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September 7, 2018

VIA ELECTRONIC FILING

Hon. David Jones, Chairman
c/o Sharla Dillon
Tennessee Public Utilities Commission
502 Deaderick Street, 4th Floor
Nashville, TN 37243

RE: ***Joint Petition of Tennessee-American Water Company, and Thunder Air, Inc. d/b/a Jasper Highlands Development, Inc. for Approval of a Purchase Agreement and for the Issuance of a Certificate of Convenience and Necessity*** **TPUC Docket No.** 18-00099

Dear Chairman Jones:

Attached for filing please find *Tennessee-American Water Company's Expedited Joint Petition for Approval of an Asset Purchase Agreement and for the Issuance of a Certificate of Convenience and Necessity*, including exhibits and pre-filed testimony.

As required, an original and four (4) hard copies of the Petition and supporting documentation will follow. We have also enclosed a check in the amount of $25.00 for the required filing fee.

For the reasons set forth within the Joint Petition, the parties are requesting that this matter be considered on an expedited basis.

An extra copy of this cover letter will also follow to be filed-stamped for our records. Should you have any questions concerning this filing or require additional information, please do not hesitate to let me know.

Very truly yours,

BUTLER SNOW LLP

Melvin J. Malone

clw
Attachments
cc: Linda Bridwell, Tennessee-American Water Company (via e-mail)
Daniel Whitaker, Consumer Protection and Advocate Division (via email)
Cynthia Kinser, Consumer Protection and Advocate Division (via email)

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BEFORE THE TENNESSEE PUBLIC UTILITY COMMISSION
NASHVILLE, TENNESSEE

JOINT PETITION OF TENNESSEE-AMERICAN WATER COMPANY, AND THUNDER AIR, INC. D/B/A JASPER HIGHLANDS DEVELOPMENT, INC. FOR APPROVAL OF AN ASSET PURCHASE AGREEMENT AND FOR THE ISSUANCE OF A CERTIFICATE OF CONVENIENCE AND NECESSITY	)	**DOCKET NO. 18-_____**

EXPEDITED JOINT PETITION OF TENNESSEE-AMERICAN WATER COMPANY AND THUNDER AIR, INC. D/B/A JASPER HIGHLANDS DEVELOPMENT, INC. FOR APPROVAL OF AN ASSET PURCHASE AGREEMENT AND FOR THE ISSUANCE OF A CERTIFICATE OF CONVENIENCE AND NECESSITY

Pursuant to Tenn. Code Ann. §§ 65-4-201 and 65-4-107, Tennessee-American Water Company ("TAWC," "Tennessee-American" or "Company") and Thunder Air, Inc. d/b/a Jasper Highlands Development, Inc. ("Thunder Air Inc."), submit this Joint Petition seeking both the approval of the acquisition of the water system owned by Thunder Air Inc. by TAWC and a Certificate of Convenience and Necessity, with its accompanying privilege and franchise, to own and operate the water system owned by Thunder Air Inc. and to serve the Thunder Air Inc. development.[1] As set forth below, the Asset Purchase Agreement is necessary and proper for the public convenience and properly conserves the public interest. Therefore, the issuance of a Certificate of Convenience and Necessity to TAWC will serve the public interest as well. For

[1] A copy of the Asset Purchase Agreement (the "Purchase Agreement") between TAWC and Thunder Air Inc. is attached as **Exhibit A** to this Joint Petition. As set forth in the Pre-filed Testimony of Thunder Air Inc. Witness Dane Bradshaw, the System is operated by the Jasper Highlands Property Owners Association, which is both aware of and supportive of this Joint Petition. Mr. Bradshaw is the President of the Jasper Highlands Property Owners Association.

the reasons and support that follow, TAWC and Thunder Air Inc. jointly request that the Tennessee Public Utility Commission ("TPUC" or "Commission") approve this Joint Petition.

Under the terms of the Purchase Agreement, a condition precedent to the closing of the sale of Thunder Air Inc.'s water system is TAWC obtaining a Certificate of Convenience and Necessity, along with acceptable accounting, ratemaking and regulatory approvals, from the Commission. Due to the impending closing of the transaction, coupled with the public interest, the parties hereby request that this Joint Petition be considered on an **expedited** basis.[2]

I. THE PARTIES

1. Thunder Air, Inc. d/b/a Jasper Highlands Development, Inc., a Tennessee corporation, owns approximately 9,000 acres atop Jasper Mountain in Marion County, Tennessee. Moreover, Thunder Air Inc. owns a water system that provides water services to customers within its growing development in Kimball, Tennessee. The location of the development and this water system is generally shown on the map attached hereto as **Exhibit B** (collectively the "System"). The development and the System are located about twenty (20) miles from TAWC's Whitwell operations.

2. As the build-out and further development of Thunder Air Inc. continues, more customers will be served by the System, as expanded from time to time to accommodate additional customers within the Thunder Air Inc. development.[3]

3. TAWC is a Tennessee corporation authorized to conduct a public utility business in the State of Tennessee and provides residential, commercial, industrial and municipal water service, including public and private fire protection service, to the City of Chattanooga, Tennessee and surrounding areas, including certain areas in Georgia. In addition to Whitwell,

[2] Moreover, expedited consideration of the Joint Petition will also aid TAWC's ability to appropriately prepare for the upcoming construction season.
[3] *See* Acquisition Agreement, Exhibit A to Purchase Agreement.

Tennessee-American currently provides water services for Powell's Crossroads and Suck Creek in Marion County. TAWC provides water service to approximately 80,670 customers.

4. Pursuant to Chapter 4 of Title 65 of the Tennessee Code Annotated, TAWC is subject to regulation by the Commission.

5. TAWC's principal place of business is located at 109 Wiehl Street, Chattanooga, TN 37403.

6. All correspondence and communication with respect to this Joint Petition should be sent to the following:

Linda C. Bridwell
Tennessee-American Water Company
2300 Richmond Road
Lexington, KY 40502
(859) 268-6373 (Office Telephone)
Linda. Bridwell@amwater.com

Melvin J. Malone
Butler Snow LLP
The Pinnacle At Symphony Place
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Nashville, TN 37201
(615) 651-6700 (Office Telephone)
melvin.malone@butlersnow.com

II. DESCRIPTION OF THE TRANSACTIONS

7. As set forth in the Purchase Agreement, Thunder Air Inc. has determined that it is in the best interest of both Thunder Air, Inc. and those served by the System for TAWC to acquire the System. Therefore, Thunder Air Inc. desires to sell all of the assets that constitute or are used in furtherance of the System to TAWC.

8. TAWC and Thunder Air Inc. have entered into the Purchase Agreement dated August 6, 2018, under which TAWC has agreed to purchase from Thunder Air Inc. the assets of

the System. Under the terms of the Purchase Agreement, the Purchase Price is the sum of One Million Five Hundred Thousand Dollars ($1,500,000.00), subject to, among other things, the results of the inspection of Thunder Air Inc.'s Assets relating to the System by TAWC, which excludes the value of any insurance policies, cash, cash equivalents and short-term investments, working capital, accumulated deferred income taxes, and accumulated deferred investment tax credits.[4] The Purchase Price is further addressed in the Pre-Filed Direct Testimony of R. Kevin Kruchinski.

9. In anticipation of the continued build-out of the Thunder Air Inc. development, the parties have entered into an Acquisition Agreement, which outlines certain terms and agreements concerning the expansion of the System.[5]

10. The Purchase Agreement also provides that TAWC will continue to provide service to the System customers at the current rates they are paying until such time as different rates may be submitted to and approved by the Commission.

11. The expenses and revenues of the System will be kept separate and distinct from the operation of TAWC's Chattanooga system.

12. The acquisition of the System will not adversely impact the rates of current TAWC ratepayers.

13. As part of the consideration for the purchase of the System, and as set forth in the Purchase Agreement, the Assets of the System includes, but is not limited to, all Real Property including easements, rights-of-way or rights granted to Thunder Air Inc. in furtherance of the operation of the System.

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[4] The capitalized terms used in this Joint Petition shall have the meaning set forth within the Purchase Agreement and all documents executed in connection with the Purchase Agreement.

[5] *See* Note 3 *supra*. As set forth in Addendum B to the Acquisition Agreement, the applicable bona fide customer distance for expanding water service to new customers will be one hundred (100) feet, as opposed to forty-five (45) feet contained within TAWC's tariff.

14. The necessary revisions to the tariffs of TAWC relative to the System are attached hereto as **Exhibit C**.

15. As set forth earlier herein, pursuant to the Purchase Agreement, consummation of the transaction, with its underlying obligations, is expressly conditioned upon Commission approval.

III. TAWC's TECHNICAL, MANAGERIAL AND FINANCIAL ABILITY

16. TAWC has a proud 131 year history of providing safe, reliable drinking water to its customers.

17. TAWC is a wholly-owned subsidiary of American Water Works Company, Inc., which is the largest water holding company in the United States, providing water and wastewater services to fifteen (15) million people in more than thirty (30) states.

18. As noted earlier herein, TAWC is regulated by the Commission. As such, the Commission is intimately familiar with the technical, managerial and financial ability of TAWC. Further, the official records of the Commission support TAWC's technical, managerial and financial ability to provide services within the areas served by the System.

19. The pre-filed testimony in support of this Joint Petition also demonstrates TAWC's technical, managerial and financial ability.

IV. PROPOSED REGULATORY TREATMENT

20. Given TAWC's unwavering commitment to provide safe, reliable drinking water to the System's customers, TAWC deserves full rate base recognition of its investment in the System, as well as the following proposed adjustments:

a. TAWC proposes to utilize the financial statements, records and reports provided by Thunder Air Inc. and its accountant to support the original cost value of utility plant in service ("UPIS") as of the Closing Date.

b. TAWC proposes to adopt the current TPUC-approved TAWC depreciation rates for Thunder Air Inc. upon Closing.

c. TAWC proposes no UPAA with this transaction, as the purchase price is equivalent to the System rate base at Closing, assuming the afore-referenced adjustments.

d. In conducting the necessary due diligence and prudency evaluation with respect to the System, which preliminary reviews benefit both shareholders and current ratepayers, and in properly documenting the transactions, TAWC has necessarily incurred reasonable acquisition expenses, including some by external parties, which, under the circumstances presented, are appropriate for recovery. Upon Closing, the System's customers will benefit substantially from the transactions. TAWC proposes that these necessary and reasonable expenses be recovered through the recording of a regulatory asset to be amortized over ten (10) years.

21. As the Commission well knows based upon its own experiences, the ever-growing pressures of needed capital investments mount more and more, causing smaller utilities to confront substantial, and oftentimes insurmountable, difficulties. In order for better positioned utilities, such as TAWC, to provide the necessary relief, to offer the opportunity for improved services, and to promote the public interest in such circumstances, fair and balanced regulatory treatment is essential.

22. Upon closing, TAWC seeks to apply all other rates and fees as authorized and applied to all other customers on the customers of Thunder Air Inc. This will include late fees, service activation fees, returned check fees, disconnection fees, the Capital Recovery Riders as approved by the TPUC, and the PCOP Rider as appropriate.

V. THE PUBLIC INTEREST

23. Thunder Air Inc. believes it is in the best interests of the customers of the System for TAWC to acquire the System from Thunder Air Inc. with the result that TAWC will be the exclusive provider of water within the service area of the System, necessarily including the Thunder Air Inc. build-out.

24. Water utilities are the most capital intensive in the utility industry. In properly maintaining and supporting a water system, the owner and operator thereof is confronted with, among other things, increasing costs and mounting capital expenditures. Aging infrastructure and technological advances must be consistently and appropriately studied and addressed. TAWC has the capability and resources to ensure that the System is appropriately maintained and upgraded in the days ahead as conditions warrant.

25. TAWC has a proud 131 year history of providing safe, reliable drinking water to its customers. During its 131 years of operation, TAWC has never received a United States Environmental Protection Agency notice of violation of any type (water quality or documentation). This transaction will benefit the current and future customers of the System through the professional management, long-term planning, and sustained investment by TAWC.

26. The representations and agreements described in the Purchase Agreement reflect the determination by the parties involved that going forward TAWC, rather than Thunder Air Inc., is best suited to provide service to customers of the System, including making future capital improvements necessary to maintain the efficiency and quality of the System.

27. The Purchase Agreement and the requested regulatory treatment and approvals are necessary and proper for the public convenience and properly conserve, promote and protect the public interest.

28. The issuance of a Certificate of Convenience and Necessity to TAWC serves the public interest.

WHEREFORE, the parties hereby request that the Commission:

(1) Approve both the Purchase Agreement, attached hereto as **Exhibit A** as necessary and proper for the public convenience and properly conserving, promoting and protecting the public interest;

(2) Issue a Certificate of Convenience and Necessity to TAWC, which will permit TAWC to serve all of the current and future water customers in the Thunder Air Inc. development, as this will serve and promote the public interest;

(3) Approve accounting and rate base treatments that reflect the full Purchase Price, plus the acquisition and transactions costs in future rate base determinations will be consistent with the value of the full Purchase Price plus acquisition and transactions costs;

(4) Grant such approvals as may be necessary to consummate the acquisition of the System by TAWC and permit the operation thereof by TAWC on the terms described in the Purchase Agreement, including all necessary licenses, permits and franchises to provide water and related services in the Thunder Air Inc. development;

(5) Consistent with the Joint Petition, authorize TAWC to apply the rules, regulations, rates and charges generally applicable to TAWC's Chattanooga operations, as the same may be changed from time to time, to service to be provided by TAWC in the areas currently served by the System;

(6) Authorize TAWC to apply its existing depreciation accrual rates to the System, along with the other regulatory treatment expressly proposed herein by TAWC;

(7) Approve the encumbering of the properties comprising the System with the lien of TAWC's Mortgage Indenture;

(8) Grant all such approvals and authorizations that are necessary to consummate the Purchase Agreement and to provide service to all customers acquired as a result of the referenced transactions, including the ability to serve those customers in accordance with the rules, regulations, rates and charges set forth in TAWC's tariff on file with the Commission; and,

(9) Grant such other relief as may be required, and all on an expedited basis.

Respectfully submitted,

BUTLER SNOW LLP

By:_____

Melvin J. Malone
The Pinnacle At Symphony Place
150 Third Avenue South, Suite 1600
Nashville, TN 37201
(615) 651-6700 (Office Telephone)
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Counsel for Tennessee-American Water Company

HORTON, BALLARD & PEMERTON PLLC

By:_____

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Chattanooga, TN 37402
(423) 243-3783
whorton@whorton-law.com

Counsel for Thunder Air, Inc. d/b/a Jasper Highlands Development, Inc.

CERTIFICATE OF SERVICE

I hereby certify that a true and correct copy of the foregoing has been served via either U.S. Mail, postage prepaid, or electronically to the following this 7th day of September, 2018.

Cynthia Kinser
Daniel Whitaker
Consumer Protection and Advocate Division
Office of the Attorney General
P.O. Box 20207
Nashville, TN 37202

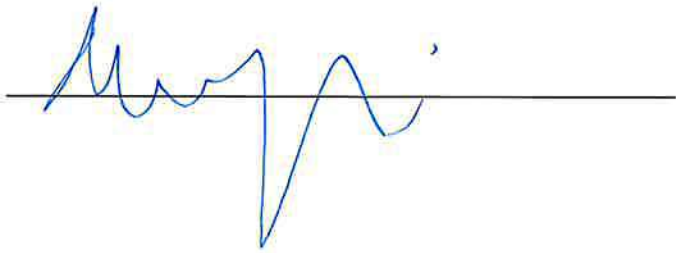

Exhibit A

ASSET PURCHASE AGREEMENT

This Asset Purchase Agreement ("Agreement") is made and entered into this 6th day of August, 2018 ("Effective Date") by and between **Tennessee-American Water Company**, a Tennessee public utility corporation ("Buyer"), and **Thunder Air, Inc., d/b/a Jasper Highlands Development, Inc.**, a Tennessee corporation, ("Seller"). Hereinafter, the Buyer and Seller may be individually referred to as a "party" or jointly as the "parties".

RECITALS:

A. Seller owns and operates a water system which provides water services to customers located within its service area (the "Service Area") (collectively referred to as the "Business").

B. Buyer desires to acquire and Seller desires to sell the Assets of Seller relating to the Business pursuant to the terms and conditions of this Agreement.

NOW, THEREFORE, in consideration of the foregoing recitals and the covenants contained herein and in exchange for other consideration the receipt and sufficiency of which are hereby acknowledged, the parties, intending to be legally bound, agree as follows:

ARTICLE 1
Definitions and Related Matters

For purposes of this Agreement and all documents executed in connection with this Agreement, the capitalized terms shall have the meanings assigned to them herein or in Schedule 1 and the rules of construction set forth in Schedule 1 shall govern.

ARTICLE 2
Purchase and Sale of Assets; Closing

2.1 Transfer and Description of Assets. Subject to and upon all other terms and conditions of this Agreement, effective as of the Effective Time on the Closing Date, Seller shall sell, convey, transfer, assign and deliver to Buyer free and clear of all Encumbrances, and Buyer shall acquire from Seller, all of Seller's right, title and interest in and to all of Seller's assets, other than the Excluded Assets, regardless of where located, which are, could be, or in the future would be part of the transmission and distribution systems used to provide water service to Seller's water customers, including but not limited to the following:

(a) all Real Property including any easements, rights-of-way or rights granted to the Seller in furtherance of the operation of the Business including but not limited to that described in Schedule 3.4;

(b) all Tangible Personal Property, as defined in Schedule 1 Definitions.

(c) all data and Records related to Seller's operation of the Business, including, but not limited to, the customer list which shall include the service and billing address of all customers of the Seller and, subject to applicable Law, copies of all Records described in Section 2.2(b);

(d) all Permits and all pending applications therefore, renewals thereof or exemptions therefrom which are necessary or advisable in the operation of Seller's Business, including but not limited to those listed in Schedule 3.8, to the extent transferable; and

(e) all of the intangible rights and property of Seller utilized by Seller in the operation of the Business.

All of the foregoing shall be hereinafter referred to collectively as the "Assets".

2.2 Excluded Assets. Notwithstanding anything to the contrary contained in Section 2.1 or elsewhere in this Agreement, the following Assets of Seller are not part of the sale and purchase contemplated hereunder, are excluded from the Assets, and shall remain the property of Seller after the Closing:

(a) all insurance policies and rights thereunder;

(b) all personnel Records and other Records that Seller is required by Law to retain in its possession;

(c) all rights in connection with and assets of the employee benefit plans and employment or independent contractor Contracts;

(d) all rights of Seller under the Transaction Documents;

(e) cash, cash equivalents and short-term investments;

(f) the assets listed on Schedule 2.2;

(g) accounts receivable arising prior to the Effective Time; and

(h) Customer Service Connections, which shall remain the property of the customer.

All of the foregoing shall be hereinafter referred to collectively as the "Excluded Assets".

2.3 Consideration. The consideration for the Assets (the "Purchase Price") will be the sum of **One Million Five Hundred Thousand Dollars ($1,500,000.00) subject to the results of the inspection of Seller's Assets by Buyer**. The Assets shall be in substantially the same condition, absent normal wear and tear, and fully able to perform the functions they are intended to at the time of Closing. If any of the Assets are not able to perform the function they are intended to, the Buyer, at its option, may request an adjustment to the purchase price to compensate for the deterioration or loss of said Asset. In the event the parties are not able to agree to the amount of the adjustment, the adjustment amount shall be the amount necessary to return the Asset to the condition it was in on the Effective Date of this Agreement.

2.4 Liabilities. The Buyer shall not be responsible for any of the Liabilities of Seller, including any that may arise after Closing, and any such Liabilities shall remain the sole responsibility of and shall be retained, paid, performed and discharged solely by Seller.

2.5 Closing. The purchase and sale provided for in this Agreement will take place at a location and time of day agreed upon by the parties (the "Closing"). The date of the Closing shall be no later than thirty (30) days following the date that the conditions precedent to Closing set forth in Article 5 are satisfied or at such later date as is agreed upon by the parties. Closing shall be effective as of 5:00 pm local time (the "Effective Time") on the actual date of Closing (the "Closing Date").

2.6 Closing Obligations.

(a) At or prior to Closing, Seller shall deliver to Buyer the following documents, duly executed:

(i) a Bill of Sale for all of the Assets that are Tangible Personal Property in a form reasonably acceptable to Buyer;

(ii) an assignment of all of the Assets that are intangible personal property in a form reasonably acceptable to Buyer;

(iii) for each interest in Real Property identified on Schedule 3.4, a recordable warranty deed or such other appropriate document or instrument of transfer or approval, as

the case may require, each in form and substance satisfactory to Buyer and its legal counsel. Notwithstanding the fact that the same may not be listed on Schedule 3.4, Seller must provide easements or other transferable property rights to Buyer for all mains used in the Business, which are not located on or in public rights-of-way, and must provide assignments of public rights-of-way Permits with only those conditions acceptable to Buyer for all mains located in municipal, county or state owned public rights-of-way;

(iv) such other deeds, bills of sale, assignments, certificates of title, documents and other instruments of transfer and conveyance as may be reasonably requested by Buyer, each in form and substance satisfactory to Buyer;

(v) a certificate as to the accuracy of Seller's representations and warranties as of the Effective Date of this Agreement and as of Closing in accordance with Section 5.1(a) and as to its compliance with and performance of its covenants and obligations to be performed or complied with at or before Closing in accordance with Section 5.1(b);

(vi) a certificate of the Secretary of Seller, dated as of the Closing, certifying: (A) that attached are true copies of the duly adopted resolutions of the Seller's governing body authorizing the execution of this Agreement and the sale of all Assets; and (B) the incumbency, signatures and authority of the governing body members of Seller executing this Agreement or any agreement contemplated hereby on behalf of Seller;

(vii) a general release in a form reasonably acceptable to Buyer;

(viii) a legal opinion of Seller's legal counsel, affirmatively opining to such matters as Buyer or its legal counsel may reasonably request, including but not limited to the due authorization and execution of this Agreement by Seller and the enforceability thereof; and the Seller's compliance with any applicable Tennessee statutes or regulations applicable to its sale of its water utility system.

(b) At or prior to Closing, Buyer shall deliver to Seller, the following documents, duly executed, or funds:

(i) The Purchase Price, by wire transfer or other immediately available funds, to an account specified by the Seller;

(ii) a certificate as to the accuracy of Buyer's representations and warranties as of the Effective Date of this Agreement and as of Closing in accordance with Section 5.2(a) and as to its compliance with and performance of its covenants and obligations to be performed or complied with at or before Closing in accordance with Section 5.2(b);

(iii) a certificate of the company secretary of Buyer, dated as of the Closing, certifying: (A) that attached are true copies of the duly adopted resolutions of the Buyer's board of directors authorizing this Agreement and the purchase of all Assets; and (B) the incumbency, signatures and authority of the officer or officers of Buyer executing this Agreement or any agreement contemplated hereby on behalf of Buyer; and

(iv) a certificate of existence issued by the Secretary of State of Tennessee with respect to Buyer, dated not earlier than thirty (30) days prior to Closing.

ARTICLE 3
Representations and Warranties of Seller

Seller hereby makes the following representations and warranties to Buyer:

3.1 Organization. Seller is a corporation duly organized and validly existing under the Laws of the State of Tennessee, with full power and authority to conduct the Business as it is now being conducted and to own and operate its Assets.

3.2 Enforcement; Authority; No Conflict.

(a) This Agreement constitutes, and the Transaction Documents (when executed and delivered) will constitute, a legal, valid and binding obligation of Seller, enforceable against Seller in accordance with its terms. Seller has the absolute and unrestricted right, power and authority to execute and deliver this Agreement and the Transaction Documents to which it is a party and to perform its obligations hereunder and thereunder, and such action has been duly authorized by all necessary action by Seller's governing body;

(b) Neither the execution and delivery of this Agreement nor the consummation of the Contemplated Transaction will, directly or indirectly (with or without notice or lapse of time):

(i) contravene, conflict with, or result in a violation of: (A) any other agreements of Seller; or (B) any resolution adopted by the governing body of Seller;

(ii) contravene, conflict with, or result in a violation of or give any Governmental Authority or other Person the right to challenge any of the Contemplated Transaction or to exercise any remedy or obtain any relief under any Laws or any Order to which Seller or any of the Assets may be subject;

(iii) contravene, conflict with or result in a violation of any of the terms or requirements of or give any Governmental Authority the right to revoke, withdraw, suspend, cancel, terminate or modify any Permit or other authorization by a Governmental Authority that is held by Seller or that otherwise relates to the Business or any of the Assets;

(iv) contravene, conflict with or result in a violation or breach of any provision of, require the Consent of any Person, or give any Person the right to declare a default or exercise any remedy under or to accelerate the maturity or performance of or to cancel, terminate or modify any Contract, indenture, mortgage, note, lease, bond, grant, or other instrument or document of which Seller is a party or by which any of the Assets are bound; or

(v) result in the imposition or creation of any Encumbrance upon or with respect to any of the Assets, except as contemplated by this Agreement.

3.3 Assets. Seller has good and marketable title to all of the Assets. The Assets are free and clear of any and all Encumbrances whatsoever, including any liens, loans, bonds or grants from any federal or state agency for the purchase or construction of the Assets. None of the Assets are leased or on loan by Seller to any third party. The Assets constitute all property necessary for the operation of the Business in the manner Seller currently operates.

3.4 Real Property; Easements. To Seller's best knowledge and belief, Seller has good and marketable title to, or a valid and binding leasehold interest in, those parcels and tracts of land and those leases, licenses, easements or rights-of-way used in the operation of the Business, together with all fixtures, fittings, buildings, structures and other improvements erected therein or thereon and all appurtenances thereto (the "Real Property"). The Real Property includes but is not necessarily limited to the property described in Schedule 3.4.

3.5 Tangible Personal Property. Tangible Personal Property is all such property as defined in Schedule 1, Definition of Tangible Personal Property.

3.6 Contracts. Set forth on Schedule 3.6 is a complete and correct list of all Contracts related to the Business to which Seller is a party. Seller has delivered or caused to be delivered to Buyer correct and complete copies of each Contract (including all amendments thereto), a description of the terms of each Contract which is not in writing, and all documents affecting the rights or obligations of any party thereto. The Contracts have not been modified or amended except as disclosed on Schedule 3.6. Each Contract is valid and enforceable against Seller in accordance with its terms and is in full force and effect, and each Contract constitutes a legal, valid and binding obligation of the other parties thereto,

enforceable against them in accordance with its terms. No default and no event which, with the giving of notice, lapse of time, or both, would be a default has occurred under any Contract. There are no setoffs, counterclaims or disputes existing or asserted with respect to such Contracts, and Seller has not made any agreement with any other party thereto for any deduction from or increase to any amount payable thereunder. There are no facts, events or occurrences which in any way impair the validity or enforcement of any Contract or tend to reduce or increase the amounts payable thereunder. Seller has not, directly or indirectly, by operation of Law or otherwise, transferred or assigned all or any part of its right, title or interest in and to any Contract to any other Person. There are no Proceedings pending nor threatened against any party to any of the Contracts which relate to the subject matter of the Contracts.

3.7 Environmental Matters.

Except as set forth on Schedule 3.7(a):

(a) Seller is and at all times has been in full compliance with and has not been and is not in violation of or liable under any applicable Environmental Law. Seller has no basis to expect nor has it received any actual or threatened Order, notice or other communication from any Governmental Authority or private citizen acting in the public interest of any actual or potential violation or failure to comply with any Environmental Law or of any actual or threatened obligation to undertake or bear the cost of any Environmental, Health and Safety Liabilities with respect to the Assets or any other properties (whether real, personal or mixed) in which Seller has or has had an interest or with respect to the Real Property or any other real property at or to which Hazardous Materials were generated, manufactured, refined, transferred, imported, used or processed by Seller or any other Person for whose conduct it is or may be held responsible, or from which Hazardous Materials have been transported, treated, stored, handled, transferred, disposed, recycled or received.

(b) There are no pending or threatened claims, Encumbrances or other restrictions of any nature, resulting from any Environmental, Health and Safety Liabilities or arising under or pursuant to any Environmental Law with respect to or affecting the Assets or any other properties (whether real, personal or mixed) in which Seller has or had an interest.

(c) Neither Seller nor any other Person for whose conduct it is or may be held to be responsible has received any citation, directive, inquiry, notice, Order, summons, warning or other communication that relates to Hazardous Activity, Hazardous Materials or any alleged, actual or potential violation or failure to comply with any Environmental Law or of any alleged, actual or potential obligation to undertake or bear the cost of any Environmental, Health and Safety Liabilities with respect to the Assets or any other properties (whether real, personal or mixed) in which Seller has or has had an interest or with respect to any other real property to which Hazardous Materials generated, manufactured, refined, transferred, imported, used or processed by Seller or any other Person for whose conduct it is or may be held responsible, have been transported, treated, stored, handled, transferred, disposed, recycled or received.

(d) Neither Seller nor any other Person for whose conduct it is or may be held to be responsible has any Environmental, Health and Safety Liabilities with respect to the Assets or any other properties (whether real, personal or mixed) in which Seller (or any predecessor) has or has had an interest or at any property geologically or hydrologically adjoining the Assets or any other properties (whether real, personal or mixed).

(e) There are no Hazardous Materials present on or in the Environment at the Real Property or at any geologically or hydrologically adjoining property, including any Hazardous Materials contained in barrels, above or underground storage tanks, landfills, land deposits, dumps, equipment (whether moveable or fixed) or other containers, either temporary or permanent and deposited or located in land, water, sumps or any other part of the Real Property or such adjoining property or incorporated into any structure therein or thereon. Neither Seller nor any other Person for whose conduct it is or may be held to be responsible has permitted or conducted, or is aware of, any Hazardous Activity conducted with respect to the Assets or any other properties (whether real, personal or mixed) in which Seller has or has had an interest except in material compliance with all applicable Environmental Laws.

(f) There has been no Release or threat of Release, of any Hazardous Materials at or from the Assets or any other properties (whether real, personal or mixed) in which Seller has or has had an interest, or any geologically or hydrologically adjoining property, whether by Seller or any other Person.

(g) Seller has delivered to Buyer true and complete copies and results of any reports, studies, analyses, tests or monitoring possessed or initiated by Seller pertaining to Hazardous Materials or Hazardous Activities in, on or under the Real Property, or concerning compliance by Seller or any other Person for whose conduct it is or may be held to be responsible, with Environmental Laws, said reports, studies, etc. to include without limitation, any and all Phase I environmental reports now or hereafter in the possession or control of Seller.

3.8 Permits. Set forth on Schedule 3.8 is a complete and correct list of all Permits used by Seller in the operation of the Business. Such Permits constitute all Permits necessary for the operation of the Business and all such Permits are valid and subsisting and in full force and effect. There exists no fact or circumstance which is reasonably likely to cause any Permit to be revoked or materially altered after the Closing Date.

3.9 Insurance. Seller maintains and has maintained appropriate insurance necessary for the full protection of all of its Assets, Business, operations, products and services. All such policies are in full force and effect and Seller will use commercially reasonable efforts to cause such policies to be outstanding and in full force and effect up to the Effective Time on the Closing Date and the premiums therefor have been paid in full as they become due and payable. There are no pending Proceedings arising out of, based upon or with respect to any of such policies of insurance and no basis for any such Proceedings exists which will result in an Encumbrance against the Assets, Business, operations, products or services. Seller is not in default with respect to any provisions contained in any such insurance policies and no insurance provider is in default with respect to such insurance policies.

3.10 No Material Adverse Change. There have been no material adverse changes in the Business or Assets nor has there been any material adverse change in the relationships Seller maintains with its customers, employees and Governmental Authorities nor are there any events, transactions or other facts which exist or have occurred and which are likely to have an adverse effect on the foregoing.

3.11 Conduct of Business In Ordinary Course. Seller has operated the Business only in the ordinary course of business. Without limitation of the foregoing, since such date, Seller has not entered into, amended, terminated or received notice of termination of any Contract or Permit.

3.12 Proceedings. Other than as set forth on Schedule 3.12, there are no Proceedings pending or threatened against Seller or directly affecting any of the Assets or the Business by or on account of any Person or before any Governmental Authority and there is no valid basis for any such Proceeding. Seller has not been charged with, nor is it under investigation with respect to any charge which has not been resolved to their favor concerning any violation of any applicable Law with respect to any of the Assets or the Business and there is no valid basis for any such charge or investigation. No judgment, Order, writ, injunction, decree, assessment or other command of any Governmental Authority affecting Seller or any of the Assets or the Business has been entered which is presently in effect. There is no Proceeding pending or threatened which challenges the validity of this Agreement or the Contemplated Transaction or otherwise seeks to prevent, directly or indirectly, the consummation of the Contemplated Transaction, nor is there any valid basis for any such Proceeding.

3.13 Compliance with Laws. Seller is in compliance with all Laws applicable to the Assets and the operation of the Business and has not committed any violation of any Law applicable to the Assets and/or operation of the Business. Seller has not received any notice or other communication (whether oral or written) from any Governmental Authority or any other Person regarding (i) any actual, alleged, possible or potential violation of, or failure to comply with, any Law or (ii) any actual, alleged, possible or potential obligation on the part of Seller to undertake, or to bear all or any portion of the cost of, any remedial action of any nature. The Assets, in their current condition, are capable of complying with all Laws.

3.14 Material Omissions. Independent of and in addition to the foregoing representations and warranties contained in this Article 3, neither this Agreement nor any written statement, list, certificate or other information furnished by or on behalf of Seller in response to specific written requests made by Buyer or Buyer's representatives or attorneys contains an untrue statement of a material fact or omits to state a material fact necessary to make the statements contained herein or therein not misleading.

ARTICLE 4
Representations and Warranties of Buyer

Buyer hereby makes the following representations and warranties to Seller:

4.1 Organization. Buyer is a duly organized and validly existing public utility corporation under the Laws of the State of Tennessee and at Closing has the power and authority to own, lease and operate its assets and to conduct this Business as it is now being conducted.

4.2 Enforcement; Authority; No Conflict.

(a) This Agreement constitutes the legal, valid and binding obligation of Buyer, enforceable against Buyer in accordance with its terms. Buyer has the absolute and unrestricted right, power and authority to execute and deliver this Agreement and the Transaction Documents to which it is a party and to perform its obligations hereunder and thereunder, and such action has been duly authorized by all necessary action by Buyer's board of directors.

(b) Neither the execution and delivery of this Agreement, nor the consummation of the Contemplated Transaction nor compliance by Buyer with any of the provisions hereof will result in: (i) a violation of or a conflict with any provision of the Organizational Documents of Buyer; (ii) a material breach of or default under any term, condition or provision of any Contract to which Buyer is a party, or an event which, with the giving of notice, lapse of time, or both, would result in any such breach or default; (iii) a material violation of any applicable Law, Order, judgment, writ, injunction, decree or award or any event which, with the giving of notice, lapse of time, or both, would result in any such violation; or (iv) any Person having the right to enjoin, rescind or otherwise prevent or impede the Contemplated Transaction or to obtain Damages from Seller or to obtain any other judicial or administrative relief.

4.3 Proceedings. There is no Proceeding pending nor, to the Knowledge of Buyer, threatened which challenges the validity of this Agreement or the Contemplated Transaction or otherwise seeks to prevent, directly or indirectly, the consummation of such transactions, nor, to the Knowledge of Buyer, is there a valid basis for any such Proceeding.

