\ 9,499,159 \\ 11,052,527 \\ 1,691,756 \\ 19,947,271 \\ 5,380,407 \\ 26,285 \\ 1,390,131 \\ 165,819 \\ 142,967 \\ 935,813 \\ 773,172 \\ 29,858 \\ \hline\end{array}$

956'L8E'01





 920222

$4,933,374,39$
$1344,34,191.90$
$134,354,191.9$
$19,964,319$.

$11,170,283$. | $N$ |
| :---: |
| $N$ |
| $N$ |
| $N$ |
| $N$ |
| 0 |
| 0 |
| 0 |
| 0 |
| $\infty$ |


16,075,077.2


ゥ 등ㅇ


PENNSYLVANIA-AMERICAN WATER COMPANY


| Account <br> (1) | EXPERIENCED AND ESTIMATED NET SALVAGE |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
|  | 2014 | 2015 | 2016 | 2017 | 2018 |
|  | (2) | (3) | (4) | (5) | (5) |
|  | 0 | 0 | 26 | 0 | 0 |
| 303.35 | (4) | 0 | 0 | 0 | 0 |
| 304.15 | $(46,636)$ | $(46,243)$ | $(70,089)$ | 0 | 0 |
| 304.20 | $(53,488)$ | $(56,757)$ | $(26,237)$ | 0 | (3,500) |
| 304.30 | 319,920 | $(476,945)$ | $(191,035)$ | $(19,080)$ | $(93,825)$ |
| 304.61 | $(65,824)$ | - | $(70,936)$ | - | $(658,910)$ |
| 304.62 | $(80,107)$ | $(3,615)$ | $(48,019)$ | $(14,400)$ | $(63,093)$ |
| 304.63 | 0 | $(59,776)$ | $(11,676)$ | $(8,250)$ | 0 |
| 305.00 | $(317,805)$ | $(46,348)$ | $(84,116)$ | $(59,314)$ | $(169,000)$ |
| 306.00 | $(2,002)$ | (324) | $(6,542)$ | , | 0 |
| 307.00 | $(13,938)$ | $(16,118)$ | $(1,054)$ | 0 | 0 |
| 310.00 | 0 | $(8,915)$ | $(45,776)$ | 0 | 0 |
| 311.00 | $(162,341)$ | $(159,509)$ | $(103,119)$ | 0 | (400) |
| 320.00 | $(93,583)$ | $(182,337)$ | $(101,953)$ | $(91,944)$ | $(108,196)$ |
| 320.30 | $(27,730)$ | $(78,144)$ | $(16,457)$ | 0 | (500) |
| 320.37 | $(6,734)$ | 0 | $(192,597)$ | 0 | 0 |
| 330.00 | $(631,746)$ | $(1,024,942)$ | $(1,370,181)$ | $(475,306)$ | $(278,070)$ |
| 331.00 | $(3,496,437)$ | $(7,578,550)$ | $(11,564,326)$ | $(4,703,868)$ | $(4,123,922)$ |
| 333.00 | $(446,624)$ | $(606,667)$ | $(987,614)$ | $(1,239,963)$ | $(1,243,387)$ |
| 334.00 | $(764,036)$ | $(1,258,131)$ | $(770,084)$ | $(1,414,519)$ | $(1,622,381)$ |
| 335.00 | $(146,091)$ | 81,394 | $(276,615)$ | $(244,260)$ | $(250,898)$ |
| 340.00 | 1,941 | $(20,871)$ | $(41,508)$ | 0 | 0 |
| 341.00 | $(1,555)$ | $(13,623)$ | $(1,158)$ | $(11,060)$ | $(13,855)$ |
| 342.00 | 0 | (630) | 0 | 0 | 0 |
| 343.00 | $(9,640)$ | $(19,321)$ | $(18,941)$ | 0 | 0 |
| 344.00 | (983) | $(3,939)$ | $(5,015)$ | 0 | 0 |
| 345.00 | (201) | $(3,680)$ | (472) | 0 | 0 |
| 346.00 | $(1,029)$ | $(7,472)$ | (777) | 0 | 0 |
| 347.00 | $(9,534)$ | $(21,448)$ | $(4,547)$ | 0 | 0 |
| TOTAL | $(6,056,209)$ | $(11,612,910)$ | (16,010,818) | $(8,281,964)$ | $(8,629,937)$ |

## PART II. DETAILED DEPRECIATION CALCULATIONS

# PENNSYLVANIA-AMERICAN WATER COMPANY 

2017 GENERAL BASE RATE CASE R-2017-2595853

EXHIBITS NO. 11-D, 11-E, 11-F DEPRECIATION STUDY

WASTEWATER OPERATIONS
(EXCLUDING SCRANTON WASTEWATER)
AS OF DECEMBER 31, 2016, 2017, 2018

# PENNSYLVANIA-AMERICAN WATER COMPANY HERSHEY, PENNSYLVANIA 

## WASTEWATER OPERATIONS

(Excluding Scranton Wastewater)

## 2016 DEPRECIATION STUDY

## CALCULATED ANNUAL DEPRECIATION ACCRUALS RELATED TO WASTEWATER PLANT AS OF DECEMBER 31, 2016

Prepared by:

# PENNSYLVANIA-AMERICAN WATER COMPANY 

Hershey, Pennsylvania

WASTEWATER OPERATIONS
(Excluding Scranton Wastewater)

2016 DEPRECIATION STUDY

CALCULATED ANNUAL DEPRECIATION ACCRUALS
RELATED TO WASTEWATER PLANT AS OF DECEMBER 31, 2016

Excellence Delivered As Promised

April 21, 2017

Pennsylvania-American Water Company 800 West Hersheypark Drive
Hershey, PA 17033
Attention Mr. John R. Cox
Manager of Rates and Regulations

## Gentlemen:

Pursuant to your request, we have determined the annual depreciation accruals applicable to wastewater plant as of December 31, 2016. Summaries of the original cost, annual accruals and the book depreciation reserve are presented in Tables 1 through 3, beginning on page $\mathrm{l}-3$ of the attached report.

A description of the methods and procedures upon which the study was based, as well as support for the service life estimates, is set forth in a companion report "2017 Depreciation Study - Calculated Annual Depreciation Accruals Related to Wastewater Plant as of December 31, 2017".

Respectfully submitted,
GANNETT FLEMING VALUATION AND RATE CONSULTANTS, LLC


JOHN J. SPANOS Sr. Vice President

JJS:mlw
062027.100

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## PART I. RESULTS OF STUDY

# PENNSYLVANIA-AMERICAN WATER COMPANY <br> WASTEWATER OPERATIONS (Excluding Scranton Wastewater) <br> DEPRECIATION STUDY PART I. RESULTS OF STUDY 

## SUMMARY OF RESULTS

Table 1 presents the development of net original cost used in the study. The net original cost is the original cost of wastewater plant less advances and contributions. The results of the depreciation study are summarized in Table 2, which sets forth the book reserve and the calculated annual depreciation related to net original cost as of December 31, 2016, and the annual amortization of net negative salvage. Table 3 presents the calculation of the amortization of experienced net salvage, by account, based on the five-year period, 2012-2016.

## DETAILED TABULATIONS OF DEPRECIATION CALCULATIONS

The supporting data for the depreciation calculations are presented in account sequence in the section beginning on page II-2. The original cost, calculated accrued depreciation, allocated book reserve, future accruals, remaining life and annual accrual are shown for each vintage of each account or subaccount. The amounts of regular retirements, gross salvage, and cost of removal are set forth by account for the years 2012 through 2016, on pages III-2 through III-6.
PENNSYLVANIA-AMERICAN WATER COMPANY
WASTEWATER OPERATIONS (EXCLUDING SCRANTON WASTEWATER)
table 1. development of net original cost as of december 31, 2016
 $\frac{\begin{array}{c}\text { EXCLUDED } \\ \text { PROPERTY } \\ (5)\end{array}}{\text { (5) }}$

247,957,465.09
$\begin{array}{r}221,139.78 \\ 1,093,483.20 \\ 85,560.07 \\ 1,552,525.60 \\ \hline\end{array}$

 | 8 |
| :--- |
| 0 |

- 

$10,000.00$
$29,000.00$


35,625,653.49

| 8 |
| :--- |
| 0 |
| 8 |
|  |



 479,
18,169,
50,958,
2,130,
4,881,
30,666,
73,305,
13,045,
15,575,
533,
20,
103,
7,114,
52,675,
6,450,
674,
273,
199,
440,
64,
536,
342,
532,
$1,522,3$
3,256,

283,954,492.70
221,139.78
 $1,677,525.60$
 2 DEPRCIABLE GROUP
354.20 STRUCTURES AND IMPROVEMENTS - COLLECTION 354.30 STRUCTURES AND IMPROVEMENTS - SPP 35470 STRUCTURES AND IMPROVEMENT - GENERAL 355.00 POWER GENERATING EQUIPMENT 360.10 COLLECTION SEWERS - FORCE MAINS 361.10 COLLECTION SEWERS - GRAVITY MAINS 361.20 MANHOLES
363.00 SERVICES
364.00 FLOW MEASURING DEVICES
370.00 RECEVING WELLS
371.00 PUMPING EQUIPMENT
381.00 PLANT SEWERS
382.00 OUTFALL. SEWER LI
381.00 PLANT SEWERS
382.00 OUTFALL SEWER LINES
389. 10 OTHER PLANT AND MISCELLANEOUS EQUIPMENT
390.00 OFFICE FURNITURE AND EQUIPMENT
391.00 TRANSPORTATION EQUIPMENT
392.00 STORES EQUIPMENT
393.00 TOOLS, SHOP AND GARAGE EQUIPMENT
394.00 LABORATORY EQUIPMENT
395.00 POWER OPERATED EQUPMENT
396.00 COMMMNICATION EQUIPMENT
397.00 MISCELLANEOUS EQUIPMENT
389.10 OTHER PLANT AND MISCELLANEOUS EQUIPMENT
390.00 OFFIC FURNITURE AND EQUIPMENT
391.00 TRANSPORTATON EQUIPMENT
392.00 STORES EQUIPMENT
393.00 TOOLS, SHOP AND GARAGE EQUIPMENT
394.00 LABORATORY EQUIPMENT
395.00 POWER OPERATED EQUIPMENT
396.00 COMMMNICATION EQUIPMENT
397.00 MISCELLANEOUS EQUIPMENT
389.10 OTHER PLANT AND MISCELLANEOUS EQUIPMENT
390.00 OFFIC FURNITURE AND EQUIPMENT
391.00 TRANSPORTATON EQUIPMENT
392.00 STORES EQUIPMENT
393.00 TOOLS, SHOP AND GARAGE EQUIPMENT
394.00 LABORATORY EQUIPMENT
395.00 POWER OPERATED EQUIPMENT
396.00 COMMMNICATION EQUIPMENT
397.00 MISCELLANEOUS EQUIPMENT
389.10 OTHER PLANT AND MISCELLANEOUS EQUIPMENT
390.00 OFFIC FURNITURE AND EQUIPMENT
391.00 TRANSPORTATON EQUIPMENT
392.00 STORES EQUIPMENT
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394.00 LABORATORY EQUIPMENT
395.00 POWER OPERATED EQUIPMENT
396.00 COMMMNICATION EQUIPMENT
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389.10 OTHER PLANT AND MISCELLANEOUS EQUIPMENT
390.00 OFFIC FURNITURE AND EQUIPMENT
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389.10 OTHER PLANT AND MISCELLANEOUS EQUIPMENT
390.00 OFFIC FURNITURE AND EQUIPMENT
391.00 TRANSPORTATON EQUIPMENT
392.00 STORES EQUIPMENT
393.00 TOOLS, SHOP AND GARAGE EQUIPMENT
394.00 LABORATORY EQUIPMENT
395.00 POWER OPERATED EQUIPMENT
396.00 COMMMNICATION EQUIPMENT
397.00 MISCELLANEOUS EQUIPMENT
389.10 OTHER PLANT AND MISCELLANEOUS EQUIPMENT
390.00 OFFIC FURNITURE AND EQUIPMENT
391.00 TRANSPORTATON EQUIPMENT
392.00 STORES EQUIPMENT
393.00 TOOLS, SHOP AND GARAGE EQUIPMENT
394.00 LABORATORY EQUIPMENT
395.00 POWER OPERATED EQUIPMENT
396.00 COMMMNICATION EQUIPMENT
397.00 MISCELLANEOUS EQUIPMENT

OTAL DEPRECIABLE PLANT
PENNSYLVANIA-AMERICAN WATER COMPANY





$60^{\circ} 59 b^{+} \angle 56^{\prime} \angle \downarrow z$

DEPRECIABLE PLANT
STRUCTURES AND IMPROVEMENTS - COLLECTION
STRUCTURES AND IMPROVEMENTS - SPP
언안응응뭉ㅇㅇㅇㅇㅇㅇㅇㅇㅇㅇㅇㅇㅇㅇㅇㅇㅇㅇㅇㅇㅇㅇㅇㅇㅇ

TOTAL DEPRECIABLE PLANT

## AMORTIZATION OF NET SALVAGE

nondepreciable plant
FRANCHISES
LAND AND LAND RIGHTS - COLLECTION
LAND AND LAND RIGHTS - SPP
LAND AND LAND RIGHTS - TDP
TOTAL NONDEPRECIABLE PLANT
TOTAL WASTEWATER PLANT IN SERVICE


## PART II. DETAILED DEPRECIATION CALCULATIONS

S:\water industry\Lower Makefield Township Sewer Authority\Lower Makefield Report \& Testimony\Lower Makefield Wastewater Colllection System Valuation as of 6-30 2020 - Created 3-11-2021

AQUA PENNSYLVANIA, INC
WASTEWATER ASSETS

TABLE 1. SUMMARY OF ESTIMATED SURVIVOR CURVES, ORIGINAL COST, BOOK RESERVE AND CALCULATED
ANNUAL DEPRECIATION ACCRUALS RELATED TO WASTEWATER PLANT AS OF MARCH 31, 2019


CONTRIBUTIONS IN AID OF CONSTRUCTION
DEPRECIABLE PLANT
354.00 STRUCTURES AND IMPROVEMENTS

## COLLECTION <br> PUMPING

TREATMENT AND DISNERAL

$$
\text { TOTAL ACCOUNT } 354
$$

360.00 COLLECTION MAINS-FORCE
361.00 COLLECTION MAINS - GRAVITY
363.00 SERVICES
371.30 PUMPING EQUIPMENT - PUMPING
380.00 TREATMENT AND DISPOSAL EQUIPMENT
381.40 PLANT SEWERS - TREATMENT AND DISPOSAL
382.00 OUTFALL LINES
389.20 OTHER PLANT AND MISCELLANEOUS EQUIPMENT - COLLECTION
390.10 OFFICE FURNITURE AND EQUIPMENT - FURNITURE
393.00 TOOLS, SHOP AND GARAGE EQUIPMENT
394.00 LABORATORY EQUIPMENT
total depreciable plant
TOTAL CONTRIBUTIONS IN AID OF CONSTRUCTION
AMORTIZATION OF NET SALVAGE
TOTAL WASTEWATER PLANT

| 55-S0.5 | 1,277,000.00 | 434,189 | 842,811 | 24,094 | 35.0 | 1.89 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 60-S1 | 1,084,876.22 | 143,926 | 940,950 | 21,563 | 43.6 | 1.99 |
| 50-R2 | 6,537,155.71 | 1,999,766 | 4,537,390 | 159,938 | 28.4 | 2.45 |
| 50-R3 | 14,636.81 | 8,877 | 5,760 | 343 | 16.8 | 2.34 |
|  | 8,913,668.74 | 2,586,758 | 6,326,911 | 205,938 |  |  |
| 75-R2.5 | 9,872,459.72 | 1,451,118 | 8,421,342 | 160,591 | 52.4 | 1.63 |
| 75-R2.5 | 4,083,815.05 | 835,606 | 3,248,209 | 64,804 | 50.1 | 1.59 |
| 70-R4 | 1,488,413.86 | 535,477 | 952,937 | 17,902 | 53.2 | 1.20 |
| 25-L0.5 | 464,547.60 | 67,831 | 396,717 | 29,081 | 13.6 | 6.26 |
| 40-S0 | 1,553,793.25 | 799,221 | 754,572 | 35,520 | 21.2 | 2.29 |
| 40-R1.5 | 1,536.55 | 1,252 | 285 | 30 | 9.5 | 1.95 |
| 40-R2.5 | 1,536.55 | 1,265 | 272 | 41 | 6.6 | 2.67 |
| 20-L3 | 13,030.75 | 5,603 | 7,428 | 707 | 10.5 | 5.43 |
| 20-SQ | 274.98 | 260 | 15 | 0 | - | - |
| 20-SQ | 4,449.14 | 4,504 | (55) | 0 |  |  |
| 25-SQ | 1,362,82 | 1,383 | (20) | 0 |  |  |
|  | 26,398,889.01 | 6,290,278 | 20,108,613 | 514,614 |  |  |
|  | 26,398,889.01 | 6,290,278 | 20,108,613 | 514,614 |  |  |
|  |  |  |  | 43,079 |  |  |
|  | 156,015,551.44 | 34,942,942 | 118,205,423 | 4,422,241 |  |  |

# Water and Wastewater Industry 

Cost of Capital / Required Return<br>Water and Wastewater Industry As of 10-1-2020

## AUS Consultants

Suite 201
8555 West Forest Home Avenue Greenfield, Wisconsin 53228
Office Telephone: 414-529-5755
J. Weinert's Cell: 414-698-8371
J. Weinert's E-Mail: weinerti@auswest.net

## Cost of Capital / Required Return

The net cashflows described in the income approach section of this report were discounted to present value using a cost of capital reflective of the investor-owned water industry with particular emphasis on investor-owned water and wastewater in the Commonwealth of Pennsylvania capital costs for both debt and equity summarized as follows:


| Water and Wastewater Cost of Capital |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Third Quarter 2020 (10-1-2020) |  |  |  |  |  |  |
| As an Investor-Owned Utility |  |  |  |  |  |  |
| Weighted Cost of Capital (Rate of Return on Rate Base) |  |  |  |  |  |  |
| (1) (2) | (2a) | (3) | (3a) | (4) | (4a) | (5) |
|  |  |  |  |  |  | Required |
| Portion of |  |  |  |  | Tax affect on | Return on |
| Capital | Type of Data | Capital Cost | Type of Data | Tax Rate | cost of capital | Rate Base |
| nus input |  | ausimpal |  |  |  | ${ }_{12}{ }^{2}(3)$ |
| Debt 45\% | Embedded | 2.82\% | Embedded | Not Applicable | Not Applicable | 1.27\% |
| Equity $55 \%$ | Embedded | 9.90\% | Market | Not Applicable | Not Applicable | 5.45\% |
| Total Capital r $100.0 \%$ |  |  |  |  |  | 6.72\% |
| Growth (g) |  |  |  |  | Not Applicable | 0.00\% |
| Rate without Growth: $[(1+\mathrm{r}) /(1+\mathrm{g})]-1$ |  |  |  |  |  | 6.72\% |

The cost of capital and required return was based on the weighted cost of capital (WACC) method; wherein the market capital cost of debt and equity at the October 1, 2020 appraisal date are weighted based on the market capital structure typical of the industry. The inputs to the WACC required return determination are described summarized below.

Debt Cost - The market cost of debt at the study data was determined based on review of financial information published by Value Line Investment Surveys in their Selected Yield weekly publication. These sources were helpful in determining the typical debt rating for investments in water industry to be A Standard and Poor's corporate debt rating. The above sources were also useful in determining that the market cost of debt at A rating to be $2.79 \%$ on October 1, 2020. Issuance cost of $0.90 \%$ was determined based on analysis annual Public Utility Financing Tracker reports over the period 2008 through 2019 published by PUFT, Inc. The final market cost of debt of $2.82 \%$ was determined for the water industry using the following formula which incorporates the above-described issuance costs:

## 1

Value Line Investment Surveys

## Water Industry

As of First Quarter 2021 (1-1-2021)

|  |  | Long Term |
| :---: | :---: | :---: | :---: |
| Interest |  |  |


| American States Water |  | 280.9 | 24.5 | $8.72 \%$ |
| :--- | :---: | ---: | ---: | ---: |
| American Water | Baa1 | $9,589.0$ | 354.0 | $3.69 \%$ |
| California Water |  | 785.3 | 40.0 | $5.09 \%$ |
| Consolidated Water Company |  | 0.1 | - |  |
| Essential Utilities, Inc. | Baa2 | $5,174.6$ | 200.0 | $3.87 \%$ |
| Middlesex Water |  | 237.9 | 7.2 | $3.03 \%$ |
| SJW Corporation |  | $1,316.0$ | 50.0 | $3.80 \%$ |
| York Water | 96.6 | 5.5 | $5.69 \%$ |  |
|  |  | $17,480.4$ | 681.2 | $3.90 \%$ |
|  |  |  |  |  |
| Minimum |  |  | $3.03 \%$ |  |
| wtd Mean |  |  | $3.90 \%$ |  |
| Mean |  |  | $4.84 \%$ |  |
| Median |  |  | $3.87 \%$ |  |
| Maximum |  |  | $8.72 \%$ |  |
| Debt Rating and Cost of Debt |  |  |  |  |


| Embedded | $3.90 \%$ wtd mean col 5 |
| :--- | :--- |
| Rating (S\&P) | A Input |
| Market Cost of Debt @Bond Rating <br> Value Line Selected Yields | $2.79 \%$ Input |
| Use | $2.79 \%$ AUS Input |
|  |  |
| Issuance Cost PUFT Data 2018-2019 <br> Final Cost of Debt | $0.90 \%$ Input |

$$
K_{d}=K_{u} /(100 \%-f)
$$

where:
$\mathrm{K}_{\mathrm{d}}=$ Cost of Debt recognizing issuance costs
$\mathrm{K}_{\mathrm{u}}$ is the market cost of debt without consideration of issuance costs
f is the cost of issuance as a percentage of the debt's par value
$K_{d}=2.79 \% /(100 \%-0.90 \%)$
$\mathrm{K}_{\mathrm{d}}=2.82 \%$
Equity Cost - The cost of equity was evaluated using the Capital Asset Pricing Model (CAPM) and the dividend growth model (DGM) which looks to market returns to quantify the cost equity capital.
Water industry

As of First Quarter 2021 (1-1-2021)


Capital Assets Pricing Model (CAPM) - The CAPM method estimates the cost of equity capital by quantifying the premium, or additional return required to entice investors to purchase equities, over an investment in which the investors would receive riskless return like that from a long-term U.S. government security.

The mathematical form of this model is:

# Capital Asset Pricing Model: 

$$
r_{e}=r_{\mathrm{f}}+B_{c}\left(r_{p}\right)+r_{s}+r_{i}
$$

where:
$B_{c}$ is an estimation of the subject Company's risk premium relative to the risk premium of the entire market. In these equity cost estimating methods the risk premium of the entire market is defined as unity or $B_{m}=1.0$.

The inputs to this model are developed from an analysis of the financial markets. The risk-free government securities rate (rf) is readily available from financial sources; we have used the risk-free rate at the study date of $4.94 \%$ as determined from the average long-term income returns of government bonds over the period 1926 through 2019 as detailed on table A-7 in lbbotson Associates' 2020 Yearbooks of Stocks, Bonds, Bills, and Inflation (SBBI).

The risk premiums ( $r_{p}$ ) and size premiums ( $r_{s}$ ) were established based on analysis of the data presented by Ibbotson Associates and published in Ibbotson Associates' 2010 through 2019 Yearbooks of Stocks, Bonds, Bills, and Inflation (SBBI), detailing the financial market returns of stocks, bonds, U.S. Treasury Bills, and Inflation for the period 1926 through 2019.

The total market risk premium ( $r_{p}$ ) required to entice an investor to invest in equity securities over risk-free government securities was established at $6.95 \%$ based on the lbbotson Associates research, while the size premiums $\left(r_{s}\right)$ were established at:
1.7\% for mid-capitalization companies with market equity capitalization between $\$ 3,636.881$ and $\$ 631.058$ million.
3.1\% for low-capitalization companies with market equity capitalization between $\$ 289.658$ and $\$ 631.058$ million.
5.8 for micro-capitalization companies with market equity capitalization under $\$ 289.658$ million.

There is no size premium ( $0.0 \%$ ) for companies with market equity capitalization above $\$ 3,636.881$ million.

## Dividend Yield and Growth Model (DGM)

The dividend yield and growth model was also review in estimating the cost of equity. Two models were considered, those of:

$$
\begin{aligned}
& \text { re }=\text { Dividend Yield }+ \text { Dividend Growth } \\
& \text { re }=\text { Dividend Yield }+ \text { Earnings Growth }
\end{aligned}
$$

Cost of Equity Conclusion - Based on these procedures the cost of equity using previous described cost of equity estimating techniques the cost of equity was determined as follows:


Equity issuance cost (f) of $3.60 \%$ was determined based on analysis annual Public Utility Financing Tracker reports over the period 2008 through 2019 published by PUFT, Inc. The final market cost of equity of $9.90 \%$ was determined for the water industry using the following formula which incorporates the above-described issuance costs:

$$
\mathrm{K}_{\mathrm{e}}=\mathrm{K}_{\mathrm{e}} /(100 \%-\mathrm{f})
$$

where:
$\mathrm{K}_{\mathrm{e}}=$ Cost of equity recognizing issuance costs
$\mathrm{K}_{e^{\prime}}$ is the market cost of equity without consideration of issuance costs (9.90\%)
fis the cost of issuance as a percentage of the equity par value (3.60\%)
$K_{e}=9.90 \% /(100 \%-3.60 \%)$
$\mathrm{K}_{\mathrm{e}}=9.90 \%$
An equity cost of $9.90 \%$ was used in the determination of the cost of capital based on the determination of Pennsylvania PUC's Bureau of Technical Utility Services (TUS) Report on Quarterly Earnings of Jurisdictional Utilities for year-ending September 30, 2020.

## Tax Rate

The tax rate was determined at $28.89 \%$ (State and Federal) based on the Value Line Investment Survey as follows:

## Value Line Investment Surveys

Water Industry
As of First Quarter 2021 (1-1-2021)


| American States Water | NYSE | AWR | 1789 | 10/09/2020 | 22.6\% | 23.0\% | 23.0\% | 23.0\% |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| American Water | NYSE | AWK | 1790 | 10/09/2020 | 25.5\% | 21.0\% | 21.0\% | 21.0\% |
| California Water | NYSE | CWT | 1791 | 10/09/2020 | 19.1\% | 21.0\% | 21.0\% | 21.0\% |
| Consolidated Water Company | NDQ | CWCO | 1792 | 10/09/2020 |  |  |  |  |
| Essential Utilities, inc. | NYSE | WTRG | 1793 | 10/09/2020 | 6.6\% | 2.0\% | 3.5\% | 8.0\% |
| Middlesex Water | NDQ | MSEX | 1794 | 10/09/2020 | 2.8\% | 21.0\% | 1.0\% | 21.0\% |
| SJW Corporation | NYSE | SJW | 1795 | 10/09/2020 | 25.3\% | 21.0\% | 21.0\% | 21.0\% |
| York Water | NDQ | YORW | 1796 | 10/09/2020 | 13.5\% | 18.5\% | 21.0\% | 21.0\% |
| Minimum |  |  |  |  | 2.80\% | 2.00\% | 1.00\% | 8.00\% |
| wtd Mean |  |  |  |  |  |  |  |  |
| Mean |  |  |  |  | 16.49\% | 18.21\% | 15.93\% | 19.43\% |
| Median |  |  |  |  | 19.10\% | 21.00\% | 21.00\% | 21.00\% |
| Maximum |  |  |  |  | 25.50\% | 23.00\% | 23.00\% | 23.00\% |
|  | Historica |  | rrent |  |  |  |  |  |
| Embedded Tax Rate | 16.49 | 2019 | 18.21 | Mean 2020 |  |  |  |  |


| Federal Tax Rate (Marginal) | 35.00\% AuS Input | 21.00\% AUS Input |
| :---: | :---: | :---: |
| US 50-state average | 4.91\% aus input | 4.91\% AUS Input |
| Pennsylvania | 9.99\% AuS Input | 9.99\% AuS Input |
| Composite Federal and State Tax Rate | 41.49\% calculated $=$ Federal Tax * 1 State Tax) + State Tax | 28.89\% calculated =Federal Tax* (1State Tax) + State |

## Capital Structure

The capital structure was determined based on the water industry market indictors published by Value Line Investment Survey published October 1, 2020 as detailed as follows:

Value tine iveretment Survers
Water industry
AS ol first Quarter 2021 (1-4-2021)

\begin{tabular}{|c|c|c|c|c|c|c|c|c|c|c|c|c|c|c|c|c|c|c|c|c|}
\hline company \& Ereherse \& noker \& \[
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\text { Jebt }
\end{gathered}
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\end{aligned}
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\& \text { nteres) }
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\hline \& \& \& \& \& sum \& * \& Huse \& tovion \& * \& * \& * \& * \& ¢wior \& * \& sonuta \& Sowsen \& shene \& * \& \& nutim \\
\hline Arencan State Wher \& N(\%) \& Awn \& 1789 \& 10103/2000 \& \({ }^{3303}\) \& 10.5s \& 2309 \& 24.5 \& \(8.78 \times\) \& 310x \& 46.0\% \& s406 \& \(\bigcirc\) \& 0.00\% \& 36833970 \& 74.3 \& 2741.5 \& 99.25 \& meicap \& 3,719 \\
\hline Arcokan Wate \& w(x) \& awk \& 1750 \& 10/09/2020 \& 10,578.0 \& 28.76\% \& 9,5890 \& 354.0 \& 3.69\% \& sook \& ك1.0x \& 39.05 \& 5 \& 001\% \& 18L.20006s0 \& ми. 6 \& 26,1930 \& 2123 \& carge Cap \& 36,760 \\
\hline Cularnawater \& Ns \& cwr \& 1791 \& 10/09/2020 \& 2.182 .3 \& 3547x \& 785 \& 40.0 \& 5096 \& saok \& 49.0x \& stom \& a \& 0.00\% \& 19.3980000 \& 43.6 \& 2.1513 \& 54.53 N \& micap \& \(3,333.5\) \\
\hline Sonichersues Water Company \& Nou \& (wco \& 1792 \& 19\%9\%\%9 \& 0.1 \& a0s* \& a, \& - \& \& 0.0. \& 0.0x \& 100.0\% \& 0 \& 0.00\% \& 15.1120490 \& 10.7 \& 1623 \& 9999\% \& Smot cap \& 1624 \\
\hline Isertal Unites, icc. \& NS \& WTMG \& 1793 \& 10/09/2020 \& 5,277.4 \& \({ }^{35036}\) \& 5,174.5 \& 2000 \& \({ }^{3878}\) \& s30x \& 515\% \& \(465 \times\) \& - \& 0.00k \& 245.1510930 \& 33.9 \& 9.788.9 \& 64.97x \& large cap \& 15,066.3 \\
\hline Matilesexwate \& Noo \& msex \& 179 \& 10/09/2030 \& 2027 \& \({ }^{20575}\) \& 2379 \& 7.2 \& \({ }^{3.036}\) \& 4200 \& \({ }^{42} 5 \mathrm{sk}\) \& 5756 \& 24 \& 0.178 \& \({ }^{12} \mathbf{1 2 6 4 9 7 9 5 0}\) \& 52.4 \& \({ }^{1,0893}\) \& 79.26 K \& miscap \& 1,374.4 \\
\hline inw caparation \& We \& STW \& 1795 \& 10/09/2030 \& 1,338,4 \& 4339\% \& 1,3150 \& 50.0 \& 380\% \& s00\% \& ss.0\% \& 42 Om \& 0 \& 0.005 \& 285167050 \& 51.2 \& \(1,746.1\) \& \(56.61 \%\) \& Midap \& 1,0845 \\
\hline vek Water \& noa \& vorw \& 1796 \& 10\%es/2030 \& 103.1 \& 15.42 x \& 96.6 \& s. 3 \& \(5.69 \%\) \& 4.0W \& \(38.5 \%\) \& 51.3K \& \(\bigcirc\) \& 000\% \& 13013999 \& 43.4 \& 3655 \& 34.58 s \& Srutciap \& 6635 \\
\hline Total \& \& \& \& \& 12.0923 \& 30.05\% \& 17,480.4 \& 681.2 \& 3.90\% \& \& \& \& 14 \& 0018 \& \& \& 44,438. \& 69.945 \& \& 63.5377 \\
\hline Monimum \& \& \& \& \& \& \(006 \%\) \& \& \& 3038 \& 0003 \& 0.00\% \& 39.00\% \& \& 000\% \& \& \& \& \(56.61 \%\) \& \& \\
\hline wromean \& \& \& \& \& \& 30.058

33985 \& \& \& 3.90K \& \& \& \& \& ${ }_{0}^{0018}$ \& \& \& \& 69.964
76308 \& \& <br>
\hline $\underset{\substack{\text { Meas } \\ \text { Mectian }}}{ }$ \& \& \& \& \& \& 23.688

24.67\% \& \& \& | 4884 |
| :--- |
| 8878 | \& 42.13 K

46.006 \& ${ }_{4}^{43.565}$ \& $56.46 \%$
$5250 \%$ \& \& 002x \& \& \& \& 76.308
75.245 \& \& <br>
\hline stomiam \& \& \& \& \& \& $43.39 \%$ \& \& \& 872\% \& 60,00\% \& 61.00 K \& $10000 \%$ \& \& ars \& \& \& \& 99965 \& \& <br>
\hline
\end{tabular}

In arriving at the capital structure, the market capital structure was used in developing the market cost of capital while an embedded capital structure was used in developing the required return on rate base as follows:

| Water Industry Capital Structure |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: |
| Capital Structure | Proportion | Reference | Proportion | Reference |
|  |  | wtd mean |  |  |
| Debt | 30.05\% | col 7 | 42.13\% | mean col 11 |
|  |  | wtd mean |  |  |
| Preferred | 0.01\% | col 15 | 0.02\% | mean col 15 |
|  |  | wtd mean |  |  |
| Equity | 69.94\% | col 19 | 56.44\% | mean col 13 |
| Total | 100.00\% |  | 98.59\% |  |
| Use |  |  |  |  |
| Debt | 29\% | AUS Input | 45\% | AUS Input Jurisdictional Execption |
| Equity | 71\% | AUS Input | 55\% | AUS Input Jurisdictional Execption |
| Total | 100\% |  | 100\% |  |

## Market Cost of Capital and Required Return on Rate Base

Using the above-described cost of debt and equity, the rate of returned required for an investment in property similar to the Company's was determined to be $7.61 \%$ as follows:

| Water and Wastewater Cost of Capital Third Quarter 2020 (10-1-2020) |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| As an Investor-Owned Utility |  |  |  |  |  |  |  |
| Weighted Cost of Capital (Discount Rate) |  |  |  |  |  |  |  |
| (1) | (2) | (2a) | (3) | (3a) | (4) | (4a) | (5) |
|  |  |  |  |  |  |  | After-tax |
|  | Portion of <br> Capital | Type of Data |  | Type of Data | Tax Rate | Tax affect on cost of capital | Market Capital Cost |
|  | Aus input |  | AUS input |  |  |  | (2) $*(3) *(4, a)$ |
| Debt | 29\% | Market | 2.82\% | Market | 28.89\% | 71.11\% | 0.58\% |
| Equity | 71\% | Market | 9.90\% | Market | 0.0\% | 100.00\% | 7.03\% |
| Total Capital r | 100.0\% |  |  |  |  |  | 7.61\% |
| Growth (g) |  |  |  |  |  |  | 1.82\% |
| Rate without Growth: $[(1+r) /(1+g)]-1$ |  |  |  |  |  |  | 5.68\% |

While the require return on rate base was determined to be $6.72 \%$ follows:

## Water and Wastewater Cost of Capital

Third Quarter 2020 (10-1-2020)
As an Investor-Owned Utility

| Weighted Cost of Capital (Rate of Return on Rate Base) |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| (1) | (2) | (2a) | (3) | (3a) | (4) | (4a) | (5) |
|  |  |  |  |  |  | Tax affect on cost of capital | Required |
|  | Portion of |  | Capital Cost <br> AUS Input | Type of Data | Tax Rate |  | Return on |
|  | Capital | Type of Data |  |  |  |  | Rate Base |
|  | Aus input |  |  |  |  |  | (2) ${ }^{(3)}$ |
| Debt | 45\% | Embedded | 2.82\% | Embedded | Not Applicable | Not Applicable | 1.27\% |
| Equity | 55\% | Embedded | 9.90\% | Market | Not Applicable | Not Applicable | 5.45\% |
| Total Capital r | 100.0\% |  |  |  |  |  | 6.72\% |
| Growth (g) |  |  |  |  |  | Not Applicable | 0.00\% |
| Rate without Growth: $[(1+r) /(1+\mathrm{g})]-1$ |  |  |  |  |  |  | 6.72\% |

The statistics supporting these findings can be found in the Cost of Capital section of this report.

## Water and Wastewater Cost of Capital

Third Quarter 2020 (10-1-2020)

## As an Investor-Owned Utility

## Weighted Cost of Capital (Discount Rate)

| (1) | (2) | (2a) | (3) | (3a) | (4) | (4a) | (5) |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | Portion of Capital AUSIInput | Type of Data | Capital Cost <br> Aus inpur | Type of Data | Tax Rate | Tax affect on cost of capital | After-tax <br> Market Capital Cost <br> (2) ${ }^{\circ}(3)^{\prime}(4 a)$ |
| Debt | 29\% | Market | 2.82\% | Market | 28.89\% | 71.11\% | 0.58\% |
| Equity | 71\% | Market | 9.90\% | Market | 0.0\% | 100.00\% | 7.03\% |
| Total Capital r | 100.0\% |  |  |  |  |  | 7.61\% |
| Growth (g) |  |  |  |  |  |  | 1.82\% |
| Rate without Growth: $[(1+\mathrm{r}) /(1+\mathrm{g})]-1$ |  |  |  |  |  |  | 5.68\% |
| Water and Wastewater Cost of Capital |  |  |  |  |  |  |  |
| Third Quarter 2020 (10-1-2020) |  |  |  |  |  |  |  |
| As an Investor-Owned Utility |  |  |  |  |  |  |  |
| Weighted Cost of Capital (Capitlization Rate) |  |  |  |  |  |  |  |
| (1) | (2) | (2a) | (3) | (3a) | (4) | (4a) | (5) |
|  | Portion of Capital AUS input | Type of Data | Capital Cost <br> AUSInput | Type of Data | Tax Rate | Tax affect on cost of capital | Market Capital Cost (2) $\cdot(3)$ |
| Debt | 29\% | Market | 2.82\% | Market | Not Applicable | Not Applicable | 0.82\% |
| Equity | 71\% | Market | 9.90\% | Market | Not Applicable | Not Applicable | 7.03\% |
| Total Capital r | 100.0\% |  |  |  |  |  | 7.85\% |
| Growth (g) |  |  |  |  |  |  | 1.82\% |
| Rate without Growth: [(1+r)/(1+g)]-1 |  |  |  |  |  |  | 5.92\% |

Water and Wastewater Cost of Capital
Third Quarter 2020 (10-1-2020)

As an Investor-Owned Utility
Weighted Cost of Capital (Rate of Return on Rate Base)

| (1) | (2) | (2a) | (3) | (3a) | (4) | (4a) | (5) |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  |  |  |  |  | Required |
|  | Portion of |  |  |  |  | Tax affect on | Return on |
|  | Capital | Type of Data | Capital Cost | Type of Data | Tax Rate | cost of capital |  |
|  | Aus input |  | Aus input |  |  |  | (2) ${ }^{\prime}(3)$ |
| Debt | 45\% | Embedded | 2.82\% | Embedded | Not Applicable | Not Applicable | 1.27\% |
| Equity | 55\% | Embedded | 9.90\% | Market | Not Applicable | Not Applicable | 5.45\% |
| Total Capital r | 100.0\% |  |  |  |  |  | 6.72\% |
| Growth (g) |  |  |  |  |  | Not Applicable | 0.00\% |
| Rate without Growth: [(1+r)/(1+g)]-1 |  |  |  |  |  |  | 6.72\% |


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Value Line Investment Surveys
Water Industry
As of First Quarter 2021 （1－1－2021）

S： Water industry \Lower Makefield Township Sewer Authority\Lower Makefield Report \＆Testimony\Lower Makefield Wastewater Collection System Valuation as of 6－30－2020－Created 3－11－2021

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## Company <br> Input Value Line

As of First Quarter 2021 (1-1-2021)

S: \water industry\Lower Makefield Township Sewer Authority\Lower Makefield Report \& Testimony\Lower Makefield Wastewater Colllection System Valuation as of 6-30-2020-Created 3-11-2021

| Exchange | Ticker | Valueline <br> No. | Valueline <br> Issue |  |  | Tax Rate |
| :--- | :---: | :---: | :---: | :---: | :---: | :---: | :---: |


| Historical | Current |
| :---: | :---: |
| 16.49\% Mean 2019 | 18.21\% Mean 2020 |
| 35.00\% aus input | 21.00\% AuS input |
| 4.91\% ausinput | 4.91\% Aus input |
| 9.99\% AuS Input | 9.99\% Aus input |
| 41.49\% Calculated <br> *Federal $\operatorname{Tax} *$. 1 - <br> State Taxi+State Tax | 28.89\% Cakulated <br> aFederal Tax * (1- <br> State Tax) + State <br> Tax |

[^14]Value Line investment Surveys
Water Industry
As of First Quarter $2021(1-1-202$

| Company | Exchange | Ticker | Valueline No. | Valueline Issue | Total Debt | Market Debt | Long Term Debt | Long Term interest | Long Term Interest Rate (embedded) | Proportion of Debt | Book Debt | Book Equity | Preferred Stock | \% Preferred | Shares Outstanding | Price per Share | Market Equity | Portion Market Equity | Capitalization | Total Market Copital |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| mear valuectoo | mean viveline | nuan vase lime | muan Viaut inm | mpan value tire | $\begin{aligned} & \text { ingut value } \\ & \text { Ine } \end{aligned}$ | (6)/[2] | $\begin{aligned} & \text { Inowa Value } \\ & \text { Line } \end{aligned}$ | $\begin{aligned} & \text { Input Value } \\ & \text { Line } \end{aligned}$ | (9)/(8) | noul value tere |  | $\begin{gathered} \text { inpat Value } \\ \text { Ime } \end{gathered}$ | Heput value lum | (14)/(2) | hpout vitue line | $\begin{gathered} \text { keut Value } \\ \text { tire } \end{gathered}$ | mpat vaturime | (188/7231 | mout value ther | (6) [14) [193) |
|  |  |  |  |  | Simman | * | Ssmation | Ss wemen | * | * | * | * | sivatuar | * | Stares mution | Sp pers Sure | Susution | * |  | Sswation |
| American States Water | NYSE | AWR | 1789 | 10/09/2020 | 330.3 | 10,75\% | 280.9 | 24.5 | 8.72\% | 31.0\% | 46.0\% | 54.0\% | 0 | 0.00\% | 36.8838740 | 74.3 | 2,741.6 | 89.25\% | Mid Cap | 3,071,9 |
| American Water | NYSE | AWK | 1790 | 10/09/2020 | 10,578.0 | 28.76\% | 9,589.0 | 354.0 | 3.69\% | 60.0\% | 61.0\% | 39.0\% | 5 | 0.01\% | 181.2040680 | 144.6 | 26,193.0 | 71.22\% | Large Cap | 36,776.0 |
| California Water | NYSE | cWT | 1791 | 10/09/2020 | 1,182.3 | 35.47\% | 785.3 | 40.0 | 5.09\% | 50.0\% | 49.0\% | 51.0\% | 0 | 0.00\% | 49.3980000 | 43.6 | 2,151.3 | 64.53\% | Mid Cap | 3,333.6 |
| Consolidated Water Company | NDQ | cWco | 1792 | 10/09/2020 | 0.1 | 0.06\% | 0.1 | . |  | 0.0\% | 0.0\% | 100.0\% | 0 | 0.00\% | 15.1120490 | 10.7 | 162.3 | 99.94\% | Small Cap | 162.4 |
| Essential Utilities, inc. | NTSE | WTRG | 1793 | 10/09/2020 | 5,277.4 | 35.03\% | 5,174.6 | 200.0 | 3.87\% | 53.0\% | 53.5\% | 46.5\% | 0 | 0.00\% | 245.1510930 | 39.9 | 9,788.9 | 64.97\% | Large Cap | 15,066.3 |
| Middlesex Water | NDQ | MSEX | 1794 | 10/09/2020 | 282.7 | 20.57\% | 237.9 | 7.2 | 3.03\% | 42.0\% | 42.5\% | 57.5\% | 2.4 | 0.17\% | 17.4647950 | 62.4 | 1,089.3 | 79.26\% | Mid Cap | 1,374.4 |
| 5JW Corporation | NYSE | siw | 1795 | 10/09/2020 | 1,338.4 | 43.39\% | 1,316.0 | 50.0 | 3.80\% | 60.0\% | 58.0\% | 42.0\% | 0 | 0.00\% | 28.5167050 | 61.2 | 1,746.1 | 56.61\% | Mid Cap | 3,084.5 |
| York Water | NDQ | Yorw | 1796 | 10/09/2020 | 103.1 | 15.42\% | 96.6 | 5.5 | 5.69\% | 41.0\% | 38.5\% | 61.5\% | 0 | 0.00\% | 13.0339990 | 43.4 | 565.5 | 84.58\% | Small Cap | $668.6$ |
| Total |  |  |  |  | 19,092.3 | 30.05\% | 17,480.4 | 681.2 | 3.90\% |  |  |  | 7.4 | 0.01\% |  |  | 44,438.0 | 69.94\% |  | $63,537.7$ |
| Minimum |  |  |  |  |  | 0.06\% |  |  | 3.03\% | 0.00\% | 0.00\% | 39.00\% |  | 0.00\% |  |  |  | 56.61\% |  |  |
| wrd Mean |  |  |  |  |  | 30.05\% |  |  | 3.90\% |  |  |  |  | 0.01\% |  |  |  | 69.94\% |  |  |
| Mean |  |  |  |  |  | 23.68\% |  |  | 4.84\% | 42.13\% | 43.56\% | 56.44\% |  | 0.02\% |  |  |  | 76.30\% |  |  |
| Median |  |  |  |  |  | 24.67\% |  |  | 3.87\% | 46.00\% | 47.50\% | 52.50\% |  | 0.00\% |  |  |  | 75.24\% |  |  |
| Maximum |  |  |  |  |  | 43.39\% |  |  | 8.72\% | 60.00\% | 61.00\% | 100.00\% |  | 0.17\% |  |  |  | 99.94\% |  |  |
| Water industry Copital Structure |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Capital Structure | Mark |  | Embe | edded |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | Proportion | Reference | Proportion | Reference |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  | wed mean |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Debt | 30.05\% | col 7 | 42.13\% | mean col 11 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  | wtd mean |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Preferred | 0.01\% | col 15 | 0.02\% | mean tol 15 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  | wtd mean |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Equity | 69.94\% | col 19 | 56.44\% | mean col 13 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Total | 100.00\% |  | 98.59\% |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Use |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Debt | 29\% | AUS input | 45\% | AUS input Juris | sdictional Exe | cption |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Equity |  | AUS input | 55\% | AUS Input Juris | sdictional Exe | cption |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Total | 100\% |  | 100\% |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |



## Selected Yields



## Federal Reserve Data

|  | Recent Levels |  |  | Average Level Over the Last... |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | 9/9/20 | 8/26/20 | Change | 12 Wks . | 26 Wks . | 52 Wks . |
| Excess Reserves | 2854690 | 2821740 | 32950 | 2848430 | 2764692 | 2117729 |
| Borrowed Reserves | 80170 | 82030 | -1860 | 89716 | 89633 | 46495 |
| Net Free/Barrowed Reserves | 2774520 | 2739710 | 34810 | 2758714 | 2675059 | 2071234 |

Actrev spey (One-Week Period; in Billions, Seasonally Adjusted)

| - | Recent Levels |  |  | Annual Growth Rates Over the Last... |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | 9/720 | 8/31/20 | Change | 3 Mos. | 6 Mos. | $12 \mathrm{Mos}$. |
| M1 (Currency+demand deposits) | 5381.2 | 5384.0 | -2.8 | 28.8\% | 80.0\% | 39.4\% |
| M2 (M1+savings+Small time deposits) | 18576.8 | 18464.6 | 112.2 | 11.9\% | 42.4\% | 24.0\% |

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Cost of Capital and Required Return




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Public Meeting held January 14, 2021
Docket Number: M-2020-3023406

# BUREAU OF TECHNICAL UTILITY SERVICES REPORT ON THE QUARTERLY EARNINGS OF JURISDICTIONAL UTILITIES FOR THE YEAR ENDED 

September 30, 2020

Gladys Brown Dutrieuille, Chairman
David W. Sweet, Vice Chairman
John F. Coleman, Jr., Commissioner
Ralph V. Yanora, Commissioner
Introduction ..... 4* PECO Energy Company - Gas Operations, Pennsylvania American Water Company, PennsylvaniaAmerican Water Company Wastewater Division, Columbia Gas of Pennsylvania, Inc., and UGIUtilities, Inc. - Gas Division have rate filings at Docket Nos. R-2020-3018929, R-2020-3019369,R-2020-9319371, R-2020-3018835, and R-2019-3015162 respectively, and filed a letter with theSecretary in place of a report in accordance with 52 Pa . Code § 71.4.
Attachment A - Summary of Equity Returns ..... 5
Attachment B - Summary of Returns. ..... 12
This chart depicts the overall and equity returns (actual and adjusted) for the filing utilities for the current quarter. The last authorized equity return and the year authorized is also shown.
Attachment C - Allowed Rates of Return on Common Equity ..... 14This is a historical chart that shows the most recent rate cases for select companies in electric, gas, andwater. A docket number followed by their final return on equity and year is also given.
Attachment D - Distribution System Improvement Charge Return on Equity ..... 15
Compares utility adjusted return on equity to Commission authorized return on equity for utilities with a Distribution System Improvement Charge.
Attachment E - Explanation of Return on Equity Methods ..... 16
Criteria for determining the industry barometer groups used in ROE calculations. Also, provides details of the Discounted Cash Flow equation and Capital Asset Pricing Model equation.
Attachment F - Market Based Returns on Equity - Electric ..... 18
The market indicated common equity cost rate range consists of data used from the electric barometer groups and is based on a series of calculations to average the DCF methods. Also, indicates Distribution System Improvement Charge Return.
Attachment F - Historic DCF and CAPM - Electric ..... 19
Historic barometer group DCF and CAPM average ROEs.
Attachment F - Electric Barometer Group Calculation of a Current and 52 Week Average Dividend Yield20-21Electric barometer companies are used to calculate a current DCF in the first chart. The second chartdemonstrates the companies 52-week average DCF. A final average of the two calculations is also shownat the bottom.
Attachment F - Development of a Representative Dividend Growth Rate ..... 22
Multiple sources of the gas barometer companies projected 5-year Earnings Per Share are used to calculate the Group Average Dividend Growth Estimate.
Attachment G - Market Based Returns on Equity - Gas ..... 23
The market indicated common equity cost rate range consists of data used from the gas barometer groups and is based on a series of calculations to average the DCF methods. Also, indicates Distribution System Improvement Charge Return.
Attachment G - Historic DCF and CAPM - Gas ..... 24
Historic barometer group DCF and CAPM average ROEs, including a linear trend line graph.
Attachment G - Gas Barometer Group Calculation of a Current and 52 Week Average Dividend Yield
Gas barometer companies are used to calculate a current DCF in the first chart. The second chart demonstrates the companies 52 -week average DCF. A final average of the two calculations is also shown at the bottom.25
Attachment G - Development of a Representative Dividend Growth Rate ..... 26
Multiple sources of the gas barometer companies projected 5-year Earnings Per Share are used to calculate the Group Average Dividend Growth Estimate.
Attachment H - Market Based Returns on Equity - Water ..... 27
The market indicated common equity cost rate range consists of data used from the water barometer groups and is based on a series of calculations to average the DCF methods. Also, indicates Distribution System Improvement Charge Return.
Attachment H - Historic DCF and CAPM - Water ..... 28
Historic barometer group DCF and CAPM average ROEs, including a linear trend line graph.
Attachment H - Water Barometer Group Calculation of a Current and 52 Week Average Dividend Yield29Water barometer companies are used to calculate a current DCF in the first chart. The second chartdemonstrates the companies 52-week average DCF. A final average of the two calculations is also shownat the bottom.
Attachment H - Development of a Representative Dividend Growth Rate ..... 30
Multiple sources of the water barometer companies projected 5-year Earnings Per Share are used to calculate the Group Average Dividend Growth Estimate.

On September 20, 1991, the Commission initiated a rulemaking at L-00910061 pertaining to earnings disclosures by the public utilities subject to its jurisdiction. At that docket, the Commission stated that the submission of accurate, reliable and complete earnings disclosure reports, at regular intervals, is essential to the fulfillment of the broad regulatory oversight responsibilities entrusted to the Commission by the Legislature in the Public Utility Code. The earnings disclosure regulations promulgated by the Commission were adopted October 1, 1992, and published January 23, 1993, at 23 Pa .B. 463. Based upon those regulations, codified at 52 Pa . Code, Chapter 71, a reporting format was developed and distributed to the jurisdictional fixed utilities of Pennsylvania.

All fixed utilities having jurisdictional revenues of $\$ 1,000,000$ or more, for a calendar year, are required to file the report by March 31 of each year. Such reports are to be based upon the results of operations for the 12 -month period ending December 31 of the prior year. Utilities having more than $\$ 10,000,000$ in jurisdictional revenues are also required to file reports for the 12 months ending on March 31, June 30, and September 30 of each year. On November 30, 2004, however, the Pennsylvania General Assembly signed into law Act 183 concerning alternative telecommunications regulation and broadband deployment. As a result of Act 183, the reporting requirements for the PUC jurisdictional telecommunications companies of Pennsylvania have been streamlined at section 3015(e) of the Public Utility Code. A quarterly earnings report is not listed among those reports now required of PUC jurisdictional telecommunications utilities in Pennsylvania and, therefore, this report does not address telephone company earnings.

The reports have been filed for the period ended September 30, 2020. ${ }^{1}$ The Finance Staff of the Bureau of Technical Utility Services has reviewed the reports and has prepared this summary report for public release. This report sets forth the achieved return on equity for each company, the last allowed return for that utility, a market return as determined through the analysis of the barometer group data and the most recent returns allowed, per industry, by the Pennsylvania Public Utility Commission and by other regulatory bodies. Where a utility has not filed a report, the reasons for not filing are indicated.

Questions pertaining to the preparation and contents of this Report should be directed to Ms. Erin Laudenslager, Manager - Finance, Bureau of Technical Utility Services, at (717) 705-4364.