ARTICLE 5
Conditions Precedent to Closing

5.1 Conditions Precedent to the Obligations of Buyer. Buyer's obligations to consummate the Contemplated Transaction are subject to the satisfaction in full, unless expressly waived in writing by Buyer, of each of the following conditions:

(a) Representations and Warranties. Each of the representations and warranties of Seller contained in Article 3 is true, correct and accurate from the Effective Date of this Agreement and as of the Closing Date shall be true, correct and accurate as though restated on and as of such date (except in the case of any representation and warranty that by its terms is made as of a date specified therein, which shall be accurate as of such date);

(b) Covenants. Seller shall have performed and complied with all covenants required by this Agreement to be performed or complied with by them prior to or at the Closing;

(c) Proceedings. No Order shall be in effect and no Proceeding by any Person shall be threatened or pending before any Governmental Authority, or before any arbitrator, wherein an unfavorable Order would: (i) prevent consummation of the Contemplated Transaction; (ii) have a

likelihood of causing the Contemplated Transaction to be rescinded following consummation; (iii) adversely affect the right of Buyer to own any of the Assets; or (iv) adversely affect the Business prospects, value or condition of any of the Assets or the Business;

(d) Approvals. Buyer shall have received prior to Closing; (i) an oral or written Order, from the Tennessee Public Utility Commission ("TPUC") approving the requested change of control and allowing the use of Seller's water tariff rates for the provision of water service to Seller's customers and the encumbrance of the Real Property with the lien of its mortgage indenture; and ii) all other regulatory approvals required by any Governmental Authority to operate the Business within the Service Area. In addition, the refund payable by Buyer to Seller as set forth in Exhibit A, is contingent on TPUC approval.

(e) Bulk Water Agreement. Buyer shall have obtained an executed bulk water agreement with South Pittsburg, TN prior to Closing.

(f) Closing Deliveries. Seller shall have delivered to Buyer the Closing requirements set forth in Section 2.6(a);

(g) Due Diligence. Buyer shall be satisfied, in its sole and absolute discretion, with the results of its due diligence review of the Business, the Assets and the Seller, including without limitation, satisfaction with the results of any environmental assessment performed with respect to the Assets.

(h) No Adverse Change. Buyer has determined that there has not been any adverse change in the Business, the Assets, financial condition or Business prospects of Seller and that there is no adverse change in the relationships maintained by Seller with its employees, suppliers, customers or Governmental Authorities as of Closing;

(i) Board Approval. Buyer shall have obtained approval of the Contemplated Transaction by Buyer's board of directors.

5.2 Conditions Precedent to Obligations of Seller. The Seller's obligation to consummate the Contemplated Transaction is subject to the satisfaction in full, unless expressly waived in writing by Seller, of each of the following conditions:

(a) Representations and Warranties. Each of the representations and warranties of Buyer contained in Article 4 is true, correct and accurate as of the date of this Agreement and, as of the Closing Date, shall be true, correct and accurate as though restated on and as of such date (except in the case of any representation and warranty that by its terms is made as of a date specified therein, which shall be accurate as of such date);

(b) Covenants. Buyer shall have performed and complied with all covenants required by this Agreement to be performed and complied with by Buyer prior to or at Closing;

(c) Buyer's Service Obligations. Seller shall be satisfied that, based on: (i) Buyer's tariff on file with the Tennessee Public Utility Commission; (ii) Buyer's statutory and regulatory obligations under Tennessee Code Annotated Chapters 4 and 5; and Buyer's service obligations to Seller's water customers, including the continuity, reliability and extension of service, will be satisfactory; and

(d) Closing Deliveries. The Buyer shall have delivered to Seller the Closing requirements set forth in Section 2.6(b).

ARTICLE 6
Covenants and Special Agreements

6.1 Covenants of Seller Prior to Closing. Seller covenants and agrees that during the period from the Effective Date hereof until Closing:

(a) Non-Solicitation. Unless and until such time as this Agreement is terminated pursuant to Article 8, Seller shall not, and will cause each employee, officer, governing body, and agent not to, directly or indirectly: (i) submit, solicit, initiate, encourage or discuss any proposal or offer from any Person relating to any sale of all or any portion of the Assets or a sublease or assignment of any lease or any similar transaction involving Seller and the Business or the Assets; (ii) enter into any agreement or commitment related to any such transaction; or (iii) furnish any information with respect to or assist or participate in or facilitate in any other manner any effort or attempt by any Person to do or seek any of the foregoing. Seller shall notify Buyer immediately if any Person makes any proposal, offer, inquiry or contact with respect to any of the foregoing.

(b) Access. Upon reasonable prior notice by Buyer, Seller shall: (i) furnish Buyer and its financial and legal advisors with copies of all such Contracts, books and Records and other existing documents and data as Buyer may reasonably request; (ii) furnish Buyer and its financial and legal advisors with such additional financial, operating and other data and information as Buyer may reasonably request; (iii) permit Buyer or its representatives to conduct such physical inspections and environmental audits of the Real Property, as requested by Buyer; and (iv) permit Buyer or its representatives to conduct interviews of employees of Seller.

(c) Ordinary Course. Seller shall carry on the operation of the Business in the ordinary course of business, consistent with prior practice, not introduce any materially new method of management or operation, and use reasonable efforts to preserve the Business and conserve the goodwill and relationships of Seller's customers, suppliers, Governmental Authorities and others having business relations with it. Seller shall not engage in any activity or transaction which is inconsistent with the terms of this Agreement.

(d) Liens; Encumbrances. Seller shall not enter into or assume any mortgage, pledge, security agreement or other title retention agreement or permit any Encumbrance to attach to any of the Assets, whether now owned or hereafter acquired.

(e) All Reasonable Efforts. Seller will use commercially reasonable efforts to satisfy each of the conditions for Closing of the Buyer set forth in Section 5.1 above.

(f) Further Covenants.

(i) Reports. Seller shall duly and timely file all reports required to be filed with any Governmental Authority and will promptly pay when due all Taxes, assessments and governmental charges including interest and penalties levied or assessed, unless diligently contested in good faith by appropriate Proceedings;

(ii) Condition of Property. Consistent with past practice, Seller shall maintain and keep the Assets in substantially the same condition as of the date hereof, normal wear and tear excepted;

(iii) Insurance. Seller shall maintain in full force and effect all policies of insurance now in effect up and through the Effective Time on the Closing Date, but not thereafter;

(iv) No Breach or Default of Contracts. Seller shall not do any act or omit any act or permit any omission to act which will cause a breach or default by Seller of any Contract;

(v) Supplies. Seller shall keep supplies at a level sufficient to operate the Business in accordance with past practice;

(vi) Contracts. Seller shall not enter into any Contract regarding the Assets or the Business other than in the ordinary course of business; and

(vii) Related Person Transactions. Seller shall not enter into any transaction with any Related Person regarding the Assets or the Business.

(viii) Approvals. Seller shall obtain all necessary regulatory and governmental approvals that may be required for Seller to sell its Assets to Buyer. These approvals are separate from and in addition to the Approvals in Section 5.1(d) that are the responsibility of Buyer.

6.2 Environmental Assessment. Buyer, in its sole discretion and at its sole expense, may conduct a Phase I environmental analysis of any or all of the Real Property, and the Seller shall cooperate and provide access for same. In the event that a Phase I study detects any actual or possible violation of any Environmental Law, the Buyer may, in its sole discretion, terminate this Agreement the effect of which is described in Section 8.2 herein.

6.3 Certain Post-Closing Covenants of Seller. Seller:

(a) shall pay in a timely manner all Taxes resulting from or payable in connection with the sale of the Assets pursuant to this Agreement, regardless of the Person on whom such Taxes are imposed.

(b) shall pay, or make adequate provisions for the payment, in full, of all of the retained Liabilities and other Liabilities of Seller under this Agreement.

(c) hereby agrees to cooperate with Buyer to ensure a proper transition of all customers with respect to billing and customer service activities.

(d) hereby acknowledges that Buyer must comply with all provisions of its tariffs as filed with and approved by the PSC.

ARTICLE 7
Indemnification

7.1 Survival; Right to Indemnification Not Affected by Knowledge. All representations, warranties, covenants and obligations of Seller given in this Agreement and/or any Transaction Document delivered pursuant to this Agreement shall survive Closing. The right to indemnification, payment of Damages or other remedy based on such representations, warranties, covenants and obligations will not be affected by any investigation conducted with respect to or any Knowledge acquired (or capable of being acquired) at any time, whether before or after the execution and delivery of this Agreement or the Closing Date, with respect to the accuracy or inaccuracy of or compliance with, any such representation, warranty, covenant or obligation. The waiver of any condition based on the accuracy of any representation or warranty or on the performance of or compliance with any covenant or obligation will not affect the right to indemnification, payment of Damages or other remedy based on such representations, warranties, covenants and obligations.

7.2 Indemnification and Payment of Damages by Seller. Seller hereby unconditionally, irrevocably and absolutely agrees to fully pay, protect, defend, indemnify and hold harmless Buyer and Buyer's past, present and future officers, directors, shareholders, employees, agents, attorneys, representatives, successors and assigns (collectively, the "Indemnified Persons"), from any and all manner of actions, suits, debts, sums of money, interest owed, accounts, controversies, agreements, charges, damages, judgments, executions, and reasonably incurred costs, expenses, fees (including reasonable attorneys' fees and court costs), counterclaims, claims, demands, causes of action, liabilities and losses and award all other Liabilities incurred, paid or sustained by any of the foregoing (hereinafter referred to in this Agreement as "Damages"), in each case, arising out of, or caused by: (i) the misrepresentation, breach of warranty or nonfulfillment of any provision of this Agreement by Seller or; (ii) all Liabilities and/or duties of Seller, whether accruing prior to or after the Effective Time on the Closing Date, and any Encumbrance affecting the Assets; (iii) assessments, charges and other similar claims due or owing, directly or indirectly, by Seller or otherwise as a result of or on account of the Assets or the Business at any time prior to the Effective Time on the Closing Date; (iv) the ownership and/or operation of any of the Assets or the Business prior to the Effective Time on the Closing Date; (v) any claim or Proceeding now existing or hereafter arising and relating to the Assets or the Business of Seller and arising from events or matters occurring prior to the Effective Time on the Closing Date; and (vi) any claim

by an employee of Seller for any severance payment or arising out of such employee's employment with Seller or under the Worker Adjustment and Retraining Notification Act, COBRA (Sections 601 through 608 of the Employee Retirement Income Security Act of 1974), or under any employee benefit plan or employment Contract to which Seller is a party.

7.3 Indemnification and Payment of Damages by Seller - Environmental Matters. In addition to the provisions of Section 7.2, Seller hereby unconditionally, irrevocably and absolutely agrees to fully pay, protect, defend, indemnify and hold harmless the Indemnified Persons, and will pay to the Indemnified Persons the amount of any Damages (including costs of cleanup, containment or other remediation) arising, directly or indirectly, from or in connection with:

(a) Any Environmental, Health and Safety Liabilities arising out of or relating to: (i) (A) the ownership, operation or condition at any time on or prior to the Effective Time on the Closing Date of the Assets or any other properties (whether real, personal or mixed and whether tangible or intangible) in which Seller has or had an interest; or (B) any Hazardous Materials or other contaminants that were present on or in the Assets or any other properties at any time on or prior to the Effective Time on the Closing Date; or (ii) (A) any Hazardous Materials or other contaminants, wherever located, that were, or were allegedly, generated, transported, stored, treated, Released or otherwise handled by Seller or by any other Person for whose conduct it is or may be held responsible at any time on or prior to the Effective Time on the Closing Date; or (B) any Hazardous Activities that were, or were allegedly, conducted by Seller or by any other Person for whose conduct it is or may be held responsible on or prior to the Effective Time on the Closing Date; or

(b) Any bodily injury (including illness, disability and death), personal injury, property damage (including trespass, nuisance, wrongful eviction and deprivation of the use of real property) or other damage of or to any Person, including any employee or former employee of Seller or any other Person for whose conduct it is or may be held responsible, in any way arising from or allegedly arising from any Hazardous Activity conducted or allegedly conducted with respect to the Assets or the Real Property by Seller prior to the Effective Time on the Closing Date, or from Hazardous Material that was: (i) present or suspected to be present on or before the Effective Time on the Closing Date on or at the Real Property (or present or suspected to be present on any other property, if such Hazardous Material emanated or allegedly emanated from any of the Real Property and was present or suspected to be present on any of the Real Property on or prior to the Effective Time on the Closing Date); or (ii) Released or allegedly Released by Seller or any other Person for whose conduct it is or may be held responsible, at any time on or prior to the Effective Time on the Closing Date.

Buyer shall control any Cleanup, any related Proceeding and, except as provided in the following sentence, any other Proceeding with respect to which indemnity may be sought under this Section 7.3. The procedure described in Section 7.5 will apply to any claim solely for monetary Damages relating to a matter covered by this Section 7.3.

7.4 Indemnification By Buyer. Buyer hereby unconditionally, irrevocably and absolutely agrees to fully pay, protect, defend, indemnify and hold harmless Seller and Seller's past, present and future officers, governing body, employees, agents, attorneys, representatives, successors and assigns from any and all Damages arising out of, or caused by: (i) Buyer's misrepresentation, breach of warranty or nonfulfillment of any provision of this Agreement; (ii) any claim or Proceeding arising after the Effective Time on the Closing Date and relating to events or matters occurring subsequent to the Effective Time on the Closing Date; and (iii) any claim by an employee of Buyer arising out of such employee's employment with Buyer after the Effective Time on the Closing Date.

7.5 Procedure for Indemnification. The procedure for indemnification shall be as follows:

(a) The party claiming indemnification (the "Claimant") shall promptly give notice to the party from whom indemnification is claimed (the "Indemnifying Party") of any claim, whether between the parties or brought by a third party, specifying: (i) the factual basis for such claim; and (ii) the amount of the claim. If the claim relates to a Proceeding filed by a third party against Claimant, Claimant shall give such notice within ten (10) Business Days after written notice of such Proceeding was given to

Claimant. Claimant's failure to give the Indemnifying Party such notice shall not preclude Claimant from obtaining indemnification from the Indemnifying Party unless Claimant's failure has materially prejudiced the Indemnifying Party's ability to defend the claim or litigation, and then the Indemnifying Party's obligation shall be reduced to the extent of such prejudice.

(b) Following receipt of notice from the Claimant of a claim, the Indemnifying Party shall have thirty (30) days to make such investigation of the claim as the Indemnifying Party deems necessary or desirable. For the purposes of such investigation, the Claimant agrees to make available to the Indemnifying Party and/or its authorized representatives the information relied upon by the Claimant to substantiate the claim. If the Claimant and the Indemnifying Party agree at or prior to the expiration of said thirty (30)-day period (or any mutually agreed upon extension thereof) to the validity and amount of such claim, the Indemnifying Party shall immediately pay to the Claimant the full amount of the claim. If the Claimant and the Indemnifying Party do not agree within said period (or any mutually agreed upon extension thereof), the Claimant may seek appropriate legal remedy.

(c) (i) With respect to any claim by a third party as to which the Claimant asserts it is entitled to indemnification hereunder, the Indemnifying Party shall have the right, at its own expense, to participate in or at its election to assume control of the defense of such claim, with counsel reasonably satisfactory to Claimant, subject to reimbursement of Claimant for actual out-of-pocket expenses incurred by Claimant as the result of request by the Indemnifying Party, subject to the following;

(A) The Claimant may retain separate co-counsel at its sole cost and expense and participate in the defense of any such claim by a third party; and

(B) The Indemnifying Party shall conduct the defense of the third party claim actively and diligently thereafter.

(ii) If the Indemnifying Party elects to assume control of the defense of any third party claim pursuant to Section 7.5(c)(i), the Indemnifying Party may nevertheless reserve the right to dispute the amount of indemnification claimed or dispute Claimant's right to be indemnified with respect to all or any portion of the claim. Except with the written Consent of the Claimant, the Indemnifying Party shall not, in defending any claim or any litigation resulting therefrom, consent to entry of any judgment or enter into any settlement which does not release the Claimant from all Liability in respect of such claim or litigation. In the event the Claimant fails to consent to any settlement or compromise which such failure results in Damages in excess of the amount for which Consent was requested, the limitation of the Indemnifying Party's obligations to indemnify the Claimant with respect to the subject matter of the claim shall be the amount of the proposed settlement or compromise rejected by Claimant and the Claimant shall be responsible for, and shall hold harmless the Indemnifying Party from, all Damages (including, without limitation, reasonable attorneys' fees incurred with respect to matters subsequent to the rejection of the settlement by Claimant) in excess of the amount of the proposed settlement or compromise rejected by Claimant.

(d) If a claim, whether between the parties or by a third party, requires immediate action, the parties will make every effort to reach a decision with respect thereto as expeditiously as possible.

7.6 Means of Indemnification and Right to Setoff. In addition to any other right or means Buyer may have to enforce the indemnities provided for in Sections 7.2 and 7.3 hereof, Buyer shall be entitled to set off any amount to which it may be entitled under this Agreement or Damages which Buyer may incur as a result of any breach of this Agreement or any covenant, guaranty or other provision contained within this Agreement against any payments of the Purchase Price and/or any indebtedness or obligation owed to Seller whether under this Agreement or any agreement or document related hereto. Buyer's right to setoff or its exercise thereof shall not prejudice the right of Buyer to pursue, in addition or as an alternative to such right, any other right or means Buyer may have to enforce the indemnification provided for in Sections 7.2 and 7.3 hereof and in no event shall the amount actually setoff limit Buyer's right to indemnification under Sections 7.2 and 7.3 hereof.

ARTICLE 8
Termination

8.1 Termination and Abandonment. This Agreement may be terminated and abandoned at any time prior to the Closing Date:

(a) by mutual written Consent of Buyer and Seller; or

(b) by Buyer, if the TPUC does not approve the adoption or approval of change of control and water rates prior to the Closing Date or such other later date as agreed upon in writing.

(c) by Buyer, if the Tennessee Department of Environment and Conservation ("TDEC") prohibits the purchase of Seller's Assets for environmental reasons or if TDEC imposes different water quality requirements on Buyer as a condition to purchasing Seller's Assets.

(d) by Buyer, if Buyer has not obtained an executed bulk water agreement with South Pittsburg, TN prior to Closing.

8.2 Effect of Termination. The right of each party to terminate this Agreement under Section 8.1 is in addition to any other rights such party may have under this Agreement or otherwise, and the exercise of a right of termination will not be an election of remedies. If this Agreement is terminated pursuant to Section 8.1, all further obligations of the parties under this Agreement will terminate, except that the obligations set forth in Sections 9.9 ("Legal Fees; Costs") and 9.15 ("Publicity; Announcements"); and all other covenants and agreements which by their terms continue after the termination of this Agreement will survive; provided, however, that if this Agreement is terminated by a party because of the breach of the Agreement by another party or because one (1) or more of the conditions to the terminating party's obligations under this Agreement is not satisfied as a result of the other party's failure to comply with its obligations under this Agreement, the terminating party's right to pursue all legal remedies will survive such termination unimpaired.

ARTICLE 9
General Provisions

9.1 Amendment and Modification. No amendment, modification, supplement, termination, Consent or waiver of any section or provision of this Agreement, nor any Consent for departure therefrom, will in any event be effective unless the same is in writing and is signed by the parties. Any waiver of any provision of this Agreement and any Consent to any departure from the terms of any provision of this Agreement is to be effective only in the specific instance and for the specific purpose for which given.

9.2 Assignments. Seller may not assign or transfer any of its rights or obligations under this Agreement to any other Person without the prior written Consent of Buyer. Buyer may assign its rights and obligations under this Agreement to any Related Person or successor in interest without the Consent of Seller.

9.3 Captions. Captions contained in this Agreement and any table of contents preceding this Agreement have been inserted herein only as a matter of convenience and in no way define, limit, extend or describe the scope of this Agreement or the intent of any provision hereof.

9.4 Counterparts; Electronic Mail. This Agreement may be executed by the parties hereto on any number of separate counterparts, and all such counterparts so executed constitute one agreement binding on all the parties hereto notwithstanding that all the parties hereto are not signatories to the same counterpart. For purposes of this Agreement, a document (or signature page thereto) signed and transmitted in .pdf format by electronic mail is to be treated as an original document. The signature of any party thereon is to be considered as an original signature, and the document transmitted is to be

considered to have the same binding effect as an original signature on an original document. At the request of any party hereto, the .pdf copy is to be re-executed in original form by the parties who executed the .pdf copy. No party hereto may raise the use of a .pdf copy or the fact that any signature was transmitted through the use of electronic mail as a defense to the enforcement of this Agreement or any amendment or other document executed in compliance with this section.

9.5 Entire Agreement. This Agreement and the other Transaction Documents constitute the entire agreement among the parties hereto pertaining to the subject matter hereof and supersede all prior agreements, letters of intent, understandings, negotiations and discussions of the parties hereto, whether oral or written.

9.6 Exhibits and Schedules. All of the Exhibits and Schedules attached to this Agreement are deemed incorporated herein by reference.

9.7 Failure or Delay. Except as otherwise provided by this Agreement, no failure on the part of any party hereto to exercise, and no delay in exercising, any right, power or privilege hereunder operates as a waiver thereof; nor does any single or partial exercise of any right, power or privilege hereunder preclude any other or further exercise thereof, or the exercise of any other right, power or privilege. No notice to or demand on any party hereto in any case entitles such party to any other or further notice or demand in similar or other circumstances.

9.8 Governing Law. This Agreement and the rights and obligations of the parties hereunder are to be governed by and construed and interpreted in accordance with the Laws of the State of Tennessee applicable to Contracts made and to be performed wholly within Tennessee, without regard to choice or conflict of Laws rules. In the event of any litigation or claim regarding breach of this Agreement, the Circuit court of Hamilton County, Tennessee would have sole venue and jurisdiction. As to any matter relating to any required regulatory approval of this Agreement, the parties agree that the TPUC has jurisdiction to govern all matters involving the Contemplated Transaction and the provision of water service by Buyer to the residents located within the Service Area.

9.9 Legal Fees, Costs. All legal, consulting and advisory fees and other costs and expenses incurred in connection with this Agreement and the Contemplated Transaction are to be paid by the party incurring such costs and expenses; provided, however, in the event litigation is instituted by either party to enforce or remedy a breach of any provision of this Agreement, in addition to any other relief therein awarded, the prevailing party shall be entitled to judgment for reasonable attorney's fees and litigation expenses. The term "prevailing party" shall include, but not be limited to, a party who obtains legal counsel or brings an action against the other by reason of the other's breach or default and obtains substantially the relief sought whether by compromise, mediation, settlement, judgment or otherwise.

9.10 Notices. All notices, Consents, requests, demands and other communications hereunder are to be in writing and are deemed to have been duly given, made or delivered: (i) when delivered in person, (ii) three (3) days after deposited in the United States mail, first class postage prepaid, (iii) in the case of telegraph or overnight courier services, one (1) Business Day after delivery to the telegraph company or overnight courier service with payment provided, or (iv) in the case of electronic mail, when sent, verification received, in each case addressed as follows:

if to Seller:

Thunder Air Inc., d/b/a Jasper Highlands Development, Inc.,
John Thornton, Owner
P.O. Box 4737
Chattanooga, Tennessee 37405

if to Buyer:

Attn: President
Tennessee-American Water Company
109 Wiehl Street
Chattanooga, Tennessee 37403

with a copy to (which shall not constitute notice):

Attn: Corporate Counsel
Tennessee-American Water Company
2300 Richmond Road
Lexington, Kentucky 40502

or to such other address as any party hereto may designate by notice to the other parties in accordance with the terms of this Section. For e-mail, a Party shall contact the other Party to receive the then-applicable e-mail for the person in the position stated above.

9.11 Severability. Any provision of this Agreement which is prohibited, unenforceable or not authorized in any jurisdiction is, as to such jurisdiction, ineffective to the extent of any such prohibition, unenforceability or nonauthorization without invalidating the remaining provisions hereof, or affecting the validity, enforceability or legality of such provision in any other jurisdiction, unless the ineffectiveness of such provision would result in such a material change as to cause completion of the Contemplated Transaction to be unreasonable.

9.12 Specific Performance and Injunctive Relief. The parties hereto recognize that if any or all of them fail to perform, observe or discharge any of their respective obligations under this Agreement, a remedy at Law may not provide adequate relief to the other parties hereto. Therefore, in addition to any other remedy provided for in this Agreement or under applicable Law, any party hereto may demand specific performance of this Agreement, and such party shall be entitled to temporary and permanent injunctive relief, in a court of competent jurisdiction at any time when any of the other parties hereto fail to comply with any of the provisions of this Agreement applicable to such party. To the extent permitted by applicable Law, all parties hereto hereby irrevocably waive any defense based on the adequacy of a remedy at Law which might be asserted as a bar to such party's remedy of specific performance or injunctive relief.

9.13 Successors and Assigns. Subject to Section 9.2, all provisions of this Agreement are binding upon, inure to the benefit of and are enforceable by or against the parties hereto and their respective heirs, executors, administrators or other legal representatives and permitted successors and assigns.

9.14 No Third-Party Beneficiary. This Agreement is solely for the benefit of the parties hereto and their respective successors and permitted assigns, and no other Person has any right, benefit, priority or interest under, or because of the existence of, this Agreement.

9.15 **Publicity; Announcements.** From the date hereof through and including Closing, no party hereto shall issue, cause or permit the publication by any of their respective Related Persons, agents or representatives, any press release or other public announcement with respect to this Agreement or the Contemplated Transaction except: (i) with the Consent of the other parties hereto (which shall not be unreasonably withheld); or (ii) as required by applicable Law (including, without limitation, any applicable securities Law). Seller will not, without the prior Consent of Buyer, make any announcements to employees of Seller with respect to the Contemplated Transaction and, at such time as an announcement to the employees is made, Buyer shall be allowed to participate in such announcement.

9.16 **Cooperation.** Any notices or certifications given under this Agreement or any related agreement shall be given in good faith without any intention to unfairly impede or delay the other party. Buyer and Seller shall cooperate fully with each other and their respective counsel and accountants in connection with any actions required to be taken as part of their respective obligations under this Agreement including, without limitation, actions required to be taken with respect to obtaining any applicable regulatory approval of the Contemplated Transaction. Buyer and Seller shall execute such other documents as may be necessary and desirable to the implementation and consummation of this Agreement. Each party agrees to use all reasonable efforts to consummate the Contemplated Transaction including, without limitation, doing all things reasonably necessary to obtain the requisite regulatory approval.

9.17 **Inspection.** Buyer shall have the right to inspect Seller's water system assets prior to Closing.

9.18 **Future Growth.** All future growth of the water system within the Service Area shall transfer to Buyer consistent with the form Acquisition Agreement and Extension Deposit Agreement or similar developer agreements as approved by TPUC. The form Acquisition Agreement is Attached as Exhibit A. The form Extension Deposit Agreement is attached as Exhibit B. All operation and maintenance responsibilities associated with all future growth of the water system within the Service Area shall transfer to Buyer pursuant to said agreements.

9.19 **Operation and Maintenance Responsibilities.** Buyer shall assume all operation and maintenance responsibilities of the Business including, but not limited to, customer service as of Closing.

IN WITNESS WHEREOF, the parties have executed this Agreement as of the date first above written.

Buyer

TENNESSEE-AMERICAN WATER COMPANY, a Tennessee public utility corporation

By: _____
Valoria Armstrong, President

Seller

THUNDER AIR INC., d/b/a JASPER HIGHLANDS DEVELOPMENT, INC., A Tennessee corporation

By: _____

Name: _____

Title: _____

9.15 **Publicity; Announcements**. From the date hereof through and including Closing, no party hereto shall issue, cause or permit the publication by any of their respective Affiliates, Persons, agents or representatives, any press release or other public announcement with respect to this Agreement or the Contemplated Transaction except: (i) with the Consent of the other parties hereto (which shall not be unreasonably withheld); or (ii) as required by applicable Law (including, without limitation, any applicable securities Law). Seller will not, without the prior Consent of Buyer, make any announcements to employees of Seller with respect to the Contemplated Transaction and, at such time as an announcement to the employees is made, Buyer shall be allowed to participate in such announcement.

9.16 **Cooperation**. Any notices or certifications given under this Agreement or any related agreement shall be given in good faith without any intention to unfairly impede or delay the other party. Buyer and Seller shall cooperate fully with each other and their respective counsel and accountants in connection with any actions required to be taken as part of their respective obligations under this Agreement including, without limitation, actions required to be taken with respect to obtaining any applicable regulatory approval of the Contemplated Transaction. Buyer and Seller shall execute such other documents as may be necessary and desirable to the implementation and consummation of this Agreement. Each party agrees to use all reasonable efforts to consummate the Contemplated Transaction including, without limitation, doing all things reasonably necessary to obtain the requisite regulatory approval.

9.17 **Inspection.** Buyer shall have the right to inspect Seller's water system assets prior to Closing.

9.18 **Future Growth.** All future growth of the water system within the Service Area shall transfer to Buyer consistent with the form Acquisition Agreement and Extension Deposit Agreement or similar developer agreements as approved by TPUC. The form Acquisition Agreement is attached as **Exhibit A**. The form Extension Deposit Agreement is attached as Exhibit B. All operation and maintenance responsibilities associated with all future growth of the water system within the Service Area shall transfer to Buyer pursuant to said agreements.

9.19 **Operation and Maintenance Responsibilities.** Buyer shall assume all operation and maintenance responsibilities of the Business including, but not limited to, customer service [illegible].

IN WITNESS WHEREOF, the parties have executed this Agreement as of the date first above written.

Buyer	Seller
TENNESSEE-AMERICAN WATER COMPANY, a Tennessee public utility corporation	THUNDER AIR INC. d/b/a [illegible] HIGHWAY DEVELOPMENT, INC., a Tennessee corporation
By: ______________________	By: [signature]
Valoria Armstrong, President	Name: John C. [illegible]
	Title: Chairman & CEO

Schedule 1
Definitions

"Assets" as defined in Section 2.1.

"Agreement" as defined in the introductory paragraph.

"Assignment and Assumption Agreement" as defined in Section 2.7(a)(ii).

"Bill of Sale" as defined in Section 2.7(a)(i).

"Business" as defined in the Recitals.

"Business Days" means any day other than (i) Saturday or Sunday, or (ii) any other day on which governmental offices in the State of Tennessee are permitted or required to be closed.

"Buyer" as defined in the introductory paragraph.

"Claimant" as defined in Section 7.5(a).

"Closing" as defined in Section 2.6.

"Closing Date" as defined in Section 2.6.

"Confidential Information" means (i) information not available to the general public concerning the Business and financial affairs with respect to a party hereto, and (ii) analyses, compilations, forecasts, studies and other documents prepared on the basis of such information by the parties or their agents, representatives, any Related Person, employees or consultants.

"Consent" means any approval, consent, ratification, waiver or other authorization.

"Contemplated Transaction" means all of the transactions contemplated by this Agreement and the Transaction Documents.

"Contract" means any agreement, contract, obligation, promise or undertaking (whether written or oral and whether express or implied), whether or not legally binding.

"Customer Premises" means a dwelling, building, structure or parcel of real estate which water service is provided.

"Customer Service Connection" means that portion of water pipe extending from the Customer Premises to the company owned collection system which Customer Service Connection shall be owned and maintained by the customer.

"Damages" as defined in Section 7.2.

"Effective Time" as defined in Section 2.6.

"Encumbrance" means any charge, claim, community property interest, condition, easement, equitable interest, lien, mortgage, option, pledge, security interest, right of first refusal, right of way, servitude or restriction of any kind, including any restriction on use, transfer, receipt of income or exercise of any other attribute of ownership, or any repayment obligation under any grant.

"Environment" means soil, land surface or subsurface strata, surface waters (including navigable waters, ocean waters, streams, ponds, drainage basins and wetlands), groundwater, drinking water supply, stream sediments, ambient air (including indoor air), plant and animal life and any other environmental medium or natural resource.

"Environmental, Health and Safety Liabilities" means any cost, Damages, expense, Liability, obligation or other responsibility arising from or under Environmental Law or Occupational Safety and Health Law and consisting of or relating to:

(a) Any environmental, health or safety matters or conditions (including on-site or off-site contamination, occupational safety and health and regulation of chemical substances or products);

(b) Fines, penalties, judgments, awards, settlements, legal or administrative proceedings, Damages, losses, claims, demands and response, investigative, remedial or inspection costs and expenses arising under Environmental Law or Occupational Safety and Health Law;

(c) Financial responsibility under Environmental Law or Occupational Safety and Health Law for cleanup costs or corrective action, including any investigation, cleanup, removal, containment or other remediation or response actions ("Cleanup") required by applicable Environmental Law or Occupational Safety and Health Law (whether or not such Cleanup has been required or requested by any Governmental Authority or any other Person) and for any natural resource Damages; or

(d) Any other compliance, corrective, investigative or remedial measures required under Environmental Law or Occupational Safety and Health Law.

The terms "removal," "remedial," and "response action," include the types of activities covered by the United States Comprehensive Environmental Response, Compensation and Liability Act, 42 U.S.C. § 9601 et seq., as amended ("CERCLA").

"Environmental Law" means any Law that requires or relates to:

(a) Advising appropriate authorities, employees and the public of intended or actual Releases of pollutants or hazardous substances or materials, violations of discharge limits or other prohibitions and of the commencements of activities, such as resource extraction or construction, that could have significant impact on the Environment;

(b) Preventing or reducing to acceptable levels the Release of pollutants or hazardous substances or materials into the Environment;

(c) Reducing the quantities, preventing the release or minimizing the hazardous characteristics of wastes that are generated;

(d) Assuring that products are designed, formulated, packaged and used so that they do not present unreasonable risks to human health or the Environment when used or disposed of;

(e) Protecting resources, species or ecological amenities;

(f) Reducing to acceptable levels the risks inherent in the transportation of hazardous substances, pollutants, oil or other potentially harmful substances;

(g) Cleaning up pollutants that have been Released, preventing the threat of Release or paying the costs of such clean up or prevention; or

(h) Making responsible parties pay private parties, or groups of them, for Damages done to their health or the Environment, or permitting self-appointed representatives of the public interest to recover for injuries done to public assets.

"Excluded Assets" as defined in Section 2.2.

"Governmental Authority(ies)" means any:

(a) Nation, state, county, city, town, village, district or other jurisdiction of any nature;

(b) Federal, state, local, municipal, foreign or other government;

(c) Governmental or quasi-governmental authority of any nature (including any governmental agency, branch, department, official or entity and any court or other tribunal);

(d) Multi-national organization or body; or

(e) Body exercising, or entitled to exercise, any administrative, executive, judicial, legislative, police, regulatory or taxing authority or power of any nature.

"Hazardous Activity" means the distribution, generation, handling, importing, management, manufacturing, processing, production, refinement, Release, storage, transfer, transportation, treatment or use (including any withdrawal or other use of groundwater) of Hazardous Materials in, on, under, about or from the property or any part thereof into the Environment, and any other act, business, operation or thing that increases the danger or risk of danger, or poses an unreasonable risk of harm to persons or property on or off the property, or that may affect the value of the property or Seller.

"Hazardous Materials" means any waste or other substance that is listed, defined, designated or classified as, or otherwise determined to be, hazardous, radioactive or toxic or a pollutant or a contaminant under or pursuant to any Environmental Law, including any admixture or solution thereof, and specifically including petroleum and all derivatives thereof or synthetic substitutes therefor and asbestos or asbestos-containing materials.

"Indemnifying Party" as defined in Section 7.5(a).

"Knowledge" means an individual will be deemed to have "Knowledge" of a particular fact or other matter if:

(a) Such individual is actually aware of such fact or other matter; or

(b) A prudent individual could be expected to discover or otherwise become aware of such fact or other matter in the course of conducting a reasonable investigation concerning the existence of such fact or other matter.

A Person (other than an individual) will be deemed to have "Knowledge" of a particular fact or other matter if any individual who is serving as a director or officer of such Person (or in any similar executive capacity) has, or at any time had, Knowledge of such fact or other matter.

"Law" means any law, rule, regulation or ordinance of any federal, foreign, state or local Governmental Authority.