[^15]The equity return summaries that follow in Attachment A are, for each quarter;

ACTUAL<br>1. Based on actual results of operations<br>and

## ADJUSTED

2. Based on company proposed pro forma and ratemaking adjustments

## ELECTRIC UTILITIES <br> EQUITY RETURNS BY QUARTER

| QTR |  | PECO |  | PPL |  | Duq |  | W Penn |  | PaPwr |  | UGI |  | Penelec |  | MetEd |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| END |  | ACT | ADJ | ACT | ADJ | ACT | ADJ | ACT | ADJ | ACT | ADJ | ACT | ADJ | ACT | ADJ | ACT | ADJ |
| 2014 | 4 | 8.23 | 9.58 |  |  | 9.77 | 9.40 |  |  |  |  | 9.01 | 10.00 |  |  |  |  |
| 2015 | 1 |  |  |  |  | 10.08 | 9.65 |  |  |  |  | 10.88 | 10.39 |  |  |  |  |
|  | 2 |  |  |  |  | 9.80 | 9.42 |  |  |  |  | 13.57 | 9.49 |  |  |  |  |
|  | 3 |  |  |  |  | 10.11 | 9.73 | 6.45 | 6.45 | 5.77 | 5.77 | 15.93 | 7.57 | 2.94 | 2.94 | 3.69 | 3.69 |
|  | 4 | 10.74 | 8.84 | 8.89 | 8.48 | 9.73 | 9.36 | 8.09 | 8.09 | 5.13 | 5.13 | 9.74 | 9.21 | 5.45 | 5.45 | 7.04 | 7.04 |
| 2016 | 1 | 10.86 | 9.74 | 7.75 | 6.94 | 9.87 | 9.89 |  |  |  |  | 10.41 | 8.69 |  |  |  |  |
|  | 2 | 11.46 | 10.15 | 9.15 | 8.51 | 9.57 | 9.47 |  |  |  |  | 8.29 | 8.10 |  |  |  |  |
|  | 3 | 13.42 | 11.44 | 10.15 | 9.59 | 10.12 | 9.46 |  |  |  |  | 19.18 | 6.99 |  |  |  |  |
|  | 4 | 12.52 | 10.65 | 10.45 | 10.29 | 9.71 | 9.01 |  |  |  |  | 26.07 | 7.30 |  |  |  |  |
| 2017 | 1 | 13.01 | 11.40 | 9.76 | 8.49 | 9.53 | 8.99 |  |  |  |  | 22.86 | 6.81 |  |  |  |  |
|  | 2 | 12.98 | 11.40 | 10.71 | 9.70 | 9.86 | 9.24 | 8.23 | 7.38 | 7.32 | 7.97 | 21.96 | 6.74 | 9.23 | 9.20 | 9.74 | 9.35 |
|  | 3 | 12.84 | 10.52 | 10.15 | 9.30 | 9.53 | 9.23 | 7.63 | 7.24 | 8.32 | 9.08 | 16.13 | 5.22 | 9.61 | 9.50 | 11.37 | 10.97 |
|  | 4 | 12.07 | 9.11 | 11.07 | 10.63 |  |  | 9.47 | 9.12 | 8.46 | 8.19 |  |  | 11.70 | 10.93 | 12.58 | 11.67 |
| 2018 | 1 |  |  | 12.53 | 11.36 |  |  | 10.35 | 9.08 | 9.03 | 8.08 |  |  | 11.84 | 9.93 | 12.77 | 11.38 |
|  | 2 |  |  | 11.05 | 9.49 |  |  | 9.92 | 8.52 | 8.79 | 7.57 |  |  | 11.56 | 9.39 | 11.90 | 10.26 |
|  | 3 |  |  | 11.19 | 9.83 |  |  | 11.41 | 6.74 | 10.30 | 5.80 |  |  | 13.97 | 8.44 | 14.46 | 9.62 |
|  | 4 | 10.88 | 7.61 | 11.10 | 10.15 | 12.06 | 9.39 | 9.92 | 6.78 | 10.64 | 7.43 |  |  | 13.27 | 9.31 | 13.05 | 7.40 |
| 2019 | 1 | 12.65 | 7.93 | 10.10 | 8.96 | 12.58 | 9.73 | 9.08 | 6.62 | 9.14 | 7.61 | 7.05 | 5.22 | 12.03 | 8.07 | 12.54 | 7.66 |
|  | 2 | 12.34 | 7.94 | 10.51 | 8.95 | 12.38 | 9.34 | 8.02 | 5.99 | 8.29 | 7.10 | 5.77 | 3.22 | 11.42 | 8.16 | 11.72 | 7.21 |
|  | 3 | 12.49 | 7.96 | 10.61 | 8.99 | 13.88 | 9.33 | 9.90 | 7.87 | 9.28 | 7.76 | 6.20 | 2.04 | 11.26 | 8.78 | 12.25 | 7.77 |
|  | 4 | 12.21 | 8.50 | 10.53 | 10.40 | 13.92 | 9.08 | 14.13 | 7.07 | 8.08 | 6.90 | 7.20 | 2.38 | 10.02 | 8.54 | 10.96 | 9.27 |
| 2020 | 1 | 11.31 | 8.35 | 10.84 | 11.20 | 12.66 | 8.31 | 9.82 | 5.54 | 5.06 | 6.71 | 5.43 | 2.26 | 7.24 | 8.74 | 7.20 | 8.31 |
|  | 2 | 9.38 | 8.17 | 11.20 | 10.81 | 12.73 | 8.56 | 10.41 | 5.53 | 5.56 | 6.55 | 6.06 | 2.01 | 6.68 | 7.94 | 7.34 | 8.04 |
|  | 3 | 9.62 | 8.56 | 11.14 | 11.20 | 12.32 | 8.08 | 10.22 | 5.42 | 5.62 | 6.74 | 7.76 | 0.41 | 7.87 | 8.75 | 7.64 | 8.37 |




## GAS UTILITIES

EQUITY RETURNS BY QUARTER

| QTR | Columbia |  | Peoples <br> Natural |  | PECO |  | UGI <br> South |  | Peoples- <br> Equitable |  | NFG |  | $\begin{aligned} & \text { UGI } \\ & \text { North } \end{aligned}$ |  | Peoples Gas |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| END | ACT | ADJ | ACT | ADJ | ACT | ADJ | ACT | ADJ | ACT | ADJ | ACT | ADJ | ACT | ADJ | ACT | ADJ |
| 20144 | 9.71 | 9.97 | 11.85 | 7.89 | 13.86 | 12.59 | 15.00 | 7.93 | 14.52 | 12.46 | 20.40 | 10.79 | 15.64 | 9.82 | 16.91 | 11.83 |
| 20151 |  |  | 14.22 | 7.90 | 14.60 | 13.01 | 15.76 | 7.87 | 15.36 | 12.14 | 20.17 | 10.31 | 15.57 | 9.52 | 16.36 | 11.23 |
| 2 |  |  | 14.37 | 8.88 | 13.89 | 12.32 | 14.07 | 7.62 | 14.08 | 11.26 | 18.82 | 10.39 | 13.76 | 8.90 | 16.15 | 12.90 |
| 3 |  |  | 13.55 | 8.14 | 13.29 | 11.77 | 15.67 | 6.51 | 11.30 | 10.87 | 16.41 | 10.27 | 13.16 | 8.32 | 15.69 | 12.58 |
| 4 | 9.75 | 9.73 | 8.80 | 9.83 | 12.50 | 12.70 |  |  | 10.60 | 10.00 | 15.01 | 10.59 | 9.17 | 7.25 | 12.71 | 12.14 |
| 20161 |  |  | 7.01 | 10.02 | 10.73 | 13.58 |  |  | 8.98 | 10.20 | 12.60 | 10.97 | 7.85 | 8.85 | 8.54 | 10.48 |
| 2 |  |  | 6.24 | 9.99 | 11.55 | 13.85 |  |  | 8.29 | 10.40 | 12.31 | 11.08 | 9.41 | 8.37 | 9.20 | 10.43 |
| 3 |  |  | 6.93 | 9.34 | 12.09 | 14.40 |  |  | 13.05 | 10.82 | 13.00 | 10.34 | 6.47 | 8.81 | 9.07 | 12.02 |
| 4 | 8.90 | 9.26 | 10.11 | 11.03 | 11.39 | 12.37 |  |  | 16.42 | 11.07 | 14.18 | 9.58 |  |  | 12.47 | 11.87 |
| 20171 | 10.52 | 10.17 | 9.96 | 9.27 | 11.45 | 12.55 | 21.08 | 10.09 | 15.85 | 10.58 | 12.84 | 9.26 |  |  | 11.82 | 12.34 |
| 2 | 9.15 | 9.81 | 9.41 | 9.71 | 10.87 | 12.17 | 19.16 | 9.44 | 15.66 | 10.30 | 13.33 | 10.53 |  |  | 11.89 | 13.47 |
| 3 | 8.15 | 8.77 | 6.69 | 6.40 | 11.26 | 10.92 | 13.34 | 9.03 | 12.59 | 9.85 | 10.92 | 10.00 |  |  | 12.04 | 13.36 |
| 4 | 7.76 | 8.48 | 9.66 | 7.27 | 11.48 | 9.83 | 11.06 | 8.62 | 11.28 | 9.23 | 11.58 | 10.56 |  |  | 12.65 | 11.79 |
| 20181 |  |  | 11.42 | 7.00 | 12.65 | 9.77 | 12.82 | 7.90 | 12.68 | 8.22 | 14.40 | 10.20 | 16.95 | 7.83 | 14.02 | 10.17 |
| 2 |  |  | 11.03 | 6.80 | 12.66 | 9.05 | 16.75 | 6.80 | 11.81 | 9.57 | 12.06 | 9.89 | 17.68 | 8.02 | 12.78 | 10.15 |
| 3 |  |  | 10.21 | 7.43 | 12.54 | 8.36 | 18.69 | 8.04 | 10.99 | 9.44 | 12.52 | 10.12 | 20.60 | 9.16 | 13.03 | 10.20 |
| 4 | 11.39 | 9.81 |  |  | 12.86 | 8.68 |  |  |  |  | 12.24 | 10.21 |  |  | 13.92 | 11.13 |
| 20191 | 12.76 | 10.22 |  |  | 13.68 | 9.06 |  |  |  |  | 11.83 | 10.93 |  |  | 14.10 | 10.71 |
| 2 | 12.04 | 9.92 |  |  | 12.62 | 8.41 |  |  |  |  | 14.56 | 9.99 |  |  | 13.80 | 11.66 |
| 3 | 11.77 | 9.85 |  |  | 12.40 | 8.31 |  |  |  |  | 14.17 | 9.75 |  |  | 14.02 | 11.63 |
| 4 | 9.21 | 9.09 | 10.74 | 12.26 | 11.75 | 6.99 |  |  |  |  | 14.20 | 9.77 |  |  | 12.76 | 11.20 |
| 20201 | 8.42 | 9.11 | 12.34 | 12.34 | 10.84 | 7.68 |  |  |  |  | 11.82 | 9.92 |  |  | 11.40 | 11.07 |
| 2 |  |  | 13.81 | 12.38 | 11.26 | 7.25 |  |  |  |  | 11.28 | 9.05 |  |  | 11.89 | 11.10 |
| 3 |  |  | 14.60 | 12.77 |  |  |  |  |  |  | 10.39 | 8.25 |  |  | 11.82 | 11.50 |



## WATER UTILITIES EQUITY RETURNS BY QUARTER

| QTR |  | PAWC |  | AQUA |  | SUEZ |  | York |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| END |  | ACT | ADJ | ACT | ADJ | ACT | ADJ | ACT | ADJ |
| 2014 | 4 | 10.49 | 9.38 | 12.62 | 11.49 | 8.90 | 9.44 | 12.3 | 11.6 |
| 2015 | 1 | 10.33 | 9.14 | 12.46 | 11.11 | 9.11 | 9.83 | 12.7 | 12.7 |
|  | 2 | 10.51 | 9.31 | 12.66 | 11.62 | 8.36 | 9.25 | 12.7 | 12.7 |
|  | 3 | 10.06 | 8.81 | 12.41 | 11.95 | 8.39 | 9.37 | 13.6 | 13.6 |
|  | 4 | 9.80 | 8.48 | 12.61 | 12.16 | 8.54 | 8.77 | 12.50 | 11.10 |
| 2016 | 1 | 10.12 | 8.68 | 12.31 | 11.71 | 9.27 | 10.19 | 12.40 | 10.90 |
|  | 2 | 9.99 | 8.47 | 11.71 | 11.21 | 11.00 | 12.37 | 12.20 | 10.80 |
|  | 3 | 9.82 | 8.47 | 11.55 | 10.32 | 8.23 | 9.99 | 12.20 | 11.00 |
|  | 4 | 9.37 | 8.51 | 11.70 | 10.57 | 9.13 | 9.90 | 11.50 | 10.40 |
| 2017 | 1 |  |  | 11.34 | 10.04 | 9.22 | 9.60 | 11.61 | 9.50 |
|  | 2 |  |  | 10.99 | 9.22 | 9.03 | 9.07 | 11.60 | 9.10 |
|  | 3 |  |  | 10.99 | 9.23 | 8.57 | 8.57 | 11.60 | 8.70 |
|  | 4 |  |  | 11.05 | 8.63 | 8.75 | 8.73 | 11.30 | 8.40 |
| 2018 | 1 | 9.55 | 8.97 | 10.94 | 8.41 |  |  |  |  |
|  | 2 | 10.27 | 9.65 |  |  |  |  |  |  |
|  | 3 | 11.03 | 9.48 |  |  |  |  |  |  |
|  | 4 | 10.08 | 9.03 |  |  |  |  | 10.70 | 10.30 |
| 2019 | 1 | 9.82 | 8.87 |  |  |  |  | 11.60 | 11.60 |
|  | 2 | 9.72 | 8.90 | 9.84 | 9.04 | 10.78 | 10.36 | 11.80 | 11.80 |
|  | 3 | 9.13 | 8.41 | 10.69 | 8.84 | 11.55 | 11.75 | 12.00 | 12.00 |
|  | 4 | 8.71 | 8.09 | 10.33 | 8.24 | 11.80 | 12.15 | 12.00 | 9.80 |
| 2020 | 1 | 8.74 | 7.56 | 10.47 | 8.31 | 11.30 | 11.30 | 12.39 | 12.39 |
|  | 2 |  |  | 10.81 | 8.57 | 10.72 | 10.69 | 12.51 | 12.51 |
|  | 3 |  |  | 10.33 | 8.55 | 11.13 | 10.69 | 13.76 | 13.76 |



## Attachment B includes:

## A. Overall Returns on rate base 1. Actual

2. Company proposed pro forma and ratemaking adjustments and

## B. Equity Returns

1. Actual
2. Company proposed pro forma and ratemaking adjustments

Summary of Returns
For the Year Ended September 30, 2020

| COMPANY NAME | OVERALL RETURN |  | EQUITY RETURN |  | $\begin{gathered} \hline \text { ROE } \\ \text { AUTH } \end{gathered}$ | $\begin{aligned} & \hline \text { YEAR } \\ & \text { AUTH } \end{aligned}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | ACTUAL | ADJ | ACTUAL | ADJ |  |  |
| ELECTRIC |  |  |  |  |  |  |
| \$10,000,000 Revenues |  |  |  |  |  |  |
| PECO Energy - Electric Operations | 6.94 | 6.30 | 9.62 | 8.56 | Settled | 2018 |
| PPL Electric Utilities Corp. | 8.09 | 8.12 | 11.14 | 11.20 | Settled | 2015 |
| Duquesne Light Company | 8.56 | 6.31 | 12.32 | 8.08 | Settled | 2018 |
| West Penn Power Company | 7.10 | 4.75 | 10.22 | 5.42 | Settled | 2017 |
| Pennsylvania Power Company | 5.55 | 6.06 | 5.62 | 6.74 | Settled | 2017 |
| UGI Utilities, Inc. - Electric Division | 6.16 | 2.30 | 7.76 | 0.41 | 9.85 | 2018 |
| Pennsylvania Electric Company | 6.16 | 6.56 | 7.87 | 8.75 | Settled | 2017 |
| Metropolitan Edison Company | 5.95 | 6.24 | 7.64 | 8.37 | Settled | 2017 |
| GAS |  |  |  |  |  |  |
| \$10,000,000 Revenues |  |  |  |  |  |  |
| Columbia Gas of PA, Inc. |  |  |  |  | Settled | 2018 |
| Peoples Natural Gas Company LLC | 8.83 | 7.95 | 14.60 | 12.77 | Settled | 2019 |
| PECO Energy - Gas Operations |  |  |  |  | Settled | 2010 |
| UGI Utilities, Inc. - Gas Division |  |  |  |  | Settled | 2020 |
| National Fuel Gas Distribution Co. | 7.49 | 6.55 | 10.39 | 8.25 | Settled | 2006 |
| Peoples Gas Company, LLC | 8.56 | 8.24 | 11.82 | 11.50 | Settled | 2013 |
| WATER |  |  |  |  |  |  |
| \$10,000,000 Revenues |  |  |  |  |  |  |
| PA American Water Company |  |  |  |  | Settled | 2018 |
| Aqua Pennsylvania | 7.27 | 6.31 | 10.33 | 8.55 | Settled | 2018 |
| York Water Company | 9.41 | 9.41 | 13.76 | 13.76 | Settled | 2019 |
| SUEZ Water Pennsylvania, Inc. | 7.99 | 7.75 | 11.13 | 10.69 | Settled | 2018 |

PECO Energy Company - Gas Operations, Pennsylvania American Water Company, Pennsylvania American Water Company Wastewater Division, Columbia Gas of Pennsylvania, Inc., and UGI Utilities, Inc. - Gas Division have rate filings at Docket Nos. R-2020-3018929, R-2020-3019369, R-2020-9319371, R-2020-3018835, and R-2019-3015162 respectively, and filed a letter with the Secretary in place of a report in accordance with 52 Pa . Code § 71.4.

## ALLOWED RATES OF RETURN ON COMMON EQUITY

This is a historical chart that shows the most recent rate cases for select companies in electric, gas, and water. A docket number followed by their final return on equity and year is also given.

## ELECTRIC

Recent PA PUC Allowed

| Duquesne Light Company | R-2018-3000124 | Settled | 2018 |
| :--- | :--- | :--- | :--- |
| PECO Energy Company | R-2018-3000164 | Settled | 2018 |
| UGI - Electric | R-2017-2640058 | 9.85 | 2018 |
| Pennsylvania Electric Company | R-2016-2537352 | Settled | 2017 |
| Metropolitan Edison Company | R-2016-2537349 | Settled | 2017 |
| Pennsylvania Power Company | R-2016-2537355 | Settled | 2017 |
| West Penn Power Company | R-2016-2537359 | Settled | 2017 |

Current Market Indicated ROE as calculated by the Bureau of Technical Utility Services.

## GAS

## Recent PA PUC Allowed

Columbia Gas of P
R-2018-2647577
UGI Utilities, Inc. - Gas Division
R-2019-3015162
R-2018-3006818
R-2010-2161592
R-2013-2355886 Settled
PECO Energy
Peoples Gas Company
Current Market Indicated ROE as calculated by the
Bureau of Technical Utility Services.

## Docket Number ROE (\%) Year

7.01-9.78

Aqua Pennsylvania
R-2018-3003558 Settled
Columbia Water
R-2017-2595853 Settled

York Water
SUEZ Water

2017
R-2017-2598203 Settled
R-2018-3000019 Settled
R-2018-3000834 Settled
2019
2018

Current Market Indicated ROE as calculated by the
6.53-12.28 Bureau of Technical Utility Services.

## Distribution System Improvement Charge (DSIC) Eligible Utilities Return on Equity (ROE) Summary

|  | Utility Adjusted <br> $\mathbf{R O E}^{2}$ (\%) | Commission Approved <br> ROE $\mathbf{( \% )}$ |
| :--- | :---: | :---: |
| ELECTRIC |  |  |
| PECO Energy - Electric Operations | 8.56 | 9.45 |
| PPL Electric Utilities Corp. | 11.20 | 9.45 |
| Duquesne Light Company | 8.08 | 9.45 |
| West Penn Power Company | 5.42 | 9.45 |
| Pennsylvania Power Company | 6.74 | 9.45 |
| Pennsylvania Electric Company | 8.75 | 9.45 |
| Metropolitan Edison Company | 8.37 | 9.45 |
| UGI Utilities, Inc.- Electric Division | 0.41 | 9.45 |
| GAS |  | 10.20 |
| Columbia Gas of PA, Inc.* |  | 10.20 |
| Peoples Natural Gas Company LLC |  | 10.20 |
| PECO Energy - Gas Operations* |  | 10.20 |
| UGI Utilities, Inc. - South* |  | 10.20 |
| UGI Utilities, Inc. - North* |  | 10.20 |
| Peoples Gas Company, LLC |  | 10.20 |
| UGI Utilities, Inc. - Central* |  |  |
| WATER |  | 9.90 |
| PA American Water Company* |  | 9.90 |
| PA American - Wastewater* |  | 9.90 |
| AQUA Pennsylvania | 9.55 | 9.90 |
| AQUA Pennsylvania - Wastewater |  | 9.90 |
| York Water Company | 8.55 | 9.90 |
| SUEZ Water Pennsylvania Inc. | 13.76 | 9.90 |
| Columbia Water Company | 10.69 | 9.90 |
| Newtown Artesian Water | 5.63 |  |
|  | 9.75 | 9 |

* PECO Energy Company - Gas Operations, Pennsylvania American Water Company, Pennsylvania American Water Company Wastewater Division, Columbia Gas of Pennsylvania, Inc., and UGI Utilities, Inc. - Gas Division have rate filings at Docket Nos. R-2020-3018929, R-2020-3019369, R-2020-9319371, R-2020-3018835, and R-2019-3015162 respectively, and filed a letter with the Secretary in place of a report in accordance with 52 Pa . Code § 71.4.

[^16]
## Explanation of Discounted Cash Flow (DCF) and Capital Asset Pricing Model (CAPM)

## Barometer Group Criteria

The criteria used for determining the industry barometer groups used to calculate ROEs in this report are as follows:

- $50 \%$ or more of the company's assets must be related to the jurisdictional utility industry;
- The company's stock must be publicly traded;
- Companies involved in merger \& acquisition activity will be excluded;
- Investment information for the company must be available to the Commission from more than one source; and
- Geographic Regions:

EDCs: Value Line East, Central, and West Group Electric Utility companies;
NGDCs: Value Line Investment Survey's Natural Gas Utility industry group companies;
Water/Wastewater: Value Line Investment Survey's Water Utility industry group companies.
The barometer group companies are reviewed by staff on a quarterly basis and make any changes to these companies based upon the criteria above.

## ROE Calculations

The Commission consistently uses the DCF model to determine the appropriate cost of equity for utilities. In this report, the DSIC ROE is calculated using two DCF models.

TUS uses the following formula to calculate the current dividend $D C F: K=D_{1} / P_{0}+G$
TUS uses the following formula to calculate the 52-week average dividend DCF: $\mathrm{K}=\mathrm{D}_{0} / \mathrm{P}_{\mathrm{a}}+\mathrm{G}$
Definitions:

| K | $=$ | Cost of equity |
| :---: | :---: | :---: |
| $\mathrm{D}_{1}$ | $=$ | Dividend expected during the year |
|  | $=$ | $\mathrm{D}_{0}+1 / 2 \mathrm{~g}$ |
| $\mathrm{D}_{0}$ | = | Latest indicated dividend, obtained from Yahoo! Finance |
| g | $=$ | Expected 5-year dividend growth rate of barometer group obtained from Value Line Investment Survey. |
| $\mathrm{P}_{0}$ | $=$ | Current price of the stock, obtained from Yahoo! Finance |
| $\mathrm{Pa}_{\mathrm{a}}$ | = | Average of high and low stock price over the latest 52-week period, obtained from Yahoo! Finance |
| G | $=$ | Average of 5-year expected earnings growth rate forecasts obtained from Value Line, Zacks Investment Survey, Yahoo! Finance, and Morningstar. |

The CAPM uses the yield of a risk-free interest-bearing obligation plus a rate of return premium that is proportional to the systematic risk of an investment.

TUS uses the following formula to calculate CAPM: $K=\beta\left(R_{m}-R_{f}\right)$
Three components are necessary to calculate the CAPM cost of equity:
$\beta \quad=\quad$ Beta, a measure of systematic risk for each stock
$R_{f}=\quad$ The risk-free rate of return, 10-year U.S. Treasury yields are used for $R_{f}$. Yields are taken from the previous two quarters and forecasted next four quarters.
$\mathrm{R}_{\mathrm{m}}=$ Total return of the equity market as determined by the SBBI Yearbook

The Commission determines the ROE used for DSIC purposes based on the range of reasonableness from the DCF barometer group data, CAPM data, recent ROEs adjudicated by the Commission, and informed judgment.

The market indicated common equity cost rate range consists of data used from the barometer groups and is based on a series of calculations to average the DCF methods.


Attachment F
Historic Electric Industry Barometer Group DCF and CAPM Average ROEs

| Electric |  |  |
| :---: | :---: | :---: |
|  | DCF | CAPM |
| Q3'18 | 9.01 | 8.29 |
| Q4'18 | 8.56 | 8.39 |
| Q1'19 | 8.33 | 8.09 |
| Q2'19 | 8.31 | 7.74 |
| Q3'19 | 8.28 | 7.65 |
| Q4'19 | 8.78 | 7.22 |
| Q1'20 | 8.56 | 10.37 |
| Q2'20 | 8.57 | 10.56 |
| Q3'20 | 8.40 | 10.71 |

Chart of Historic Electric Industry DCF and CAPM Average ROEs


Barometer electric companies are used to calculate a current DCF in the first chart. The second chart demonstrates the companies 52-week average DCF. A final average of the two calculations is also shown at the bottom.

| Electric Company Barometer Group |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| Calculation of a Current Dividend Yield |  |  |  |  |  |
|  | Closing | Latest | Ind. Div. |  |  |
|  | Market | Indicated | Plus 1/2 | Current |  |
|  | Price (Po) | Dividend | Div. Growth | Dividend |  |
|  | 12/18/2020 | Do | Rate (D1) | $\underline{\text { Yield(D1/Po) }}$ | DCF |
|  | (\$) | (\$) | (\$) | (\%) | (\%) |
| Allete, Inc. | 60.35 | 2.47 | 2.52 | 4.17 | 9.92 |
| Alliant Energy Corp | 51.05 | 1.52 | 1.57 | 3.08 | 8.81 |
| Ameren Corp | 78.86 | 2.06 | 2.11 | 2.68 | 8.63 |
| American Electric Power | 83.29 | 2.96 | 3.04 | 3.65 | 9.64 |
| AVANGRID, Inc. | 45.03 | 1.76 | 1.76 | 3.92 | 8.87 |
| Avista Corp | 38.85 | 1.62 | 1.65 | 4.25 | 8.25 |
| CMS Energy Corp | 59.23 | 1.63 | 1.69 | 2.85 | 10.08 |
| Consolidated Edison | 71.15 | 3.06 | 3.11 | 4.38 | 7.11 |
| DTE Energy Company | 121.70 | 4.34 | 4.48 | 3.68 | 9.49 |
| Duke Energy Company | 90.32 | 3.86 | 3.91 | 4.33 | 8.10 |
| Edison International | 62.54 | 2.65 | 2.70 | 4.32 | 5.99 |
| Entergy Corp. | 100.02 | 3.80 | 3.88 | 3.88 | 8.36 |
| Eversource Energy | 84.14 | 2.27 | 2.34 | 2.78 | 9.13 |
| Exelon Corp | 42.57 | 1.53 | 1.57 | 3.69 | 5.99 |
| Fortis Inc. | 41.15 | 1.54 | 1.59 | 3.85 | 8.15 |
| IDACORP, Inc.. | 94.93 | 2.84 | 2.93 | 3.09 | 5.99 |
| MGE Energy, Inc. | 71.24 | 1.48 | 1.52 | 2.13 | 6.67 |
| NextEra Energy, Inc. | 74.51 | 1.40 | 1.47 | 1.98 | 10.69 |
| NorthWestern Corp | 56.01 | 2.40 | 2.45 | 4.37 | 7.14 |
| OGE Energy Corp | 31.14 | 1.61 | 1.66 | 5.33 | 8.35 |
| Otter Tail Corp | 42.81 | 1.48 | 1.52 | 3.54 | 11.29 |
| Pinnacle West Capital Corp | 78.65 | 3.32 | 3.41 | 4.34 | 8.29 |
| Portland General Electric Co. | 41.78 | 1.63 | 1.68 | 4.02 | 8.77 |
| PPL Corporation | 26.95 | 1.66 | 1.68 | 6.22 | 7.07 |
| Public Service Enterprise Group | 56.82 | 1.96 | 2.00 | 3.52 | 6.69 |
| Southern Company | 60.14 | 2.56 | 2.60 | 4.32 | 8.43 |
| WEC Energy Group, Inc. | 91.32 | 2.71 | 2.80 | 3.06 | 9.64 |
| Xcel Energy Inc. | 66.10 | 1.72 | 1.77 | 2.68 | 8.78 |
| Group Average | 65.09 | 2.28 | 2.34 | 3.72 | 8.37 |
| Group Average G |  |  |  | 4.70 |  |
| DCF |  |  |  | 8.42 |  |


| Electric Company Barometer Group |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 52-week Average Dividend Yield Calculation |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
|  |  |  |  | Latest | Average |  |
|  |  |  |  | Indicated | Dividend |  |
|  | High | Low | Average (Pa) | Dividend (Do) | Yield ( $\mathrm{Do} / \mathrm{Pa}$ ) | DCF |
|  | (\$) | (\$) | (\$) | (\$) | (\%) | (\%) |
| Allete, Inc. | 84.71 | 48.22 | 66.47 | 2.47 | 3.72 | 9.47 |
| Alliant Energy Corp | 60.28 | 37.66 | 48.97 | 1.52 | 3.10 | 8.83 |
| Ameren Corp | 87.66 | 58.74 | 73.20 | 2.06 | 2.81 | 8.76 |
| American Electric Power | 104.97 | 65.14 | 85.06 | 2.96 | 3.48 | 9.47 |
| AVANGRID, Inc. | 57.24 | 35.62 | 46.43 | 1.76 | 3.79 | 8.74 |
| Avista Corp | 53.00 | 32.09 | 42.55 | 1.62 | 3.81 | 7.81 |
| CMS Energy Corp | 69.17 | 46.03 | 57.60 | 1.63 | 2.83 | 10.06 |
| Consolidated Edison | 95.10 | 62.03 | 78.57 | 3.06 | 3.89 | 6.63 |
| DTE Energy Company | 135.67 | 71.21 | 103.44 | 4.34 | 4.20 | 10.00 |
| Duke Energy Company | 103.79 | 62.13 | 82.96 | 3.86 | 4.65 | 8.42 |
| Edison International | 78.93 | 43.63 | 61.28 | 2.65 | 4.32 | 5.99 |
| Entergy Corp. | 135.55 | 75.19 | 105.37 | 3.80 | 3.61 | 8.09 |
| Eversource Energy | 99.42 | 60.69 | 80.06 | 2.27 | 2.84 | 9.19 |
| Exelon Corp | 50.54 | 29.28 | 39.91 | 1.53 | 3.83 | 6.13 |
| Fortis Inc. | 44.72 | 28.59 | 36.66 | 1.54 | 4.20 | 8.50 |
| IDACORP, Inc.. | 113.58 | 69.05 | 91.32 | 2.84 | 3.11 | 6.01 |
| MGE Energy, Inc. | 83.26 | 47.19 | 65.23 | 1.48 | 2.27 | 6.80 |
| NextEra Energy, Inc. | 83.34 | 43.70 | 63.52 | 1.40 | 2.20 | 10.91 |
| NorthWestern Corp | 65.38 | 47.43 | 56.41 | 2.40 | 4.25 | 7.02 |
| OGE Energy Corp | 46.43 | 23.01 | 34.72 | 1.61 | 4.64 | 7.66 |
| Otter Tail Corp | 56.90 | 30.95 | 43.93 | 1.48 | 3.37 | 11.12 |
| Pinnacle West Capital Corp | 105.51 | 60.05 | 82.78 | 3.32 | 4.01 | 7.97 |
| Portland General Electric Co. | 63.08 | 31.96 | 47.52 | 1.63 | 3.43 | 8.18 |
| PPL Corporation | 36.83 | 18.12 | 27.48 | 1.66 | 6.04 | 6.89 |
| Public Service Enterprise Group | 62.15 | 34.75 | 48.45 | 1.96 | 4.05 | 7.22 |
| Southern Company | 71.10 | 41.96 | 56.53 | 2.56 | 4.53 | 8.64 |
| WEC Energy Group, Inc. | 109.53 | 68.01 | 88.77 | 2.71 | 3.05 | 9.63 |
| Xcel Energy Inc. | 76.44 | 46.58 | 61.51 | 1.72 | 2.80 | 8.90 |
| Group Average | 79.80 | 47.11 | 63.45 | 2.28 | 3.67 | 8.32 |
| Group Average G |  |  |  |  | 4.70 |  |
| DCF |  |  |  |  | 8.37 |  |
|  |  |  |  |  |  |  |
|  |  | Aver | ge of Current a | and 52-Week | 8.40 |  |

Multiple sources of the Barometer companies projected 5-year Earnings Per Share are used to calculate the Group Average Dividend Growth Estimate.


The market indicated common equity cost rate range consists of data used from the barometer groups and is based on a series of calculations to average the DCF methods.


Historic Gas Industry DCF and CAPM Average ROEs

| Gas |  |  |
| :---: | :---: | :---: |
|  | DCF | CAPM |
| Q3'18 | 9.96 | 8.88 |
| Q4'18 | 8.53 | 9.04 |
| Q1'19 | 8.69 | 8.78 |
| Q2'19 | 9.27 | 8.46 |
| Q3'19 | 9.27 | 8.46 |
| Q4'19 | 9.58 | 8.10 |
| Q1'20 | 9.92 | 10.18 |
| Q2'20 | 10.02 | 10.36 |
| Q3'20 | 10.26 | 10.65 |

Graph of Historic Gas Industry DCF and CAPM Average ROEs


Barometer gas companies are used to calculate a current DCF in the first chart. The second chart demonstrates the companies 52-week average DCF. A final average of the two calculations is also shown at the bottom.

| Gas Company Barometer Group |  |  |  |  |  |
| :--- | :---: | :---: | :---: | :---: | :---: |
|  | Calculation of a Current Dividend Yield |  |  |  |  |
|  |  |  |  |  |  |
|  | Closing | Latest | Ind. Div. |  |  |
|  | Market | Indicated | Plus 1/2 | Current |  |
|  | Price (Po) | Dividend | Div. Growth | Dividend |  |
|  | $\underline{12 / 18 / 2020}$ | $\underline{\text { Do }}$ | $\underline{\text { Rate (D1) }}$ | $\underline{\text { Yield(D1/Po) }}$ | (\$CF |
|  | $(\$)$ | $(\$)$ | $(\$)$ | $(\%)$ | $(\%)$ |
|  | 95.11 | 2.50 | 2.59 | 2.73 | 9.93 |
|  | 107.00 | 1.76 | 1.83 | 1.71 | 9.09 |
| Atmos Energy | 34.65 | 1.33 | 1.37 | 3.95 | 9.40 |
| Chesapeake Utilities Corporation | 22.40 | 0.84 | 0.87 | 3.89 | 10.10 |
| New Jersey Resources | 49.19 | 1.92 | 1.92 | 3.91 | 6.91 |
| NiSource Inc. | 78.25 | 2.16 | 2.24 | 2.86 | 8.53 |
| Northwest Natural Gas | 22.29 | 1.21 | 1.23 | 5.52 | 18.02 |
| ONE Gas, Inc. | 61.15 | 2.28 | 2.33 | 3.80 | 9.80 |
| South Jersey Industries | 64.23 | 2.60 | 2.67 | 4.15 | 12.12 |
| Southwest Gas Holdings, Inc. | 59.36 | 1.84 | 1.90 | 3.62 | 10.44 |
| Spire Inc. |  |  |  | 6.80 |  |
| Group Average |  |  |  | $\mathbf{1 0 . 4 2}$ |  |
| Group Average G |  |  |  |  |  |
| DCF |  |  |  |  |  |


| Gas Company Barometer Group |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 52-week Average Dividend Yield Calculation |  |  |  |  |  |  |
|  |  |  |  | Latest | Average |  |
|  |  |  |  | Indicated | Dividend |  |
|  | High | Low | Average ( Pa ) | Dividend (Do) | Yield ( $\mathrm{Do} / \mathrm{Pa}$ ) | DCF |
|  | (\$) | (\$) | (\$) | (\$) | (\%) | (\%) |
| Atmos Energy | 121.08 | 77.92 | 99.50 | 2.50 | 2.51 | 9.71 |
| Chesapeake Utilities Corporation | 111.40 | 69.47 | 90.44 | 1.76 | 1.95 | 9.33 |
| New Jersey Resources | 45.45 | 21.14 | 33.30 | 1.33 | 3.99 | 9.44 |
| NiSource Inc. | 30.46 | 19.56 | 25.01 | 0.84 | 3.36 | 9.57 |
| Northwest Natural Gas | 77.26 | 42.33 | 59.80 | 1.92 | 3.21 | 6.21 |
| ONE Gas, Inc. | 96.97 | 63.67 | 80.32 | 2.16 | 2.69 | 8.36 |
| South Jersey Industries | 33.43 | 18.24 | 25.84 | 1.21 | 4.68 | 17.18 |
| Southwest Gas Holdings, Inc. | 81.62 | 45.68 | 63.65 | 2.28 | 3.58 | 9.58 |
| Spire Inc. | 87.96 | 50.58 | 69.27 | 2.60 | 3.75 | 11.72 |
| Group Average | 76.18 | 45.40 | 60.79 | 1.84 | 3.30 | 10.12 |
| Group Average G |  |  |  |  | 6.80 |  |
| DCF |  |  |  |  | 10.10 |  |
|  |  |  |  |  |  |  |
|  |  | Average of Current and 52-Week |  |  | 10.26 |  |

Multiple sources of the Barometer companies projected 5-year Earnings Per Share are used to calculate the Group Average Dividend Growth Estimate.

| Development of a Representative Dividend Growth Rate |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| for the Barometer Group of Gas Companies |  |  |  |  |  |  |  |
| 5 Yr Forecast |  |  |  |  |  |  |  |
|  |  |  |  |  |  | Avgerage |  |
|  | Value Line | Value Line | Zack's | Yahoo | Morningstar | Earnings | Growth |
|  | DPS | EPS | EPS | EPS | EPS | Growth | Estimate |
|  | (\%) | (\%) | (\%) | (\%) | (\%) | (\%) | (\%) |
|  |  |  |  |  |  |  |  |
| Atmos Energy | 7.50 | 7.00 | 7.10 | 7.10 | 7.60 | 7.20 | 7.20 |
| Chesapeake Utilities Corporation | 8.50 | 9.00 | NA | 4.74 | 8.40 | 7.38 | 7.38 |
| New Jersey Resources | 6.00 | 2.00 | 6.00 | 6.00 | 7.80 | 5.45 | 5.45 |
| NiSource Inc. | 7.50 | 13.00 | 5.60 | 1.65 | 4.60 | 6.21 | 6.21 |
| Northwest Natural Gas | 0.50 | 24.50 | 3.10 | 3.10 | 2.80 | 8.38 | 3.00 |
| ONE Gas, Inc. | 7.50 | 6.50 | 5.50 | 5.00 | NA | 5.67 | 5.67 |
| South Jersey Industries | 3.50 | 12.50 | 24.50 | 24.50 | NA | 20.50 | 12.50 |
| Southwest Gas Holdings, Inc. | 4.00 | 9.00 | 5.00 | 4.00 | NA | 6.00 | 6.00 |
| Spire Inc. | 5.00 | 5.50 | 16.50 | 5.37 | 4.50 | 7.97 | 7.97 |
| Group Average | 5.56 | 9.89 | 9.16 | 6.83 | 5.95 | 8.31 | 6.82 |
| USE |  |  |  |  |  |  | 6.80 |
| Sources: Value Line Investment Survey, December 21, 2020 |  |  |  |  |  |  |  |
| Zacks, December 21, 2020 (www.zacks.com) |  |  |  |  |  |  |  |
| Yahoo!,December 21, 2020 (http://finance.yahoo.com/) |  |  |  |  |  |  |  |
|  | Morningstar, December 21, 2020 (http://financials.morningstar.com) |  |  |  |  |  |  |
|  | * NA signifies that a forecast was not available |  |  |  |  |  |  |

The market indicated common equity cost rate range consists of data used from the barometer groups and is based on a series of calculations to average the DCF methods.


Historic Water Industry DCF and CAPM Average ROEs

| Water |  |  |
| :---: | :---: | :---: |
|  | DCF | CAPM |
| Q3'18 | 9.67 | 9.50 |
| Q4'18 | 9.35 | 9.23 |
| Q1'19 | 9.30 | 9.02 |
| Q2'19 | 9.17 | 8.62 |
| Q3'19 | 9.16 | 8.55 |
| Q4'19 | 8.87 | 7.95 |
| Q1'20 | 9.10 | 9.46 |
| Q2'20 | 9.34 | 9.47 |
| Q3'20 | 9.40 | 9.68 |

Chart of Historic Water Industry DCF and CAPM Average ROEs


Barometer water companies are used to calculate a current DCF in the first chart. The second chart demonstrates the companies 52-week average DCF. A final average of the two calculations is also shown at the bottom.

| Water Company Barometer Group |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Calculation of a Current Dividend Yield |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
|  | Closing | Latest | Ind. Div. |  |  |  |
|  | Market | Indicated | Plus 1/2 | Current |  |  |
|  | Price (Po) | Dividend | Div. Growth | Dividend |  |  |
|  | 12/18/2020 | Do | Rate (D1) | $\underline{\text { Yield(D1/Po) }}$ | Growth | DCF |
|  | (\$) | (\$) | (\$) | (\%) | (\%) | (\%) |
| American States Water Company | 78.19 | 1.34 | 1.40 | 1.80 | 5.29 | 7.08 |
| American Water Works Co., Inc. | 150.24 | 2.20 | 2.29 | 1.53 | 8.40 | 9.93 |
| California Water Service Group | 53.29 | 0.85 | 0.87 | 1.64 | 9.58 | 11.22 |
| Essential Utilities, Inc. | 45.90 | 1.00 | 1.04 | 2.26 | 6.78 | 9.04 |
| Middlesex Water Company | 71.63 | 1.04 | 1.07 | 1.49 | 4.35 | 5.84 |
| SJW Group | 67.94 | 1.28 | 1.32 | 1.95 | 12.73 | 14.68 |
| The York Water Company | 47.26 | 0.75 | 0.77 | 1.63 | 5.95 | 7.58 |
| Group Average | 73.49 | 1.21 | 1.25 | 1.76 | 7.58 | 9.34 |
| Group Average G |  |  |  | 7.60 |  |  |
| DCF |  |  |  | 9.36 |  |  |


| 52-week High-Low Dividend Yield Calculation |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  |  | Latest | Average |  |  |
|  |  |  |  | Indicated | Dividend |  |  |
|  | High | Low | Average ( Pa ) | Dividend (Do) | Yield ( $\mathrm{Do} / \mathrm{Pa}$ ) | Growth | DCF |
|  | (\$) | (\$) | (\$) | (\$) | (\%) | (\%) | (\%) |
| American States Water Company | 96.64 | 65.11 | 80.88 | 1.34 | 1.66 | 5.29 | 6.94 |
| American Water Works Co., Inc. | 172.56 | 92.00 | 132.28 | 2.20 | 1.66 | 8.40 | 10.06 |
| California Water Service Group | 57.36 | 39.74 | 48.55 | 0.85 | 1.75 | 9.58 | 11.33 |
| Essential Utilities, Inc. | 54.52 | 30.40 | 42.46 | 1.00 | 2.36 | 6.78 | 9.13 |
| Middlesex Water Company | 76.08 | 48.79 | 62.44 | 1.04 | 1.67 | 4.35 | 6.02 |
| SJW Group | 74.99 | 45.60 | 60.30 | 1.28 | 2.12 | 12.73 | 14.86 |
| The York Water Company | 51.27 | 34.56 | 42.92 | 0.75 | 1.75 | 5.95 | 7.70 |
| Group Average | 83.35 | 50.89 | 67.12 | 1.21 | 1.85 | 7.58 | 9.43 |
| Group Average G |  |  |  |  | 7.60 |  |  |
| DCF |  |  |  |  | 9.45 |  |  |
|  |  |  |  |  |  |  |  |
|  |  | Aver | of Current an | d 52-Week | 9.40 |  |  |

Multiple sources of the Barometer companies projected 5-year Earnings Per Share are used to calculate the Group Average Dividend Growth Estimate.

| Development of a Representative Dividend Growth Rate |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| for the Barometer Group of Water Companies |  |  |  |  |  |  |  |
| 5 Yr Forecast |  |  |  |  |  |  |  |
|  |  |  |  |  |  | Avgerage |  |
|  | Value Line | Value Line | Zacks | Yahoo | Morningstar | Earnings | Growth |
|  | DPS | EPS | EPS | EPS | EPS | Growth | Estimate |
|  | (\%) | (\%) | (\%) | (\%) | (\%) | (\%) | (\%) |
| American States Water Company | 9.50 | 6.50 | 4.90 | 4.85 | 4.90 | 5.29 | 5.29 |
| American Water Works Co., Inc. | 8.50 | 8.50 | 8.10 | 8.40 | 8.60 | 8.40 | 8.40 |
| California Water Service Group | 5.50 | 6.50 | NA | 10.75 | 11.50 | 9.58 | 9.58 |
| Essential Utilities, Inc. | 7.50 | 7.00 | 6.20 | 6.70 | 7.20 | 6.78 | 6.78 |
| Middlesex Water Company | 5.50 | 6.00 | NA | 2.70 | NA | 4.35 | 4.35 |
| SJW Group | 7.00 | 10.50 | 14.00 | 13.70 | 47.50 | 21.43 | 12.73 |
| The York Water Company | 6.00 | 7.00 | NA | 4.90 | NA | 5.95 | 5.95 |
| Group Average | 7.07 | 7.43 | 8.30 | 7.43 | 15.94 | 8.82 | 7.58 |
| USE |  |  |  |  |  |  | 7.60 |
|  |  |  |  |  |  |  |  |
| Sources: Value Line Investment Survey December 21, 2020 |  |  |  |  |  |  |  |
| Zacks, December 21, 2020 (www.zacks.com) |  |  |  |  |  |  |  |
| Yahoo!, December 21, 2020 (http://finance.yahoo.com/) |  |  |  |  |  |  |  |
| Morningstar, December 21, 2020 (http://financials.morningstar.com) |  |  |  |  |  |  |  |
| * NA signifies that a forecast was not available |  |  |  |  |  |  |  |

# The Township of Lower Makefield, Bucks County <br> Wastewater Collection System and Purchased Treatment Capacity 

Appraisal Work Papers

As of September 17, 2020

Value Line Investment Surveys
Water Industry
Market and Financial Ratios

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The Water Utility Industry consists of companies that provide water services to specific regions. In exchange for being granted a monopoly, utilities agree to allow state authorities to set the rates that they are allowed to earn.

Stocks in the group have performed extremely well over the past one-, three,, and five-year periods. Since our last report in July, however, the group has not managed to keep pace with the S\&P 500 Index. Though the Industry's rank has declined slightly, it easily remains within the top quintile of the 95 industries followed by Value Line.
After decades of under investment, American utilities are now spending heavily to modernize and upgrade aging pipelines and wastewater facilities. Funding these projects requires significant amounts of capital, much of it coming from external financing.

Consolidation continues to be a major force in this sector Bigger, better-capitalized utilities are making dozens of bolt-on acquisitions every year.
In general, regulators and the water utilities they seem to be on the same page. This is not always the case for a regulated industry.

## Water Stocks Lose Some Steam

Over the past half decade, most of the water utility equities have turned in an excellent performance. This came despite conventional wisdom being that these shares were mainly for conservative investors willing to forfeit some capital appreciation potential in return for less risk. Indeed, total returns here have been so impressive that skeptics began questioning how these companies, that have a cap on their earnings, could continue to do so well. Sincelate May, however, as the stock market has bounced back, most of the prices on on most of these equities have declined. While we don't think that the gains achieved are sustainable, we do believe that the Industry holds some attraction For starters, there are less than 10 members in this group, and their total market capitalization combined is less than that of a major electric utility. Hence, to become involved in this space, investors must be willing to pay a premium. This applies specifically to institutions that are looking to diversify their risk away from electric and gas utilities.

## INDUSTRY THIMELHNESS: 10 (of 95)

should be noted that most of the mergers are not substantial, as the major companies typically make dozens of acquisitions a year. Another benefit of the consolidation is that economies of scale and synergies are actually quite achievable in this sector. This is the main reason why regulators are in favor of them.

## Positive Regulatory Climate

All of the recent strides made in the industry would not have been possible without water utilities and the authorities that oversee them having a constructive relationship. State commissions realize that these companies are investing a lot of money on investors behalf and need to make a fair return on it. Utilities understand that they are being granted a monopoly of a vital resource and must provide good service. The regulatory climate is much more favorable in the water industry compared to that of other the electric utility industry, where epic battles have been fought between the two sides over what qualifies as a "fair" return.

## Well-Defined Profits And Dividends

Not many industries have the stability of these utilities. Much of this is due to water being an essential commodity that has very predictable demand. Whether the economy is booming or in a recession, people are still going to consume water for their personal needs. So, earning swings in these companies are much lower than the average business.

## Conclusion

There are several stocks in this group that are ranked to outperform the market in the year ahead. In addition, there are very few companies that have better-defined earnings prospects than this Industry. Investors have to pay a premium for these attributes, however, as can be seen in the elevated P/E ratios in the group. As always, we recommend that subscribers read each individual report closely to better understand the specific risks before making any commitments.

James A. Flood

## Industiry Fundamentals

In the United States, most water services are provided by local-, city-, or state-run organizations. To raise funds, they do not issue stock, but rather raise debit by selling municipal bonds. This market is also incredibly fragmented, as there are literally almost 100,000 water districts in the country when all of the small entities are included. Currently, the industry is involved in a major construction program. For decades, insufficient investment was made to maintain the nation's water infrastructure. Thus, the average age of many pipelines is somewhere between 50 and 75 years old. Fortunately, both the companies and regulators realize that vast amounts of money need to be spent on construction to fix the system. Also, many of the smaller water districts do not have the financial wherewithal required for the repairs. Too, it has became obvious that the market's fragmented nature is very inefficient. This began a period of consolidation that we expect to continue. It

RELATIVE STRENGTH (Ratio of Industry to Value Line Comp.)


Value Line's estimates of sales and earnings growth for individual companies are derived by correlating sales, earnings, and dividends to appropriate components or subcomponents of the Gross Domestic Product, presented below. A more detailed forecast appears periodically in Selection \& Opinion.

## HYPOTHESIZED ECONOMIC

## ENVIRONMENT 3.TO 5 YEARS HENCE

The hypothesized 2023-2025 economic environment into which earnings are forecast is as follows: Unemployment will average about $5 \%$ of the national labor force. There will be no major wars in progress at that time. Industrial production will be expanding modestly. Inflation will be increasing at a relatively restrained pace: Prices as measured by the broad-
based GDP deflator will be advancing about $1.5 \%$ per year, on average. Long-term interest rates on AAA corporate bonds are projected to average between $2 \%$ and $3 \%$ in the years 2023-2025. We expect the Federal Reserve to pursue accommodative monetary policies, given the very gradual recovery path following the severe COVID-19-induced recession. Based on these assumptions, the Gross Domestic Product will average just about $\$ 24,000$ billion in the years $2023-2025$, a level that is roughly $11 \%$ above the 2019 total of $\$ 21,440$ billion.

Things may turn out differently. But in the absence of knowledge of the future, we use the above assumptions, which appear to be most plausible. Thus we are able to apply a common economic environment to all stocks for the purpose of measuring relative growth potential.


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| $\begin{array}{lllll}\text { CURRENT POSTION } \\ \text { (SMILL.) } & 2018 & 2019 & 6 / 30 / 20\end{array}$ |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: |
| $\begin{array}{llll}\text { Cash Assets } & 7.1 & 1.3 & 6.5\end{array}$ |  |  |  |  |
| Other |  | le 23.4 | 20.9 | 30.4 |
|  |  | 101.0 | 100.3 | 100.1 |
| Current Assets. |  | 131.5 | 122.5 | 137.0 |
| Accts Payable |  | 59.5 | 55.6 | 51.8 |
| Debt Duie |  | 40.3 | 5.3 | 49.4 |
| Other Current Liab |  | 46:8 | 55.1 | 57.5 |
|  |  | 146.6 | 116.0 | 158.7 |
| ANNUAL RATES Past Past Est'd '17-19 |  |  |  |  |
| of change (per sh) : 10 Yrs. 5 Yr |  |  |  |  |
| Reven |  | 3.0\% |  | 5,0\% |
| "Cash Flow" $\quad 6.0 \% \quad 3.0 \% \quad 7.0 \%$ |  |  |  |  |
| Earnings $\quad 9.5 \%$ 5.0\% $6.5 \%$ |  |  |  |  |
| Book Value |  | 8.0\% | 9.5\% |  |
|  |  |  |  |  |
| $\begin{gathered} \text { Cal- } \\ \text { endar } \end{gathered}$ | QUARTERLY REVENUES ( mill.) Mar:31 Jun. 30 Sep. 30 Dec. 31 |  |  | Full |
|  |  |  |  | Year |
| 2017 | 98.8 | 113.2124 .4 | 104.2 | 440.6 |
| 2018 | 94.7 | $106.9 \quad 124.2$ | 111.0 | 436.8 |
| 2019 | 101.7 | 124.7 134.5 | 113.0 | 473.9 |
| 2020 | 109.1 | $121.3 \quad 139.6$ | 115 | 485 |
| 2021. | 110 | $125 \quad 145$ | 120 | 500 |
| $\begin{aligned} & \text { Cal- } \\ & \text { endar } \end{aligned}$ | EABNINGS PER SHARE A |  |  | F |
|  |  |  |  | Year |
| 2017 | 34 | 62 . 57 | .35 | 1.88 |
| 2018 | . 29 | .44 . 62 | . 37 | 1.72 |
| 2019 | . 35 | . $72 \quad .76$ | . 45 | 2.28 |
| 2020 | . 38 | . $69 \quad 73$ | . 50 | 2.30 |
| 2021 | . 43 | $.72 \quad .75$ | . 55 | 2.45 |
| Calendar | QUARTERLY DIVIDENDS PAID $\mathrm{Eax}_{\square}$ |  |  | Full |
|  | Mar. 31 | Jun, 30 Sep, 30 | Dec. 31 | Year |
| 2016 | . 224 | . 224.224 | . 242 | . 91 |
| 2017 | . 242 | . 242 :255 | . 255 | .99 |
| 2018 | . 255 | . 255 . 275 | . 275 | 1.06 |
| 2019 | . 275 | . 275.305 | . 305 | 1.16 |
| 2020 | . 305. | . 305 . 335 |  |  |

BUSINESS: American States Water Co operates as a holding it supplies water to 260,708 customers in 10 California counties. Service areas include the metropolitan areas of Los Angeles and Orange Countles. The company also provides electricity to 24,420 customers in Bigi Bear Lake and San Bernardino Cnty. Provides
American States Water recently raised its dividend by more than we had anticipated. In the third quarter, the water utility hiked the quarterly payout almost $10 \%$ : This represented one of the largest increases in the entire industry. What's more, with a dividend-to-net profit ratio that is considered low for this group, there is ample room for growth in the distribution in the years ahead We think annual increases of close to double digits are possible through mid-decade.
Golden State Water is doing well, despite problems in its home state. The second-quarter year-over-year earnings comparison was much better than it appeared, as the company recorded a large one-time gain in the 2019 period. As California deals with the impact of the coronavirus and wildfires, the utility is opexating smoothly as the demand for water typically remains stable whether the economy is booming or in a recession, as is the case now.
Our earnings estimates are umchanged, once again. As we often point out, one of the main advantages of a water utility is the predictable nature of its in-
water \& wastewater services to U.S. militany bases through its ASUS subsidiary. Sold Chaparral City Wir. of AZ. (6/11). Employs 844\% BlackRock, Inc. owns $15.9 \%$ of out. shares; Vanguard, 11.9\%; off: \& dir. 1.0\%, (4/20 Proxy). Chairman: Lloyd Ross. Pres. \& CEO: Robert Sprowis. Inc: CA. Address: 630 East Foothill Bivd., San Dimas; CA 91773. Tel: 909-394-3600. Internet: www.aswater.com.
come stream. Hence, we are still looking for share earnings of $\$ 2.30$ and $\$ 2.45$ for 2020 and 2021 , respectively.
Nonregullated operations should be a key driver of long-term growth. Though its ASUS subsidiary, American States provides water services to U.S. Army bases around the country. As the military continues to privatize its water systems, we expect the company to win its fair share of the 50 -year contracts. Responsible for over $17 \%$ of net profits last quarter, this percentage should continue to trend higher. Also, profitability in this sector is not capped like it is in the regulated business.

## Short-term investors might find these

 shares attractive. For starters, the equity is expected to outperform the market averages in the year ahead. What's more, during this period of economic and political uncertainty, the utility has very welldefined prospects. As usual, a premium will have to be paid to own stock in this space. Also, as is the case with most utilities, AWR's total return prospects out to 2023-2025 are not impressive. James A. FloodOctober 9, 2020

 due early November. $10 \phi$. Next earnings report vestment plan available.
2020 value ember.


| Cash Assets | 158 | 91 | 569 |
| :--- | ---: | ---: | ---: |
| Accts Receivable | 301 | 294 | 298 |
| Other | 322 | 900 | 1029 |
| Current Assets | 781 | 1285 | 1896 |
| Accts Payable | 175 | 203 | 169 |
| Debt Due | 1035 | 814 | 989 |
| Other | 884 | 1028 | 955 |
| Current Liab. | 2094 | 2045 | 2113 |


| ANNUAL: RATES Past Past Est'd'17'19 of change (per sh) $10 \mathrm{Yrs} . \quad 5 \mathrm{Yrs} . \quad 10{ }^{\prime} 23 \cdot{ }^{\prime} 25$ |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: |
|  |  |  |  |  |
| Revenues |  | 3.0\% | \% 3.0\% | 4.5\% |
| "Cash Flow" |  | 13.0\% | \% 6.0\% | . $5 \%$ |
| Earinings |  | 45.5\% | \% 6.5\% | 8.5\% |
| Dividends |  | 16.0\% | \% - $10.5 \%$ | 5.0\% |
| Book Value |  | 2.5\% | \% $4.0 \%$ |  |
| Cal- | QUARTERLY REVENUES (\$ milli) |  |  | Full |
| endar | Mar. 31 | Junt 30 S | Sep. 30 Dec. 31 | Year |
| 2017 | 756 | 844 | $936 \quad 821$ | 3357 |
| 2018 | 761 | 853 | 976850 | 3440 |
| 2019 : | 813 | 882 | 1013 : 902 | 3610 |
| 2020 | 844 | 931 | 1090 935 | 3800 |
| 2021 | 885 | 970 | 11201000 | 3975 |
| Cal. |  | TINGS PE | EM SHARE A | Full |
| endar | Mar. 31 | Jun. 30 S | Sep. 30 Dec. 31 | Year |
| 2017. | . 52 | 73 | $1.12 \ldots 01$ | 2.38 |
| 2018 | . 59 | . 91 | 1.03 . 62 | 3.15 |
| 2019 | . 62 | . 94 | $1.33: .54$ | 3.43 |
| 2020 | . 68 | 97 | 1.40 . 80 | 3.85 |
| 2021 | . 72 | 1.05 | 1.60 . 83 | 4.20 |
| Cal. | OUARTE | EREY DID | IDFNDS PAID ${ }^{\text {日发 }}$ | Full |
| endar | Miar.31 | dun 30 S | Sep. 30 Dec. 31 | Year. |
| 2016 | . 34 | . 375 | : . 375 . 375 | 1.47 |
| 2017 | ; 375 | . 415 | $\cdots .415 .415$ | 1.62 |
| 2018 | . 415 | . 455 | .455 . 455 | 178 |
| 2019 | . 455 | . 50 | . 50 . 50 | 1,96 |
| 2020 | . 50 | . 55 | . 55 |  |

BUSINESS: American Water Works Company, ine. is the largest
investor-owned water and wastewater utlity in the U:Sis providing senices to approximately 15 million people in 46 states, Nonregulated business assists municipalities and, military bases with the maintenance and upkeep as well. Regulated operations made up $86 \%$ of 2019 revenues, New Jersey is its largest market accounting
Shares of American Water Works continue to outperform the broader market, as well as that of its peers. Since our last report three months ago, the equity has increased nearly $14 \%$ in value, versus about a $6 \%$ rise in the S\&P 500 Index. In addition, most of the other stocks in this group have actually posted negative returns averaging in the double digits over the same time span.
Earnings and dividend growth prospects are bright. Due to its bolt-on acquisition strategy, a constructive relationship with its many different state regulators, and the ability to cut costs, we estimate that American Water's share-net and annual payout may well rise $9 \%-11 \%$ in 2020 and 2021. This is far superior to most others in the industry Much of the expense control is related to its merger policy Because the water industry is very fragmented, significant economies of scale are very attainable. So, American Water can purchase other water districts and increase the margins on the purchased as sets. Through July of this year, more than 60,000 new customers were added, with another 43,600 under agreement.
for $24.6 \%$ of regulated revenues; Pennsylvania, 22.3\%; Missouri, $10: 5 \%$. Has 6,800 employees, The Vanguard Grp, owns $12.4 \%$ of outstanding shares; BlackRock, Inc., 8.7\%, officers \& directors, less than $1.0 \%$ ( $3 / 20$ Proxy). President \& CEO: Susan N. Story. Chairmàn: George MacKenzie. Address: 1 Water Street, Camden, NJ 08102. Tel.: $856-346-8200$. Internet: www.amwater.com.

The construction budget remain massive. As is the case with most water utili-ties, the company is investing heavily to upgrade and modernize its pipeline and water treatment assets. Approximately $\$ 28$ billion has been spent over the past decade, with about another $\$ 20$ billion projected to be used over the next decade. Still, we expect American Water's balance sheet to remain in decent shape even though a fair amount of new debt will probably be needed to finance the building program.
Investors will likely have to continue to pay a hefty premium for these timely shares. As we have pointed out in previous reports, by a metric such as the Price/Earnings ratio, AWK is trading at levels well above the market averages and its group. We attribute this to the company's well-defined earnings and dividend growth prospects. The equity also seems to benefit from it large size, as well as the lack of options in this space for institutions seeking to take large positions. Over the pull to 2023-2025, these shares have subpar total return prospects. James A. Flood

October 9, 2020

[^17]


| CURBENT POSITION (\$MILL.) | 2018 | 2019 | 6/30/20 |
| :---: | :---: | :---: | :---: |
| Cash Assets | 31.3 | 42.9 | 35.0 |
| Accls Receivable | 24.2 6.9 | 23.2 7 | 26.9 |
| Current Assets |  | 73.4 | 70.8 |
|  |  |  |  |
| Accis Payable | 4.6 | 3.7 | 3.6 |
| Other | 3.3 | 4.5 | 4.4 |
| Current Liab. | 7.9 | 8.2 | 8.0 |


| ANNUAL RATES of change (per sh) | Past 10 Yis. | Past 5 Yrs . | Est'd ' 15 -' 17 |
| :---: | :---: | :---: | :---: |
| Revenues | 5.0\% | . $5 \%$ | 13.5\% |
| "Cash Flow" | 2.0\% | .5\% | 10.0\% |
| Earnings | -3.0\% | -4.5\% | 17.0\% |
| Dividends | 5.0\% | - | 14.5\% |
| Book Value | 5.0\% | 2.0\% | 2.5\% |


| Cal:- <br> endar | QUARTEALY REVENUES (S mill.) Mar. 31 Jun. 30 Sep. 30 Dec. 31 |  |  |  | Full Year |
| :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  |  |  |  |
| 2017 | 15.6 | 15.3 | 16.6 | 14.8 | 6 |
| 2018 | 14.3 | 15.9 | 18.8 | 16.7 | 7 |
| 2019 | 17.0 | 18.3 | 15.9 | 17.6 | 68.8 |
| 2020 | 20.8 | 19.1 | 17.1 | 19.0 | 76.0 |
| 2021 | 20.0 | 20.0 | 19.0 | 20.0 | 79.0 |
| Calendar | EARNNGS PER SHARE AMar. 31 Jun. 30 Sep. 30 Dec. 31 |  |  |  | Full Year |
| 2017 | . 18 | . 11 | . 08 | . 04 | 41 |
| 2018 | . 14 | . 14 | . 30 | . 10 | 68 |
| 2019 | 17 | . 16 | . 11 | . 12 | 56 |
| 2020 | . 19 | d.07 | . 10 | . 13 | .35 |
| 2021 | . 15 | . 10 | . 10 | 15 | 50 |
| C | QUARTERLY DIVIDENDS PAID BeMar 31 Jun. 30 Sep. 30 Dec. 31 |  |  |  | III |
| end |  |  |  |  | Year |
| 2016 | . 075 | . 075 | . 075 | 075 | 30 |
| 2017 | . 075 | . 075 | . 075 | . 075 | 30 |
| 2018 | . 085 | . 085 | . 085 | . 085 | 34 |
| 2019 | . 085 | . 085 | . 085 | . 085 | 34 |
| 2020 | 085 | 085 | 085 |  |  |

BUSINESS: Consolidated Water Co. Litd develops and operates: desalination plants and water distribution systems in areas where.
naturally occurring supplies of water are scarce. It provides water in the Cayman Islands, the Bahamas ${ }_{5}$ and the British Virgin Islands. At $12 / 31 / 19_{3}$; t operated 12 plants with a capacity of 25,6 million galIons per day. Sold Ball operations and divested Belize assets in '19.
Consolidated Water"s plans for a
plant in Mexico have hit anag. plant in Mexico have hit a snag.
Shortly after our July report on the water company, management disclosed that its affiliate had received a letter from Mexican authorities that terminated an agreement for construction of a large desalination facility. To be located in the state of Baja, Califormia, it would originally supply 50 millions gallons of water a day mostly to the city of Tijuana. Consolidated has spent millions of dollars buying land and doing developmental work, as the planning process began around 2010. After clearing one legal and regulatory liurdle after another, the outlook was looking promising. According to the letter, however, the project has become too costly. It is difficult to determine whether this is just another obstacle in getting the Rosarito plant built, or a major roadblock. In any case, one thing is for sure, the region needs more sources of fresh water. Maxket conditions in the company's main service areas remain challenging. As a supplier of water from its desalination plants to several Caribbean nations, Consolidated has seen..depmand
discontinued operations: 17, $\$ 0.07$ a share; $;$ April, Jully, and October, a Dividend reinvest'18, $\$ 0.07$ a share' '19, $\$ 0.24$ a share Next earnings report due mid-November. April, Jutly, and Oct
ment plan available.

Also manufactures products for the industry through Aerex sub:
Inc.: Cayman is. Employs: 105 . Pres/CEO: F. McTaggart. Based on Inc.: Cayman is Employs 105. Pres/CEO: F. McTaggart. Based on
4119 proxy Ofts./ Dirs. own $48 \%$ of stock; Amund Asset; $7.7 \%$; BlackRock, 5.6\%. (No proxy flled in 2020). Addr.: Regatta Oft. Pk Windward Three, West Bay Rd., P.O. Box 1114 Grand Gayman, KYI-1102, Cayman Is. Tel: (345) 945-4277. Int: www.cwco.com.
fall due to the collapse in the tourism industry. And with many people still hesitant to travel, the situation does not look like it will turn around anything soon. Meanwhile we have reduced our earnings estimates. The company posted a loss in the second quarter mainly due to the steep decline in activity caused by the coronavirus. In addition, its manufacturing business has been hurt by the global economic slowdown and the deferral of some major projects. As of now, the picture doesn't seem too bright. To reflect this, we have shaved another $\$ 0.15$ a share off of our earnings estimates for both 2020 , and 2021.

The very small-cap stock is ranked to underperform the market averages in the year ahead, Consolidated continues to have a good story: It builds plants around the world that make undrinkable water potable. However, the uncertainty regarding the Rosarito plant makes the company's prospects ill-defined. It also highlights some of the negative aspects of dealing with regulators outside of the United States.
James A. Flood
October 9, 2020


| TIMELINESS 2 Lowered $4 / 24120$ <br> SAFETY 2 Ralsed $4120 / 12$ <br> TECHNICAL 2 Lowered $6 / 12 / 20$ <br> BETA 90 ( 1.00 = Market):  |  |  |  | High: |  | 18 |  | 21 | 28 | 28.2 | 31.1 | 35.8 | 39.6 | 39 | 47.3 | . 5 |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  |  |  |  |  |  |  |  |  | 24.4 | 28.0 | 29.4 | 32.1 | 32.7 | 30.4 | Q |  | 20232024 | - 2025 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 80 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 60. |
| 18-Month Target Price RangeLow-High $\quad$ Midpoint (\% to Mid)$\$ 31-\$ 80 \quad \$ 56(40 \%):$ |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | $2+1$ |  |  |  |
|  |  |  |  | \% | W |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 30 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 25 |
|  | , | (0) |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 20 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 15 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  | (Nil) |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Institutional Decisions |  |  |  | \% |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | \% TOT RETURN 8/20 |  | - |
|  | 402019 | 102020 | 202020 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | THís VLARITH: |  |
| ${ }^{10} 10$ Buy | $\begin{array}{r} 274 \\ : 242 \\ \hline \end{array}$ | $\begin{array}{r} 252 \\ 292 \end{array}$ | $\begin{aligned} & 250 \\ & 235 \end{aligned}$ |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | $\begin{array}{rr}2.4 \\ 357 & 8.7\end{array}$ |  |  |
| Hfld $0^{(000)}$ | 49836. | 161407 | 161504 |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 3 yr 5 yr | $\begin{array}{lr}35.7 & 17.6 \\ 87.5 & 45.6\end{array}$ |  |  |
| 2004 | 2005 | 2006 | 2007 |  |  | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | $20: 16$ | 2017 | 2018 | 2019 | 2020 | 2021 | ¢V | LINE PUB: LLC | 25 |  |
| 2.78 | 3.08 | $3: 23$ | 3.61 | 3.71 | 3.93 | 4.21 | 4.10 | 4.32 | 4.32 | 4.37 | 4.61 | 4.62 | 4.56 | 4.71 | 4.03 | 6.35 | 7.55 | Revenue | per sh | 8.45 |  |
| . 87 | . 97. | 1:01 | 1.10 | 1.14 | 1.29 | 1.42 | 1.45 | 1.51 | 1.82 | 1.89 | 1.87 | 2.07 | 2.12 | 1.90 | 1.73 | 1.95 | 2.30 | "Cash Fl | ow" per sh | 2.65 |  |
| . 51 | 57 | . 56 | 57 | . 58 | 62 | . 72 | 83 | . 87 | \% 1.16 | 1.20 | 1.14 | 1.32 | 1.35 | 1.08 | 1.04 | 1.00 | 1.20 | Earnings | per sh ${ }^{\text {A }}$ : | 1.75 |  |
| . 29 | 32. | $\square 35$ | 38 | . 41 | . 44 | 47 | . 50 | 54 | 58 | 63 | 69 | 74 | 79 | . 85 | 91 | , 97 | 1.04 | Div'd Dec | cld per sh' $\mathrm{Bm}_{\text {m }}$ | 1.30 |  |
| 1.23 | 1.47 | -164 | 143 | 1.58 | 1.66 | 1.89 | 1.90 | 1.98 | 1.73 | 1.84 | 2.07 | 2.16 | 2.69 | 278 | 2.49 | 22.20 | 3.80 | Cap'I Sp | ending per sh | 4.75 |  |
| 4.71 | 5.04 | 5.57 | 5.85 | 6.26 | 6.50 | 6.81 | 7.21 | 7.90 | 8.63 | 9.27 | 9.78 | 10.43 | 11.02 | 11.28 | 17.58 | 19.00 | 19.05 | Book V | e per sh | 20,00 |  |
| 158:97 | 161.21 | 165.41 | 468.75 | 169.21 | 170.61 | 172.46 | 173.60 | 175.43 | 177.93 | 178.59 | 176.54 | 177.39 | 177.71 | 178.09 | 220.76 | 251.25 | 252.00 | Commo | Shs Outst'g ${ }^{\text {c }}$ | 260:00 |  |
| 25.1 | 31:801 | . 34.7 | 32.0 | 24.9 | 23.1 | 21.1 | 21.3 | 21.9 | 21.2 | 20.8 | 23.5 | 23.9 | 24.7 | 32.6 | 339.1 | Bo | res are | Avg Ann | PIE Ratio ? | 27.0 |  |
| 1.33 | 1.69 | :187 | 170 | 1.50 | 1.54 | 1.34 | 1.34 | 1.39 | 1.19 | 1.09 | 1.18 | 1.25 | 1.24 | 1.76 | 2.12 | $\square$ Valus $L$ | Lne | Relative | P/E Ratio | 1.50 |  |
| 2.3\% | 1:8\% | 18\% | 2.1\% | 2.8\% | 3.1\% | 3.1\% | 2.8\% | 2.8\% | 2.4\% | 2.5\% | 2.6\% | 2.3\% | 2.4\% | 2.4\% | 2:2\% | etr |  | Avg Ann | 1 Div'd Yield: | 2.7\% |  |
| CAPITAL STRUCTURE as of $6 / 30 / 20$ <br> Total Debt $\$ 5277.4$ mill. Due.In 5 Yrs $\$ 496.0$ mill. LT Debt $\$ 5174.6$ mill. LT Interest $\$ 200.0$ mill. ( $53 \%$ of $\mathrm{Cap}^{\prime}$ ) |  |  |  |  |  | . 1 | 712.0 | 57.8 | 768.6 | 779.9 | 814.2 | 819.9 | 809.5 | 838.1 | 889.7 | 1600 | 1900: | Reven | (1) | 2200 |  |
|  |  |  |  |  |  | 124.0 | 144.8 | 153.1 | 205.0 | 213.9 | 201.8 | 234.2 | 239.7 | 192.0 | 224.5 | 250 | 300 | Net Proil | (\$mill) $\%$ | 455 |  |
|  |  |  |  |  |  | 39.2\% | 32.9\% | 39.0\% | 10.0\% | 10.5\% | 6.9\% | 8.2\% | 6.6\% | 6.6\% | 6.6\% | 2.0\% | 3.5\% | Income $T$ | ax Rate | 8.0\% |  |
|  |  |  |  |  |  |  |  |  | . $1.1 \%$ | 2.4\% | 3.1\% | 3.8\% | 6.3\% | 6.8\% | 7.2\% | 7.0\% | 7,0\%. | AFULC $\%$ | to Net Profit | 7,0\% |  |
| Pension Asseis-12/19 \$266.4 mill : |  |  |  |  |  | 56.6\% | 52.7\% | 52.7\% | 48.9\% | 48.5\% | 50.3\% | 48.4\% | 50.6\% | 54,4\% | 43.3\% | 53.5\% | 57.0\% | Long.Te | $m$ Debt Ratio | 40.5\% |  |
| Ptd Stock None Common Stock 245,151,093 shares as of 7/27/20 |  |  |  |  |  | 43:4\% | 47.3\% | 47:3\% | 51:1\% | 51.5\% | 49.7\% | 51.6\% | 49.4\% | 45,6\% | 56.9\% | 46.5\% | 43,0\% | Common | Equity Ratio | 59.5\% |  |
|  |  |  |  |  |  | 2706.2 | 2646.8 | 2929.7 | 3003.6 | 3216.0 | 3469.5 | 35877 | 3965.4 | 4407, 8 | 6824.2 | 10300 | 11000 | Total Cap | ital (\$mill) | 12800 |  |
|  |  |  |  |  |  | 3469.3 | 3612.9 | 3936.2 | 4167.3 | 4402.0 | 4688.9 | 5001.6 | 5399.9 | 5930.3 | 6345.8 | 9500 | 10150 | Net Plant | (\$mill) | 12000 |  |
|  |  |  |  |  |  | 5.9\% | 6.9\% | 6.6\% | 8.0\% | 7.8\% | 6.9\% | 7.6\% | 73\% | 5.5\% | 4.2\% | 3.0\% | 4.0\% | Return on | Total Cap' | 4.5\% |  |
| MARKET CAP \$9,8 billon (Large Cap) |  |  |  |  |  | 10.6\% | 11.6\% | 11.0\% | 13.4\% | 12.9\% | 117\% | 12:7\% | 12:\% | 9.6\% | 5.8\% | 5.0\% | 6.5\% | Return on | Shr. Equily | 9.0\% |  |
|  |  |  |  |  |  | 10.6\% | 11.6\% | 11.0\% | 13,4\% | 12:9\% | 117\% | 127\% | 12.2\% | 9.6\% | 5.8\% | 5.0\% | 6.5\% | Return on | Com Equity : | 9.0\% |  |
| CURRENT POSITION 2018 2019 $6 / 30 / 20$ <br> (SMILLL.,  3.6 1868.9 <br> Cash Assets 101.3   <br> Receivablestr, 1012 67.1 152.9 |  |  |  |  |  | $3.7 \%$ | $4.6 \%$ | $4.3 \%$ | 6.7\% | 6:1\% | 47\% | 56\% | 51\% | n2.1\% | 9\% | NMF | 1.0\% |  |  | $2.5 \%$ |  |
|  |  |  |  |  |  | $65 \%$ | $60 \%$ | $61 \%$ | 50\% | 52\% | 60\% | 56\% | 59\% | 779\%. | 8184\% | 97\% | $87 \%$ | All Dlv'd. | Net Prof | $74 \%$ |  |


| Cash Assets. | 3.6 | 1868.9 | 7.3 |
| :--- | ---: | ---: | ---: |
| Receivabless. | 1012 | 67.1 | 152.9 |
| Inventory (AvgCst) | 15.8 | 18.4 | 50.1 |
| Other | 26.6 | 58.3 | 102.2 |
| Current Assets | 147.2 | 2012.7 | 312.5 |
| Accts Payable | 77.3 | 74.9 | 124.1 |
| Debt Due | 160.0 | 130.8 | 102.8 |
| Other | 161.7 | 113.1 | 221.3 |
| Current Liab. | 399.0 | 318.8 | 448.2 |


| ANNUAL RATES | Past | Past | Est'd '17'19 |
| :--- | :--- | :--- | :--- |
| of change (per sh) | 10 Yrs, | 5 Yrs | 1023.25 |
| Revenues | $1.5 \%$ | $5 \%$ | $11.5 \%$ |
| "Cash Flow" | $5.0 \%$ | $2.0 \%$ | $5.5 \%$ |
| Earnings | $7.0 \%$ | $1.5 \%$ | $7.0 \%$ |
| Dividends. | $7.5 \%$ | $8.0 \%$ | $7.5 \%$ |
| Book Value | $8.0 \%$ | $9.0 \%$ | $7.0 \%$ |


|  | QUARTERLY REVENUES (\$ mill ) : |  |  | Full Year |
| :---: | :---: | :---: | :---: | :---: |
| endar | Mar,31 Jun 30 | Sep. 30 | Dec. 31 |  |
| 2017 | $187.8 \quad 203.4$ | 215.0 | 203.3 | 809.5 |
| 2018 | 194.3211 .9 | 226.2 | 205.7 | 838.1 |
| 2019 | 20111218.9 | 243.6 | 226.1: | 889.7 |
| 2020 | 255.6 ¢ 384.5 | 395 | 564.9 | 1600. |
| 2021 | 395. 450 | 430 | 625 | 1900 |
| Cal endar | $\begin{aligned} & \text { EARNINGS } \\ & \text { Mar. } 31 \text { Jun. } 30 \end{aligned}$ | Sep | Dec. 31 | Full. |
| 2017 | 28.34 | 43 | 30 | 1.35 |
| 2018 | . $29 \quad 37$ | . 44 | d.02 | 1.08 |
| 2019 | 09.25 | 38 | . 28 | 1.04 |
| 2020 | 20\% 29 | . 23 | . 28 | 1,00 |
| 2021 | 22 . 33 | . 33 | . 32 | 1:20 |
| ar- | QUARTERLY DIVI | DENDS P | $10^{81}$ | Full |
| endar | Mar.31 Jun. 30 | Sep. 30 | Dec.31 | Vear |
| 2016 | . 178 . 178 | 1913 | . 1913 | 74 |
| 2017 | . 1913.1913 | . 2047 | . 2047 | 79 |
| 2018 | . 2047 . 2047 | . 219 | . 219 | 85 |
| 2019 | . 219.219 | . 2343 | . 2343 | . 91 |
| 2020 | 2343 . 2343 | . 2507 |  |  |

Aqua America on Feb. 3,2020 , to reflect the acquistion of Peoples, a natural gas utility; which ocourred In $3 / 20$. In 2019, Aqua Amer: provided water and wastewater services to about three million people in $P A, O H, T X, H_{3} N C, N J, N$, and VA Employed 1;583. Acquired AquaSource, $7 / 73$; North Maine Utilities, $7 / 15$; and others.
Essential Utilities raised its dividend a solid $7 \%$ last quarter The company in creased the share payout from $\$ 0.2343$ to $\$ 0.2507$. This rate of increase ought to be maintained to mid-decade.
Earnings comparisons should be flat in 2020. Even though the second quarter surpassed our expectations, the company will probably be hindered by the costs as sociated with the large acquisition it made earlier this year. Recall that it (then known as Aqua America), paid $\$ 4.3$ billion and assumed over $\$ 1$ billion in debt to purchase Peoples gas utility, All told, Esisential's share net should to be around $\$ 1.00$ which isn't bad considering the amount of unusual charges. It also should be noted that both of the company's two key seg. ments are much less vulnerable to the economic slowdown caused by the coronavirus. With the exception of industrial customers, the demand for prater and gas is relatively inelastic.
In 2021, we expect the bottom line to get back on track. Management is es timating that the regulated water and segments will grow $6 \%$ to $7.0 \%$, and $8 \%$ to 10\%, annually"throúghe 2022. This, along

Water slipply revenues 2019 , residential, $58 \%$; commerciali $6 \%$; Industrial, wastewater \& other, 26\%. Off. \& dir. own less than $1 \%$ of the commont stock: BlackRock, $10.5 \%$ Vanguard, $10.4 \%$; ( $4 / 20$ proxp), Canadian Penslon Plan about $8.8 \%$. Pres, \& CEO Christopher Franklin. Inc.: PA Addr.: 762 West Lancaster Ave: Byin Mawr, PA 19010. Tel.: 610-525-1400. Int.: www.essentila, co.
with some rate relief and cost savings, should enable Essential's share net to reách $\$ 1.20$.
The construction budget is large. This year, the company plans on spending only $\$ 550$ million to upgrade its water pipelines and other assets, However, capital expenditures have been projected to total about $\$ 28$ billion through 2022 . Thus, spending ought to average over a $\$ 1$ billion annually in 2021 and 2020.
Finances are more than decent. True, debt levels have increased as a result of the Peoples merger. In addition, external funds will be required to fund the massive building program discussed above. Nevertheless, the balance sheet is still better than average, and will likely remain so.
These shares are ranked 2 (Above Average) for year-ahead performance. So short-term investors looking for welldefined prospects should find the stock of interest. For those looking out to 20232025, however, total return potential remains well below the Value Line median, as is the case with most members in this group.
James A. Flood
October 9, 2020

 $94 ;{ }^{i} 14,114$. Quarterly EPS do not add in ' 19 , in early March, June, Sept., \& Dec. a Div'd. bill./\$9.55 a share. due to a large change in the number of shares reinvesiment plan avallable ( $5 \%$ discount).
OHE PUBLISHEA IS NOT RESPONSIELE FOA ANY ERRORS OR OMISSIONS HEREIN. This publication to be reliable and is provided without warrantes of any kind:
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|  |  |  |  |  |  |  |  | $\begin{aligned} & \text { RECENT } \\ & \text { PRICE } \end{aligned}$ | $62$ | $\text { PE } R \text { RTIO } 20 \text { O (Trailing: } 29.4$ |  |  |  | $\begin{aligned} & \text { RELATVE } \\ & \text { PFER RATIO } \end{aligned}$ |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| TIMELIN | $\text { NESS } 2$ | 2 Raised |  | High: | 17.9 11.6 | 19.3 | 19.4 16.5 | 19.6 | 22.5 18.6 | $\begin{aligned} & 23.7 \\ & 19.1 \end{aligned}$ | $\begin{aligned} & 28.0 \\ & 21.2 \end{aligned}$ | $\begin{aligned} & 44.5 \\ & 25.0 \end{aligned}$ | $\begin{aligned} & 46.7 \\ & 32.2 \end{aligned}$ | $\begin{aligned} & 60.3 \\ & 34.0 \end{aligned}$ | $\begin{aligned} & \hline 67.7 \\ & 51.0 \end{aligned}$ | $\begin{aligned} & 1 \\ & 72.4 \\ & 48.8 \end{aligned}$ |  |  | Target Pri | Fange |
| SAFET | - | 2 New 1 |  | LEGENDS <br> $\longrightarrow 1.20 \times$ Dlvidends p sh divided by Interest hale $\because$ Relative Pice Strengh Options Yes Shaded area indicales recossion |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | - |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 100 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 80 |
| BETA | 1.00 | Markel) |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 64 |
| 18-Month Target Price Range |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Low H | m | point ( | Mid) |  |  |  |  |  |  |  |  |  |  | 利112 |  |  |  |  |  |  |
| \$53-\$9 | \$76 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 2023-25 PROJECTIONS |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 24 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 16 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | -12 |
| Low |  | \%) |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | \% TOT. RETURN 8/20 |  | -12 |
| Institutional Decisio |  |  |  |  |  | $2010$ |  |  |  |  | $\cdots$ | 1 |  |  |  |  |  |  THIS VLAARIIH. <br>  STOCK NNDE <br> 1 yr 6.4 8.7 <br> 3 yr 77.7 17.6 <br> 5 yr 211.4 45.6 |  | $-8$ |
|  | $4 Q 2019$ | 102220 | 20020 | Percient shares traded |  |  |  |  |  |  |  | 1 |  |  |  |  |  |  |  |  |
|  | $68$ |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Hidi $(000)$ | 10433 . | 10280 | 10369 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 2004 | 2005 | 2006 | 2007 | 20082009 |  |  | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | © VAL | ELINE PJE.LLC | 33.25 |
| 25 | 6.44 | 6.16 | 6.50 | 79 | 6.75 | 6.60 | 6.50 | 6.98 | 7.19 | 7.26 | 7.77 | . 16 | 8.00 | 42 | 7.72 | . 20 | 8.45 | Reve | es per sh | 9.15 |
| ¢ 1.28 | 1.33 | 1:33 | 1.49 | 1.53 | 1.40 | 1.55 | 1.46 | 1.56 | 1.72 | 1.84 | 1.97 | 2.17 | 2.24 | 2.89 | 2.90 | 3.00 | 3.15 | Cash F | low" per sh | 3.50 |
| . 73 | 71 | 82 | . 87 | . 69 | . 72 | 96 | . 84 | 1, 90 | 1.03 | 1.13 | 1.22 | 1.38 | 1.38 | 1.96 | 2.01 | 2,15 | 2.25 | Earning | persh ${ }^{\text {a }}$ | 2.50 |
| 66 | 67 | 68 | +69 | 70 | 71 | 72 | 73 | . 74 | 75 | 76 | . 78 | 81 | 86 | . 91 | . 98 | 1.04 | 1.10 | Div'd De | col'd per sh $\mathrm{Ba}_{\text {a }}$ | 1.25 |
| 2.54 | $2: 18$ | 2.31 | 1.66 | 2.12 | 1.49 | 1.90 | 1.50 | 1.36 | 1.26 | 1.40 | 1.59 | 2.9 | 3.0 | 4.4 | 5.11 | 3.9 | 4.5 | Cap'I | ending per sh | 5.00 |
| 8.02 | 8.26 | 9.52 | 10.05 | 10.03 | 10.33 | 1.1. 13 | 11.27 | $11: 48$ | 11.82 | 12,24 | 12.74 | 13.40 | 14.02 | $\because 15.17$ | 18.57 | 16.15 | 16.50 | Book Va | lue per sh | 17.35 |
| 11.36 | 11.58 | 13:17. | 413.25 | $13: 40$ | 13.52 | 15.57 | 1570 | 15.82 | 15.96 | 16.12 | 16.23 | 16.30 | 16.35 | 16.40 | 17:43 | 17.65 | 17775 | Comm | Shs Outstg ${ }^{\text {c }}$ | 18:00 |
| 26.4 | 27.4 | 22.7 | 21.6 | 19.8 | 21.0 | 17.8 | 21.7 | 20.8 | 19.7 | 18.5 | 19.1 | 25.6 | 28.4 | 22.2 | 29.7 | Bold fig | ries a | Avg | 'IP/E Ratio | 23.0 |
| 1.39 | 1.46 | 1,23 | 1.15 | 169 | 1.40 | t. 13 | 1.36 | 1.32 | 1.11 | . 97 | . 96 | 1.34 | 1.43 | 1.20 | 1.61 | Value | Line | Rela | P/E Ratio | 1.30 |
| 3.4\% | $3.5 \%$ | 3:7\% | 3.7\% | 4.0\% | 4.7\% | 4.2\% | 4.0\% | 4:0\% | 37\% | 37\% | 3,3\% | 2.3\% | 2.2\% | 2:1\% | 1:6\% |  |  | Avg | Div'd Yield | 2.2\% |
| CAPITAL STRUCTURE as of 6/30/20. Total Debt $\$ 282.7$ mill. Due $\ln 5$ Yrs $\$ 33: 3$ mill, LT Debt $\$ 237.9$ mill.: LT Interest $\$ 7.2$ mill. (Total interest coverage: 7.4x) ( $42 \%$ of Cap'l) |  |  |  |  |  | 27 | 102.1 | 110.4 | 114.8 | 117.1 | 126.0 | 32.9 | 130.8 | 138.1 | 134.6 | 145 | 50 | Reven | es (\$mill) | 165 |
|  |  |  |  |  |  | 14.3 | 13.4 | 14.4 | 16.6 | 18.4 | 20.0 | 22.7 | 22.8 | 32.5 | 33.9 | 38.0 | 40.0 | Net Prom | iti (\$mill) | 45.0 |
|  |  |  |  |  |  | 32:\% | 32.7\% | 33.9\% | 34:1\% | 35.0\% | 34.5\% | 34.0\% | 32.7\% | 28\% | 2.8\% | 21.0\% | 21.0\% | Incom | Tax Rate | 21.0\% |
|  |  |  |  |  |  | 6.8\% | 6.1\% | 3.4\% | 81.9\% | 1.7\% | 1.9\% | 2.7\% | 3.1\% | 1.4\% | 3.4\% | 2.0\% | 2.0\% | AFUDC | \% to Net Profit | 2.5\% |
|  |  |  |  |  |  | 43.1\% | 423\% | 41.5\% | 40.4\% | 40.5\% | 39.4\% | 37.9\% | 37.5\% | 37.8\% | 41:5\% | 42.5\% | 41.5\% | Long-Te | rm Debl Ratio | 39.0\% |
| Ision Assets-12/19 \$80.4 mil |  |  |  |  |  | 55,8\% | 56,6\% | 57.4\% | 58.7\% | 58.8\% | 59.8\% | 61.5\% | 61:8\% | 61.6\% | 58.2\%. | 57,0\% | 58,0\% | Cómmo | Equity Ratio | 60.5\% |
| Pfd Stock $\$ 2.4$ mill. Pid Divido $\$ 100.9$ mill |  |  |  |  |  | 310.5 | ,312.5 | 316.5 | 32.1.4 | 335.8 | 345.4 | 355.4 | 370.7 | 404.1 | 556.7 | 500 | 505 | Total Ca | pital (\$mill) | 515 |
|  |  |  |  |  |  | 405.9 | 4222 | 435.2 | 446.5 | 465.4 | 481.9 | 517.8 | 557.2 | 618.5 | 705.7 | 720 | 735 | Net Pla | t'(\$mili) | 775 |
| Common Stock 17,464,795 shs. as of $7 / 31 / 20$ |  |  |  |  |  | 5.7\% | 5.2\% | 5.4\% | 5.9\% | 6.3\% | 6.6\% | 71\% | 6.9\% | 8.9\% | 6.7\% | 8.0\% | 8.5\% | Return 0 | on Total Cap'l | 9.0\% |
|  |  |  |  |  |  | 8.1\% | 7.5\% | 78\% | 8.7\% | 9.2\% | 9.6\% | 103\% | 9.8\% | 12.9\% | 10.4\% | 13.0\% | 13.5\% | Return | on Shr. Equity | 14.5\%: |
| MARKET CAP: $\$ 1.1$ billon (Mild-Cap) |  |  |  |  |  | 8.2\% | +7.5\% | 78\% | 8.7\% | 9.3\% | 9.6\% | 10.3\% | 9,9\% | 13.0\% | 10.4\% | 13.5\% | 13.5\% | Return | on Com Equity | 14.5\% |
|  |  |  |  |  |  | 75\% | 10\% | 1.4\% | 2:4\% | 3.1\% | 3.5\% | 43\% | 3.8\% | 7.0\% | 5.4\% | 7.0\% | 7.0\% | Retain | to Com Eq | 7.0\% |
|  |  |  |  |  |  | 87\% | 83\% | 73\% | 67\% | 63\% | 58\% | 62\% | 46\% | 48\% | 48\% | 49 | Ail Div'd | s to Net Prof | 50\% |  |



BUUSINESS: Middilesex Water Company engages in the owintership and operation of fegulated water utilly systems in New Jeisey; Delaware, and Pennsyliania. It also operates water and wastewater. systems under contract on behalf of munlicipal and pifvate clients in NJ and DE IIs Mididlesex System providés water senices to 61,000
Middlesex Water's bottom line surged in the June period. The regulated water utility posted second-quarter profits of $\$ 0.55$ a share, a nickel better than we had expected. Driving the outperformance was healthier operating margins and an in come tax benefit related to recently adopted tangible property regulations. Revenues rose nicely as well, thanks to an expanding eustomer base in ite Delaware cordingly, we are adding 80.05 to our earnings-per-bhare forecaste for this year and next, to $\$ 2.15$ end $\$ 2.25$, reapectively. We are leaving unchanged our top-line es. timater at thle time. Plenty of tallwinds, auch as higher rates, increasing custom erg, and a helghten approach to personal hygiene, are likely to peralist. However, we are keeping an eye on residential water consumption levels as stay-at-home restrictions fade and members of the household slowly return to the office and classroom. The company recently wrapped up a major infrastructure project. Middlesex completed construction of a two

2019, the Middlesex System accounted for $60 \%$ of operating revenues. At 12/31/19, the company had 352 employees. Incorporated: NJ. President, CEO and Chairman: Dennis W. Doll. Officicers \& difectors own $3.1 \%$ of the com. stock; BlackFock Inst. Trust Co ., $7.7 \%$ (4/20 proxy). Add.: 485 C Route 1 South, Suite 400 , 1 sein, $\mathrm{N}, \mathrm{J}$ 08830. Tel. 732 -634-1500, Int, www.middlesexwater.com.
sion pipeline in its New Jersey system. Subsequent to this accomplishment, we do not expect leadership to take its foot off the gas in terms of infrastructure improvement spending. To reiterate, the company's long-term program, Water For Tomorrow, boasts a $\$ 300$ million budget, and ought to be used to replace and improve aging infrastructure such as watermains, pipelines, and wastewater treatment facilities.

## At recent levels, Middlesex stook in

 suited primarily for subseribers with a short-term investment horizon. The equity is presently th the good graces of our Timelines, Ranting System, That said the atock's multiyear price ascent(MSEX shares recently traded at an all time high) has limited some of its longterm appeal To this point, capital appreciation potential over the 3 - to 6 -year time frame is below average, and the current dividend yield is dwarfed by the Value Line median. All told, we recommend buy-and-hold accounts defer capital commitments until a more attractive entry point is available:
Nicholas P. Patrikis

October 9, 2020



Shares of SJW traded above $\$ 70$ per operating expenses, as well as lower prodshare in mid-August before pulling uction and water purchase costs.
back to levels seen three months Despite slightly lagging the Value prior. The East and West coasts (post Line median, SJW is currently one of CTWS merger) regulated water utility the more-attractive, incomefound some market support following the generating options in the Water Utilirelease of betterthan-expected second- ty industry. The current yield is hovering quarter financial results. Earlier this year, just above $2.0 \%$, while many of its peers the company had been on shaky ground fall below that metric. Additionaliy, a reastemming from a combination of COVID sonable payout ratio and prospects for in-19-related disruptions and the ongoing in-, creased profitability suggest that annual tegration of Connecticut Water. Even so, dividend hikes are likely on tap over the SJW delivered a relatively inspiring June- coming years.
period performance Revenues of $\$ 147$ mil- We are fans of the long term story hon exceeded our $\$ 135$ million call, while here; however, at the recent quotaearnings came in $\$ 0.09$ better than expect- tion, we are not presently recomed, at $\$ 0.69$ a share However the stock mending the stock. From a business perwas unable to hold its gains, likely due to spective, SJW is well positioned to benefit recent broader market turbulence amidst an uncertain economic backdrop.
We are lifting our profit forecasts for this year and next. Specifically, we are adding $\$ 0.10$ and $\$ 0.05$ to our 2020 and 2021. share-net estimates, to $\$ 2.05$ and \$2.50, respectively. In regard to the latter, line expansion is underpinned by the as-
from increased hygiene awareness, a rapidly expanding customer base, and periodic rate hikes Nevertheless, unranked SJW shares have risen considerably in price over the past few years, thus rendering 3 - to 5 -year total return potential subpar. All told, subscribers interested in adding a noncyclical water utility to their portfolios should hold off, for now.
portfolios should hol
Nicholas P. Patrikis
October 9, 2020
(A) Diluted eamings. Excludes nonrecurring Quarterly egs. may not add due to rounding.

\$1.22; 10, \$0.46. GAAP accounting as of June, September, and December. . Div'd rein-
2013. Next eamings report due early Nov. vestment plan avaliable.
(C) In milllons.
D) Pald special dividend of $\$ 0.17$ per share on
$11 / 17$. 11/17.
(E) Sus
(E) Suspended due to recent CTWS merger.
 of it may be reproduced, resold, stored or transmited in any printed, electronic or other tom, or used for generating or marketing any printed or electionic publication, service or product
$\begin{array}{ll}\text { TIMELINESS } & 2 \text { Raised } 5 / 29 / 20 \\ \text { SAFETY } & 3 \text { Lowered } 7 / 17 / 1 \\ \text { TECHNICAL } & 2 \text { Lowered } 5 / 29 / 2\end{array}$ BETA $80 \quad(1.00=$ Markei $)$ 18-Month Target Price Range Low-High Midpoint (\% to Mid) $2023-25$ PROJECTIONS

 Institutional Decisions |  | 402019 | 102020 | 202020 |
| :--- | ---: | ---: | ---: |
| 10 | 52 | 61 | 59 |
| to Buy | 39 | 52 | 48 |
| Sild $18(000)$ | 5387 | 5387 | 5479 |
| 2004 | 2005 | 2006 | 2007 |



| 218 | 2.58 | 2.56 | 279 | 8 |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| 65 | 79 | 77 | 86 | 88 |  |
| 49 | . 56 | . 58 | 57 | 57 |  |
| 39 | . 42 | 45 | 48 | 49 |  |
| 2.50 | 1.69 | 185 | 1.69 | 2.17 |  |
| 4.65 | 4.85 | 5.84. | 5.97 | 6.14 |  |
| 10.33 | 10.40 | 11:20 | 11.27 | 11,37 |  |
| 25.7. | 26.3 | 31.2 | 30.3 | 24.6 |  |
| 1.36 | 1.40 | 168 | 1.61 | 1.48 |  |
| 3.1\% | 2.9\% | 2:5\% | 2.8\% | 3.5\% | 3. |
| CAPITAL STRUCTURE AS of 6/30/20 Total Debt $\$ 103.1$ mill. Due in 5 Yis $\$ 42.5$ mill; LT Dett $\$ 96.6$ mill. LT Interest $\$ 5.5$ mill. |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |

( $41 \%$ of Capil)
Peision Assets $12 / 19 \$ 49.3$ mill.
Obllg. $\$ 47.3 \mathrm{~m}$ Obllg. $\$ 47.3$ mill.
Pfd Slock None
Common Stock $13,033,999$ shis.
MARKET CAP: $\$ 575$ million (Small Cap) CURRENTPOSITION 2018,2019 6/30/20 Cash Assets
Accounts Receivable Inventory (Avg. Cost) Other
Current Assets Accts Payable Debt Due
Current Liab.

|  | - |  | 4 |
| :---: | ---: | ---: | ---: |
| blt) | 4.8 | 4.4 | 5.0 |
|  | 3.3 | 1.0 | 1.1 |
| 9.0 | 9.4 | 10.2 |  |
|  | 3.0 | 3.4 | 4.0 |
| 1.0 | 6.5 | 6.5 |  |
|  | 6.8 | 5.3 | 5.7 |
|  | 10.8 | 15.2 | 16.2 |


| ANNUAL RATES of change (par sh) Revenues "Cash Flow" Earnings Dividends Book Value |  | Past 10 Yrs. $3.0 \%$ $6.0 \%$ $6.0 \%$ $3.0 \%$ $4.5 \%$ |  Past Est'd $17{ }^{\prime} 19$  <br>  5 Yrs to'23.25 <br> $\%$ $2.5 \%$ $5.0 \%$ <br> $\%$ $5.5 \%$ $7.0 \%$ <br> $\%$ $6.0 \%$ $7.0 \%$ <br> $\%$ $4.0 \%$ $6.0 \%$ <br>  $4.0 \%$ $4: 0 \%$ |  |
| :---: | :---: | :---: | :---: | :---: |
| Calendiar | $\text { Mar. } 31$ | Jun. 30 | VENUES (\$ milli) Sep. 30 Dec. 31 | $\begin{aligned} & \text { Full } \\ & \text { Year } \end{aligned}$ |
| 2017 | 11.0 | 12.3 | 12.7 12.3 | 48.6 |
| 2018 | 11.6 | 120 | $127 \quad 12.1$ | 0 |
| 2019 | 17.8 | 13.0 | $13.7 \quad 13.1$ | 16 |
| 2020 | 12.9 | 13.3 | $14.0 \quad 13.3$ | ¢ |
| 2021 | 13.0 | 13.5 | $14.5 \quad 13.5$ | A |
| Calendar | Mar. 31 | $\begin{aligned} & \text { INGS PE } \\ & \text { in } 30 S \end{aligned}$ | SHAREA ep. 30 Dec. 31 | Full |
| 2017 | 20 | 23 | 31.27 | . 01 |
| 2018 | 20 | . 26 | .29: 29 | 1.04 |
| 2019 | . 22 | 28 | $.35 \quad .26$ | 1.11 |
| 2020 | 31 | 32 | $35 \quad 32$ | 1,30 |
| 2021 | 28 | . 35 | . $37 \quad .35$ | 135 |
| endar | QUART Mar. 31 | $\text { Jun. } 30$ | IDENDS PAID ${ }^{3}$ Sep. 30 Dec. 31 | Full Year |
| 2016 | . 1555 | 1555 | $1555 \cdot 1602$ | 627 |
| 2017 | . 1602 | . 1602 | . 1602.1666 | 64, |
| 2018 | . 1666 | . 1666 | .1666 , 1733 | . 673 |
| 2019 | . 1733 | . 1733 | .1733 . 1802 | . 70 |
| 2020 | . 1802 | . 1802 | . 1802 |  |

BUSINESS: The York Water Company is the oldest Investor-owned regulated water unliny In the United States, It has operated continuously since 1816. As of December 31, 2019, the company's average dally avallabllity was 35.4 million gallons and lis service territory had an estimated population of 201,000. Has more than 71,400 customers. Residential customers accounted for $65 \%$ of 2019 reve-
York Water delivered stirong top- and bottom-line performances in the sec. ond quarter Indeed, the Pennsylvaniabased regulated water utility held up considerably well during the height of the pandemic, and should continue to thrive as the economy appears to be entering recovery mode. The company generated $\$ 13.3$ million in revenues in the June period, up $21 \%$ from the previous-year figure, while earnings clocked in at $\$ 0.32$ a share, up about $14 \%$ year over year. Underpinning the advances was a combination of recent rate hikes, increased water consumption per residential customers (largely due to more people staying and working from home amidst lingering health concerns), as well as growth in its customer base (both acquisition and homebuying related). Moreover, share profits were boosted by lower taxes tied to greater tangible property deductions and a declining interest expense.
We think modest financial growth is in the cards next year. Revenues are expected to increase to about $\$ 55$ million, while earnings may edge up a nickel, to
$\$ 1.35$ a share. Our somewhat conservative

| 2018 | 2019 | 2020 | 2021 | $\bigcirc$ | 25 |
| :---: | :---: | :---: | :---: | :---: | :---: |
| 3.74 | 3.96 | 4.10 | 4.20 | Re | 5.10 |
| 158 | 1.70 | 1.90 | 1.95 | "Cash Flow" per sh | 240 |
| 1.04 | 1.11 | 130 | 1.35 | Earnings per sh A | 1.60 |
| 667 | 70 | 73 | . 78 | Div'd Decl'd per sh e | 95 |
| 1.95 | 16 | . 85 | 1,35 | Cap'l Spending per sh | . 85 |
| 9.75 | 10.31 | 11.15 | 11.60 | Book Value per sh | 12.50 |
| 12.94 | 13.02 | 13.00 | 12.95 | Common Shs Ouist'g | 12.8 |
| 30.3 | 33.8 | Bold figures are Value line estimates |  | Avg Ann'I P/E Ratio | $25: 0$ |
| 164 | 183 |  |  | Relative P/E Ratio | 1.40 |
| 2:1\% | 1.9\% |  |  | Avg Ann'I Div'd Yield | 2.4\% |
| 48.4 | 51.6 | 53.5 | 54 | Revenues (Smill) |  |
| 13.4 | 14.4 | 17.0 | 17.5 | Net Profit (Smill) | 20. |
| 157\% | 135\% | 18.5\% | 21.0\% | Income Tax Rate z | 21.0\% |
| 1.7\% | 2.5\% | 1.5\% | 1.5\% | AFUDC \% to Net Profit | 1.5\% |
| 42.5\% | 41:3\% | 38.5\% | 37.5\% | Long-Term Debt Ratio | 6.0\% |
| 57.5\% | 58.7\% | 61.5\% | 62.5\% | Common Equity Hatio | 64.0\% |
| 219.5 | 228.7 | 235 | 240 | Total Capital (Smill) | 250 |
| 2992 | 313.2 | 315 | 320 | Net Plant (\$mill) | 335 |
| 73\% | 7.4\% | 8.5\% | 8.5\% | Return on Total Cap'! | 9.0\% |
| 10.6\% | 10.7\% | 11.5\% | 11.5\% | Return on Shr. Equity | 13.0\% |
| 10.6\% | 10.7\% | 11.5\% | 11.5\% | Return on Com Equity | 13.0\% |
| 8\% | 4.0\% | 5.0\% | 50\% | Retained to Com Eq | . $0 \%$ |
| $464 \%$ | 62\% | 56\% |  |  |  |

nues; commercial and industrial ( $28 \%$ ); other ( $7 \%$ ), It also provides sewer billing services. Incorporated: PA. York had 106 full-time employees at $12 / 31 / 19$. President/Chief Executive Officer: J.T. Hand. Officers/directors own 1.2\% of the common stock (3/20 proxy). Address. 130 East Market Street, York, Pennsylvania 17401. Telephone, (717) 845-3601. Internet: www.yorkwater.com.
projections stem partly from periodically rising operation and maintenance expenses. On top of that, as much of the population slowly returns to work and school, household water consumption could talke a slight step back, despite an increase in general hygiene practices.
True to form, infrastructure upgrades are on tap over the pull to middecade. York invested $\$ 9.0$ million year to date on various replacements and water system improvements, and expects to spend an additional $\$ 12.0$ million over the next six months on main extensions, wastewater treatment plant expansions, and broad pipe and service line upgrades. Infrastructure spending ought to considerably ramp up over the coming years, as the company focuses on delivering safe water to its growing customer base.
The equity is favorably ranked (2) for relative year-ahead price performance. That said, although York shares have slipped modestly in price since our mid-July review, total return potential out to $2023-2025$ still leaves much to be desired at the recent quotation.
Nicholas P. Patrikis
October 9, 2020

[^18](C). In millions, adjusted for split.
o, Ser, and Decomber

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# The Township of Lower Makefield, Bucks County Wastewater Collection System and Purchased Treatment Capacity 

Appraisal Work Papers<br>As of September 17, 2020

Financials 2018 through 2019

AUS Consultants
Suite 201
8555 West Forest Home Avenue
Greenfield, Wisconsin 53228
Office Telephone: 414-529-5755
J. Weinert's Cell: 414-698-8371
J. Weinert's E-Mail: weinerti@auswest.net

Lower Makefield Township

|  | 2018 | 2019 |
| :---: | :---: | :---: |
| Revenues |  |  |
| Services | 6,560,789 | 8,241,312 |
| Micellaneoue | 18,770 | 45,119 |
| Total Revenues | 6,579,559 | 8,286,431 |
|  |  | 25.94\% |
| Expenses |  |  |
| Operating | 6,103,954 | 5,732,389 |
| Depreciation | 1,262,705 | 1,297,902 |
| Total Expenses | 7,366,659 | 7,03D,291 |
| Operating Income | $(787,100)$ | 1,256,140 |
| Non Operating |  |  |
| Earning on Investments | 3,267 | 4,673 |
| Taping Fees | 111,948 | 201,524 |
| Gain on sale of fixed assets | 9,700 | - |
| Interest Expense | $(449,144)$ | $(415,823)$ |
| Amortization | 35,125 | 35,126 |
| Total Non Operating Revenues (expenses) | $(289,103)$ | $(174,500)$ |
| Income (Loss) Before Interfunds Transfers | $(1,076,203)$ | 1,081,640 |
| Inter Fund Transfers |  |  |
| Transfers in | 2,427,005 | 476,081 |
| Transfers Out | $(2,677,001)$ | $(655,332)$ |
| Total Interfund Transfers | $(249,996)$ | $(179,251)$ |
| Chane in Net Position | $(1,326,199)$ | 902,389 |
| Net Position Begin Year | 3,454,955 | 2,128,756 |
|  | $(1,326,199)$ | 902,389 |
| Net Postion End Year | 2,128,756 | 3,031,145 |

Assets
Current Assets
Cash and Cash Equivalen
Account Receivables, net
Due from other Funds
Inventory
Prepaid Expenses
Sybtotal Current Assets
Capital Assets
Gross
Acccumulated Depreciation
Net Capital Assets
Total Assets
Defered Outflows of Resources
Deferred Pension Outflow
Deferred Charges on Refunding of Bonds
Total Defered Outflows of Resources

Liabilities
Current Liabilities
Accounts Payable
Accrued Expenses
Unearned Revenues
Current Portion of long-term Debt
Subtotal Current Liabilities

| $2,471,553$ | $1,578,454$ |
| ---: | ---: |
| $1,311,732$ | $1,459,473$ |
| 159,084 | 86,416 |
| 728,500 | 720,100 |
| $4,670,869$ | $3,844,443$ |
|  |  |
| 481,567 | 353,663 |
| 16,858 | 11,707 |
| $13,505,552$ | $12,774,166$ |
| $14,003,977$ | $13,139,536$ |
|  |  |
|  |  |
| 58,418 | 24,681 |
|  |  |
| $4,242,969$ | $4,097,805$ |
| $(2,114,213)$ | $(1,066,650)$ |
| $2,128,756$ | $3,031,145$ |

S:\water industry\Lower Makefield Township Sewer Authority \Lower Makefield Report \& Testimony\Lower Makefield Wastewater Colllection System Valuation as of 6-30-2020 - Created 3-11-2021

| 1st Quarter 2020 | Customers | Usage - Gallons |
| :--- | ---: | ---: |
|  |  |  |
| Residential | 10886 | 142172700 |
| Commercial | 218 | 10523500 |
|  |  |  |
| Total - 1st Qtr., 2020 | 11104 | 152696200 |

2nd Quarter 2020

| Residential | 10902 | 141803700 |
| :--- | ---: | ---: |
| Commercial | 220 | 9524300 |
|  |  |  |
| Total-2nd Qtr., 2020 | 11122 | 151328000 |

## 3rd Quarter 2020

| Residential | 10896 | 171246260 |
| :--- | ---: | ---: |
| Commercial | 219 | 9011500 |
|  |  |  |
| Total - 3rd Qtr., 2020 | 11115 | 180257760 |

4th Qurater 2020

| Residential | 10916 | 159674400 |
| :--- | ---: | ---: |
| Commercial | 235 | 10251200 |
|  |  |  |
| Total - 4th Qtr., 2020 | 11151 | 169925600 |
| Year Growth | 1.004232709 |  |

## 2020 Total Usage

Residential
614897060
Commercial
39310500

654207560

S: \water industry\Lower Makefield Township Sewer Authority\Lower Makefield Report \& Testimony\Lower Makefield Wastewater Colllection System Valuation as of 6-30-2020 - Created 3-11-2021
Projects Under consideration
$496 \mathrm{~N} \quad 30$
$562 \quad 5$
574
590
643
655
658
664
665
666
667
Recently Approved
642
Projects Under Construction
335T 377
$412 \quad 7$
538 5
543 7
$560 \quad 14$
$569 \quad 15$
596
597
612
629
648
$651 \quad 227$
652
532
29
5655769Current Customers11151
Projects ..... 937
Growth ..... 8.4\%





# TOWNSHIP OF LOWER MAKEFIELD 

## ANNUAL FINANCIAL REPORT

Year Ended December 31, 2018

Expertise Beyond The Numbers
Certified Public Accountants and Business Consultants

## STATEMENT OF NET POSITION <br> PROPRIETARY FUNDS

DECEMBER 31, 2018

|  |  | Sewer Fund |  | Community Pool Fund |  | Golf Course Fund |  | Total |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| ASSETS |  |  |  |  |  |  |  |  |
| CURRENT ASSETS |  |  |  |  |  |  |  |  |
| Cash and cash equivalents \$ | \$ | - | \$ | 487,774 | \$ | 393,686 | \$ | 881,460 |
| Accounts receivable, net |  | 2,139,050 |  | - |  | 4,104 |  | 2,143,154 |
| Inventory |  | - |  | - |  | 108,324 |  | 108,324 |
| Prepaid expenses |  | - |  | - |  | 27,764 |  | 27,764 |
| TOTAL CURRENT ASSETS |  | 2,139,050 |  | 487,774 |  | 533,878 |  | 3,160,702 |
| CAPITAL ASSETS, net |  | 18,477,021 |  | 426,573 |  | 15,109,397 |  | 34,012,991 |
| TOTAL ASSETS |  | 20,616,071 |  | 914,347 |  | 15,643,275 |  | 37,173,693 |
| DEFERRED OUTFLOWS OF RESOURCES |  |  |  |  |  |  |  |  |
| Deferred pension outflow |  | 171,073 |  | - |  | - |  | 171,073 |
| Deferred charges on refunding of bond |  | 74,874 |  | - |  | 63,863 |  | 138,737 |
| TOTAL DEFERRED OUTFLOWS OF RESOURCES |  | 245,947 |  | - |  | 63,863 |  | 309,810 |
| LIABILITIES |  |  |  |  |  |  |  |  |
| CURRENT LIABILITIES |  |  |  |  |  |  |  |  |
| Accounts payable |  | 2,471,553 |  | 5,397 |  | 26,932 |  | 2,503,882 |
| Accrued expenses |  | 1,311,732 |  | 3,830 |  | 16,945 |  | 1,332,507 |
| Unearned revenue |  | 159,084 |  | 130 |  | 272,918 |  | 432,132 |
| Current portion of long-term debt |  | 728,500 |  | - |  | 625,000 |  | 1,353,500 |
| TOTAL CURRENT LIABILITIES |  | 4,670,869 |  | 9,357 |  | 941,795 |  | 5,622,021 |
| LONG-TERM LIABILITIES |  |  |  |  |  |  |  |  |
| Net pension liability |  | 481,567 |  | - |  | - |  | 481,567 |
| Compensated absences |  | 16,856 |  | 5,572 |  | - |  | 22,428 |
| Bonds and notes payable |  | 13,505,552 |  | - |  | 14,045,649 |  | 27,551,201 |
| TOTAL LONG-TERM LIABILITIES |  | 14,003,975 |  | 5,572 |  | 14,045,649 |  | 28,055,196 |
| DEFERRED INFLOWS OF RESOURCES |  |  |  |  |  |  |  |  |
| Deferred pension inflow |  | 58,418 |  | - |  | - |  | 58,418 |
| NET POSITION |  |  |  |  |  |  |  |  |
| Net investment in capital assets |  | 4,242,969 |  | 426,573 |  | 438,748 |  | 5,108,290 |
| Unrestricted |  | $(2,114,213)$ |  | 472,845 |  | 280,946 |  | $(1,360,422)$ |
| TOTAL NET POSITION \$ | \$ | 2,128,756 | \$ | 899,418 | \$ | 719,694 | \$ | 3,747,868 |

See accompanying notes to the basic financial statements.

|  |  | Sewer Fund |  | $\begin{aligned} & \text { Community } \\ & \text { Pool } \\ & \text { Fund } \\ & \hline \end{aligned}$ |  | Golf Course Fund |  | Total |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| OPERATING REVENUES |  |  |  |  |  |  |  |  |
| Charges for services | \$ | 6,560,789 | \$ | 940,051 | \$ | 2,592,770 | \$ | 10,093,610 |
| Miscellaneous |  | 18,770 |  | 9,808 |  | - |  | 28,578 |
| TOTAL OPERATING |  |  |  |  |  |  |  |  |
| REVENUES |  | 6,579,559 |  | 949,859 |  | 2,592,770 |  | 10,122,188 |
| OPERATING EXPENSES |  |  |  |  |  |  |  |  |
| Operations |  | 6,103,954 |  | 896,238 |  | 2,138,578 |  | 9,138,770 |
| Depreciation |  | 1,262,705 |  | 93,340 |  | 297,992 |  | 1,654,037 |
| TOTAL OPERATING - |  |  |  |  |  |  |  |  |
| EXPENSES |  | 7,366,659 |  | 989,578 |  | 2,436,570 |  | 10,792,807 |
| OPERATING INCOME (LOSS) |  | $(787,100)$ |  | $(39,719)$ |  | 156,200 |  | $(670,619)$ |
| NONOPERATING REVENUES (EXPENSES) |  |  |  |  |  |  |  |  |
| Earnings on investments |  | 3,267 |  | 1,195 |  | 1,137 |  | 5,599 |
| Tapping fees |  | 111,948 |  | - |  | - |  | 111,948 |
| Gain on sale of fixed assets |  | 9,700 |  |  |  | 2,000 |  | 11,700 |
| Interest expense |  | $(449,144)$ |  | - |  | $(354,795)$ |  | $(803,939)$ |
| Bond issuance costs |  | ( |  | - |  | $(110,119)$ |  | $(110,119)$ |
| Amortization |  | 35,126 |  | - |  | 62,477 |  | 97,603 |
| TOTAL NONOPERATING |  |  |  |  |  |  |  |  |
| REVENUES (EXPENSES) |  | $(289,103)$ |  | 1,195 |  | $(399,300)$ |  | $(687,208)$ |
| LOSS BEFORE <br> INTERFUND TRANSFERS |  | $(1,076,203)$ |  | $(38,524)$ |  | $(243,100)$ |  | $(1,357,827)$ |
| INTERFUND TRANSFERS |  |  |  |  |  |  |  |  |
| Transfers in |  | 2,427,005 |  | 200,000 |  | 950,000 |  | 3,577,005 |
| Transfers out |  | $(2,677,001)$ |  | $(228,512)$ |  | - |  | (2,905,513) |
| TOTAL INTERFUND TRANSFERS |  | $(249,996)$ |  | $(28,512)$ |  | 950,000 |  | 671,492 |
| CHANGE IN NET POSITION |  | $(1,326,199)$ |  | $(67,036)$ |  | 706,900 |  | $(686,335)$ |
| NET POSITION AT BEGINNING OF |  |  |  |  |  |  |  |  |
| YEAR |  | 3,454,955 |  | 966,454 |  | 12,794 |  | 4,434,203 |
| NET POSITION AT END OF YEAR | \$ | 2,128,756 | \$ | 899,418 | \$ | 719,694 | \$ | 3,747,868 |

See accompanying notes to the basic financial statements.