"Liability" with respect to any Person any liability or obligation of such Person for any kind, character or description, whether known or unknown, absolute or contingent, accrued or unaccrued, disputed or undisputed, liquidated or unliquidated, secured or unsecured, joint or several, due or to become due, vested or unvested, executory, determined, determinable or otherwise and whether or not the same is required to be accrued on the financial statements of such Person.

"Occupational Safety and Health Law" means any Law designed to provide safe and healthful working conditions and to reduce occupational safety and health hazards, and any program, whether governmental or private (including those promulgated or sponsored by industry associations and insurance companies), designed to provide safe and healthful working conditions.

"Order" means any award, decision, injunction, judgment, order, ruling, subpoena or verdict entered, issued, made or rendered by any court, administrative agency or other Governmental Authority or by any arbitrator.

"Organizational Documents" means the articles or certificate of incorporation and the bylaws of a corporation and any amendment thereto.

"Permit" means any approval, Consent, license, permit, waiver or other authorization issued, granted, given or otherwise made available by or under the authority of any Governmental Authority or pursuant to any Law.

"Person" means any individual, corporation (including any non-profit corporation), general or limited partnership, limited liability company, joint venture, estate, trust, association, organization, labor union or other entity or Governmental Authority.

"Proceeding" means any action, arbitration, audit, hearing, investigation, litigation or suit (whether civil, criminal, administrative, investigative or informal) commenced, brought, conducted or heard by or before, or otherwise involving, any Governmental Authority or arbitrator.

"Purchase Price" as defined in Section 2.3.

"Real Property" as defined in Section 3.4.

"Records" means information that is inscribed on a tangible medium or that is stored in an electronic or other medium and is retrievable in perceivable form.

"Related Person" with respect to a particular individual, means:

(a) Each other member of such individual's Family (as hereinafter defined);

(b) Any Person that is directly or indirectly controlled by such individual or one or more members of such individual's Family;

(c) Any Person in which such individual or members of such individual's Family hold (individually or in the aggregate) a Material Interest; and

(d) Any Person with respect to which such individual or one or more members of such individual's Family serves as a director, officer, partner, executor or trustee (or in a similar capacity).

With respect to a specified Person other than an individual:

(e) Any Person that directly or indirectly controls, is directly or indirectly controlled by, or is directly or indirectly under common control with such specified Person;

(f) Any Person that holds a Material Interest in such specified Person;

(g) Each Person that serves as a director, officer, partner, executor or trustee of such specified Person (or in a similar capacity);

(h) Any Person in which such specified Person holds a Material Interest;

(i) Any Person with respect to which such specified Person serves as a general partner or a trustee (or in a similar capacity); and

(j) Any Related Person of any individual described in clause (b) or (c).

For purposes of this definition, (i) the "Family" of an individual includes (A) the individual, (B) the individual's spouse, (C) any other natural person who is related to the individual or the individual's spouse within the second degree, and (D) any other natural person who resides with such individual; and (ii) "Material Interest" means direct or indirect beneficial ownership (as defined in Rule 13d-3 under the Securities Exchange Act of 1934) of voting securities or other voting interests representing at least five percent (5%) of the outstanding equity securities or equity interests in a Person.

"Release" means any spilling, leaking, emitting, discharging, depositing, escaping, leaching, dumping or other releasing into the Environment, whether intentional or unintentional.

"Seller" shall have the meaning given that term in the introductory paragraph.

"Service Area" as defined in the Recitals.

"Service Line" means that portion of water pipe extending from the water main to and including the curb stop and curb box located at or near the property line of a Customer Premises.

"Tangible Personal Property" means all wells, treatment plants, pumps, water transmission and distribution mains, valves and appurtenances, storage tanks, Service Lines, meters, meter installations, hydrants, machinery, equipment, tools, furniture, office equipment, computer hardware, supplies (including chemicals and spare parts), materials, vehicles and other items of tangible personal property of every kind owned or leased by Seller (wherever located and whether or not carried on Seller's books), which are, could be, or in the future would be part of the production, transmission and distribution system utilized to provide water service to Seller's water customers, together with any express or implied warranty by the manufacturers or sellers or lessors of any item or component part thereof, and all maintenance Records and other documents relating thereto.

"Tax" means all taxes, charges, withholdings, fees, levies, penalties, additions, interest or other assessments, including, without limitation, income, gross receipts, excise, property, sales, employment, withholding, social security, occupation, use, service, service use, license, payroll, franchise, transfer and recording taxes, fees and charges, windfall profits, severance, customs, import, export, employment or similar taxes, charges, fees, levies or other assessments, imposed by any Governmental Authority, whether computed on a separate, consolidated, unitary, combined or any other basis.

"Transaction Documents" means this Agreement, the Bill of Sale, and all other documents, certificates, assignments and agreements executed and/or delivered in connection with this Agreement in Order to consummate the Contemplated Transaction, as the same may be amended, restated, modified or otherwise replaced by mutual agreement from time to time.

Rules of Construction

For purposes of this Agreement and the other documents executed in connection herewith, the following rules of construction shall apply, unless specifically indicated to the contrary: (i) wherever from the context it appears appropriate, each term stated in either the singular or plural shall include the singular and the plural, and pronouns stated in the masculine, feminine or neuter gender shall include the masculine, the feminine and the neuter; (ii) the term "or" is not exclusive; (iii) the term "including" (or any form thereof) shall not be limiting or exclusive; (iv) all references to statutes and related regulations shall include any amendments of same and any successor statutes and regulations; (v) all references in this Agreement or in the Schedules to this Agreement to sections, schedules, exhibits and attachments shall refer to the corresponding sections, schedules, exhibits and attachments of or to this Agreement; and (vi) all references to any instruments or agreements, including references to any of the documents executed in connection herewith, shall include any and all modifications or amendments thereto and any and all extensions or renewals thereof.

Schedule 2.2
Excluded Assets

This schedule will be completed to Buyer's satisfaction prior to closing.

Schedule 3.4
Real Property and Easements

This schedule will be completed to Buyer's satisfaction prior to closing.

Schedule 3.6
Contracts

This schedule will be completed to Buyer's satisfaction prior to closing.

Schedule 3.7(a)
Environmental Matters

This schedule will be completed to Buyer's satisfaction prior to closing.

Schedule 3.8
Permits

This schedule will be completed to Buyer's satisfaction prior to closing.

Schedule 3.12
Proceedings

This schedule will be completed to Buyer's satisfaction prior to closing.

EXHIBIT A

ACQUISITION AGREEMENT

THIS ACQUISITION AGREEMENT made this _____ day of _____ _____, 20____, by and between TENNESSEE-AMERICAN WATER ("TAW") and THUNDER AIR, INC. d/b/a JASPER HIGHLANDS DEVELOPMENT, INC. ("Developer").

WHEREAS, Developer has undertaken to improve and develop certain real property situated in Marion County, Tennessee (the "Development") known as _____; and

WHEREAS, TAW purchased Developer's water system serving certain portions of the Development pursuant to the Asset Purchase Agreement dated _____, which is incorporated herein by reference (including all definitions); and

WHEREAS, in the furtherance of additional expansion of the Development following the Closing of the Asset Purchase Agreement, Developer has inquired of and been advised by TAW that in order for water service to be made available to the Development, an extension of TAW distribution main(s) acquired pursuant to the Asset Purchase Agreement will be required; and

WHEREAS, Developer has requested that it be permitted to construct and install the necessary main extension and appurtenant facilities and, at the conclusion of such construction, transfer ownership of the extended main and facilities to TAW; and

WHEREAS, TAW has orally advised Developer that it would consent to Developer's desire, provided that the proposed main extension and facilities were made pursuant to plans and specification approved by TAW and all applicable governmental agencies and authorities; and

WHEREAS, TAW and Developer mutually desire to set forth in writing the terms and conditions pursuant to which the said main extension and related facilities are to be constructed and transferred to TAW;

NOW, THEREFORE, in consideration of the premises, the mutual promises contained in the agreement and other good and valuable considerations, the receipt and sufficiency of all of which are hereby acknowledged, the parties to this agreement agrees as follows:

I. CONSTRUCTION OF FACILITIES

A. Developer shall construct and install, solely at Developer's cost and expense, the extended water main (s) and appurtenant facilities more fully described on Addendum A hereto. All of the main(s) and facilities on Addendum A hereto are hereinafter referred to collectively as the "Facilities". The Facilities shall be constructed and installed by a TAW approved contractor pursuant to plans, specifications and standards approved by TAW and Developer, and any applicable governmental agencies of authorities, including the

appropriate State Department of Health. Execution and delivery of this agreement by Developer is an acknowledgment of possession of, familiarity with, and acceptance of the specifications and standards of TAW and all applicable governmental agencies and authorities. A copy of the current specifications and standards of TAW are attached hereto as Addendum D; however, said specifications and standards are subject to change in the normal course of TAW's business.

B. TAW shall have the right, but not the obligation, to inspect the Facilities, at its expense, during construction and prior to acquisition by TAW.

C. TAW shall be under no obligation to acquire or take possession of any of the Facilities which do not, in the sole judgment and discretion of TAW, meet all of TAW's specifications and standards and all applicable governmental specifications and standards.

II. TRANSFER OF TITLE TO FACILITIES

Upon completion of construction of the Facilities by Developer in accordance with the terms and conditions described in Section I of this agreement, TAW agrees to accept title to the Facilities and thereafter to own, operate, maintain, repair and replace such Facilities as part of TAW's water system. Upon acceptance of the Facilities by TAW, Developer agrees to convey the same to TAW, together with all necessary and appropriate rights of way and easements, by apt and proper deed and/or bill of sale, free and clear of all liens and encumbrances. Concurrently with the delivery of title to the Facilities, Developer shall also provide to TAW the following:

A. an "as built" drawing(s) of the Facilities; and

B. a release of liens duly executed by any and all contractors, subcontractors and material suppliers releasing any and all claims and liens which any of them have, or might have, against Developer, TAW or the Facilities, by reason of the labor, materials and equipment furnished in connection with the installation of the Facilities.

Developer agrees to remedy any defects in work done or materials used in the construction of the Facilities for a period of one year from the delivery of title to the Facilities to TAW.

It is expressly agreed and understood that Developer shall concurrently with the signing of this agreement pay all estimated costs and expenses to install the Facilities, including but not limited to the cost of construction, engineering, inspection and administration and permits and licenses.

The Developer shall, prior to signing of this agreement, provide an estimate of the Facilities construction cost, attached as Addendum C, and promptly following completion of construction, provide TAW with full and complete records of the actual cost to Developer of the Facilities

III. REFUND PAYABLE BY TAW TO DEVELOPER

Developer shall be entitled to receive refunds as set forth in Addendum B to this agreement of up to, but not exceeding, the total cost to Developer of constructing and installing the Facilities as provided herein, with said refunds to be made in the amounts and under the circumstances provided in the then applicable rules of TAW contained in TAW's tariffs filed from time to time with the Tennessee Public Utility Commission. For purposes of interpretation of the aforesaid rules, which currently speak in terms of "Deposits", the aforesaid total cost to Developer of the Facilities that are to be transferred to TAW shall be deemed to be a "Deposit" or "Deposits" within the meaning of said rules. An example of how the 100' refund process would work is attached as Addendum E.

IV. OWNERSHIP AND OPERATION OF FACILITIES AFTER ACQUISITION BY TAW

Upon acquisition of TAW of title to the Facilities as provided herein, TAW shall have the absolute right to extend any portion of the Facilities in, on or to other lands, avenues, streets, alleys or places and to connect other mains and services thereto, and Developer shall not, by reason thereof, be entitled to any payments or compensation, nor any refund (except as may be required by the terms of section IV hereof), and the Facilities shall be and remain in all respects the entire and sole property of TAW.

V. FURTHER AGREEMENTS BETWEEN DEVELOPER AND TAW

In addition to any and all other agreements and undertakings set forth in this agreement, TAW and Developer mutually agree that all persons receiving water service through, or as a result of, the Facilities shall be customers of TAW, shall sign individual contracts or applications for water service with TAW and shall be billed at the rates and charges of TAW as approved from time to time by the Tennessee Public Utility Commission.

VI. INDEMNIFICATION

A. Developer agrees to indemnify and hold harmless TAW and its affiliated companies, agents and employees from and against all claims, damages, losses and expenses, including attorney's fees, arising out of or resulting from the performance of the work in connection with the Facilities, provided that any such claim, damage, loss or expense (a) attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property including the loss of use resulting there from, (b) is caused in whole or in part by any negligent act or omission of Developer or any contractor or subcontractor, anyone directly or indirectly employed by any of them or anyone for whose acts any of them may be liable, regardless of whether or not it is caused in part by the negligence of party indemnified hereunder; and (c) arises within one (1) year of transfer of record title to TAW of that portion of the Facilities giving rise to the claim, or upon which the injury, damage or loss occurred.

B. TAW agrees to indemnify and hold harmless Developer and its affiliated companies, agents and employees from and against all claims, damages, losses and expenses, including attorney's fees, arising out of or resulting from the performance of

the work in connection with the Facilities after TAW takes over the Facilities.

C. Any provision of this Agreement in respect to indemnifications which are prohibited or unenforceable by law in the State of Tennessee shall be ineffective and to the extent of such prohibition of unenforceability, shall not invalidate the remaining provisions of this Agreement.

IN WITNESS WHEREOF, Tennessee-American Water has caused its name to be signed hereto by Valoria Armstrong, President, thereunto duly authorized and Thunder Air, Inc., d/b/a Jasper Highlands Development, Inc. has caused its name to be signed thereto by John C. Thornton, Sr., its President, thereunto duly authorized.

WITNESS:

TENNESSEE-AMERICAN WATER

_____

By: _____
Valoria Armstrong, President

WITNESS:

THUNDER AIR, INC. d/b/a JASPER HIGHLANDS DEVELOPMENT, INC.

_____

By: _____
John C. Thornton, Sr., President

ADDENDUM A

The water main (s) and appurtenant facilities ("the Facilities") to be constructed and installed by Developer pursuant to the acquisition agreement between TAW and Developer dated the _____ day of _____, 20____, to which the Addendum is attached, are shown on the attached drawings, are listed as follows:

Drawings prepared by: _____

Name of project: _____

Site Utility Water Line: _____

Drawings dated: _____

ADDENDUM B

TAW hereby agrees to pay to the DEVELOPER, during the period of ten (10) years from the date of this Agreement for the extended mains and all appurtenances thereto, for each additional Bona Fide Customer for which a service line has been connected to the extended main in question, an amount equal to the Unit Cost Per Foot of Main multiplied by one hundred (100) provided however, the total of such payments under this Addendum shall not exceed the total of the amount determined under paragraph III of Acquisition Agreement, without interest. For the purpose of this Addendum, the term "Unit Cost Per Foot of Main" shall mean the qualified cost of the project divided by feet of pipe installed. For purposes of this Addendum, a Bona Fide Customer is any person who has signed a water service agreement with TAW and is purchasing water pursuant to said water service agreement.

WITNESS: TENNESSEE-AMERICAN WATER

_____ By: _____
Valoria Armstrong, President

WITNESS: DEVELOPER

_____ By: _____
Owner

ADDENDUM C

ESTIMATE OR ACTUAL
(circle one)

DATE:	
PROJECT:	
OWNER:	
CONTRACTOR:	

Item Description	Quantity	Unit	Unit Price	Total
6" Water Line (DIP)				
8" Water Line (DIP)				
12" Water Line (DIP)				
6" Gate Valve (O.R.) & Box				
8" Gate Valve (O.R.) & Box				
12" Gate Valve (O.R.) & Box				
Fire Hydrant w/fittings & 6" Gate (O.L.)				
Blow Off Assembly (2")				
Service Laterals				
Air Release Valve Assembly				

TOTAL COST:

THIS FORM COMPLETED BY:

ADDENDUM D

TAW Specifications and Standards

SECTION 1000

SUMMARY OF WORK

PART 1: GENERAL

1.01 WORK UNDER THIS CONTRACT

CONTRACTOR shall furnish all labor, materials (except as herein noted), equipment and means to construct the pipeline(s) and other Work as described in the Contract Documents and shown on the Drawings. The Work includes, but is not limited to, the following:

A. Pavement removal, including saw cutting, as required.

B. Construction and maintenance of bridges and other structures as required for traffic control.

C. Furnishing of flagmen, traffic warning and control as required.

D. Sheeting, bracing and support of adjoining ground where necessary.

E. Furnish and install thrust blocking and rodding as required.

F. Handling drainage and groundwater removal

G. Guarding the site.

H. Unloading, loading, hauling, distributing, laying and testing the pipe and appurtenances.

I. Rearranging sewer lateral and other pipes and ducts where necessary.

J. Excavation and backfilling of trenches and pits.

K. Restoration of paved surfaces, and curbing.

L. Removal of surplus excavated material.

M. Performance of pressure and leakage tests.

N. Disinfection of pipeline.

O. Site cleaning.

P. Maintenance of street or other surfaces for the required period of time.

Q. Ground restoration and planting.

R. Submit schedules, shop drawings and as-built records.

The above general outline of principal features does not in any way limit the responsibility of the CONTRACTOR to perform all Work and furnish the required materials, equipment, labor and means as shown or required by the Contract Documents.

Materials, equipment, labor, etc., obviously a part of the Work and necessary for the proper operation and installation of same, although not specifically indicated in the Contract Documents, shall be provided as if called for in detail without additional cost to the OWNER.

1.02 WORK BY OWNER

OWNER will perform certain items of Work related to this project as follows:

A. Operate all valves necessary to shut-off and reactivate its pipeline.

B. Mark locations of existing services, valves, etc.

C. Other work, if any, as described in the Specifications Special Conditions.

1.03 MATERIALS FURNISHED BY OWNER

Materials to be furnished by the OWNER and installed by the CONTRACTOR are listed in the Specifications Special Conditions.

1.04 LOCATIONS

Work is to be performed on OWNER's property and/or public rights-of-ways or easements shown on the drawings and described in the Specifications Special Conditions. Work shall be performed by the CONTRACTOR within these limits.

It is the obligation and responsibility of the CONTRACTOR to determine the exact limitations of the rights-of-way and/or easements and any conditions limiting or affecting the use thereof by the OWNER and/or the CONTRACTOR. All agreements respecting rights-of-way and the easements are available for the CONTRACTOR's inspection at the OWNER's office. The CONTRACTOR agrees to indemnify and hold harmless the OWNER against any claims made by any property owner, including, without limiting the generality hereof, any claim that the CONTRACTOR has failed to keep his work, equipment, materials, or workmen within the limits authorized by the right-of-way and/or easement or any claim that the CONTRACTOR

has failed to comply with any condition or requirement, or agreement respecting the right-of-way and/or easement.

Some of the locations shown or described in the Contract Documents, such as tie-ins, are approximate and the CONTRACTOR shall be responsible for locating the exact locations.

PART 2: PRODUCTS

2.01 GENERAL

Specifications for the materials and equipment to be provided by the CONTRACTOR are detailed in the respective Specification Sections.

PART 3: EXECUTION

3.01 FIELD SURVEY WORK

OWNER will provide reference points and CONTRACTOR will be responsible for the laying out of the Work in accordance with Paragraph 4.4 of the General conditions.

3.02 COORDINATION

CONTRACTOR will be required to coordinate his work, to phase the construction operations, and provide, install and maintain any temporary connections necessary to prevent interference to operation of OWNER's facilities. Any construction work requiring the shutdown of facilities must be scheduled and performed only at such times as shall be authorized by the OWNER. Such Work must be completed during the specific periods authorized by the OWNER. It may be necessary that Work will be performed during several shutdown periods and/or during periods of premium time payment to accomplish the desired construction. All costs to perform the CONTRACTOR's Work, including premium time payments, shall be borne by the CONTRACTOR and are included in the Contract Price.

3.03 REGULATORY REQUIREMENTS

When the Work is to be done in a state right-of-way and a state inspector is assigned to the Project during the construction of the Work, the CONTRACTOR will make necessary arrangements for obtaining and pay all costs in connection with the inspector in accordance with Paragraph 13.5 of the General Conditions.

SECTION 1010

DRAWING INDEX

PART 1: GENERAL

1.01 DRAWINGS

The following drawings, dated _____, 20__, and prepared by _____, accompany this Specification and are a part thereof. Drawings are the property of the OWNER and shall not be used for any purpose other than that intended by the Specifications.

Sheet	Title

SECTION 1075

BASIS OF PAYMENT

PART 1: GENERAL

1.01 SCOPE

Work to be performed under this Contract shall be paid for in accordance with Price Schedule - A, of the Bid. When authorized by OWNER, additional work will be paid for in accordance with the unit prices of Price Schedule - B, of the Bid. The cost of labor, equipment, materials or work called for in the Specifications, shown on the Drawings, or necessary for a complete and satisfactory installation, but which are not specifically mentioned in this Section shall be included in the appropriate pay item by the CONTRACTOR at no additional expense to the OWNER.

1.02 PAYMENT ITEMS

A. Price Schedule - A

The prices shown in Price Schedule A of the Bid include all costs to construct the pipeline(s) under this Contract. The quantities shown on Price Schedule A are not guaranteed and final payment will be made on the in place measurement of the length(s) of pipeline(s) installed.

1. Pipe Installation (Item No. A-1)

CONTRACTOR shall be solely responsible for the means, methods, techniques, sequences and procedures for the construction of the pipeline(s). The minimum width and depth of the pipe trench shall be in accordance with the requirements of Specification Section 2210.

All costs to complete the pipeline installation are included in the unit price per lineal foot of pipeline, regardless of whether the CONTRACTOR uses sloped sides or shoring and sheeting when excavating the pipe trench. The unit price for each pipeline is the sum of all costs to complete the Work as described in Specification Section 1000.1.01, divided by the estimated length of the pipeline as shown in the Bid.

When fire hydrants, wet connections, air release valves, air vents, blow-off assemblies, stream crossings and casing installations are required for the Project, these items will be paid for at the unit prices to Item Nos. A-2 to A-8 inclusive as shown in the Bid.

2. Fire Hydrant Installation (Item No. A-2)

Payment will be made at the Contract unit price for each fire hydrant installation. The unit price shall include all costs to install any materials furnished by OWNER as well as Contractor furnished material. Also included in the unit price shall be all costs to furnish and install reaction blocking, crushed stone and to perform all excavation and backfill for the fire hydrant service from the main to and including the hydrant.

3. Wet Connection Installation (Item No. A-3)

Payment will be made at the Contract unit price for each wet connection required. The unit price shall include all costs for furnishing, testing and installing the tapping sleeve or saddle and tapping valve. When OWNER furnishes the tapping sleeves, saddle and tapping valve the unit price shall be for testing and installation costs only.

4. Air Release Valves, Air Vents and Blow-off Assemblies (Item Nos. A-4, A-5 and A-6)

Payment will be made at the Contract unit price for each air release valve, air vent and blow-off assembly. The unit price shall include all labor, materials, (except where materials are furnished by OWNER) tools, excavation and backfilling, furnishing and installing manhole frames and covers, ladders, painting; the furnishing, installing and testing of all piping, valves, air valves, fittings, small piping and piping appurtenances and all incidental work required to construct each structure complete as shown on the Drawings, as specified and necessary to make a complete and satisfactory installation.

5. Stream Crossing (Item No. A-7)

Payment will be made at the Contract unit price for the crossing pipe furnished (except where furnished by the OWNER) and installed, complete in place as shown on the Drawings. The Contract unit price shall include all pipe, fittings, specials, anchors, joint harnesses, etc., as shown on the Drawings, required by these Specifications and necessary to make a complete and satisfactory installation. In addition, the Contract unit price shall include all excavation, embankment and backfill construction of reaction backings and concrete encasements, providing an approved means for holding the pipe in place, constructing cofferdams, stone backfill, etc.

6. Casing Installation (Item No. A-8)

Payment will be made at the Contract unit price for the casing installation complete in place as shown on the drawings. The Contract unit price shall include all casing pipe, water pipe, and fittings (except where furnished by OWNER), strapping, skids, specials, anchors, harnesses, etc. as required by these specifications or as necessary for a complete and satisfactory installation. In addition the Contract unit price shall include all excavation (soil or rock), dewatering, jacking, drilling or boring (rock or soil), backfilling, brick and mortar installation, sheeting, bracing, shoring, temporary construction, safety measures, etc. all as necessary for a complete and satisfactory installation.

B. Price Schedule - B

1. General Excavation (Item No. B-1)

When authorized by the OWNER, the CONTRACTOR shall perform additional general excavation to the limits designated by the ENGINEER. The measurement for all additional general excavation will be by the cubic yard of material removed from its original natural state to the lines and grades designated by the ENGINEER.

2. Rock Excavation - Within Pipe Trench (Item No. B-2)

When rock occurs within the pipe trench, the CONTRACTOR shall remove the rock to the limits of the pipe trench. The measurement for the rock excavation will be by the cubic yard of material removed. The unit prices for the Rock Excavation - Within Pipe Trench (Bid Item No. B-2) reflects a deduction of equivalent volume and cost for the trench excavation included in Bid Item NO. A-1 but not performed by the CONTRACTOR. The unit prices also include all costs to haul and dispose the rock at an approved dump site.

3. Rock Excavation - Beyond Limits of Planned Pipe Trench (Item No. B-3)

When authorized by the OWNER, the CONTRACTOR shall remove rock beyond the limits of the planned pipe trench to the limits designated by the ENGINEER. The measurement for the rock excavation will be by the cubic yard of material removed. The unit prices include all costs to remove, haul and dispose of the rock at an approved dump site.

4. Excavation of Unsuitable Material Below Planned Pipe Trench Subgrade (Item No. B-4)

CONTRACTOR shall notify ENGINEER whenever the material below the pipe trench subgrade may be unsuitable. Determination as to the suitability of the material and the necessity for its removal is within the sole discretion of the ENGINEER.

The measurement for the excavation of unsuitable material will be by the cubic yard of material removed below the planned pipe trench subgrade. The unit prices include all costs to excavate, haul and dispose the unsuitable material at an approved dump site.

5. Backfill With Common Fill - Type A (Item No. B-5)

When authorized by the OWNER, the CONTRACTOR shall furnish, place and compact additional Common Fill - Type A at the locations and to the limits designated by the ENGINEER. The measurement for backfill with Common Fill - Type A shall be the in place measurement of cubic yards of material furnished, placed and compacted.

6. Backfill With Common Fill - Type B (Item No. B-6)

Same as for Item No. B-5, except the backfill material will be Type B.

7. Backfill with Bedding Material (Item No. B-7)

Same as for Item No. B-5, except the backfill material will be the bedding material defined in Specification Section 2210.2.03.

8. Filter Fabric (Item No. B-8)

When authorized by the OWNER, the CONTRACTOR shall furnish and install the filter fabric as described in Specification Section 2210.2.04 where directed by the ENGINEER. Payment will be made at the unit price per square yard of the installed contact surface of the filter fabric with the trench bottom and sides.

9. Polyethylene Encasement (Item No. B-9)

When authorized by OWNER, the CONTRACTOR shall furnish and install polyethylene encasement to the limits designated by the ENGINEER. Payment will be made at the unit price per linear foot of pipe covered by the polyethylene encasement.

10. Bituminous Pavement With Crushed Stone Base (Item No. B-10)

When authorized by the OWNER, the CONTRACTOR shall furnish and install additional bituminous pavement with crushed stone base at the locations and to the limits designated by the ENGINEER. Payment will be made at the unit price per square yard of bituminous pavement with crushed stone base measured in place.

11. Bituminous Pavement With Concrete Base (Item No. B-11)

Same as for Item No. B-10, except the pavement will be a bituminous pavement with concrete base.

12. Concrete Pavement

When authorized by OWNER, the CONTRACTOR shall construct an 8" thick 3000 psi compressive strength concrete pavement in the locations and to the limits designed by the ENGINEER. Payment will be at the unit price per square yard of concrete pavement measured in place.

13. Steel Pipe Bollard

When authorized by OWNER, CONTRACTOR shall install and paint, steel pipe bollards in locations designated by the ENGINEER all in accordance with Specification Section 15180 - Fire Hydrants, and Sketch 61-300-13.

14. Valve Marking Post

When authorized by OWNER, CONTRACTOR shall install and paint valve marking posts at locations designated by the ENGINEER in accordance with Specification Section 15000 and Sketch 61-300-14.

SECTION 1300

SUBMITTALS

PART 1: GENERAL

1.01 CONSTRUCTION SCHEDULE

CONTRACTOR shall prepare and submit detailed progress schedules, schedule of values and shop drawing and sample submittal schedules to the ENGINEER for approval in accordance with Paragraphs 2.6 and 2.9 of the General Conditions. The schedule shall be in bar graph form showing material delivery schedules and starting and completion dates for all phases of construction.

If, in the opinion of the ENGINEER, the CONTRACTOR falls behind the progress schedule, the CONTRACTOR shall take such steps as may be necessary to improve his progress, which may require him to increase the number of shifts, and/or overtime operations, days of work, and/or the amount of construction planned, and to submit for approval such supplementary schedule or schedules as necessary to demonstrate the manner in which the agreed rate to progress will be regained, all without additional cost to the OWNER.

1.02 CASH FLOW SCHEDULE

In addition to the Construction Schedule required above, the CONTRACTOR shall also submit to the ENGINEER, for approval, a Cash Flow Schedule. The Cash Flow Schedule shall show the amounts of money by months, which will be required to reimburse the CONTRACTOR for Work performed during each month of the Contract Time. The sum of all the monthly cash requirements shall equal the total price of the Contract. The monthly cash requirements shall be proportioned with the aid of the Construction Schedule.

The approved Cash Flow Schedule will be used by the OWNER to program funds for progress payments to the CONTRACTOR. Monthly payments will be made to the CONTRACTOR in accordance with the Contract Agreement, but at no time will the aggregate amount of payments exceed the accumulated amount of payments for the same period of the Cash Flow Schedule.

1.03 SHOP DRAWINGS

The CONTRACTOR shall promptly supply to the ENGINEER for approval, shop drawings with details and schedules for all items as noted in the Drawings and/or Specifications and/or required by the ENGINEER.

Seven (7) copies of all drawings, schedules and brochures shall be submitted for approval. Black line prints, blue line prints or reproducible transparencies are required. Blueprints (white lines on a blue background) are not acceptable. Each submittal shall have the job name on it.

Submittals smaller than 8-1/2 by 11 inches shall be secured to paper 8-1/2 by 11 inches.

1.04 SAMPLES

When required by the ENGINEER or where noted in other Sections of these Specifications, samples of materials shall be submitted for approval.

1.05 PRE-CONSTRUCTION PHOTOGRAPHS

Prior to commencement of work the CONTRACTOR shall submit to ENGINEER photographs of the work areas and material storage areas. Photographs shall be taken along the center line of the proposed pipe trench and should capture all existing features of the sites such as mail boxes, curbing, lawns, driveways, signs, culverts, etc. As many photographs as is necessary shall be taken but as a minimum one photograph for every 50-feet of pipe trench is required. Each photograph shall have the date taken, a description, and sequential number (to follow pipe route) recorded on the back.

SECTION 1500

TEMPORARY FACILITIES

PART 1: GENERAL

1.01 WATER SUPPLY

If reasonably available, water for the purpose of this Contract will be supplied to the CONTRACTOR by the OWNER. The water will be furnished at no cost to the CONTRACTOR. The CONTRACTOR shall furnish and install all necessary meters, temporary piping and valves in connection with such water supply.

OWNER reserves the right to impose such limitations upon the CONTRACTOR's use of temporary water as the OWNER, in its sole discretion, determines may be necessary to assure it of its continued ability to meet the demands of its customers and the volumes and pressures required for fire protection. Any water required by the CONTRACTOR in excess of the quantities the OWNER provides to the CONTRACTOR must be furnished by the CONTRACTOR at his own cost.

1.02 TEMPORARY HEAT

The CONTRACTOR shall provide, when required, approved type heating apparatus with the necessary fuel in order to protect and/or dry out the work. The stored materials and finished work shall be protected at all times from damage by the elements.

1.03 ELECTRICAL SUPPLY

The CONTRACTOR shall pay all fees, obtain necessary permits and have meters installed for power and light as may be required for the prosecution of his work. Energy charges shall be paid by the CONTRACTOR.

1.04 SANITARY FACILITIES

The CONTRACTOR shall provide suitable temporary facilities and enclosures for the use of workmen and shall maintain same in a sanitary condition and remove same when directed by the OWNER.

CONTRACTOR is advised that OWNER is in the business of providing potable water and the CONTRACTOR's sanitary arrangements shall not endanger the OWNER's facilities.

SECTION 1570

TRAFFIC REGULATION

PART 1: GENERAL

1.01 SCOPE OF WORK

CONTRACTOR shall furnish and install all traffic barricades, markers, signs, controls and provide flagmen, traffic police and other facilities required by the Federal, State and local government authorities and the ENGINEER to protect general public and maintain the existing roads, streets and highways.

Competent uniformed traffic directors shall be employed at every location where the CONTRACTOR'S equipment is working immediately adjacent to, or is entering, leaving or crossing, active traffic lanes. The traffic directors shall be employed continuously for the full time such conditions exist.

Special attention shall be given for the protection of pedestrians and, in particular, children going to and coming from school. Ingress and egress shall be maintained for all properties abutting the pipeline.

The CONTRACTOR shall notify the State and local police, ambulance services and fire departments of daily traffic diversions.

The OWNER or ENGINEER make no warranty or representation that the CONTRACTOR will be permitted to divert or barricade traffic and the CONTRACTOR shall be fully responsible to complete all obligations of the Contract regardless of any restrictions which may be imposed by Federal, State or local authorities.

1.02 MAINTAINING TRAFFIC

A. Traffic Diversion

Whenever it is necessary to divert traffic from its normal channel into another channel, such diversion shall be clearly marked by cones, drums, barricades or temporary guard rail. If the markers are left in place at night, suitable lights shall be provided and maintained.

B. One Way Traffic

Whenever one way traffic is established, at least two (2) flagmen shall be provided.

C. Street Closing

When permitted by Federal, State or local authorities having jurisdiction, the CONTRACTOR may close streets to through traffic for minimum periods of time. CONTRACTOR must notify and secure the permission of the local police and fire departments and such other public authorities and, if required by any law, ordinance or regulation, the occupants of all premises bordering the streets. CONTRACTOR must give all occupants reasonable notice with respect to the closing of any street, in whole or in part, even when not required by any law, ordinance, or regulation. CONTRACTOR shall so schedule his work that the time the street is closed is kept to a minimum and shall, whenever possible, make suitable preparations for access by local residents, school buses, and mail delivery vehicles. CONTRACTOR shall provide access for police, fire, ambulance and emergency vehicles at all times. Fire hydrants and other public utility valves shall be kept accessible at all times by the CONTRACTOR.

1.03 TRAFFIC SIGNALS AND CONTROLS

The installation and operation of all traffic signals and traffic control devices shall conform to the requirements of Federal, State and local government highway departments.

To protect persons from injury and to avoid property damage, adequate barricades including flasher and reflectorized construction signs and guards as required shall be placed and maintained during the progress of the construction work and until it is safe for traffic and pedestrians to use the trenched area.

When the CONTRACTOR is permitted to close a street or road to traffic, the CONTRACTOR shall furnish, erect, maintain and remove barricades, suitable and sufficient red lights, and other lights or reflecting material at the limits of the project, where side streets intersect, and at other points of public access to the project. The CONTRACTOR shall furnish, erect and maintain advance warning signs and barricades on side streets at the first street intersection beyond the one closed by construction indicating "Street Closed, One Block Ahead". The CONTRACTOR shall furnish, erect, maintain and remove detour marking signs on temporary routes.

1.04 TRENCH AND STORED MATERIAL MARKINGS

Before completion of each day's work, in traveled areas, the pipe trench shall be completely backfilled and tamped, and the necessary temporary paving installed. 3/4-inch stone will be used in sidewalk and walkway areas and blacktop in driveways. These areas are not to be left open, impassable or unsafe through the night. In the event that the pipe trench cannot be completely backfilled and tamped, temporary bridges and crossings shall be used to accommodate through traffic and the general public. The job site will be left in a neat and satisfactory condition at the end of each day. The requirements of this Section are in addition to any requirements of Federal, State or local laws, rules, regulations or ordinances or any requirements found elsewhere

in the Contract Documents.

Equipment and material stored on the street shall be marked at all times. At night any such material or equipment stored between the side ditches, or between lines 5 feet behind any raised curbs, shall be clearly outlined with light or other dependable warning devices that are approved by the ENGINEER. In addition, the CONTRACTOR shall provide any other lights, barricades, etc., that may be needed for the protection of pedestrian traffic.

1.05 OTHER REQUIREMENTS

If the regulation of traffic and controls are not being provided in accordance with this Section 1570, and the public is inconvenienced or its safety is being endangered, in the judgement of the ENGINEER, the OWNER may take such steps as it deems advisable to provide such services and all costs in providing such services will be deducted from any payment which may be due or may thereafter become due the CONTRACTOR.

SECTION 1600

MATERIAL AND EQUIPMENT

PART 1: GENERAL

1.01 PROTECTION OF MATERIAL AND EQUIPMENT

The CONTRACTOR shall be responsible for the safe storage of all material furnished to or by him until it has been incorporated in the completed project and accepted by the ENGINEER. The CONTRACTOR shall bear the risk of loss and/or damage to the materials and Work until the Work is finally accepted by the ENGINEER.

The interior of all pipe and accessories shall be kept free from dirt and foreign matter at all times.

After valves and hydrants have been inspected, the CONTRACTOR shall properly store them prior to use. In order to prevent entry of foreign material that could cause damage to the seating surfaces, the valves and hydrants shall be stored in a fully closed position unless recommended otherwise by the manufacturer. Resilient seated valves shall be stored in accordance with the manufacturer's recommendations. This may include storage with protective covers for rubber seats and in a marginally open condition. Valves and hydrants should be stored indoors.

If valves must be stored outdoors, the CONTRACTOR shall protect the operating mechanism, such as gears, motor, actuators and cylinders, from weather elements. Valve ports and flanges must be protected from the weather and foreign materials. If valves are subject to freezing temperatures, all water must be removed from the valve interior and the valve closed tightly before storage, unless specifically recommended otherwise by the manufacturer. Failure to do so may result in a cracked valve casting. Valves shall be stored on pallets with the discs in a vertical position to prevent rainwater from accumulating on top of the disc, seeping into the valve body cavity and freezing and cracking the casting.

PART 2: PRODUCTS

2.01 GENERAL

Unless otherwise specifically provided for in these specifications, all equipment, materials and articles incorporated in the Work shall be new, in current production and the best grade obtainable consistent with general construction usage.

Materials specified by reference to the number or symbol of a specific standard, such as a Commercial Standard, Federal Specification or other similar standard, shall comply with the supplement in effect on the date of the Specifications, except as limited to type, class or grade, or modified by these Specifications.

The CONTRACTOR shall submit to ENGINEER samples of materials for approval when requested and/or directed.

PART 3: EXECUTION

3.01 COORDINATION OF DIMENSIONS

The CONTRACTOR shall verify and make necessary corrections to construction dimensions so all specified materials can be installed and will function within the intent of the Contract Drawings and Specifications. The CONTRACTOR will promptly notify the ENGINEER of all necessary corrections required.

3.02 SAFETY AND HEALTH REQUIREMENTS

All material, equipment, fixtures and devices furnished shall comply with the requirements and standards of all Federal, State and local laws, ordinances and codes governing safety and health.

3.03 RESPONSIBILITY FOR MATERIAL AND EQUIPMENT

When received from the Carrier and at time of unloading, the CONTRACTOR shall inspect all pipe and accessories for loss or damage. No shipment of material shall be accepted by the CONTRACTOR unless loss or damage has been described on the Bill of Lading by the Carrier's agent. Any discrepancies between the Bill of Lading and the physical material shall be noted on the Bill of Lading. All demurrage charges on carloads or truckloads of pipe or other material shall be paid by the CONTRACTOR.

The CONTRACTOR shall be responsible for all material furnished by him. All such material which is defective in manufacture or has been damaged in transit or has been damaged after delivery shall be replaced by the CONTRACTOR at his expense.

The CONTRACTOR's responsibility for material furnished by the OWNER shall begin upon CONTRACTOR's acceptance at the point of delivery to him. All such material shall be examined, and material defective in manufacture and/or otherwise damaged shall be rejected by the CONTRACTOR at the time and place of delivery to him and replaced by the OWNER. Once Accepted by the CONTRACTOR, at the point of delivery to him, all defective and/or damaged material discovered prior to final acceptance of the Work shall be removed by the CONTRACTOR and he shall install, at his own expense, the material replaced. In such case the CONTRACTOR shall furnish all labor, equipment and material incidental to replacement and

necessary for the completion of the Work to the satisfaction of the ENGINEER. The CONTRACTOR will be reimbursed for the cost of replacing defective materials furnished by the OWNER and accepted by the CONTRACTOR if, but only if, the CONTRACTOR submits proof satisfactory to the ENGINEER and to the manufacturer and/or supplier from whom the OWNER purchased the material that the defect was latent and could not have been discovered by the CONTRACTOR.

SECTION 1700

PROJECT CLOSEOUT

PART 1: GENERAL

1.01 CLEANING UP

The CONTRACTOR shall periodically, or as directed during the progress of the Work, remove and properly dispose of the resultant dirt and debris and keep the premises reasonably clear. Upon completion of the Work, he shall remove all temporary construction facilities and unused materials provided for the Work and put the premises in a neat and clean condition and do all cleaning required by the Specifications. Trash and combustible materials shall not be allowed to accumulate in construction locations.

1.02 GUARANTEES AND WARRANTIES

The CONTRACTOR expressly warrants that all workmanship and materials performed or furnished under this Contract will conform to the Specifications, Drawings, samples and other applicable descriptions furnished or adopted by the CONTRACTOR and with all applicable laws, provisions and requirements of the Contract Documents. The CONTRACTOR shall remedy any defects due to faulty materials or workmanship which shall appear within a period of one year from the date of acceptance of the Work hereunder and pay for any damage to other Work resulting therefrom. The OWNER shall give notice of observed defects with reasonable promptness. The CONTRACTOR's warranty hereunder is in addition to, and not in limitation of, any obligations found elsewhere in the Contract Documents, any special guarantees provided by the CONTRACTOR, and any obligations imposed by law.

In addition to the above requirements, the CONTRACTOR shall assign material and equipment guarantees and warranties from all manufacturers and suppliers to the OWNER and deliver copies of such guarantees and warranties and the assignments thereof to the OWNER in order to assure the OWNER of the full benefit of such guarantees and warranties.

1.03 RESTORATION

The CONTRACTOR shall restore and/or replace paving, curbing, sidewalks, gutters, shrubbery, fences, sod or other disturbed surfaces and structures to a condition equal to that before the Work began and to the satisfaction of the ENGINEER and shall furnish all labor and materials incidental thereto. In restoring improved surfaces, new pavement is required. No permanent bituminous top paving shall be placed within twenty (20) days, or other specified time frame required by law, after the backfilling shall have been completed, except by order of the ENGINEER. Temporary paving will be installed prior to the placement of permanent surfaces when required by the ENGINEER or by any federal, state or local governing body having

jurisdiction over the site where the work is being performed. In any event, all permanent bituminous top paving shall be placed within forty five (45) days or other specified time required by law, after the backfill has been completed unless otherwise ordered by the ENGINEER.

1.04 MAINTENANCE OF SURFACES

Following the certification of completion by the ENGINEER, the CONTRACTOR shall, unless otherwise stipulated by the ENGINEER, maintain the surfaces of paved and unpaved trenches and adjacent curbs and gutters, sidewalks, fencing, sod and other disturbed surfaces for a period of one (1) year thereafter or as required by state, county or local authorities. All material and labor required for the maintenance of the trench surfaces and structures shall be supplied by the CONTRACTOR, and the work shall be done in a manner satisfactory to the ENGINEER.

SECTION 2020

DEWATERING

PART 1: GENERAL

1.01 GENERAL

The dewatering of all areas where work must be performed under this Contract is the responsibility of the CONTRACTOR and no additional sum will be allowed for any dewatering operation, overtime, equipment rental or any other expense incurred due to the occurrence of ground water, surface water or water from possible leakage of existing buildings, structures and piping in the vicinity of the CONTRACTOR'S operations.

Should water be encountered, the CONTRACTOR shall furnish and operate suitable pumping equipment of such capacity adequate to dewater the trench. The trench shall be sufficiently dewatered so that the laying and joining of the pipe is made in the dry. The CONTRACTOR shall convey all trench water to a natural drainage channel or storm sewer without causing any property damage and in strict accordance with state and/or local requirements.

Disposal of silt and debris which accumulates during construction shall be performed in strict accordance with state and/or local requirements.

1.02 PERMITS

The CONTRACTOR shall be responsible for obtaining and paying for any permits required for dewatering and disposal.

SECTION 2025

EXISTING UTILITIES AND STRUCTURES

PART 1: GENERAL

1.01 SCOPE OF WORK

Certain information regarding the reputed presence, size, character, and location of existing Underground Facilities such as pipes, drains, sewers, electrical lines, telephone lines, cable TV lines, gas lines, and water lines has been shown on the Contract Drawings and/or provided herein. This information with respect to Underground Facilities is provided by the OWNER in accordance with conditions described in paragraphs 4.3.1, 4.3.1.1, 4.3.1.2 and 4.3.2 of the General Conditions.

1.02 NOTIFICATION OF UTILITIES

CONTRACTOR shall notify all utility companies that construction of the work under this Contract will pass through the areas where their services exist. Notification to the utilities must be made in a sufficient amount of time in advance (min. 72 hours) prior to start of any construction work in the affected areas.

PART 2: PRODUCTS

2.01 MATERIALS

Materials for temporary support, adequate protection, and maintenance for all underground and surface utility structures, drains, sewers and other obstructions encountered in the progress of the work shall be furnished by the CONTRACTOR at his own expense.

PART 3: EXECUTION

3.01 OBSTRUCTIONS BY OTHER UTILITY STRUCTURES

Where the grade or alignment of the pipe is obstructed by existing utility structures such as conduits, ducts, pipes, branch connections to main sewers, or drains, the obstruction shall be permanently supported, relocated, removed or reconstructed by the CONTRACTOR in cooperation with the owners of such utility structures. Before proceeding the CONTRACTOR must reach an agreement with the ENGINEER on method to avoid obstruction.

No deviation shall be made from the required line or depth except with the consent of the ENGINEER.

3.02 REPAIRS

Existing pipes or conduits crossing the trench, or otherwise exposed, shall be adequately braced and supported to prevent trench settlement from disrupting the line or grade of the pipe or conduit, all in accordance with the directions of the ENGINEER. Utility services broken or damaged shall be repaired at once to avoid inconvenience to customers. Storm sewers shall not be interrupted overnight. Temporary arrangements, as approved by the ENGINEER, may be used until any damaged items can be permanently repaired. All items damaged or destroyed by construction and subsequently repaired must be properly maintained by the CONTRACTOR.

Attached to this section are Sketch Nos. 61-300-1SK and 61-300-2SK providing the requirements for repair or replacement of sanitary or storm drains removed or damaged during installation of the water main.

3.03 RELOCATION

Where it is necessary to relocate an existing utility or structure, the work shall be done in such a manner as is necessary to restore it to a condition equal to that of the original facility. No such relocation shall be done until approval is received from the owner of the utility or structure being changed.

3.04 SEPARATION OF WATER MAINS, SANITARY SEWER AND STORM SEWERS

A. General

The following factors should be considered in providing adequate separation:

(1) Materials and type of joints for water and sewer pipes,

(2) Soil conditions,

(3) Service and branch connections into the water main and sewer line,

(4) Compensating variations in horizontal and vertical separations,

(5) Space for repair and alterations of water and sewer pipes,

(6) Off-setting of pipes around manholes.

B. Parallel Installation

Water mains shall be laid at least 10 feet horizontally from any existing or proposed sewer. The distance shall be measured edge to edge. In cases where it is not practical to maintain a 10 foot separation, the State Environmental Protection Agency

may allow deviation on a case-by-case basis, if supported by data from the ENGINEER. Such deviation may allow installation of the water main closer to a sewer, provided that the water main is laid in a separate trench or on an undisturbed earth shelf located on one side of the sewer at such an elevation that the bottom of the water main is at least 18 inches above the top of the sewer.

C. Crossings

Whenever water mains must cross building drains, storm drains, or sanitary sewers, the water main shall be laid at such an elevation that the bottom of the water main is 18 inches above the top of the drain or sewer. This vertical separation shall be maintained for the portion of the water main located within 10 feet horizontally of any sewer or drain it crosses. The 10 feet is to be measured as a perpendicular distance from the drain or sewer line to the water line.

D. Exception

When it is impossible to obtain the proper horizontal and vertical separation as stipulated above the ENGINEER is to be notified. If directed by the ENGINEER both the water main and sewer line shall be constructed of cast iron, ductile iron, galvanized steel or protected steel pipe having mechanical joints. Other types of joints of equal or greater integrity may be used at the discretion of the ENGINEER after consultation with the State Environmental Protection Agency. Thermoplastic pipe may be used provided mechanical or solvent weld pipe joints are used. These shall be pressure-tested to assure water tightness before backfilling. Where water mains must cross under a sewer, additional protection shall be provided by:

(1) A vertical separation of at least 18 inches between the bottom of the sewer and the top of the water line,

(2) Adequate structural support for the sewers to prevent excessive deflection of the joints and the settling on and breaking of the water line,

(3) That the length of the water line be centered at the point of the crossing so that the joints shall be equidistant and as far as possible from the sewer.

Through the ENGINEER the State Environmental Protection Agency shall be consulted when any of the above conditions cannot be met to discuss the use of double casing or concrete encasement of sewer and/or water lines as possible alternatives.

SECTION 2105

CLEARING AND GRUBBING

PART 1: GENERAL

1.01 PROTECTION

Existing trees, shrubs and bushes outside the clearing limits shall be protected from damage during the life of this Contract.

1.02 REQUIREMENTS OF REGULATORY AGENCIES

Comply with State and local code requirements when disposing of trees, shrubs and all other materials removed under this Section.

1.03 PAYMENT

All costs to obtain a suitable disposal area, hauling to the disposal area and dumping at the disposal area shall be borne by the CONTRACTOR.

PART 2: PRODUCTS

2.01 MATERIALS AND EQUIPMENT

Provide all materials and equipment required to complete all clearing and grubbing in accordance with this Section.

PART 3: EXECUTION

3.01 CLEARING AND GRUBBING

Clear and grub the minimum area to provide space for construction operations.

Trees, down timber, shrubs, bushes, vines, roots, stumps, undergrowth, rubbish, paving materials, debris and all other objectionable materials shall be removed within the limits of clearing and grubbing.

3.02 DISPOSAL

Burning of logs, stumps, roots, cuttings and other material on the site will not be permitted.

All materials obtained as a result of the clearing and grubbing operations shall be disposed of in accordance with the requirements of the applicable governing agencies.

Chipping of brush materials will be permitted, but the resultant chips must be disposed of at an approved location.

SECTION 2210

TRENCHING, BACKFILLING AND COMPACTING

PART 1: GENERAL

1.01 SUBMITTALS

All materials to be used for backfill, including common fill and bedding materials, shall be approved by ENGINEER prior to placing the materials in the pipe trench. All backfill and bedding materials whether obtained from the trench excavation or from an off-site source must be tested as directed by the ENGINEER.

Samples of the materials shall be submitted to an approved testing agency for analysis. The test results and report stating that the materials meet the requirements of these Specifications and the Specifications of Federal, State and local authorities (where applicable) shall be submitted to the ENGINEER for approval prior to placing the materials in the pipe trench.

1.02 PROFILES AND TOPOGRAPHY

Contours, topography and profiles of the ground shown on the Drawings are believed to be reasonably correct, but are not guaranteed to be absolutely so and are presented only as an approximation.

The CONTRACTOR shall accept the construction site with conditions the same as existed at the time of bidding.

PART 2: PRODUCTS

2.01 GENERAL

See Sketch No. 61-300-3 SK at the end of this section for the locations of trench backfill and bedding materials.

2.02 FILL MATERIAL

Material for backfilling shall be earth materials entirely free from vegetation, trash, lumber, frozen, soft or organic materials. No stones or rock larger than the sizes listed below will be permitted in the backfill:

Common Fill-Type A: No stones or rocks larger than 1-inch
Common Fill-Type B: No stones or rocks larger than 4-inches
Common fill material may be obtained from the trench excavation provided it has been

tested in accordance with the requirements of Section 2210.1.01 above and approved by the ENGINEER. If approved material obtained from the trench excavation is insufficient to complete the backfill, the CONTRACTOR shall obtain the necessary approved common fill materials from an off-site source.

2.03 BEDDING MATERIAL

Materials used for bedding and the haunch around the pipe shall be a course to fine sandy material with maximum stone size of 1-inch. The material shall conform to ASTM D2487 "Standard Method for Classification of Soils for Engineering Purposes" using the "Unified Soil Classification System", except where a higher standard is required elsewhere in the Contract Documents or by rules or regulations of Federal, State or local governmental bodies having jurisdiction over the site of the Work.

The material shall meet a Class II designation. Soil types GW, GP, SW and SP, non-cohesive, well graded and containing some fines are included in this Class. Where voids, finer grained soils or movement may allow migration of this material, a filter fabric as directed by the ENGINEER will be used in the trench bottom and sides before the select fill bedding is placed.

Bedding material may be obtained from the trench excavation provided it has been tested in accordance with the requirements of Section 2210.1.01 above and approved by the ENGINEER. If the approved material obtained from the trench excavation is insufficient to complete the bedding, the CONTRACTOR shall obtain the necessary tested and approved bedding materials from an off-site source.

2.04 FILTER FABRIC

Filter fabric shall be non-woven, synthetic fiber material with sieve design to not permit the select material in the pipe bedding and haunching to migrate into the surrounding soils. The material shall have a minimum thickness of 15 mils, tensile strength of 130 lbs., elongation at break of 62% and trapezoidal tear strength of 70 lbs.

PART 3: EXECUTION

3.0l CONSTRUCTION EQUIPMENT

Where mains are located in or adjacent to pavements, all backfilling and materials handling equipment shall have rubber tires. Crawler equipment shall be permitted when there is no danger of damaging pavement. It is the CONTRACTOR's responsibility, to repair, at his expense, any damages due to the use of any equipment to complete the work.

3.02 NOISE, DUST AND ODOR CONTROL

The CONTRACTOR'S construction activities shall be conducted so as to eliminate all unnecessary noise, dust and odors.

3.03 PROTECTION OF TREES

Special care shall be taken to avoid damage to trees and their root system. Machine excavation shall not be used when, in the opinion of the ENGINEER, it would endanger the tree. In general, where the line of trench falls within the limits of the limb spread, headers are required across the trench to protect the tree. The operation of all equipment, particularly when employing booms, the storage of materials, and the disposition of excavation shall be conducted in a manner which will not injure trees, trunks, branches or their roots unless such trees are designated for removal.

3.04 TRENCH SUPPORT

Unsupported open cut excavation for mains will not be permitted where trenching may cause danger to life, unnecessary damage to street pavement, trees, structures, poles, utilities, or other private or public property. During the progress of the work, whenever and wherever it is necessary, the CONTRACTOR shall, at his expense, support the sides of the excavation by adequate and suitable sheeting, shoring, bracing or other approved means. Such trench support materials and equipment shall be maintained and remain in place until backfilling operations have progressed to the point where the supports may be withdrawn without endangering property.

3.05 TRENCH EXCAVATION AND BOTTOM PREPARATION

A. General Excavation

General excavation shall consist of the satisfactory removal and disposal of all materials taken from within the limits of the Work contracted, meaning the material lying between the original ground line and the finished ground line as shown on the Drawings regardless of whether the original ground line is exposed to air or is covered by water. Excavation below existing ground line to enable any required construction or removals is included. It is distinctly understood that any reference to earth, rock, silt, debris or other materials on the Drawings or in the Specifications is solely for the OWNER's information and shall not be taken as an indication of classified excavation or the quantity of earth, rock, silt, debris or other material encountered.

All excavation shall be made to the lines and grades indicated on the Drawings or established in the field by the ENGINEER.

Excess excavated materials and excavated materials unsuitable for backfilling shall be properly disposed of by the CONTRACTOR clear of the site. The CONTRACTOR shall furnish to ENGINEER satisfactory evidence that an appropriate disposal site will be used.

B. Rock Excavation

The Contract includes a unit price for rock excavation, the excavation shall include the removal, hauling, stockpiling and/or proper disposal of all material required to be excavated which requires systematic blasting, barring and wedging for removal, boulders or loose rock of one cubic yard or more in volume, and material which cannot be loosened or broken down by ripping in a single pass with a hydraulic ripper or other devices and equipment designed to remove rock. No payment will be made for rock removal unless the CONTRACTOR gives prompt notice to the ENGINEER upon encountering such material and prior to its removal. The ENGINEER's determination as to whether the material meets the definition or rock and ENGINEER's measurement of the volume of rock removal for which the CONTRACTOR is entitled to payment will be final and conclusive.

C. Blasting Rock

The CONTRACTOR must notify ENGINEER, in advance, of his intention to use blasting. The ENGINEER will require evidence that the proposed blasting will comply fully with Laws or Regulations.

No blasting of rock shall be done where limited or prohibited by any Federal, State or local laws or regulations or in violation of any limitation or restriction contained in any right-of-way or wherever specifically prohibited in any Drawing or other Contract Document; nor will any such blasting be done within forty (40) feet of any pipe or structure without specific permission from the ENGINEER. Blasts shall be properly covered and the pipe or structure properly protected. Warning shall be given to all persons in the vicinity. Blasting shall be at the risk of the CONTRACTOR who shall be liable for all damages to persons or property. Necessary permits shall be secured and paid for by the CONTRACTOR. It is the CONTRACTOR'S responsibility to perform whatever pre-blast surveys and investigations may be required by the circumstances and/or by Federal, State or local laws.

D. Trench Width

Widths of trenches shall be held to a minimum to accommodate the pipe and appurtenances. The trench width shall be measured at the top of the pipe barrel and shall conform to the following limits:

Earth

Minimum:	Outside diameter of the pipe barrel plus 8 inches, i.e., 4 inches each side.
Maximum:	Nominal pipe diameter plus 24 inches.

Rock

	Nominal Pipe Diameter	
	12 inches or less	16 inches or larger
Minimum:	Outside diameter of the pipe barrel plus 16 inches, i.e., 8 inches each side.	Outside diameter of the pipe barrel plus 24 inches, i.e., 12 inches each side.
Maximum:	Nominal pipe diameter plus 24 inches.	

E. Excessive Trench Width

If, for any reason the trench width exceeds the maximum trench width defined in Paragraph D, "Trench Width", the CONTRACTOR shall provide additional bedding and backfill material as specified in Sections 2210.2.02 and 2210.2.03 to fill the additional width of trench, at no cost to the OWNER.

F. Trench Depth

(1) General. All trenches shall provide for a minimum of 36 inches of cover over the top of the pipe barrel to the top of the finished grade of the roadway unless otherwise authorized by the ENGINEER.

(2) Earth. The trench shall be excavated to the depth required, so as to provide a uniform and continuous bearing and support for the pipe barrel on solid and undisturbed ground at every point between joints, except that it will be permissible to disturb the finished trench bottom over a maximum length of 18 inches near the middle of each length of pipe by the withdrawal of pipe slings or other lifting tackle. When required, bell holes shall be provided. The finished trench bottom shall be accurately prepared by means of hand tools.

(3) Rock. Where excavation is made in rock or boulders, the trench shall be excavated 8 inches below the pipe barrel for pipe 12 inches in diameter or less, and 12 inches below the pipe barrel for 16 inch diameter pipe and larger. All loose material shall be removed from the trench bottom. After preparation of the trench bottom, a pipe bed shall be prepared using bedding material as specified in Section 2210.1.03.

(4) Unsuitable Bottom. When unsuitable material is found below subgrade, as

determined by the ENGINEER, CONTRACTOR shall remove the material to a depth determined by the ENGINEER, and provide compacted bedding material as specified in Section 2210.2.03 to backfill the trench in the area where unsuitable material has been excavated.

3.06 TRENCH BACKFILLING

A. Backfill to Centerline of Pipe Barrel

All trench excavation shall be backfilled immediately after pipe is laid. Compacted bedding material as described in Section 2210.2.03 shall be used to backfill the trench from the bottom of the pipe barrel to the centerline of the pipe barrel. The material shall be placed in uniform 6 inch loose layers and each layer compacted so as to eliminate the possibility of settlement, pipe misalignment or damage of joints.

B. Backfill to 12 inches over Pipe Barrel

From the centerline of the pipe barrel to an elevation of 12 inches over the top of the pipe barrel, Common Fill-Type A, as described in Section 2210.2.02, shall be used as backfill material. Care shall be taken to avoid injuring or moving the pipe.

C. Remaining Trench Backfill

From 12 inches above the pipe barrel to the surface, Common Fill-Type B, as described in Section 2210.2.02, shall be used as backfill material. No material shall be used for backfilling that contains frozen earth, rock, large stones, boulders, or other unsuitable material. The CONTRACTOR may use mechanical equipment to place the backfill. This shall be done in such a manner that the material does not free fall, but shall be so placed that it will flow onto the previously placed material. The CONTRACTOR shall consolidate the backfill in such a manner as will insure the minimum possible settlement and the least interference with traffic. No compacting of the backfill with mechanical equipment, such as wheeled vehicles, will be permitted unless sufficient cover is provided over the pipe to prevent damage to the pipe.

D. Surface Conditions

The trench surface shall be regularly attended to during the course of the Contract. The CONTRACTOR shall take prompt corrective measures to correct any settlement or wash-out. The trench surface shall be maintained in a safe condition and shall not interfere with natural drainage.

E. Deficiency of Backfill

Any material required for backfilling the trenches or for filling depressions caused by settlement or wash-out shall be supplied and placed by the CONTRACTOR at his expense.

3.07 TRENCH MAINTENANCE

The CONTRACTOR shall be responsible for the condition of the trenches for a period of one (1) year from the date of the final acceptance of the CONTRACTOR'S work, or as required by state, county or local authorities, and any materials required for filling depressions caused by settlement or washout shall be supplied and placed by the CONTRACTOR at his expense.

SECTION 2220

CASING INSTALLATION

PART 1: GENERAL

1.01 GENERAL REQUIREMENTS

The installation of casing pipe shall conform to these Specifications and any Federal, State or local Highway requirements or any Railroad requirements which may be more restrictive.

1.02 SUBMITTALS

Details of proposed jacking or boring pits shall be submitted to the ENGINEER showing locations and dimensions and details of sheeting and shoring required.

1.03 RELATED WORK

Excavation, backfilling and compaction for jacking and receiving pits and for open cut installation shall conform to the requirements set forth in Section 2210.

Installation of casing in open cut excavation shall conform to the requirements of Section 15110.

PART 2: PRODUCTS

2.01 MATERIAL

Casing pipe shall be bare wall steel pipe with a minimum yield strength of 35,000 psi with a minimum wall thickness as listed below:

	Highway Crossings	**Railroad Crossings**
Casing Outside Diameter Inches	Casing Wall Thickness Inches	Casing Wall Thickness Inches
8.625	0.250	0.250
10.750	0.250	0.250
12.750	0.250	0.250
14	0.250	0.281
16	0.250	0.281
18	0.250	0.312
20	0.312	0.344

	Highway Crossings	Railroad Crossings
Casing Outside Diameter Inches	Casing Wall Thickness Inches	Casing Wall Thickness Inches
24	0.312	0.406
30	0.375	0.469
36	0.500	0.532
42	0.500	0.563
48	0.625	0.625
54	0.625	0.688
60	0.625	0.750
66	0.625	0.813
72	0.750	0.875

Smooth wall steel plates with a nominal diameter of over 54 inches shall not be permitted.

The inside diameter of the casing pipe shall be at least two (2) inches greater than the outside diameter of the carrier pipe joints or couplings for carrier pipe less than six (6) inches in diameter; and at least four (4) inches greater than the outside diameter of the carrier pipe joints or couplings for carrier pipe six (6) inches and over in diameter.

PART 3: EXECUTION

3.01 ALIGNMENT AND GRADE

Pipelines shall be located, where practicable, to cross roadways or tracks at approximately right angles thereto but preferably at not less than 45 degrees and shall not be placed within culverts nor under bridges where there is likelihood of restricting the area required for the purposes for which the bridges or culverts were built, or of endangering the foundations. The casing pipe shall be installed on an even grade for its entire length and shall slope to one end.

3.02 WELDING

Steel casing sections shall be connected by welding. Welding shall conform to AWWA C206.

3.03 PROTECTION AT ENDS OF CASING

Casings shall have both ends blocked up in such a way as to prevent the entrance of foreign material, but allowing leakage to pass in the event of a carrier break.

3.04 DEPTH OF INSTALLATION

Casing pipe depth shall be in accordance with highway or railroad requirements. The minimum cover shall be three (3) feet.

3.05 CASING INSULATORS

The carrier pipe and casing shall be separated by an insulator. The insulator shall be timber skids as shown on Sketch 61-300-4 or steel casing insulators models C18/C12 with compatible runners (based on pipe diameter) manufactured by Pipeline Seal and Insulator, Inc. (PSI) of Houston, Texas. The insulator spacing shall be installed to support the weight of the pipe and contents. As a minimum, an insulator shall be placed a maximum of one foot from each side of a joint.

3.06 INSTALLATION

Refer to Sketch No. 61-300-4 at the end of this section for a typical casing installation detail.

Casing pipes shall be installed by one of the following methods:

A. Jacking

This method shall be in accordance with the current American Railway Engineering Association Specifications, Chapter 1, Part 4, "Jacking Culvert Pipe Through Fills", except that steel pipe shall be used with welded joints. This operation shall be conducted without hand mining ahead of the pipe and without the use of any type of boring, auguring or drilling equipment.

Bracing and backstops shall be so designed and jacks of sufficient rating used so that the jacking can progress without stoppage (except for adding lengths of pipe).

B. Drilling

This method employs the use of an oil field type rock roller bit or a plate bit made up of individual roller cutter units which is solidly welded to the pipe casing being installed and which is turned as it is advanced. The pipe is turned for its entire length from the drilling machine to the head to give the bit the necessary cutting action against the ground being drilled. A high density slurry (oil field drilling mud) is injected through a supply line to the head which acts as a cutter lubricant. This slurry is injected at the rear of the cutter units to prevent any jetting action ahead of the pipe. The drilling machine runs on a set of steel rails and is advanced (thus advancing the pipe) by a set of hydraulic jacks. The method is the same whether earth or rock is

being drilled. Methods of a similar nature shall be submitted to the ENGINEER for approval.

C. Boring

This method consists of pushing the pipe into the fill with a boring auger rotating within the pipe to remove the soil. When augers or similar devices are used for pipe emplacement, the front of the pipe shall be provided with mechanical arrangements or devices that will positively prevent the auger and cutting head from leading the pipe so that there will be no unsupported excavation ahead of the pipe. The auger and cutting head arrangement shall be removable from within the pipe in the event an obstruction is encountered. The over-cut by the cutting head shall not exceed the outside diameter of the pipe by more than one-half inch. The face of the cutting head shall be arranged to provide reasonable obstruction to the free flow of soft or poor material.

If an obstruction is encountered during installation to stop the forward action of the pipe, and it becomes evident that it is impossible to advance the pipe, operations will cease and the pipe shall be abandoned in place and filled completely with grout.

Bored or jacked installations shall have a bore hole essentially the same as the outside diameter of the pipe. If voids should develop or if the bored hole diameter is greater than the outside diameter of the pipe by more than 1 inch, grouting shall be employed to fill such voids.

SECTION 2230

STREAM CROSSING

PART 1: GENERAL

1.01 SCOPE

The CONTRACTOR shall furnish all labor, materials, and equipment necessary to install the stream crossings as shown on the plans and described herein.

It is the intent of this Section to install the stream crossings in such a manner as to protect the mains from erosion and to restore, as much as practicable, the stream banks and bottom to their original condition.

The main will be protected from erosion by concrete encasement around the pipe and by a sufficient depth of compacted backfill as shown on Sketch No. 61-300-5SK included at the end of this Section.

1.02 PROFILES AND TOPOGRAPHY

Contours, topography and profiles of the ground shown on the Drawings are believed to be reasonably correct, but are not guaranteed to be absolutely so and are presented only as an approximation.

The CONTRACTOR shall accept the site with conditions the same as existed at the time of bidding.

1.03 RELATED WOR

Excavation, backfilling and compaction procedures shall conform to Section 2210.

Concrete placement shall conform to Section 3300.

PART 2: PRODUCTS

2.01 MATERIALS

Excavation, fill and concrete materials shall be as specified in Related Work Sections.

PART 3: EXECUTION

3.01 STREAM BANK RESTORATION

The stream banks will be restored by backfilling the main trench with mechanically compacted backfill of earth approved by the ENGINEER or with rip rap approved by the ENGINEER to the original ground surface. The limits of compaction shall extend from the top of bank to top of bank on each side of the crossing as determined by the ENGINEER and as shown on the sketches.

Immediately following the completion of a stream crossing, straw bales or silt-fence shall be placed along the stream bank on each side within two (2) feet of the edge of water and of sufficient length to extend beyond the limits of the excavated trench width. Straw bales or silt-fence shall remain in place until after the stream banks have been fine graded, fertilized and seeded, and until such time as the seeding has sufficiently grown to protect the stream banks from erosion.

3.02 STREAM BOTTOM RESTORATION

The stream bottom trench will be backfilled with mechanically compacted earth or approved rip rap.

3.03 CONSTRUCTION PROCEDURE

The CONTRACTOR shall use either of the following methods to install the stream crossings.

A. Method 1. The CONTRACTOR shall construct an earth embankment from the stream bank to a point beyond the centerline of the stream. The slopes of the earth embankment shall be protected from erosion by covering them with 6 mil polyethylene sheeting. The sheeting shall extend from the stream bottom to an elevation two (2) feet above the water level. The main shall then be installed in a trench excavated through the embankment. The embankment and material and any excess trench excavation shall be removed to an off-site disposal area when the pipe is installed to a point beyond the centerline of the stream.

The same procedure shall be used to install the remainder of the stream crossing.

B. Method 2. The CONTRACTOR shall construct a cofferdam of sand bags or inflatable bags from the stream bank to a point beyond the centerline of the stream. The main shall then be installed in a trench within the cofferdam. Any excess trench excavation shall be removed to an off-site disposal area. The cofferdam shall then be removed when the pipe is installed to a point beyond the centerline of the stream.

The same procedure shall be used to install the remainder of the stream crossing.

At the sole discretion of the ENGINEER, alternate methods in lieu of those described in the above options may be permitted. The CONTRACTOR shall adequately describe any proposed alternate method and submit the same to the ENGINEER and all Federal, State and local authorities having jurisdiction of the stream for their review and approval.

SECTION 2540

EROSION AND SEDIMENTATION CONTROL

PART 1: GENERAL

1.01 SCOPE OF WORK

Work to be performed under this Section refers to temporary and permanent vegetation covers, mulching and baling at the construction site and all areas disturbed during construction, including borrow areas. In addition to the requirements of these Specifications, the CONTRACTOR will comply with all local Conservation District laws, rules and regulations and all other Federal, State and local requirements for erosion and sedimentation control.