# TOWNSHIP OF LOWER MAKEFIELD <br> FINANCIAL STATEMENTS AND SUPPLEMENTARY INFORMATION 

Year Ended December 31, 2019

|  |  | Sewer Fund |  | Community Pool Fund |  | Golf Course Fund |  | Total |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| ASSETS |  |  |  |  |  |  |  |  |
| CURRENT ASSETS |  |  |  |  |  |  |  |  |
| Cash and cash equivalents | \$ | - | \$ | 42,459 | \$ | 275,477 | \$ | 317,936 |
| Accounts receivable, net |  | 2,373,744 |  | - |  | 14,069 |  | 2,387,813 |
| Due from other funds |  | 1,019 |  |  |  | 103,999 |  | 105,018 |
| Inventory |  | - |  | - |  | 110,585 |  | 110,585 |
| Prepaid expenses |  | - - |  | - |  | 36,858 |  | 36,858 |
| TOTAL CURRENT ASSETS |  | 2,374,763 |  | 42,459 |  | 540,988 |  | 2,958,210 |
| CAPITAL ASSETS, net |  | 17,592,071 |  | 869,675 |  | 14,814,457 |  | 33,276,203 |
| TOTAL ASSETS |  | 19,966,834 |  | 912,134 |  | 15,355,445 |  | 36,234,413 |
| DEFERRED OUTFLOWS OF RESOURCES |  |  |  |  |  |  |  |  |
| Deferred pension outflow |  | 7,457 |  | - |  | - |  | 7,457 |
| Deferred charges on refunding of bond |  | 65,514 |  | - |  | 42,902 |  | 108,416 |
| TOTAL DEFERRED OUTFLOWS of RESOURCES |  | 72,971 |  | - |  | 42,902 |  | 115,873 |
| LIABILITIES |  |  |  |  |  |  |  |  |
| CURRENT LIABILITIES |  |  |  |  |  |  |  |  |
| Accounts payable |  | 1,578,454 |  | 5,329 |  | 19,412 |  | 1,603,195 |
| Accrued expenses |  | 1,459,473 |  | 5,356 |  | 14,725 |  | 1,479,554 |
| Unearned revenue |  | 86,416 |  | - |  | 319,639 |  | 406,055 |
| Current portion of long-term debt |  | 720,100 |  | - - |  | 645,000 |  | 1,365,100 |
| TOTAL CURRENT LIABILITIES |  | 3,844,443 |  | 10,685 |  | 998,776 |  | 4,853,904 |
| LONG-TERM LIABILITIES |  |  |  |  |  |  |  |  |
| Net pension liability |  | 353,663 |  | - |  | - |  | 353,663 |
| Compensated absences |  | 11,707 |  | 5,776 |  | - |  | 17,483 |
| Bonds and notes payable |  | 12,774,166 |  | - |  | 13,294,624 |  | 26,068,790 |
| TOTAL LONG-TERM LIABILITIES |  | 13,139,536 |  | 5,776 |  | 13,294,624 |  | 26,439,936 |
| DEFERRED INFLOWS OF RESOURCES <br> Deferred pension inflow |  | 24,681 |  | - |  | - |  | 24,681 |
| NET POSITION |  |  |  |  |  |  |  |  |
| Net investment in capital assets |  | 4,097,805 |  | 869,675 |  | 874,833 |  | 5,842,313 |
| Unrestricted |  | $(1,066,660)$ |  | 25,998 |  | 230,114 |  | $(810,548)$ |
| TOTAL NET POSITION | \$ | 3,031,145 | \$ | 895,673 | \$ | 1,104,947 | \$ | 5,031,765 |

See accompanying notes to the basic financial statements.

TOWNSHIP OF LOWER MAKEFIELD
STATEMENT OF REVENUES, EXPENSES AND
CHANGES IN NET POSITION
PROPRIETARY FUNDS
YEAR ENDED DECEMBER 31, 2019

|  |  | Sewer Fund |  | Community Pool Fund |  | Golf Course Fund |  | Total |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| OPERATING REVENUES |  |  |  |  |  |  |  |  |
| Charges for services | \$ | 8,241,312 | \$ | 946,369 | \$ | 3,011,167 | \$ | 12,198,848 |
| Miscellaneous |  | 45,119 |  | 10,768 |  | - |  | 55,887 |
| TOTAL OPERATING - |  |  |  |  |  |  |  |  |
| REVENUES |  | 8,286,431 |  | 957,137 |  | 3,011,167 |  | 12,254,735 |
| OPERATING EXPENSES |  |  |  |  |  |  |  |  |
| Operations |  | 5,732,389 |  | 905,525 |  | 2,423,423 |  | 9,061,337 |
| Depreciation |  | 1,297,902 |  | 103,296 |  | 302,272 |  | 1,703,470 |
| TOTAL OPERATING - - - |  |  |  |  |  |  |  |  |
| EXPENSES |  | 7,030,291 |  | 1,008,821 |  | 2,725,695 |  | 10,764,807 |
| OPERATING INCOME (LOSS) |  | 1,256,140 |  | $(51,684)$ |  | 285,472 |  | 1,489,928 |
| NONOPERATING REVENUES (EXPENSES) |  |  |  |  |  |  |  |  |
| Earnings on investments |  | 4,673 |  | 1,429 |  | 1,402 |  | 7,504 |
| Tapping fees |  | 201,524 |  | , |  | 1, |  | 201,524 |
| Interest expense |  | $(415,823)$ |  | - |  | $(434,811)$ |  | $(850,634)$ |
| Amortization |  | 35,126 |  | - |  | 85,064 |  | 120,190 |
| TOTAL NONOPERATING $\quad \square$ |  |  |  |  |  |  |  |  |
| REVENUES (EXPENSES) |  | $(174,500)$ |  | 1,429 |  | $(348,345)$ |  | $(521,416)$ |
| INCOME (LOSS) BEFORE |  |  |  |  |  |  |  |  |
| INTERFUND TRANSFERS |  | 1,081,640 |  | $(50,255)$ |  | $(62,873)$ |  | 968,512 |
| INTERFUND TRANSFERS |  |  |  |  |  |  |  |  |
| Transfers in |  | 476,081 |  | 467,185 |  | 448,126 |  | 1,391,392 |
| Transfers out |  | $(655,332)$ |  | $(420,675)$ |  | , |  | $(1,076,007)$ |
| TOTAL INTERFUND TRANSFERS |  | $(179,251)$ |  | 46,510 |  | 448,126 |  | 315,385 |
| CHANGE IN NET POSITION |  | 902,389 |  | $(3,745)$ |  | 385,253 |  | 1,283,897 |
| NET POSITION AT BEGINNING OF |  |  |  |  |  |  |  |  |
| YEAR |  | 2,128,756 |  | 899,418 |  | 719,694 |  | 3,747,868 |
| NET POSITION AT END OF YEAR |  |  |  |  |  |  |  |  |
| OF YEAR | \$ | 3,031,145 | \$ | 895,673 | \$ | 1,104,947 | \$ | 5,031,765 |

See accompanying notes to the basic financial statements.

## ENGINEERS ASSESSMENT STUDY

for the

# SALE OF LOWER MAKEFIELD TOWNSHIP SANITARY SEWER SYSTEM 

Lower Makefield Township
Bucks County, Pennsylvania
Prepared For
Lower Makefield Township
1100 Edgewood Road Yardley, PA 19067

And
Aqua Pennsylvania Wastewater, Inc.
762 West Lancaster Avenue
Bryn Mawr, PA 19010


Prepared By
弱bert Ensineering, Inc.
Water and Wastewater Engineering
P.O. Box 540

4397 Skippack Pike
Skippack, PA 19474
EE, INC. PROJECT NO. 068-064
February 22, 2021
Revised March 22, 2021

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III. System Description. ..... 2
IV. Historical Growth ..... 4

| Appendix I | Analysis of Original Cost of Assets |
| :--- | :--- |
| Appendix II | Unit Price |
| Appendix III | Cost Estimates for Pump Stations and Meter Pits |
| Appendix IV | Project Development Summary |
| Appendix V | Lower Makefield Township System Map |

## LOWER MAKEFIELD TOWNSHIP SANITARY SEWER SYSTEM ENGINEERS ASSESSMENT STUDY

## I．Executive Summary

In October 2020，Ebert Engineering Inc．was authorized by Lower Makefield Township and Aqua Pennsylvania Wastewater，Inc．to prepare an Act 12 of 2016 Engineers Assessment Study for the purchase of the Lower Makefield Township＇s Wastewater System Assets by Aqua Pennsylvania Wastewater，Inc．The assessment of tangible assets of the facilities and equipment to be purchased，was prepared following the guideline of Pennsylvania Act 12 of 2016，amended Chapter 13 of the Pennsylvania Public Utility Code and the Final Implementation Order entered by Public Utility Commission at Docket No．M－2016－2543193（＂Act 12＂）by adding section 1329 Valuation of acquired water and wastewater system．Information for this assessment and to prepare the report was derived from various sources including，but not limited to，system maps，site visit，discussions from Township staff and engineer（s），Township asset listing，contracts，institutional escrow payment statements and other sources to provide an inventory and listing．A complete list of the assets， organized by National Association of Regulatory Utility Commissions（NARUC） system of accounts，showing the original cost and year of installation is included in Appendix I of this report．This assessment will be used by the Utility Valuation Experts（UVEs）retained by both the seller（Lower Makefield Township）and buyer （Aqua Pennsylvania Wastewater，Inc．）．

## II．Methodology

The purpose of this report is to＂conduct an assessment of tangible assets of the selling utility＂．Ebert Engineering Inc．obtained and reviewed Township records such as PA DEP and PA DER Water Quality Management permits，developer agreements， escrow amounts，and contracts that were utilized to construct the sanitary sewer system．A summary of assets has been developed，which includes used and useful utility system assets and any system held for future use that is to be part of the asset sale．The assets were categorized by NARUC system of accounts for Class A wastewater systems．A list of the Township＇s wastewater assets is contained in Appendix I Analysis of Original Costs of Assets in Service．The Township has no property held for future use．

The original cost of assets was found through research of the aforementioned documents（escrows，contracts，WQM permits，etc．）．When information was inadequate to find the original cost，a current evaluation was made．This current evaluation is a cost estimate of the specific sewer element based on current prices． The current evaluation is then indexed back to its original cost using the Engineering News－Record（ENR）construction cost indices．The unit prices for these current
evaluations can be found in Appendix II. The current evaluation of pump stations and meter pits can be found in Appendix III. For a majority of the sewer elements listed in this report, their original documents could not be found and the only source of information came from the institutional knowledge of the Township staff.

Sanitary sewer pipes with missing original documents had their age, size, and material estimated with the help of the Township staff's institutional knowledge. Specifically, the sanitary gravity pipe material was assumed to be vitrified clay if the pipe was constructed before 1980. After 1980, the sanitary gravity pipe material was assumed to be SDR-35. Pump station force mains with missing original documents were also assumed to be made of ductile iron pipe. Sanitary laterals were assumed to be 25 feet long and made of SDR-35. More information on the lateral assumptions can be found in Appendix II.

Each asset has been indexed (e.g. 1.1 or 9.999) that corresponds to a map of the Lower Makefield sanitary sewer collection system found in Appendix V. The map contains all sewer elements as well as the developments names for specific sanitary sewer collection areas.

Appendix IV lists projects that are in various states of approval or construction. The projects that are included in this assessment are listed below:

- Erin Development
- Regency at Yardley
- Towering Oaks at Yardley
- Reserve at Yardley
- Scammel's Corner
- Flowers Field at Edgewood
- Estates at Sandy Run
- Caddis Healthcare Real Estate Senior Living Facility
- Artis Senior Living Facility
- Brookshire III


## III.System Description

A large portion of the developed areas within Lower Makefield Township are served by the public sanitary sewage collection system constructed in 1966. This system has subsequently been expanded as the Township has developed and the system now contains 14 pump stations, force mains, gravity sewer, low pressure collection systems, and 8 wastewater metering chambers.

The collected wastewater ultimately is treated at two different treatment plants located in the Borough of Morrisville and the City of Philadelphia. Lower Makefield also utilizes the conveyance facilities of authorities to transport its wastewater for treatment. These include the Borough of Yardley, the Bucks County Water and Sewer Authority, Middletown Township, and the Township of Falls Authority. The following paragraphs will identify each drainage basin in Lower Makefield Township and describe how the sanitary sewer collection subsystem operates, identify ownership of the sanitary sewer elements, and the ultimate disposal of the wastewater.

The collection subsystem located in the Buck Creek drainage basin and the major portion of the Brock Creek basin discharge flows into the sewage facilities of the Borough of Yardley. These flows are then pumped back into the Township system via Yardley's Pumping Station, and then flow by gravity to Morrisville for treatment by way of the Pennsylvania Canal Interceptor. The flows from the newer developments in the lower portion of the Brock Creek basin are discharged to the Heacock Road Pumping Station. These wastewater flows are pumped to a connection point on the existing Pennsylvania Canal Interceptor at Black Rock Road, which conveys these flows via gravity to the Morrisville Wastewater Treatment Plant.
The entire Silver Lake collection subsystem discharges flow to the Silver Lake Pumping Station constructed on the Yardley Borough boundary. The flow is then pumped to the Pennsylvania Canal Interceptor for treatment at Morrisville.

A portion of the sewers in the Rock Run basin are owned and operated by the Township of Falls Authority. The area containing these sewers is referred to as the "Falls Township Service Area". This area was not included in the assessment.

Township of Falls has also agreed to accept the flow originating in sewers located in the area known as "Falls Township Contract Area". However, sewer facilities within the Contract Area are both owned and operated by Lower Makefield Township.

The flows from developments in the Mill Creek basin are conveyed via gravity to the Middletown Interceptor (Yerkes Line). These consist mostly of residential subdivisions in the vicinity of Oxford Valley Road and Big Oak Road, and include commercial developments at the southeast corner of these roads. Flows from most of those developments are pumped to the Middletown Interceptor via the Yardley Oaks Pumping Station.

## IV. Historical Growth

The majority of the current sewer system for Lower Makefield Township was built in 1966. There were some developments and their corresponding sewer systems built in the 1950 's but most of the gravity lines and the gravity interceptors were built in 1966. The table below shows the growth of the sanitary sewer system over the decades.

| Decade | Number of New <br> Developments | Number of New <br> Pump Stations | Number of New <br> Interceptors |
| :---: | :---: | :---: | :---: |
| $1950-1960$ | 11 | - | - |
| $1960-1970$ | 17 | 3 | - |
| $1970-1980$ | 11 | 2 | 6 |
| $1980-1990$ | 24 | 5 | - |
| $1990-2000$ | 33 | 2 | 1 |
| $2000-2010$ | 23 | 2 | - |
| $2010-2020$ | 6 | - | - |

During the early 1960's when Lower Makefield Township was rapidly expanding their sanitary sewer system, the Falls Township Wastewater Treatment Plant (WWTP) was anticipated to be constructed and was planned to serve areas of the Lower Makefield Township and adjacent to Fairless Hills. Ultimately, the Falls Township WWTP was never constructed. The Morrisville WWTP was also to serve portions of the Lower Makefield Township (watersheds discharging toward the Delaware River). Between the 1960's and 1970's, the Morrisville WWTP was expanded and began accepting wastewater from portions of Lower Makefield Township and Yardley Borough.

In the 1970's it was still proposed that the Falls Township WWTP would serve additional areas in the Lower Makefield Township. Flows in excess of the plant's capacity would be diverted to the Bristol Township Sewage Treatment plant by a proposed extension to the then existing Neshaminy Interceptor.

From 1970 to 1980, significant sewer expansion occurred as a result of increased development in Lower Makefield Township. The Core Creek Branch of the Neshaminy Interceptor was completed, and the Morrisville WWTP was expanded and upgraded. It was proposed that the Morrisville WWTP begin serving additional areas in Lower Makefield Township, as well as part of the Upper Makefield Township by 1980. After 1980, the Morrisville WWTP would serve the remaining portions of the Lower Makefield Township within the watersheds discharging towards the Delaware River.

From 1980 to 1990, a majority of the pump stations were constructed: Heacock Road Pumping Station, Maplevale PS, Oxford Glen/Yardley Oaks PS, Sherwood PS, and Silver Lakes PS. Additional capacity/upgrades were purchased from the Morrisville WWTP to keep up with increasing number of developments.

From 1990 to 2000, the Township increased development at rates higher than anticipated. The Morrisville WWTP was near its capacity and as a result the Heacock Road Pumping Station was temporarily pumping wastewater from the Lower Makefield portion of the Brock Creek basin to the Bucks County Water and Sewer Authority Core Creek Interceptor. Once the Morrisville WWTP expansions were completed, the WWTP was re-rated from 7.1 MGD to 8.7 MGD and these flows were diverted back to the Morrisville WWTP.

From 2000 to current day, all the wastewater generated in the Township is conveyed to treatment plants located outside the Township: the Morrisville WWTP and the City of Philadelphia Northeast Water Pollution Control Plant.

## APPENDIX I ANALYSIS OF ORIGINAL COST OF ASSETS IN SERVICE

| LOWER MAKEFIELD TOWNSHIP, BUCKS COUNTY, PA ORIGINAL COST OF WASTEWATER COLLECTION SYSTEM As of March 22, 2021 |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: |
| Acct. No. | DESCRIPTION |  | ORIGINAL COST |  |
| 353.20 | Depreciable System Land and Right-of-Ways | Subtotal | \$ | $\begin{aligned} & 646.00 \\ & 646.00 \end{aligned}$ |
| 354.20 | Depreciable System <br> Pump Station Structures and Improvements |  | \$ | $2213,536.78$ |
| 354.40 | Structures and Improvements - Treatment and Disposal Facilities |  | \$ | 2,186,739.00 |
| 355.20 | Pump Station Power Generation Equipment |  | \$ | 292,281.69 |
| 356.20 | Pump Station Power Protection and Control Devises |  | \$ | 506,720.07 |
| 359.20 | Collection Sewers - Low Pressure |  | \$ | 354,372.85 |
| 360.20 | Pump Station Force Mains |  | \$ | 837,435.81 |
| 361.20 | Collection Sewers - Gravity |  | \$ | 22,142,440.90 |
| 363.20 | Services to Customers - Laterals |  | \$ | 2,286,076.98 |
| 363.20 | Services to Customers - Flow Meters |  | \$ | 308,281.03 |
| 371.20 | Pump Station Pumping Equipment |  | \$ | 875,393.07 |
|  |  | Subtotal | \$ | 32,003,278.18 |
|  |  | TOTAL | \$ | 32,003,924.18 |









| LOWER MAKEFIELD TOWNSHIP, BUCKS COUNTY, PA ORIGINAL COST OF WASTEWATER COLLECTION SYSTEM As of March 22, 2021 <br> Account 354.40 |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| Acct. No. | Index No. | DESCRIPTION | YEAR | ORIGINAL COST |  |
| 354.40 |  | Structures and Improvements - Treatment and Disposal Facilities Contributions to Morrisvile to Purchase Treatment Capacity/Capacity Increases | 1966 1975 1976 1977 1978 1983 1984 1985 1986 1987 1988 1991 | $\$$ <br> $\$$ <br> $\$$ <br> $\$$ <br> $\$$ <br> $\$$ <br> $\$$ | $\begin{array}{r} 314,714.00 \\ 42,463.00 \\ 382,282.00 \\ 65,871.00 \\ 10,421.00 \\ 2,306.00 \\ 15,150.00 \\ 49,580.00 \\ 69,196.00 \\ 72,339.00 \\ 138,781.00 \\ 757,000.00 \\ 200,636.00 \\ 66,000.00 \end{array}$ |
| Total Account 354.40 Structures and Improvements |  |  |  | \$ | 2,186,739.00 |


| LOWER MAKEFIELD TOWNSHIP, BUCKS COUNTY, PA ORIGINAL COST OF WASTEWATER COLLECTION SYSTEM As of March 22, 2021 <br> Account 355.20 |  |  |  |  |  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| $\begin{array}{\|c\|} \hline \text { Acct. No. } \\ \hline 355.20 \\ \hline \end{array}$ | Index No. | description | Year built | Quantity | UNITS | UNIT PRICE |  | CURRENT EVALUATION | 2020 COST INDEX | $\begin{gathered} \text { OLD } \\ \text { Costindex } \end{gathered}$ |  | NAL COST |
|  | 1.0 | Pump Station Power Generation Equipment |  |  |  |  |  |  |  |  |  |  |
|  | 1.1 | Black Rock Road Pumping Station 45 KW Generator and Pad | 1964 | 1 | LS | $\begin{gathered} \$ 75,000.00 \\ \text { Subtotal } \end{gathered}$ |  | $\begin{aligned} & 75,000.00 \\ & 75,000.00 \end{aligned}$ | 11392 | $\begin{gathered} 936 \\ \text { Subtotal } \end{gathered}$ | \$ | $\begin{aligned} & 6,162.22 \\ & 6,162.22 \end{aligned}$ |
|  | 1.2 | Chanticleer Pump Station Portable Generator | 1965 | 1 | LS | \$ 24.500 .00 |  | $\begin{aligned} & 24,500.00 \\ & 24,500.00 \end{aligned}$ | 11392 | $\begin{aligned} & 971 \\ & \text { Subtotal } \end{aligned}$ | \$ | 2,088.26 2,088.26 |
|  | 1.3 | Clearview Pump Station 150 KW Generator | 1965 | 1 | Ls | \$ 125.000 .00 |  | 125,000.00 125,000.00 | 11392 | $\begin{gathered} 971 \\ \text { Subtotal } \end{gathered}$ | \$ | 10,654.4 10,654.41 |
|  | 1.4 | Farmview Pump Station 60 KW Generator | 1978 | 1 | LS | \$ 65.000 .00 |  | $65,000.00$ $65,000.00$ | 11392 | $\begin{gathered} 2776 \\ \text { Subtota } \end{gathered}$ | \$ | $15,839.19$ $15,839.19$ |
|  | 1.5 | Fox Hill Pump Station 75 KW Generator | 1978 | 1 | LS | \$ 85.000 .00 |  | 85,000.00 85,000.00 | 11392 | 2776 Subtota | \$ | $\begin{aligned} & 20,712.78 \\ & 20,712.78 \end{aligned}$ |
|  | 1.6 | Heacock Road Pump Station* | 1980 | * | * | Subtotal |  | * | * | Subtotal |  | * |
|  | 1.7 | Maplevale Pump Station Portable Generator | 1985 | 1 | LS | $\begin{aligned} & \$ \begin{array}{c} 24,500.00 \\ \text { Subtotal } \end{array} \end{aligned}$ |  | $\begin{aligned} & 24,500.00 \\ & 24,500.00 \end{aligned}$ | 11392 | $\begin{gathered} 4182 \\ \text { Subtota } \end{gathered}$ | \$ | 8,993.94 8,993.94 |
|  | 1.8 | Oxford Glen / Yardley Oaks Pump Station 80 KW Generator | 1985 | 1 | LS | \$ $92,500.00$ |  | $92,500.00$ $92,500.00$ | 11392 | $4182$ Subtotal | \$ | $33,956.72$ $33,956.72$ |
|  | 1.9 | Sherwood Park Pump Station 45 KW Generator and Pad | 1987 | 1 | LS | \$ 75.000 .00 |  | $\begin{aligned} & 75,000.00 \\ & 75,000.00 \end{aligned}$ | 11392 | 4406 Subtotal | \$ | $\begin{aligned} & 29,007.20 \\ & 29,007.20 \end{aligned}$ |
|  | 1.10 | Silver Lake Pumping Station 80 KW Generator and Pad | 1988 | 1 | LS | \$ $92,500.00$ |  | $92,500.00$ $92,500.00$ | 11392 | $4519$ Subtotal | \$ | $36,693.07$ $36,693.07$ |
|  | 1.11 | Stackhouse Drive Pump Station** <br> 51 KW Generator and Pad | 2021 | 1 | LS | $\begin{array}{\|c} \$ \begin{array}{c} 23,500.00 \\ \text { Subtotal } \end{array} \\ \hline \end{array}$ |  | $\begin{array}{r} 23,500.00 \\ 23,500.00 \\ \hline \end{array}$ | ** | Subtotal | \$ | $\begin{aligned} & 23,500.00 \\ & 23,500.00 \end{aligned}$ |


**Original escrow was used to find original cost **Pump station power generation equipment costs were based off cost estimates listed in Appendix III


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| LOWER MAKEFIELD TOWNSHIP, BUCKS COUNTY, PA ORIGINAL COST OF WASTEWATER COLLECTION SYSTEM As of March 22, 2021 <br> Account 359.20 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Acct. No. | Index No. | DESCRIPTION | LENGTH <br> (FT) | DIAMETER <br> (IN) | PIPE MATERIAL | manholes | $\begin{gathered} \text { IN ROAD I } \\ \text { OUT OF ROAD } \end{gathered}$ | YEAR | COST OF PIPE | COST OF MANHOLES | $\begin{array}{\|c\|} \hline \text { CURRENT } \\ \text { EVALUATION } \end{array}$ | 2020 COST INDEX | $\begin{array}{\|c\|} \hline \text { OLD COST } \\ \text { INDEX } \\ \hline \end{array}$ | ORIGINAL COST |
| 359.20 | 3.0 | Collection Sewers - Low Pressure |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 3.1 | St. Ignatius** Low Pressure |  |  |  |  | 3 | 2016 |  |  |  |  |  | \$ 150,367.20 |
|  | 3.1 | St. Ignatius* - Low Pressure | 1,155 | 2 | SDR-21 | 1 |  |  |  |  | ** | , | . | (Included above) |
|  | 3.2 | Brookshire - Low Pressure | 2,340 | 2 | SDR-21 | 10 | Out of Road | 2011 | 63.00 | 4,500.00 | \$ 192,420.00 | 11392 | 9070 | \$ 153,199.56 |
|  | 3.3 | Caddis Senior Living Facility | 87 | 1.5 | SDR-21 | 1 | In Road | 2019 | \$ 120.00 | 4,500.00 | \$ 14,940.00 | 11392 | 11281 | 14,794.43 |
|  | 3.3 | Caddis Senior Living Facility | 627 | 1.5 | SDR-21 | 0 | Out of Road | 2019 | 58.00 | 4,500.00 | \$ 36,366.00 | 11392 | 11281 | \$ 36,011.66 |
|  |  |  |  |  |  |  |  |  |  | Total Account 359.20 Collection Sewers - Pressure \$ $354,372.85$ |  |  |  |  |



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| 361.20 | 5.125 | Loberg Estates | 2,020 | 8 | SDR-35 | 11 | Out of Road | 2003 | \$ | 47.00 | \$ | 4,500.00 | \$ | 144,440.00 | 11392 | 6695 | \$ | 84,886.39 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | 5.125 | Loberg Estates | 50 | 8 | SDR-35 | 1 | In Road | 2003 | \$ | 130.00 | \$ | 4,500.00 | \$ | 11,000.00 | 11392 | 6695 | \$ | 6,464.62 |
|  | 5.126 | Trolio Tract | 710 | 8 | SDR-35 | 4 | Out of Road | 2011 | \$ | 47.00 | \$ | 4,500.00 | \$ | 51,370.00 | 11392 | 9070 |  | 40,899.39 |
|  | 5.127 | Brookshire | 600 | 8 | SDR-35 | 11 | Out of Road | 2011 | \$ | 47.00 | \$ | 4,500.00 | \$ | 77,700.00 | 11392 | 9070 | \$ | 61,862.62 |
|  | 5.128 | Stackhouse Drive Pump Station* | 433 | 8 | SDR-26 | 2 |  | 2021 |  |  |  |  | \$ | 81,280.00 |  |  | \$ | 81,280.00 |
|  |  | Collection Sewers - Gravity Interceptors |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 5.129 | Buck Creek Trunk | 2,383 | 10 | CIP | 8 | Out of Road | 1966 | \$ | 197.00 | \$ | 4,500.00 | \$ | 505,451.00 | 11392 | 1019 | \$ | 45,211.95 |
|  | 5.129 | Buck Creek Trunk | 974 | 10 | VCP | 4 | Out of Road | 1966 | \$ | 62.00 | \$ | 4,500.00 | \$ | 78,388.00 | 11392 | 1019 | \$ | 7,011.71 |
|  | 5.129 | Buck Creek Trunk | 164 | 10 | VCP | 3 | In Road | 1966 | \$ | 145.00 | \$ | 4,500.00 | \$ | 37,280.00 | 11392 | 1019 | \$ | 3,334.65 |
|  | 5.129 | Buck Creek Trunk | 7,918 | 12 | VCP | 29 | Out of Road | 1966 | \$ | 70.00 | \$ | 4,500.00 | \$ | 684,760.00 | 11392 | 1019 | \$ | 61,250.92 |
|  | 5.130 | Rock Run | 1,120 | 10 | VCP | 4 | Out of Road | 1966 | \$ | 62.00 | \$ | 4,500.00 | \$ | 87,440.00 | 11392 | 1019 | \$ | 7,821.40 |
|  | 5.130 | Rock Run - Owned by Falls Township | 2,159 | 10 | VCP | 8 | Out of Road | 1966 |  |  |  |  |  |  |  |  |  |  |
|  | 5.130 | Rock Run - Owned by Falls Township | 274 | 12 | VCP | 2 | Out of Road | 1966 |  |  |  |  |  |  |  |  |  |  |
|  | 5.131 | Canal Interceptor | 4,020 | 27 | RCP | 21 | Out of Road | 1992 | \$ | 110.00 | \$ | 4,500.00 | \$ | 536,700.00 | 11392 | 4985 | \$ | 234,853.36 |
|  | 5.131 | Canal Interceptor | 11,754 | 30 | RCP | 33 | Out of Road | 1992 | \$ | 122.00 | \$ | 4,500.00 | \$ | 1,582,488.00 | 11392 | 4985 | \$ | 692,477.41 |
|  | 5.132 | Core Creek Interceptor | 5,440 | 15 | SDR-35 | 49 | Out of Road | 1992 | \$ | 177.00 | \$ | 4,500.00 | \$ | 1,183,380.00 | 11392 | 4985 | \$ | 517,832.63 |
|  | 5.132 | Core Creek Interceptor | 875 | 15 | SDR-35 | 3 | In Road | 1992 | \$ | 177.00 | \$ | 4,500.00 | \$ | 168,375.00 | 11392 | 4985 | \$ | 73,678.84 |
|  | 5.133 | Silver Lake Trunk | 1,367 | 12 | VCP | 9 | Out of Road | 1966 | \$ | 70.00 | \$ | 4,500.00 | \$ | 136,190.00 | 11392 | 1019 | \$ | 12,182.02 |
|  | 5.133 | Silver Lake Trunk | 1,550 | 12 | VCP | 9 | Out of Road | 1966 | \$ | 70.00 | \$ | 4,500.00 | \$ | 149,000.00 | 11392 | 1019 | \$ | 13,327.86 |
|  | 5.134 | Yardley Road Trunk | 2,198 | 10 | VCP | 9 | Out of Road | 1966 | \$ | 62.00 | \$ | 4,500.00 | \$ | 176,776.00 | 11392 | 1019 | \$ | 15,812.39 |
|  | 5.134 | Yardley Road Trunk | 1,019 | 10 | VCP | 4 | In Road | 1966 | \$ | 145.00 | \$ | 4,500.00 | \$ | 165,755.00 | 11392 | 1019 | \$ | 14,826.58 |
|  | 5.135 | Black Rock Road Trunk | 3,541 | 12 | VCP | 9 | Out of Road | 1966 | \$ | 70.00 | \$ | 4,500.00 | \$ | 288,370.00 | 11392 | 1019 | \$ | 25,794.33 |
|  | 5.135 | Black Rock Road Trunk | 836 | 12 | VCP | 4 | In Road | 1966 | \$ | 151.00 | \$ | 4,500.00 | \$ | 144,236.00 | 11392 | 1019 | \$ | 12,901.73 |
|  | 5.136 | Taylorsville Trunk | 2,061 | 10 | VCP | 7 | In Road | 1966 | \$ | 145.00 | \$ | 4,500.00 | \$ | 330,345.00 | 11392 | 1019 | \$ | 29,548.94 |
|  | 5.136 | Taylorsville Trunk | 2,479 | 12 | VCP | 7 | In Road | 1966 | \$ | 151.00 | - | 4,500.00 | \$ | 405,829.00 | 11392 | 1019 | \$ | 36,300.89 |
| Total Account 361.20 Collection Sewers - Gravity \$ 22,142,440.90 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |


| LOWER MAKEFIELD TOWNSHIP, BUCKS COUNTY, PA ORIGINAL COST OF WASTEWATER COLLECTION SYSTEM As of March 22, 2021 <br> Account 363.20 |  |  |  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Acct. No. | Index No. | DESCRIPTION | COUNT | YEAR | LATERAL COST** | CURRENT EVALUATION | $\begin{aligned} & 2020 \text { COST } \\ & \text { INDEX } \end{aligned}$ | OLD COST INDEX | ORGINAL COST |  |
| 363.20 |  | Services to Customers - Laterals |  |  |  |  |  |  |  |  |
|  | 5.1 | Stafford Place | 9 | 1968 | \$ 750.00 | \$ 6,750.00 | 11392 | 1155 | \$ | 684.36 |
|  | 5.2 | Edgehill Gardens | 34 | 1988 | \$ 750.00 | \$ 25,500.00 | 11392 | 4519 | \$ | 10,115.39 |
|  | 5.3 | Makefield Terrace | 16 | 1968 | \$ 750.00 | \$ 12,000.00 | 11392 | 1155 | \$ | 1,216.64 |
|  | 5.4 | ERB Tract | 13 | 1997 | \$ 750.00 | \$ 9,750.00 | 11392 | 5826 | \$ | 4,986.26 |
|  | 5.5 | Oak Tree Farms - Owned by Falls Township | 14 | 1965 |  |  |  |  |  |  |
|  | 5.6 | Marlboro Manor - Owned by Falls Township | 14 | 1955 |  |  |  |  |  |  |
|  | 5.7 | Valleywood - Owned by Falls Township | 27 | 1965 |  |  |  |  |  |  |
|  | 5.8 | Makefield Village - Owned by Falls Township | 14 | 1955 |  |  |  |  |  |  |
|  | 5.9 | Woodlands (Stony Hill Estates) | 51 | 1995 | \$ 750.00 | \$ 38,250.00 | 11392 | 5471 | \$ | 18,369.54 |
|  | 5.10 | Rolling Green (Santosa Estates) | 27 | 2003 | \$ 750.00 | \$ 20,250.00 | 11392 | 6695 | \$ | 11,900.79 |
|  | 5.11 | Big Oak Woods | 124 | 1975 | \$ 750.00 | \$ 93,000.00 | 11392 | 2212 | \$ | 18,057.94 |
|  | 5.12 | Oxford Oaks Shopping Center | 6 | 2006 | \$ 750.00 | \$ 4,500.00 | 11392 | 7751 | \$ | 3,061.75 |
|  | 5.13 | Regency at Yardley | 65 | 2014 | \$ 750.00 | \$ 48,750.00 | 11392 | 9806 | \$ | 41,963.00 |
|  | 5.14 | Cornerstone | 17 | 1996 | \$ 750.00 | \$ 12,750.00 | 11392 | 5620 | \$ | 6,289.94 |
|  | 5.15 | Brookstone | 39 | 1995 | \$ 750.00 | \$ 29,250.00 | 11392 | 5471 | \$ | 14,047.29 |
|  | 5.16 | Palmer Farms | 174 | 1996 | \$ 750.00 | \$ 130,500.00 | 11392 | 5620 | \$ | 64,379.39 |
|  | 5.17 | Glenwood | 32 | 1950 | \$ 750.00 | \$ 24,000.00 | 11392 | 510 | \$ | 1,074.44 |
|  | 5.18 | West Acres | 43 | 1945 | \$ 750.00 | \$ 32,250.00 | 11392 | 308 | \$ | 871.93 |
|  | 5.19 | Parktown Estates | 96 | 1970 | \$ 750.00 | \$ 72,000.00 | 11392 | 1381 | \$ | 8,728.23 |
|  | 5.20 | River Glen | 135 | 1955 | \$ 750.00 | \$ 101,250.00 | 11392 | 660 | \$ | 5,865.96 |
|  | 5.21 | Black Rock | 2 | 1955 | \$ 750.00 | \$ 1,500.00 | 11392 | 660 | \$ | 86.90 |
|  | 5.22 | Bedford Place | 19 | 1955 | \$ 750.00 | \$ 14,250.00 | 11392 | 660 | \$ | 825.58 |
|  | 5.23 | Penn Valley Terrace | 120 | 1955 | \$ 750.00 | \$ 90,000.00 | 11392 | 660 | \$ | 5,214.19 |
|  | 5.24 | Rivergate | 44 | 1995 | \$ 750.00 | \$ 33,000.00 | 11392 | 5471 | \$ | 15,848.23 |
|  | 5.25 | Belmondo | 195 | 1966 | \$ 750.00 | \$ 146,250.00 | 11392 | 1019 | \$ | 13,081.88 |
|  | 5.26 | Makefield Chase | 59 | 1978 | \$ 750.00 | \$ 44,250.00 | 11392 | 2776 | \$ | 10,782.83 |
|  | 5.27 | Clearview Estates | 63 | 2002 | \$ 750.00 | \$ 47,250.00 | 11392 | 6538 | \$ | 27,117.32 |
|  | 5.28 | Longshore Estates | 58 | 1998 | \$ 750.00 | \$ 43,500.00 | 11392 | 5920 | \$ | 22,605.34 |
|  | 5.29 | Leedoms Field (Farmview III) | 23 | 1998 | \$ 750.00 | \$ 17,250.00 | 11392 | 5920 | \$ | 8,964.19 |
|  | 5.30 | Gatefield (Farmview VI) | 24 | 2000 | \$ 750.00 | \$ 18,000.00 | 11392 | 6221 | \$ | 9,829.53 |
|  | 5.31 | Kimbles field (Farmview V Phase I thru III) | 65 | 2000 | \$ 750.00 | \$ 48,750.00 | 11392 | 6221 | \$ | 26,621.64 |
|  | 5.32 | Pennsfield (Farmview IV Phase 1 thru III) | 81 | 1988 | \$ 750.00 | \$ 60,750.00 | 11392 | 4519 | \$ | 24,098.42 |
|  | 5.33 | Dolington Estates I Phase I thru IV | 106 | 2002 | \$ 750.00 | \$ 79,500.00 | 11392 | 6538 | \$ | 45,625.97 |
|  | 5.34 | Dolington Estates II | 44 | 2002 | \$ 750.00 | \$ 33,000.00 | 11392 | 6538 | \$ | 18,939.08 |
|  | 5.35 | Brookfield (Farmview II) | 82 | 1998 | \$ 750.00 | \$ 61,500.00 | 11392 | 5920 | \$ | 31,959.27 |
|  | 5.36 | Heather Ridge | 83 | 1995 | \$ 750.00 | \$ 62,250.00 | 11392 | 5471 | \$ | 29,895.52 |
|  | 5.37 | Yardley Run | 153 | 1995 | \$ 750.00 | \$ 114,750.00 | 11392 | 5471 | \$ | 55,108.61 |
|  | 5.38 | Lindenhurst | 50 | 2003 | \$ 750.00 | \$ 37,500.00 | 11392 | 6695 | \$ | 22,038.49 |




| LOWER MAKEFIELD TOWNSHIP, BUCKS COUNTY, PA ORIGINAL COST OF WASTEWATER COLLECTION SYSTEM As of March 22, 2021 <br> Account 363.20 |  |  |  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Acct. No. | Index No. | DESCRIPTION | YEAR BUILT | TYPE OF METER | TYPE OF FLUME | CURRENT EVALUATION | $\begin{aligned} & 2020 \text { COST } \\ & \text { INDEX } \\ & \hline \end{aligned}$ | $\begin{aligned} & \hline \text { OLD COST } \\ & \text { INDEX } \\ & \hline \end{aligned}$ |  | AL COST |
| 363.20 | $\begin{aligned} & 6.0 \\ & 6.1 \\ & 6.2 \\ & 6.3 \\ & 6.4 \\ & 6.5 \\ & 6.6 \\ & 6.7 \\ & 6.8 \end{aligned}$ | Services to Customers - Flow Meters <br> Belmondo Meter Pit <br> Buck Creek Meter <br> Delmorr Avenue Meter <br> Derbyshire Road Meter <br> East Ferry Road Meter <br> Main Street Meter <br> Sandy Run Meter Pit <br> Big Oak Road Meter | $\begin{aligned} & 1966 \\ & 1996 \\ & 1994 \\ & 1988 \\ & 1966 \\ & 1966 \\ & 1979 \\ & 2017 \end{aligned}$ | Control Electronics model PDS Control Electronics model PDS Control Electronics model PDS ISCO Signature Series Meter ISCO Signature Series Meter Control Electronics model PDS ISCO Signature Series Meter Control Electronics model PDS | 3" Parshall Flume <br> 6" Parshall Flume <br> 12" Parshall Flume <br> 10" Palmer Bowlus Flume <br> 12" Parshall Flume <br> 6" Parshall Flume <br> 6" Parshall Flume <br> 8" Round Pipe | $\$$ $65,000.00$ <br> $\$$ $105,000.00$ <br> $\$$ $225,000.00$ <br> $\$$ $165,000.00$ <br> $\$$ $225,000.00$ <br> $\$$ $105,000.00$ <br> $\$$ $105,000.00$ <br> $\$$ $22,500.00$ | 11392 11392 11392 11392 11392 11392 11392 11392 | 1019 <br> 5620 <br> 5408 <br> 4519 <br> 1019 <br> 1019 <br> 3003 <br> 10737 | \$ $\$$ $\$$ $\$$ $\$$ $\$$ $\$$ $\$$ | $5,814.17$ $51,799.51$ $106,811.80$ $65,452.51$ $20,125.97$ $9,392.12$ $27,678.63$ $21,206.33$ |
| Total Account 363.20 Services to Customers - Flow Meters \$ 308,281.03 |  |  |  |  |  |  |  |  |  |  |


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| Acct. No. | Index No. | description | Year bulit | Quantity | UNITS | UNIT PRICE | CURRENT EVALUATION | 2020 COST INDEX | $\begin{gathered} \text { OLD } \\ \text { CSTIINDEX } \end{gathered}$ | ORIGINAL COSt |
| 371.20 | 1.0 | Pump Station Pumping Equipment |  |  |  |  |  |  |  |  |
|  | 1.1 | Black Rock Road Pumping Station | 1964 |  |  |  |  |  |  |  |
|  |  | Pumps, 20 HP |  |  | LS | \$ 87,500.00 | 87,500.00 | 11392 | 936 | 7,189.26 |
|  |  | Controls |  | 1 | Ls | \$ 68,500.00 | \$ 68,500.00 | 11392 | 936 | 5,628.16 |
|  |  | Piping and Vaves (ry Welli) |  | 1 | Ls | \$ 78,500.00 | \$ 78,500.00 | 11392 | 936 | \$ 6,449.79 |
|  |  |  |  |  |  | Subtotal | \$ 234,500.00 |  | Subtotal | 19,267.21 |
|  | 1.2 | Chanticleer Pump Station | 1965 |  |  |  |  |  |  |  |
|  |  | Pumps, 3 HP and Controls |  | 1 | LS | \$ 27,500.00 | \$ 27,500.00 | 11392 | 971 | 2,343.97 |
|  |  | Piping and Vaves (Weiwell) |  |  | Ls | \$ $\begin{gathered}\text { 4,500.00 } \\ \text { Subtotal }\end{gathered}$ | \$\$ <br> $\$$ <br> 32,5000000 | 11392 | 971 Subtotal | $\begin{array}{lr}\text { \$ } & 388.56 \\ \$ & 2,727.53\end{array}$ |
|  |  |  |  |  |  |  |  |  |  |  |
|  | 1.3 | Clearview Pump Station Pumps, 20 HP and Controls | 1965 |  |  |  |  |  |  |  |
|  |  | Piping (Wetwell) |  | 1 | LS | \$ ${ }_{\text {\$ }}$ 8,500.00 | \$ 8 8,500.00 | 11392 | 971 | 14,966.17 724.50 |
|  |  | Vaut P Piping and Valves |  | 1 | Ls | \$ 17,000.00 | \$ 17,000.00 | 11392 | 971 | ${ }^{1,449900}$ |
|  |  |  |  |  |  | Subtotal | \$ 200,500.00 |  | Subtotal | \$ 17,089.67 |
|  | 1.4 | Farmview Pump Station | 1978 |  |  |  |  |  |  |  |
|  |  | Pumps, 15 HP and Controls |  |  |  | \$ 155,000.00 | \$ 155,000.00 | 11392 | 2776 | 37,770.37 |
|  |  | Piping (Wetwell) |  | 1 | Ls | \$ 8,500.00 | \$ 8,500.00 | 11392 | 2776 | 2,071.28 |
|  |  | Vaut Piping and Vaves |  | 1 | Ls | \$ 17,000.00 | \$ 17,000.00 | 11392 | 2776 | 4,142.56 |
|  |  |  |  |  |  | Subtotal | \$ 180,500.00 |  | Subtotal | 43,984.20 |


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## APPENDIX II

UNIT PRICE

## EE, Inc.

## LOWER MAKEFIELD TOWNSHIP, BUCKS COUNTY, PA <br> SANITARY SEWER SYSTEM <br> UNIT PRICES IN 2020 DOLLARS

| DESCRIPTION | UNIT |  | PRICE | QTY/SYSTEM UNIT |  | STEM |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Excavation, installation, and restoration for 8" diameter gravity sewer in roadways |  |  |  |  |  | 115.00 |
| Excavate Trench (8' deep) | CY | \$ | 6.48 | 1.481 | \$ | 9.60 |
| Crushed stone bedding | CY | \$ | 43.50 | 0.148 | \$ | 6.44 |
| Compact bedding | CY | \$ | 3.72 | 0.058 | \$ | 0.22 |
| Backfill trench w/2A stone | TN | \$ | 10.00 | 1.783 | \$ | 17.83 |
| Compact fill material | CY | \$ | 3.72 | 0.093 | \$ | 0.35 |
| Sawcut pavement for excavation | LF | \$ | 4.66 | 2.000 | \$ | 9.32 |
| Dispose of excess fill material | CY | \$ | 9.60 | 1.481 | \$ | 14.22 |
| Temp paving (5' wide) | SY | \$ | 10.25 | 0.556 | \$ | 5.70 |
| Temp paving hauling | CY | \$ | 9.60 | 0.031 | \$ | 0.30 |
| Pressure testing | LF | \$ | 3.75 | 1.000 | \$ | 3.75 |
| Televising | LF | \$ | 2.00 | 1.000 | \$ | 2.00 |
| Sawcut pavement for final restoration | LF | \$ | 4.66 | 2.000 | \$ | 9.32 |
| Excavate (7' W x 8.5" D x 1' L) | CY | \$ | 6.35 | 0.184 | \$ | 1.17 |
| Dispose of excess material | CY | \$ | 9.60 | 0.184 | \$ | 1.77 |
| Compact trench surfface | CY | \$ | 3.72 | 0.129 | \$ | 0.48 |
| 1.5" Wearing course (7' wide) | SY | \$ | 7.70 | 0.778 | \$ | 5.99 |
| 3 Cl Binder course ( 7 ' wide) | SY | \$ | 13.45 | 0.778 | \$ | 10.46 |
| 4" Base course (7' wide) | SY | \$ | 18.00 | 0.778 | \$ | 14.00 |
| Seal | SY | \$ | 3.01 | 0.111 | \$ | 0.33 |
| Hauling | CY | \$ | 9.60 | 0.184 | \$ | 1.77 |
| 8" VCP gravity main located in roadways |  |  |  |  | \$ | 140.00 |
| 8" VCP | LF | \$ | 25.00 | 1.000 | \$ | 25.00 |
| Excavation, installation, and restoration | LS | \$ | 115.00 | 1.000 | \$ | 115.00 |
| 8" PVC gravity main located in roadways |  |  |  |  | \$ | 130.00 |
| 8" SDR-35 PVC | LF | \$ | 15.00 | 1.000 | \$ | 15.00 |
| Excavation, installation, and restoration | LS | \$ | 115.00 | 1.000 | \$ | 115.00 |

## LOWER MAKEFIELD TOWNSHIP, BUCKS COUNTY, PA <br> SANITARY SEWER SYSTEM <br> UNIT PRICES IN 2020 DOLLARS

| DESCRIPTION | UNIT |  | PRICE | QTY/SYSTEM UNIT |  | TEM |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Excavation, installation, and restoration for 8" diameter gravity sewer out of roadways |  |  |  |  | \$ | 32.00 |
| Excavate Trench (8' deep) | CY | \$ | 6.48 | 1.481 | \$ | 9.60 |
| Crushed stone bedding | CY | \$ | 43.50 | 0.148 | \$ | 6.44 |
| Compact bedding | CY | \$ | 3.72 | 0.058 | \$ | 0.22 |
| Backfill trench w/suitable materials | CY | \$ | 3.03 | 1.321 | \$ | 4.00 |
| Compact fill material | CY | \$ | 3.72 | 0.093 | \$ | 0.35 |
| Dispose of excess fill material | CY | \$ | 9.60 | 0.160 | \$ | 1.54 |
| Pressure testing | LF | \$ | 3.75 | 1.000 | \$ | 3.75 |
| Televising | LF | \$ | 2.00 | 1.000 | \$ | 2.00 |
| Finish grading \& seeding | SY | \$ | 3.92 | 1.050 | \$ | 4.12 |
| 8" VCP gravity main located out of roadways |  |  |  |  | \$ | 57.00 |
| 8" VCP | LF | \$ | 25.00 | 1.000 | \$ | 25.00 |
| Excavation, installation, and restoration | LS | \$ | 32.00 | 1.000 | \$ | 32.00 |
| 8" PVC gravity main located out of roadways |  |  |  |  | \$ | 47.00 |
| 8" SDR-35 PVC | LF | \$ | 15.00 | 1.000 | \$ | 15.00 |
| Excavation, installation, and restoration | LS | \$ | 32.00 | 1.000 | \$ | 32.00 |

## LOWER MAKEFIELD TOWNSHIP, BUCKS COUNTY, PA <br> SANITARY SEWER SYSTEM <br> UNIT PRICES IN 2020 DOLLARS

| DESCRIPTION | UNIT |  | PRICE | QTY/SYSTEM UNIT |  | STEM |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Excavation, installation, and restoration for 10" diameter gravity sewer in roadways |  |  |  |  | \$ | 115.00 |
| Excavate Trench (8' deep) | CY | \$ | 6.48 | 1.481 | \$ | 9.60 |
| Crushed stone bedding | CY | \$ | 43.50 | 0.148 | \$ | 6.44 |
| Compact bedding | CY | \$ | 3.72 | 0.058 | \$ | 0.22 |
| Backfill trench w/2A stone | TN | \$ | 10.00 | 1.783 | \$ | 17.83 |
| Compact fill material | CY | \$ | 3.72 | 0.093 | \$ | 0.35 |
| Sawcut pavement for excavation | LF | \$ | 4.66 | 2.000 | \$ | 9.32 |
| Dispose of excess fill material | CY | \$ | 9.60 | 1.481 | \$ | 14.22 |
| Temp paving (5' wide) | SY | \$ | 10.25 | 0.556 | \$ | 5.70 |
| Temp paving hauling | CY | \$ | 9.60 | 0.031 | \$ | 0.30 |
| Pressure testing | LF | \$ | 3.75 | 1.000 | \$ | 3.75 |
| Televising | LF | \$ | 2.00 | 1.000 | \$ | 2.00 |
| Sawcut pavement for final restoration | LF | \$ | 4.66 | 2.000 | \$ | 9.32 |
| Excavate (7' W x 8.5" D x $1^{\prime} \mathrm{L}$ ) | CY | \$ | 6.35 | 0.184 | \$ | 1.17 |
| Dispose of excess material | CY | \$ | 9.60 | 0.184 | \$ | 1.77 |
| Compact trench surfface | CY | \$ | 3.72 | 0.129 | \$ | 0.48 |
| 1.5 " Wearing course (7' wide) | SY | \$ | 7.70 | 0.778 | \$ | 5.99 |
| 3 Cl Binder course (7' wide) | SY | \$ | 13.45 | 0.778 | \$ | 10.46 |
| 4" Base course (7' wide) | SY | \$ | 18.00 | 0.778 | \$ | 14.00 |
| Seal | SY | \$ | 3.01 | 0.111 | \$ | 0.33 |
| Hauling | CY | \$ | 9.60 | 0.184 | \$ | 1.77 |
| 10" VCP gravity main located in roadways |  |  |  |  | \$ | 145.00 |
| 10" VCP | LF | \$ | 30.00 | 1.000 | \$ | 30.00 |
| Excavation, installation, and restoration | LS | \$ | 115.00 | 1.000 | \$ | 115.00 |
| 10" CIP gravity main located in roadways |  |  |  |  | \$ | 280.00 |
| 10" CIP | LF | \$ | 165.00 | 1.000 | \$ | 165.00 |
| Excavation, installation, and restoration | LS | \$ | 115.00 | 1.000 | \$ | 115.00 |

## LOWER MAKEFIELD TOWNSHIP, BUCKS COUNTY, PA <br> SANITARY SEWER SYSTEM <br> UNIT PRICES IN 2020 DOLLARS

| DESCRIPTION | UNIT |  | PRICE | QTY/SYSTEM UNIT |  | STEM |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Excavation, installation, and restoration for 10" diameter gravity sewer out of roadways |  |  |  |  | \$ | 32.00 |
| Excavate Trench (8' deep) | CY | \$ | 6.48 | 1.481 | \$ | 9.60 |
| Crushed stone bedding | CY | \$ | 43.50 | 0.148 | \$ | 6.44 |
| Compact bedding | CY | \$ | 3.72 | 0.058 | \$ | 0.22 |
| Backfill trench w/suitable materials | CY | \$ | 3.03 | 1.321 | \$ | 4.00 |
| Compact fill material | CY | \$ | 3.72 | 0.093 | \$ | 0.35 |
| Dispose of excess fill material | CY | \$ | 9.60 | 0.160 | \$ | 1.54 |
| Pressure testing | LF | \$ | 3.75 | 1.000 | \$ | 3.75 |
| Televising | LF | \$ | 2.00 | 1.000 | \$ | 2.00 |
| Finish grading \& seeding | SY | \$ | 3.92 | 1.050 | \$ | 4.12 |
| 10" VCP gravity main located out of roadways |  |  |  |  | \$ | 62.00 |
| 10" VCP | LF | \$ | 30.00 | 1.000 | \$ | 30.00 |
| Excavation, installation, and restoration | LS | \$ | 32.00 | 1.000 | \$ | 32.00 |
| 10" CIP gravity main located out of roadways |  |  |  |  | \$ | 197.00 |
| 10" CIP | LF | \$ | 165.00 | 1.000 | \$ | 165.00 |
| Excavation, installation, and restoration | LS | \$ | 32.00 | 1.000 | \$ | 32.00 |

## LOWER MAKEFIELD TOWNSHIP, BUCKS COUNTY, PA <br> SANITARY SEWER SYSTEM <br> UNIT PRICES IN 2020 DOLLARS

| DESCRIPTION | UNIT |  | PRICE | QTY/SYSTEM UNIT |  | STEM |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Excavation, installation, and restoration for 12" diameter gravity sewer in roadways |  |  |  |  | \$ | 116.00 |
| Excavate Trench (8' deep) | CY | \$ | 6.48 | 1.481 | \$ | 9.60 |
| Crushed stone bedding | CY | \$ | 43.50 | 0.187 | \$ | 8.13 |
| Compact bedding | CY | \$ | 3.72 | 0.058 | \$ | 0.22 |
| Backfill trench w/2A stone | TN | \$ | 10.00 | 1.708 | \$ | 17.08 |
| Compact fill material | CY | \$ | 3.72 | 0.093 | \$ | 0.35 |
| Sawcut pavement for excavation | LF | \$ | 4.66 | 2.000 | \$ | 9.32 |
| Dispose of excess fill material | CY | \$ | 9.60 | 1.481 | \$ | 14.22 |
| Temp paving (5' wide) | SY | \$ | 10.25 | 0.556 | \$ | 5.70 |
| Temp paving hauling | CY | \$ | 9.60 | 0.031 | \$ | 0.30 |
| Pressure testing | LF | \$ | 3.75 | 1.000 | \$ | 3.75 |
| Televising | LF | \$ | 2.00 | 1.000 | \$ | 2.00 |
| Sawcut pavement for final restoration | LF | \$ | 4.66 | 2.000 | \$ | 9.32 |
| Excavate ( $7^{\prime} \mathrm{W} \times 8.5{ }^{\prime \prime} \mathrm{D} \times 1{ }^{\prime} \mathrm{L}$ ) | CY | \$ | 6.35 | 0.184 | \$ | 1.17 |
| Dispose of excess material | CY | \$ | 9.60 | 0.189 | \$ | 1.81 |
| Compact trench surfface | CY | \$ | 3.72 | 0.129 | \$ | 0.48 |
| 1.5 " Wearing course (7' wide) | SY | \$ | 7.70 | 0.778 | \$ | 5.99 |
| $3{ }^{\text {" }}$ Binder course ( 7 ' wide) | SY | \$ | 13.45 | 0.778 | \$ | 10.46 |
| 4" Base course (7' wide) | SY | \$ | 18.00 | 0.778 | \$ | 14.00 |
| Seal | SY | \$ | 3.01 | 0.111 | \$ | 0.33 |
| Hauling | CY | \$ | 9.60 | 0.184 | \$ | 1.77 |
| 12" VCP gravity main located in roadways |  |  |  |  | \$ | 151.00 |
| 12" VCP | LF | \$ | 35.00 | 1.000 | \$ | 35.00 |
| Excavation, installation, and restoration | LS | \$ | 116.00 | 1.000 | \$ | 116.00 |

## LOWER MAKEFIELD TOWNSHIP, BUCKS COUNTY, PA <br> SANITARY SEWER SYSTEM <br> UNIT PRICES IN 2020 DOLLARS

| DESCRIPTION | UNIT | UNIT PRICE |  | QTY/SYSTEM UNIT | PRICE SYSTEM |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Excavation, installation, and restoration for 12" diameter gravity sewer out of roadways |  |  |  |  | \$ | 35.00 |
| Excavate Trench (8' deep) | CY | \$ | 6.48 | 1.481 | \$ | 9.60 |
| Crushed stone bedding | CY | \$ | 43.50 | 0.187 | \$ | 8.13 |
| Compact bedding | CY | \$ | 3.72 | 0.058 | \$ | 0.22 |
| Backfill trench w/suitable materials | CY | \$ | 3.03 | 1.265 | \$ | 3.83 |
| Compact fill material | CY | \$ | 3.72 | 0.093 | \$ | 0.35 |
| Dispose of excess fill material | CY | \$ | 9.60 | 0.216 | \$ | 2.07 |
| Pressure testing | LF | \$ | 3.75 | 1.000 | \$ | 3.75 |
| Televising | LF | \$ | 2.00 | 1.000 | \$ | 2.00 |
| Finish grading \& seeding | SY | \$ | 3.92 | 1.288 | \$ | 5.05 |
| 12" VCP gravity main located out of roadways |  |  |  |  | \$ | 70.00 |
| 12" VCP | LF | \$ | 35.00 | 1.000 | \$ | 35.00 |
| Excavation, installation, and restoration | LS | \$ | 35.00 | 1.000 | \$ | 35.00 |

## LOWER MAKEFIELD TOWNSHIP, BUCKS COUNTY, PA <br> SANITARY SEWER SYSTEM <br> UNIT PRICES IN 2020 DOLLARS

| DESCRIPTION | UNIT |  | PRICE | QTY/SYSTEM UNIT |  | STEM |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Excavation, installation, and restoration for 15" diameter gravity sewer in roadways |  |  |  |  | \$ | 117.00 |
| Excavate Trench (8' deep) | CY | \$ | 6.48 | 1.481 | \$ | 9.60 |
| Crushed stone bedding | CY | \$ | 43.50 | 0.218 | \$ | 9.48 |
| Compact bedding | CY | \$ | 3.72 | 0.058 | \$ | 0.22 |
| Backfill trench w/2A stone | TN | \$ | 10.00 | 1.678 | \$ | 16.78 |
| Compact fill material | CY | \$ | 3.72 | 0.093 | \$ | 0.35 |
| Sawcut pavement for excavation | LF | \$ | 4.66 | 2.000 | \$ | 9.32 |
| Dispose of excess fill material | CY | \$ | 9.60 | 1.481 | \$ | 14.22 |
| Temp paving (5' wide) | SY | \$ | 10.25 | 0.556 | \$ | 5.70 |
| Temp paving hauling | CY | \$ | 9.60 | 0.031 | \$ | 0.30 |
| Pressure testing | LF | \$ | 3.75 | 1.000 | \$ | 3.75 |
| Televising | LF | \$ | 2.00 | 1.000 | \$ | 2.00 |
| Sawcut pavement for final restoration | LF | \$ | 4.66 | 2.000 | \$ | 9.32 |
| Excavate (7' W x 8.5" D x 1' L) | CY | \$ | 6.35 | 0.184 | \$ | 1.17 |
| Dispose of excess material | CY | \$ | 9.60 | 0.184 | \$ | 1.77 |
| Compact trench surfface | CY | \$ | 3.72 | 0.129 | \$ | 0.48 |
| 1.5" Wearing course (7' wide) | SY | \$ | 7.70 | 0.778 | \$ | 5.99 |
| 3 3 Binder course (7' wide) | SY | \$ | 13.45 | 0.778 | \$ | 10.46 |
| 4" Base course (7' wide) | SY | \$ | 18.00 | 0.778 | \$ | 14.00 |
| Seal | SY | \$ | 3.01 | 0.111 | \$ | 0.33 |
| Hauling | CY | \$ | 9.60 | 0.184 | \$ | 1.77 |
| 15" PVC gravity main located in roadways |  |  |  |  | \$ | 177.00 |
| 15" SDR-26 | LF | \$ | 60.00 | 1.000 | \$ | 60.00 |
| Excavation, installation, and restoration | LS | \$ | 117.00 | 1.000 | \$ | 117.00 |

## LOWER MAKEFIELD TOWNSHIP, BUCKS COUNTY, PA <br> SANITARY SEWER SYSTEM <br> UNIT PRICES IN 2020 DOLLARS

| DESCRIPTION | UNIT |  | PRICE | QTY/SYSTEM UNIT |  | TEM |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Excavation, installation, and restoration for 15" diameter gravity sewer out of roadways |  |  |  |  | \$ | 35.00 |
| Excavate Trench (8' deep) | CY | \$ | 6.48 | 1.481 | \$ | 9.60 |
| Crushed stone bedding | CY | \$ | 43.50 | 0.187 | \$ | 8.13 |
| Compact bedding | CY | \$ | 3.72 | 0.058 | \$ | 0.22 |
| Backfill trench w/suitable materials | CY | \$ | 3.03 | 1.265 | \$ | 3.83 |
| Compact fill material | CY | \$ | 3.72 | 0.093 | \$ | 0.35 |
| Dispose of excess fill material | CY | \$ | 9.60 | 0.216 | \$ | 2.07 |
| Pressure testing | LF | \$ | 3.75 | 1.000 | \$ | 3.75 |
| Televising | LF | \$ | 2.00 | 1.000 | \$ | 2.00 |
| Finish grading \& seeding | SY | \$ | 3.92 | 1.288 | \$ | 5.05 |
| 15" PVC gravity main located out of roadways |  |  |  |  | \$ | 55.00 |
| 15" SDR-26 | LF | \$ | 20.00 | 1.000 | \$ | 20.00 |
| Excavation, installation, and restoration | LS | \$ | 35.00 | 1.000 | \$ | 35.00 |

## LOWER MAKEFIELD TOWNSHIP, BUCKS COUNTY, PA <br> SANITARY SEWER SYSTEM <br> UNIT PRICES IN 2020 DOLLARS

| DESCRIPTION | UNIT |  | PRICE | QTY/SYSTEM UNIT |  | STEM |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Excavation, installation, and restoration for 27" diameter gravity sewer in roadways |  |  |  |  | \$ | 120.00 |
| Excavate Trench (8' deep) | CY | \$ | 6.48 | 1.481 | \$ | 9.60 |
| Crushed stone bedding | CY | \$ | 43.50 | 0.248 | \$ | 10.81 |
| Compact bedding | CY | \$ | 3.72 | 0.058 | \$ | 0.22 |
| Backfill trench w/2A stone | TN | \$ | 10.00 | 1.846 | \$ | 18.46 |
| Compact fill material | CY | \$ | 3.72 | 0.093 | \$ | 0.35 |
| Sawcut pavement for excavation | LF | \$ | 4.66 | 2.000 | \$ | 9.32 |
| Dispose of excess fill material | CY | \$ | 9.60 | 1.481 | \$ | 14.22 |
| Temp paving (5' wide) | SY | \$ | 10.25 | 0.556 | \$ | 5.70 |
| Temp paving hauling | CY | + | 9.60 | 0.031 | \$ | 0.30 |
| Pressure testing | LF | \$ | 3.75 | 1.000 | \$ | 3.75 |
| Televising | LF | \$ | 2.00 | 1.000 | \$ | 2.00 |
| Sawcut pavement for final restoration | LF | \$ | 4.66 | 2.000 | \$ | 9.32 |
| Excavate (7' W x 8.5" D x 1' L) | CY | \$ | 6.35 | 0.184 | \$ | 1.17 |
| Dispose of excess material | CY | \$ | 9.60 | 0.184 | \$ | 1.77 |
| Compact trench surfface | CY | \$ | 3.72 | 0.129 | \$ | 0.48 |
| 1.5" Wearing course (7' wide) | SY | \$ | 7.70 | 0.778 | \$ | 5.99 |
| 3 3 Binder course (7' wide) | SY | \$ | 13.45 | 0.778 | \$ | 10.46 |
| 4" Base course (7' wide) | SY | \$ | 18.00 | 0.778 | \$ | 14.00 |
| Seal | SY | \$ | 3.01 | 0.111 | \$ | 0.33 |
| Hauling | CY | \$ | 9.60 | 0.184 | \$ | 1.77 |
| 27" RCP gravity main located in roadways |  |  |  |  | \$ | 185.00 |
| 27" RCP | LF | \$ | 65.00 | 1.000 | \$ | 65.00 |
| Excavation, installation, and restoration | LS | \$ | 120.00 | 1.000 | \$ | 120.00 |

## LOWER MAKEFIELD TOWNSHIP, BUCKS COUNTY, PA <br> SANITARY SEWER SYSTEM <br> UNIT PRICES IN 2020 DOLLARS

| DESCRIPTION | UNIT | UNIT PRICE |  | QTY/SYSTEM UNIT | PRICE SYSTEM |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Excavation, installation, and restoration for 27" diameter gravity sewer out of roadways |  |  |  |  | \$ | 45.00 |
| Excavate Trench (8' deep) | CY | \$ | 6.48 | 1.481 | \$ | 9.60 |
| Crushed stone bedding | CY | \$ | 43.50 | 0.386 | \$ | 16.79 |
| Compact bedding | CY | \$ | 3.72 | 0.058 | \$ | 0.22 |
| Backfill trench w/suitable materials | CY | \$ | 3.03 | 1.049 | \$ | 3.18 |
| Compact fill material | CY | \$ | 3.72 | 0.093 | \$ | 0.35 |
| Dispose of excess fill material | CY | \$ | 9.60 | 0.497 | \$ | 4.77 |
| Pressure testing | LF | \$ | 3.75 | 1.000 | \$ | 3.75 |
| Televising | LF | \$ | 2.00 | 1.000 | \$ | 2.00 |
| Finish grading \& seeding | SY | \$ | 3.92 | 1.111 | \$ | 4.36 |
| 27" RCP gravity main located out of roadways |  |  |  |  | \$ | 110.00 |
| 27" RCP | LF | \$ | 65.00 | 1.000 | \$ | 65.00 |
| Excavation, installation, and restoration | LS | \$ | 45.00 | 1.000 | \$ | 45.00 |

## LOWER MAKEFIELD TOWNSHIP, BUCKS COUNTY, PA <br> SANITARY SEWER SYSTEM <br> UNIT PRICES IN 2020 DOLLARS

| DESCRIPTION | UNIT |  | PRICE | QTY/SYSTEM UNIT |  | STEM |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Excavation, installation, and restoration for 30" diameter gravity sewer in roadways |  |  |  |  | \$ | 225.00 |
| Excavate Trench (8' deep) | CY | \$ | 6.48 | 1.481 | \$ | 9.60 |
| Crushed stone bedding | CY | \$ | 43.50 | 2.610 | \$ | 113.54 |
| Compact bedding | CY | \$ | 3.72 | 0.058 | \$ | 0.22 |
| Backfill trench w/2A stone | TN | \$ | 10.00 | 1.985 | \$ | 19.85 |
| Compact fill material | CY | \$ | 3.72 | 0.093 | \$ | 0.35 |
| Sawcut pavement for excavation | LF | \$ | 4.66 | 2.000 | \$ | 9.32 |
| Dispose of excess fill material | CY | \$ | 9.60 | 1.554 | \$ | 14.92 |
| Temp paving (5' wide) | SY | \$ | 10.25 | 0.556 | \$ | 5.70 |
| Temp paving hauling | CY | + | 9.60 | 0.031 | \$ | 0.30 |
| Pressure testing | LF | \$ | 3.75 | 1.000 | \$ | 3.75 |
| Televising | LF | \$ | 2.00 | 1.000 | \$ | 2.00 |
| Sawcut pavement for final restoration | LF | \$ | 4.66 | 2.000 | \$ | 9.32 |
| Excavate (7' W x 8.5" D x 1' L) | CY | \$ | 6.35 | 0.184 | \$ | 1.17 |
| Dispose of excess material | CY | \$ | 9.60 | 0.202 | \$ | 1.94 |
| Compact trench surfface | CY | \$ | 3.72 | 0.129 | \$ | 0.48 |
| 1.5" Wearing course (7' wide) | SY | \$ | 7.70 | 0.778 | \$ | 5.99 |
| 3 3 Binder course (7' wide) | SY | \$ | 13.45 | 0.778 | \$ | 10.46 |
| 4" Base course (7' wide) | SY | \$ | 18.00 | 0.778 | \$ | 14.00 |
| Seal | SY | \$ | 3.01 | 0.111 | \$ | 0.33 |
| Hauling | CY | S | 9.60 | 0.184 | \$ | 1.77 |
| 30" RCP gravity main located in roadways |  |  |  |  | \$ | 300.00 |
| 30" RCP | LF | \$ | 75.00 | 1.000 | \$ | 75.00 |
| Excavation, installation, and restoration | LS | \$ | 225.00 | 1.000 | \$ | 225.00 |

## LOWER MAKEFIELD TOWNSHIP, BUCKS COUNTY, PA <br> SANITARY SEWER SYSTEM <br> UNIT PRICES IN 2020 DOLLARS

| DESCRIPTION | UNIT | UNIT PRICE |  | QTY/SYSTEM UNIT | PRICE SYSTEM |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Excavation, installation, and restoration for 30" diameter gravity sewer out of roadways |  |  |  |  | \$ | 47.00 |
| Excavate Trench (8' deep) | CY | \$ | 6.48 | 1.481 | \$ | 9.60 |
| Crushed stone bedding | CY | \$ | 43.50 | 0.427 | \$ | 18.57 |
| Compact bedding | CY | \$ | 3.72 | 0.058 | \$ | 0.22 |
| Backfill trench w/suitable materials | CY | \$ | 3.03 | 1.049 | \$ | 3.18 |
| Compact fill material | CY | \$ | 3.72 | 0.093 | \$ | 0.35 |
| Dispose of excess fill material | CY | \$ | 9.60 | 0.520 | \$ | 4.99 |
| Pressure testing | LF | \$ | 3.75 | 1.000 | \$ | 3.75 |
| Televising | LF | \$ | 2.00 | 1.000 | \$ | 2.00 |
| Finish grading \& seeding | SY | \$ | 3.92 | 1.111 | \$ | 4.36 |
| 30" RCP gravity main located out of roadways |  |  |  |  | \$ | 122.00 |
| 30" RCP | LF | \$ | 75.00 | 1.000 | \$ | 75.00 |
| Excavation, installation, and restoration | LS | \$ | 47.00 | 1.000 | \$ | 47.00 |

## LOWER MAKEFIELD TOWNSHIP, BUCKS COUNTY, PA <br> SANITARY SEWER SYSTEM <br> UNIT PRICES IN 2020 DOLLARS

| DESCRIPTION | UNIT |  | PRICE | QTY/SYSTEM UNIT |  | STEM |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Excavation, installation, and restoration for 6" diameter lateral sewer |  |  |  |  | \$ | 100.00 |
| Excavate Trench (6' deep) | CY | \$ | 6.35 | 1.111 | \$ | 7.05 |
| Crushed stone bedding | CY | \$ | 43.50 | 0.129 | \$ | 5.61 |
| Compact bedding | CY | \$ | 3.72 | 0.058 | \$ | 0.22 |
| Backfill trench w/2A stone | TN | \$ | 10.00 | 1.317 | \$ | 13.17 |
| Compact fill material | CY | \$ | 3.72 | 0.093 | \$ | 0.35 |
| Sawcut pavement for excavation | LF | \$ | 4.66 | 2.000 | \$ | 9.32 |
| Dispose of excess fill material | CY | \$ | 9.60 | 1.111 | \$ | 10.67 |
| Temp paving (5' wide) | SY | \$ | 10.25 | 0.417 | \$ | 4.27 |
| Temp paving hauling | CY | \$ | 9.60 | 0.031 | \$ | 0.30 |
| Pressure testing | LF | \$ | 3.75 | 1.000 | \$ | 3.75 |
| Sawcut pavement for final restoration | LF | \$ | 4.66 | 2.000 | \$ | 9.32 |
| Excavate (7' W x 8.5" D x 1' L) | LF | \$ | 6.35 | 0.184 | \$ | 1.17 |
| Dispose of excess material | CY | \$ | 9.60 | 0.184 | \$ | 1.77 |
| Compact trench surface | CY | \$ | 3.72 | 0.129 | \$ | 0.48 |
| 1.5 " Wearing course (7' wide) | CY | \$ | 7.70 | 0.778 | \$ | 5.99 |
| $3{ }^{\text {" }}$ Binder course (7' wide) | SY | \$ | 13.45 | 0.778 | \$ | 10.46 |
| 4" Base course (7' wide) | SY | \$ | 18.00 | 0.778 | \$ | 14.00 |
| Seal | SY | \$ | 3.01 | 0.111 | \$ | 0.33 |
| Hauling | SY | \$ | 9.60 | 0.184 | \$ | 1.77 |
| 6" PVC lateral sewer |  |  |  |  | \$ | 750.00 |
| 6" PVC (20 ft assumed) | LF | \$ | 20.00 | 20.000 | \$ | 400.00 |
| 6" PVC Cleanout | EA | \$ | 250.00 | 1.000 | \$ | 250.00 |
| Excavation, installation, and restoration | LS | \$ | 100.00 | 1.000 | \$ | 100.00 |

## LOWER MAKEFIELD TOWNSHIP, BUCKS COUNTY, PA <br> SANITARY SEWER SYSTEM <br> UNIT PRICES IN 2020 DOLLARS

| DESCRIPTION | UNIT |  | PRICE | QTY/SYSTEM UNIT |  | STEM |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Excavation, installation, and restoration for 2" diameter forcemain in roadways |  |  |  |  | \$ | 95.00 |
| Excavate Trench (4.83' deep) | CY | \$ | 6.38 | 0.894 | \$ | 5.70 |
| Crushed stone bedding | CY | \$ | 43.50 | 0.110 | \$ | 4.79 |
| Compact bedding | CY | \$ | 3.72 | 0.058 | \$ | 0.22 |
| Backfill trench w/2A stone | TN | \$ | 10.00 | 1.101 | \$ | 11.01 |
| Compact fill material | CY | \$ | 3.72 | 0.093 | \$ | 0.35 |
| Sawcut pavement | LF | \$ | 4.66 | 2.000 | \$ | 9.32 |
| Dispose of excess fill material | CY | \$ | 9.60 | 0.894 | \$ | 8.58 |
| Temp paving (5' wide) | SY | \$ | 10.25 | 0.556 | \$ | 5.70 |
| Temp paving hauling | CY | \$ | 9.60 | 0.031 | \$ | 0.30 |
| Pressure testing | LF | \$ | 3.75 | 1.000 | \$ | 3.75 |
| Sawcut pavement | LF | \$ | 4.66 | 2.000 | \$ | 9.32 |
| Excavate (7' W x 8.5" D x $1^{\prime} \mathrm{L}$ ) | LF | \$ | 6.35 | 0.184 | \$ | 1.17 |
| Dispose of excess material | CY | + | 9.60 | 0.184 | \$ | 1.77 |
| Compact trench surfface | CY | \$ | 3.72 | 0.129 | \$ | 0.48 |
| 1.5 " Wearing course (7' wide) | CY | \$ | 7.70 | 0.778 | \$ | 5.99 |
| 3 Cl Binder course (7' wide) | SY | \$ | 13.45 | 0.778 | \$ | 10.46 |
| 4" Base course (7' wide) | SY | \$ | 18.00 | 0.778 | \$ | 14.00 |
| Seal | SY | \$ | 3.01 | 0.111 | \$ | 0.33 |
| Hauling | SY | \$ | 9.60 | 0.184 | \$ | 1.77 |
| 2" PVC forcemain located in roadways |  |  |  |  | \$ | 125.00 |
| 2" SDR 21 | LF | \$ | 30.00 | 1.000 | \$ | 30.00 |
| Excavation, installation, and restoration | LS | \$ | 95.00 | 1.000 | \$ | 95.00 |

## LOWER MAKEFIELD TOWNSHIP, BUCKS COUNTY, PA <br> SANITARY SEWER SYSTEM <br> UNIT PRICES IN 2020 DOLLARS

| DESCRIPTION | UNIT | UNIT PRICE |  | QTY/SYSTEM UNIT | PRICE SYSTEM |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Excavation, installation, and restoration for 2" diameter forcemain sewer out of roadways |  |  |  |  | \$ | 33.00 |
| Excavate Trench (4.83' deep) | CY | \$ | 6.48 | 0.894 | \$ | 5.79 |
| Crushed stone bedding | CY | \$ | 43.50 | 0.110 | \$ | 4.79 |
| Compact bedding | CY | \$ | 3.72 | 0.058 | \$ | 0.22 |
| Backfill trench w/suitable materials | CY | \$ | 3.03 | 1.101 | \$ | 3.34 |
| Compact fill material | CY | \$ | 3.72 | 0.093 | \$ | 0.35 |
| Dispose of excess fill material | CY | \$ | 9.60 | 0.894 | \$ | 8.58 |
| Pressure testing | LF | \$ | 3.75 | 1.000 | \$ | 3.75 |
| Televising | LF | \$ | 2.00 | 1.000 | \$ | 2.00 |
| Finish grading \& seeding | SY | \$ | 3.92 | 1.070 | \$ | 4.19 |
| 2" PVC forcemain located out of roadways |  |  |  |  | \$ | 63.00 |
| 2" SDR 21 | LF | \$ | 30.00 | 1.000 | \$ | 30.00 |
| Excavation, installation, and restoration | LS | \$ | 33.00 | 1.000 | \$ | 33.00 |

## LOWER MAKEFIELD TOWNSHIP, BUCKS COUNTY, PA <br> SANITARY SEWER SYSTEM <br> UNIT PRICES IN 2020 DOLLARS

| DESCRIPTION | UNIT |  | PRICE | QTY/SYSTEM UNIT |  | STEM |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Excavation, installation, and restoration for 4" diameter forcemain in roadways |  |  |  |  | \$ | 95.00 |
| Excavate Trench (4.83' deep) | CY | \$ | 6.38 | 0.894 | \$ | 5.70 |
| Crushed stone bedding | CY | \$ | 43.50 | 0.110 | \$ | 4.79 |
| Compact bedding | CY | \$ | 3.72 | 0.058 | \$ | 0.22 |
| Backfill trench w/2A stone | TN | \$ | 10.00 | 1.101 | \$ | 11.01 |
| Compact fill material | CY | \$ | 3.72 | 0.093 | \$ | 0.35 |
| Sawcut pavement | LF | \$ | 4.66 | 2.000 | \$ | 9.32 |
| Dispose of excess fill material | CY | \$ | 9.60 | 0.894 | \$ | 8.58 |
| Temp paving (5' wide) | SY | \$ | 10.25 | 0.556 | \$ | 5.70 |
| Temp paving hauling | CY | \$ | 9.60 | 0.031 | \$ | 0.30 |
| Pressure testing | LF | \$ | 3.75 | 1.000 | \$ | 3.75 |
| Sawcut pavement | LF | \$ | 4.66 | 2.000 | \$ | 9.32 |
| Excavate (7' W x 8.5" D x $1^{\prime} \mathrm{L}$ ) | LF | \$ | 6.35 | 0.184 | \$ | 1.17 |
| Dispose of excess material | CY | \$ | 9.60 | 0.184 | \$ | 1.77 |
| Compact trench surfface | CY | \$ | 3.72 | 0.129 | \$ | 0.48 |
| 1.5 " Wearing course (7' wide) | CY | \$ | 7.70 | 0.778 | \$ | 5.99 |
| $3{ }^{\text {" }}$ Binder course ( 7 ' wide) | SY | \$ | 13.45 | 0.778 | \$ | 10.46 |
| 4" Base course (7' wide) | SY | \$ | 18.00 | 0.778 | \$ | 14.00 |
| Seal | SY | \$ | 3.01 | 0.111 | \$ | 0.33 |
| Hauling | SY | \$ | 9.60 | 0.184 | \$ | 1.77 |
| 4" DIP forcemain located in roadways |  |  |  |  | \$ | 135.00 |
| 4" DIP | LF | \$ | 40.00 | 1.000 | \$ | 40.00 |
| Excavation, installation, and restoration | LS | \$ | 95.00 | 1.000 | \$ | 95.00 |
| 4" CIP forcemain located in roadways |  |  |  |  | \$ | 175.00 |
| 4" CIP | LF | \$ | 80.00 | 1.000 | \$ | 80.00 |
| Excavation, installation, and restoration | LS | \$ | 95.00 | 1.000 | \$ | 95.00 |

## LOWER MAKEFIELD TOWNSHIP, BUCKS COUNTY, PA <br> SANITARY SEWER SYSTEM <br> UNIT PRICES IN 2020 DOLLARS

| DESCRIPTION | UNIT | UNIT PRICE |  | QTY/SYSTEM UNIT | PRICE SYSTEM |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Excavation, installation, and restoration for 4" diameter forcemain sewer out of roadways |  |  |  |  | \$ | 33.00 |
| Excavate Trench (4.83' deep) | CY | \$ | 6.48 | 0.894 | \$ | 5.79 |
| Crushed stone bedding | CY | \$ | 43.50 | 0.110 | \$ | 4.79 |
| Compact bedding | CY | \$ | 3.72 | 0.058 | \$ | 0.22 |
| Backfill trench w/suitable materials | CY | \$ | 3.03 | 1.101 | \$ | 3.34 |
| Compact fill material | CY | \$ | 3.72 | 0.093 | \$ | 0.35 |
| Dispose of excess fill material | CY | \$ | 9.60 | 0.894 | \$ | 8.58 |
| Pressure testing | LF | \$ | 3.75 | 1.000 | \$ | 3.75 |
| Televising | LF | \$ | 2.00 | 1.000 | \$ | 2.00 |
| Finish grading \& seeding | SY | \$ | 3.92 | 1.070 | \$ | 4.19 |
| 4" DIP forcemain located out of roadways |  |  |  |  | \$ | 73.00 |
| 4" DIP | LF | \$ | 40.00 | 1.000 | \$ | 40.00 |
| Excavation, installation, and restoration | LS | \$ | 33.00 | 1.000 | \$ | 33.00 |
| 4" CIP forcemain located out of roadways |  |  |  |  | \$ | 113.00 |
| 4" CIP | LF | \$ | 80.00 | 1.000 | \$ | 80.00 |
| Excavation, installation, and restoration | LS | \$ | 33.00 | 1.000 | \$ | 33.00 |

## LOWER MAKEFIELD TOWNSHIP, BUCKS COUNTY, PA <br> SANITARY SEWER SYSTEM <br> UNIT PRICES IN 2020 DOLLARS

| DESCRIPTION | UNIT |  | PRICE | QTY/SYSTEM UNIT |  | STEM |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Excavation, installation, and restoration for 6" diameter forcemain in roadways |  |  |  |  | \$ | 100.00 |
| Excavate Trench (6' deep) | CY | \$ | 6.35 | 1.111 | \$ | 7.05 |
| Crushed stone bedding | CY | \$ | 43.50 | 0.129 | \$ | 5.61 |
| Compact bedding | CY | \$ | 3.72 | 0.058 | \$ | 0.22 |
| Backfill trench w/2A stone | TN | \$ | 10.00 | 1.317 | \$ | 13.17 |
| Compact fill material | CY | \$ | 3.72 | 0.093 | \$ | 0.35 |
| Sawcut pavement | LF | \$ | 4.66 | 2.000 | \$ | 9.32 |
| Dispose of excess fill material | CY | \$ | 9.60 | 1.111 | \$ | 10.67 |
| Temp paving (5' wide) | SY | \$ | 10.25 | 0.417 | \$ | 4.27 |
| Temp paving hauling | CY | \$ | 9.60 | 0.031 | \$ | 0.30 |
| Pressure testing | LF | \$ | 3.75 | 1.000 | \$ | 3.75 |
| Sawcut pavement | LF | \$ | 4.66 | 2.000 | \$ | 9.32 |
| Excavate (7' W x 8.5" D x $1^{\prime} \mathrm{L}$ ) | LF | \$ | 6.35 | 0.184 | \$ | 1.17 |
| Dispose of excess material | CY | \$ | 9.60 | 0.184 | \$ | 1.77 |
| Compact trench surfface | CY | \$ | 3.72 | 0.129 | \$ | 0.48 |
| 1.5 " Wearing course (7' wide) | CY | \$ | 7.70 | 0.778 | \$ | 5.99 |
| $3{ }^{\text {" }}$ Binder course ( 7 ' wide) | SY | \$ | 13.45 | 0.778 | \$ | 10.46 |
| 4" Base course (7' wide) | SY | \$ | 18.00 | 0.778 | \$ | 14.00 |
| Seal | SY | \$ | 3.01 | 0.111 | \$ | 0.33 |
| Hauling | SY | \$ | 9.60 | 0.184 | \$ | 1.77 |
| 6" DIP forcemain located in roadways |  |  |  |  | \$ | 150.00 |
| 6" DIP | LF | \$ | 50.00 | 1.000 | \$ | 50.00 |
| Excavation, installation, and restoration | LS | \$ | 100.00 | 1.000 | \$ | 100.00 |
| 6" CIP forcemain located in roadways |  |  |  |  | \$ | 200.00 |
| 6" CIP | LF | \$ | 100.00 | 1.000 | \$ | 100.00 |
| Excavation, installation, and restoration | LS | \$ | 100.00 | 1.000 | \$ | 100.00 |

## LOWER MAKEFIELD TOWNSHIP, BUCKS COUNTY, PA <br> SANITARY SEWER SYSTEM <br> UNIT PRICES IN 2020 DOLLARS

| DESCRIPTION | UNIT |  | PRICE | QTY/SYSTEM UNIT |  | STEM |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Excavation, installation, and restoration for 6" diameter forcemain sewer out of roadways |  |  |  |  | \$ | 38.00 |
| Excavate Trench (6' deep) | CY | \$ | 6.35 | 1.111 | \$ | 7.05 |
| Crushed stone bedding | CY | \$ | 43.50 | 0.129 | \$ | 5.61 |
| Compact bedding | CY | \$ | 3.72 | 0.058 | \$ | 0.22 |
| Backfill trench w/suitable materials | CY | \$ | 3.03 | 1.319 | \$ | 4.00 |
| Compact fill material | CY | \$ | 3.72 | 0.093 | \$ | 0.35 |
| Dispose of excess fill material | CY | \$ | 9.60 | 1.111 | \$ | 10.67 |
| Pressure testing | LF | \$ | 3.75 | 1.000 | \$ | 3.75 |
| Televising | LF | \$ | 2.00 | 1.000 | \$ | 2.00 |
| Finish grading \& seeding | SY | \$ | 3.92 | 1.111 | \$ | 4.36 |
| 6" DIP forcemain located out of roadways |  |  |  |  | \$ | 88.00 |
| 6" DIP | LF | \$ | 50.00 | 1.000 | \$ | 50.00 |
| Excavation, installation, and restoration | LS | \$ | 38.00 | 1.000 | \$ | 38.00 |
| 6" CIP forcemain located out of roadways |  |  |  |  | \$ | 138.00 |
| 6" CIP | LF | \$ | 100.00 | 1.000 | \$ | 100.00 |
| Excavation, installation, and restoration | LS | \$ | 38.00 | 1.000 | \$ | 38.00 |

LOWER MAKEFIELD TOWNSHIP, BUCKS COUNTY, PA
SANITARY SEWER SYSTEM
UNIT PRICES IN 2020 DOLLARS

| DESCRIPTION | UNIT |  | PRICE | QTY/SYSTEM UNIT |  | STEM |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Excavation, installation, and restoration for 8" diameter forcemain in roadways |  |  |  |  | \$ | 113.00 |
| Excavate Trench (6' deep) | CY | \$ | 6.48 | 1.481 | \$ | 9.60 |
| Crushed stone bedding | CY | \$ | 43.50 | 0.148 | \$ | 6.44 |
| Compact bedding | CY | \$ | 3.72 | 0.058 | \$ | 0.22 |
| Backfill trench w/2A stone | TN | \$ | 10.00 | 1.783 | \$ | 17.83 |
| Compact fill material | CY |  | 3.72 | 0.093 | \$ | 0.35 |
| Sawcut pavement | LF | \$ | 4.66 | 2.000 | \$ | 9.32 |
| Dispose of excess fill material | CY | \$ | 9.60 | 1.481 | \$ | 14.22 |
| Temp paving (5' wide) | SY | \$ | 10.25 | 0.556 | \$ | 5.70 |
| Temp paving hauling | CY | \$ | 9.60 | 0.031 | \$ | 0.30 |
| Pressure testing | LF | \$ | 3.75 | 1.000 | \$ | 3.75 |
| Sawcut pavement | LF | \$ | 4.66 | 2.000 | \$ | 9.32 |
| Excavate (7' W x 8.5" D x $1^{\prime} \mathrm{L}$ ) | LF | \$ | 6.35 | 0.184 | \$ | 1.17 |
| Dispose of excess material | CY | \$ | 9.60 | 0.184 | \$ | 1.77 |
| Compact trench surfface | CY | \$ | 3.72 | 0.129 | \$ | 0.48 |
| 1.5 " Wearing course (7' wide) | CY | \$ | 7.70 | 0.778 | \$ | 5.99 |
| 3 Cl Binder course (7' wide) | SY | + | 13.45 | 0.778 | \$ | 10.46 |
| 4" Base course (7' wide) | SY | \$ | 18.00 | 0.778 | \$ | 14.00 |
| Seal | SY | \$ | 3.01 | 0.111 | \$ | 0.33 |
| Hauling | SY | \$ | 9.60 | 0.184 | \$ | 1.77 |
| 8" CIP forcemain located in roadways |  |  |  |  | \$ | 233.00 |
| 8" CIP | LF | \$ | 120.00 | 1.000 | \$ | 120.00 |
| Excavation, installation, and restoration | LS | \$ | 113.00 | 1.000 | \$ | 113.00 |

## LOWER MAKEFIELD TOWNSHIP, BUCKS COUNTY, PA <br> SANITARY SEWER SYSTEM <br> UNIT PRICES IN 2020 DOLLARS

| DESCRIPTION | UNIT | UNIT PRICE | QTY/SYSTEM UNIT |  | STEM |
| :---: | :---: | :---: | :---: | :---: | :---: |
| Excavation, installation, and restoration for 8" diameter forcemain sewer out of roadways |  |  |  | \$ | 46.00 |
| Excavate Trench (6' deep) | CY | \$ 6.35 | 1.481 | \$ | 9.40 |
| Crushed stone bedding | CY | \$ 43.50 | 0.148 | \$ | 6.44 |
| Compact bedding | CY | \$ 3.72 | 0.058 | \$ | 0.22 |
| Backfill trench w/suitable materials | CY | \$ 3.03 | 1.783 | \$ | 5.40 |
| Compact fill material | CY | \$ 3.72 | 0.093 | \$ | 0.35 |
| Dispose of excess fill material | CY | \$ 9.60 | 1.481 | \$ | 14.22 |
| Pressure testing | LF | \$ 3.75 | 1.000 | \$ | 3.75 |
| Televising | LF | \$ 2.00 | 1.000 | \$ | 2.00 |
| Finish grading \& seeding | SY | \$ 3.92 | 1.079 | \$ | 4.23 |
| 8" CIP forcemain located out of roadways |  |  |  | \$ | 166.00 |
| 8" CIP | LF | \$ 120.00 | 1.000 | \$ | 120.00 |
| Excavation, installation, and restoration | LS | \$ 46.00 | 1.000 | \$ | 46.00 |

## LOWER MAKEFIELD TOWNSHIP, BUCKS COUNTY, PA <br> SANITARY SEWER SYSTEM <br> UNIT PRICES IN 2020 DOLLARS

| DESCRIPTION | UNIT |  | PRICE | QTY/SYSTEM UNIT |  | STEM |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Excavation, installation, and restoration for 10" diameter forcemain in roadways |  |  |  |  | \$ | 113.00 |
| Excavate Trench (6' deep) | CY | \$ | 6.48 | 1.481 | \$ | 9.60 |
| Crushed stone bedding | CY | \$ | 43.50 | 0.148 | \$ | 6.44 |
| Compact bedding | CY | \$ | 3.72 | 0.058 | \$ | 0.22 |
| Backfill trench w/2A stone | TN | \$ | 10.00 | 1.783 | \$ | 17.83 |
| Compact fill material | CY | \$ | 3.72 | 0.093 | \$ | 0.35 |
| Sawcut pavement | LF | \$ | 4.66 | 2.000 | \$ | 9.32 |
| Dispose of excess fill material | CY | \$ | 9.60 | 1.481 | \$ | 14.22 |
| Temp paving (5' wide) | SY | \$ | 10.25 | 0.556 | \$ | 5.70 |
| Temp paving hauling | CY | \$ | 9.60 | 0.031 | \$ | 0.30 |
| Pressure testing | LF | \$ | 3.75 | 1.000 | \$ | 3.75 |
| Sawcut pavement | LF | \$ | 4.66 | 2.000 | \$ | 9.32 |
| Excavate (7' W x 8.5" D x $1^{\prime} \mathrm{L}$ ) | LF | \$ | 6.35 | 0.184 | \$ | 1.17 |
| Dispose of excess material | CY | \$ | 9.60 | 0.184 | \$ | 1.77 |
| Compact trench surfface | CY | \$ | 3.72 | 0.129 | \$ | 0.48 |
| 1.5 " Wearing course (7' wide) | CY | \$ | 7.70 | 0.778 | \$ | 5.99 |
| 3 Cl Binder course (7' wide) | SY | \$ | 13.45 | 0.778 | \$ | 10.46 |
| 4" Base course (7' wide) | SY | \$ | 18.00 | 0.778 | \$ | 14.00 |
| Seal | SY | \$ | 3.01 | 0.111 | \$ | 0.33 |
| Hauling | SY | \$ | 9.60 | 0.184 | \$ | 1.77 |
| 10" CIP forcemain located in roadways |  |  |  |  | \$ | 253.00 |
| 10" CIP | LF | \$ | 140.00 | 1.000 | \$ | 140.00 |
| Excavation, installation, and restoration | LS | \$ | 113.00 | 1.000 | \$ | 113.00 |

## LOWER MAKEFIELD TOWNSHIP, BUCKS COUNTY, PA <br> SANITARY SEWER SYSTEM <br> UNIT PRICES IN 2020 DOLLARS

| DESCRIPTION | UNIT | UNIT PRICE |  | QTY/SYSTEM UNIT | PRICE SYSTEM |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Excavation, installation, and restoration for 10" diameter forcemain in roadways |  |  |  |  | \$ | 46.00 |
| Excavate Trench (6' deep) | CY | \$ | 6.35 | 1.481 | \$ | 9.40 |
| Crushed stone bedding | CY | \$ | 43.50 | 0.148 | \$ | 6.44 |
| Compact bedding | CY | \$ | 3.72 | 0.058 | \$ | 0.22 |
| Backfill trench w/suitable materials | CY | \$ | 3.03 | 1.783 | \$ | 5.40 |
| Compact fill material | CY | \$ | 3.72 | 0.093 | \$ | 0.35 |
| Dispose of excess fill material | CY | \$ | 9.60 | 1.481 | \$ | 14.22 |
| Pressure testing | LF | \$ | 3.75 | 1.000 | \$ | 3.75 |
| Televising | LF | \$ | 2.00 | 1.000 | \$ | 2.00 |
| Finish grading \& seeding | SY | \$ | 3.92 | 1.079 | \$ | 4.23 |
| 10" CIP forcemain located out of roadways |  |  |  |  | \$ | 186.00 |
| 10" CIP | LF | \$ | 140.00 | 1.000 | \$ | 140.00 |
| Excavation, installation, and restoration | LS | \$ | 46.00 | 1.000 | \$ | 46.00 |

## LOWER MAKEFIELD TOWNSHIP, BUCKS COUNTY, PA <br> SANITARY SEWER SYSTEM <br> UNIT PRICES IN 2020 DOLLARS

| DESCRIPTION | UNIT |  | PRICE | QTY/SYSTEM UNIT |  | STEM |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Excavation, installation, and restoration for 12" diameter forcemain in roadways |  |  |  |  | \$ | 113.00 |
| Excavate Trench (6' deep) | CY | \$ | 6.48 | 1.481 | \$ | 9.60 |
| Crushed stone bedding | CY | \$ | 43.50 | 0.148 | \$ | 6.44 |
| Compact bedding | CY | \$ | 3.72 | 0.058 | \$ | 0.22 |
| Backfill trench w/2A stone | TN | \$ | 10.00 | 1.783 | \$ | 17.83 |
| Compact fill material | CY | \$ | 3.72 | 0.093 | \$ | 0.35 |
| Sawcut pavement | LF | \$ | 4.66 | 2.000 | \$ | 9.32 |
| Dispose of excess fill material | CY | \$ | 9.60 | 1.481 | \$ | 14.22 |
| Temp paving (5' wide) | SY | \$ | 10.25 | 0.556 | \$ | 5.70 |
| Temp paving hauling | CY | \$ | 9.60 | 0.031 | \$ | 0.30 |
| Pressure testing | LF | \$ | 3.75 | 1.000 | \$ | 3.75 |
| Sawcut pavement | LF | \$ | 4.66 | 2.000 | \$ | 9.32 |
| Excavate (7' W x 8.5" D x $1^{\prime} \mathrm{L}$ ) | LF | \$ | 6.35 | 0.184 | \$ | 1.17 |
| Dispose of excess material | CY | \$ | 9.60 | 0.184 | \$ | 1.77 |
| Compact trench surfface | CY | \$ | 3.72 | 0.129 | \$ | 0.48 |
| 1.5 " Wearing course (7' wide) | CY | \$ | 7.70 | 0.778 | \$ | 5.99 |
| 3 Cl Binder course (7' wide) | SY | \$ | 13.45 | 0.778 | \$ | 10.46 |
| 4" Base course (7' wide) | SY | \$ | 18.00 | 0.778 | \$ | 14.00 |
| Seal | SY | \$ | 3.01 | 0.111 | \$ | 0.33 |
| Hauling | SY | \$ | 9.60 | 0.184 | \$ | 1.77 |
| 12" DIP forcemain located in roadways |  |  |  |  | \$ | 183.00 |
| 12" DIP | LF | \$ | 70.00 | 1.000 | \$ | 70.00 |
| Excavation, installation, and restoration | LS | \$ | 113.00 | 1.000 | \$ | 113.00 |

## LOWER MAKEFIELD TOWNSHIP, BUCKS COUNTY, PA <br> SANITARY SEWER SYSTEM <br> UNIT PRICES IN 2020 DOLLARS

| DESCRIPTION | UNIT | UNIT PRICE |  | QTY/SYSTEM UNIT | PRICE SYSTEM |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Excavation, installation, and restoration for 12" diameter forcemain in roadways |  |  |  |  | \$ | 46.00 |
| Excavate Trench (6' deep) | CY | \$ | 6.35 | 1.481 | \$ | 9.40 |
| Crushed stone bedding | CY | \$ | 43.50 | 0.148 | \$ | 6.44 |
| Compact bedding | CY | \$ | 3.72 | 0.058 | \$ | 0.22 |
| Backfill trench w/suitable materials | CY | \$ | 3.03 | 1.783 | \$ | 5.40 |
| Compact fill material | CY | \$ | 3.72 | 0.093 | \$ | 0.35 |
| Dispose of excess fill material | CY | \$ | 9.60 | 1.481 | \$ | 14.22 |
| Pressure testing | LF | \$ | 3.75 | 1.000 | \$ | 3.75 |
| Televising | LF | \$ | 2.00 | 1.000 | \$ | 2.00 |
| Finish grading \& seeding | SY | \$ | 3.92 | 1.079 | \$ | 4.23 |
| 12" DIP forcemain located out of roadways |  |  |  |  | \$ | 116.00 |
| 12" DIP | LF | \$ | 70.00 | 1.000 | \$ | 70.00 |
| Excavation, installation, and restoration | LS | \$ | 46.00 | 1.000 | \$ | 46.00 |

## LOWER MAKEFIELD TOWNSHIP, BUCKS COUNTY, PA <br> SANITARY SEWER SYSTEM <br> UNIT PRICES IN 2020 DOLLARS

| DESCRIPTION | UNIT |  | PRICE | QTY/SYSTEM UNIT |  | STEM |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Excavation, installation, and restoration for 1.5" diameter low pressure sewer in roadways |  |  |  |  | \$ | 95.00 |
| Excavate Trench (4.83' deep) | CY | \$ | 6.38 | 0.894 | \$ | 5.70 |
| Crushed stone bedding | CY | \$ | 43.50 | 0.110 | \$ | 4.79 |
| Compact bedding | CY | \$ | 3.72 | 0.058 | \$ | 0.22 |
| Backfill trench w/2A stone | TN | \$ | 10.00 | 1.101 | \$ | 11.01 |
| Compact fill material | CY | \$ | 3.72 | 0.093 | \$ | 0.35 |
| Sawcut pavement | LF | \$ | 4.66 | 2.000 | \$ | 9.32 |
| Dispose of excess fill material | CY | \$ | 9.60 | 0.894 | \$ | 8.58 |
| Temp paving (5' wide) | SY | \$ | 10.25 | 0.556 | \$ | 5.70 |
| Temp paving hauling | CY | \$ | 9.60 | 0.031 | \$ | 0.30 |
| Pressure testing | LF | \$ | 3.75 | 1.000 | \$ | 3.75 |
| Sawcut pavement | LF | \$ | 4.66 | 2.000 | \$ | 9.32 |
| Excavate (7' W x 8.5" D x $1^{\prime} \mathrm{L}$ ) | LF | \$ | 6.35 | 0.184 | \$ | 1.17 |
| Dispose of excess material | CY | \$ | 9.60 | 0.184 | \$ | 1.77 |
| Compact trench surfface | CY | \$ | 3.72 | 0.129 | \$ | 0.48 |
| 1.5 " Wearing course (7' wide) | CY | \$ | 7.70 | 0.778 | \$ | 5.99 |
| 3 Cl Binder course (7' wide) | SY | \$ | 13.45 | 0.778 | \$ | 10.46 |
| 4" Base course (7' wide) | SY | \$ | 18.00 | 0.778 | \$ | 14.00 |
| Seal | SY | \$ | 3.01 | 0.111 | \$ | 0.33 |
| Hauling | SY | \$ | 9.60 | 0.184 | \$ | 1.77 |
| 1.5" PVC low pressure sewer located in roadways |  |  |  |  | \$ | 120.00 |
| 1.5" SDR-21 | LF | \$ | 30.00 | 1.000 | \$ | 25.00 |
| Excavation, installation, and restoration | LS | \$ | 95.00 | 1.000 | \$ | 95.00 |

## LOWER MAKEFIELD TOWNSHIP, BUCKS COUNTY, PA <br> SANITARY SEWER SYSTEM <br> UNIT PRICES IN 2020 DOLLARS

| DESCRIPTION | UNIT | UNIT PRICE |  | QTY/SYSTEM UNIT | PRICE SYSTEM |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Excavation, installation, and restoration for 1.5" diameter low pressure sewer out of roadways |  |  |  |  | \$ | 33.00 |
| Excavate Trench (4.83' deep) | CY | \$ | 6.48 | 0.894 | \$ | 5.79 |
| Crushed stone bedding | CY | \$ | 43.50 | 0.110 | \$ | 4.79 |
| Compact bedding | CY | \$ | 3.72 | 0.058 | \$ | 0.22 |
| Backfill trench w/suitable materials | CY | \$ | 3.03 | 1.101 | \$ | 3.34 |
| Compact fill material | CY | \$ | 3.72 | 0.093 | \$ | 0.35 |
| Dispose of excess fill material | CY | \$ | 9.60 | 0.894 | \$ | 8.58 |
| Pressure testing | LF | \$ | 3.75 | 1.000 | \$ | 3.75 |
| Televising | LF | \$ | 2.00 | 1.000 | \$ | 2.00 |
| Finish grading \& seeding | SY | \$ | 3.92 | 1.070 | \$ | 4.19 |
| 1.5" PVC low pressure sewer located out of roadways |  |  |  |  | \$ | 58.00 |
| 1.5" SDR-21 | LF | \$ | 30.00 | 1.000 | \$ | 25.00 |
| Excavation, installation, and restoration | LS | \$ | 33.00 | 1.000 | \$ | 33.00 |

## LOWER MAKEFIELD TOWNSHIP, BUCKS COUNTY, PA <br> SANITARY SEWER SYSTEM <br> UNIT PRICES IN 2020 DOLLARS

| DESCRIPTION | UNIT |  | PRICE | QTY/SYSTEM UNIT |  | STEM |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Excavation, installation, and restoration for 2" diameter low pressure sewer in roadways |  |  |  |  | \$ | 95.00 |
| Excavate Trench (4.83' deep) | CY | \$ | 6.38 | 0.894 | \$ | 5.70 |
| Crushed stone bedding | CY | \$ | 43.50 | 0.110 | \$ | 4.79 |
| Compact bedding | CY | \$ | 3.72 | 0.058 | \$ | 0.22 |
| Backfill trench w/2A stone | TN | \$ | 10.00 | 1.101 | \$ | 11.01 |
| Compact fill material | CY | \$ | 3.72 | 0.093 | \$ | 0.35 |
| Sawcut pavement | LF | \$ | 4.66 | 2.000 | \$ | 9.32 |
| Dispose of excess fill material | CY | \$ | 9.60 | 0.894 | \$ | 8.58 |
| Temp paving (5' wide) | SY | \$ | 10.25 | 0.556 | \$ | 5.70 |
| Temp paving hauling | CY | \$ | 9.60 | 0.031 | \$ | 0.30 |
| Pressure testing | LF | \$ | 3.75 | 1.000 | \$ | 3.75 |
| Sawcut pavement | LF | \$ | 4.66 | 2.000 | \$ | 9.32 |
| Excavate (7' W x 8.5" D x $1^{\prime} \mathrm{L}$ ) | LF | \$ | 6.35 | 0.184 | \$ | 1.17 |
| Dispose of excess material | CY | \$ | 9.60 | 0.184 | \$ | 1.77 |
| Compact trench surfface | CY | \$ | 3.72 | 0.129 | \$ | 0.48 |
| 1.5 " Wearing course (7' wide) | CY | \$ | 7.70 | 0.778 | \$ | 5.99 |
| 3 Cl Binder course (7' wide) | SY | \$ | 13.45 | 0.778 | \$ | 10.46 |
| 4" Base course (7' wide) | SY | \$ | 18.00 | 0.778 | \$ | 14.00 |
| Seal | SY | \$ | 3.01 | 0.111 | \$ | 0.33 |
| Hauling | SY | \$ | 9.60 | 0.184 | \$ | 1.77 |
| 2" PVC low pressure sewer located in roadways |  |  |  |  | \$ | 125.00 |
| 2" SDR-21 | LF | \$ | 30.00 | 1.000 | \$ | 30.00 |
| Excavation, installation, and restoration | LS | \$ | 95.00 | 1.000 | \$ | 95.00 |

## LOWER MAKEFIELD TOWNSHIP, BUCKS COUNTY, PA <br> SANITARY SEWER SYSTEM <br> UNIT PRICES IN 2020 DOLLARS

| DESCRIPTION | UNIT | UNIT PRICE |  | QTY/SYSTEM UNIT | PRICE SYSTEM |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Excavation, installation, and restoration for 2" diameter low pressure sewer out of roadways |  |  |  |  | \$ | 33.00 |
| Excavate Trench (4.83' deep) | CY | \$ | 6.48 | 0.894 | \$ | 5.79 |
| Crushed stone bedding | CY | \$ | 43.50 | 0.110 | \$ | 4.79 |
| Compact bedding | CY | \$ | 3.72 | 0.058 | \$ | 0.22 |
| Backfill trench w/suitable materials | CY | \$ | 3.03 | 1.101 | \$ | 3.34 |
| Compact fill material | CY | \$ | 3.72 | 0.093 | \$ | 0.35 |
| Dispose of excess fill material | CY | \$ | 9.60 | 0.894 | \$ | 8.58 |
| Pressure testing | LF | \$ | 3.75 | 1.000 | \$ | 3.75 |
| Televising | LF | \$ | 2.00 | 1.000 | \$ | 2.00 |
| Finish grading \& seeding | SY | \$ | 3.92 | 1.070 | \$ | 4.19 |
| 2" PVC low pressure sewer located out of roadways |  |  |  |  | \$ | 63.00 |
| 2" SDR-21 | LF | \$ | 30.00 | 1.000 | \$ | 30.00 |
| Excavation, installation, and restoration | LS | \$ | 33.00 | 1.000 | \$ | 33.00 |