1.02 STANDARDS

The CONTRACTOR shall comply with the highest erosion and sedimentation control standards, whether Conservation District, Federal, State or local. If the CONTRACTOR is in doubt as to the applicable standard, he shall notify the ENGINEER and comply with the ENGINEER'S directions.

PART 2: PRODUCTS

2.01 MATERIALS - GENERAL

All materials such as seeds, mulch and bales shall conform to the Specifications of the Conservation District and all other applicable Federal, State and local requirements.

PART 3: EXECUTION

3.01 GENERAL

Prior to construction, diversion ditches with catch basins and drains shall be constructed at the lowest area of the sites in question. All run-off water will be directed to these locations.

The settled water from the catch basins shall be drained to the natural local drains. The catch basins shall be cleaned regularly. The area shall be seeded with appropriate seed in the required amount per acre and mulched after final grading.

Permanent vegetation cover, mulching and baling shall be in accordance with the Conservation District specifications and all other applicable Federal, State and local requirements.

SECTION 2610

PAVING AND SURFACING

PART 1: GENERAL

1.01 DESCRIPTION

The CONTRACTOR shall provide all labor, tools, material and equipment to replace pavement, curbs, drives and walks that have been damaged or disturbed during the course of the work, all as specified herein, as directed by the ENGINEER, or as required by local, state or federal regulations. Placement will be at least equal to the type of pavement, curb, drive, or walk which existed before the work began and to the satisfaction of the ENGINEER.

During the entire period of construction of the project, all streets, curbs, drives and walks shall be kept in usable and safe condition for public use. Before final acceptance, and after trench settlement has been corrected to the satisfaction of the ENGINEER, pavement, curbs, drives and walks designated by the ENGINEER shall be replaced with the type of replacement specified herein.

The CONTRACTOR, where directed by the ENGINEER, shall furnish all labor, tools, material, and equipment necessary to spread and roll and/or tamp temporary bituminous pavement, complete, in place, and shall maintain the same all as specified or directed.

PART 2: PRODUCTS

2.01 MATERIALS

Materials of construction for paving, curbing, and surfacing shall be furnished in accordance with applicable Federal, State and local standards. If there are no applicable standards, the CONTRACTOR shall use materials which will produce a result at least equal to the type which existed before the work began and to the satisfaction of the ENGINEER.

PART 3: EXECUTION

3.01 INSTALLATION

Where necessary to disturb the existing pavement, the pavement will be saw or line cut, as required by local, State or Federal regulations, and the edges of the face of the old pavement or base shall be left vertical. Ragged edges shall be trimmed so as to provide a substantially straight line juncture between the old and new surfaces.

The pavement replacement shall be so placed as to conform in grade to the existing streets, drives or sidewalks.

The type of pavement replacement shall be as shown on the pavement replacement details in accordance with applicable Federal, State or local standards. If there are no such applicable standards, replacement will be made to the satisfaction of the ENGINEER.

Over trenches where temporary pavement is ordered, the CONTRACTOR shall roll and tamp in place a 2" thick minimum course of bituminous material. Over those trenches where temporary pavement has been placed to the surface of the adjacent pavement, such temporary pavement shall be removed prior to the placing of the permanent pavement and the cost shall be included in the contract price. The finished temporary surface shall be flush with the adjacent undisturbed surface and the CONTRACTOR shall maintain the temporary bituminous surface until the temporary surface is replaced.

Before the completion of each day's work, in traveled areas, the pipe trench shall be paved with 6" of stabilized base unless another method of pavement restoration is required by the authorized governing body. Final paving shall be placed over the stabilized base and overlapping each side of the trench a minimum of 6" and feathered to meet the existing pavement unless another method of pavement restoration is required by the authorized governing body. Final pavement shall not be placed within 20 days after the backfilling has been completed and shall be placed no longer than 45 days after the backfilling has been completed, unless otherwise ordered by the ENGINEER.

3.02 MAINTENANCE

Following the certification of completion by the ENGINEER, the CONTRACTOR shall maintain the surfaces of curbs and gutters, paved surfaces and sidewalks for a period of one year thereafter, or for such greater period as may be required by Federal, State or local authorities. All material and labor required for such maintenance shall be supplied by the CONTRACTOR, and the work shall be done in a manner satisfactory to the OWNER at no additional cost to the OWNER.

SECTION 2820

LAWN RESTORATION

PART 1: GENERAL

1.01 DESCRIPTION

The CONTRACTOR shall restore and replace shrubbery, fencing, sod or other disturbed surfaces or structures to conditions equal to that before the work began and to the satisfaction of the ENGINEER.

PART 2: PRODUCTS

2.01 TOPSOIL

Topsoil shall not contain more than 40 percent clay in that portion passing a No. 10 sieve and shall contain not less than 5 percent or more than 20 percent organic matter as determined by loss on ignition of samples oven-dried to constant weight at 212? Fahrenheit.

2.02 FERTILIZER

Fertilizer shall be lawn or turf grade 12-12-12.

2.03 SEED

A. Lawn Areas

All areas to be seeded which are lawn areas, whether residential, commercial or office areas, where lawns are, or have been regularly maintained, shall be seeded with the following mixture or a mixture as required by the Soil Conservation District or other governing authority. (Percentages are by weight.)

40 percent Kentucky Bluegrass (Poa pratensis)

40 percent Creeping Red Fescue (Festuca rubra)

20 percent Annual Ryegrass (Lolium multiflorum)

Where sod is required, the sod shall be green, freshly cut and of good quality with grass free from all noxious weeds. It shall contain all the dense root system of the grass and shall not be less than 1?" thick.

B. All other Areas

All other areas shall be seeded with the following mixture:

90 percent Perennial Ryegrass (Lolium perenne)

10 percent Alsike Clover (Trifolium hybridum)

2.04 MULCH

Mulch shall be straw reasonably free of weed seed and any foreign materials which may affect plant growth. Other materials may be used if approved by the ENGINEER.

2.05 ASPHALT EMULSION

Emulsion shall be non-toxic to plants and shall conform to AASHTO M140 or AASHTO M208.

PART 3: EXECUTION

3.01 PREPARATION OF SEED BED

A. Topsoil Areas

If suitable topsoil is available as part of the excavated material it shall be removed, stored, and used to backfill the top 4 inches of the excavation. All grass, weeds, roots, sticks, stones, and other debris are to be removed and the topsoil carefully brought to the finished grade by raking.

B. Non-Topsoil Areas

In lawn areas, as described in Part 2.03, Paragraph A of this Section, where there is a deficiency of suitable topsoil, the CONTRACTOR shall furnish 4 inches of topsoil to be used as a seed bed.

In areas not considered lawn areas, and where approved by the ENGINEER, the trench backfill may be used as a seed bed. After the backfill has been given a reasonable time to settle, it shall be graded off to the finished grade and harrowed to a depth of 3 inches. All grass, weeds, roots, sticks, stones and other debris are to be removed and the soil carefully brought to the finished grade by raking.

3.02 FERTILIZING

Fertilizer shall be uniformly applied to all areas to be seeded at the rate of 1 pound per 100 square feet in topsoil or 2 pounds per 100 square feet in non-topsoil. The fertilizer shall be thoroughly disked, harrowed or raked into the soil to a depth of not less than 2 inches. Immediately before sowing the seed, the CONTRACTOR shall rework the surface until it is a fine, pulverized, smooth seed bed, varying not more than 1 inch in 10 feet.

3.03 SEEDING

Immediately after the preparation and fertilization of the seed bed, the seed shall be thoroughly mixed and then evenly sown over the prepared areas at the rate of 3 pounds per 1,000 square feet. Seed shall be sown dry or hydraulically. After sowing, the area shall be raked, dragged, or otherwise treated to cover the seed to a depth of approximately 1/4".

Areas with slopes greater than 10% shall be sodded.

3.04 MULCHING

Within 48 hours after any given area is seeded, mulching material shall be evenly placed over all seeded areas at the rate of approximately 2 tons per acre, when seeding is performed between the dates of March 15 and October 15 of the same year, and at the approximate rate of 3 tons per acre when seeding is performed between the dates of October 15 and March 15 of the succeeding year.

3.05 EMULSION

Mulching materials shall be kept in place with asphalt emulsion applied at a minimum rate of 60 gallons per ton of mulch or by methods as are approved or may be otherwise required to prevent displacement of material. Mulching which is displaced shall be replaced at once but only after the seeding or other work which preceded the mulching and which work was damaged as a result of displacement of mulching material has been acceptably repaired.

3.06 MAINTENANCE

All seeded and sodded areas shall be carefully maintained, tended and watered by the CONTRACTOR as necessary to secure a good turf. Settled areas shall be filled, graded and reseeded or resodded. The CONTRACTOR shall be responsible for the condition of the seeded and sodded areas for a period of one year from the date of final completion.

SECTION 3300

CAST-IN-PLACE CONCRETE

PART 1: GENERAL

1.01 SCOPE OF WORK

Concrete for thrust blocking, manhole bases, pipe encasement, curbs, sidewalks and pavement shall be provided in accordance with this Section.

PART 2: PRODUCTS

2.01 MATERIALS

A. Portland Cement shall be Type I or Type III and conform to "Specification for Portland Cement" ASTM C-150.

B. Air-Entraining Agent for approved manufacture shall be added in accordance with manufacturer's directions to the normal Portland cement to entrain 4 1/2 percent air ± 1 percent with all other ingredients and strength as specified. Air-entraining admixtures shall conform to "Specifications for Air-Entraining Admixtures for Concrete" ASTM C-260.

C. Concrete Aggregates shall conform to "Specifications for Concrete Aggregates" ASTM C-33. Coarse aggregates shall be a maximum of 1 1/2 inches in size in footings and plain concrete. Pea gravel shall be used for sections 3 inches or less in thickness.

D. Water used in mixing concrete shall be clean and free from injurious amounts of oils, acids, alkalies, organic materials or other deleterious substances. In effect, the water used shall be potable water.

E. Reinforcing Bars shall be billet steel grade (60,000 psi minimum yield) and conforming to the requirements of ASTM A-615, Grade 60. Reinforcing bars shall be new stock, free from rust, scale or other coating tending to destroy or reduce bond.

F. Welded Wire Mesh shall conform to "Specifications for Welded Steel Wire Fabric for Concrete Reinforcements" ASTM A-185.

G. Premolded Expansion Joint Material shall be provided where shown on the Drawings or directed by the WATER COMPANY. This non-extruding compressible joint material shall conform with the requirements of "Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction", ASTM D-1751.

2.02 CONCRETE MIXES

Ready-mixed concrete shall conform to "Specifications for Ready-Mixed Concrete", ASTM C-94.

All concrete mixes shall be capable of producing a dense durable concrete. The compressive strength of the concrete shall be able to attain the following minimum strengths within 28 days:

2,500 psi - sidewalks, curbs and pipe encasement

3,000 psi - thrust blocking, manhole bases and road pavement

Water/cement ratio for the concrete shall not exceed a maximum as shown in Table 4.4 of the ACI Standard 318 latest edition, Building Code Requirements For Reinforced Concrete, when strength data from field experience or trial mixtures are not available. A workable concrete with minimum slump of 3 inches and a maximum slump of 5 inches shall be produced not exceeding the water/ cement ratio.

PART 3: EXECUTION

3.01 FORMWORK

All forms shall be built mortartight and of sufficient rigidity to prevent distortion due to the pressure of the concrete and other loads incident to the construction operations. Forms shall be constructed and maintained so as to prevent warping and the opening of joints.

The forms shall be substantial and unyielding and shall be so designed that the finished concrete will conform to the proper dimensions and contours. The design of the forms shall take into account the effect of vibration of concrete as it is placed.

3.02 PLACING REINFORCING STEEL

All steel reinforcement shall be accurately placed in the positions shown on the plans and firmly held during the placing and setting of concrete. When placed in the work, it shall be free from dirt, detrimental rust, loose scale, paint, oil or other foreign material. Bars shall be tied at all intersections except where spacing is less than one foot in each direction when alternate intersections shall be tied.

Distances from the forms shall be maintained by means of stays, blocks, ties, hangers or other approved supports. Continuous high chairs will not be permitted.

All reinforcement shall be furnished in full lengths indicated on the plans. Splicing of bars, except where shown on the plans, will not be permitted without the approval of the

ENGINEER. Splices shall be staggered as far as possible. Unless otherwise shown on the plans, bars shall be lapped 36 diameters to make the splice.

Welded wire mesh shall be lapped at least 1 1/2 meshes plus end extension of wires but not less than twelve (12) inches in structural slabs. Welded wire mesh shall be lapped at least 1/2 mesh plus end extension of wires but not less than six (6) inches in slabs on the ground.

3.03 CONVEYING AND PLACING CONCRETE

Concrete shall be conveyed from mixer to the forms as rapidly as practical by approved methods which will prevent segregation and loss of ingredients.

All concrete shall be placed in the dry. Formwork shall be cleaned of dirt and construction debris, water drained and snow and ice removed. After the forms have been inspected, the concrete shall be deposited in approximately horizontal layers to avoid flowing along the forms. All concrete shall be deposited continuously or in layers of a thickness such that no concrete will be deposited on concrete which has hardened sufficiently to cause the formation of seams and planes of weakness within the sections: a monolithic structure, the component parts of which are securely bonded together, shall be produced. During placing, the concrete shall be compacted by suitable means and shall be worked around the reinforcement and embedded fixtures and into corners and angles of forms, care being taken to avoid overworking which may result in segregation.

Concrete shall not be dropped into forms from a height greater than 5 feet. In depositing from a greater height, a spout shall be used, or the forms shall be provided with openings to limit the height of drop. When special methods of placing are used, the approval of the ENGINEER shall be obtained.

Concrete shall be directed through chutes to prevent it from striking reinforcement or sides of the form above the level of placement. Avoid segregation and coating of the surfaces with paste which may dry before concrete reaches its level.

If pumping of concrete is chosen by the CONTRACTOR as a method of placing concrete, the CONTRACTOR shall submit a concrete mix design to the ENGINEER for approval prior to placing any concrete by pumping.

3.04 THRUST BLOCKING

See the Specifications Special Conditions for the number and sizes of thrust blocking.

Blocking shall be constructed back against the vertical face of undisturbed earth or sheeting left in place. The concrete shall be prevented from enclosing more than half the circumference of the pipe and shall be kept away from joints or bolts in the piping.

Thrust blocking for hydrants shall be placed to allow the hydrant to drain.

3.05 PLACING CONCRETE IN COLD WEATHER

No concrete shall be placed when the atmospheric temperature is below 35°F. without written consent of the ENGINEER. When directed by the ENGINEER, the CONTRACTOR shall enclose the structure in such a way that the concrete and air within the enclosure can be kept above 60°F. for a period of seven (7) days after placing the concrete.

If high early strength cement is used, these periods may be reduced, as directed by the ENGINEER.

The CONTRACTOR shall supply such heating apparatus as stoves, salamanders or steam equipment and the necessary fuel. When dry heat is used, means of maintaining atmospheric moisture shall be provided. All aggregates and mixing water shall be heated to a temperature of at least 70° but not more than 60° at the time of placing in the forms. In case of extremely low temperatures, the ENGINEER may, at their discretion, raise the minimum limiting temperatures for water, aggregates and mixed concrete.

SECTION 3450

PRECAST CONCRETE MANHOLE

PART 1: GENERAL

1.01 SCOPE

The CONTRACTOR shall furnish all labor, materials, tools and equipment necessary and shall do all work required to install manholes as indicated on the Drawings and as herein specified.

1.02 SUBMITTALS

The CONTRACTOR shall submit shop drawings or manufacturer's literature to the ENGINEER for approval.

PART 2: PRODUCTS

2.01 MANHOLE SECTIONS

Manhole riser sections shall be designed, manufactured, tested, finished and marked in accordance with the Drawings and ASTM C478, "Precast Reinforced Concrete Manhole Sections".

2.02 BRICK

Brick used to bring manhole to grade shall comply with ASTM C62, Grade SW.

2.03 LADDER RUNGS

Aluminum ladder rungs shall be provided in accordance with OSHA regulations. Rungs shall have a minimum diameter of 1-inch and 10-inch clear tread width and be of the drop front design. Rungs shall be tar coated where embedded in concrete.

2.04 FRAME AND COVER

Manhole frame with vented lid shall be Neenah Foundry Company's R-1752 Series Heavy Duty.

PART 3: EXECUTION

3.01 HANDLING

All precast manhole components shall be lifted and moved by use of suitable lifting slings and plugs that will not damage the precast manhole lip.

All damage to precast sections shall be thoroughly repaired in the presence of the ENGINEER. Repair and patching of minor breaks shall be done by chipping and scarifying the defective area before application of grout. Sufficient time shall be allowed for curing before the precast sections are put together. Concrete cast-in-place bases shall be specially formed and keyed to accommodate the bottom precast section.

3.02 INSTALLATION

Manhole bases shall rest upon and be uniformly supported by a 6-inch mat of compacted crushed stone or gravel placed over a base of sound, level, undisturbed earth.

Before placing concrete base, the downstream and upstream pipes shall be set to proper grade so the pipe ends will be flush with the inside of the manhole.

Pipes entering precast sections of manholes shall be set securely in the precast opening and grouted at the correct line and grade. There shall be at least a one-half inch clearance between the outside of the pipe and the manhole opening to insure proper grouting. The pipe and base shall be thoroughly cleaned before the grout is applied.

The top of all precast manholes may be brought to proper grade for receiving manhole frames by using not more than three courses of brick.

The masonry walls shall be parged on the inside and outside with a one-half inch coat of Portland cement mortar.

SECTION 15000

PIPING - GENERAL PROVISIONS

PART 1: GENERAL

1.01 DRAWINGS

Dimensions shown on Contract Drawings are approximate only. CONTRACTOR shall verify all piping geometry in the field and shall be responsible for insuring proper alignment and fit of all piping consistent with the intent of the Contract Drawings. Field layout drawings shall be submitted as required for approval.

1.02 RELATED WORK

See Specification Section 1600.3.03-Responsibility for Material and Equipment.

PART 2: PRODUCTS

2.01 CONTRACTOR'S RESPONSIBILITY FOR MATERIAL

The CONTRACTOR shall carefully examine all material for defects. Material which is known, or thought, to be defective shall not be installed.

The ENGINEER reserves the right to inspect all material and to reject all defective material shipped to the job site or stored on the site. Failure of the ENGINEER to detect damaged material shall not relieve the CONTRACTOR from his total responsibility for the completed work if it leaks or breaks after installation. Lay all defective material aside for final inspection by the ENGINEER to determine if corrective repairs may be made, or if the material is to be rejected. The ENGINEER shall determine the extent of the repairs.

CONTRACTOR to classify defective pipe prior to ENGINEER's inspection as follows:

1. Damage to interior and/or exterior paint seal coats.
2. Damage to interior cement-mortar lining.
3. Insufficient cement-mortar lining thickness.
4. Poor quality interior paint seal coat.
5. Pipe out of round.
6. Damaged pipe barrel area to a point where pipe class thickness is reduced.
7. Denting or gouges in plain end of pipe.

The CONTRACTOR shall be responsible for all material, equipment, fixtures and devices furnished and such materials, equipment, fixtures and devices shall comply with the

requirements and standards of all Federal, State and local laws, ordinances, codes, rules and regulations governing safety and health.

The CONTRACTOR shall be solely responsible for the safe storage of all material furnished to or by him until it has been incorporated in the completed project and accepted by the ENGINEER.

Pipe, fittings, valves, hydrants and accessories shall be loaded and unloaded by lifting with hoists or skidding so as to avoid shock or damage. Under no circumstances shall such materials be dropped. Pipe handled on skidways shall not be skidded or rolled against other pipe. Handling of this material is to be in accordance with AWWA C600-87.

Keep fittings and valves drained and stored before installation in a manner protecting them from damage due to freezing of trapped water in accordance with Section 01600.

PART 3: EXECUTION

3.01 INSTALLATION - GENERAL REQUIREMENTS

All pipe shall be laid and maintained to the required lines and depths. Fittings, valves and hydrants shall be at the required locations with joints centered, spigots home and all valve and hydrant stems plumb and otherwise in strict accordance with the Specifications.

All buried steel lugs, rods, brackets and flanged joint bolts and nuts shall be given one (1) coat of Koppers #50 coal tar coating prior to backfilling and polyethylene encased if the specifications require polyethylene encasement of pipe.

No deviation shall be made from the required alignment, depth or grade except with the written consent of the ENGINEER.

All pipe shall be laid to the depth specified. The depth shall be measured from the final surface grade to the top of the pipe barrel. The minimum pipe cover shall be as shown on the Drawings or as specified in the Specifications Special Conditions.

Do not lay pipe in a wet trench, on subgrade containing frost, and when trench conditions are unsuitable for such work. If all efforts fail to obtain a stable dry trench bottom and the ENGINEER determines that the trench bottom is unsuitable for trench foundation, he will order in writing the kind of stabilization to be constructed.

Thoroughly clean the pipes and fittings before they are installed and this material shall be kept clean until the acceptance of the completed work. Lay pipe with the bell ends facing in the direction of laying, unless otherwise shown on the Drawings, or directed by the ENGINEER. Exercise care to insure that each length abuts against the next in such manner that no shoulder or unevenness of any kind occurs in the pipe line.

No wedging or blocking is permitted in laying pipe unless by written order of ENGINEER.

Before joints are made, bed each section of pipe the full length of the barrel with recesses excavated so pipe invert forms continuous grade with invert of pipe previously laid. Do not bring succeeding pipe into position until the preceding length is embedded and securely in place.

Dig bell holes sufficiently large to permit proper joint making and to insure pipe is firmly bedded full length of its barrel.

Walking or working on completed pipeline, except as necessary in tamping and backfilling, is not permitted until trench is backfilled one-foot deep over top of pipes.

Take up and relay pipe that is out of alignment or grade, or pipe having disturbed joints after laying.

Take up and replace with new, such in-place pipe sections found to be defective. Replacement work at CONTRACTOR's expense.

Take necessary precautions to prevent the floating of the pipeline by the accumulation of water in the trench, or the collapse of the pipeline from any cause. Should floating or collapse occur, restoration will be at the CONTRACTOR's expense.

Bedding materials and concrete work for the pipe bedding and thrust restraint shall be as specified previously in Division 2 and 3 respectively.

Take every precaution to prevent foreign material from entering the pipe while it is being placed. During laying operations, do not place debris, tools, clothing, or other materials in the pipe.

Close all openings in the pipeline with watertight plugs when pipe laying is stopped at the close of the day's work or for other reasons, such as rest breaks or meal periods.

Place enough backfill over the center sections of the pipe to prevent floating.

Carry out the cutting of pipe only with equipment specifically designed for that purpose such as an abrasive wheel, rotary wheel cutter, a guillotine pipe saw or a milling wheel saw. The use of chisels or hand saws will not be permitted. Cut ends and rough edges should be ground smooth and for push-on connections, the cut end should be beveled slightly.

In distributing material at the site of the Work, each piece shall be unloaded opposite or near the place where it is to be laid in the trench.

If the pipe is to be strung out, it shall be done so in a straight line or in a line conforming

to the curvature of the street. Each length of pipe shall be adequately blocked to prevent movement. Stockpiled pipe shall be adequately blocked to prevent movement. No pipe, material, or any other object shall be placed on private property, obstruct walkways or driveways, or in any manner interfere with the normal flow of traffic.

In the case of prestressed concrete, gray and ductile iron pipe, special care shall be exercised, during handling temporary storage or construction to avoid damage to the bells, spigots or flanged ends. If damaged pipe cannot be repaired to the ENGINEER's satisfaction, it shall be replaced at the CONTRACTOR's expense.

The CONTRACTOR shall remove all existing pipe, fittings, valves, pipe supports and blocking and all other items necessary to provide space for making connections to existing pipe and installing all piping which is to be done under this Contract.

The CONTRACTOR shall be responsible for maintaining the minimum required distance between the water line and other utility lines in strict accordance with all Federal, State and local requirements and all right-of-way limitations.

If polyethylene encasement is required by the Drawing or Specification Special Conditions, see Section 15130 or 15131 as applicable, for material and installation requirements.

Maximum allowable deflection at the joints for push-on joint pipe shall be as follows providing manufacturer's recommendations are not more stringent:

Size of Pipe	Deflection Angle	Maximum Deflection (18-ft. Length)	(20-ft. Length)
Thru 12"	2 ½°	9 ½"	10 ½"
14"-36"	1 ½°	5 ½"	6"
42"-48"	1°	3 ¼"	4"

In case the curve is too sharp for the allowable deflection, short lengths of pipe may be used upon approval of the ENGINEER and at no additional cost to the OWNER.

When shown on the Drawings or required by the Specification Special Conditions the CONTRACTOR shall furnish air relief valve assemblies in accordance with Sketch 61-300-8 which is attached to this Section.

Particular care shall be exercised to that no high points are established where air can accumulate. In the event that unforeseen field conditions necessitate a change in the pipe profile and, in the opinion of the ENGINEER, the resulting change requires the installation of an air release valve and manhole, install the same as extra Work to the Contract. If the CONTRACTOR requests a change in the pipe profile solely for ease of construction, and the requested change requires the installation of an air release valve and manhole as determined by the ENGINEER,

then the cost of furnishing and installing the air release valve and manhole will be at the expense of the CONTRACTOR. See Sketch 61-300-8 and 61-300-8A included at the end of this Section for details of an air release valve assembly.

3.02 CONSTRUCTION METHODS TO AVOID CONTAMINATION

Heavy particulates generally contain bacteria and prevent even very high chlorine concentrations from contacting and killing such organisms. It is essential that the procedures of this section be observed to assure that a water main and its appurtenances are thoroughly clean for the final disinfection by chlorination.

Precautions shall be taken to protect the interiors of pipes, fittings, and valves against contamination. Pipe delivered for construction shall be strung so as to minimize entrance of foreign material. All openings in the pipeline shall be closed with watertight plugs when pipe laying is stopped at the close of the day's work or for other reasons, such as rest breaks or meal periods. Rodent-proof plugs may be used where it is determined that watertight plugs are not practical and where thorough cleaning will be performed.

Delay in placement of delivered pipe invites contamination. The more closely the rate of delivery is correlated to the rate of pipe laying, the less likelihood of contamination.

Joints of all pipe in the trench shall be completed before work is stopped. If water accumulates in the trench, the plugs shall remain in place until the trench is dry.

Yarning or packing material shall consist of molded or tubular rubber rings, or rope of treated paper or other approved materials. Materials such as jute, asbestos or hemp shall not be used. Packing material shall be handled in a manner that avoids contamination.

No contaminated material or any material capable of supporting prolific growth of microorganisms shall be used for sealing joints. Sealing material or gaskets shall be handled in a manner that avoids contamination. The lubricant used in the installation of sealing gaskets shall be suitable for use in potable water. It shall be delivered to the job in closed containers and shall be kept clean.

If dirt enters the pipe, and in the opinion of the ENGINEER the dirt will not be removed by the flushing operation, the interior of the pipe shall be cleaned by mechanical means and then shall be swabbed with a 1% hypochlorite disinfecting solution. Cleaning with the use of a pig, swab or "go-devil" should be undertaken only when the ENGINEER has specified such and has determined that such operation will not force mud or debris into pipe joint spaces.

It if it not possible to keep the pipe and fittings dry during installation, every effort shall be made to assure that any of the water that may enter the pipe joint spaces contains an available chlorine concentration of approximately 25 mg/L. This may be accomplished by adding calcium hypochlorite granules or tablets to each length of pipe before it is lowered into a wet trench, or by

treating the trench water with hypochlorite tablets.

If the main is flooded during construction, it shall be cleared of the flood water by draining and flushing with potable water until the main is clean. The section exposed to the flood water shall then be filled with a chlorinated potable water that, at the end of a 24 hour holding period, will have a free chlorine residual of not less than 25 mg/L. The chlorinated water may then be drained or flushed from the main. After construction is completed, the main shall be disinfected using the continuous feed or slug method.

3.03 VALVE INSTALLATION

Prior to installation, inspect valves for direction of opening, freedom of operation, tightness of pressure containing bolting, cleanliness of valve ports and especially seating surfaces, handling damage and cracks. Correct defective valves or hold for inspection by the ENGINEER.

Set and join to the pipe in the manner specified in Section 3.01. Provide valves 12-inch and larger with special support, such as crushed stone or concrete pads, so that the pipe will not be required to support the weight of the valve. Set truly vertical.

Provide all valves with a valve box. Set the top of the valve box neatly to the grade of the surface of the existing ground, unless directed otherwise by the ENGINEER. Do not transfer shock or stress to the valve, and center and plumb the box over the wrench nut of the valve. Do not use valves to bring misaligned pipe into alignment during installation. Support pipe in such manner as to prevent stress on the valve. See Sketch 61-300-6 at the end of this Section for a typical valve box installation detail.

When authorized by the OWNER provide valve marking posts at locations designated by the ENGINEER all in accordance with Sketch 61-300-14 included at the end of this section. Payment will be made per post in accordance with supplemental unit price schedule.

3.04 THRUST RESTRAINT

Provide all plugs, caps, tees, and bends (both horizontal and vertical) with concrete reaction backings and/or restrained joint pipe as detailed on the Drawings, or specified in the Specification Special Conditions.

Place concrete reaction backing between undisturbed solid ground and the fitting to be anchored. Concrete reaction backing to be installed in accordance with Specification Section 3300. The backing unless otherwise shown or directed, shall be located as to contain the resultant thrust force and so that the pipe and fitting joints will be accessible for repair.

Temporary thrust restraint at temporary caps or plugs shall be the responsibility of the CONTRACTOR. Submit details of temporary restraint to the ENGINEER for approval.

At connections with existing water mains where there is a limit on the time the water main may be removed from service, use metal harnesses of anchor clamps, tie rods and straps; mechanical joints utilizing set-screw retainer glands; or restrained push-on joints. Metal harnessing may not be used by the CONTRACTOR in lieu of concrete backing without the approval of the ENGINEER. Submit details of the proposed installation to the ENGINEER for approval. For pipe up to 12 inches in size, use a minimum of two 3/4-inch tie rods. For pipe 16-inch in size, four 3/4-inch tie rods are required and for 20-24 inches pipe, six 3/4-inch tie rods are required. For larger pipe sizes, consult the ENGINEER. Install retainer glands in accordance with the instructions of the particular manufacturer furnishing the glands.

Material for metal harnessing and tie-rods shall be ASTM A-36 or A-307 as a minimum requirement.

Protection of Metal Harnessing: Protect ties rods, clamps and other metal components against corrosion by hand application of a bituminous coating or by encasement of the entire assembly with 8-mil thick, loose polyethylene film in accordance with AWWA C105. Grease all tie rods prior to installing polyethylene.

3.05 TYPICAL INSTALLATION DETAILS

The below listed Sketch numbers are attached to this Specification Section and are referenced throughout the Specifications.

Sketch No.	Description	Issue Date
61-300-6	Typical Valve Box Installation	12/90
61-300-7	Typical Fire Hydrant Assembly	12/90
61-300-8	Typical Air Release Valve-Deep Bury	12/90
61-300-8A	Typical Air Blow-Off Detail-Shallow Bury	12/90
61-300-9	Typical Air Blow-Off Detail	12/90
61-300-10	Typical Service Line Detail	12/90
61-300-11	Optional Arrangement, For 1-1/2" and 2" Service Lines	12/90
61-300-13	Steel Pipe Bollard Detail	12/90
61-300-14	Valve Marking Post Detail	12/90

SECTION 15020

DISINFECTING PIPELINES

PART 1: GENERAL

1.01 SCOPE OF WORK

The CONTRACTOR shall flush and disinfect all pipelines installed under this Contract.

1.02 WORK BY OWNER

The OWNER will furnish water for testing, flushing and disinfecting pipelines. The OWNER will also perform bacteriological testing.

1.03 PROTECTION

Due to the toxicity of chlorine fumes, men performing work under this Section shall be equipped with all safety equipment and shall be attended by other personnel who are in the vicinity where work is to be performed.

The forward of AWWA Standards B300-87 and B301-87 contain information and additional reference material regarding the safe handling of hypochlorites and liquid chlorine. The CONTRACTOR shall familiarize himself with this information prior to performing any disinfection work.

1.04 RELATED WORK

Pipeline installation precautions to avoid contamination are described in Specification Section 15000.

PART 2: PRODUCTS

2.01 MATERIALS AND EQUIPMENT

CONTRACTOR shall furnish chlorine liquid and injection equipment and/or calcium hypochlorite (HTH) as needed to complete the disinfection of all pipelines.

Liquid chlorine contains 100% available chlorine and is packaged in steel containers usually of 100 lb, 150 lb, or 1 ton net chlorine weight. Liquid chlorine is to be furnished in accordance with AWWA B301-87.

Calcium hypochlorite is available in granular form or in approximately 5-g tablets, and

contains approximately 65% available chlorine by weight. The material should be stored in a cool, dry, and dark environment to minimize its deterioration.

Calcium hypochlorite is to be furnished in accordance with AWWA B300-87.

PART 3: EXECUTION

3.01 PREPARATION

With the exception of the tablet method, all pipelines shall be pressure and leak tested, flushed, and cleaned of debris and dirt prior to application of the disinfectant. The tablet method requires the pipeline to be kept completely clean and dry during construction.

3.02 APPLICATION OF DISINFECTANT

Methods to be used for disinfection are those detailed in ANSI/AWWA C-651-86 (water mains).

3.03 WATER MAINS

Three (3) methods of chlorination are described below. Information in the forward of AWWA Standard C651 will be helpful in determining the best method to be used.

A. Tablet Method

The tablet method consists of placing calcium hypochlorite granules and tablets in the water main as it is being installed and then filling the main with potable water when installation is completed.

NOTE: This method may be used only if the pipes and appurtenances are kept clean and dry during construction.

Placing of calcium hypochlorite granules. During construction, calcium hypochlorite granules shall be placed at the upstream end of the first section of pipe, at the upstream end of each branch main, and at 500 foot intervals. The quantity of granules shall be as shown in Table 1.

WARNING: This procedure must not be used on solvent welded plastic or on screwed joint steel pipe because of the danger of fire or explosion from the reaction of the joint compounds with the calcium hypochlorite.

Placing of calcium hypochlorite tablets. During construction, 5-g calcium hypochlorite tablets shall be placed in each section of pipe and also one such tablet shall be placed in each hydrant, hydrant branch and other appurtenances. The number of 5-g

tablets required for each pipe section shall be 0.0012d L rounded to the next higher integer, where D is the inside pipe diameter in inches and L is the length of the pipe section in feet. Table 2 shows the number of tablets required for commonly used sizes of pipe. They shall be attached by a food grade adhesive such as *Permatex Form-A Gasket No. 2 and *Permatex clear RTV Silicone adhesive or equal. There shall be no adhesive on the tablet except on the broad side attached to the surface of the pipe. Attach all the tablets inside and at the top of the main, with approximately equal numbers of tablets at each end of a given pipe length. If the tablets are attached before the pipe section is placed in the trench, their position shall be marked on the section so it can be readily determined that the pipe is installed with the tablets at the top.

Filling and contact. When installation has been completed, the main shall be filled with water at a rate such that water within the main will flow at a velocity no greater than 1 fps. Precautions shall be taken to assure that air pockets are eliminated. This water shall remain in the pipe for at least 24 hours. If the water temperature is less than 5?C (41?F), the water shall remain in the pipe for at least 48 hours. Valves shall be positioned so that the strong chlorine solution in the main being treated will not flow into water mains in active service.