APPENDIX III
COST ESTIMATES FOR PUMP STATIONS AND METER PITS

| BLACK ROCK PUMP STATION WET WELL DRY WELL POURED IN PLACE CONSTRUCTION COST ESTIMATE March 22, 2021 |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| ITEM <br> NUMBER | DESCRIPTION | QUANTITY | UNITS | UNIT PRICE |  | TOTAL cOSTS |
| BLACK ROCK PUMP STATION |  |  |  |  |  |  |
| 1.01.011.021.031.04 | Site Work |  |  |  |  |  |
|  | Site Grading and Clearing | 1 | LS | \$25,000.00 | \$ | 25,000.00 |
|  | Erosion and Sedimentation Control | 1 | LS | \$8,500.00 | \$ | 8,500.00 |
|  | Driveway | 1 | LS | \$15,000.00 | \$ | 15,000.00 |
|  | Final Grading and Seeding | 1 | LS | \$5,000.00 | \$ | 5,000.00 |
|  |  |  |  | Subtotal $=$ | \$ | 53,500.00 |
| 2.0 | Control Building Including Wet Well and Dry Well |  |  |  |  |  |
| 2.01 | Excavation and Backfill | 1 | LS | \$175,000.00 | \$ | 175,000.00 |
| 2.02 | Wet Well and Dry Well Structure | 1 | LS | \$545,000.00 | \$ | 545,000.00 |
| 2.03 | Control Building Above Wet Well and Dry Well | 1 | LS | \$137,500.00 | \$ | 137,500.00 |
| 2.04 | Interior Stairs | 1 | LS | \$22,500.00 | \$ | 22,500.00 |
| 2.05 | Plumbing and HVAC | 1 | LS | \$32,500.00 | \$ | 32,500.00 |
|  |  |  |  | Subtotal = | \$ | 912,500.00 |
| 3.0 | Wet Well and Valve Vault |  |  |  |  |  |
| 3.01 | Pumps, 20 HP | 1 | LS | \$87,500.00 | \$ | 87,500.00 |
| 3.02 | Controls | 1 | LS | \$68,500.00 | \$ | 68,500.00 |
| 3.03 | Piping and Valves (Dry Welll) | 1 | LS | \$78,500.00 | \$ | 78,500.00 |
| 3.04 | Pump Hoist | 1 | LS | \$12,750.00 | \$ | 12,750.00 |
| 3.05 | Bar Screen | 1 | LS | \$14,500.00 | \$ | 14,500.00 |
|  |  |  |  | Subtotal $=$ | \$ | 261,750.00 |
| 4.0 | Electrical |  |  |  |  |  |
| 4.01 | Electric Service | 1 | LS | \$12,500.00 | \$ | 12,500.00 |
| 4.02 | Interior Wiring and Pump Power | 1 | LS | \$38,725.00 | \$ | 38,725.00 |
| 4.03 | Interior Lighting | 1 | LS | \$18,500.00 | \$ | 18,500.00 |
| 4.04 | Automatic Transfer Switch | 1 | LS | \$12,500.00 | \$ | 12,500.00 |
| 4.05 | 45 KW Generator and Pad | 1 | LS | \$75,000.00 | \$ | 75,000.00 |
| 4.06 | Site Lighting | 1 | EA | \$4,500.00 | \$ | 4,500.00 |
| 4.07 | Electrical Gear (Wire, Conduit, LP Panel, etc.) | 1 | EA | \$85,000.00 | \$ | 85,000.00 |
|  |  |  |  | Subtotal $=$ | \$ | 246,725.00 |
|  |  | Tot | al Con | tion Cost Estimate | \$ | 1,474,475.00 |


| CHANITCLEER PUMP STATION SUBMERSIBLE STYLE PUMP STATION WITH TWO PUMPS CONSTRUCTION COST ESTIMATE March 22, 2021 |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| $\begin{array}{\|c\|} \hline \text { ITEM } \\ \text { NUMBER } \\ \hline \end{array}$ | DESCRIPTION | QUANTITY | UNITS | UNIT PRICE |  | $\begin{aligned} & \hline \text { TOTAL } \\ & \text { COSTS } \end{aligned}$ |
| CHANITCLEER PUMP STATION |  |  |  |  |  |  |
| 1.0 Site Work |  |  |  |  |  |  |
| 1.01 | Site Grading and Clearing | 1 | LS | \$12,500.00 | \$ | 12,500.00 |
| 1.02 | Erosion and Sedimentation Control | 1 | LS | \$5,000.00 | \$ | 5,000.00 |
| 1.03 | Driveway | 1 | LS | \$30,000.00 | \$ | 30,000.00 |
| 1.05 | Fencing and Gate | 1 | LS | \$12,500.00 | \$ | 12,500.00 |
| 1.06 | 1" K Copper Water Service with Yard Hydrant | 1 | LS | \$2,000.00 | \$ | 2,000.00 |
| 1.07 | Final Grading and Seeding | 1 | LS | \$5,000.00 | \$ | 5,000.00 |
|  |  |  |  | Subtotal $=$ | \$ | 67,000.00 |
| 2.0 | Control Enclosure |  |  |  |  |  |
| 2.01 | Foundation | 1 | LS | \$4,500.00 | \$ | 4,500.00 |
| 2.02 | Control Enclosure | 1 | LS | \$12,500.00 | \$ | 12,500.00 |
| 2.03 | USEMCO Control Enclosure | 1 | LS | \$12,500.00 | \$ | 12,500.00 |
|  |  |  |  | Subtotal $=$ | \$ | 29,500.00 |
| 3.0 | Wet Well (Valves in Wet Well) |  |  |  |  |  |
| 3.01 | Excavation and Backfill | 1 | LS | \$24,500.00 | \$ | 24,500.00 |
| 3.02 | Precast Concrete Wet Well | 1 | LS | \$22,500.00 | \$ | 22,500.00 |
| 3.03 | Pumps, 3 HP and Controls | 1 | LS | \$27,500.00 | \$ | 27,500.00 |
| 3.04 | Piping and Valves (Wetwell) | 1 | LS | \$4,500.00 | \$ | 4,500.00 |
| 3.05 | Pump Hoist | 1 | LS | \$1,250.00 | \$ | 1,250.00 |
|  |  |  |  | Subtotal $=$ | \$ | 80,250.00 |
| 4.0 | Electrical |  |  |  |  |  |
| 4.01 | Power and Control Wiring | 1 | LS | \$18,500.00 | \$ | 18,500.00 |
| 4.02 | Electric Service | 1 | LS | \$7,500.00 | \$ | 7,500.00 |
| 4.03 | Manual Transfer Switch | 1 | LS | \$3,500.00 | \$ | 3,500.00 |
| 4.04 | Portable Generator | 1 | LS | \$24,500.00 | \$ | 24,500.00 |
| 4.05 | Site Lighting | 1 | EA | \$2,500.00 | \$ | 2,500.00 |
| 4.06 | Electrical Gear (Wire, Conduit, LP Panel, etc.) | 1 | EA | \$12,500.00 | \$ | 12,500.00 |
|  |  |  |  | Subtotal $=$ | \$ | 69,000.00 |
|  |  | Tota | al Con | ion Cost Estimate | \$ | 245,750.00 |


| CLEARVIEW PUMP STATION <br> SUBMERSIBLE STYLE PUMP STATION WITH TWO PUMPS CONSTRUCTION COST ESTIMATE <br> March 22, 2021 |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| $\square$ NUMBER | DESCRIPTION | UNITS | UNIT PRICE |  | TOTAL COSTS |
| CLEARVIEW PUMP STATION |  |  |  |  |  |
| 1.0 | Site Work |  |  |  |  |
| 1.01 | Site Grading and Clearing | LS | \$12,500.00 | \$ | 12,500.00 |
| 1.02 | Erosion and Sedimentation Control | LS | \$5,000.00 | \$ | 5,000.00 |
| 1.03 | Driveway | LS | \$12,500.00 | \$ | 12,500.00 |
| 1.05 | Fencing and Gate | LS | \$8,500.00 | \$ | 8,500.00 |
| 1.06 | 1" K Copper Water Service with Yard Hydrant | LS | \$2,000.00 | \$ | 2,000.00 |
| 1.07 | Final Grading and Seeding | LS | \$5,000.00 | \$ | 5,000.00 |
|  |  |  | Subtotal $=$ | \$ | 45,500.00 |
| 2.0 | Control Building |  |  |  |  |
| 2.01 | Foundation | LS | \$12,500.00 | \$ | 12,500.00 |
| 2.02 | Control Building | LS | \$45,000.00 | \$ | 45,000.00 |
| 2.03 | Plumbing and HVAC | LS | \$8,500.00 | \$ | 8,500.00 |
|  |  |  | Subtotal $=$ | \$ | 66,000.00 |
| 3.0 | Wet Well and Valve Vault |  |  |  |  |
| 3.01 | Excavation and Backfill | LS | \$85,000.00 | \$ | 85,000.00 |
| 3.02 | Precast Concrete Wet Well | LS | \$38,000.00 | \$ | 38,000.00 |
| 3.03 | Pumps, 20 HP and Controls | LS | \$175,000.00 | \$ | 175,000.00 |
| 3.04 | Piping (Wetwell) | LS | \$8,500.00 | \$ | 8,500.00 |
| 3.05 | Pump Hoist | LS | \$3,500.00 | \$ | 3,500.00 |
| 3.06 | Bar Screen | LS | \$3,500.00 | \$ | 3,500.00 |
| 3.07 | Precast Concrete Valve Vault | LS | \$25,000.00 | \$ | 25,000.00 |
| 3.08 | Vault Piping and Valves | LS | \$17,000.00 | \$ | 17,000.00 |
|  |  |  | Subtotal $=$ | \$ | 355,500.00 |
| 4.0 | Electrical |  |  |  |  |
| 4.01 | Control Building Electrical | LS | \$12,500.00 | \$ | 12,500.00 |
| 4.02 | Electric Service | LS | \$7,500.00 | \$ | 7,500.00 |
| 4.03 | Automatic Transfer Switch | LS | \$8,500.00 | \$ | 8,500.00 |
| 4.04 | 150 KW Generator | LS | \$125,000.00 | \$ | 125,000.00 |
| 4.05 | Site Lighting | EA | \$2,500.00 | \$ | 2,500.00 |
| 4.06 | Electrical Gear (Wire, Conduit, LP Panel, etc.) | EA | \$40,000.00 | \$ | 40,000.00 |
|  |  |  | Subtotal $=$ | \$ | 196,000.00 |
|  |  | al Con | ion Cost Estimate | \$ | 663,000.00 |



| FOX HILL PUMP STATIONUSEMCO STEEL DRY WELL AND CONCRETE WET WELLCONSTRUCTION COST ESTIMATEMarch 22, 2021 |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| $\begin{array}{\|c\|} \hline \text { ITEM } \\ \text { NUMBER } \\ \hline \end{array}$ | DESCRIPTION | QUANTITY | UNITS | UNIT PRICE |  | $\begin{aligned} & \hline \text { TOTAL } \\ & \text { COSTS } \end{aligned}$ |
| FOX HILL PUMP STATION |  |  |  |  |  |  |
| 1.0 S | Site Work |  |  |  |  |  |
| 1.01 | Site Grading and Clearing | 1 | LS | \$12,500.00 | \$ | 12,500.00 |
| 1.02 | Erosion and Sedimentation Control | 1 | LS | \$5,000.00 | \$ | 5,000.00 |
| 1.03 | Driveway | 1 | LS | \$12,500.00 | \$ | 12,500.00 |
| 1.05 | Fencing and Gate | 1 | LS | \$8,500.00 | \$ | 8,500.00 |
| 1.06 | 1" K Copper Water Service with Yard Hydrant | 1 | LS | \$2,000.00 | \$ | 2,000.00 |
| 1.07 | Final Grading and Seeding | 1 | LS | \$5,000.00 | \$ | 5,000.00 |
|  |  |  |  | Subtotal $=$ | \$ | 45,500.00 |
| 2.0 | Control Building |  |  |  |  |  |
| 2.01 | Foundation | 1 | LS | \$12,500.00 | \$ | 12,500.00 |
| 2.02 | Control Building | 1 | LS | \$35,000.00 | \$ | 35,000.00 |
| 2.03 | Plumbing and HVAC | 1 | LS | \$8,500.00 | \$ | 8,500.00 |
|  |  |  |  | Subtotal $=$ | \$ | 56,000.00 |
| 3.0 | Wet Well and Valve Vault |  |  |  |  |  |
| 3.01 | Excavation and Backfill | 1 | LS | \$125,000.00 | \$ | 125,000.00 |
| 3.02 | Precast Concrete Wet Well | 1 | LS | \$47,500.00 | \$ | 47,500.00 |
| 3.03 | Pumps, 25 HP and Controls | 1 | LS | \$175,000.00 | \$ | 175,000.00 |
| 3.04 | Dry Well Piping | 1 | LS | \$27,500.00 | \$ | 27,500.00 |
| 3.05 | Prefabricated Steel Dry Well | 1 | LS | \$65,000.00 | \$ | 65,000.00 |
| 3.06 | Bar Screen | 1 | LS | \$4,750.00 | \$ | 4,750.00 |
|  |  |  |  | Subtotal $=$ | \$ | 444,750.00 |
| 4.0 | Electrical |  |  |  |  |  |
| 4.01 | Control Building Electrical | 1 | LS | \$18,500.00 | \$ | 18,500.00 |
| 4.02 | Electric Service | 1 | LS | \$7,500.00 | \$ | 7,500.00 |
| 4.03 | Automatic Transfer Switch | 1 | LS | \$8,500.00 | \$ | 8,500.00 |
| 4.04 | 75 KW Generator | , | LS | \$85,000.00 | \$ | 85,000.00 |
| 4.05 | Site Lighting | 1 | EA | \$2,500.00 | \$ | 2,500.00 |
| 4.06 | Electrical Gear (Wire, Conduit, LP Panel, etc.) | 1 | EA | \$47,250.00 | \$ | 47,250.00 |
|  |  |  |  | Subtotal = | \$ | 169,250.00 |
|  |  | Tota | al Con | ion Cost Estimate | \$ | 715,500.00 |


| MAPLEVALE PUMP STATION SUBMERSIBLE STYLE PUMP STATION WITH TWO PUMPS CONSTRUCTION COST ESTIMATE March 22, 2021 |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| ITEM <br> NUMBER | DESCRIPTION | QUANTITY | UNITS | UNIT PRICE |  | $\begin{aligned} & \text { TOTAL } \\ & \text { COSTS } \end{aligned}$ |
| MAPLEVALE PUMP STATION |  |  |  |  |  |  |
| 1.0 S | Site Work |  |  |  |  |  |
| 1.01 | Site Grading and Clearing | 1 | LS | \$12,500.00 | \$ | 12,500.00 |
| 1.02 | Erosion and Sedimentation Control | 1 | LS | \$5,000.00 | \$ | 5,000.00 |
| 1.03 | Driveway | 1 | LS | \$6,500.00 | \$ | 6,500.00 |
| 1.05 | Fencing and Gate | 1 | LS | \$8,500.00 | \$ | 8,500.00 |
| 1.06 | 1" K Copper Water Service with Yard Hydrant | 1 | LS | \$2,000.00 | \$ | 2,000.00 |
| 1.07 | Final Grading and Seeding | 1 | LS | \$5,000.00 | \$ | 5,000.00 |
|  |  |  |  | Subtotal $=$ | \$ | 39,500.00 |
| 2.0 | Control Enclosure |  |  |  |  |  |
| 2.01 | Foundation | 1 | LS | \$4,500.00 | \$ | 4,500.00 |
| 2.02 | Control Enclosure | 1 | LS | \$3,500.00 | \$ | 3,500.00 |
| 2.03 | USEMCO Control Enclosure | 1 | LS | \$12,500.00 | \$ | 12,500.00 |
|  |  |  |  | Subtotal $=$ | \$ | 20,500.00 |
| 3.0 | Wet Well (Valves in Wet Well) |  |  |  |  |  |
| 3.01 | Excavation and Backfill | 1 | LS | \$24,500.00 | \$ | 24,500.00 |
| 3.02 | Precast Concrete Wet Well | 1 | LS | \$22,500.00 | \$ | 22,500.00 |
| 3.03 | Pumps, 3 HP and Controls | 1 | LS | \$27,500.00 | \$ | 27,500.00 |
| 3.04 | Piping and Valves (Wetwell) | 1 | LS | \$4,500.00 | \$ | 4,500.00 |
| 3.05 | Pump Hoist | 1 | LS | \$1,250.00 | \$ | 1,250.00 |
|  |  |  |  | Subtotal $=$ | \$ | 80,250.00 |
| 4.0 | Electrical |  |  |  |  |  |
| 4.01 | Power and Control Wiring | 1 | LS | \$18,500.00 | \$ | 18,500.00 |
| 4.02 | Electric Service | 1 | LS | \$7,500.00 | \$ | 7,500.00 |
| 4.03 | Manual Transfer Switch | 1 | LS | \$3,500.00 | \$ | 3,500.00 |
| 4.04 | Portable Generator | 1 | LS | \$24,500.00 | \$ | 24,500.00 |
| 4.05 | Site Lighting | 1 | EA | \$2,500.00 | \$ | 2,500.00 |
| 4.06 | Electrical Gear (Wire, Conduit, LP Panel, etc.) | 1 | EA | \$12,500.00 | \$ | 12,500.00 |
|  |  |  |  | Subtotal = | \$ | 69,000.00 |
|  |  | Tot | al Con | ion Cost Estimate | \$ | 209,250.00 |


| YARDLEY OAKS PUMP STATIONUSEMCO STEEL DRY WELL AND CONCRETE WET WELLCONSTRUCTION COST ESTIMATEMarch 22, 2021 |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| ITEM <br> NUMBER | DESCRIPTION |  | UNITS | UNIT PRICE |  | $\begin{aligned} & \text { TOTAL } \\ & \text { COSTS } \end{aligned}$ |
| YARDLEY OAKS PUMP STATION |  |  |  |  |  |  |
| 1.0 Site Work |  |  |  |  |  |  |
| 1.01 | Site Grading and Clearing |  | LS | \$22,500.00 | \$ | 22,500.00 |
| 1.02 | Erosion and Sedimentation Control |  | LS | \$5,000.00 | \$ | 5,000.00 |
| 1.03 | Driveway |  | LS | \$18,500.00 | \$ | 18,500.00 |
| 1.05 | Fencing and Gate |  | LS | \$12,500.00 | \$ | 12,500.00 |
| 1.06 | 1" K Copper Water Service with Yard Hydrant |  | LS | \$2,000.00 | \$ | 2,000.00 |
| 1.07 | Final Grading and Seeding |  | LS | \$8,500.00 | \$ | 8,500.00 |
|  |  |  |  | Subtotal $=$ | \$ | 69,000.00 |
| 2.0 | Control Building |  |  |  |  |  |
| 2.01 | Foundation |  | LS | \$12,500.00 | \$ | 12,500.00 |
| 2.02 | Control Building |  | LS | \$45,000.00 | \$ | 45,000.00 |
| 2.03 | Plumbing and HVAC |  | LS | \$8,500.00 | \$ | 8,500.00 |
|  |  |  |  | Subtotal $=$ | \$ | 66,000.00 |
| 3.0 | Wet Well and Valve Vault |  |  |  |  |  |
| 3.01 | Excavation and Backfill |  | LS | \$105,000.00 | \$ | 105,000.00 |
| 3.02 | Precast Concrete Wet Well |  | LS | \$38,500.00 | \$ | 38,500.00 |
| 3.03 | Pumps, 7.5 HP and Controls |  | LS | \$105,000.00 | \$ | 105,000.00 |
| 3.04 | Dry Well Piping |  | LS | \$27,500.00 | \$ | 27,500.00 |
| 3.05 | Prefabricated Steel Dry Well |  | LS | \$55,000.00 | \$ | 55,000.00 |
| 3.06 | Bar Screen |  | LS | \$4,750.00 | \$ | 4,750.00 |
|  |  |  |  | Subtotal $=$ | \$ | 335,750.00 |
| 4.0 | Electrical |  |  |  |  |  |
| 4.01 | Control Building Electrical |  | LS | \$18,500.00 | \$ | 18,500.00 |
| 4.02 | Electric Service |  | LS | \$7,500.00 | \$ | 7,500.00 |
| 4.03 | Automatic Transfer Switch |  | LS | \$8,500.00 | \$ | 8,500.00 |
| 4.04 | 80 KW Generator |  | LS | \$92,500.00 | \$ | 92,500.00 |
| 4.05 | Site Lighting |  | EA | \$2,500.00 | \$ | 2,500.00 |
| 4.06 | Electrical Gear (Wire, Conduit, LP Panel, etc.) |  | EA | \$47,250.00 | \$ | 47,250.00 |
|  |  |  |  | Subtotal $=$ | \$ | 176,750.00 |
|  |  |  | al Con | ion Cost Estimate | \$ | 647,500.00 |


| SHERWOOD PARK PUMP STATION WET WELL DRY WELL POURED IN PLACE CONSTRUCTION COST ESTIMATE March 22, 2021 |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| ITEM | DESCRIPTION |  | UNITS | UNIT PRICE |  | TOTAL costs |
| SHERWOOD PARK PUMP STATION |  |  |  |  |  |  |
| 1.01.011.021.031.04 | Site Work |  |  |  |  |  |
|  | Site Grading and Clearing |  | LS | \$25,000.00 | \$ | 25,000.00 |
|  | Erosion and Sedimentation Control |  | LS | \$8,500.00 | \$ | 8,500.00 |
|  | Driveway |  | LS | \$15,000.00 | \$ | 15,000.00 |
|  | Final Grading and Seeding |  | LS | \$5,000.00 | \$ | 5,000.00 |
|  |  |  |  | Subtotal $=$ | \$ | 53,500.00 |
| 2.0 | Control Building Including Wet Well and Dry Well |  |  |  |  |  |
| 2.01 | Excavation and Backfill |  | LS | \$145,000.00 | \$ | 145,000.00 |
| 2.02 | Wet Well and Dry Well Structure |  | LS | \$475,000.00 | \$ | 475,000.00 |
| 2.03 | Control Building Above Wet Well and Dry Well |  | LS | \$115,000.00 | \$ | 115,000.00 |
| 2.04 | Interior Stairs |  | LS | \$18,500.00 | \$ | 18,500.00 |
| 2.05 | Plumbing and HVAC |  | LS | \$26,000.00 | \$ | 26,000.00 |
|  |  |  |  | Subtotal $=$ | \$ | 779,500.00 |
| 3.0 | Wet Well and Valve Vault |  |  |  |  |  |
| 3.01 | Pumps, 15 HP |  | LS | \$77,500.00 | \$ | 77,500.00 |
| 3.02 | Controls |  | LS | \$68,500.00 | \$ | 68,500.00 |
| 3.03 | Piping and Valves (Dry Welll) |  | LS | \$78,500.00 | \$ | 78,500.00 |
| 3.04 | Pump Hoist |  | LS | \$12,750.00 | \$ | 12,750.00 |
| 3.05 | Bar Screen |  | LS | \$14,500.00 | \$ | 14,500.00 |
|  |  |  |  | Subtotal $=$ | \$ | 251,750.00 |
| 4.0 | Electrical |  |  |  |  |  |
| 4.01 | Electric Service |  | LS | \$12,500.00 | \$ | 12,500.00 |
| 4.02 | Interior Wiring and Pump Power |  | LS | \$36,250.00 | \$ | 36,250.00 |
| 4.03 | Interior Lighting |  | LS | \$18,500.00 | \$ | 18,500.00 |
| 4.04 | Automatic Transfer Switch |  | LS | \$12,500.00 | \$ | 12,500.00 |
| 4.05 | 45 KW Generator and Pad |  | LS | \$75,000.00 | \$ | 75,000.00 |
| 4.06 | Site Lighting |  | EA | \$4,500.00 | \$ | 4,500.00 |
| 4.07 | Electrical Gear (Wire, Conduit, LP Panel, etc.) |  | EA | \$74,000.00 | \$ | 74,000.00 |
|  |  |  |  | Subtotal $=$ | \$ | 233,250.00 |
|  |  |  | tal Con | ion Cost Estimate | \$ | 1,318,000.00 |


| SILVER LAKE PUMP STATION WET WELL DRY WELL POURED IN PLACE CONSTRUCTION COST ESTIMATE March 22, 2021 |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| ITEM <br> NUMBER | DESCRIPTION | QUANTITY | UNITS | UNIT PRICE |  | $\begin{aligned} & \text { TOTAL } \\ & \text { COSTS } \end{aligned}$ |
| SILVER LAKE PUMP STATION |  |  |  |  |  |  |
| 1.0 Site Work |  |  |  |  |  |  |
| 1.01 | Site Grading and Clearing | 1 | LS | \$25,000.00 | \$ | 25,000.00 |
| 1.02 | Erosion and Sedimentation Control | 1 | LS | \$8,500.00 | \$ | 8,500.00 |
| 1.03 | Driveway | 1 | LS | \$15,000.00 | \$ | 15,000.00 |
| 1.04 | Final Grading and Seeding | 1 | LS | \$5,000.00 | \$ | 5,000.00 |
|  |  |  |  | Subtotal $=$ | \$ | 53,500.00 |
| 2.0 | Control Building Including Wet Well and Dry Well |  |  |  |  |  |
| 2.01 | Excavation and Backfill | 1 | LS | \$245,000.00 | \$ | 245,000.00 |
| 2.02 | Wet Well and Dry Well Structure | 1 | LS | \$625,000.00 | \$ | 625,000.00 |
| 2.03 | Control Building Above Wet Well and Dry Well | 1 | LS | \$165,750.00 | \$ | 165,750.00 |
| 2.04 | Interior Stairs | 1 | LS | \$38,500.00 | \$ | 38,500.00 |
| 2.05 | Plumbing and HVAC | 1 | LS | \$42,500.00 | \$ | 42,500.00 |
|  |  |  |  | Subtotal $=$ | \$ | 1,116,750.00 |
| 3.0 | Wet Well and Valve Vault |  |  |  |  |  |
| 3.01 | Pumps, 15 HP (Three Pumps) | 1 | LS | \$132,500.00 | \$ | 132,500.00 |
| 3.02 | Controls | 1 | LS | \$78,500.00 | \$ | 78,500.00 |
| 3.03 | Piping and Valves (Dry Welll) | 1 | LS | \$112,500.00 | \$ | 112,500.00 |
| 3.04 | Pump Hoist | 1 | LS | \$22,500.00 | \$ | 22,500.00 |
| 3.05 | Bar Screen | 1 | LS | \$14,500.00 | \$ | 14,500.00 |
|  |  |  |  | Subtotal = | \$ | 360,500.00 |
| 4.0 | Electrical |  |  |  |  |  |
| 4.01 | Electric Service | 1 | LS | \$12,500.00 | \$ | 12,500.00 |
| 4.02 | Interior Wiring and Pump Power | 1 | LS | \$56,000.00 | \$ | 56,000.00 |
| 4.03 | Interior Lighting | 1 | LS | \$22,500.00 | \$ | 22,500.00 |
| 4.04 | Automatic Transfer Switch | 1 | LS | \$12,500.00 | \$ | 12,500.00 |
| 4.05 | 80 KW Generator and Pad | 1 | LS | \$92,500.00 | \$ | 92,500.00 |
| 4.06 | Site Lighting | 1 | EA | \$4,500.00 | \$ | 4,500.00 |
| 4.07 | Electrical Gear (Wire, Conduit, LP Panel, etc.) | 1 | EA | \$105,000.00 | \$ | 105,000.00 |
|  |  |  |  | Subtotal $=$ | \$ | 305,500.00 |
|  |  | Tot | tal Con | ion Cost Estimate | \$ | 1,836,250.00 |


| STACKHOUSE PUMP STATIONSUBMERSIBLE STYLE PUMP STATION WITH TWO PUMPSCONSTRUCTION COST ESTIMATEMarch 22, 2021 |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| ITEM NUMBER | DESCRIPTION |  | UNITS | UNIT PRICE |  | TOTAL COSTS |
| STACKHOUSE PUMP STATION |  |  |  |  |  |  |
| 1.0 | Site Work |  |  |  |  |  |
| 1.01 | Site Grading and Clearing |  | LS | \$20,000.00 | \$ | 20,000.00 |
| 1.02 | Erosion and Sedimentation Control |  | LS | \$5,000.00 | \$ | 5,000.00 |
| 1.03 | Driveway |  | LS | \$20,000.00 | \$ | 20,000.00 |
| 1.05 | Fencing and Gate |  | LS | \$15,000.00 | \$ | 15,000.00 |
| 1.06 | 1" K Copper Water Service with Yard Hydrant |  | LS | \$2,000.00 | \$ | 2,000.00 |
| 1.07 | Final Grading and Seeding |  | LS | \$5,000.00 | \$ | 5,000.00 |
|  |  |  |  | Subtotal $=$ | \$ | 67,000.00 |
| 2.0 | Control Building |  |  |  |  |  |
| 2.01 | Foundation |  | LS | \$12,500.00 | \$ | 12,500.00 |
| 2.02 | Control Building |  | LS | \$35,000.00 | \$ | 35,000.00 |
| 2.03 | Plumbing and HVAC |  | LS | \$8,500.00 | \$ | 8,500.00 |
|  |  |  |  | Subtotal $=$ | \$ | 56,000.00 |
| 3.0 | Wet Well and Valve Vault |  |  |  |  |  |
| 3.01 | Excavation and Backfill |  | LS | \$35,000.00 | \$ | 35,000.00 |
| 3.02 | Precast Concrete Wet Well |  | LS | \$38,000.00 | \$ | 38,000.00 |
| 3.03 | Pumps, 11 HP and Controls |  | LS | \$156,200.00 | \$ | 156,200.00 |
| 3.04 | Piping (Wetwell) |  | LS | \$7,500.00 | \$ | 7,500.00 |
| 3.05 | Pump Hoist |  | LS | \$3,500.00 | \$ | 3,500.00 |
| 3.06 | Sewage Grinder |  | LS | \$40,000.00 | \$ | 40,000.00 |
| 3.07 | Precast Concrete Valve Vault |  | LS | \$25,000.00 | \$ | 25,000.00 |
| 3.08 | Vault Piping and Valves |  | LS | \$17,000.00 | \$ | 17,000.00 |
| 3.09 | Flow Meter and Recorder |  | LS | \$9,000.00 | \$ | 9,000.00 |
|  |  |  |  | Subtotal $=$ | \$ | 331,200.00 |
| 4.0 | Electrical |  |  |  |  |  |
| 4.01 | Control Building Electrical |  | LS | \$9,500.00 | \$ | 9,500.00 |
| 4.02 | Electric Service |  | LS | \$7,500.00 | \$ | 7,500.00 |
| 3.03 | Automatic Transfer Switch |  | LS | \$8,500.00 | \$ | 8,500.00 |
| 4.04 | Generator and Pad |  | LS | \$50,000.00 | \$ | 50,000.00 |
| 4.05 | Site Lighting |  | EA | \$2,500.00 | \$ | 2,500.00 |
| 4.06 | Electrical Gear (Wire, Conduit, LP Panel, etc.) |  | EA | \$40,000.00 | \$ | 40,000.00 |
|  |  |  |  | Subtotal $=$ | \$ | 118,000.00 |



| MILL ROAD ESTATES PUMP STATION <br> SUBMERSIBLE STYLE PUMP STATION WITH TWO PUMPS CONSTRUCTION COST ESTIMATE <br> March 22, 2021 |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| ITEM <br> NUMBER | DESCRIPTION |  | UNITS | UNIT PRICE |  | TOTAL COSTS |
| MILL ROAD ESTATES PUMP STATION |  |  |  |  |  |  |
| 1.0 | Site Work |  |  |  |  |  |
| 1.01 | Site Grading and Clearing |  | LS | \$12,500.00 | \$ | 12,500.00 |
| 1.02 | Erosion and Sedimentation Control |  | LS | \$5,000.00 | \$ | 5,000.00 |
| 1.03 | Driveway |  | LS | \$12,500.00 | \$ | 12,500.00 |
| 1.05 | Fencing and Gate |  | LS | \$8,500.00 | \$ | 8,500.00 |
| 1.06 | 1" K Copper Water Service with Yard Hydrant |  | LS | \$2,000.00 | \$ | 2,000.00 |
| 1.07 | Final Grading and Seeding |  | LS | \$5,000.00 | \$ | 5,000.00 |
|  |  |  |  | Subtotal $=$ | \$ | 45,500.00 |
| 2.0 | Control Building |  |  |  |  |  |
| 2.01 | Foundation |  | LS | \$12,500.00 | \$ | 12,500.00 |
| 2.02 | Control Building |  | LS | \$45,000.00 | \$ | 45,000.00 |
| 2.03 | Plumbing and HVAC |  | LS | \$8,500.00 | \$ | 8,500.00 |
|  |  |  |  | Subtotal $=$ | \$ | 66,000.00 |
| 3.0 | Wet Well and Valve Vault |  |  |  |  |  |
| 3.01 | Excavation and Backfill |  | LS | \$85,000.00 | \$ | 85,000.00 |
| 3.02 | Precast Concrete Wet Well |  | LS | \$38,000.00 | \$ | 38,000.00 |
| 3.03 | Pumps, 30 HP and Controls |  | LS | \$195,000.00 | \$ | 195,000.00 |
| 3.04 | Piping (Wetwell) |  | LS | \$8,500.00 | \$ | 8,500.00 |
| 3.05 | Pump Hoist |  | LS | \$3,500.00 | \$ | 3,500.00 |
| 3.06 | Bar Screen |  | LS | \$3,500.00 | \$ | 3,500.00 |
| 3.07 | Precast Concrete Valve Vault |  | LS | \$25,000.00 | \$ | 25,000.00 |
| 3.08 | Vault Piping and Valves |  | LS | \$17,000.00 | \$ | 17,000.00 |
|  |  |  |  | Subtotal $=$ | \$ | 375,500.00 |
| 4.0 | Electrical |  |  |  |  |  |
| 4.01 | Control Building Electrical |  | LS | \$12,500.00 | \$ | 12,500.00 |
| 4.02 | Electric Service |  | LS | \$7,500.00 | \$ | 7,500.00 |
| 4.03 | Automatic Transfer Switch |  | LS | \$8,500.00 | \$ | 8,500.00 |
| 4.04 | 60 KW Generator |  | LS | \$72,500.00 | \$ | 72,500.00 |
| 4.05 | Site Lighting |  | EA | \$2,500.00 | \$ | 2,500.00 |
| 4.06 | Electrical Gear (Wire, Conduit, LP Panel, etc.) |  | EA | \$40,000.00 | \$ | 40,000.00 |
|  |  |  |  | Subtotal $=$ | \$ | 143,500.00 |
|  |  |  | al Con | ion Cost Estimate | \$ | 630,500.00 |


| BROOKSTONE PUMP STATIONUSEMCO STEEL DRY WELL AND CONCRETE WET WELLCONSTRUCTION COST ESTIMATEMarch 22, 2021 |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| $\begin{array}{\|c\|} \hline \text { ITEM } \\ \text { NUMBER } \\ \hline \end{array}$ | DESCRIPTION |  | UNITS | UNIT PRICE |  | TOTAL COSTS |
| BROOKSTONE PUMP STATION |  |  |  |  |  |  |
| 1.0 Site Work |  |  |  |  |  |  |
| 1.01 | Site Grading and Clearing |  | LS | \$18,500.00 | \$ | 18,500.00 |
| 1.02 | Erosion and Sedimentation Control |  | LS | \$5,000.00 | \$ | 5,000.00 |
| 1.03 | Driveway |  | LS | \$18,500.00 | \$ | 18,500.00 |
| 1.05 | Fencing and Gate |  | LS | \$12,500.00 | \$ | 12,500.00 |
| 1.06 | 1" K Copper Water Service with Yard Hydrant |  | LS | \$2,000.00 | \$ | 2,000.00 |
| 1.07 | Final Grading and Seeding |  | LS | \$4,500.00 | \$ | 4,500.00 |
|  |  |  |  | Subtotal $=$ | \$ | 61,000.00 |
| 2.0 | Control Building |  |  |  |  |  |
| 2.01 | Foundation |  | LS | \$14,500.00 | \$ | 14,500.00 |
| 2.02 | Control Building |  | LS | \$45,000.00 | \$ | 45,000.00 |
| 2.03 | Plumbing and HVAC |  | LS | \$8,500.00 | \$ | 8,500.00 |
|  |  |  |  | Subtotal $=$ | \$ | 68,000.00 |
| 3.0 | Wet Well and Valve Vault |  |  |  |  |  |
| 3.01 | Excavation and Backfill |  | LS | \$105,000.00 | \$ | 105,000.00 |
| 3.02 | Precast Concrete Wet Well |  | LS | \$38,500.00 | \$ | 38,500.00 |
| 3.03 | Pumps, 15 HP and Controls |  | LS | \$125,000.00 | \$ | 125,000.00 |
| 3.04 | Dry Well Piping |  | LS | \$27,500.00 | \$ | 27,500.00 |
| 3.05 | Prefabricated Steel Dry Well |  | LS | \$55,000.00 | \$ | 55,000.00 |
| 3.06 | Bar Screen |  | LS | \$4,750.00 | \$ | 4,750.00 |
|  |  |  |  | Subtotal $=$ | \$ | 355,750.00 |
| 4.0 | Electrical |  |  |  |  |  |
| 4.01 | Control Building Electrical |  | LS | \$18,500.00 | \$ | 18,500.00 |
| 4.02 | Electric Service |  | LS | \$7,500.00 | \$ | 7,500.00 |
| 4.03 | Automatic Transfer Switch |  | LS | \$8,500.00 | \$ | 8,500.00 |
| 4.04 | 50 KW Generator |  | LS | \$65,000.00 | \$ | 65,000.00 |
| 4.05 | Site Lighting |  | EA | \$2,500.00 | \$ | 2,500.00 |
| 4.06 | Electrical Gear (Wire, Conduit, LP Panel, etc.) |  | EA | \$52,500.00 | \$ | 52,500.00 |
|  |  |  |  | Subtotal $=$ | \$ | 154,500.00 |
| Total Construction Cost Estimate |  |  |  |  | \$ | 639,250.00 |



## APPENDIX IV <br> DEVELOPMENT PROJECTS STATUS

Township of Lower Makefield
Projects Under Consideration in the Review Process

| Plan | Project Name | Type | Description | Owner \& Applicant | Lot Size (Acres) | Tax Parcel | Zoning | Status/Action | Time Expires | Escrow Balance as of <br> MAY 15, 2019 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 496 N | Fieldstone at Lower Makefield Edgewood Road | Major <br> Subdivision | 30 single-family residential building lots | Quaker Group Bucks, L. P. / Same | 39.2 | 20-16-73 | R-2 <br> Residential Mediur Density | Preliminary Plan | 12/31/2019 | \$0.00 |
| 562 | Dogwood Drive(aka Harmony Lane) Dogwood Drive | Major <br> Subdivision | 5 single-family residential building lots | Dogwood Drive, L.P. / Same | 14.727 | 20-8-25 | R-2 <br> Residential Mediur <br> Density | Recommended for Final Plan Approval by PC 1/22/2018 | 11/1/2019 | \$20.70 |
| 574 | Capstone Terrace Stony Hill Road at Township Line Road | Land Development | 3-story 180,000 sq. ft. office building | Shady Brook Investors, L.P. <br> / Same | 14.855 | $\begin{aligned} & 20-16-39 \\ & 20-12-1 \\ & 20-12-2 \end{aligned}$ | O/R Office Research | Final Plan <br> Preliminary Approval by BOS 11/5/2008 | 11/1/2019 | \$0.00 |
| 590 | Aria Health <br> (fka Frankford Health System) Route 332 \& Stony Hill Road | Land <br> Development | 3-story 375,000 sq. ft. hospital, two (2)-40,000 sq. ft. medical buildings with 976 parking space \& a heliport | Aria Health / ssame | 41.178 | 20-12-1-1 | o/R <br> Office <br> Research | Preliminary Plan | 12/31/2019 | \$39,236.28 |
| 643 | Erin Development 1685 Dobry Road Dobry Road | Major <br> Subdivision | 76 single-family attached dwelling Age-Qualifie Community | Dobry Road, LLC. / ERIN Development | 16.57 | 20-12-28 | $\begin{array}{\|ll\|} \hline \text { C-3 } & \\ \text { General } & \text { Busines } \\ \text { Industrial } & \\ \hline \end{array}$ | Preliminary Plan <br> Variances approved at the $12 / 4 / 2018$ ZHB meeting. Revised plans submitted in July 2019. | 10/1/2019 | (\$157.39) |
| 655 | Marrazzo Garden CenterProperty YardleyMorrisville Road \& Sutphi Road | Major <br> Subdivision | 16 single-family attached townhouse dwellings w/ 10 parking spaces (non-conforming use) | Dan \& Carmela Marrazz / Same | 2.6 | 20-50-1-1 | $\mathrm{R}-2$ <br> Residential Mediur Density | Sketch Plan <br> Discussed by PC on $3 / 26 / 2018$. | N/A | \$502.04 |
| 658 | Snipes Tract Athletic FieldsDolington Road \& Quarry Road | Land <br> Development | 3 large \& 1 small multi-purpose athletic fields, concession/restroom building, skate park, 157 parking spaces | Lower Makefield Township / Same | 36.26 | $\begin{aligned} & 20-16-2 \\ & 20-16-1-1 \end{aligned}$ | $\mathrm{R}-2$ <br> Residential Mediur Density | Preliminary/Final Approval by BOS 5/30/2017. Remanded by Court back to Board of Supervisor | N/A | N/A <br> Township Project |
| 664 | Fieldstone <br> (Harris Tract) <br> Edgewood Rd | Major <br> Subdivision | 32 lot or 36 lot single-family residential buildin lots | Quaker Group Bucks, L.P. / J P O Fieldstone | 39.2 | 20-16-73 | R-2 <br> Residential Mediur <br> Density | Informal Sketch Plan Discussed by PC on $1 / 22 / 2018$. Discussed by BO on 2/7/2018. | N/A | \$0.00 |
| 665 | Weldon Homes LLC 1273 Lindenhurst Road | Major <br> Subdivision | Subdivide a 3.03 -acre lot containing an existing stone dwelling and stone barn into 3 single-fan residential lots (creating 2 new building lots) | Weldon Homes LLC / Same | 3.03 | 20-3-20 | $\begin{array}{\|l} \hline \text { R-1 } \\ \text { Residential Low } \\ \text { Density } \end{array}$ | Informal Sketch Plan <br> Discussed at PC meeting on 11/26/2018. | N/A | N/A |
| 666 | Eric Renfors \& George Schott TLY 670 LLC 670 Stony Hill Road | Special Exception | Proposed use of $2,040 \mathrm{sq}$. ft. of existing space within the Lower Makefield Shopping Center fo a Learning Center for computer coding and game building | Eric Renfors \& George ISchott TLY 670 LLC / IRPF YARDLEY LOWER MAKEFIELD, LLC | 11.476 | 20-016-062 | C-1 Commercial <br> Neighborhood <br> Shopping | Special Exception Approved <br> ZHB $4 / 2 / 2019$  | Doy/A | \$0.00 |
| 667 | Shady Brook Investors (fka Capstone Terrace) Stony Hill Road at Township Line Road | Land <br> Development | Proposed use for a 125,775 square foot single story warehouse building with 252 parking spaces | Shady Brook Investors, L.P. <br> / Same | 14.855 | $\begin{aligned} & 20-16-39 \\ & 20-12-1-3 \\ & 20-12-2-2 \end{aligned}$ | O/R Office Research | Special Exception <br> ZHB Meeting held 4/16/2019. <br> to the $8 / 20 / 2019$ ZHB meeting. | $\begin{aligned} & \mathrm{N} / \mathrm{A} \\ & \mathrm{ed} \end{aligned}$ | \$0.00 |


| $\begin{aligned} & \text { Plan } \\ & \# \\ & \hline \end{aligned}$ | Project Name | Type | Projects Under Consideratio |  <br> Applicant | $\left.\begin{array}{\|l\|l} \text { Lot Size } \\ \text { (Acres) } \end{array}\right]$ | Tax Parcel | Zone | Original Escrow/Bond | Escrow/Bond Balance Remaining | Project Status / Outstanding Items | Total \# <br> Building Lots | Building <br> Permits Issued | $\begin{array}{\|l} \text { Building } \\ \text { C.o.'s } \\ \text { Issued } \end{array}$ | Inspection Escrow <br> Balance as of May <br> 15, 2019 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 335 | Regency at Yardley <br> (fka Octagon <br> Center) <br>  <br> Oxford Valley Road | Major <br> Subdivision | 191 single family <br> dwellings and 186 townhous (carriage homes) units with a clubhouse, pool, tennis courts, plus 5 acres along Old Oxford Valley Road to be donated to LMT (including a 2,500 <br> SF pavilion) | Toll Brothers | 133.5 | $\begin{aligned} & 20-32-4-1 \\ & 20-32-1-2 \end{aligned}$ | C-3 | $\$ 783,860.83$ <br> $\$ 161,923.85$ <br> $\$ 2,860,142.73$ <br> $\$ 1,548,171.08$ <br> $\$ 619,016.72$ <br> $\$ 500,000.00$ <br> $\$ 6,473,115.21$ <br> North Total <br>  <br> $\$ 826,000.00$ <br> $\$ 595,000.00$ <br> $\$ 668,350.00$ <br> $\$ 1,223,035.25$ <br> $\$ 3,312,385.25$ <br> South Total | \$121,152.33 North Ph. 1 $\$ 27,400.60$ North Ph. 2 $\$ 383,733.48$ North Ph. 3 $\$ 345,439.24$ North Ph. 4 $\$ 118,577.12$ North Ph. 5 $\$ 49,710.98$ North $6 / 7$ $\$ 1,046,013.75$ Remaining for North (Singles) $\$ 209,085.50$ South Ph. I $\$ 205,742.25$ South Ph. II $\$ 418,981.60$ South Ph. III $\$ 776,075.00$ South IV/V $\$ 2,306,213.00$ Remaining for South (Carriages) | Regency North (Singles) Houses are all complete, except for 6 units adjacent to model homes. Toll Brothers is working on punchlists in anticipation of paving next Spring. Videos of sanitary sewer \& storm sewer lines showed deficiencies that will need to be addressed prior to paving. <br> Regency South (Carriages). Houses are $27 \%$ complete. Site improvements and roads are $80 \%$ complete (remaining area is the part of Phase 3 where sanitary sewer flows into Matrix Residential (62 unit) project across Big O Road). | North 197 <br> to <br> 18outh <br> 180 |  | North | $\begin{gathered} \hline \text { 9,169.04 } \\ \text { Regency @ } \\ \text { Yardley } \\ \text { \#D335T } \\ \\ \\ \\ \text { \$7,219.48 } \\ \text { Regency } \\ \text { Carriage } \\ \text { Homes } \\ \text { \#D338T } \end{gathered}$ |
| 412 | Towering Oaks at Yardley Dolington Road \& Susan Circle | Major <br> Subdivision | 7 lot single family residential subdivision | Triumph Building Group / Towering Oaks LLC | 12.087 | 20-3-48 | R-1 | \$447,077.04 | \$241,650.23 | 6 of 7 houses are being constructed by Triumph Building Group. Outstanding items include final paving, landscaping, basin conversion, etc. | 7 | 6 | 5 | (\$ 41,641.12) <br> Billed for <br> Shortagew/Attorney for collections |
| 538 | Boxwood Farm Oxford Valley Road \& Collins Grant Court | Major <br> Subdivision | Subdivide 8.0 acres into 5 single family residential lots | Boxwood Farm LLC | 5.84 | 20-32-21 | R-2 | \$767,757.34 | \$302,577.43 (Release 4) | Township passed a resolution to make a claim against the bond on $11 / 26 / 2018$. Developer performed final paving of Collins Grant Court on 12/4/2017, and there are still a few open items resolve prior to dedication. If these items are completed we may be in position to rescind the Resolution to take action against his performande bond. |  | 8 | 8 | (\$14,241.57) Billed for Shortage and requested $\$ 2,500$ add'l deposit w/attorney for collections |
| 543 | J.C. McGinn Construction (Minehart Tract) Woodside Road \& Lindenhurst Road | Major <br> Subdivision | Subdivide property into 7 single-family residential building lots and 1 lot to be added to adjoining property |  <br> Catherine <br> Minehart/ John C. <br> McGinn | 30.86 | $\begin{aligned} & \hline 20-3-28 \\ & 20-3-28-2 \end{aligned}$ | R-1 | \$32,525.00 | \$32,525.00 | Developer has requested release of Letter of Credit. Only outstanding items are on- lot stormwater management work for 2 unsold lots (Lot 2 \& 7), payment of fee-in-lieu, and setting monuments. | ${ }^{7}$ | 5 | 5 | \$690.98 |
| 560 | Reserve at Yardley (aka Freeman's Farm or Ferri Tract) Big Oak Road | Major Subdivision | 14 single-family residential building lots and 1 existing lot | Toll <br> Brothers/Erin <br> Development <br> Co. | 18.228 | 20-34-129 | R-2 | \$851,070.97 | \$158,314.49 (Release 2) | RVE met with developer on 9/19/2018 to review last few items remain outstanding. Developer is compiling informatio in preparation for dedication. | 14 | 14 | 14 | $\begin{aligned} & \hline(\$ 829.27) \\ & \text { Erin Dev } \\ & \text { \#D560A } \end{aligned}$ |
| 569 | Scammel's Corner University Drive, Yardley-Newtown Road, West Afton Avenue | Major <br> Subdivision | 15 single family residential lots, 1 existing lot with historic house reconstructed and 1 open space lot | JP O Scammels Corner L.P. | 17.73 | 20-16-32 | R-2 | \$1,020,402.58 | \$113,593.75 (Release 4) | Rain gardens \& detention basins need additiona work to drain properly. JP Orleans final paved on $12 / 14 / 2018$. Developer is working with the Township Engineer to complete all items prior to dedication. | 16 | 16 | 16 | (\$19,761.61) Billed, but not paying nor replyin to requests. \#D569s |

## APPENDIX V <br> LOWER MAKEFIELD TOWNSHIP SEWER MAP



## Execution Version

## ASSET PURCHASE AGREEMENT

By and Between
The Township of Lower Makefield, Bucks County
As Seller
and
Aqua Pennsylvania Wastewater, Inc.
As Buyer

Dated as of September 17,2020

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## ASSET PURCHASE AGREEMENT

THIS ASSET PURCHASE AGREEMENT (this "Agreement"), dated as of September
$\qquad$ , 2020 (the "Effective Date"), is made and entered into by and between the Township of Lower Makefield, Bucks County, a body corporate and politic, organized under the laws of the Commonwealth of Pennsylvania (the "Seller"), and Aqua Pennsylvania Wastewater, Inc., (the "Buyer"), a Pennsylvania corporation.

## WITNESSETH:

WHEREAS, the Seller, acting by and through its board of supervisors (the "Seller Board"), owns that certain sanitary wastewater collection and treatment system (the "System") that provides sanitary wastewater service to various customers in the Township of Lower Makefield, Pennsylvania, and portions of Falls Township, Bucks County, Pennsylvania, as set forth on Schedule A (the "Service Area"); and

WHEREAS, prior to the Closing, the Seller intends to (i) terminate the Municipal Sewer Authority of the Township of Lower Makefield (the "Authority") pursuant to Sections 5619 and 5622 of the Pennsylvania Municipal Authorities Act, (ii) take ownership of the System, to the extent any parts of the System or System improvements are not already owned by the Seller, and (iii) assume all obligations of the Authority, to the extent any obligations of the Authority exist and are outstanding on the Effective Date;

WHEREAS, Buyer is a regulated public utility that furnishes water and wastewater service to the public in various counties throughout Pennsylvania; and

WHEREAS, Buyer, in reliance upon the representations, warranties and covenants of the Seller in this Agreement, desires to purchase and acquire from the Seller, and the Seller, in reliance upon the representations, warranties and covenants of Buyer in this Agreement, desires to sell, transfer and convey to Buyer all of the assets of the System (other than the Excluded Assets), and in connection therewith, Buyer has agreed to assume certain ongoing obligations and liabilities of the Seller related to such acquired assets, all on the terms and conditions set forth in this Agreement.

NOW, THEREFORE, in consideration of the foregoing and of the mutual representations, warranties, covenants, and agreements in this Agreement, the receipt and sufficiency of which are acknowledged, intending to be legally bound, the Parties agree as follows:

## ARTICLE I.

## DEFINITIONS

In addition to the capitalized terms defined elsewhere in this Agreement, the following terms, as used in this Agreement (unless otherwise specified in this Agreement), have the meanings set forth in this Article I:
"Acquired Assets" has the meaning specified in Section 2.01.
"Affiliate" means, when used to indicate a relationship with a specified Person, means a Person that, directly or indirectly, through one or more intermediaries has a $10 \%$ or more voting or economic interest in such specified Person or controls, is controlled by or is under common control with (which include, with respect to a managed fund or trust, the right to direct or cause the direction of the management and policies of such managed fund or trust as manager, advisor, supervisor, sponsor or trustee pursuant to relevant contractual arrangements) such specified Person, and a Person is deemed to be controlled by another Person if controlled in any manner whatsoever that results in control in fact by that other Person (or that other Person and any Person or Persons with whom that other Person is acting jointly or in concert), whether directly or indirectly and whether through share ownership, a trust, a contract or otherwise (and for purposes of this definition, a managed fund or trust is deemed to be an Affiliate of the Person managing, supervising, sponsoring or advising such fund or trust and a limited partner in a managed fund or trust is deemed to be an Affiliate of such fund or trust and of the Person managing, supervising, sponsoring or advising such fund or trust).
"Agreement" has the meaning specified in the Preamble to this Agreement (and includes all Schedules and Exhibits referred to herein), as amended, modified and supplemented from time to time in accordance with the terms hereof.
"ALTA" has the meaning specified in Section 2.03.
"Assigned Contracts" has the meaning specified in Section 2.01(c).
"Assignment and Assumption Agreement" has the meaning specified in Section 13.02(c).
"Assumed Liabilities" has the meaning specified in Section 2.04(a).
"Authorizations and Permits" mean all licenses, permits, franchises, authorizations, certificates, registrations, consents, orders, adjudications, variances, waivers and approvals currently in effect issued or granted by Governmental Authorities, including without limitation, environmental permits, operating permits and approvals that are held by the Seller that primarily relate directly or indirectly to the operation of the System, including those set forth in Schedule 4.13.
"Business Day" means any day that is neither a Saturday, a Sunday nor a day observed as a holiday by either the Commonwealth of Pennsylvania or the United States government.
"Buyer" has the meaning specified in the Preamble of this Agreement.
"Buyer Fundamental Representations" has the meaning specified in Section 8.01.
"Buyer Indemnified Persons" has the meaning specified in Section 8.02.
"CERCLA" means the Comprehensive Environmental Response Compensation and Liability Act of 1980, 42 U.S.C. $\S 9601$ et seq., as amended.
"Closing" means the consummation of the sale and purchase of the Acquired Assets and assumption of the Assumed Liabilities, the release/waiver of liabilities and the other transactions contemplated by this Agreement, all in accordance with the terms and conditions of this Agreement and as provided for in Article XIII.
"Closing Date" has the meaning specified in Section 13.01.
"Closing Effective Time" has the meaning specified in Section 13.01.
"Code" means the Internal Revenue Code of 1986, as amended.
"Confidential Information" means any information about Buyer, Seller or the System related to the transactions contemplated by this Agreement; provided, however, that such term does not include information which the receiving Party can demonstrate (a) is generally available to or known by the public other than as a result of improper disclosure by the receiving Party, (b) is obtained by the receiving Party from a source other than the disclosing Party, provided that such source was not bound by a duty of confidentiality to the disclosing Party with respect to such information, or (c) is legally in the public domain.
"Corrective Action Plan" means that Corrective Action Plan submitted by the Seller to the PaDEP on September 21, 2017, which was approved by means of the Seller's Act 537 Plan on November 5, 2018.
"Customer Sewer Laterals" has the meaning specified in Section 2.02(b).
"Easements" means all easements, rights of way, licenses, use agreements, occupancy agreements, leases and other agreements and appurtenances for and over the real property of third parties that are necessary for and used in connection with the operation of the System or to provide continuous rights of way for the Acquired Assets (including access thereto).
"Effective Date" has the meaning specified in the Preamble.
"Environment" means soil, surface waters, ground waters, land, stream sediments, flora, fauna, surface or subsurface strata and ambient air.
"Environmental Claims" means all notices of investigations, warnings, notice letters, notices of violations, Liens, orders, claims, demands, suits or administrative or judicial actions for any injunctive relief, fines, penalties, third party claims, or other claims asserting violations of Environmental Requirements or responsibility for Environmental Liabilities.
"Environmental Conditions" means the Release of Hazardous Materials or the presence of Hazardous Materials on, in, under or within any property (including the presence in the Environment), other than the presence of Hazardous Materials in locations and at concentrations that are naturally occurring.
"Environmental Liabilities" means any legal obligation or liability arising under Environmental Requirements or related to or arising out of any Environmental Condition, including those consisting of or relating to any (a) duty imposed by, breach of or noncompliance
with any Environmental Requirements; (b) environmental, health or safety matters or conditions (including on-site or off-site contamination, occupational safety and health and regulation of Hazardous Materials); (c) Remedial Action undertaken by any Person; (d) bodily injury (including illness, disability and death, and regardless of when any such bodily injury occurred, was incurred or manifested itself), property damage (including trespass, nuisance, wrongful eviction and deprivation of the use of real or personal property), or other losses or damages incurred by any other Person (including any employee or former employee of such Person); (e) any injury to, destruction of, or loss of natural resources, or costs of any natural resource damage assessments; (f) exposure of any Person to any Hazardous Materials; and (g) the presence or Release of any Hazardous Materials.
"Environmental Requirements" mean all present Laws (including common law), regulations, legally binding or otherwise enforceable requirements and Authorizations and Permits relating to human health, pollution, or protection of the Environment (including ambient air, surface water, ground water, land surface or surface strata), including (i) those relating to emissions, discharges, Releases, or threatened Releases of Hazardous Materials, and (ii) those relating to the identification, generation, manufacture, processing, distribution, use, treatment, storage, disposal, release, recovery, transport or other handling of Hazardous Materials. Without limiting the foregoing, the term "Environmental Requirements" includes (1) CERCLA; the Superfund Amendments and Reauthorization Act, Public Law 99-499, 100 Stat. 1613; the Emergency Planning and Community Right to Know Act, 42 U.S.C. Sections 11001-11050; the Resource Conservation and Recovery Act, 42 U.S.C. Sections 6901-6992k ("RCRA"); the Safe Drinking Water Act, 42 U.S.C. Sections 300f to 300j-26; the Toxic Substances Control Act, 15 U.S.C. Sections 2601-2692; the Hazardous Materials Transportation Act, 49 U.S.C. Sections 5101-5127; the Federal Water Pollution Control Act, 33 U.S.C. Sections 1251-1387; the Oil Pollution Act of 1990, 33 U.S.C. Sections 2701--2761; the Clean Air Act, 42 U.S.C. Sections 7401-7671q; the Atomic Energy Act of 1954, as amended, 42 U.S.C. Sections 2011 et seq.; the Low Level Radioactive Waste Policy Act, as amended, 42 U.S.C. Section 2021b et seq.; the Occupational Safety and Health Act, 29 U.S.C. Sections 651-678, and the regulations promulgated pursuant to the above-listed federal statutes, and (2) counterpart Laws and regulations promulgated or issued by any state or local Governmental Authority, specifically including the Pennsylvania Storage Tank and Spill Prevention Act of 1989 (35 Pa. C.S.A. § 6021.101 et. seq.).
"EPA" means the United States Environmental Protection Agency, or a successor Governmental Authority with substantially similar power and authority thereto.
"Equipment and Machinery" means (i) all the equipment, tangible personal property, machinery, office furniture and equipment, fixtures, tooling, spare maintenance or replacement parts, environmental testing equipment, and vehicles owned or leased by the Seller (including all leases of such property), which are primarily used in the operation of the System, (ii) any rights of the Seller to warranties applicable to the foregoing (to the extent assignable), and licenses received from manufacturers and Seller of any such item, and (iii) any related claims, credits, and rights of recovery with respect thereto, including those set forth on Schedule 4.10.
"Excluded Assets" has the meaning specified in Section 2.02.
"Excluded Liability" or "Excluded Liabilities" means all liabilities other than Assumed Liabilities.
"Files and Records" means all files and records of the Seller primarily relating to the System, whether in hard copy or magnetic or other format including customer and supplier records, customer lists (both current and prospective), customer billing records, manuals, books, files, records, engineering data, procedures, systems, instructions, drawings, blueprints, plans, designs, specifications, equipment lists, parts lists, equipment maintenance records, equipment warranty information, plant plans, specifications and drawings, sales and advertising material, computer software, and records relating to the System, and whether stored on-site or off-site.
"Final Order" means a Governmental Approval by a Governmental Authority as to which (a) no request for stay of the action is pending, no such stay is in effect and if any time period is permitted by statute or regulation for filing any request for such stay, such time period has passed, (b) no petition for rehearing, reconsideration or clarification of the action is pending and the time for filing any such petition has passed, (c) such Governmental Authority does not have action under consideration on its own motion and (d) no appeal to a court or administrative tribunal or a request for stay by a court or administrative tribunal of the Government Authority's action is pending or in effect and the deadline for filing any such appeal or request for stay has passed.
"Governmental Approval" means any consent, approval, authorization, notice, filing, registration, submission, reporting, order, adjudication or similar item of, to or with any Governmental Authority.
"Governmental Authority" or "Governmental Authorities" means any court, department, commission, board, bureau, municipality, municipal authority (established pursuant to the Pennsylvania Municipal Authorities Act of the Commonwealth of Pennsylvania), agency or instrumentality of the United States, any state, county, city or political subdivision thereof, or any foreign governmental body, including without limitation, the PaPUC, the EPA, PaDEP, and Seller Board.
"Hazardous Materials" means any solid, liquid, gas, odor, heat, sound, vibration, radiation or other substance or emission which is a contaminant, pollutant, dangerous substance, toxic substance, hazardous waste, residual waste, solid waste, hazardous material or hazardous substance which is or becomes regulated by applicable Environmental Requirements or which is classified as hazardous or toxic under applicable Environmental Requirements (including gasoline, diesel fuel or other petroleum hydrocarbons, polychlorinated biphenyls, asbestos and urea formaldehyde foam insulation).
"Indemnified Party" means any Buyer Indemnified Persons or Seller Indemnified Persons, as applicable, entitled to indemnification pursuant to Article VIII.
"Indemnifying Party" means a Party which is obligated to indemnify the Buyer Indemnified Persons or the Seller Indemnified Persons, as applicable, pursuant to Article VIII.
"Insurable Claim" has the meaning specified in Section 6.02(e).
"Knowledge" when used to qualify or limit a Party's representations or warranties means the knowledge of such Party's Representatives who are engaged in a material way in the performing the functions of such Party with respect to which the representations are made, after conducting a reasonable investigation and inquiry with respect to the subject matter of the representation.
"Law" means any applicable law, statute, regulation, ordinance, rule, order, judicial, administrative and regulatory decree, judgment, adjudication, consent decree, settlement agreement or governmental requirement enacted, promulgated, entered into, agreed or imposed by any Governmental Authority, as may be in effect at the relevant time or times in the context in which the term is used.
"Liability Cap" has the meaning specified in Section 8.05(c).
"Lien" means any lien in a fixed and ascertainable monetary sum, or any pledge, mortgage, deed of trust or security interest securing a fixed and ascertainable monetary sum, or any charge or claim in a fixed and ascertainable monetary sum. In addition, in connection with Real Property, any item otherwise falling within the definition of a "Lien" must be filed of record by the responsible Party in accordance with the terms of this Agreement.
"Loss" means any and all losses, liabilities, obligations, damages, penalties, interest, Taxes, claims, actions, demands, causes of action, judgments, reasonable attorneys', consultants' and other professional fees, and all other reasonable costs and expenses sustained or incurred in investigating, preparing or defending or otherwise incident to any such claim, action, demand, cause of action or judgment or the enforcement of a Party's rights under Article VIII; except that "Losses" do not include punitive, incidental, consequential, special or indirect damages, including loss of future revenue or income, loss of business reputation or opportunity relating to the breach or alleged breach of this Agreement, or diminution of value or any damages based on any type of multiple, except in the case of fraud or to the extent actually awarded to a Governmental Authority or other third party in respect of a Third Party Claim.
"Material Adverse Effect," means a material adverse effect on the business, financial condition or results of operations of the System; provided, however, that no effect arising out of or in connection with or resulting from any of the following will be deemed, either alone or in combination, to constitute or contribute to a Material Adverse Effect: (i) general economic conditions or changes therein; (ii) financial, banking, currency or capital markets fluctuations or conditions (either in the United States or any international market and including changes in interest rates); (iii) conditions affecting the real estate, financial services, construction, water utility or sewer utility industries generally; (iv) any existing event, circumstance, condition or occurrence of which the Buyer has Knowledge as of the Effective Date; (v) any action, omission, change, effect, circumstance or condition contemplated by this Agreement or attributable to the execution, performance or announcement of this Agreement or the transactions contemplated by this Agreement; and (vi) negligence, intentional misconduct or bad faith of the Buyer or its Representatives.
"Missing Easements" means, as of any particular date, each Easement that is for or used in connection with the operation of the System or to provide continuous and unimpeded rights of
way for the Acquired Assets (including access thereto) that either (a) has not been obtained by Seller and is for or used in connection with the operation of the System or (b) if such Easement has been obtained by Seller, such Easement is unrecorded or such Easement is not sufficient to operate the System as currently conducted.
"MMA Agreement" means that agreement dated September 1, 1977 by and among Municipal Authority of the Borough of Morrisville, Borough of Yardley, Yardley Borough Sewer Authority, Township of Lower Makefield and Municipal Sewer Authority of the Township of Lower Makefield providing for the treatment and disposal of sewage and waste collected by the Yardley Authority and Lower Makefield Authority by the Morrisville Authority, as amended from time to time.
"Outside Date" means 365 days after the date the application to the PaPUC is accepted as complete by the PaPUC and the statutory six (6) month consideration period is initiated for a regulated utility.
"PaDEP" means the Pennsylvania Department of Environmental Protection, or any successor Governmental Authority with substantially similar powers thereto.
"PaPUC" means the Pennsylvania Public Utility Commission, or any successor Governmental Authority with substantially similar powers thereto.
"Party" means Buyer or the Seller and the term "Parties" means collectively Buyer and the Seller.
"PCB Equipment" means PCB equipment as defined in 40 C.F.R. Part 761.
"Pending Development Plan" means any project for the development of real property which is the subject of a subdivision or land development plan that has been submitted to Seller for approval, or for which Seller already has granted approval but which has yet to be constructed, pursuant to the Pennsylvania Municipal Planning Code as of the Effective Date (and as updated before the Closing Date).
"Permitted Liens" means (a) Liens for Taxes not yet due and payable or being contested in good faith by appropriate procedures; (b) easements, rights of way, zoning ordinances and other similar encumbrances affecting Real Property and Easements as disclosed on Schedule 4.09; (c) other than with respect to Real Property owned by Seller, Liens arising under original purchase price conditional sales contracts and equipment leases with third parties entered into in the ordinary course of business; (d) other imperfections of title or Liens, if any, that have not had, and would not have, a Material Adverse Effect; and (e) any encumbrances identified in the Title Commitment not identified in the Objection Notice in accordance with the procedures and deadlines prescribed in Section 6.02(a).
"Person" means any individual (including, the heirs, beneficiaries, executors, legal representatives or administrators thereof), corporation, partnership, joint venture, trust, limited liability company, limited partnership, joint stock company, unincorporated association or other entity or a Governmental Authority.
"Purchase Price" has the meaning specified in Section 3.01.
"Real Property" means those certain parcels of land, with buildings, improvements and Equipment and Machinery thereon or therein, that are part of the System and fee simple title to which owned by Seller.
"Regulated Asbestos Containing Material" means regulated asbestos containing material as defined by 40 C.F.R. § 61.141.
"Release" means any actual or threatened spilling, leaking, pumping, pouring, injecting, emptying, discharging, emitting, escaping, leaching, dumping, disposal, or release or migration of Hazardous Materials into the Environment, including the abandonment or discarding of barrels, containers and other receptacles containing any Hazardous Materials.
"Remedial Action" means any and all actions to (a) investigate, clean up, remediate, remove, treat, contain or in any other way address any Hazardous Materials in the Environment, (b) prevent the Release or threat of Release or minimize the further Release of any Hazardous Materials so it does not migrate or endanger public health or welfare or the indoor or outdoor Environment, and (c) perform pre-remedial studies and investigations and post-remedial monitoring, maintenance and care. The term "Remedial Action" includes any action which constitutes (i) a "removal", "remedial action" or "response" as defined by Section 101 of CERCLA, 42 U.S.C. §§ 9601(23), (24), and (25); (ii) a "corrective action" as defined in RCRA, 42 U.S.C. § 6901 et seq.; or (iii) a "response" or "interim response" as defined in the Pennsylvania Hazardous Sites Cleanup Act, 35 P.S. §6020.103.
"Representative" means, with respect to any Party, any director (including, in the case of Seller, any member of the Seller Board), officer, employee, official, lender mortgagee, financier, provider of any financial instrument (or any agent or trustee acting on their behalf), partner, member, owner, agent, lawyer, accountant, auditor, professional advisor, consultant, engineer, contractor, other Person for whom such Person is at law responsible or other representative of such Person and any professional advisor, consultant or engineer designated by such Person as its "Representative."
"Schedules" means the disclosure schedules delivered by Seller and Buyer, respectively, concurrently with the execution and delivery of this Agreement, and as may be supplemented and updated pursuant to Sections 9.03 and 10.04. Any disclosure set forth on any particular Schedule is deemed disclosure in reference to all Schedules comprising the Schedules to which such disclosure is reasonably apparent.
"Seller" has the meaning specified in the Preamble of this Agreement.
"Seller Board" has the meaning specified in the recitals to this Agreement.
"Seller Fundamental Representations" has the meaning specified in Section 8.01.
"Seller Indemnified Persons" has the meaning specified in Section 8.03.
"Seller Permits" means the permits set forth on Schedule 4.13.
"Seller's Benefit Obligations" means all material obligations, arrangements, or practices, whether or not legally enforceable, to provide benefits, other than salary or wages to present or former directors, employees or agents, (other than obligations, arrangements and practices that are Seller's Plans), that are owed, adopted or followed by the Seller. "Seller's Benefit Obligation's" also include consulting agreements under which the compensation paid does not depend upon the amount of service rendered, sabbatical policies, severance payment policies and fringe benefits within the meaning of Code $\S 132$.
"Seller's Plans" means each voluntary employees' beneficiary association under Section 501(c)(9) of the Code whose members include any Personnel, any "employee benefit plans" within the meaning of Section 3(3) of ERISA, whether or not tax-qualified and whether or not subject to ERISA, or any other retirement, profit sharing, stock option, stock bonus, deferred compensation (including any "nonqualified deferred compensation plan" within the meaning of Section 409A of the Code), severance, sick leave or other material plan or arrangement providing benefits to current or former Personnel, in each case, if either currently in effect or terminated within the last six (6) years, to which the Seller is a plan sponsor or to which the Seller otherwise contributes or has contributed within the last six (6) years, or in which the Seller otherwise participates or has participated within the last six (6) years.
"Service Area" has the meaning specified in the recitals to this Agreement.
"Supplies" means all lubricants, spare parts, fuel, chemicals, raw materials, and other supplies and inventory, and all rights to warranties received from suppliers with respect to the foregoing, and related claims, credits, and rights of recovery with respect thereto.
"System" has the meaning specified in the recitals to this Agreement and includes the Acquired Assets and excludes the Excluded Assets.
"System Improvements" has the meaning specified in Section 7.08(a).
"Taxes" means any federal, state, local or foreign income, gross receipts, license, payroll, employment, excise, severance, stamp, occupation, premium, windfall profits, environmental, customs duties, permit fees, capital stock, franchise, profits, withholding, social security, unemployment, disability, real property, personal property, parking, sales, use, transfer, registration, value added, alternative or add-on minimum, estimated or other tax, levy, impost, stamp tax, duty, fee, withholding or similar imposition of any kind payable, levied, collected, withheld or assessed at any time, including any interest, penalty or addition thereto, whether disputed or not.
"Threshold Amount" has the meaning specified in Section 8.05(a).
"Title Commitment" has the meaning specified in Section 6.01.
"Title Company" has the meaning specified in Section 6.01.
"Title Policy" has the meaning specified in Section 2.03.
"UCC Search" has the meaning specified in Section 6.04.
"Unscheduled Real Property" has the meaning specified in Section 6.06.
"Utility Valuation Expert" means an expert that has applied and has been approved by the PaPUC and is currently, at the time of this Agreement, on the list of approved appraisers maintained by the PaPUC.


#### Abstract

ARTICLE II.

\section*{TERMS OF PURCHASE AND ASSUMPTION OF LIABILITIES}


## Section 2.01. Purchase and Sale of Acquired Assets

Subject to the terms and conditions set forth in this Agreement, at Closing, Buyer shall purchase from the Seller and the Seller shall sell, transfer, assign and deliver to Buyer, free and clear of all Liens except for Permitted Liens, all of Seller's right, title and interest in and to all assets, facilities, business, goodwill, properties and rights of the Seller of every kind and description, whether tangible or intangible, real, personal or mixed, wherever situated, in each case used in, held for use in, or acquired or developed for use in, the System, or otherwise related to, or arising out of the operation or conduct of the System (whether or not any such assets have any value for accounting purposes or are carried or reflected on the books or financial records of the Seller), but in all cases other than the Excluded Assets (the foregoing collectively referred to as the "Acquired Assets"), including:
(a) all real property and appurtenant interests necessary for the operation of the System, including without limitation (i) good and marketable fee simple title to the Real Property as set forth on Schedule 4.09, and (ii) all Easements, including without limitation those identified on Schedule 4.09;
(b) all sanitary wastewater related treatment and conveyance facilities, including but not limited to the Seller's (i) assets set forth on Schedule 2.01(b), (ii) sewage lift and pump stations, and (iii) all collection system mains (whether gravity or force mains), laterals (from the collection system main to the edge-of-road or curb-line when the main is located within a public right-of-way or the edge of an easement where the main is located within private property), generators, manholes, and other related appurtenances and any billing and collections related assets necessary to own and operate the System;
(c) all contracts, licenses and leases identified on Schedule 4.14 to which the Seller is a party, including without limitation, all construction contracts, surety bonds, operation and maintenance agreements, management agreements, reserved capacity agreements, architect agreements and consultant agreements, relating to vehicles and other items of personal property (the "Assigned Contracts");
(d) all Supplies;
(e) all personal property and fixed assets, including all Equipment and Machinery, auxiliary equipment and plant equipment, including without limitation those items set forth on Schedule 4.10;
(f) all prepaid expenses and security deposits paid by Seller;
(g) all Files and Records;
(h) all Authorizations and Permits of or held by the Seller (to the extent transferrable to Buyer under Law), including all Authorizations and Permits which are environmental permits, the Seller Permits, other operating permits and those items set forth on Schedule 4.13; and
(i) all goodwill of the System.


#### Abstract

EXCEPT AS EXPRESSLY SET FORTH IN THIS AGREEMENT, THE SELLER MAKES NO EXPRESS OR IMPLIED REPRESENTATION OR WARRANTY REGARDING ANY REPRESENTATION REGARDING THE FUTURE PROFITABILITY OR FUTURE EARNINGS PERFORMANCE OF THE ACQUIRED ASSETS OR THE SYSTEM OR ANY FUTURE RATEMAKING THAT MAY BE ALLOWED BY THE PAPUC FOR ANY OF THE ACQUIRED ASSETS. NOTWITHSTANDING THE FOREGOING, ALL IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE VALID UNTIL THE TIME OF CLOSING.


## Section 2.02. Excluded Assets

Notwithstanding anything in the Agreement to the contrary, the Acquired Assets do not include the following (the "Excluded Assets"):
(a) all contracts, licenses and leases that are not Assigned Contracts;
(b) any and all connecting facilities originating from Seller's terminus point of collection facilities at the edge-of-road or curb-line or edge of an easement to and throughout the customer's property (the "Customer Sewer Laterals"), including any grinder pumps;
(c) any and all piping and fixtures internal to each individual customer structure (whether residential, commercial, industrial or other customer classes/types);
(d) the seals, organizational documents, minute books, Tax returns, books of account or other records having to do with the organization of Seller and all employee-related or employee benefit-related files or records;
(e) cash (including any cash resulting from the payment to the Seller for EDUs received on or before the Closing Date) and cash equivalents, including accounts receivable and existing financial security guaranteeing installation of public improvements (including sewer facilities);
(f) all insurance policies of Seller and all rights to applicable claims and proceeds thereunder;
(g) all rights to any action, suit or claim of any nature available to or being pursued by Seller, whether arising by way of counterclaim or otherwise;
(h) all assets, properties and rights used by Seller other than those which primarily relate to the ownership and operation of the System;
(i) the assets, properties and rights specifically set forth on Schedule 2.02(i);
(j) all municipal separate storm sewer system ("MS4") assets and stormwater assets of the Seller (and any related NPDES permits); and
(k) the rights which accrue or will accrue to Seller under this Agreement and any related agreement, exhibit or schedule.

## Section 2.03. Sale Free of Liens

After Buyer fulfills its obligations pursuant to Section 3.01(a), on the Closing Date, the Acquired Assets will be free and clear of all Liens other than Permitted Liens. The Seller shall convey such Acquired Assets by appropriate special warranty or other deed (subject to Section 6.02(c)), bills of sale, endorsements, assignments and other instruments of transfer or conveyance described in the Agreement, or by transfer documents satisfactory in form and substance reasonably acceptable to Buyer and Seller and their counsel in their reasonable discretion. At Closing, Buyer shall cause the Title Company to insure the Real Property, at the Title Company's filed rates, as a good and marketable title, free and clear of all Liens and exceptions to coverage, except for the Permitted Liens, pursuant to an owner's policy of title insurance on the American Land Title Association's ("ALTA") Owner's Form 2006, subject to the terms of Section 6.02 (the "Title Policy").

## Section 2.04. Assumption of Liabilities

(a) On the terms and subject to the conditions set forth in this Agreement and excluding the Excluded Liabilities, Buyer shall assume and agrees to pay, perform and discharge when due any and all liabilities and obligations of the Seller (1) arising under the Seller Permits (arising from, related to, or based on events or circumstances occurring on or after the Closing Date), (2) arising under the Corrective Action Plan on or after the Closing and (3) arising out of or relating to the System or the Acquired Assets on or after the Closing, defined as the following:
(i) All liabilities and obligations under the Assigned Contracts (which contain all capacity rights with other municipal entities for treatment of sewage) and Authorizations and Permits resulting from events that occur or conditions that arise on or after the Closing;
(ii) any litigation initiated against Seller related to the System or the Acquired Assets resulting from events that occur on or after the Closing;
(iii) all liabilities and obligations for Taxes relating to the System, its operation, the Acquired Assets and the Assumed Liabilities attributable to the period beginning on the Closing Date; and
(iv) all other liabilities and obligations arising out of or relating to Buyer's ownership or operation of the System and the Acquired Assets on or after the Closing (all of the aforementioned liabilities in this Section 2.04(a) are referred to as the "Assumed Liabilities").
(b) Buyer neither assumes nor takes liability for any Excluded Liabilities. For the avoidance of doubt, all liabilities and obligations related to Seller's Plans and Seller's Benefit Obligations are Excluded Liabilities.

Section 2.05. Further Assurances At any time and from time to time after the Closing Date, the Seller shall, upon the request of Buyer, and Buyer shall, upon the request of the Seller, at the cost of requesting Party, promptly execute, acknowledge and deliver, or cause to be executed, acknowledged and delivered, such other instruments of conveyance and transfer and other documents, and perform or cause to be performed such further acts, as may be reasonably required to evidence or effectuate, or more fully evidence or effectuate, (a) the sale, conveyance, transfer, assignment and delivery hereunder of the Acquired Assets to Buyer, (b) the assumption by Buyer of any of the Assumed Liabilities, (c) performance by the Parties of any of their other respective obligations under this Agreement, (d) the vesting in Buyer of all right, title and interest in the Acquired Assets and the System as provided in this Agreement, and (e) any other matters reasonably requested by a Party to carry out the provisions, purposes and intent of this Agreement.

## Section 2.06. Certain Transfers; Assignment of Contracts

(a) Notwithstanding anything to the contrary in this Agreement, and subject to the provisions of this Section 2.06(a), Section 2.06(b) and Section 12.01(b), to the extent that the sale, transfer, assignment, conveyance and delivery, or attempted sale, transfer, assignment, conveyance and delivery, to Buyer of any Assigned Contract or other Acquired Asset would result in a violation of Law, or would require the consent, authorization, approval or waiver of any Person (other than the Parties), including any Governmental Authority, and such consent, authorization, approval or waiver has not been obtained before the Closing, this Agreement shall not constitute a sale, transfer, assignment, conveyance and delivery, or an attempted sale, transfer, assignment, conveyance and delivery, thereof (any such Acquired Asset, a "Nonassignable Asset"). Following the Closing, the Seller, the Seller and the Buyer shall use its commercially reasonable efforts (at the cost and expense of the Party that is responsible for compliance with such Law or obtaining such consent, authorization, approval or waiver), and shall cooperate with each other, to obtain any such required consent, authorization, approval or waiver, or any release, substitution, novation or amendment required to sell, transfer, assign, convey and deliver any such Nonassignable Asset to Buyer; except that in no event will Buyer be required to pay any consideration therefor. Once such consent, authorization, approval, waiver, release, substitution or amendment is obtained, the Seller shall sell, transfer, assign, convey and deliver to Buyer the relevant Acquired Asset to which such consent, authorization, approval, waiver, release, substitution or amendment relates for no additional consideration. Any applicable sales, transfer and other similar Taxes in connection with such sale, transfer, assignment, conveyance and delivery shall be paid one-half ( $50 \%$ ) by Buyer and one-half ( $50 \%$ ) by the Seller.
(b) Until such time as a Nonassignable Asset is transferred to Buyer pursuant to this Article II, Buyer and the Seller shall cooperate in any commercially reasonable and economically feasible arrangements (such as subleasing, sublicensing or subcontracting) to provide to the Parties the economic and, to the extent permitted under Law, operational equivalent of the transfer of such Nonassignable Asset to Buyer at the Closing and the performance by Buyer of its obligations with respect thereto, and so long as the Seller transfers and turns over all economic and beneficial rights with respect to each such Nonassignable Asset, Buyer shall, to the extent permitted under Law and
the terms of any applicable contract that constitutes a Nonassignable Asset, as agent or subcontractor for the Seller, pay, perform and discharge the liabilities and obligations of the Seller thereunder from and after the Closing Date, but only to the extent that such liabilities and obligations would constitute Assumed Liabilities if the applicable consent or approval had been obtained on or before the Closing Date and such Nonassignable Asset had been assigned to Buyer at Closing. To the extent permitted under Law, the Seller shall hold in trust for and pay to Buyer promptly upon receipt thereof, such Nonassignable Asset and all income, proceeds and other monies received by the Seller with respect to such Nonassignable Asset in connection with the arrangements under this Article II.
(c) If, following the Effective Date and before the Closing, Buyer identifies any contract to which the Seller is a party which is not identified on Schedule 4.14 as an Assigned Contract as of the Effective Date, and Buyer reasonably determines such contract is necessary to the operation of the System, Buyer shall give notice of such determination to the Seller and the Seller shall, promptly following receipt of such notice, deliver to Buyer an updated Schedule 4.14 identifying such contract, and such contract will thereafter constitute and be deemed an Assigned Contract for all purposes hereunder.
(d) If, during the twelve (12) month period following the Closing Date, Buyer identifies any contract to which the Seller was a party as of the Closing and which (i) was not set forth on or properly identified on Schedule 4.14 (as may be updated pursuant to (c)) and (ii) Buyer reasonably believes is necessary to the operation of the System, the Seller shall, promptly following Buyer's written request therefor, execute, acknowledge and deliver, or cause to be executed, acknowledged and delivered, such other instruments of conveyance and transfer and other documents, and perform or cause to be performed such further acts, as may be reasonably required to evidence or effectuate, or more fully evidence or effectuate the assignment of such contract to Buyer for no additional consideration, and upon such assignment, such contract will be deemed an Assigned Contract for all purposes hereunder.

## ARTICLE III.

## PURCHASE PRICE AND ADDITIONAL CONSIDERATION

## Section 3.01. Purchase Price and Additional Consideration

The purchase price for the Acquired Assets is Fifty Three Million Dollars $(\$ 53,000,000)$ (the "Purchase Price") which Buyer shall pay as follows at Closing:
(a) Buyer shall pay Three Million Dollars $(\$ 3,000,000)$ to Seller as a deposit on account of the Purchase Price (the "Deposit") upon the earlier to occur of: (1) the third business day following Buyer's receipt of notice from the PaPUC that the application to the PaPUC for the transaction contemplated by this Agreement has been conditionally accepted; and (2) December 15, 2020. The Deposit shall be governed as follows:
(i) Subject to subparagraph (ii) below, Seller shall be free to use the Deposit upon receipt as it determines in Seller's sole discretion.
(ii) In the event that this Agreement is terminated for any reason, Seller shall return the Deposit to Buyer within ninety (90) days following the effective date of termination per Section 14.01, provided, however, if the Agreement is terminated by Seller pursuant to Section 14.01(c), then Seller shall be permitted to offset against Seller's obligation to refund the Deposit any damages recoverable by Seller per the terms of this Agreement.
(iii) The obligation to refund the Deposit hereunder shall be a general obligation of Seller and shall not be subject to the Threshold Amount or the Liability Cap set forth in Section 8.05.
(b) Subject to any adjustment in Purchase Price resulting from the proration procedures set forth in Section 3.01(c), Buyer shall pay to the Seller at Closing by wire transfer of immediately available funds the balance of the Purchase Price (i.e., after accounting for the Deposit) to one or more accounts that Seller designates and provides to Buyer at least three (3) Business Days before the Closing Date; and
(c) Final Billing: The Buyer is entitled to all customer billings with respect to sanitary wastewater customers' services for the period on or after the Closing Effective Time, and the Seller is entitled to all such billings before the Closing Effective Time. The Parties shall cooperate to calculate an agreed upon proration of billing amounts and to credit the Purchase Price for the appropriate Party on the Closing Date.

## Section 3.02. Fair Consideration

The Parties acknowledge and agree that the consideration provided for in this Article III represents fair consideration and reasonable equivalent value for the sale and transfer of the Acquired Assets and the transactions, covenants and agreements set forth in this Agreement, which consideration was agreed upon as the result of arm's-length good faith negotiations between the Parties and their respective Representatives.

## Section 3.03. Transfer Taxes

Any and all deed stamps or transfer Taxes which may be due the Commonwealth of Pennsylvania or any political subdivision in connection with the sale, transfer, assignment, conveyance and delivery hereunder of the Acquired Assets to Buyer (collectively, "Transfer Taxes"), will be paid fifty percent (50\%) by Buyer and fifty percent (50\%) by Seller. The terms hereof shall survive Closing.

## ARTICLE IV.

## REPRESENTATIONS AND WARRANTIES OF THE SELLER

The Seller makes only the specified representations and warranties as to each of them which are set forth in this Article IV.

As a material inducement to Buyer to enter into this Agreement and to consummate the transactions contemplated by this Agreement, the Seller represents and warrants, as of the

Effective Date (except to the extent any of the following representations and warranties specifically apply to or relate to another date, in which event such representations and warranties shall be true and correct as of such other date), as follows:

## Section 4.01. Organization

The Seller is a body corporate and politic, duly organized and existing under the laws of the Commonwealth of Pennsylvania.

Section 4.02. Power and Authority
The Seller (i) duly adopted the ordinance(s) or resolutions authorizing the transactions contemplated by this Agreement, which is in full force and effect, (ii) duly authorized and approved the execution and delivery of this Agreement and (iii) duly authorized and approved the performance by the Seller of its obligations contained in this Agreement. The Seller has all requisite power and authority to own, lease and operate the Acquired Assets and the System and have the power and authority to enter into this Agreement and to do all acts and things and execute and deliver all other documents as are required hereunder to be done, observed or performed by it in accordance with the terms of this Agreement.

## Section 4.03. Enforceability

This Agreement has been duly authorized, executed and delivered by the Seller and constitutes a valid and legally binding obligation of the Seller, enforceable against the Seller in accordance with its terms, subject only to applicable bankruptcy, insolvency and similar laws affecting the enforceability of the rights of creditors generally and to general principles of equity.

## Section 4.04. No Conflict or Violation

The execution and delivery of this Agreement by the Seller, the consummation of the transactions contemplated by this Agreement and the performance by the Seller of the terms, conditions and provisions hereof has not and will not contravene or violate or result in a breach of (with or without the giving of notice or lapse of time, or both) or acceleration of any material obligations of the Seller under (i) any Law or (ii) any agreement, instrument or document to which the Seller is a party or by which it is bound.

## Section 4.05. Consents and Approvals

Schedule 4.05 sets forth a list of each consent, waiver, authorization or approval of any Governmental Authority, or of any other Person, and each declaration to or filing or registration with any Governmental Authority required in connection with the execution and delivery of this Agreement by the Seller or the performance by the Seller of its obligations hereunder.

## Section 4.06. Undisclosed Liabilities

Except as set forth in Schedule 4.06, there are no liabilities or obligations of Seller, either accrued, absolute, contingent or otherwise, relating to the Acquired Assets or the System that would be required to be set forth on a balance sheet prepared under generally accepted accounting principles
applicable to municipalities, other than liabilities incurred in the ordinary course that could not reasonably be expected to have a Material Adverse Effect.

## Section 4.07. Absence of Certain Changes or Events

Except as set forth on Schedule 4.07, since December 31, 2017, there has not been any transaction or occurrence that has resulted or is reasonably likely to result in a Material Adverse Effect and the Seller has operated and maintained the System since December 31, 2017 in the ordinary course.

## Section 4.08. Tax Matters

Except as set forth in Schedule 4.08 or as would not have a Material Adverse Effect, (i) the Seller has timely paid all Taxes that may have been or may be due and payable by the Seller on or before the Closing Date, arising from the ownership or operation of the Acquired Assets or the System on or before the Closing Date; (ii) no Taxing authority has asserted any claim against the Seller for the assessment of any additional Tax liability or initiated any action or proceeding which could result in such an assertion; and (iii) the Seller has made all withholding of Taxes required to be made under all Laws and regulations, including without limitation, withholding with respect to compensation paid to employees, and the amounts withheld have been properly paid over to the appropriate Taxing authorities.

## Section 4.09. Real Property and Easements

Schedule 4.09 identifies all of Seller's rights in and to Real Property and Easements Seller owns and uses in the operation of the System. Seller does not lease (as lessee) any real property that is used in the operation of the System. There are no pending condemnation proceedings relating to any of the Real Property or Easements. Seller has not received any written threats of any condemnation proceedings and, to the Knowledge of Seller, no such proceedings are threatened. Seller has not received any written notices of any violations of any Law from any Governmental Authority with respect to the Real Property or the Easements which has not been cured in all material respects and, to Seller's Knowledge, no such violations of Law exist. With respect to the Real Property (i) there are no leases, options, rights of reversions or other rights of use or rights to acquire the Real Property held by third parties, (ii) Seller is in sole possession of the Real Property, and (iii) to Seller's Knowledge there are no encroachments either way across the boundary of the Real Property, nor any dispute with adjacent real property owners over the location of boundaries or potential claims adverse to title. With respect to each Easement, (i) there are no leases, options, rights of reversions or other rights of use or rights to acquire the Easement held by third parties, and (ii) to Seller's Knowledge there are no disputes with adjacent real property owners of the owners of the real property encumbered by the Easement over the location of boundaries or potential claims adverse to title.

## Section 4.10. Equipment and Machinery

All Equipment and Machinery included in the Acquired Assets is set forth on Schedule 4.10. Except as set forth in Schedule 4.10, the Seller has good title, free and clear of all Liens (other than the Permitted Liens and Liens which are released on or before Closing) to the Equipment and Machinery owned by Seller.

## Section 4.11. Seller's Personnel

(a) The Seller has not, in the past five (5) years, effectuated:
(i) a "plant closing" (as defined in the Worker Adjustment and Retraining Notification Act ("WARN Act")) affecting any site of employment or one or more facilities or operating units within any site of employment or facility of the System; or
(ii) a "mass layoff" (as defined in the WARN Act) affecting any site of employment or facility of the System; nor has the System been affected by any transaction or engaged in layoffs or employment terminations sufficient in number to trigger application of any similar state or local Law.

None of the Personnel has suffered an "employment loss" (as defined in the WARN Act) during the previous six months.

## Section 4.12. Environmental Compliance

Except as set forth in Schedule 4.12 or that otherwise could not be expected to have a Material Adverse Effect:
(a) To the Seller's Knowledge, the System as currently operated by the Seller and all operations and activities conducted by the Seller with respect to the System are in compliance in all material respects with all applicable Environmental Requirements.
(b) To the Seller's Knowledge, the Seller has generated, used, handled, treated, stored and disposed of all Hazardous Materials in (i) compliance in all material respects with all applicable Environmental Requirements and (ii) a manner that has not given, and could not reasonably be anticipated to give, rise to Environmental Liabilities.
(c) Except as has been disclosed to Buyer on Schedule 4.12, the Seller has not received notice of any Environmental Claims related to the System that have not been fully and finally resolved, and to the Knowledge of Seller no claims of Environmental Liabilities have been threatened allegedly arising from or relating to the System that have not been fully and finally resolved.
(d) To Seller's Knowledge, there has been no Release of Hazardous Materials at, on or from any part of the System or the Acquired Assets, in each case in a manner that violates any Environmental Requirements or has resulted in, or could reasonably be anticipated to give rise to, Environmental Liabilities which has not been appropriately resolved pursuant to applicable Environmental Requirements.
(e) No Lien or activity use limitation or institutional control has been recorded affecting any Acquired Assets by any Governmental Authority due to either the presence of any Hazardous Material on or off the Acquired Assets or a violation of any Environmental Requirement except as has been disclosed by Seller to Buyer.
(f) Seller is not aware of any underground storage tanks on or at any of the Acquired Assets. To the Seller's Knowledge, any underground storage tanks previously located at the Acquired Assets have been removed or otherwise closed, plugged and abandoned in compliance with applicable Environmental Requirements in effect at the time of such closure.
(g) To the Seller's Knowledge, there is no PCB Equipment on or at any of the Acquired Assets.
(h) To the Seller's Knowledge, there is no Regulated Asbestos Containing Material in or on the Acquired Assets.
(i) The Seller has delivered to Buyer (1) all material environmental site assessments pertaining to the System it is aware of, (2) all material compliance audits or compliance assurance reviews prepared within the previous five (5) years relating to compliance with Environmental Requirements by the System, and (3) all documents pertaining to, any known and unresolved Environmental Liabilities incurred in relation to the System, to the extent possessed by or under the reasonable control of the Seller.

## Section 4.13. Authorizations and Permits

Schedule 4.13 sets forth the Authorizations and Permits of the Seller. The Seller has made true and complete copies of all Authorizations and Permits available to Buyer. Except as set forth on Schedule 4.13, the Seller is in compliance in all material respects with all terms, conditions and requirements of all Authorizations and Permits, except in each case where such violation or failure, individually or in the aggregate, would not have a Material Adverse Effect, and no proceeding is pending or, to the Knowledge of the Seller threatened relating to the revocation or limitation of any of the Authorizations or Permits, other than those revocations or limitations which do not individually or in the aggregate have a Material Adverse Effect.

## Section 4.14. System Contracts

(a) Schedule 4.14 contains a complete and accurate list of all the Assigned Contracts.
(b) The Seller has made available to Buyer true and complete copies of all the contracts related to the System, including the foregoing Assigned Contracts.
(c) All of the Assigned Contracts specified in Schedule 4.14 are in full force and effect. Seller has not, nor to the Knowledge of the Seller has any other party thereto, breached any material provision of or defaulted under the material terms of, nor does any condition exist which, with notice or lapse of time, or both, would cause the Seller, or to the Knowledge of Seller, any other party, to be in default under any Assigned Contract.

## Section 4.15. Compliance with Law; Litigation

(a) The Seller has operated and is operating the System in compliance, in all material respects, with all Laws, Authorizations and Permits and is not in breach of any Law, Authorization or Permit that would have a Material Adverse Effect on the operations of the System or on the

Buyer. There are no Authorizations or Permits from any Governmental Authority necessary for the operation of the System as currently being operated except for those Authorizations and Permits set forth on Schedule 4.13.
(b) Except as disclosed to the Buyer in the Schedules (as updated pursuant to Section 9.03), there are no facts, circumstances, conditions or occurrences regarding the System that could reasonably be expected to give rise to any environmental claims or governmental enforcement actions that could reasonably be expected to have a Material Adverse Effect, and there are no past, pending or threatened environmental claims or governmental enforcement actions against the Seller that individually or in the aggregate could reasonably be expected to have a Material Adverse Effect.
(c) There is no action, suit or proceeding, at law or in equity, or before or by any Governmental Authority, pending nor, to the Knowledge of the Seller, threatened against the Seller before or at the Closing Effective Time, which will have a Material Adverse Effect. As of the date of this Agreement, there is no action, suit or proceeding, at Law or in equity, or before or by any Governmental Authority, pending nor, to the Knowledge of the Seller, threatened against the Seller which could materially affect the validity or enforceability of this Agreement.

## Section 4.16. Broker's and Finder's Fees

No broker, finder, or Person is entitled to any commission or finder's fee by reason of any agreement or action of Seller in connection with this Agreement or the transactions contemplated by this Agreement. Seller has employed Public Financial Management, Inc., as municipal advisor to provide transaction structuring advice and to provide Seller with municipal advice relating to the sale of the System. Seller is solely responsible to pay all fees owed to Public Financial Management, Inc. in connection with the transactions contemplated by this Agreement.

## Section 4.17. Title to the Acquired Assets; Sufficiency

(a) Except as set forth on Schedule 4.17(a), the Seller has good and marketable title to, valid leasehold interest in or valid licenses to use, all of the Acquired Assets, free and clear of all Liens, other than Permitted Liens and Liens which will be fully and unconditionally released at or before Closing. The use of the Acquired Assets is not subject to any Liens, other than Permitted Liens, and such use does not encroach on the property or the rights of any Person.
(b) Except as set forth on Schedule 4.17(b), the Acquired Assets are sufficient for, and constitute all the assets, properties, business, goodwill and rights of every kind and description, and services required for, the continued conduct and operation of the System by Buyer in substantially the same manner as currently conducted and operated by Seller. Except for the Excluded Assets and except as set forth on Schedule 4.17(b), (i) the Acquired Assets, taken as a whole, comprise all the assets, properties, business, goodwill and rights of every kind and description used or held for use in, or useful or necessary to the operation of the System as currently operated by Seller, and (ii) there are no assets, properties, business, goodwill, rights or services used in the conduct or operation of the System that are owned by any Person other than Seller that will not be licensed or leased to Buyer under valid, current license arrangements or leases. None of the Excluded Assets are material to the System.

## Section 4.18. Pending Development Plans

Schedule 4.18 sets forth a full and complete list of all Pending Development Plans as of the Effective Date. Each Pending Development Plan, if consummated, could result in additional customers and a corresponding reduction of available treatment capacity. Seller provides no assurances whatsoever that any development or expansion of the Service Area associated with any Pending Development Plan will actually be undertaken or completed. The Parties expect that Schedule 4.18 will change from time to time between the Effective Date and Closing, and the Seller shall provide updates to Schedule 4.18 pursuant to Section 9.03.

## ARTICLE V.

## REPRESENTATIONS AND WARRANTIES OF BUYER

Buyer makes only the representations and warranties which are set forth in this Article V.
As a material inducement to the Seller to enter into this Agreement and to consummate the transactions contemplated hereby, Buyer represents and warrants to the Seller, as of the Effective Date and as of the Closing Date (except to the extent any of the following representations and warranties specifically apply or relate to another date, in which event such representations and warranties shall be true and correct as of such other date), as follows:

## Section 5.01. Organization

The Buyer is duly organized, validly existing and in good standing under the laws of the state of its organization.

Section 5.02. Authorization and Validity of Agreement
The Buyer has the power and authority to enter into this Agreement and to do all acts and things and execute and deliver all other documents as are required hereunder to be done, observed or performed by it in accordance with the terms hereof. This Agreement has been duly authorized, executed and delivered by the Buyer and constitutes a valid and legally binding obligation of the Buyer, enforceable against it in accordance with the terms hereof, subject only to applicable bankruptcy, insolvency and similar laws affecting the enforceability of the rights of creditors generally and to general principles of equity.

## Section 5.03. No Conflict or Violation

The execution and delivery of this Agreement by the Buyer, the consummation of the transactions contemplated by this Agreement and the performance by the Buyer of the terms, conditions and provisions hereof has not and will not contravene or violate or result in a material breach of (with or without the giving of notice or lapse of time, or both) or acceleration of any material obligations of the Buyer under (i) any Law, (ii) any material agreement, instrument or document to which the Buyer is a party or by which it is bound or (iii) the articles, bylaws or governing documents of the Buyer.

Section 5.04. Consents and Approvals

Schedule 5.04, sets forth a list of each consent, waiver, authorization or approval of any Governmental Authority, or of any other Person, and each declaration to or filing or registration with any Governmental Authority required in connection with the execution and delivery of this Agreement by Buyer or the performance by Buyer of its obligations hereunder.

## Section 5.05. Broker's and Finder's Fees

No broker, finder or third party is entitled to any commission or finder's fee in connection with this Agreement or the transactions contemplated by this Agreement.

Section 5.06. Financial Wherewithal
Upon Closing, and after giving effect to the consummation of the transactions contemplated by this Agreement and the incurrence of any indebtedness in connection therewith, Buyer shall have the financial ability and will have sufficient working capital for its needs and anticipated needs to operate the System as a certificated public utility system regulated by the PaPUC authorized, among things, to provide wastewater utility services to retail residential, commercial and industrial customers in the System.

## Section 5.07. Sufficient Funds

Buyer has sufficient funds available to consummate the transactions contemplated by this Agreement, to pay the Purchase Price in accordance with Article III and expenses related to the transactions contemplated by this Agreement, and on and after Closing, to generally provide ownership, operation and capital for the operations and capital needs of the System following the Closing, and assuring that the customers of the System will receive safe, adequate and reliable wastewater service equal to or better than such customers would have received without the transactions contemplated by this Agreement and at all times consistent with Law.

## Section 5.08. Independent Decision

Except as expressly set forth in this Agreement, Buyer acknowledges that (a) Seller has not made any representation or warranty, express or implied, as to the accuracy or completeness of the System or information provided to Buyer, and (b) Seller shall not be subject to any liability to Buyer or any other Person resulting from the distribution to Buyer, or Buyer use of, any information regarding the System or Acquired Assets that has been furnished or made available to Buyer and its Representatives. Buyer acknowledges that other than as expressly set forth in this Agreement or any other related agreement, instrument or certificate, Seller expressly disclaims any warranty of income potential, operating expenses, or costs of operation of any Acquired Assets or the System.

## Section 5.09. Scheduled Matters

Buyer acknowledges that: (a) the inclusion of any matter on any Schedule is not an admission by Seller that such listed matter is material or that such listed matter has or could have a material adverse effect or constitutes a material liability with respect to the Acquired Assets; (b) matters reflected in the Schedules are not necessarily limited to matters required by this Agreement to be
reflected in such Schedules; and (c) such additional matters are set forth for informational purposes only and do not necessarily include other matters of a similar nature.

## Section 5.10. Independent Investigation

Buyer acknowledges that it has conducted an independent investigation of the financial condition, assets, liabilities, properties and projected capital needs and operations of the System in making its determination as to the propriety of the transaction contemplated by this Agreement and, in entering into this Agreement and related agreements, has relied solely on the results of its investigation and on the representations and warranties of the Seller expressly contained in Article IV of this Agreement.

## Section 5.11. Litigation

The Buyer is not in breach of any Law that could have a material adverse effect on the operations of the System or the Buyer. Neither the Buyer nor any Affiliate of the Buyer is listed on any of the following lists maintained by the Office of Foreign Assets Control of the United States Department of the Treasury, the Bureau of Industry and Security of the United States Department of Commerce or their successors, or on any other list of Persons with which the Seller may not do business under Law: the Specially Designated Nationals List, the Denied Persons List, the Unverified List, the Entity List and the Debarred List. Except as set forth on Schedule 5.11, there is no action, suit or proceeding, at law or in equity, or before or by any Governmental Authority, pending nor, to the Knowledge of the Buyer, threatened against the Buyer before or at the Closing Effective Time, which will have a material adverse effect on (i) the transactions contemplated by this Agreement or (ii) the validity or enforceability of this Agreement.

ARTICLE VI.

## TITLE TO REAL ESTATE; EASEMENTS

## Section 6.01. Evidence of Title

Subject to Section 6.06, with respect to all Real Property, Buyer shall obtain, at its sole cost and expense, a commitment for an owner's policy of title insurance on the ALTA Owner's Form 2006 (the "Title Commitment"), issued by a title insurance company selected by Buyer and licensed to insure title to real property by the Commonwealth of Pennsylvania (the "Title Company"), having an effective date after the Effective Date. Following the Effective Date, Buyer shall order the Title Commitment from the Title Company and shall provide Seller evidence of the same. Notwithstanding anything to the contrary in Section 6.02(a), Buyer shall not be entitled to send an Objection Notice with respect to any parcel of Real Property and the Title Commitment for the same if, within thirty (30) Business Days after the Effective Date, Buyer has not ordered the Title Commitment from the Title Company for such parcel of Real Property and provided with Seller evidence of the same.

Section 6.02. Objections to Title
(a) Notice of Objections. Within thirty (30) days of Buyer's receipt from the Title Company of a Title Commitment for any of the parcels of Real Property, Buyer shall deliver to Seller a true, correct and complete copy of the Title Commitment and true, correct, complete and legible copies of any and all exception documents listed in the same, along with Buyer's notice to Seller of any of the exceptions to title set forth on Schedule B of such Title Commitment to which Buyer objects (such notice of Buyer being referred to as the "Objection Notice") provided such exceptions (a) are not Permitted Liens, (b) pertain to the Buyer or any requirements, conditions or obligations of the Buyer, (c) are matters of record and set forth in the Title Commitment and adversely restrict or prevent the use of the Real Property in the operation of the System and (d) are not standard Title Company exceptions (such as the "survey" exception) (such exceptions objected to in the Objection Notice, provided the same are not as described in (a) through and including (d) aforesaid, being referred to as the "Title Objection Items"). The Buyer shall include a true, correct and complete copy of the Title Commitment and true, correct, complete and legible copies of any and all exception documents listed in the same in the Objection Notice. If Buyer provides the Seller with an Objection Notice, the Seller shall use its commercially reasonable efforts to have all of the Title Objection Items cured, satisfied or released of record, or insured over, by the Title Company (individually, "Cure" and collectively, "Cured") before or as of the Closing. At or before the Closing, the Seller shall deliver written evidence to Buyer, in form and substance reasonably satisfactory to Buyer, evidencing that Seller has Cured all such Title Objection Items. For avoidance of doubt, Buyer acknowledges that no item listed in clauses (a) through and including (d) aforesaid, may be objected to by Buyer as a Title Objection Item.
(b) Liens. Without limiting the Seller's obligations pursuant to Section 6.02(a), before or as of the Closing, the Seller shall, at its cost and expense, to Cure any Lien encumbering the Real Property which can be Cured by the payment of money (other than Permitted Liens).
(c) Title Endorsements/Survey. Buyer shall pay for any endorsements required by the Buyer or any mortgagee of the Buyer to Buyer's Title Policy. If any survey is required by Buyer or its mortgagee, either as a condition to any such endorsement or otherwise, the Buyer shall obtain it at its sole cost and expense. If Buyer obtains a survey of any or all of the Real Property and desires the deed to contain the legal description based on such survey, if the same is not identical to the legal description contained in Seller's deed of record, Seller is not obligated to include the same in the deed to Buyer unless the survey is certified to Seller and such description is included in the deed on a "quitclaim" basis only and without warranty of title.
(d) License at Closing. If requested by Buyer, Seller shall provide Buyer with a license agreement granting Buyer a license in all of Seller's rights to access Real Property in order to allow Buyer to operate and maintain the System until such time as Buyer is provided title to such Real Property as provided for in this Agreement. For the avoidance of doubt, Seller shall provide such title as soon as reasonably practicable in accordance with Section 6.01.
(e) Insurable Claims. To the extent any Claim for Losses under Article VIII constitutes an Insurable Claim, Buyer shall assert the Insurable Claim and use its commercially reasonable efforts to obtain recovery for such Insurable Claim against the Title Company (which shall include commencing litigation and diligently prosecuting such Insurable Claim to a Final Order) before pursuing a Claim for Losses under Article VIII. If at any time following a non-favorable Final Order that substantially denies the relief sought by Buyer from the Title Company in connection
with the Insurable Claim (each a "Non-Favorable Judgment"), Buyer may, following such NonFavorable Judgment, to pursue the Seller with a Claim for Losses under Article VIII (any such Claim against the Seller following an attempted Insurable Claim against the Title Company being a "Residual Title Claim"). Notwithstanding anything to the contrary in Article VIII, Buyer may assert a Claim for Losses based upon a Residual Title Claim for a sixty (60) day period after the Non-Favorable Judgment. For purposes of this Section 6.02(d), an "Insurable Claim" means a Claim that: (i) arises out of Buyer's discovery of a title defect or encumbrance with respect to any of the Real Property following the Closing that materially restricts or prevents the use of such Real Property in the operation of the System; and (ii) constitutes a claim against the Title Company under Buyer's Title Policy. Buyer acknowledges that any and all Claims which Buyer could otherwise bring as a breach of a covenant of title under the special warranty deed to the Real Property shall be included within the Claim for Losses under Article VIII and is subject to the terms of this Section 6.02(d).

## Section 6.03. Title Expenses

Irrespective of whether the transactions described by this Agreement are consummated and Closing occurs, Buyer shall pay all costs and expenses of obtaining the Title Commitment, Title Policy and any survey.

## Section 6.04. UCC Search; Releases

Not later than ninety (90) days after the Effective Date, Buyer shall obtain at its sole cost and expense a Uniform Commercial Code search against Seller covering any of the personal property or fixtures included among the Acquired Assets from the Office of the Secretary of the Commonwealth of Pennsylvania and the Recorder of Bucks County, Pennsylvania (the "UCC Search"). On or before the Closing Date, Seller shall at its sole cost and expense obtain releases of any and all Liens in any of the Acquired Assets other than Permitted Liens. The Seller shall provide the form of the releases of such Liens to Buyer on or before the Closing Date.

## Section 6.05. Easements.

(a) Promptly after the Effective Date and before the Closing, the Seller will, at its sole cost and expense, cause and abstractor selected by the Seller and reasonably acceptable to Buyer and the Title Company (the "Abstractor"), to perform a search of the public land records of Bucks County, based on the Seller's records and plans of the System (and such other sources of information as are reasonably related thereto), by searching the grantee index in the names of the Seller and such other searches as the Abstractor may reasonably make, to (i) identify and provide Buyer with title information on any and all recorded Easements (including information related to any Liens or encumbrances on Seller's title thereto), and (ii) together with the Seller, identify all Missing Easements. During the process, as the Abstractor provides written search results to the Seller (including updated versions of the Abstractor Search Result Chart), the Seller will promptly provide the same to Buyer for its review, and, without limiting the foregoing, the Seller shall, or shall cause the Abstractor to, provide Buyer with periodic updates (which shall occur no less frequently than bi-weekly) on the status of the activities set forth in the previous sentence.
(b) Notice of Objections. Within forty five (45) days of Buyer's receipt from the Seller (or the Abstractor) of the information described in 6.05(a), Buyer shall deliver to Seller notice identifying the Liens, restrictions and limitations on the Easements that, in Buyer's reasonable opinion, could materially and adversely restrict or prevent the use of the Easements in the operation of the System, (an "Easement Objection Notice"). Buyer shall not be permitted to include in its Easement Objection Notice any Liens, restrictions and limitations that: (a) are Permitted Liens, (b) pertain to the Buyer or any requirements, conditions or obligations of the Buyer, or (c) are matters of record and set forth in the Abstractor's search results that do not, in Buyer's reasonable opinion, materially and adversely restrict or prevent the use of the Easements in the operation of the System (specifically including mortgages or other instruments securing indebtedness incurred by the owner of the land burdened by the Easement) (such exceptions objected to in the Objection Notice, the "Easement Objection Items." If Buyer provides the Seller with an Easement Objection Notice, the Seller shall use its commercially reasonable efforts to have the Easement Objection Items Cured, prior to or as of the Closing. At or prior to the Closing, the Seller shall deliver written evidence to Buyer, in form and substance reasonably satisfactory to Buyer, evidencing that Seller has Cured all objections identified in the Easement Objection Notice. In the event that Seller is unable to Cure any such Objection Item per this Section 6.05(b), Seller shall: (i) grant Buyer a license per Section 6.05(d); and (ii) Seller's obligation to assign such Easements to Buyer per Section 2.01(a) shall survive Closing.
(c) If during the process of Abstractor's review and investigation of the Bucks County land records, Seller determines, based on the Abstractor's investigation, that there is a Missing Easement, the Seller, at its cost and expense, shall take any and all actions (including the use of its power of condemnation) to obtain any such Missing Easements so that the same may be sold, assigned, transferred and conveyed to Buyer at the Closing pursuant to the terms and conditions of this Agreement. The Seller shall pay for all costs and expenses incurred in connection with obtaining each Missing Easement (including any consideration payable to the landowner in connection with condemnation, in lieu of condemnation or otherwise to obtain Missing Easements). If Seller has not obtained all Missing Easements by the date that is ninety (90) days after the date that Abstractor has completed his review of the County land records and delivered the last results of the same to Seller (the "Abstract Completion Date"), then the Seller, at its cost and expense, shall, as soon as reasonably practicable, commence and file in the Court of Common Pleas, Bucks County, a condemnation or eminent domain proceeding to obtain any and all such Missing Easements. For the purposes of clarity, upon obtaining each Missing Easement pursuant to this Section 6.05(c) (including upon the final resolution of a condemnation proceeding), each Missing Easement that has been acquired or obtained by the Seller is considered an Easement.
(d) License at Closing. Seller shall provide Buyer with a license agreement granting Buyer a license in all of Seller's rights to access Easement in order to allow Buyer to operate and maintain the System until such time as Buyer is provided title to such Easement as provided for in this Agreement.

## Section 6.06. Unscheduled Property

The Parties acknowledge that the Seller may own interests in or have the legal right to use or occupy the Real Property and Easements that are necessary or essential to the operation of the System and that are not specifically identified in Schedule 4.09 (the "Unscheduled Real

Property"). If the Parties discover before or after the Closing Date, one or more parcels of Unscheduled Real Property, the discovering Party shall give notice of such discovery to the nondiscovering Party. In addition to its obligations in Section 2.03, Seller shall convey, assign or otherwise transfer any rights to each parcel of Unscheduled Real Property, with no adjustment to the Purchase Price, in such a manner as to provide Buyer with reasonable assurances that Buyer will have the right to use or occupy the Unscheduled Real Property as it was used by Seller as of the Effective Date.

## ARTICLE VII.

## OTHER AGREEMENTS

## Section 7.01. Taxes

Except as otherwise provided in this Agreement, the Seller shall pay any and all Taxes, if any, arising out of the ownership of the Acquired Assets and out of the operation of the System before the Closing Date.

## Section 7.02. Cooperation on Tax Matters

The Seller shall furnish or cause to be furnished to Buyer, as promptly as practicable, whether before or after the Closing Date, such information and assistance relating to the System as is reasonably necessary for the preparation and filing by Buyer of any filings relating to any Tax matters.

## Section 7.03. Rates

After Closing, Buyer shall charge the Seller's sanitary wastewater rates ("Base Rates"), as reflected on Schedule 7.03, as Buyer's initial base rates within the Service Area on and after the Closing Date. The Base Rates shall not be increased until after the second anniversary of the Closing Date. Buyer shall apply, at and after Closing, its then-existing miscellaneous fees and charges, rules and regulations for wastewater service as set forth in Buyer's Tariff within Seller's Service Area including Buyer's Distribution System Improvement Charge and State Tax Adjustment Surcharge.

## Section 7.04. Buyer Taxpayer

From and after the Closing Date, Buyer acknowledges that, upon conveyance of the Acquired Assets to Buyer, the Buyer will be subject to, among other Taxes, real estate Taxes, which Buyer shall pay when due.

## Section 7.05. PaPUC Approval

(a) Promptly after the Effective Date, Buyer shall timely initiate and faithfully prosecute the necessary proceedings to obtain from the PaPUC (i) the issuance of certificates of public convenience to Buyer to provide wastewater services in the Service Area and (ii) the approval of the acquisition of the System by Buyer under terms and conditions that are reasonably
acceptable to Seller and Buyer. Seller shall cooperate with and assist Buyer in proceedings before the PaPUC.
(b) Buyer and Seller agree that the procedures for determining fair market value of the System and Acquired Assets outlined in subsection (a) of Section 1329 of Title 66 of the Pennsylvania Consolidated Statutes ("Section 1329") shall be utilized and filed with the PaPUC as contemplated by Section 1329.
(c) The fees and expenses related to engaging the licensed engineer for such Section 1329 determination shall be paid fifty percent (50\%) by Buyer and fifty percent (50\%) by Seller.
(d) Buyer, in Buyer's first base rate proceeding with respect to the System following the Closing, shall propose the use of statutory and regulatory mechanisms available to benefit the Buyer's acquired customers for ratemaking purposes pursuant to Section 1311 of Title 66 of the Pennsylvania Consolidated Statutes.