TABLE 1

Ounces of Calcium Hypochlorite Granules to be placed at beginning of Main and at each 500-foot Intervals

Pipe Diameter	Calcium Hypochlorite Granules
4	0.5
6	1.0
8	2.0
12	4.0
16 and larger	8.0

TABLE 2

Number of 5-g Hypochlorite Tablets
Required for Dose of 25 mg/L[a]

Pipe Diameter Inches	Length of Pipe Section, ft. 13 or less	18	20	30	40
4	1	1	1	1	1
6	1	1	1	2	2
8	1	2	2	3	4
10	2	3	3	4	5
12	3	4	4	6	7
16	4	6	7	10	13

* A product of the Permatex Co., Brooklyn, New York and Kansas City, Kansas.

[a] Based on 3.25g available chlorine per tablet, any portion of tablet rounded to next higher number.

B. Continuous Feed Method

The continuous feed method consists of placing calcium hypochlorite granules in the main during construction (optional), completely filling the main to remove all air pockets, flushing the completed main to remove particulates, and filling the main with potable water chlorinated so that after a 24-hour holding period in the main there will be a free chlorine residual of not less than 10 mg/L.

Placing calcium hypochlorite granules. The purpose of this procedure is to provide a strong chlorine concentration in the first flow of flushing water that flows down the main. This procedure is recommended particularly where the type of pipe is such that this first flow of water will flow into annular spaces at pipe joints.

Preliminary flushing. Prior to being chlorinated, the main shall be filled to eliminate air pockets and shall be flushed to remove particulates. The flushing velocity in the main shall be not less than 2.5 fps unless the ENGINEER determines that conditions do not permit the required flow to be discharged to waste. Table 3 shows the rates of flow required to produce a velocity of 2.5 fps in pipes of various sizes.

NOTE: Flushing is no substitute for preventive measures during construction. Certain contaminants such as caked deposits resist flushing at any feasible velocity.

TABLE 3

Required Flow and Openings to Flush Pipelines
(40 psi Residual Pressure in Water Main)

Pipe Diameter In.	Flow Required To Produce Velocity in Main (gpm)	Size of Tap on Main[b] In.	Hydrant Outlets	
			Number	Size
4	100	15/16	1	2 ½
6	220	1 3/8	1	2 ½
8	390	1 7/8	1	2 ½
10	610	2 5/16	1	2 ½
12	880	2 13/16	1	2 ½
16	1565	3 5/8	2	2 ½

[a] With a 40 psi pressure in the main with the hydrant flowing to atmosphere, a 2 1/2-inch hydrant outlet will discharge approximately 1000 gpm and a 4 1/2-inch hydrant nozzle will discharge approximately 2500 gpm.

[b] Size of tap on main, with no significant length of discharge piping.

In mains of 24-inches or larger diameter, an acceptable alternative to flushing is to broom-sweep the main, carefully removing all sweepings prior to chlorinating the main.

Chlorinating the Main.

(1) Water from the existing distribution system or other approved source of supply shall be made to flow at a constant, measured rate into the newly laid water main. In the absence of a meter, the rate may be approximated by means such as placing a pitot gauge in the discharge or measuring the time to fill a container of known volume.

(2) At a point not more than 10 feet downstream from the beginning of the new main, water entering the new main shall receive a dose of chlorine fed at a constant rate such that the water will have not less than 25 mg/L free chlorine. To assure that this concentration is provided, measure the chlorine concentration at regular intervals in accordance with the procedures described in the current edition of the AWWA Standard Methods.

Table 4 gives the amount of chlorine required for each 100 feet of pipe of various diameters. Solutions of 1 percent chlorine may be prepared with calcium hypochlorite. The solution requires 1 lb. of calcium hypochlorite in 8 gallons of water.

TABLE 4

Chlorine Required to Produce 25mg/L
Concentration in 100 feet of Pipe by Diameter

Pipe Diameter in.	100 Percent Chlorine lb.	1 Percent Chlorine Solutions gal.
4	.013	.16
6	.030	.36
8	.054	.65
10	.085	1.02
12	.120	1.44
16	.217	2.60

(3) During the application of chlorine, valves shall be positioned so that the strong chlorine solution in the main being treated will not flow into water mains in active service. Chlorine application shall not cease until the entire main is filled with heavily chlorinated water. The chlorinated water shall be retained in the main for at least 24 hours, during which time all valves and hydrants in the section treated shall be operated in order to disinfect the appurtenances. At the end of this 24-hour period, the treated water in all portions of the main shall have a residual of not less than 10 mg/L free chlorine.

(4) The preferred equipment for applying liquid chlorine is a solution feed vacuum-operated chlorinator to mix the chlorine gas in solution water, in combination with a booster pump for injecting the chlorine gas solution water into the main to be disinfected. It is recommended that direct feed chlorinators not be used. (A direct feed chlorinator is one which operates solely from the pressure in the chlorine cylinder.) Hypochlorite solution may be applied to the water main with a gasoline or electrically powered chemical feed pump designed for feeding chlorine solutions. Feed lines shall be of such material and strength as to withstand safely the corrosion caused by the concentrated chlorine solutions and the maximum pressures that may be created by the pumps. All connections shall be checked for tightness before the solution is applied to the main.

C. Slug Method

The slug method consists of placing calcium hypochlorite granules in the main during construction, completely filling the main to eliminate all air pockets, flushing the main to remove particulates, and slowly flowing through the main a slug of water dosed with chlorine to a concentration of 100 mg/L in order that all parts of the main and its appurtenances will be exposed to the highly chlorinated water for a period of not less than 3 hours.

The flushing is to be performed in accordance with the flushing procedure described in Section B. Continuous Feed Method.

Chlorinating the main. At a point not more than 10 feet downstream from the beginning of the new main, water entering the new main shall receive a dose of chlorine fed at a constant rate such that the water will have not less than 100 mg/L free chlorine. To assure that this concentration is provided, the chlorine concentration should be measured at regular intervals. The chlorine shall be applied continuously and for a sufficient period to develop a solid column or "slug" of chlorinated water that will, as it moves through the main, expose all interior surfaces to a concentration of approximately 100 mg/L for at least 3 hours.

The free chlorine residual shall be measured in the slug as it moves through the main. If at any time it drops below 50 mg/L the flow shall be stopped, chlorination equipment shall be relocated at the head of the slug, and as flow is resumed, chlorine shall be applied to restore the free chlorine in the slug to not less than 100 mg/L.

As the chlorinated water flows past fittings and valves, related valves and hydrants shall be operated so as to disinfect appurtenances and pipe branches.

3.04 DISPOSAL OF HEAVILY CHLORINATED WATER

After the applicable retention period, heavily chlorinated water should not remain in contact with pipe for more than 48 hours. In order to prevent damage to the pipe lining or corrosion damage to the pipe itself, the heavily chlorinated water shall be flushed from the main until chlorine measurements show that the concentration in the water leaving the main is no higher than that generally prevailing in the system or is acceptable for domestic use. CONTRACTOR shall contact the local sewer department to arrange for disposal of the heavily chlorinated water to the sanitary sewer.

The chlorine residual of water being disposed shall be neutralized by treating with one of the chemicals listed in Table 5. If a sanitary sewer system is unavailable for disposal of the chlorinated water an alternative disposal site must be selected.

The proposed alternative disposal site to which the chlorinated water is to be discharged shall be inspected and approved by the ENGINEER. A reducing agent shall be applied to the chlorinated water to be wasted to completely neutralize the chlorine residual remaining in the water. (See Table 5 for neutralizing chemicals). Where necessary, federal, state and local regulatory agencies should be contacted to determine special provisions for the disposal of heavily chlorinated water.

TABLE 5

Pounds of Chemicals Required to Neutralize Various Residual Chlorine Concentrations in 100,000 gallons of Water

Residual Chlorine Concentration mg/L	Sulfur Dioxide (SO_2)	Sodium Bisulfate ($NaHSO_3$)	Sodium Sulfite ($NaSO_3$)	Sodium Thiosulfate ($Na_2S_2O_3.5H_2O$)
1	0.8	1.2	1.4	1.2
2	1.7	2.5	2.9	2.4
10	8.3	12.5	14.6	12.0
50	41.7	62.6	73.0	60.0

3.05 BACTERIOLOGICAL TESTING

After final flushing and before the water main is placed in service, a sample or samples will be collected from the end of the line by the CONTRACTOR and be tested by the OWNER for bacteriological quality in accordance with Standard Methods of the Examination of Water and Wastewater. At least one sample will be collected from the new main and one from each branch. In the case of mains greater than 2500 feet, samples will be collected along the length of the line when possible as well as at its end.

Bacteriological tests must show complete absence of coliforms. If tests show presence of coliform CONTRACTOR will be required to perform additional flushing and disinfection of the pipeline until such time acceptable tests are obtained, all at no cost to the OWNER. The CONTRACTOR will not be charged for the additional testing performed by the OWNER.

SECTION 15025

CLEANING PIPELINES

PART 1: GENERAL

1.01 SCOPE OF WORK

When required by the Specification Special Conditions or when it is determined that normal flushing will not sufficiently remove dirt and debris introduced during construction the CONTRACTOR shall clean the required pipelines installed under these Contract Documents. The cleaning shall use foam pigs, swabs or "go-devils" as described herein.

1.02 GENERAL

After the installation of water mains normal flushing often proves inadequate to remove all the entrapped air, loose debris and other objects that may have been left in the main during installation. Therefore, after the installation of water mains it may be necessary to use polyurethane foam pigs and/or polyurethane hard foam swabs to remove all foreign matter from the pipeline (i.e. "pig" the pipeline).

Cleaning per the requirements of this section shall be performed prior to testing and disinfection of the main.

1.03 RELATED WORK

See Specification Section 15000.3.02-Construction Methods to Avoid Contamination.
See Specification Section 15020.3.01-Preparation (prior to disinfecting pipelines).

1.04 PROTECTION DURING FLUSHING AND CLEANING

The CONTRACTOR shall assure that an adequate amount of flushing water at sufficiently high pressures exists and that disposal of the water can be done safely. Do not flush a large main supplied by a single smaller one as the volume available is usually inadequate for flushing.

Prior to flushing, or cleaning, the CONTRACTOR shall notify OWNER, ENGINEER and the following:

a. Fire Department
b. Other utilities, such as gas, electric and telephone companies, who may have underground facilities in the area.
c. Customers who may be inconvenienced by reduced pressure or dirty water.

Isolate the section to be flushed from the system. Close valves slowly to prevent water

hammer.

Open the fire hydrant or blow-off valve slowly until the desired flow rate is obtained. When flushing from a dry barrel fire hydrant, use the gate valve upstream of the hydrant for throttling purposes. Open the hydrant valve fully to prevent water from escaping into the ground through the fire hydrant barrel drain.

Minimize worker injury risks by following adequate safety precautions. A safety program should include the education and training of workers in accident prevention, emergency response, and first aid techniques. Prepare specific safety rules for your equipment operators, excavation crews and main flushing and cleaning crews.

Many of the valves to be operated during flushing operations may be in or close to traffic in the street. When operating these valves warn or detour nearby traffic with the use of signs or flags. Place vehicles with warning lights to protect workers. One member should watch for traffic while the other operates the valve. Wear brightly colored safety vests at all times.

An energy dissipator will avoid damage to property and the flooding of streets. Attach an energy dissipator directly to a fire hydrant, blow-off assembly, fire hose or vehicle. An energy dissipator connected to a fire hose, while providing the ability to control the direction of flow, requires means of securing its position. Do not allow crew members to hold energy dissipators in place. Dissipators will move violently if not held securely. Use the flushing crew vehicle to secure the position of an energy dissipator.

The heavy flow of water may create traffic problems. If this is unavoidable, place traffic signs well ahead of the flushing site. Keep children away from the flow of flushing water.

The safety considerations just discussed also apply to main cleaning. If excavation is required during main cleaning operations, crews will most likely be working in the street as will crews operating valves during cleaning operations. Ensure that traffic is diverted safely around the immediate working areas by using traffic signs and a flag person. Wear brightly colored safety vests and hard hats near excavation areas at all times.

PART 2: PRODUCTS

2.01 MATERIALS AND EQUIPMENT

CONTRACTOR shall furnish the foam cleaning plugs, labor and equipment as needed to pig all pipelines, and shall furnish all materials required for the expulsion of air and other debris from pipelines.

As the cleaning described in this section pertains to new water mains, the use of pipe cleaning plugs which utilize Bristles, wire brushes, carbide abrasives, steel studs or any other Type abrasive is not permitted unless specifically approved by the ENGINEER.

The CONTRACTOR is to consult a manufacturer of pipe cleaning plugs, such as Knapp Polly Pig (Houston, Texas), to determine the type and size of cleaning plug best suited for the application. Two types of plugs shall be considered and are described as follows:

A. Swabs

Swabs used for cleaning mains shall be made of polyurethane foam. This foam has a density of 1 to 2 lb./cu. ft. Swabs shall be purchased from commercial manufacturers of swabs for pipes. Both soft and hard grade foam swabs are available. New mains are typically cleaned with hard foam swabs.

B. Pigs

The other type of cleaning plug available is called a pig. Pigs, if used, shall be commercially manufactured for the specific purpose of cleaning pipes. They shall be made of polyurethane foam weighing 2 to 15 lb./cu.ft. Pigs are bullet shaped and come in various grades of flexibility and roughness.

C. Sizing of Plugs

Use swabs cut into cubes and cylinders slightly larger than the size of the pipe to be cleaned. Cubes one inch larger in dimension than the nominal diameter of the pipe being cleaned have worked well for cleaning pipes up to 12-inches in diameter.

For mains greater than 12-inches in diameter, the swab diameter must be considered individually for each operation. For new mains, swabs 3-inches larger than the pipe diameter have worked well. Swabs for the larger mains are usually 1-1/2 times the diameter in length.

Use pigs typically 1/4 -inch to 1/2-inch larger in diameter than the pipe to be cleaned.

Consult suppliers for the proper size of plug to use on the specific job.

PART 3: EXECUTION

3.01 PLUG INSTALLATION AND REMOVAL

In general, the CONTRACTOR shall furnish all equipment, material, and labor to satisfactorily expose cleaning wyes, or other entry or exit points. Remove cleaning wye covers, etc., as required by the ENGINEER and to insert the plugs into the mains.

If approved by the ENGINEER, stripped fire hydrants, air valves and blow-offs may serve as

entry and exit points for smaller sized mains. The ENGINEER will examine these appurtenances and the connecting laterals to ensure that adequate openings exist through which a plug may be launched.

If these appurtenances are used, a special launcher to ease the insertion and launching of the plug is required. If available a pressurized water source such as a fire hydrant can be used to launch the plug. If water from the system is not available nearby, use a water truck with pump.

If hydrants are used as entry and exit points, the CONTRACTOR shall, under ENGINEER supervision, remove the internal mechanisms and plug the drains. Insert the plug and replace the cap with a special flange with a 2-1/2-inch fitting. Connect the 2-1/2-inch fitting with a pressure gauge and valve to a pressurized water source. After the last valve isolating the section to be cleaned is closed, open the hydrant supply valve. Propel the swab or pig into the main by opening the exit valve.

In mains greater than 8-inches, Wyes shall be used at the entry and exit points. Fabricate the wye section one size larger than the main to ease the insertion and extraction of the plug. The use of wyes, as with the previously mentioned appurtenances, requires an outside source of pressurized water for launching. Cap the wye with a flange with a 2 to 6 inch fitting for connecting with the pressurized water source.

Many pigs, since they are less flexible than swabs, are harder to insert into a pipe. Other methods acceptable to insert pigs include:

1. winching with a double sling,
2. winching with a rope attached to the pig,
3. compression with a banding machine prior to insertion, and
4. the use of a specially designed tapered steel pipe which is removed after use.

During swab or pig installation, leave as much water as possible in the main to be cleaned. The water suspends the material being removed from the pipe and minimizes the chance of the material forming a solid plug. Water in the pipe also keeps the swab or pig from traveling through the pipe at excessive rates. If swabs or pigs travel too fast they will remove less material. The swab or pig will also wear more rapidly in such a case.

At the exit point or blow-off, install a wye long enough to house the swab or pig. Attach temporary piping to the end cap to allow the drainage of the water.

Where expulsion of the cleaning plugs is required through a dead end main, the CONTRACTOR shall prevent backflow of purged water into the main after passage of the cleaning plug. This can be accomplished by installing mechanical joint bends and pipe joints to provide a riser out of the trench. Additional excavation of the trench may serve the same purpose and is acceptable.

3.02 PRE-CLEANING PROCEDURES

Preplan and prepare for the ENGINEER's review, a written cleaning plan.

Suggested procedures prior to cleaning include the following:

1. Identify mains to be cleaned on a map. Mark the location of the entry, water supply and exit points, any blow-offs to be used, main gates to be closed, and the path of the swab or pig.
2. Under the ENGINEER's supervision, inspect and operate all valves and hydrants to be used in the cleaning operation. Ensure that all operate correctly and that a tight shutdown is possible.
3. Check location and type of hydrants, launch and exit location, and blow-offs to be used. Make blow-off tap connections if necessary.
4. The OWNER will notify customers served by the main to be cleaned that their water will be off for a specified period on the day of the cleaning.
5. The OWNER will identify customers who may require temporary services during the main cleaning operation. The CONTRACTOR shall provide the temporary connections.
6. Determine the number and size of plugs to be used.

3.03 CLEANING PROCEDURE

After approval by the ENGINEER of the CONTRACTOR's cleaning plan the following cleaning procedures as applicable shall be performed by the CONTRACTOR:

A. Swab Cleaning Procedures

1. Open the water supply upstream of the swab. Throttle the flow in the main at the discharge (plug exit) point so that the swab passes through the main at a speed of 2 to 4 fps. At this velocity, swabs will effectively clean pipes for distances of up to 4000 feet before disintegrating to a size smaller than the main. Use pitot gauges at the exist hydrant or blow-off to estimate the flow rate in the main.
2. Note the time of entry of the swab into the main and estimate its time or arrival at the exit point. If the swab does not reach the exit point in the estimated time plus ten minutes, then a blockage has probably occurred. Reverse the flow in the main and note the time required for the swab to reach the original entry point. From the return travel time, approximate the location of the blockage. The ENGINEER may require a swab to which a transmitter has been attached to be used to accurately locate a blockage.
3. Once the first swab has been recovered, typically, make two to three runs of four to five swabs each depending on how quickly flushing water clears.

Continue operations until the water behind the swabs emerging at the exit clears up within one minute. Account for all swabs inserted into the main.

4. After the last swab has been recovered, flush the main to remove swab particles. This may require up to an hour or flushing.

B. Pig Cleaning Procedures

1. Remove all air valves along the line. This will provide pressure relief should the pig suddenly stop and assure that no air is trapped in the main.
2. If the pig is inserted directly into the main, set it in motion by opening the upstream gate valve and a downstream fire hydrant or blow-off valve (usually the valve on the capped end at the exit point). If the pig is launched from a wye, fire hydrant, or other appurtenance, use an external pressurized water source to inject the pig into the main as described in Section 3.01.
3. Once the pig is in motion in the main, control it's speed by throttling the discharge at a downstream fire hydrant or blow-off. Operate pigs typically at 1 fps. This slow speed will help prevent pressure surges when the pig passes through undersized valves, enters smaller pipes, or turns through tees or crosses. Speeds of up to 2 fps. can be used on straight runs with no restrictions or sharp turns.
4. Make sufficient passes of the pig to obtain thorough cleaning. Two pigs may be used in tandem to save time and water. Sufficient cleaning is established when the water discharging after the pig becomes clear within one minute.

3.04 POST CLEANING PROCEDURE

After successful completion of cleaning the main shall be tested, flushed and disinfected in accordance with applicable sections of these Specifications.

SECTION 15030

PRESSURE AND LEAKAGE TESTS

PART 1: GENERAL

1.01 SCOPE OF WORK

The CONTRACTOR shall test all piping, valves and appurtenances installed under these Contract Documents. Testing shall be performed concurrent with installation. Unless otherwise approved by the ENGINEER no more than 1000 feet of pipe shall be installed without being tested.

1.02 SUBMITTALS

The CONTRACTOR shall prepare and submit to the ENGINEER schedules and procedures for testing of all parts of the water main installed in accordance with these Contract Documents. The schedule shall be submitted seven days prior to any testing.

PART 2: PRODUCTS

2.01 EQUIPMENT

The pump, pipe connections, and all necessary apparatus for the pressure and leakage tests, except gauges and metering devices, shall be furnished by the CONTRACTOR. The OWNER will furnish gauges and metering devices for the tests, but the CONTRACTOR shall make all excavations and backfills, and furnish all necessary assistance for conducting the tests.

PART 3: EXECUTION

3.01 GENERAL

After the pipe has been laid, thrust backing cured (min. 5 days) and the trench completely or partially backfilled, the entire pipeline, or any section thereof, shall be subjected to hydrostatic pressure and leak tests in accordance with ANSI/AWWA C600-87, Section 4 - Hydrostatic Testing.

The CONTRACTOR may, at his option, completely backfill the trench or partially backfill the trench over the center portion of each pipe section to be tested. The ENGINEER may however direct the CONTRACTOR to completely backfill the trench if local traffic or safety conditions require such action.

The pipeline will be subjected to a hydrostatic pressure of no less than 100 psi above the normal operating pressure for operating pressures that do not exceed 200 psi. For operating pressures

in excess of 200 psi, the pipeline will be subjected to a hydrostatic pressure that is 1.5 times the normal operating pressure, but no more than the design rating of the pipe.

After installation of a tapping sleeve and valve but prior to making the tap into the main the tapping sleeve and valve assembly shall be tested. The required test pressure shall be determined in the same manor as for pipe but no pressure drop will be allowed during the test. Test pressure must be maintained for 15 minutes for acceptance.

3.02 FILLING AND TESTING

Each segregated section of pipeline will be slowly filled with water insuring that all air is expelled. Extreme care must be taken to insure all air is expelled from the pipeline during the filling of pipe with water. The line shall stand full of water for twenty-four hours prior to testing to allow all air to escape. If necessary, tap the main at points of highest elevation so that air can be expelled as the pipe is filled with water. After successful completion of filling and air expulsion, but prior to testing, the corporation stops shall be removed and the taps tightly plugged.

The specified test pressure, measured at the point of lowest elevation, will then be applied by means of a pump connected to the pipe in a manner satisfactory to the ENGINEER. If the elevation of the high point of the pipeline being tested is such that the pressure during testing will be below 85% of the required test pressure the ENGINEER will require a separate test to be performed on this section of pipeline. In lieu of a separate test the test pressure measured at the lowest elevation may be increased, within the pressure rating of the pipeline material, such that resulting pressure at the highest point exceeds 85% of the required test pressure. The test pressure will not vary by more than $\pm$ 5 psi and the test will be of at least two-hour duration.

A leakage test will be conducted concurrently with the pressure test. Leakage is defined as the quantity of the water measured as make-up water (volumetrically in a container or meter) that must be supplied into the newly laid pipeline to maintain pressure within 5 psi of the test pressure after the air in the pipeline has been expelled and the pipe filled with water.

No pipeline installation will be accepted by the ENGINEER if the leakage is greater than that shown in the following table:

Allowable Leakage per 1000 ft. of Pipeline*---gph

Avg. Test Pressure	Nominal Pipe Diameter---in.										
psi	4	6	8	12	16	20	24	30	36	42	48
100	0.30	0.45	0.60	0.90	1.20	1.50	1.80	2.25	2.70	3.15	3.60
125	0.34	0.50	0.67	1.01	1.34	1.68	2.01	2.52	3.02	3.53	4.03
150	0.37	0.55	0.74	1.10	1.47	1.84	2.21	2.76	3.31	3.86	4.41
175	0.40	0.59	0.80	1.19	1.59	1.98	2.38	2.98	3.58	4.17	4.77
200	0.43	0.64	0.85	1.28	1.70	2.12	2.55	3.19	3.82	4.46	5.09
225	0.45	0.68	0.90	1.35	1.80	2.25	2.70	3.38	4.05	4.73	5.41
250	0.47	0.71	0.95	1.42	1.90	2.37	2.85	3.56	4.27	4.99	5.70
275	0.50	0.75	1.00	1.49	1.99	2.49	2.99	3.73	4.48	5.23	5.98
300	0.52	0.78	1.04	1.56	2.08	2.60	3.12	3.90	4.68	5.46	6.24
350	0.56	0.84	1.12	1.69	2.25	2.81	3.37	4.21	5.06	5.90	6.74
400	0.60	0.90	1.20	1.80	2.40	3.00	3.60	4.50	5.41	6.31	7.21
450	0.64	0.95	1.27	1.91	2.55	3.18	3.82	4.78	5.73	6.69	7.64

*If the pipeline under test contains sections of various diameters, the allowable leakage will be the sum of the computed leakage for each size.

The table has been generated from the formula: $L=\frac{SD(P)1/2}{133,200}$

where L is the allowable leakage in gallons per hour, S equals the length of pipe in feet, D is the nominal pipe diameter in inches and P is the test pressure in PSIG.

Should any test disclose damaged or defective materials or leakage greater than that permitted, the CONTRACTOR shall at his own expense, locate and repair and/or replace defective materials. The tests shall be repeated until the leakage is within the permitted allowance and is satisfactory to the ENGINEER.

SECTION 15105

DUCTILE IRON PIPE AND FITTINGS
(OWNER Furnished)

PART 1: GENERAL

1.01 COORDINATION OF WORK

Connection to existing pipelines may require shutdown of OWNER facilities. Construction work and connections shall be closely coordinated with the OWNER through the ENGINEER. The ENGINEER, in consult with the OWNER, may select the time, including Saturdays, Sundays, or holidays, which, in the opinion of the ENGINEER, will cause the least inconvenience to the ENGINEER and/or its customers, for connection to existing pipelines, and the CONTRACTOR will perform such connections at such times as may be directed by the OWNER at the Contract prices and no claim for premium time or additional costs will be made by the CONTRACTOR.

1.02 RELATED WORK

Piping - General Provisions - Section 15000

PART 2: PRODUCTS

2.01 PIPE MATERIAL

OWNER will furnish and CONTRACTOR shall install all ductile iron pipe and fittings. Materials to be furnished by OWNER are included in Section SSC-1000.1.03 of the Specifications Special Conditions.

Research has documented that certain pipe materials (such as polyvinyl chloride, polyethylene, and polybutylene) and certain elastomers (such as those used in gasket material) may be subject to permeation by lower-molecular weight organic solvents or petroleum products. Products supplied under this section have been selected based on the non-expectation of encountering petroleum products or organic solvents. If during the course of pipeline installation the CONTRACTOR identifies, or suspects, the presence of petroleum products or any unknown chemical substance the ENGINEER is to be notified immediately. Installation of any further piping in the area of suspected contamination shall be stopped until direction is provided by the ENGINEER.

PART 3: EXECUTION

3.01 INSTALLATION

The provisions specified in Section 15000 shall be strictly followed in addition to the following requirements:

A. Push-On Joints

The surfaces with which the rubber gasket comes in contact shall be thoroughly cleaned just prior to assembly. The gasket shall then be inserted into the groove in the bell. Before starting joint assembly, a liberal coating of special lubricant shall be applied to the gasket and the spigot end. With the spigot end centered in the bell, the spigot end is pushed home.

B. Mechanical Joints

All components shall be cleaned and lubricated with soapy water prior to assembly. Slip the follower gland and gasket over the pipe plain end making sure the small side of the gasket and lip of the gland face the bell socket. Insert the plain end into socket. Push gasket into position with fingers, gasket should be evenly seated. Slide gland into position, insert bolts and tighten nuts by hand. Bolts are then tightened alternately (across from one another) to the following normal torques:

Range of Torque

Bolt Size	In Foot-Pounds
5/8"	40 – 60
¾"	60 – 90
1"	70 – 100
1?"	90 – 120

C. Restrained Joints

(1) Ball and Socket

Assemble and install the ball and socket joint according to the manufacturer's recommendations. The joint shall be thoroughly cleaned and lubricated. Check the retainer ring fastener.

(2) Push-On

Assemble and install the push-on joint according to the manufacturer's recommendations. The joint shall be thoroughly cleaned and lubricated. Check the retainer ring fastener.

During "pushing home" of any style piping timber shall be placed between the jacking device (backhoe bucket, pipe jack, etc.) and the pipe being driven home.

SECTION 15106

DUCTILE IRON PIPE AND FITTINGS
(CONTRACTOR Furnished)

PART 1: GENERAL

1.01 COORDINATION OF WORK

Connection to existing pipelines may require shutdown of OWNER facilities. Construction work and connections shall be closely coordinated with the OWNER through the ENGINEER. The ENGINEER, in consult with the OWNER, may select the time, including Saturdays, Sundays, or holidays, which, in the opinion of the ENGINEER, will cause the least inconvenience to the OWNER and/or its customers, for connection to existing pipelines, and the CONTRACTOR will perform such connections at such times as may be directed by the ENGINEER at the Contract prices and no claim for premium time or additional costs will be made by the CONTRACTOR.

1.02 RELATED WORK

Piping - General Provisions - Section 15000

1.03 SUBMITTALS

Shop drawings and manufacturer's literature for all CONTRACTOR supplied materials shall be promptly submitted to the ENGINEER for approval in accordance with Section 1300.

PART 2: PRODUCTS

Research has documented that certain pipe materials (such as polyvinyl chloride, polyethylene, and polybutylene) and certain elastomers (such as those used in gasket material) may be subject to permeation by lower-molecular weight organic solvents or petroleum products. Products supplied under this section have been selected based on the non-expectation of encountering petroleum products or organic solvents. If during the course of pipeline installation the CONTRACTOR identifies, or suspects, the presence of petroleum products or any unknown chemical substance the ENGINEER is to be notified immediately. Installation of any further piping in the area of suspected contamination shall be stopped until direction is provided by the ENGINEER.

2.01 PIPE MATERIAL

A. General

Ductile iron pipe shall conform to the latest specifications as adopted by the American National Standards Institute, Inc., (ANSI) and the American Water Works

Association (AWWA). Specifically, ductile iron pipe shall conform to ANSI/AWWA C151/A21.51.

The pipe shall be coated outside with a bituminous coating in accordance with ANSI/AWWA C151/A21.51. The pipe interior shall be cement mortar lined and seal coated in compliance with the latest revision of ANSI/AWWA C104/A21.4. The cement mortar lining shall be double thickness.

B. Pipe Class

The class of pipe to be furnished shall be in accordance with Table 1 and the below listed notes.

TABLE 1

RATED WORKING PRESSURE AND MAXIMUM DEPTH OF COVER FOR DUCTILE IRON PIPE MANUFACTURED IN ACCORDANCE WITH ANSI/AWWA C151/A21.51

Pipe Size In.	Thick.. Class	Nominal Thick In.	Rated Water Working Pressure, Psi+	Laying Condition Type 1	Type 2	Type 3	Type 4	Type 5
				Maximum Depth of Cover, Feet				
6	50	0.25	350	32	38	44	56	75
8	50	0.27	350	25	30	36	46	64
12	50	0.31	350	17	22	27	36	64
16	50	0.34	350	13	17	21	30	47
20	50	0.36	300	10	14	18	27	38
24	50	0.38	250	8	12	17	23	31

NOTES:

1. Larger pipe sizes up to 54-inch can be installed as Class 50 with cover up to nine (9) feet and an operating pressure of 200 psi. When trench depths exceed fifteen (15) feet for pipe sizes of 16-inch or larger, Class 51 pipe should be used.

2. The thickness of Class 50 ductile iron pipe is adequate to support 3/4 and 1-inch corporations. For the installation of equipment requiring a larger tap (i.e., air relief valves or larger corporations) a full saddle is required due to limited wall thickness.

3. There are special conditions where a larger wall thickness is required. At treatment plant or booster station sites where frequent excavation can be anticipated in the vicinity of pipe, Class 54 pipe shall be installed to minimize external damage to the pipe from trenching equipment. Class 56 pipe is

required where the pipeline is laid on a river channel bottom to prevent external damage to the pipe and minimize the potential for costly pipe replacement.

C. Testing

Each length of pipe shall be subjected to a hydrostatic proof test as required by ANSI/AWWA C151/A21.51.

D. Joints

1. Mechanical and Push-On

Mechanical and push-on joints including accessories shall conform to ANSI/AWWA C111/A21.11.

2. Flanged

Flanged joints shall conform to ANSI/AWWA C110/A21.10 or ANSI B16.1 for fittings and ANSI/AWWA C115/A21.15 for pipe. Flanged joints shall not be used in underground installations except within structures.

All flanged joints shall be furnished with 1/8-inch thick, red rubber or styrene butadiene rubber gaskets. The bolts shall have American Standard heavy unfinished hexagonal head and nut dimensions all as specified in American Standard for Wrench Head Bolts and Nuts and Wrench Openings (ANSI B18.2). For bolts of 1-3/4-inches in diameter and larger, bolt studs with a nut on each end are recommended. Material for bolts and nuts shall conform to ASTM A107.

2.02 FITTINGS

A. Ductile Iron Fittings

Standard fittings shall be ductile iron conforming to ANSI/AWWA C110/A21.10. Compact ductile iron fittings shall meet the requirements of ANSI/AWWA C153/A21.53.

1. Working Pressures

Fittings shall be suitable for the following working pressures unless otherwise noted:

Size	Pressure Pounds per Square Inch Compact Ductile Iron	Standard Ductile Iron
3" – 24"	350	350
30" – 48"	350	250

2. Coating and Lining

The fittings shall be coated with a bituminous coating in accordance with ANSI/AWWA C110/A21.10 and lined inside with cement mortar and seal coated in accordance with ANSI/AWWA C104/A21.4. The cement mortar lining shall be double thickness.

B. Joints

1. Mechanical and Push-On

Mechanical and push-on joints including accessories shall conform to ANSI/AWWA C111/A21.11.

2. Flanged

Flanged joints shall meet the requirements of ANSI/AWWA C115/A21.15 or ANSI B16.1. Flanged joints shall not be used in underground installations except within structures.

All flanged joints shall be furnished with a minimum 1/8-inch, thick red rubber or styrene butadiene rubber gasket. The bolts shall have American Standard heavy unfinished hexagonal head and nut dimensions all as specified in ANSI B18.2. For bolts of 1-3/4-inches in diameter and larger, bolt studs with a nut on each end are recommended. Material for bolts and nuts shall conform to ASTM A107.

3. Restrained

When restrained joints are required, for pipe and fittings, they shall be of the boltless push-on type which provides joint restraint independent of the joint seal. Restrained system shall be suitable for the following working pressures:

Size	Pressure Pounds per Square Inch
4" – 12"	250
14" – 24"	350
30" – 50"	250

PART 3: EXECUTION

3.01 INSTALLATION

The provisions specified in Section 15000 shall be strictly followed in addition to the following requirements:

A. Push-On Joints

The surfaces with which the rubber gasket comes in contact shall be thoroughly cleaned just prior to assembly. The gasket shall then be inserted into the groove in the bell. Before starting joint assembly, a liberal coating of special lubricant shall be applied to the gasket and the spigot end. With the spigot end centered in the bell, the spigot end is pushed home.

B. Mechanical Joints

All components shall be cleaned and lubricated with soapy water prior to assembly. Slip the follower gland and gasket over the pipe plain end making sure the small side of the gasket and lip of the gland face the bell socket. Insert the plain end into socket. Push gasket into position with fingers, gasket should be evenly seated. Slide gland into position, insert bolts and tighten must by hand. Bolts are then tightened alternately (across from one another) to the following normal torques:

Bolt Size	Range of Torque In Foot-Pounds
5/8"	40 – 60
¾"	60 – 90
1"	70 – 100
1 ¼"	90 - 120

C. Restrained Joints

1. Ball and Socket

Assemble and install the ball and socket joint according to the manufacturer's recommendations. The joint shall be thoroughly cleaned and lubricated. Check the retainer ring fastener.

2. Push-On

Assemble and install the push-on joint according to the manufacturer's recommendations. The joint shall be thoroughly cleaned and lubricated. Check the retainer ring fastener.