## Section 7.06. Remedies for Breach of Article VII Agreements

If Buyer breaches any of the covenants and agreements set forth in this Article VII, in addition to all other rights and remedies available at law or in equity, including specific performance and/or injunctive relief, Seller may commence proceedings before the PaPUC seeking enforcement of such covenants and agreements.

## Section 7.07. Pending Development Plans

(a) Buyer and the Seller acknowledge that from the time of the Effective Date, the Seller shall continue to administer, and perform its duties and responsibilities with respect to the Pending Development Plans set forth on Schedule 4.18. For the avoidance of doubt, after the Closing Date, the Seller shall not seek to collect any EDU-related fees.
(b) Following the Effective Date, except with respect to the Planned Project, Seller shall not enter into any contract with a third party that contemplates the construction of new sanitary wastewater facilities, including, without limitation, pumping stations, force mains, manholes, or pipelines for service to future customers related to Pending Development Plans (collectively, "New System Assets") without providing a draft of such contracts to Buyer for its review and approval as to the design and specifications before execution by the parties to such contracts. Buyer shall have fifteen (15) Business Days to review and approve such contracts, and Buyer's failure to object in writing to any terms of such contracts within such fifteen (15) Business Day review period is deemed an approval of the same by Buyer.

## Section 7.08. Act 537 Plan

(a) Buyer acknowledges that Seller has previously drafted and committed to an Act 537 Plan under the Pennsylvania Sewage Facilities Act (the "Plan"), which has been made available to Buyer. Buyer understands that the Plan contains obligations and commitments, as more fully set forth in the Plan to complete certain improvements and upgrades to the System (the "System Improvements"). Buyer shall accept and complete all of the System Improvements as Seller agreed to complete under the Plan.
(b) Buyer acknowledges Seller has jurisdiction over sewage facilities planning and sewer service through the Plan and its Act 537 planning program, zoning, subdivision and land development ordinances and comprehensive land use planning policies. Buyer and Seller shall to cooperate with respect to current and future sewage facilities planning and sewer service consistent with the provisions of this Section 7.08.
(c) Subject to PaPUC approval of the Service Area as provided in Section 7.08, Buyer shall extend sewer lines and provided sewage collection and treatment services to properties within the Service Area in a manner consistent with the Plan and the Buyer's Tariff. Seller will confer with Buyer concerning any amendment to the Plan that would affect the provision of sewage collection and treatment services within the Service Area. Seller shall not propose or adopt any amendment to the Plan that would reduce the Service Area or divert wastewater flows generated from properties located within the Service Area from being served by the System without the approval of Buyer.
(d) Buyer will not request, pursue, or implement expansions of the System beyond the current Service Area (that would trigger a Plan amendment) without the prior written approval of Seller and the PaDEP. Seller shall promptly notify and confer with Buyer, and consider Buyer's comments, concerning any proposed Plan amendment (including any sewage facilities planning module) that would involve the provision of sewage collection and treatment services by the System to area or properties outside of the Service Area. With respect to any such potential Plan amendment, Seller and Buyer shall cooperate in evaluating alternatives for provision of sewage services to such areas consistent with the requirements of 25 Pa Code Ch .71 , including consideration of the technical feasibility, economic feasibility and cost effectiveness, consistency with the objectives and policies of plans and requirements of 25 Pa . Code Ch. 71.21(a)(5), consistency with municipal land use plans and ordinances, subdivision ordinances and other ordinances and plans for controlling land use and development, technically and administratively able to be implemented, and other factors required under Act 537 or under Buyer's Tariff.
(e) If Seller and Buyer each determine that the provision of sewage collection and treatment services by the System to certain areas or properties outside of the Service Area is technically feasible, economically feasible and cost effective, and meets all of the requirements set forth in Act 537 and 25 Pa . Code Ch. 71, the Seller shall amend the Plan to include such identified areas and properties in the Service Area. If Seller amends the Plan pursuant to this subsection and such amendment is approved by PaDEP, (i) Buyer shall request that the modified Service Area be approved by PaPUC; and (ii) subject to PaPUC approval of the inclusion of such modified Service Area, Buyer shall extend sewer lines and provide sewage collection services to properties within such Service Area in a manner consistent with the Plan and Buyer's Tariff.

## Section 7.09. Utility Valuation Experts

Buyer and Seller shall each will be responsible for the costs associated with their respective Utility Valuation Expert for the preparation and completion of their respective Utility Valuation Expert's appraisal report and any additional work by their respective Utility Valuation Expert necessary to
assist in the processing and prosecution of the application to the PaPUC in regard to this transaction under Section 1329.

## Section 7.10. Compliance and Operations Reports

After the Effective Date and through the Closing Date, Seller shall provide Buyer with periodic reports to the person designated by Buyer, disclosing the status of the operations and all material compliance and operational deficiencies.

## Section 7.11. Covenant Survival

The covenants set forth in this Article survive Closing.

## ARTICLE VIII.

## INDEMNIFICATION

## Section 8.01. Survival

All representations and warranties contained in this Agreement shall survive until twelve (12) months following the Closing Date, except that (a) the representations and warranties of the Seller set forth in Section 4.01 (Organization), Section 4.02 (Power and Authority), Section 4.03 (Enforceability) and Section 4.16 (Brokers' and Finders' Fees) (collectively, the "Seller Fundamental Representations") shall survive the Closing indefinitely or until the latest date permitted by Law, and (b) the representations and warranties of Buyer set forth in Section 5.01 (Organization), Section 5.02 (Authorization and Validity of Agreement), and Section 5.05 (Brokers' and Finders' Fees) (collectively, the "Buyer Fundamental Representations") shall survive the Closing indefinitely or until the latest date permitted by Law. The covenants and agreements of the Parties contained herein shall survive the Closing indefinitely or for the shorter period explicitly specified therein, except that for such covenants and agreements that survive for such shorter period, breaches thereof shall survive indefinitely or until the latest date permitted by Law. Notwithstanding the preceding sentences, (x) any breach of representation, warranty, covenant or agreement in respect of which indemnity may be sought under this Agreement shall survive the time at which it would otherwise terminate pursuant to the preceding sentences, if notice of the inaccuracy or breach thereof giving rise to such right of indemnity shall have been given to the party against whom such indemnity may be sought before such time, and (y) nothing contained in this Section 8.01 shall limit in any way any rights a Party may have to bring claims grounded in fraud, intentional misrepresentation or willful misconduct, which rights shall survive the Closing indefinitely.

## Section 8.02. Indemnification by the Seller

To the maximum extent permitted by Law and subject to the terms and conditions of this Article VIII, the Seller shall indemnify, defend and hold harmless, Buyer and its successors and Affiliates and their respective employees, officers, directors, trustees and agents (the "Buyer Indemnified Persons"), from and against any and all claims for Losses arising from or relating to: (a) any material misrepresentation as to, or any material inaccuracy in, any of the representations
and warranties of the Seller contained in this Agreement or in any exhibit, schedule, certificate or other instrument or document furnished or to be furnished by the Seller before the Closing pursuant to this Agreement (without regard to any materiality, Material Adverse Effect or related qualifications in the relevant representation or warranty (except where such provision requires disclosure of lists of items of a material nature or above a specified threshold)); (b) any material breach or material nonfulfillment of any of the covenants or agreements of the Seller contained in this Agreement or in any exhibit, schedule, certificate or other instrument or document furnished or to be furnished by the Seller before the Closing pursuant to this Agreement; or (c) any Excluded Liability or Excluded Asset.

## Section 8.03. Indemnification by Buyer

To the maximum extent permitted by Law and subject to the terms and conditions of this Article VIII, Buyer shall defend, indemnify and hold harmless the Seller and its successors and Affiliates and each of their respective employees, officers, directors and agents (the "Seller Indemnified Persons") from and against any and all claims for Losses arising from or relating to: (a) any material misrepresentation as to, or any material inaccuracy in, any of the representations and warranties of Buyer contained in this Agreement or in any exhibit, schedule, certificate or other instrument or document furnished or to be furnished by Buyer pursuant to this Agreement; (b) any material breach of any of the covenants or agreements of Buyer contained in this Agreement or in any exhibit, schedule certificate or other instrument or document furnished or to be furnished by the Buyer pursuant to this Agreement; (c) any Assumed Liability as and when payment and performance is due, including without limitation any liability related to any claims by any Governmental Authority; (d) Buyer's actions involving Environmental Requirements, Hazardous Materials or environmental claims from and after the Closing Date; or (e) the ownership, operation or control of the Acquired Assets or the System from and after the Closing Date.

## Section 8.04. Indemnification Procedure

(a) Third Party Claims. If any Indemnified Party receives notice of the assertion or commencement of any action, suit, claim or other legal proceeding made or brought by any Person who is not a party to this Agreement or an Affiliate of a party to this Agreement or a representative of the foregoing (a "Third Party Claim") against such Indemnified Party with respect to which the Indemnifying Party may be obligated to provide indemnification under this Agreement, the Indemnified Party shall give the Indemnifying Party prompt notice thereof. The failure to give such prompt notice shall not, however, relieve the Indemnifying Party of its indemnification obligations, except and only to the extent that the Indemnifying Party forfeits material rights or material defenses because of such failure. Such notice by the Indemnified Party shall describe the Third Party Claim in reasonable detail and shall indicate the estimated amount, if reasonably practicable, of the Loss that has been or may be sustained by the Indemnified Party. The Indemnifying Party has the right to participate in, or by giving notice to the Indemnified Party (and subject to the other requirements herein) to assume the defense of any Third Party Claim at the Indemnifying Party's expense and by the Indemnifying Party's own counsel (which counsel is reasonably acceptable to the Indemnified Party), so long as (i) the Indemnifying Party notifies the Indemnified Party, within ten (10) Business Days after the Indemnified Party has given notice of the Third Party Claim to the Indemnifying Party (or by such earlier date as may be necessary under
applicable procedural rules in order to file a timely appearance and response) that the Indemnifying Party is assuming the defense of such Third Party Claim, provided, that if the Indemnifying Party assumes control of such defense it must first agree and acknowledge in such notice that the Indemnifying Party is fully responsible (with no reservation of any rights other than the right to be subrogated to the rights of the Indemnified Party) for all Losses relating to such Third Party Claim, (ii) the Indemnifying Party conducts the defense of the Third Party Claim actively and diligently and at its own cost and expense, and (iii) the Third Party Claim (A) does not involve injunctive relief, specific performance or other similar equitable relief, any claim in respect of Taxes, any Governmental Authority, any criminal allegations, or any potential damage to the goodwill, reputation or overriding commercial interests of Buyer or its Affiliates, (B) is not one in which the Indemnifying Party is also a party and joint representation would be inappropriate or there may be legal defenses available to the Indemnified Party which are different from or additional to those available to the Indemnifying Party, or (C) does not involve a claim which, upon petition by the Indemnified Party, the appropriate court rules that the Indemnifying Party failed or is failing to vigorously prosecute or defend. The Indemnified Party shall reasonably cooperate in good faith in such defense. If the Indemnifying Party assumes the defense of any Third Party Claim, subject to Section 8.04(b), it shall have the right to take such action as it deems necessary to avoid, dispute, defend, appeal or make counterclaims pertaining to any such Third Party Claim in the name and on behalf of the Indemnified Party. The Indemnified Party may, at its own cost and expense, to participate in the defense of any Third Party Claim with counsel selected by it subject to the Indemnifying Party's right to control the defense thereof. If the Indemnifying Party elects not to compromise or defend such Third Party Claim or fails to promptly notify the Indemnified Party in writing of its election to defend as provided in this Agreement, the Indemnified Party has the right, subject to Section 8.04 (b), to pay, compromise, defend such Third Party Claim and seek indemnification for any and all Losses based upon, arising from or relating to such Third Party Claim. The Seller and Buyer shall reasonably and in good faith cooperate with one another in all reasonable respects in connection with the defense of any Third Party Claim, including making available records relating to such Third Party Claim and furnishing, without expense (other than reimbursement of actual out-of-pocket expenses) to the defending party, management employees of the non-defending party as may be reasonably necessary for the preparation of the defense of such Third Party Claim.
(b) Settlement of Third Party Claims. Notwithstanding any other provision of this Agreement, the Indemnifying Party shall not enter into settlement of any Third Party Claim without the prior written consent of the Indemnified Party (which consent shall not be unreasonably withheld or delayed), except as provided in this Section 8.04(b). If a firm offer is made to settle a Third Party Claim without leading to liability or the creation of a financial or other obligation on the part of the Indemnified Party and provides, in customary form, for the unconditional release of each Indemnified Party from all liabilities and obligations in connection with such Third Party Claim and the Indemnifying Party desires to accept and agree to such offer, the Indemnifying Party shall give prompt notice to that effect to the Indemnified Party. If the Indemnified Party fails to consent to such firm offer within fifteen (15) days after its receipt of such notice, the Indemnified Party may continue to contest or defend such Third Party Claim and in such event, the maximum liability of the Indemnifying Party as to such Third Party Claim shall not exceed the amount of such settlement offer. If the Indemnified Party fails to consent to such firm offer and also fails to assume defense of such Third Party Claim, the Indemnifying Party may
settle the Third Party Claim upon the terms set forth in such firm offer to settle such Third Party Claim. If the Indemnified Party has assumed the defense pursuant to Section 8.04(a), it shall not agree to any settlement without the written consent of the Indemnifying Party (which consent shall not be unreasonably withheld or delayed).
(c) Direct Claims. Any claim by an Indemnified Party with respect to any Loss which does not arise or result from a Third Party Claim (a "Direct Claim") shall be asserted by the Indemnified Party giving the Indemnifying Party prompt notice thereof. The failure to give such prompt notice shall not, however, relieve the Indemnifying Party of its indemnification obligations, except and only to the extent that the Indemnifying Party forfeits material rights or material defenses because of such failure. Such notice by the Indemnified Party shall describe the Direct Claim in reasonable detail and shall indicate the estimated amount, if reasonably practicable, of the Losses that have been or may be sustained by the Indemnified Party. The Indemnifying Party shall have thirty (30) days after its receipt of such notice to respond in writing to such Direct Claim. During the thirty (30) day period, the Indemnified Party shall reasonably cooperate and assist the Indemnifying Party in determining the validity and amount of such Direct Claim. If the Indemnifying Party does not so respond within such thirty (30) day period, by delivery of notice disputing the basis or amount of the Direct Claim, the Indemnifying Party is deemed to have rejected such claim, in which case the Indemnified Party is free to pursue such remedies as may be available to the Indemnified Party on the terms and subject to the provisions of this Agreement. If the Indemnifying Party has timely disputed its indemnity obligation for any Losses with respect to such Direct Claim, the Parties shall proceed in good faith to negotiate a resolution of such dispute and, if not resolved through negotiations, such dispute may resolved by litigation in an appropriate court of jurisdiction determined pursuant to this Agreement.

## Section 8.05. Limitations on Indemnification Obligations

(a) Subject to the other limitations contained in this Section 8.05, neither Buyer nor Buyer Indemnified Persons is entitled to indemnification pursuant to Section 8.02(a) (other than for an intentional breach of any agreement or covenant contained in this Agreement) unless the aggregate amount of Losses incurred by Buyer and Buyer Indemnified Persons under this Agreement exceeds One Percent (1\%) of the Purchase Price in the aggregate (the "Threshold Amount"), in which case Seller shall then be liable for Losses in excess of the Threshold Amount; provided, however, that the foregoing limitations contained in this Section 8.05(a) shall not apply to any claims for indemnification based on fraud, intentional misrepresentation or willful misconduct or pursuant to Section 8.02(c).
(b) Subject to the other limitations contained in this Section 8.05 neither Seller nor the Seller Indemnified Persons is entitled to indemnification pursuant to Section 8.03(a) (other than for an intentional breach of any agreement or covenant contained in this Agreement) unless the aggregate amount of Losses incurred by Seller and Seller Indemnified Persons under this Agreement exceeds the Threshold Amount, in which case Buyer shall then be liable for Losses in excess of the Threshold Amount; provided, however, that the foregoing limitations contained in this Section 8.05(a) shall not apply to any claims for indemnification based on fraud, intentional misrepresentation or willful misconduct or pursuant to Sections 8.03(c)(d) and (e).
(c) Except in the case of fraud, intentional misrepresentation or willful misconduct (for which all applicable legal and equitable remedies will be available to Buyer), the Buyer Indemnified Parties shall only be entitled to assert claims under Section 8.02(a) (other than claims with respect to breaches of any of the Seller Fundamental Representations, which shall not be limited by this Section 8.05(c)) up to the aggregate amount of 5\% of Purchase Price (the "Liability Cap"), which shall represent the sole and exclusive remedy of Buyer and the other Buyer Indemnified Parties for any such claims under Section 8.02(a) (other than claims with respect to breaches of any of the Seller Fundamental Representations, in the case of fraud, intentional misrepresentation or willful misconduct or pursuant to Section 8.02(c) which shall not be subject to the Liability Cap, but is capped at the Purchase Price).
(d) Payments by an Indemnifying Party pursuant to Section 8.02 or Section 8.03 in respect of any Loss is limited to the amount of any liability or damage that remains after deducting therefrom any insurance proceeds actually received and any indemnity, contribution or other similar payment received or reasonably expected to be received by the Indemnified Party in respect of any such claim. The Indemnified Party shall use its commercially reasonable efforts to recover under insurance policies or indemnity, contribution or other similar agreements for any Losses before seeking indemnification under this Agreement.
(e) Payments by an Indemnifying Party pursuant to Section 8.02 or Section 8.03 in respect of any Loss will be reduced by an amount equal to any Tax benefit realized or reasonably expected to be realized as a result of such Loss by the Indemnified Party.
(f) Each Indemnified Party shall take, and cause its Affiliates to take, all reasonable steps to mitigate any Loss upon becoming aware of any event or circumstance that would be reasonably expected to, or does, give rise thereto, including incurring costs only to the minimum extent necessary to remedy the breach that gives rise to such Loss.
(g) Subject to the provisions of Sections 3.01, 7.06, 15.11 and any other provisions for equitable relief and/or specific performance, the Parties acknowledge and agree that their sole and exclusive remedy with respect to any and all claims for any breach of any representation, warranty, covenant, agreement or obligation set forth herein or otherwise relating to the subject matter of this Agreement, shall be pursuant to the indemnification provisions set forth in this Article VIII. In furtherance of the foregoing, each Party waives, to the fullest extent permitted under Law, any and all rights, claims and causes of action for any breach of any representation, warranty, covenant, agreement or obligation set forth herein or otherwise relating to the subject matter of this Agreement it may have against the other Party and their Affiliates and each of their respective representatives arising under or based upon any Law, except pursuant to the indemnification provisions set forth in this Article VIII. Nothing in this Section $8.05(\mathrm{~g})$ limits any Parties' right to seek and obtain any equitable relief and/or specific performance to which any Party is entitled pursuant to this Agreement.

## Section 8.06. Knowledge of Breach

Seller will not be liable under this Article VIII for any Losses based upon or arising out of any inaccuracy in or breach of any of the representations or warranties of Seller contained in this Agreement if Buyer had Knowledge of such inaccuracy or breach before the Closing Date.

## ARTICLE IX.

## PRE-CLOSING COVENANTS OF THE SELLER

## Section 9.01. Operation of the System

Except as otherwise expressly permitted by this Agreement, as required by Law or with the prior written consent of Buyer (which consent shall not be unreasonably withheld, delayed or conditioned), from the Effective Date until the Closing, the Seller shall (i) operate and manage the System only in the ordinary course of business in accordance with past practices and procedures, (ii) comply in all material respects with all Laws and Authorizations and Permits, (iii) use commercially reasonable efforts to maintain and preserve intact the business and assets of the System, including all of the Acquired Assets, and preserve the rights, franchises, goodwill and relationships of the Seller and the System and their customers, lenders, suppliers, regulators and others having business relationships with the Seller and the System; (iv) continue to collect accounts receivable, EDU Fees, and sewer rents in a manner consistent with past practice, without discounting such accounts receivable, EDU Fees, and sewer rents; (v) perform all of its obligations under all Assigned Contracts; and (vi) not take any action, or omit to take any action, that would cause to occur a fact, circumstance, condition or occurrence regarding the System or any of the Acquired Assets that could reasonably be expected to have a Material Adverse Effect.

## Section 9.02. Cooperation

The Seller shall reasonably cooperate with Buyer and its employees, attorneys, accountants and other agents and, generally, act in reasonably good faith to timely carry out the purposes of this Agreement and the consummation of the transactions contemplated by this Agreement.

## Section 9.03. Supplements and Updates

The Seller shall promptly deliver to Buyer any supplemental information updating the information set forth in the representations and warranties set forth in Article IV of this Agreement so that such representations and warranties as supplemented by such information will be true and correct as of the Closing Date (or such other date as provided in such representations and warranties) as if then made. Promptly upon having Knowledge of any facts which would constitute a breach of a representation or warranty as of the date made or a default in a covenant contained herein Seller shall advise Buyer of those facts.

## Section 9.04. Consents and Approvals

Promptly after Effective Date, or as required by Law, except as provided in Section 7.05 or otherwise expressly provided in this Agreement, the Seller and, and when necessary, the Seller shall file all applications and reports that are required to be filed by Seller with any Governmental Authority as provided on Schedule 4.05 to the Buyer. The Seller shall also promptly provide all information that any Governmental Authority may require in connection with any such application or report. The Seller shall use its commercially reasonable efforts to obtain all required consents, waivers, authorizations or approvals of any Governmental Authority, or of any other Person in connection with the transactions contemplated by this Agreement. All authorizations of any

Governmental Authority necessary to consummate the transactions contemplated by this Agreement shall be in form and content reasonably satisfactory to Buyer and the Seller before Closing and must be final and non-appealable. If a party to the PaPUC proceeding appeals PaPUC authorization of the transaction, the Buyer and the Seller may agree to proceed to consummate the transaction.

## Section 9.05. Pending Development Plan Agreements and Future Developments

Seller shall enforce all of its rights and the counterparties' obligations under any agreements relating to Pending Development Plans in existence as of the Effective Date, which shall not be amended without notice to and the consent of Buyer, which consent shall not be unreasonably withheld and Buyer shall provide or withhold such consent to Seller within fifteen (15) days of notice from Seller or this consent requirement is deemed waived by Buyer after such date. After the Effective Date, Seller shall not enter into any new agreements (including Land Development Agreements and Financial Security Agreements) with landowners regarding the construction of any sewer facilities which, upon completion of construction, will be transferred to Buyer pursuant to Section 2.01 hereof without notice to and the consent of Buyer, which consent shall not be unreasonably withheld and Buyer shall provide or withhold such consent to Seller within seven (7) days of notice from Seller or this consent requirement is deemed waived by Buyer after such date. For the avoidance of doubt, any attempt by Buyer to withhold consent for entry into any amendment or new agreement by Seller pursuant to this Section 9.05 that is, in the opinion of Seller's solicitor, required pursuant to the Pennsylvania Municipal Planning Code is deemed unreasonable. Prior to Closing, Seller shall complete the dedication of all Assets (including but not limited to all assets listed in the engineer's assessment of tangible assets.

## ARTICLE X.

## PRE-CLOSING COVENANTS OF BUYER

## Section 10.01. Actions Before the Closing Date

Buyer shall not take any action that will cause it to be in breach of any representation, warranty, covenant or agreement contained in this Agreement or cause it to be unable to perform in any material respect its obligations hereunder, and Buyer shall use its commercially reasonable efforts (subject to any conditions set forth in this Agreement) to perform and satisfy all conditions to Closing to be performed or satisfied by Buyer under this Agreement, including action necessary to obtain all consents and approvals of third parties required to be obtained by Buyer to effect the transactions contemplated by this Agreement.

## Section 10.02. Consents and Approvals

Promptly after the execution of this Agreement, or as required by Law, except as otherwise expressly provided herein, Buyer shall file all applications and reports which are required to be filed by Buyer with any Governmental Authority as provided on Schedule 5.04. Buyer shall also promptly provide all information that any Governmental Authority may reasonably require in
connection with any such application or report. Buyer shall use its commercially reasonable efforts to obtain all consents, waivers, authorizations or approvals of any Governmental Authority, or of any other Person of any kind in connection with the transactions contemplated by this Agreement.

## Section 10.03. Cooperation

Buyer shall reasonably cooperate with the Seller and its employees, attorneys, accountants and other agents and, generally, do such other acts and things in good faith as may be reasonable to timely carry out the purposes of this Agreement, including in obtaining the amendments set forth in Section 12.01(b) and the consummation of the transactions contemplated in accordance with the provisions of this Agreement.

## Section 10.04. Supplements and Updates

Buyer shall promptly deliver to the Seller any supplemental information updating the information set forth in the representations and warranties set forth in Article V of this Agreement so that such representations and warranties as supplemented by such information will be true and correct as of the Closing Date (or such other date as provided in such representations and warranties) as if then made. At least three (3) Business Days before the Closing Date, Buyer shall advise the Seller of any facts which would constitute a breach of a representation or warranty as of the date made or a default in a covenant contained herein.

## ARTICLE XI.

## CONDITIONS PRECEDENT TO OBLIGATIONS OF THE SELLER

The obligation of the Seller to consummate the transactions provided for in this Agreement is subject to the satisfaction, at or before the Closing, of the following conditions, any one or more of which may be waived in writing by the Seller in its sole discretion:

## Section 11.01. Consents and Approvals

The Seller must receive all required material, consents, waivers, authorizations or approvals of any Governmental Authority, or of any other Person and any other approvals necessary to consummate the transactions contemplated by this Agreement set forth in Schedule 5.04, including without limitation all required EPA and PaDEP approvals and all such Authorizations and Permits and Governmental Approvals must be final (and not subject to any appeal and any applicable appeal period having expired); and

## Section 11.02. Representations and Warranties of Buyer

The representations and warranties made by Buyer in Article V which are (a) not qualified by materiality shall be true and correct in all material respects on and as of the Closing Date (except for representations or warranties that speak of a specific date or time other than the Closing Date which shall be true and correct in all material respects as of such specified date) and (b) qualified by materiality shall be true and correct in all respects on and as of the Closing Date (except for representations or warranties that speak of a specific date or time other than the Closing Date which shall be true and correct in all respects as of such specified date), and the Seller must receive a
certificate to the effect of the foregoing from a duly authorized officer of Buyer dated as of the Closing Date.

## Section 11.03. PaPUC Approval

PaPUC must issue a Final Order approving the acquisition of the System under terms and conditions that are reasonably acceptable to the Seller and Buyer. If a party to the PaPUC proceeding appeals PaPUC authorization of the transaction, the Buyer and Seller may agree to proceed to consummate the transaction.

## Section 11.04. No Injunctions

Neither the Seller nor Buyer shall be subject to any injunction, preliminary restraining order or other similar decree of a court of competent jurisdiction prohibiting the consummation of the transactions contemplated by this Agreement.

## Section 11.05. Performance of the Obligations of Buyer

Buyer must have performed in all material respects all obligations required under this Agreement to be performed by Buyer on or before the Closing Date, and the Seller must have received a certificate to that effect from Buyer dated the Closing Date.

## Section 11.06. Deliveries by Buyer

Buyer must deliver to the Seller all of the documents and items specified in Section 13.03.

## Section 11.07. No Material Adverse Effect

There must not have occurred any event or condition which gives rise to a Material Adverse Effect with respect to the Acquired Assets or the System.

## ARTICLE XII.

## CONDITIONS PRECEDENT TO OBLIGATIONS OF BUYER

The obligation of Buyer to consummate the transactions provided for in this Agreement is subject to the satisfaction, at or before the Closing, of the following conditions, any one or more of which may be waived in writing by Buyer in its sole discretion:

## Section 12.01. Consents and Approvals

Buyer must receive:
(a) All required material, non-governmental third party consents and any other approvals necessary or advisable to consummate the transactions contemplated by this Agreement set forth in Schedule 4.05 and all consents, waivers, authorizations and approvals of any Governmental Authority required pursuant to Section 5.04, including without limitation all required EPA and PaDEP approvals/renewals and all such Authorizations and Permits and

Governmental Approvals must be final (and not subject to any appeal and any applicable appeal period having expired); and
(b) Notwithstanding Section 2.06, the Assigned Contracts set forth on Schedule 12.01(b), shall be amended on terms reasonably acceptable to Buyer.

## Section 12.02. Representations and Warranties of Seller

The representations and warranties made by the Seller in Article IV this Agreement (disregarding all "materiality" and "Material Adverse Effect" or similar qualifications contained therein) must be true and correct on and as of the Closing Date (except for representations and warranties expressly stated to relate to a specific date, in which case each such representation and warranty shall be true and correct as of such earlier date), with only such exceptions as would not, individually or in the aggregate, reasonably be expected to have a Material Adverse Effect, and the Buyer must receive a certificate to that effect from the Seller dated as of the Closing Date.

## Section 12.03. PaPUC Approval

PaPUC must issue a Final Order approving the acquisition of the System under terms and conditions that are reasonably acceptable to the Seller and Buyer. If a party to the PaPUC proceeding appeals PaPUC authorization of the transaction, the Buyer and Seller may agree to proceed to consummate the transaction.

## Section 12.04. No Injunctions

Neither the Seller nor Buyer are subject to any injunction, preliminary restraining order or other similar decree of a court of competent jurisdiction prohibiting the consummation of the transactions contemplated by this Agreement.

## Section 12.05. No Material Adverse Effect

There must not have occurred any event or condition which gives rise to a Material Adverse Effect with respect to the Acquired Assets or the System.

Section 12.06 . Deliveries by Seller
Seller must deliver to Buyer all of the documents and items specified in Section 13.02.

## Section 12.07. Performance of the Obligations of Seller

Seller must have performed in all material respects all obligations required under this Agreement to be performed by Seller on or before the Closing Date, and Buyer shall have received a certificate to that effect from Seller dated the Closing Date.

## ARTICLE XIII.

## CLOSING

## Section 13.01. Closing Date

The Parties shall cause the Closing to take place at a place in Pennsylvania that is mutually agreed upon by the Parties, at 10:00 a.m. eastern standard time on the earliest agreed upon date or within twenty (20) Business Days after the date upon which all the conditions precedent to Closing described in this Agreement have been fulfilled or waived and Buyer and the Seller receive the last of the required consents, waivers, authorizations and approvals from the Governmental Authorities, in each case, for the transactions contemplated by this Agreement, or at such other place and time, by such other method, or on such other date, as may be mutually agreed to by the Parties (the "Closing Date"). The Closing will be effective at 12:01 a.m., Township of Lower Makefield, PA time, on the Closing Date (the "Closing Effective Time").

## Section 13.02. Deliveries by the Seller

At the Closing, the Seller shall have delivered or cause to be delivered to Buyer executed copies of the following agreements, documents and other items:
(a) A Bill of Sale transferring all of the Acquired Assets comprising personal property, in the form attached as Exhibit A;
(b) Possession of the Acquired Assets, including without limitation, the Real Property, the Easements and an interest in the Missing Easements (including a license from Seller to Buyer);
(c) A duly executed counterpart to an Assignment and Assumption Agreement with respect to the Assumed Liabilities (the "Assignment and Assumption Agreement"), in the form attached as Exhibit B;
(d) The consents to transfer all of the Assigned Contracts, Authorizations and Permits (including environmental Authorizations and Permits), to the extent required hereunder and the amendment required pursuant to Section 12.01(b);
(e) One or more special warranty or other deeds in recordable form reasonably acceptable to Buyer transferring fee simple title of Real Property;
(f) Copies or originals of all Files and Records, materials, documents and records in possession of the Seller relating to the Real Property, the Easements or the Assigned Contracts;
(g) Certificate of the Seller pursuant to Section 12.02 of this Agreement;
(h) Certificate of the Seller pursuant to Section 12.07 of this Agreement;
(i) Any documents duly executed by Seller required by the Title Company to issue final owner's title policies in accordance with the procedures set forth in Article VI; and
(j) All such other instruments of conveyance or other documents as shall, in the reasonable opinion of Buyer and its counsel, be necessary to transfer to Buyer the Acquired Assets in accordance with this Agreement or to carry out the terms of this Agreement, duly executed and acknowledged by Seller and in a recordable form.

## Section 13.03. Deliveries by Buyer

At the Closing, Buyer shall have delivered or caused to be delivered to the Seller, the following agreements, documents and other items:
(a) Payment in full of the Purchase Price;
(b) A duly executed counterpart to the Assignment and Assumption Agreement;
(c) Certificate of Buyer pursuant to Section 11.02 of this Agreement;
(d) Certificate of Buyer pursuant to Section 11.05 of this Agreement;
(e) Evidence of PaPUC approval as provided in Section 11.03; and
(f) All such other instruments of assumption as shall, in the reasonable opinion of Seller and its counsel, be necessary for Buyer to assume the Assumed Liabilities in accordance with this Agreement.

## ARTICLE XIV.

## TERMINATION

## Section 14.01. Events of Termination

This Agreement may, by notice given in the manner hereinafter provided, be terminated and abandoned at any time before completion of the Closing:
(a) By the mutual written consent of the Seller and the Buyer;
(b) By the Seller or the Buyer if:
(i) the Closing shall not have occurred on or before the

Outside Date; provided, however, the Buyer shall have the one-time right to extend the Outside Date for up to ninety (90) days if, in the Buyer's sole discretion, any such amount of time up to ninety (90) days is necessary to obtain a required Governmental Approval; or
(ii) any Governmental Authority shall have issued an order, decree or ruling or taken any other action, in each case permanently restraining, enjoining or otherwise prohibiting the material transactions contemplated by this Agreement and such order, decree, ruling or other action will have become final and non-appealable; provided, however, that the Party seeking termination pursuant to this clause (b) of this Section 14.01 is not in breach
in any material respect of any of its representations, warranties, covenants or agreements contained in this Agreement;
(c) By the Seller (if Seller is not then in material breach of any provision of this Agreement) in the event of a material breach of any covenant or agreement to be performed or complied with by the Buyer pursuant to the terms of this Agreement or of any representation or warranty of the Buyer contained in this Agreement, which breach (i) has continued without cure for a period of sixty (60) days following notice thereof by the Seller to the Buyer or if such breach cannot be cured and (ii) would result in a condition to Closing set forth in Article XI of this Agreement not being satisfied (which condition has not been waived by the Seller in writing), in which case any damages recoverable by Seller under this Agreement shall be capped at the amount of the Deposit; or
(d) By the Buyer (if Buyer is not then in material breach of any provision of this Agreement) in the event of a material breach of any covenant or agreement to be performed or complied with by the Seller pursuant to the terms of this Agreement or of any representation or warranty of the Seller contained in this Agreement, which breach (i) has continued without cure for a period of sixty (60) days following notice thereof by the Buyer to the Seller or if such breach cannot be cured and (ii) would result in a condition to Closing set forth in Article XII of this Agreement not being satisfied (which condition has not been waived by the Buyer in writing).

This Agreement may not be terminated after completion of the Closing.

## Section 14.02. Effect of Termination

If this Agreement is terminated by the Seller or the Buyer pursuant to Section 14.01, notice thereof will forthwith be given to the other and all further obligations of the Parties under this Agreement will terminate without further action by any Party and without liability or other obligation of any Party to any other Party hereunder; provided, however, that no Party will be released from liability hereunder if this Agreement is terminated and the transactions abandoned because of any willful breach of this Agreement.

## ARTICLE XV.

## MISCELLANEOUS

## Section 15.01. Confidentiality

Except as and to the extent required by Law (including but not limited to the Pennsylvania Right-To-Know Act at $65 \mathrm{~Pa} \S 67.101$ ) or pursuant to an order of a court of competent jurisdiction and as required hereunder to obtain any and all required Governmental Approvals, no Party shall, directly or indirectly, disclose or use (and no Party shall permit its representatives to disclose or use) any Confidential Information with respect to any other Party furnished, or to be furnished, by such other Party or its shareholders, directors, officers, agents, or representatives to the other Party or its employees, directors, officers, agents or representatives in connection herewith at any time or in any manner other than in connection with the completion of the transactions contemplated by this Agreement and related transactions.

Section 15.02. Public Announcements Subject to Law or listing rules of an exchange on which Buyer's parent corporation's stock is listed, and except as otherwise set forth herein, the initial public announcement relating to the transactions contemplated herein will be mutually agreed upon and jointly made by the Parties. Subsequent public announcements by one Party are subject to review and approval by the other Parties before issuance, such approval not to be unreasonably withheld, conditioned or delayed.

## Section 15.03. Notices

The Parties shall make all notices, other communications and approvals required or permitted by this Agreement in writing, stating specifically that they are being given pursuant to this Agreement and shall be addressed as follows:
in the case of the Seller:
1100 Edgewood Rd
Yardley, PA 19067
Attention: Township Manager
Fax:
with a copy to:
1100 Edgewood Rd
Yardley, PA 19067
Attention: Solicitor
Fax:
in the case of the Buyer:
Aqua Pennsylvania, Inc.
762 W. Lancaster Avenue
Bryn Mawr, PA 19010
Attention: Marc A. Lucca, President
malucca@aquaamerica.com
with a copy to:
Aqua Pennsylvania, Inc.
762 W. Lancaster Avenue
Bryn Mawr, PA 19010
Attention: Frances P. Orth, Vice President and Senior Managing Counsel
fporth@aquaamerica.com
or such other persons or addresses as a Party may from time to time designate by notice to the other Party. A notice, other communication or approval is deemed to have been sent and received (i) on the day it is delivered, or if such day is not a Business Day or if the notice is received after
ordinary office hours (time of place of receipt), the notice, other communication or approval is deemed to have been sent and received on the next Business Day, or (ii) on the fourth Business Day after mailing if sent by United States registered or certified mail.

## Section 15.04. Headings

The article, section and paragraph headings in this Agreement are for reference purposes only and have no affect the meaning or interpretation of this Agreement.

## Section 15.05. Severability

If any term, provision, covenant or restriction contained in this Agreement is held by a court of competent jurisdiction to be invalid, void or unenforceable, the remainder of the terms, provisions, covenants and restrictions contained in this Agreement remain in full force and effect and in no way be affected, impaired or invalidated.

## Section 15.06. Entire Agreement

This Agreement constitutes the entire agreement between the Parties pertaining to the subject matter hereof and supersedes all prior agreements, negotiations, discussions and understandings, written or oral, between the Parties. There are no representations, warranties, conditions or other agreements, whether direct or collateral, or express or implied, that form part of or affect this Agreement, or that induced any Party to enter into this Agreement or on which reliance is placed by any Party, except as specifically set forth in this Agreement. The Parties acknowledge and agree that (i) each has substantial business experience and is fully acquainted with the provisions of this Agreement, (ii) the provisions and language of this Agreement have been fully negotiated and (iii) no provision of this Agreement shall be construed in favor of any Party or against any Party because of such provision of this Agreement having been drafted on behalf of one Party rather than the other Party.

## Section 15.07. Amendments; Waivers

This Agreement may be amended, changed or supplemented only by a written agreement signed by the Parties. Any waiver of, or consent to depart from, the requirements of any provision of this Agreement will be effective only if it is in writing and signed by the Party giving it, and only in the specific instance and for the specific purpose for which it has been given. No failure on the part of any Party to exercise, and no delay in exercising, any right under this Agreement will operate as a waiver of such right. No single or partial exercise of any such right precludes any other or further exercise of such right or the exercise of any other right.

## Section 15.08. Parties in Interest; Third Party Beneficiary

This Agreement is not intended to and shall not be construed to create upon any Person other than the Parties any rights or remedies hereunder.

Section 15.09. Anti-Assignment; Successors and Assigns

Neither Party to this Agreement may assign any right or delegate any performance under this Agreement without the prior written consent of the other Party. A purported assignment or purported delegation without prior written consent is void. This Agreement is binding upon, and inures to the benefit of, the Parties and their respective permitted successors and assigns.

## Section 15.10. Governing Law; Jurisdiction

The laws of the Commonwealth of Pennsylvania (without giving effect to its conflicts of law principles) govern all matters arising and relating to this Agreement, including torts. The Parties irrevocably agree and consent to the jurisdiction of the United States District Court for the Eastern District of Pennsylvania and the Court of Common Pleas of Bucks County, Pennsylvania, for the adjudication of any matters arising under or in connection with this Agreement. Any action initiated in court shall be filed and litigated (including all discovery proceedings) exclusively in the United States District Court for the Eastern District of Pennsylvania and the Court of Common Pleas of Bucks County, Pennsylvania, and each Party irrevocably submits to the exclusive jurisdiction of such courts in any such suit, action or proceeding. Service of process, summons, notice or other document by mail to such Party's address set forth herein shall be effective service of process for any suit, action or other proceeding brought in any such court. EACH PARTY ACKNOWLEDGES AND AGREES THAT ANY CONTROVERSY WHICH MAY ARISE UNDER THIS AGREEMENT OR THE OTHER TRANSACTION DOCUMENTS IS LIKELY TO INVOLVE COMPLICATED AND DIFFICULT ISSUES AND, THEREFORE, EACH SUCH PARTY IRREVOCABLY AND UNCONDITIONALLY WAIVES ANY RIGHT IT MAY HAVE TO A TRIAL BY JURY IN RESPECT OF ANY LEGAL ACTION ARISING OUT OF OR RELATING TO THIS AGREEMENT, THE OTHER TRANSACTION DOCUMENTS OR THE TRANSACTIONS CONTEMPLATED HEREBY OR THEREBY. EACH PARTY TO THIS AGREEMENT CERTIFIES AND ACKNOWLEDGES THAT (A) NO REPRESENTATIVE OF ANY OTHER PARTY HAS REPRESENTED, EXPRESSLY OR OTHERWISE, THAT SUCH OTHER PARTY WOULD NOT SEEK TO ENFORCE THE FOREGOING WAIVER IN THE EVENT OF A LEGAL ACTION, (B) SUCH PARTY HAS CONSIDERED THE IMPLICATIONS OF THIS WAIVER, (C) SUCH PARTY MAKES THIS WAIVER VOLUNTARILY, AND (D) SUCH PARTY HAS BEEN INDUCED TO ENTER INTO THIS AGREEMENT BY, AMONG OTHER THINGS, THE MUTUAL WAIVERS AND CERTIFICATIONS IN THIS SECTION.

## Section 15.11. Specific Performance

The Parties agree that irreparable damage would occur if any provision of this Agreement were not performed in accordance with the terms hereof and that the Parties is entitled to specific performance of the terms hereof, in addition to any other remedy to which they are entitled at law or in equity.

## Section 15.12. Counterparts; Electronic Mail; Facsimile Execution

This Agreement may be executed in any number of counterparts which, taken together, shall constitute one and the same agreement. This Agreement will be effective when it has been executed by each Party and delivered to both Parties. To evidence the fact that it has executed this

Agreement, a Party may send a copy of its executed counterpart to the other Party by electronic mail or facsimile transmission. Such Party is deemed to have executed and delivered this Agreement on the date it sent such electronic mail or facsimile transmission. In such event, such Party shall forthwith deliver to the other Party an original counterpart of this Agreement executed by such Party.

## [THIS SPACE INTENTIONALLY LEFT BLANK;

SIGNATURES NEXT PAGE]

IN WITNESS WHEREOF, the Parties have executed, or caused to be executed by their duly authorized Representatives, this Agreement as of the Effective Date.

TOWNSHIP OF LOWER MAKEFIELD, BUCKS COUNTY


Printed: Fredric $K$ Weiss
Its: Beard Chair,

## ATTEST:



AQUA PENNSYLVANIA WASTEWATER, INC.

By: $\qquad$
Printed: Marc A. Lucca
Its: President

ATTEST:

By:
Name:
Its:

IN WITNESS WHEREOF, the Parties have executed, or caused to be executed by their duly authorized Representatives, this Agreement as of the Effective Date.

TOWNSHIP OF LOWER MAKEFIELD, AQUA PENNSYLVANIA WASTEWATER, BUCKS COUNTY INC.

By: $\qquad$
Printed: $\qquad$
Its:

ATTEST:

By:
Name:
Its:
By:


Printed: Marc A. Lucca
Its: President

## ATTEST:

By: Heidi A. M'Anty
Name: HEidi H. Mcintyre
Its: Ass't Secretary

February 15, 2021

Mr. Kurt Ferguson
Township Manager
Lower Makefield Township
1100 Edgewood Road
Yardley, PA 19067

Re: Lower Makefield Township Wastewater Collection System Fair Market Value Appraisal

Dear Mr. Ferguson:

AUS Consultants is please to respond to Scott Shearer"s (PFM Financial Advisors, LLC) request for a proposal for a valuation of Lower Makefield Township's wastewater collection system. We understand the nature and purpose of the request is to determine the fair market value of the Township's wastewater collection property and its operation for compliance with Title 66 (Public Utilities) of the Pennsylvania Consolidated Statues Section 1329 of the "Valuation of Acquired water and wastewater systems" collectively referred to as Act 12 of the Commonwealth of Pennsylvania's 2016 legislative session. AUS Consultants is a Utility Valuation Expert (UVE) as designated by the Pennsylvania Public Utility Commission (PUC) Docket No. A-2016-2566251 Entity Code 9919181 renewed January 13, 2020. Our appraisal assumes an investor-owned utility as the purchaser and that the purchaser would be successful in establishing the purchase price, assumed to be the appraised value, as rate-base for regulatory purposes under Section 1329 of the Public Utility Code of Pennsylvania.

Our response to this request will include the scope of our services, a list of AUS Consultants staff and their qualifications, an initial listing of data required to perform the appraisal and a range of project costs through the completion of the appraisal report; activities subsequent to the delivery of our final report will be billed at our hourly per diems defined below. The appraisal will be prepared under the 2020-2021 edition of the Uniform System of Professional Appraisal Practices (USPAP).

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Before addressing the proposal requirements, it is important to understand the valuation concepts and parameters as they would apply to this project which will be subject to consideration of issues regarding to recent Commission decisions and settlements entered into between the Pennsylvania Office of Consumer Advocate (OCA) and the participants (Aqua Pennsylvania and Pennsylvania American) in other recent Act 12 cases.

## Valuation Study

AUS Consultants understands the purpose of the valuation study is to determine the fair market of the Township's wastewater collection system assets and their operation. Fair market value is defined as:
"The most probable price, as of a specified date, in cash, or in terms equivalent to cash, or in other precisely revealed terms, for which the specified property rights should sell after reasonable exposure in a competitive market under conditions requisite to a fair sale, with the buyer and seller each acting prudently, knowledgeably, and for self-interest, and assuming that neither is under undue duress." The Appraisal of Real Estate, $13^{\text {th }}$ Edition, page 23

Our conclusion will represent the fair market value as a going concern, in this case an operating wastewater collection system and not an amount that would be realized from a liquidation of those assets.

## Valuation Methodologies

The valuation of the Township's wastewater collection assets, as part of a going concern, will the three (3) generally accepted valuation methodologies: the cost, income and market approaches.

The primary valuation method that will be utilized is the cost approach. In preparing the cost approach we will rely on the "Engineer's Assessment" inventory prepared for the Township and the Purchaser per the Pennsylvania PUC's (Act 12) Final Implementation Order M-2016-2543993. In order for the Engineer's Assessment to be of maximum use to the UVEs it should detail the property by account, type and size of property and or equipment, its date of installation and its

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original cost. It should be noted that Section 1329 does not restrict the property to be appraised in any fashion so all property of the Township subject to the sale whether Township constructed and/or developer contributed is subject to the appraisal. The cost approach will give consideration to the Township's wastewater collection plant and equipment's replacement cost adjusted for appraisal depreciation. The replacement cost new will be developed using either trending the property's investment by account and installation year or by application of appraisal date unit costs to property's inventory by account and installation year. Next, appraisal depreciation, physical, function and economic, will be assessed and deducted from the replacement cost new. The physical and functional depreciation will be determined based on the age-life depreciation methods using aging from the Engineer's Assessment, the service lives applicable to wastewater industry depreciation lives and a physical inspections of the property.

The property subsequent to its acquisition, will be regulated by the Pennsylvania PUC utilizing a rate base/rate of return regulation. This form regulation allows for the fair return on and of the Company's capital invested for the provision of wastewater services. The last step in the Cost Approach's we will consider the property's economic returns under PUC regulation in order to determine if economic obsolescence exits in the preliminary Cost Approach conclusion discussed above. We will use the results of Income and Market Approaches (discussed below) in making this determination.

The income approach provides an indication of value by evaluation the future returns of the operation of the property as wastewater collection system. There are two commonly used methods of the income approach: the discounted cash flow (DCF) approach and the capitalized income approach. Both procedures discount the future returns of the property using a recognized cost of capital for the wastewater industry.

In the DCF, the expected or future cash flows of the operation of the property are discounted to the appraisal date (present value) using a recognized cost of capital for the wastewater industry. Future cash flows are based on historical results from operation in terms of revenues and expenses as the basis forecast of future operations. The projected cash flow levels must provide for additional cash investment and working capital additions, as well as reflect the specific growth potential of the system being valued.

In the capitalize income approach the property's future returns are consolidated into a single estimate for all future periods. The capitalized income approach to value is determined by the

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direct capitalization of the estimated income using an adjusted cost of capital removing future growth from the cost of capital rate.

The discount rate used in the income approaches will be developed from a market analysis of debt and equity reflecting the risks associated with a rate regulated water and wastewater companies regulated by the Pennsylvania PUC.

The market approach looks to market sales of similar water and wastewater utility properties (companies). There are two methods which are commonly utilized to estimate the market approach: actual market sales and market multiples based on wastewater industry comparables based on financial performance as reported in Value Line Investment Surveys for the water/wastewater industry.

The final appraised value will consider each of the three approaches to value both individually and collectively.

## AUS Consultants Professional Staff

AUS Consultants' professional staff has extensive nationwide experience in preparing business enterprise valuations for water and wastewater systems.

Jerome C. Weinert, Professional Engineer (PE), Accredited Senior Appraiser (ASA), Certified Depreciation Professional (CDP)

- 48 years in Appraisal and Depreciation Consulting
- BS in Mechanical Engineering - Milwaukee School of Engineering (1972)
- Master's in Business Administration - Marquette University (1988)
- Testimony Experience:

Regulatory (Depreciation and Rate Base)
Courtroom (Valuations - ad valorem taxation and eminent domain and rate of return)
Michael J. Diedrich, PE, ASA, CDP, Certified General Appraiser

- 37 years in Appraisal and Depreciation Consulting
- BS in Architectural Engineering Technology - Milwaukee School of Engineering (1981)
- Master's in Business Administration - Marquette University (1991)
- Testimony Experience:

Courtroom (Valuations ad valorem taxation and eminent domain)

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## David Weiler

- 35 years in Valuations of Business Enterprises, Closely-held common Stock, Cost of Capital Studies and Valuations of Intangible Property
- Bachelor of Science in Finance-Drexel University (1978)


## David A. Sheffer

- 38 years in Regulatory Consulting (Depreciation, Rate Base, Cost of Service, Valuations and Original Cost Studies)


## Elizabeth A Weinert

- 18 years in Appraisal and Depreciation Consulting
- B Bachelor of Science in Mechanical Engineering - Milwaukee School of Engineering (2001)
- Master's in Aeronautical Engineering - University of Alabama (2015)


## First Request for Data

In order to expedite the project upon the Lower Makefield Township's acceptance of our proposal, AUS Consultants needs the following data:

Inventory of property plant and equipment. Ultimately this inventory needs to be provided by the firm preparing the "Engineer's Assessment" for both the Township and the Purchaser. As stated above:
"In order for the Engineer's Assessment to be of maximum value use it should detail the property by account, type and size of equipment, its date of installation and its original cost. It should be noted that Section 1329 does not restrict the property to be appraised in any fashion so all property whether municipally constructed and/or developer contributed is subject to the appraisal."

Township's financial information related to the operation of the wastewater collection system over each of the last four to six years.

Customer information for the last four years

This data request is not intended to be all inclusive of the information required. There will be follow-up questions and additional requests for data.

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AUS Consultants would like to perform a physical inspection of the Township's wastewater system and schedule interviews, as appropriate, with township personnel familiar with the wastewater collection system's operation.

## Fee Estimate

AUS Consultants would offer a professional fee range of $\$ 25,000$ to $\$ 27,000$ plus expenses to complete a valuation study. Expenses billed at our cost will include travel and living, report preparation, and Fed Ex as necessary.

For activities subsequent to our final report the following table of hourly per diems plus expenses:

| Consultant | Hourly Per Diems (\$s/hr.) |
| :--- | :---: |
| Jerome C. Weinert | 275 |
| Michael J Diedrich | 250 |
| Earl Robinson | 200 |
| David A. Sheffer | 200 |
| David Weiler | 170 |
| Elizabeth A. Weinert | 150 |
| Susan Macchia | 70 |

These activities typically include responding to interrogatories (Commission staff, OCA, Small Business Advocate, and/or other possible intervenors), reviewing the testimony of participating parties, preparing testimony (direct, cross, and possibly sur-rebuttal), attending Commission hearings. If expert testimony is required, Jerome C. Weinert will be the witness and attend any hearings which is required.

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## Closure

AUS Consultants appreciates the opportunity to respond to Lower Makefield Township's request for our services. Should you have any questions regarding our response, please contact the undersigned.

Respectfully submitted,
Jerome C. Weinert
AUS Consultants
Principal \& Director
Jerme CWeinent
Date: February 15, 2021

Accepted by:

Lower Makefield Township, PA
Date: $\qquad$


[^0]:    ${ }^{1}$ The Appraisal of Real Estate, $14^{\text {th }}$ Edition. pages 569-570
    ${ }^{2}$ lbid, page 570
    ${ }^{3}$ Valuing Machinery and Equipment: The Fundamentals of Appraising Machinery and Technical Assets, Third Edition. Page 50

[^1]:    ${ }^{4}$ The Dictionary of Real Estate Appraisal, $4^{\text {th }}$ Edition
    ${ }^{5}$ Valuing Machinery and Equipment: The Fundamentals of Appraising Machinery and Technical Assets, Second Edition. Page 67.
    ${ }^{6}$ The Appraisal of Real Estate, 13 ${ }^{\text {th }}$ Edition, page 442.

[^2]:    ${ }^{7}$ Valuing Machinery and Equipment: The Fundamentals of Appraising Machinery and Technical Assets, Second Edition, pp. 96-97.

[^3]:    ${ }^{8}$ Extracted from Engineer's Assessment page 2 through 5

[^4]:    ${ }^{11}$ Valuing Machinery and Equipment: The Fundamentals of Appraising Machinery and Technical Assets, Second Edition. Page 59

[^5]:    ${ }^{12}$ The Dictionary of Real Estate Appraisal, $4^{\text {th }}$ Edition
    ${ }^{13}$ Valuing Machinery and Equipment: The Fundamentals of Appraising Machinery and Technical Assets, Second Edition. Page 67.
    ${ }^{14}$ The Appraisal of Real Estate, $13^{\text {th }}$ Edition, page 442.

[^6]:    ${ }^{15}$ Valuing Machinery and Equipment: The Fundamentals of Appraising Machinery and Technical Assets, Second Edition, pp. 96-97.

[^7]:    ${ }^{1}$ The Appraisal Institute has extended the 2020-2021Edition of USPAP until year-end 2022.

[^8]:    Activity
    Ad Valorem Tax Appraisal
    Depreciation Study
    Depreciation Study
    Depreciation Study
    Ad Valorem Tax Appraisal

[^9]:    

[^10]:    

[^11]:    50\%

[^12]:    TOTAL NONDEPRECIABLE PLANT

[^13]:    $\begin{array}{ll}382.00 & \text { OUTFALL SEWER LINES } \\ 389.10 & \text { OTHER PLANT AND MISCELLANEOUS EQUIPMENT - INTANGIBLES } \\ 389.60 & \text { OTHER PLANT AND MISCELLANEOUS EQUIPMENT - CPS } \\ 390.00 & \text { OFFICE FURNITURE AND EQUIPMENT } \\ 391.00 & \text { TRANSPORTATION EQUIPMENT } \\ 392.00 & \text { STORES EQUIPMENT } \\ 393.00 & \text { TOOLS, SHOP AND GARAGE EQUIPMENT } \\ 394.00 & \text { LABORATORY EQUIPMENT } \\ 395.00 & \text { POWER OPERATED EQUIPMENT } \\ 396.00 & \text { COMMUNICATION EQUIPMENT } \\ 397.00 & \text { MISCELLANEOUS EQUIPMENT } \\ 398.00 & \text { OTHER TANGIBLE PLANT }\end{array}$

[^14]:    Value Line Investment Surveys
    Water Industry
    As of First Quarter 2021 (1-1-2021)

[^15]:    ${ }^{1}$ PECO Energy Company - Gas Operations, Pennsylvania American Water Company, Pennsylvania American Water Company Wastewater Division, Columbia Gas of Pennsylvania, Inc., and UGI Utilities, Inc. - Gas Division have rate filings at Docket Nos. R-2020-3018929, R-2020-3019369, R-2020-9319371, R-2020-3018835, and R-2019-3015162 respectively, and filed a letter with the Secretary in place of a report in accordance with 52 Pa . Code § 71.4.

[^16]:    2 Each utility lists adjustments on Schedule B of their quarterly financial report.
    3 The ROE is approved in a utility's most recent fully litigated base rate proceeding for which a final order was entered not more than two years prior to the effective date of the DSIC. If more than two years have elapsed between the entry of a final order and the DSIC effective date, the ROE is from this report. If the base rate proceeding is settled, without a stipulated ROE, the ROE is from this report.

[^17]:    (A) Diluted earnings: Excludes nonrecur, ings report due early Nov,
    

[^18]:    'A) Diluted earnings. Next earnings report due
    ite October.
    (B) Dividends historically paid in late February,

    June, September, and Decomber.

[^19]:    