During "pushing home" of any style piping timber shall be placed between the jacking device (backhoe bucket, pipe jack, etc.) and the pipe being driven home.

SECTION 15110

STEEL PIPE AND FITTINGS
(CONTRACTOR Furnished)

PART 1: GENERAL

1.01 COORDINATION OF WORK

Connection to existing pipelines may require shutdown of OWNER facilities. Construction work and connections shall be closely coordinated with the OWNER through the ENGINEER. The ENGINEER, in consult with the OWNER, may select the time, including Saturdays, Sundays or holidays, which, in the opinion of the ENGINEER, will cause the least inconvenience to the OWNER and/or its customers, for connection to existing pipelines, and the CONTRACTOR will perform such connection at such times as may be directed by the ENGINEER at the Contract prices and no claim for premium time or additional costs will be made by the CONTRACTOR.

1.02 RELATED WORK

Piping - General Provisions - Section 15000

1.03 SUBMITTALS

Shop drawings and manufacturer's literature for all CONTRACTOR supplied materials shall be promptly submitted to the ENGINEER for approval in accordance with Section 1300.

PART 2: PRODUCTS

2.01 PIPE MATERIAL

All steel pipe shall be either fabricated pipe or mill pipe manufactured in accordance with AWWA C200 and the following:

Pipe up to and including, 24-inch diameter shall be mill type pipe conforming to ASTM Specification A53, Grade B, seamless or fabricated pipe using ASTM A283, Grade C steel. Pipe larger than 24-inches shall be fabricated pipe using ASTM, A283, Grade C steel with straight longitudinal welded seams.

The diameter specified shall be the nominal inside diameter for pipe sizes up to 12-inches and the nominal outside diameter for pipe larger than 12-inches.

Wall thicknesses for steel pipe and fittings shall be minimum .375 inches for pipe sizes up to eight (8) inches. For pipe diameters larger than eight (8) inches the minimum wall thickness shall be

.5 inches. Heavier wall thickness, if required, will be specified in the Specification Special Conditions.

Steel fittings to be furnished shall conform to AWWA Standard C208.

Flanges shall be Class D, slip-on type in accordance with AWWA Standard C207. Flanges shall be flat faced with O.D. and drilling in accordance with ANSI Standard B16.1.

Field welding of pipe shall be in accordance with AWWA Standard C206.

Interior of all steel pipe and fittings shall be cement mortar lined in accordance with AWWA Standard C205. Field welded joints shall be lined in accordance with the Appendix to AWWA Standard C205. All lining shall be sealed with a bituminous seal coat approved for use with potable water.

Pipe and fittings shall be provided with water stops where shown on the Drawings or as required to prevent leakage around the pipe fittings at penetrations between wet and dry areas.

The exterior of all buried steel pipe and fittings shall receive shop applied prime coat and coal tar enamel protective coating in accordance with AWWA Standard C203. Fusion-bonded epoxy coating in accordance with AWWA Standard C213 is also acceptable.

PART 3: EXECUTION

3.01 INSTALLATION

General provisions provided in Specification Section 15000 shall be strictly followed in addition to the following:

Pipe joints shall be where shown on the Drawings except where field conditions dictate changes and such changes are approved by the ENGINEER. The CONTRACTOR shall be responsible for insuring proper alignment and fit of all steel piping.

The cutting of pipe for installing valves or fittings shall be done in a neat and workmanlike manner without damage to the pipe or lining. The end shall be smooth and at right angle to the axis of the pipe or properly beveled for the weld joint as required. Flame cutting of metal pipe shall not be permitted. All pipe cutting shall be at the CONTRACTOR's expense.

All required field welding of steel pipe shall be performed in accordance with AWWA Standard C206.

SECTION 15115

CONCRETE PIPE AND FITTINGS
(CONTRACTOR Furnished)

PART 1: GENERAL

1.01 COORDINATION OF WORK

Connection to existing pipelines may require shutdown of OWNER facilities. Construction work and connections shall be closely coordinated with the OWNER through the ENGINEER. The ENGINEER, in consult with the OWNER, may select the time, including Saturdays, Sundays or holidays, which, in the opinion of the ENGINEER, will cause the least inconvenience to the OWNER and/or its customers, for connection to existing pipelines, and the CONTRACTOR will perform such connections at such times as may be directed by the ENGINEER at the Contract prices and no claim for premium time or additional costs will be made by the CONTRACTOR.

1.02 RELATED WORK

Piping - General Provisions - Section 15000

1.03 SUBMITTALS

Shop drawings and manufacturer's literature for all CONTRACTOR supplied materials shall be promptly submitted to the ENGINEER for approval in accordance with Section 1300.

PART 2: PRODUCTS

Research has documented that certain pipe materials (such as polyvinyl chloride, polyethylene, and polybutylene) and certain elastomers (such as those used in gasket material) may be subject to permeation by lower-molecular weight organic solvents or petroleum products. Products supplied under this section have been selected based on the non-expectation of encountering petroleum products or organic solvents. If during the course of pipeline installation the CONTRACTOR identifies, or suspects, the presence of petroleum products or any unknown chemical substance the ENGINEER is to be notified immediately. Installation of any further piping in the area of suspected contamination shall be stopped until direction is provided by the ENGINEER.

2.01 PIPE MATERIALS

A. Prestressed Concrete Pressure Pipe, Steel Cylinder Type

Prestressed concrete pressure pipe shall conform to the latest specifications as adopted by the American Water Works Association (AWWA). Specifically, prestressed

concrete pressure pipe, steel cylinder type shall conform to AWWA C300, latest issue, except as modified herein.

The pipe shall be designed to meet the following requirements:

1. External Load

Depth of cover - 2-1/2 feet to 10 feet, whichever depth produces the greatest load in conjunction with live load.

Trench width - nominal pipe diameter plus 24 inches.

Soil density - 120 pounds per cubic foot.

Ku - 0.130

Laying condition - Type 2, per AWWA Standard C600.

Live load - per ANSI/AWWA Standard C151/A21.51, (H-20, one truck, plus 1.5 impact).

If the depth of cover exceeds 10 feet, it will be so indicated on the Drawings and the pipe manufacturer shall design the pipe as required in these areas.

2. Internal Pressures

Working pressure - as per the Specification Special Conditions.

If not provided use 250 PSIG.

Surge pressure allowance - 100 psi.

3. Combined Loading

Concrete pipe shall be designed in accordance with AWWA C300, latest revision, using the "Cubic Parabola Design Method" outlined in Appendix A and as follows:

(a) The combination of design pressure and earth loading will fall under the Design-Curve.

(b) The combination of design pressure plus the specified surge pressure, and earth loading shall fall under the Transient-Capacity Curve.

(c) The combination of design pressure and earth loading plus line loading shall fall within the Transient-Capacity Curve.

B. Design Calculations

The CONTRACTOR shall submit design calculations to the ENGINEER for the most severe loading conditions for each size and class of pipe. If requested by the ENGINEER, the CONTRACTOR shall submit calculations to support the design of any particular piece or pieces of pipe anywhere in the project as part of his Bid Price for the Contract and at no additional cost to the OWNER.

The design calculations shall be presented in a neat, readable form, with all fixtures, values and units included to facilitate ease of checking. Calculations shall include, but not be limited to, the following:

1. pipe size
2. cylinder thickness and area
3. cylinder yield point and ultimate strength (ASTM Designation)
4. wire diameter or gauge
5. wire area
6. wire size
7. wire spacing
8. wire wrapping force
9. ultimate strength of wire
10. internal pressure at zero core compression (P_o)
11. elastic limit pressure (P_L)
12. burst strength (PBurst)
13. 3-edge bearing load to produce incipient cracking
14. 9/10 of the three-edge bearing loading producing .001 inch crack in the core with no internal pressure (W_o)
15. ultimate 3-edge load
16. resultant concrete compression
17. gross wrapping stress in wire
18. compressive strength of core concrete at time of wrapping
19. core thickness
20. outside coating thickness
21. plottings related to design curves for Cubic Parabola Design Method for combined load conditions

C. Testing

The design of each size and class of pipe shall be checked by hydrostatic tests conducted on representative pipe in the manufacturer's shop to obtain the following actual test strengths:

1. The pressure to produce a surface crack in the coating of the barrel 0.001 inches wide by 12 inches long shall be at least 0.8 P_o for lined cylinder pipe or P_o for embedded cylinder pipe.
2. The ultimate pressure to produce burst shall be at least P_b.

The design of each size and class of concrete cylinder pipe shall be verified by tests conducted on representative specimens. The tests described in this paragraph are for proof of design only and it is not necessary that such tests be made on pipe manufactured specifically for this Contract. Certified reports covering tests made on other pipe of the same size, class, and design as specified herein and manufactured from materials or equivalent type and quality may be accepted as adequate proof of design.

D. Joints

Joints for concrete pipe and fittings shall be of the rubber gasket type meeting the requirements of AWWA Specification C300 with exposed portions of the joint rings after casting, being protected with a metallic coating having a minimum thickness of 0.004 inches. Joint lubricant shall be as recommended by the pipe manufacturer. Rubber gaskets shall meet the physical requirements of the appropriate ASTM Specifications.

2.02 FITTINGS

Fittings for reinforced concrete pipe, steel cylinder type, prestressed shall be designed so as to be compatible with the pipe, and so as to provide at least equal resistance to internal and external loads of the pipe. Design criteria, joints, coatings and linings shall be as specified for the pipe. Fittings shall conform to the requirements of AWWA C300, latest revision. The CONTRACTOR shall furnish adaptor units from concrete pipe to iron pipe or valves where necessary for proper connection.

The CONTRACTOR shall stock, without additional compensation, a number of bevel adaptors and short lengths of pipe at the job site to be used for diverting the main past obstructions or to make any changes in the line and grade of the main due to omissions on the laying schedule or tabulated layout.

He also shall provide, without additional compensation, bevel pipe, outlet connections on straight pipe, closure-pieces, and other accessories required as required to satisfactorily install the new main as shown on the plans.

2.03 COATING

Pipe and fittings shall have an exterior mortar coating as specified in AWWA C301, latest revision.

PART 3: EXECUTION

3.01 INSTALLATION

General provisions provided in Section 15000 shall be strictly followed in addition to the following:

Before assembling a joint, the spigot end of the pipe shall be thoroughly cleaned. The inside of the bell end of the pipe and the gasket shall be cleaned and lubricated with vegetable soap. The gasket is then placed around the spigot end so it is properly seated in the circumferential groove to maintain uniform tension in the gasket all around the pipe. The spigot end is then aligned with the bell end of the pipe and carefully entered into the bell.

The joint shall be checked to determine if the gasket is in the proper position. The joints of pipe 24 inches or larger shall be checked from the inside of the pipe. Before the spigot is thrust completely, home, steel spacers are inserted in the seat of the bell to leave a half inch clearance. A feeler gauge is then entered into the recess to check the position of the gasket. If the gasket cannot be felt all around the pipe, the spigot shall be removed. If the gasket is not damaged, it may be reused, but both the gasket and the joint shall be relubricated. After it has been determined the gasket is in its proper position, the joint spacers are removed and the pipe pushed or pulled completely home. The joints of pipe smaller than 24 inches may be checked from the outside of the pipe by inserting a feeler gauge into the flare of the bell to assure that no portion of the gasket is protruding.

After the joint is assembled, a cloth band is placed around the joint recess and wired or strapped in position to provide a means of pouring grout in the recess. A grout composed of one part cement and three parts sand is poured into the joint recess beneath the band. Measures should be taken to assure the entire recess around the pipe is completely filled.

If welding of prestressed concrete pipe joints is required by the ENGINEER, the welding shall be done in accordance with American Water Works Service Company drawing no. 61-300-12SK titled, "Specifications for Welding Prestressed Concrete Pipe Joints". This drawing is included at the end of this Section.

SECTION 15120

POLYVINYL CHLORIDE (PVC) PIPE
(OWNER Furnished)

PART 1: GENERAL

1.01 COORDINATION OF WORK

Connection to existing pipelines may require shutdown of OWNER facilities. Construction work and connections shall be closely coordinated with the OWNER through the ENGINEER. The ENGINEER, in consult with the OWNER, may select the time, including Saturdays, Sundays or holidays, which, in the opinion of the ENGINEER, will cause the least inconvenience to the OWNER and/or its customers, for connection to existing pipelines, and the CONTRACTOR will perform such connections at such times as may be directed by the ENGINEER at the Contract prices and no claim for premium time or additional costs will be made by the CONTRACTOR.

1.02 RELATED WORK

Piping General Provisions - Section 15000

PART 2: PRODUCTS

Research has documented that certain pipe materials (such as polyvinyl chloride, polyethylene, and polybutylene) and certain elastomers (such as those used in gasket material) may be subject to permeation by lower-molecular weight organic solvents or petroleum products. Products supplied under this section have been selected based on the non-expectation of encountering petroleum products or organic solvents. If during the course of pipeline installation the CONTRACTOR identifies, or suspects, the presence of petroleum products or any unknown chemical substance the ENGINEER is to be notified immediately. Installation of any further piping in the area of suspected contamination shall be stopped until direction is provided by the ENGINEER.

2.01 PIPE MATERIALS

OWNER will furnish and CONTRACTOR shall install all PVC pipe and jointing materials. Materials to be furnished by OWNER are included in Section SSC-1000.1.03 of the Specifications Special Conditions.

PART 3: EXECUTION

3.01 INSTALLATION

The general provisions specified in Section 15000 shall be strictly followed in addition to the following:

A. Pipe Joint Assembly

The assembly of joints should be performed as recommended by the pipe manufacturer. The elastomeric gaskets may be supplied separately in cartons or positioned in the bell joint or coupling at the factory. When gaskets are color coded, be sure to consult the pipe manufacturer or his literature for the significance. In all cases, clean the gasket, the bell or coupling interior, especially the groove area (except when gasket is permanently installed) and the spigot area with a rag, brush or paper towel to remove any dirt or foreign material before the assembling. Inspect the gasket, pipe spigot bevel, gasket groove, and sealing surfaces for damage or deformation. When gaskets are separate, use only gaskets which are designed for and supplied with the pipe. Insert them as recommended by the manufacturer.

Lubricant should be applied as specified by the pipe manufacturer. Bacterial growth, damage to the gaskets or the pipe, may be promoted by use of non-approved lubricants. Use only lubricant supplied by the pipe manufacturer.

After lubrication, the pipe is ready to be joined. Good alignment of the pipe is essential for ease of assembly. Align the spigot to the bell and insert the spigot into the bell until it contacts the gasket uniformly. Do not swing or "stab" the joint; that is, do not suspend the pipe and swing it into the bell. The spigot end of the pipe is marked by the manufacturer to indicate the proper depth of insertion.

Solvent cemented joints where approved by the ENGINEER should be made in accordance with manufacturer's recommendations or in accordance with ASTM D2855, "Standard Recommended Practice for Making Solvent Cemented Joints with Polyvinyl Chloride (PVC) Pipe and Fittings".

To join field-cut pipe, it is necessary to first prepare the pipe end. A square cut is essential for proper assembly. The pipe shall be marked around its entire circumference prior to cutting to assure a square cut. Use a factory-finished beveled end as a guide for proper bevel angle, and depth of bevel plus the distance to the insertion reference mark. The end shall be beveled using a pipe beveling tool or a wood rasp which will cut the correct taper. A portable sander or abrasive disc may also be used to bevel the pipe end. Round off any sharp edges on the leading edge of the bevel with a pocket knife or a file.

SECTION 15121

POLYVINYL CHLORIDE (PVC) PIPE
(CONTRACTOR Furnished)

PART 1: GENERAL

1.01 SCOPE

This Section covers PVC pressure pipe in diameters 4 inches through 12 inches.

1.02 COORDINATION OF WORK

Connection to existing pipelines may require shutdown of OWNER facilities. Construction work and connections shall be closely coordinated with the OWNER through the ENGINEER. The ENGINEER, in consult with the OWNER, may select the time, including Saturdays, Sundays or holidays, which, in the opinion of the ENGINEER, will cause the least inconvenience to the OWNER and/or its customers, for connection to existing pipelines, and the CONTRACTOR will perform such connections at such times as may be directed by the ENGINEER at the Contract prices and no claim for premium time or additional costs will be made by the CONTRACTOR.

1.03 SUBMITTALS

Shop drawings and manufacturer's literature for all CONTRACTOR supplied materials shall be promptly submitted to the OWNER for approval in accordance with Section 1300.

1.04 RELATED WORK

Piping General Provisions - Section 15000

PART 2: PRODUCTS

Research has documented that certain pipe materials (such as polyvinyl chloride, polyethylene, and polybutylene) and certain elastomers (such as those used in gasket material) may be subject to permeation by lower-molecular weight organic solvents or petroleum products. Products supplied under this section have been selected based on the non-expectation of encountering petroleum products or organic solvents. If during the course of pipeline installation the CONTRACTOR identifies, or suspects, the presence of petroleum products or any unknown chemical substance the ENGINEER is to be notified immediately. Installation of any further piping in the area of suspected contamination shall be stopped until direction is provided by the ENGINEER.

2.01 PIPE MATERIALS

PVC pipe shall conform to the latest edition of American Water Works Association (AWWA) Standard C900 with elastomeric gasket couplings in accordance with this Standard. The use of solvent cement connections shall not be allowed unless approved by the ENGINEER

Pipe shall be furnished with cast iron pipe equivalent outside diameter and the Pressure Class shall be 100, 150 or 200 psi. depending on the system design pressure and laying conditions.

PART 3: EXECUTION

3.01 INSTALLATION

The general provisions provided in Specification Section 15000 shall be strictly followed in addition to the following:

A. Pipe Joint Assembly

The assembly of joints should be performed as recommended by the pipe manufacturer. The elastomeric gaskets may be supplied separately in cartons or positioned in the bell joint or coupling at the factory. When gaskets are color coded, be sure to consult the pipe manufacturer or his literature for the significance. In all cases, clean the gasket, the bell or coupling interior, especially the groove area (except when gasket is permanently installed) and the spigot area with a rag, brush or paper towel to remove any dirt or foreign material before the assembling. Inspect the gasket, pipe spigot bevel, gasket groove, and sealing surfaces for damage or deformation. When gaskets are separate, use only gaskets which are designed for and supplied with the pipe. Insert them as recommended by the manufacturer.

Lubricant should be applied as specified by the pipe manufacturer. Bacterial growth, damage to the gaskets or the pipe, may be promoted by use of non-approved lubricants. Use only lubricant supplied by the pipe manufacturer.

After lubrication, the pipe is ready to be joined. Good alignment of the pipe is essential for ease of assembly. Align the spigot to the bell and insert the spigot into the bell until it contacts the gasket uniformly. Do not swing or "stab" the joint; that is, do not suspend the pipe and swing it into the bell. The spigot end of the pipe is marked by the manufacturer to indicate the proper depth of insertion.

Solvent cemented joints where approved by the ENGINEER should be made in accordance with manufacturer's recommendations or in accordance with ASTM D2855, "Standard Recommended Practice for Making Solvent Cemented Joints with Polyvinyl Chloride PVC Pipe and Fittings".

To join field-cut pipe, it is necessary to first prepare the pipe end. A square cut is

essential for proper assembly. The pipe shall be marked around its entire circumference prior to cutting to assure a square cut. Use a factory-finished beveled end as a guide for proper bevel angle, and depth of bevel plus the distance to the insertion reference mark. The end shall be beveled using a pipe beveling tool or a wood rasp which will cut the correct taper. A portable sander or abrasive disc may also be used to bevel the pipe end. Round off any sharp edges on the leading edge of the bevel with a pocket knife or a file.

SECTION 15130

PIPING SPECIALTIES
(OWNER Furnished)

PART 1: GENERAL

1.01 RELATED WORK SPECIFIED ELSEWHERE

See Specification Section 15000 - Piping - General Provisions. See sketches included at the end of Section 15000 for installation details for piping specialties.

PART 2: PRODUCTS

2.01 MATERIALS FURNISHED BY OWNER

OWNER will furnish and CONTRACTOR shall install the piping specialties included in Section SSC-1000.1.03 of the Specifications Special Conditions. Piping specialties in general include:

a. Gate valves
b. Butterfly valves
c. Tapping valves
d. Tapping sleeves
e. Valve boxes
f. Polyethylene encasement
g. Air release valves
h. Corporation and curb stops

PART 3: EXECUTION

3.01 INSTALLATION

General provisions provided in Section 15000 shall be strictly followed in addition to the following:

a. Polyethylene Encasement

Piping shall be encased in polyethylene to prevent contact with surrounding backfill and bedding material in areas shown or designated by the ENGINEER. Polyethylene material shall be installed in accordance with ANSI/AWWA C105/A21.5 Standards.

Polyethylene material will deteriorate rapidly when exposed to direct sunlight. Store all polyethylene encasement out of the sunlight. If during the installation period it is anticipated that the polyethylene encasement will be exposed to sunlight for more than two weeks (i.e., an open trench) Type C (black) polyethylene material must be used.

Service taps for polyethylene encased pipe shall follow the procedure described in AWWA Standard C600-87 Section 7.1.

b. Valve Boxes

Valve boxes shall be supported so that no load can be transmitted from the valve box to the valve. See Sketch No. 61-300-6 at the end of Section 15000. Tops shall be set at established grade.

c. Valves

Valves shall be set at the required locations with joints centered, spigots home and valve stems plumb unless otherwise directed by the OWNER.

d. Tapping Sleeves and Valves

Pressure testing of tapping sleeve and valve assemblies is required prior to making the tap. Refer to Specification Section 15030 for special requirements.

e. Air Release Valve Assembles

See Sketch 61-300-8 SK in Section 15000 for a typical air release valve assembly.

f. Air Blow-off

See Sketch 61-300-9 SK in Section 15000 for a typical air blow-off detail.

SECTION 15131

PIPING SPECIALTIES
(CONTRACTOR Furnished)

PART 1: GENERAL

1.01 SCOPE

This Section covers furnishing and installation of miscellaneous piping specialties as shown on the Drawings or in the Specification Special Conditions or as required to fulfill the intent of the project.

PART 2: PRODUCTS

2.01 POLYETHYLENE ENCASEMENT

Polyethylene encasement shall conform to ANSI/AWWA C105/A21.5 Standards.

Polyethylene material will deteriorate rapidly when exposed to direct sunlight. Store all polyethylene encasement out of the sunlight. If during the installation period it is anticipated that the polyethylene encasement will be exposed to sunlight for more than two weeks (i.e., an open trench) Type C (black) polyethylene material must be used.

2.02 VALVE BOXES

All valves shall be provided with valve boxes. Valve boxes shall be of the standard, adjustable, cast iron extension type, three piece, 5-1/4-inch shaft, screw type, and of such length as necessary to extend from valve to finished grade. The valve box shall be hot coated inside and out with coal tar or asphaltic compound.

Valve boxes shall be manufactured by one of the following approved manufacturers"

Bingham & Taylor, Mueller, Handley Industries, A.Y. McDonald, Quality Water Products, or Clay and Bailey.

Valve box bases shall conform to the following:

Valve Size	Base
4" and smaller	Round, 8" in height, 10 7/8" diameter at bottom
6" and 8"	Round, 11" in height, 14 3/8" diameter at bottom
10" and larger	Oval, 11" in height, 15" x 11 1/8" diameter at bottom

2.03 RODS, BOLTS, LUGS AND BRACKETS

All steel rods, bolts, lugs and brackets shall be ASTM A36 or A-307 carbon steel as a minimum requirement. After field installation all steel surfaces shall have one coat of Koppers #50 coal tar coating applied before backfill.

2.04 RETAINING GLANDS

All retaining glands shall be ductile iron with ductile iron set screws. Pressure ratings for use with ductile iron pipe shall be 150 psi.

PART 3: EXECUTION

3.01 INSTALLATION

See pipe installation specifications for general installation.

Piping shall be encased in polyethylene to prevent contact with surrounding backfill and bedding material in areas shown or designated by the ENGINEER. Polyethylene material shall be installed in accordance with ANSI/AWWA C105/A21.5 Standards.

Service taps for polyethylene encased pipe shall following the procedure described in AWWA Standard C600-87 Section 7.1.

Valve boxes shall be supported so that no load can be transmitted from the valve box to the valve. See sketch at the end of this Section. Tops shall be set at established grade.

Valves shall be set at the required locations with joints centered, spigots home and valve stems plumb unless otherwise directed by the OWNER.

Tapping sleeve and valve assemblies require pressure testing prior to making the tap. Refer to Specification Section 15030 for specific requirements.

SECTION 15150

GATE VALVES
(CONTRACTOR Furnished)

PART 1: GENERAL

1.01 SCOPE

The CONTRACTOR shall furnish, install and test all gate valves shown on the drawings and/or in the Specification Special Conditions.

1.02 SUBMITTALS

Shop drawings and manufacturer's literature shall be submitted to the ENGINEER for approval in accordance with Section 1300.

1.03 RELATED WORK

Specification Section 15000 - Piping - General Provisions.

PART 2: PRODUCTS

2.01 SMALL GATE VALVES

All gate valves, 3 inches through 12 inches, shall be iron body, resilient-seated, nut-operated, non-rising stem, gate valves suitable for buried service. The valves shall be designed for an operating pressure of 200 psi and test pressures to 400 psi. Valves shall be designed to operate in the vertical position. Valves shall comply fully with AWWA Standard C509. Valve ends shall be mechanical joint in accordance with AWWA C111. Stem seals shall be double O ring stem seals. Square operating nuts conforming to AWWA C509 shall be used. Valves shall open (left or right) in accordance with the OWNER's standard.

2.02 LARGE GATE VALVES

Gate valves larger than 12-inches NPS shall be iron body, double disc, parallel seats, bronze mounted, rubber "O" ring packing seals, and conforming to ANSI/AWWA C500 Standard. All valves shall have openings through the body of the same circular area as that of the pipe to which they are attached. All valves furnished shall open (left or right) in accordance with the OWNER standard.

Testing of valves shall be in accordance with AWWA C500 Section 28. Certified copies of all tests shall be provided prior to shipment. The ENGINEER reserves the right to observe all tests.

Valves shall have mechanical joint ends unless otherwise designated on the plans or approved

by the ENGINEER.

All valves shall be designed for a working pressure of 150 pounds per square inch (psi) and 300 psi test pressure unless otherwise noted on the plans or directed by the ENGINEER. The CONTRACTOR shall make all valves tight under their working pressures after they have been placed and before the main is placed in operation. Any defective parts shall be replaced at the CONTRACTOR's expense.

Acceptable manufacturers: Mueller Company, Decatur, Illinois, Waterous Company, St. Paul, Minnesota, McWane Cast Iron Pipe Co. (Clow and M&H Divisions only) Birmingham, Alabama, United States Pipe and Foundry, Burlington, New Jersey and Stockham Valves and Fittings, Birmingham, Alabama.

PART 3: EXECUTION

3.01 INSTALLATION

Installation requirements contained in Specification Section 15000 shall be strictly followed.

SECTION 15155

BUTTERFLY VALVES
(CONTRACTOR Furnished)

PART 1: GENERAL

1.01 SCOPE

The CONTRACTOR shall furnish all butterfly valves shown on the drawings and/or the Specification Special Conditions.

1.02 RELATED WORK

Specification Section 15000 - Piping - General Provisions.

1.03 SUBMITTALS

Shop drawings and manufacturer's literature shall be submitted to the ENGINEER for approval in accordance with Section 1300.

PART 2: PRODUCTS

2.01 VALVES

Rubber-seated butterfly valves shall be installed as shown on the Contract Drawings and shall be furnished to conform with Class 150B of the ANSI/AWWA C504 Standard and the following specifications. All valves furnished shall open (left or right) in accordance with the OWNER standard.

Valve bodies shall be cast iron or ductile iron with mechanical joint ends. Mechanical joint ends shall conform with ANSI/AWWA C111/A21.11 standards.

Valve shafts shall consist of one-piece units extending through the discs of 18-8 stainless Type 303 or 304. Shaft diameter shall be in accordance with Table 3 of ANSI/AWWA C504 standard.

Valve discs shall be Ni-Resist, Type 1, or cast iron with stainless steel edges.

Valve seats shall be hycar or natural rubber mounted in the valve body.

Valve bearings shall be nylon or teflon.

Manual buried operators shall be either worm gear or traveling nut type and shall be furnished with 2-inch AWWA nuts and extension shafts. Input required at nuts to produce specified output torque shall be less than 150 ft.-lb. Operators shall be designed to withstand an input at the nut of 300 ft.-lb. without damage to any operator components. Operator output torque shall be equal to or greater than that specified in Table 4 of C504 for the valve class specified in the schedule.

Acceptable manufacturers: Henry Pratt Company, Aurora, Illinois and McWane Cast Iron Pipe Co. (Clow and M&H Divisions only) Birmingham, Alabama.

PART 3: EXECUTION

3.01 SETTING VALVES

Installation requirements in Specification Section 15000 shall be strictly followed.

SECTION 15170

TAPPING SLEEVES, SADDLES AND VALVES
(CONTRACTOR Furnished)

PART 1: GENERAL

1.01 SCOPE

The CONTRACTOR shall furnish, install and test all tapping sleeves and valves and tapping saddles as shown on the drawings and/or in the Specification Special Conditions.

1.02 RELATED WORK

Specification Section 15000 - Piping - General Provisions

1.03 SUBMITTALS

Shop drawings and manufacturer's literature shall be submitted to the ENGINEER for approval in accordance with Section 1300.

PART 2: PRODUCTS

2.01 GENERAL

All tapping sleeves, saddles and valves shall be designed for a working pressure of 200 psig for 12-inch and smaller and 150 psig for sizes larger than 12-inch. Test pressure shall be twice the working pressure.

2.02 TAPPING SLEEVES AND VALVES

The CONTRACTOR shall verify the type of existing pipe and the outside diameter of the pipe on which the tapping sleeve is to be installed.

Tapping sleeves shall be ductile iron or cast-iron dual compression type. The sleeves shall be made in two halves which can be assembled and bolted around the main.

The horizontal tapping valve shall conform to the applicable requirements of AWWA C509. The tapping valves shall have flanged inlets with mechanical joint outlets, enclosed bevel gears, bypass valve, rollers, tracks and scrapers.

Acceptable manufacturers: Mueller, McWane, U.S. Pipe and Waterous.

2.03 TAPPING SADDLES

Tapping saddles shall consist of ductile iron outlet castings, attached to the pipeline with high strength steel straps. Castings shall be sealed to pipeline with O-ring seals. Saddles shall have ANSI A21.10 flanged outlets counterbored for use with tapping valves and tapping equipment.

PART 3: EXECUTION

3.01 INSTALLATION

General provisions provided in Specification Section 15000 shall be strictly followed. Installation of the tapping sleeves, tapping saddle, and tapping valve is to be in accordance with the manufacturers instructions. The tapping procedure is to be in accordance with the tapping machine manufacturer's instructions.

3.02 PRELIMINARY TESTING

After installation of the tapping sleeve and valve assembly but prior to making the tap the assembly shall be pressure tested hydrostatically in accordance with Specification Section 15030. The test shall be made with the valve open using a tapped mechanical joint cap. No leakage is acceptable. The test pressure shall be maintained for 15 minutes minimum.

SECTION 15180

FIRE HYDRANTS
(OWNER Furnished)

PART 1: GENERAL

1.01 SCOPE

The CONTRACTOR shall furnish all labor, material, tools and equipment required to install fire hydrants at the location shown on the plans, or where designated by the ENGINEER. The OWNER will furnish the fire hydrants which will be available at the OWNER'S storage yard.

PART 2: PRODUCTS

2.01 MATERIAL

Fire hydrants will be furnished by the OWNER.

PART 3: EXECUTION

3.01 INSPECTION PRIOR TO INSTALLATION

Fire hydrants shall be inspected at time of delivery to the CONTRACTOR. Each hydrant shall be cycled to full open and full closed positions to ensure that no internal damage or breakage has occurred during shipment and handling. All external bolts shall be checked for proper tightness.

After inspection, the hydrant valves shall be closed and the outlet nozzle caps replaced to prevent the entry of foreign matter. Stored hydrants shall be protected from weather elements with the inlets facing downward.

3.02 INSTALLATION

Hydrants shall be located as shown on the plans or as directed by the ENGINEER. The location shall provide complete accessibility and minimize the possibility of damage from vehicles or injury to pedestrians. When placed behind the curb, the hydrant barrel shall be set so that no portion of the pumper or hose nozzle cap will be less than eighteen to twenty-four inches, depending on local requirements, from the gutter face of the curb. All hydrants shall stand plumb with the pumper nozzle facing the curb. Hydrants having two hose nozzles 90? apart shall be set with each nozzle facing the curb at an angle of 45?. Hydrants shall be set to the established grade, with nozzles at least eighteen inches above the ground as shown or as directed by the ENGINEER.

Unless otherwise shown each hydrant shall be connected to the main with a six inch branch connection controlled by an independent six inch gate valve.

When hydrant installations have a greater than normal exposure to damage due to vehicular traffic (parking lot installations, unusual driving situation, etc.) the ENGINEER may authorize hydrant protection using steel pipe bollards, hydrants requiring such protection are to be designated by the ENGINEER and installed by CONTRACTOR in accordance with Sketch No. 61-300-13 included in Section 15000 of these specifications. Bollards shall be located as necessary adjacent to the hydrant and in such a manner as not to interfere with the ability to connect hoses or operate the hydrant. Additionally, the bottom of the bollard and encasement shall be located above the hydrant supply piping and valve to prevent the possibility of damage to the piping should the bollard be displaced during vehicular contact. Payment for bollards shall be per the supplemental unit price schedule.

Unless otherwise directed by the ENGINEER, a drainage pit two feet in diameter and two feet deep shall be excavated below each hydrant. The pit shall be filled and compacted with coarse gravel or broken stone mixed with coarse sand, under and around the base of the hydrant to a level 6 inches above the waste opening. No hydrant drainage pit shall be connected to a sewer.

The drainage pit shall be lined and covered with geotextile fabric and the fabric shall completely isolate the gravel or stone so that no fill material or adjacent earth comes in contact with pit material.

In situations where the ground water table is above the drain opening of the hydrant barrel the ENGINEER is to be notified. Then, if directed by ENGINEER, the drain opening shall be plugged using a method acceptable to the hydrant manufacturer. In this situation the drainage pit is not required but special marking on the hydrant acceptable to the OWNER is required to indicate the drain opening has been plugged. Prior to project acceptance if CONTRACTOR operates a hydrant having a plugged drain connection, CONTRACTOR is required to pump the barrel dry after each use.

A reaction or thrust backing shall be provided at the base of each hydrant and shall not obstruct the drainage outlet of the hydrant. The size and shape of concrete thrust backing and the number and size of tie rods shall be approved by the ENGINEER. The material to be used for thrust backing shall be as specified in Section 3300. Requirements for tie rods is specified in Section 15000.

Please refer to Sketch No. 61-300-7 in Section 15000 for a typical fire hydrant assembly detail.

3.03 TESTING

After installation and before backfilling (and after pressure testing the water main, if it has been installed) test the hydrant as follows:

A. Pressure Test

1. Open the hydrant fully and fill with water; close all outlets.
2. To prevent caps from being blow off dry-barrel hydrants and to prevent other possible damage, vent air from the hydrant by leaving one of the caps slightly loose as the hydrant is being filled. After all air has escaped, tighten the cap before proceeding.
3. Apply line pressure.
4. Check for leakage at flanges, nozzles and operating stem.
5. If leakage is noted, repair or replace components or complete hydrant until no leaks are evident.

B. Drainage Test for Dry-Barrel Hydrants

1. Following the pressure test, close hydrant.
2. Remove one nozzle cap and place pylon or hand over nozzle opening.
3. Drainage rate should be sufficiently rapid to create a noticeable suction.
4. After backfilling, operate the hydrant to flush out any foreign material.
5. Tighten nozzle caps, them back them off slightly so that they will not be excessively tight; leave tight enough to prevent removal by hand.

SECTION 15190

AIR RELEASE AND BLOW-OFF OUTLETS
(CONTRACTOR Furnished)

PART 1: GENERAL

1.01 SCOPE

The CONTRACTOR shall furnish and install air release and blow-off outlets at the locations shown on the Drawings or as directed by the ENGINEER. The details of the outlets shall be as shown on Sketches 61-300-8, 61-300-8A and 61-300-9 included at the end of Section 15000.

1.02 SUBMITTALS

Shop drawings and manufacturer's literature for equipment to be supplied shall be submitted to the ENGINEER for approval in accordance with Section 1300.

1.03 RELATED WORK

Specification Section 15000 - Piping - General Provisions.
Specification Section 3450 - Precast Concrete Manhole.

PART 2: PRODUCTS

2.01 COMBINATION AIR/VACUUM RELEASE VALVES

The CONTRACTOR shall provide APCO Model No. 145C as manufactured by Valve and Primer Corporation, Schaumburg, Illinois. Bodies shall be case iron with stainless steel floats.

2.02 CURB BOXES

Curb boxes shall be the standard, cast iron, sliding or screw type, 1" or 2-1/2" as required, complete with lid and head bolt. Boxes shall be adjustable from 18 inches to 66 inches.

Acceptable manufacturers: Bingham & Taylor, Mueller, Handley Industries, Clay and Baily, A.Y. McDonald, Quality Water Products.

2.03 COPPER PIPE

Copper pipe shall be Type L or Type K, as specified, meeting the requirements of ASTM Standard B88.

2.04 CORPORATION STOPS

Corporation stops shall be of the brass ball valve type manufactured in accordance with AWWA Standard C800. The inlet connection shall have standard AWWA tapered threads unless otherwise required by the ENGINEER. The outlet connection shall be a flared copper connection end. The sizes shall range from 1/2" to 2" and shall match the size of specified copper pipe material.

Acceptable manufacturers and model numbers are:

Ford Meter Box Company - FB400 thru FB1600
Mueller - H-15000 Series
A.Y. McDonald - 4701 Series

2.05 CURB STOPS

Curb stops shall be bronze body construction, ball valves, with Double O-ring stem seals. Curb stops shall conform with AWWA Standard C800. End connections shall be suitable for flared copper connection. If required by the ENGINEER valves shall be furnished with square gate valve operating nuts. Sizes shall be from 3/4" to 2" and shall match the service line size.

Acceptable manufacturers and model numbers:

Ford Meter Box Company - B Series
Mueller - H15000 Series
A.Y. McDonald - 6000 Series

2.06 MISCELLANEOUS SERVICE LINE FITTINGS

Miscellaneous service line fittings such as couplings, adaptors, saddles, bends, plugs, etc. shall conform to AWWA Specification C800.

Acceptable manufacturers: Ford Meter Box, Mueller, and A.Y. McDonald.

PART 3: EXECUTION

3.01 INSTALLATION

See Specification Section 15000 for Sketches 61-300-8, 61-300-8A and 61-300-9 showing typical installation details for air/vacuum release valve assemblies and air blow-off assemblies respectively.

3.02 INSTALLATION OF CORPORATION STOPS

Tapping of all water mains shall be performed by experienced craftsmen familiar with installation of water service lines.

All taps shall be made with a suitable tapping machine (Mueller, Ford, Hays or Dresser type) using the proper combined drill and tap. Hand held drilling equipment is not acceptable.

Corporation stops shall be inspected for damaged threads and proper operation of the ball valve prior to installation.

Should the water main wall thickness or material (plastic, concrete or A-C pipeline material) be unsuitable for direct tapping a tapping saddle shall be used.

Proper installation of the corporation stop should allow between 2 and 3 threads to extend beyond the inside wall of the main. If necessary a test tap shall be made with the boring bar marked to the proper depth. The corporation shall not be threaded completely into the pipe such that it becomes shouldered with the main. Lubricants of any type shall not be used when installing the corporation.

Taps made to polyethylene encased water main shall be made using the procedure outlined in AWWA C600-87 Section 7.1.

3.03 INSTALLATION OF LINE AND FITTINGS

Copper pipe shall be installed between the tap connection and the curb stop or air release valve location making only gradual changes in grade or alignment as required. Sharp bends (greater than 15°) in any direction are not allowed unless approved by the ENGINEER.

Curb stops shall be installed with the operating nut in the vertical position and the curb box centered over the nut. Curb boxes are to be installed and adjusted to be flush with finished grade. Curb boxes shall have lids installed and locked.

Excavation, backfilling and surface restoration shall be completed in accordance with Division 2 of these Specifications.

After completion of copper pipe installation but prior to backfilling the corporation stop shall be opened slowly to fill the line. When the line is full and all air has been removed completely open the corporation. All piping, fittings and taps shall be visually checked for leaks.

SECTION 15200

SERVICE LINES
(CONTRACTOR Furnished)

PART 1: GENERAL

1.01 SCOPE

Where shown on the drawings and/or Specification Special Conditions the CONTRACTOR shall furnish and install service lines originating at the water main and terminating at a curb stop connection. This section does not include service lines or meter installations beyond the curb stop. Refer to Sketch No. 61-300-10 contained in Section 15000 for a typical service line installation.

1.02 RELATED WORK

Specification Section 15000 - Piping - General Provisions.

PART 2: PRODUCTS

2.01 COPPER SERVICE LINE MATERIAL

Copper pipe shall be Type L or Type K, as specified, meeting the requirements of ASTM Standard B88. Pipe size (3/4", 1", 1-1/2", 2") and type to be determined by the ENGINEER.

2.02 POLYETHYLENE SERVICE LINE MATERIAL

Polyethylene service line material shall be Class 160 (SDR-7), ultra high molecular weight, conforming to AWWA Standard C901. Pipe sizes to be 3/4", 1", 1-1/2" and 2", copper tube size (CTS) or iron pipe size (IPS) as per ENGINEER's requirements.

Acceptable manufacturers: Orangeburg Industries, Continental Industries.

2.03 CURB BOXES

Curb boxes shall be standard, 1" or 2-1/2", cast iron, sliding or screw type, complete with lid and head bolt, adjustable from 18-inches to 66-inches. Size to be determined by ENGINEER.

Acceptable manufacturers: Bingham & Taylor, Mueller, Handley Industries, Clay & Baily, A.Y. McDonald, Quality Water Products.

2.04 CORPORATION STOPS

Corporation stops shall be of the brass, ball valve type manufactured in accordance with AWWA Standard C800. The inlet connection shall have standard AWWA tapered threads unless otherwise required by the ENGINEER. The outlet connection shall be flared copper connection end or pack joint for polyethylene pipe as required. The sizes shall range from 1/2" to 2" and shall match the size of specified service line material.

Acceptable manufacturers and model numbers are:

Ford Meter Box Company - FB400 thru FB1600
Mueller - H-15000 Series
A.Y. McDonald - 4701 Series

2.05 CURB STOPS

Curb stops shall be bronze body construction, ball valves, with Double O-ring stem seals. Curb stops shall conform with AWWA Standard C800. End connections shall be suitable for flared copper connection or pack joint for polyethylene pipe as required. If required by the ENGINEER valves shall be furnished with square gate valve operating nuts. Sizes shall be from 3/4" to 2" and shall match the service line size.

Acceptable manufacturers and model numbers:

Ford Meter Box Company - B Series
Mueller - H-15000 Series
A.Y. McDonald - 6000 Series

2.06 MISCELLANEOUS SERVICE LINE FITTINGS

Miscellaneous service line fittings such as couplings, adaptors, saddles, bends, plugs, etc. shall conform to AWWA Specification C800.

Acceptable manufacturers: Ford Meter Box, Mueller, and A.Y. McDonald.

2.07 POLYETHYLENE ENCASEMENT

Copper service line material (pipe, valves, stops, etc.) installed on mains with polyethylene encasement or other type protective wrap shall be encased in polyethylene. Encasement material and installation shall be per Specification Section 15131 and ANSI/AWWA Standard C105/A21.5.

PART 3: EXECUTION

3.01 INSTALLATION OF CORPORATION STOPS

Tapping of all water mains shall be performed by experienced craftsmen familiar with installation of water service lines.

All taps shall be made with a suitable tapping machine (Mueller, Ford, Hays or Dresser type) using the proper combined drill and tap. hand held drilling equipment is not acceptable.

Corporation stops shall be inspected for damaged threads and proper operation of the ball valve prior to installation.

The main may be tapped at the horizontal centerline ±45° as shown on Sketch No. 61-300-10 in Section 15000.

Should the water main wall thickness or material (plastic, concrete or A-C pipeline material) be unsuitable for direct tapping a tapping saddle shall be used.

Proper installation of the corporation stop should allow between 2 and 3 threads to extend beyond the inside wall of the main. If necessary a test tap shall be made with the boring bar marked to the proper depth. The corporation shall not be threaded completely into the pipe such that it becomes shouldered with the main. Lubricants of any type shall not be used when installing the corporation.

Taps made to polyethylene encased water main shall be made using the procedure outlined in AWWA C600-87, Section 7.1.

3.02 INSTALLATION OF SERVICE LINE AND FITTINGS

Service lines shall be installed between the tap connection and the curb stop location making only gradual changes in grade or alignment as required. Sharp bends (greater than 15°) in any direction are not allowed unless approved by the ENGINEER. 1 ½" and 2" service lines may be installed using three (3) 1-inch corporation stops and a 3-branch connection. This is in lieu of installing a 1 ½" or 2" corporation stop. Included in Section 15000 is Sketch No. 61-300-11 which is to be followed for this type of installation.

All plastic service line connections shall use insert stiffeners of the appropriate length and size.

Curb stops shall be installed with the operating nut in the vertical position and the curb box centered over the nut. Curb boxes are to be installed plum and adjusted to be flush with finished grade. Curb boxes shall have lids installed and locked.

Excavation, backfilling and surface restoration shall be completed in accordance with Division 2 of these Specifications.

After completion of service line installation but prior to backfilling the corporation stop shall by opened slowly to fill the line. When the line is full and all air has been removed completely open the corporation and close the curb stop. All piping, fittings, and taps shall be visually checked for leaks.

SECTION 15205

SERVICE LINES
(OWNER Furnished)

PART 1: GENERAL

1.01 SCOPE

Where shown on the drawings and/or Specification Special Conditions the OWNER shall furnish and the CONTRACTOR shall install service lines originating at the water main and terminating at a curb stop connection. This section does not include service lines or meter installations beyond the curb stop. Refer to Sketch No. 61-300-10 contained in Section 15000 for a typical service line installation.

1.02 RELATED WORK

Specification Section 15000 - Piping - General Provisions.

PART 2: PRODUCTS

Service line material shall be furnished by the OWNER for installation by the CONTRACTOR. Refer to Section SSC-1000.1.03 for material to be furnished by the OWNER.

PART 3: EXECUTION

3.01 INSTALLATION OF CORPORATION STOPS

Tapping of all water mains shall be performed by experienced craftsmen familiar with installation of water service lines.

All taps shall be made with a suitable tapping machine (Mueller, Ford, Hays, or Dresser type) using the proper combined drill and tap. Hand held drilling equipment is not acceptable.

Corporation stops shall be inspected for damaged threads and proper operation of the ball valve prior to installation.

The main may be tapped at the horizontal centerline ±45° as shown on Sketch No. 61-300-10 included in Section 15000.

Should the water main wall thickness or material (plastic, concrete or A-C pipeline material) be unsuitable for direct tapping a tapping saddle shall be used.

Proper installation of the corporations top should allow between 2 and 3 threads to extend beyond the inside wall of the main. If necessary a test tap shall be made with the boring bar marked to the proper depth. The corporation shall not be threaded completely into the pipe such that it becomes shouldered with the main. Lubricants of any type shall not be used when installing the corporation.

Taps made to polyethylene encased water main shall be made using the procedure outlined in AWWA C600-87, Section 7.1.

3.02 INSTALLATION OF SERVICE LINE AND FITTINGS

Service lines shall be installed between the tap connection and the curb stop location making only gradual changes in grade or alignment as required. Sharp bends (greater than 15°) in any direction are not allowed unless approved by the ENGINEER. 1 ½" and 2" service lines may be installed using three (3) 1-inch corporation stops and a 3-branch connection. This is in lieu of installing a 1 ½" or 2" corporation stop. Included in Section 15000 is Sketch No. 61-300-11 which is to be followed for this type of installation.

All plastic service line connections shall use insert stiffeners of the appropriate length and size.

Curb stops shall be installed with the operating nut in the vertical position and the curb box centered over the nut. Curb boxes are to be installed plum and adjusted to be flush with finished grade. Curb boxes shall have lids installed and locked.

Excavation, backfilling and surface restoration shall be completed in accordance with Division 2 of these Specifications.

After completion of service line installation but prior to backfilling the corporation stop shall be opened slowly to fill the line. When the line is full and all air has been removed, completely open the corporation and close the curb stop. All piping, fittings and taps shall be visually checked for leaks.

SECTION 15120

POLYVINYL CHLORIDE (PVC) PIPE
(OWNER Furnished)

PART 1: GENERAL

1.01 COORDINATION OF WORK

Connection to existing pipelines may require shutdown of OWNER facilities. Construction work and connections shall be closely coordinated with the OWNER through the ENGINEER. The ENGINEER, in consult with the OWNER, may select the time, including Saturdays, Sundays or holidays, which, in the opinion of the ENGINEER, will cause the least inconvenience to the OWNER and/or its customers, for connection to existing pipelines, and the CONTRACTOR will perform such connections at such times as may be directed by the ENGINEER at the Contract prices and no claim for premium time or additional costs will be made by the CONTRACTOR.

1.02 RELATED WORK

Piping General Provisions - Section 15000

PART 2: PRODUCTS

Research has documented that certain pipe materials (such as polyvinyl chloride, polyethylene, and polybutylene) and certain elastomers (such as those used in gasket material) may be subject to permeation by lower-molecular weight organic solvents or petroleum products. Products supplied under this section have been selected based on the non-expectation of encountering petroleum products or organic solvents. If during the course of pipeline installation the CONTRACTOR identifies, or suspects, the presence of petroleum products or any unknown chemical substance the ENGINEER is to be notified immediately. Installation of any further piping in the area of suspected contamination shall be stopped until direction is provided by the ENGINEER.

2.01 PIPE MATERIALS

OWNER will furnish and CONTRACTOR shall install all PVC pipe and jointing materials. Materials to be furnished by OWNER are included in Section SSC-1000.1.03 of the Specifications Special Conditions.

PART 3: EXECUTION

3.01 INSTALLATION

The general provisions specified in Section 15000 shall be strictly followed in addition to the following:

A. Pipe Joint Assembly

The assembly of joints should be performed as recommended by the pipe manufacturer. The elastomeric gaskets may be supplied separately in cartons or positioned in the bell joint or coupling at the factory. When gaskets are color coded, be sure to consult the pipe manufacturer or his literature for the significance. In all cases, clean the gasket, the bell or coupling interior, especially the groove area (except when gasket is permanently installed) and the spigot area with a rag, brush or paper towel to remove any dirt or foreign material before the assembling. Inspect the gasket, pipe spigot bevel, gasket groove, and sealing surfaces for damage or deformation. When gaskets are separate, use only gaskets which are designed for and supplied with the pipe. Insert them as recommended by the manufacturer.

Lubricant should be applied as specified by the pipe manufacturer. Bacterial growth, damage to the gaskets or the pipe, may be promoted by use of non-approved lubricants. Use only lubricant supplied by the pipe manufacturer.

After lubrication, the pipe is ready to be joined. Good alignment of the pipe is essential for ease of assembly. Align the spigot to the bell and insert the spigot into the bell until it contacts the gasket uniformly. Do not swing or "stab" the joint; that is, do not suspend the pipe and swing it into the bell. The spigot end of the pipe is marked by the manufacturer to indicate the proper depth of insertion.

Solvent cemented joints where approved by the ENGINEER should be made in accordance with manufacturer's recommendations or in accordance with ASTM D2855, "Standard Recommended Practice for Making Solvent Cemented Joints with Polyvinyl Chloride (PVC) Pipe and Fittings".

To join field-cut pipe, it is necessary to first prepare the pipe end. A square cut is essential for proper assembly. The pipe shall be marked around its entire circumference prior to cutting to assure a square cut. Use a factory-finished beveled end as a guide for proper bevel angle, and depth of bevel plus the distance to the insertion reference mark. The end shall be beveled using a pipe beveling tool or a wood rasp which will cut the correct taper. A portable sander or abrasive disc may also be used to bevel the pipe end. Round off any sharp edges on the leading edge of the bevel with a pocket knife or a file.

SECTION 15121

POLYVINYL CHLORIDE (PVC) PIPE
(CONTRACTOR Furnished)

PART 1: GENERAL

1.01 SCOPE

This Section covers PVC pressure pipe in diameters 4 inches through 12 inches.

1.02 COORDINATION OF WORK

Connection to existing pipelines may require shutdown of OWNER facilities. Construction work and connections shall be closely coordinated with the OWNER through the ENGINEER. The ENGINEER, in consult with the OWNER, may select the time, including Saturdays, Sundays or holidays, which, in the opinion of the ENGINEER, will cause the least inconvenience to the OWNER and/or its customers, for connection to existing pipelines, and the CONTRACTOR will perform such connections at such times as may be directed by the ENGINEER at the Contract prices and no claim for premium time or additional costs will be made by the CONTRACTOR.

1.03 SUBMITTALS

Shop drawings and manufacturer's literature for all CONTRACTOR supplied materials shall be promptly submitted to the OWNER for approval in accordance with Section 1300.

1.04 RELATED WORK

Piping General Provisions - Section 15000

PART 2: PRODUCTS

Research has documented that certain pipe materials (such as polyvinyl chloride, polyethylene, and polybutylene) and certain elastomers (such as those used in gasket material) may be subject to permeation by lower-molecular weight organic solvents or petroleum products. Products supplied under this section have been selected based on the non-expectation of encountering petroleum products or organic solvents. If during the course of pipeline installation the CONTRACTOR identifies, or suspects, the presence of petroleum products or any unknown chemical substance the ENGINEER is to be notified immediately. Installation of any further piping in the area of suspected contamination shall be stopped until direction is provided by the ENGINEER.

2.01 PIPE MATERIALS

PVC pipe shall conform to the latest edition of American Water Works Association (AWWA) Standard C900 with elastomeric gasket couplings in accordance with this Standard. The use of solvent cement connections shall not be allowed unless approved by the ENGINEER

Pipe shall be furnished with cast iron pipe equivalent outside diameter and the Pressure Class shall be 100, 150 or 200 psi. depending on the system design pressure and laying conditions.

PART 3: EXECUTION

3.01 INSTALLATION

The general provisions provided in Specification Section 15000 shall be strictly followed in addition to the following:

A. Pipe Joint Assembly

The assembly of joints should be performed as recommended by the pipe manufacturer. The elastomeric gaskets may be supplied separately in cartons or positioned in the bell joint or coupling at the factory. When gaskets are color coded, be sure to consult the pipe manufacturer or his literature for the significance. In all cases, clean the gasket, the bell or coupling interior, especially the groove area (except when gasket is permanently installed) and the spigot area with a rag, brush or paper towel to remove any dirt or foreign material before the assembling. Inspect the gasket, pipe spigot bevel, gasket groove, and sealing surfaces for damage or deformation. When gaskets are separate, use only gaskets which are designed for and supplied with the pipe. Insert them as recommended by the manufacturer.

Lubricant should be applied as specified by the pipe manufacturer. Bacterial growth, damage to the gaskets or the pipe, may be promoted by use of non-approved lubricants. Use only lubricant supplied by the pipe manufacturer.

After lubrication, the pipe is ready to be joined. Good alignment of the pipe is essential for ease of assembly. Align the spigot to the bell and insert the spigot into the bell until it contacts the gasket uniformly. Do not swing or "stab" the joint; that is, do not suspend the pipe and swing it into the bell. The spigot end of the pipe is marked by the manufacturer to indicate the proper depth of insertion.

Solvent cemented joints where approved by the ENGINEER should be made in accordance with manufacturer's recommendations or in accordance with ASTM D2855, "Standard Recommended Practice for Making Solvent Cemented Joints with Polyvinyl Chloride PVC Pipe and Fittings".

To join field-cut pipe, it is necessary to first prepare the pipe end. A square cut is essential for proper assembly. The pipe shall be marked around its entire circumference prior to cutting to assure a square cut. Use a factory-finished beveled end as a guide for proper bevel angle, and depth of bevel plus the distance to the insertion reference mark. The end shall be beveled using a pipe beveling tool or a wood rasp which will cut the correct taper. A portable sander or abrasive disc may also be used to bevel the pipe end. Round off any sharp edges on the leading edge of the bevel with a pocket knife or a file.

ADDENDUM E

100' Refund Process Example

TENNESSEE AMERICAN WATER JOB COST/DEPOSIT RECORD ADDENDUM E

ASSET W.O.	ADV. MAIN	ADV. LAT.
D26-0201-P-0519		

DEPOSITOR: ABC Devloper
ADDRESS: 42 Wallaby Way
Sydney Australia

JOB NAME: Developer Extension

			TOTAL JOB COST $100,000.00 ESTIMATED	$90,000.00 ACTUAL	$10,000.00 VARIANCE
A. COST OF MAIN			$ 95,000.00	$ 85,000.00	$ 10,000.00
B. COST OF SERVICE LATERALS			$ -		$ -
C. FOOTAGE OF MAIN			1000	1000	0
D. UNIT COST OF MAIN, LATERALS (A+B/C)			$ 95.00	$ 85.00	$ 10.00
E. NUMBER OF UPFRONT CREDITS			0	0	
F. UPFRONT CREDIT RATE (100XD)	MAIN	100	$ 9,500.00	$ 8,500.00	$ 1,000.00
G. UPFRONT CREDIT AMOUNT (EXF)			$ -	$ -	$ -
H. DEPOSIT FOR MAINS - REFUNDABLE		YES	$ 95,000.00	$ 85,000.00	$ 10,000.00
ACCOUNT #72801100					
I. DEPOSIT FOR SERVICES - REFUNDABLE		YES	$ -	$ -	$ -
ACCOUNT #72801000					
J. DEPOSIT FOR FIRE HYDRANTS - REFUNDABLE		NO	$ 5,000.00	$ 5,000.00	$ -
ACCOUNT #72802100					
K. TOTAL JOB COST			$ 100,000.00	$ 90,000.00	$ 10,000.00 **
L. TOTAL DEPOSIT (H+I+J)			$ 100,000.00	$ 90,000.00	$ 10,000.00
M. CLERK,DATE					
N. SUPERVISOR, DATE					

** DUE CUSTOMER DISBURSEMENT $10,000.00
BILL CUSTOMER M.I.

APPROVED BY:

TOTAL REFUNDABLE AMOUNT (H+I)	MAIN %	LATERALS %	
$85,000.00	100.00%	0.00%	
Total Per Refund	$8,500.00	$0.00	$8,500.00

EXHIBIT B

EXTENSION DEPOSIT AGREEMENT

THIS AGREEMENT made and entered into this _____ day of _____, 20_____, by and between the TENNESSEE-AMERICAN WATER, hereinafter called the "TAW" and _____ hereinafter called the "DEPOSITOR."

WHEREAS, the DEPOSITOR desires an extension of the water distribution mains of TAW as hereinafter described.

W I T N E S S E T H:

FIRST: TAW contracts and agrees to lay the water main (s) as shown in red on the diagram which is hereto attached and made a part hereof, which main (s) and described and located as follows:

Install

SECOND: It is expressly understood and agreed that if TAW shall be delayed or prevented from installing the water main (s) hereinabove described because of its failure to secure pipe or other necessary construction materials, or for any other causes beyond its control, such failure or delay in performance shall be excused; provided, however, that if such failure or delay in performance shall extend for a period of more than one (1) year from the date hereof, the DEPOSITOR shall have the right to cancel and terminate this Agreement on thirty (30) days' written notice to TAW and thereafter both parties shall be relieved of all duties and obligations arising hereunder. The right to cancel and terminate this Agreement by the DEPOSITOR shall not be revoked, however, if TAW has received the necessary pipe and construction materials and the DEPOSITOR has made the deposit as hereinafter required, in which event TAW shall have the obligation to prosecute diligently the work of installing the water main (s) hereinabove described until said work is completed.

THIRD: The DEPOSITOR hereby agrees to deposit with TAW, upon receipt of written notice from TAW that it is prepared and able to go forward with the work provided in Paragraph FIRST hereof, an amount equal to (a) the estimated number of feet of pipe to be installed multiplied by the estimated Unit Cost Per Foot of Main, plus the estimated cost of all

other facilities (excluding public fire hydrants, hydrant laterals, service lines and meters) which TAW shall have determined are required to render adequate service, less (b) a credit equal to the amount produced by multiplying the estimated Unit Cost Per Foot of Main by one hundred (100) and by multiplying this result by the number of Bona Fide Prospective Customers whose premises abut said extension and will be directly connected thereto.

FOURTH: Upon completion of the installation of the water main (s) described in Paragraph FIRST above, or as soon thereafter as may be practicable, TAW shall furnish to the DEPOSITOR a statement of actual cost. In the event that such statement of cost is less than the original estimate of cost, TAW shall promptly return to the DEPOSITOR the difference between such amounts. In the event that such statement of cost exceeds the original estimate of cost, the DEPOSITOR shall promptly make a further deposit with TAW in an amount equal to the difference between such amounts. It is the intent of this paragraph that the DEPOSITOR shall deposit the actual cost to TAW, less the credit provided for in Paragraph THIRD above.

FIFTH: TAW hereby agrees to refund to the DEPOSITOR, during the period of ten (10) years from the actual date of the original deposit hereunder, for each additional Bona Fide Customer for which a service line has been connected to the extension in question an amount equal to the completed actual Unit Cost Per Foot of Main used in calculating the final deposit multiplied by one hundred (100).

SIXTH: The ownership of the water main (s) installed hereunder shall at all times be and remain in TAW, its successors and assigns.

SEVENTH: This Agreement shall be valid and binding on TAW only when executed by its President or a Vice President.

EIGHTH: This Agreement shall be binding upon the heirs, executors, administrators, successors, and assigns of the respective parties.

NINTH: Any notice given hereunder shall be deemed sufficient if in writing and sent by registered mail to TAW at: 109 Wiehl Street, Chattanooga, TN 37403 and the DEPOSITOR at: _____.

TENTH: This Agreement is entered into pursuant to the legally established Rules and Regulation of TAW, and the words, phrases, and terms hereof are to be understood and interpreted in conformity with said Rules and Regulations, which are hereby incorporated herein by reference.

Executed in triplicate by the parties hereto on the date first above written,

WITNESS:

TENNESSEE-AMERICAN TAW

_____

By: _____
Valoria Armstrong, President

WITNESS:

DEPOSITOR

_____

By: _____
Owner

SUPPLEMENTAL MEMORANDUM

This Supplemental Memorandum is executed by the parties hereto under and pursuant to the provisions of paragraph THIRD of an Extension Deposit Agreement in writing between the parties entered into on the _____ day of _____20___, for the installation by TAW of a certain water main (s) described therein in the paragraph FIRST. It is therefore agreed and stipulated:

The estimated cost of the extension is _____ Dollars.

Credit is allowed for _____ Bona Fide Prospective Customers at the rate of _____ Dollars each for a total amount of _____ _____ Dollars in accordance with paragraph THIRD (b) of the Extension Deposit Agreement.

The amount of deposit received from the DEPOSITOR (S) is _____ _____ Dollars.

The Supplemental Memorandum shall be attached to the original Extension Deposit Agreement.

Dated

_____
Date of Deposit

WITNESS: TENNESSEE-AMERICAN WATER

_____ By: _____
Valoria Armstrong, President

WITNESS: DEPOSITOR

_____ By: _____
Owner

EXTENSION DEPOSIT AGREEMENT BETWEEN

TENNESSEE-AMERICAN WATER

AND

_____

DATED

_____

Covering installation of:

_____

WBS# _____

Exhibit B


Grid North
N
W
E
S
TN SPC NAD 83
Information taken from water plans provided by others
0
450
900
1,800
B&H Surveying Services
PO Box 446 Jasper, TN 37347
423-942-0022
bChadford84@gmail.com
Water System Map For
Jasper Highlands Subdivision
Phases 1 & 2
Revisions

Exhibit C

TENNESSEE-AMERICAN WATER COMPANY

TPUC No. 19
Tenth Revision of Sheet No. 3-C
Cancelling
Ninth Revision of Sheet No. 3-C

CLASSIFICATION OF SERVICE

COMMERCIAL

1. **Schedule of Rate and Charges Available For:**

(N,C) a) **The General Water Service Tariff is available for public water supply service in all territory served by the Company except that area served by the Lookout Mountain System, Elder Mountain, territory served in Lakeview and other unincorporated areas in Georgia, east of Rossville, Suck Creek and other unincorporated areas of Marion County served by Suck Creek Utility District, the City of Whitwell, TN and the Jasper Highlands in Kimball, TN.**

b) **The Lookout Mountain Tariff is available for public water supply service in the territory served by the Company's Lookout Mountain High Service Area in the town of Lookout Mountain, Tennessee, Lookout Mountain, Georgia, and Elder Mountain, Tennessee.**

(C) c) **The Lakeview Tariff is available for public water supply service in the territory served by the Company in Lakeview and other unincorporated areas of Georgia, east of Rossville as indicated on the Service Area Map: TPUC No. 19 Pages 13 and 14.**

d) **The Suck Creek Tariff is available for public water supply service in the territory served by the Company in Suck Creek and other unincorporated areas of Marion County formerly served by Suck Creek Utility District.**

(E) e) **The Lone Oak Tariff is available for public water supply service in the territory served by the Lone Oak Utility District.**

(N) f) **The Whitwell Tariff is available for public water supply in the City of Whitwell, TN.**

(N) g) **The Jasper Highlands Tariff is available for public water supply in the Jasper Highlands development in Kimball, TN.**

(C) Change in text
(E) Eliminated
(N) New text

ISSUED: **September 6, 2018** **EFFECTIVE: October 6, 2018**

BY:

Valoria V. Armstrong, President
109 Wiehl Street
Chattanooga, Tennessee 37403

TENNESSEE-AMERICAN WATER COMPANY

TPUC No. 19
Ninth Revision of Sheet No. 3-O
Cancelling
Eighth Revision of Sheet No. 3-O

CLASSIFICATION OF SERVICE

OTHER PUBLIC AUTHORITY

1. Schedule of Rate and Charges Available For:

(N,C) a) The General Water Service Tariff is available for public water supply service in all territory served by the Company except that area served by the Lookout Mountain System, Elder Mountain, territory served in Lakeview and other unincorporated areas in Georgia, east of Rossville, the City of Whitwell, TN and the area of Jasper Highlands in Kimball, TN.

b) The Lookout Mountain Tariff is available for public water supply service in the territory served by the Company's Lookout Mountain High Service Area in the town of Lookout Mountain, Tennessee, Lookout Mountain, Georgia, and Elder Mountain, Tennessee.

(C) c) The Lakeview Tariff is available for public water supply service in the territory served by the Company in Lakeview and other unincorporated areas of Georgia, east of Rossville as indicated on the Service Area Map: TPUC No. 19 Pages 13 and 14.

(N) d) The Whitwell Tariff is available for public water supply in the City of Whitwell, TN.

(N) e) The Jasper Highlands Tariff is available for public water supply in the Jasper Highlands development in Kimball, TN.

(C) Change in text
(N) New text

ISSUED: September 6, 2018 **EFFECTIVE:** October 6, 2018

BY:

Valoria V. Armstrong, President
109 Wiehl Street
Chattanooga, Tennessee 37403

TENNESSEE-AMERICAN WATER COMPANY

TPUC No. 19
Tenth Revision of Sheet No. 3-R
Cancelling
Ninth Revision of Sheet No.3-R

CLASSIFICATION OF SERVICE

RESIDENTIAL

1. **Schedule of Rate and Charges Available For:**

(N,C) **a) The General Water Service Tariff is available for public water supply service in all territory served by the Company except that area served by the Lookout Mountain System, Elder Mountain, territory served in Lakeview and other unincorporated areas in Georgia, east of Rossville, Suck Creek and other unincorporated areas of Marion County served by Suck Creek Utility District, the City of Whitwell, TN and the area of Jasper Highlands in Kimball, TN.**

b) The Lookout Mountain Tariff is available for public water supply service in the territory served by the Company's Lookout Mountain High Service Area in the town of Lookout Mountain, Tennessee, Lookout Mountain, Georgia, and Elder Mountain, Tennessee.

(C) **c) The Lakeview Tariff is available for public water supply service in the territory served by the Company in Lakeview and other unincorporated areas of Georgia, east of Rossville as indicated on the Service Area Map: TPUC No. 19 Pages 13 and 14.**

d) The Suck Creek Tariff is available for public water supply service in the territory served by the Company in Suck Creek and other unincorporated areas of Marion County formerly served by Suck Creek Utility District.

(E) **e) The Lone Oak Tariff is available for public water supply service in the territory served by the Lone Oak Utility District.**

(N) **f) The Whitwell Tariff is available for public water supply in the City of Whitwell, TN.**

(N) **g) The Jasper Highlands Tariff is available for public water supply in the Jasper Highlands development in Kimball, TN**

(C) Change in text
(E) Eliminated
(N) New text

ISSUED: **September 6, 2018** **EFFECTIVE: October 6, 2018**

BY:

Valoria V. Armstrong, President
109 Wiehl Street
Chattanooga, Tennessee 37403

TENNESSEE-AMERICAN WATER COMPANY **TPUC No. 19**
JASPER HIGHLANDS **Original Sheet No. 4R-JH**

CLASSIFICATION OF SERVICE

APPLICABILITY

For all residential, commercial, and other public authority customers of Jasper Highlands development in Kimball, TN.

VOLUMETRIC RATES:

Cost per 100 Gallons

Monthly Use	Jasper Highlands General Water Service	
First 2,500 gallons	$67.50	(N)
Next 2,500 gallons	$1.70 per 100 gallons	(N)
Next 2,500 gallons	$1.51 per 100 gallons	(N)
Above 7,500 gallons	$1.35 per 100 gallons	(N)

(N) Indicates New rate

ISSUED: September 6, 2018 **EFFECTIVE: October 6, 2018**

BY: _____

Valoria V. Armstrong, President
109 Wiehl Street
Chattanooga, Tennessee 37403

Exhibit D

PETITIONER'S EXHIBIT VVA-1

TENNESSEE-AMERICAN WATER COMPANY, INC.

DOCKET NO. 18-_____

DIRECT TESTIMONY

OF

VALORIA V. ARMSTRONG

ON

JOINT PETITION OF TENNESSEE-AMERICAN WATER COMPANY AND THUNDER AIR INC. D/B/A JASPER HIGHLANDS DEVELOPMENT INC. ("THUNDER AIR INC."). FOR THE APPROVAL OF AN ASSET PURCHASE AGREEMENT AND FOR THE ISSUANCE OF A CERTIFICATE OF CONVENIENCE AND NECESSITY

Q. PLEASE STATE YOUR NAME AND BUSINESS ADDRESS.

A. My name is Valoria V. Armstrong and my business address is 109 Wiehl Street, Chattanooga, Tennessee, 37403.

Q. BY WHOM ARE YOU EMPLOYED AND IN WHAT CAPACITY?

A. I am employed by Tennessee American Water Company ("TAWC" or "Company") as President.

Q. HAVE YOU PREVIOUSLY FILED TESTIMONY BEFORE THIS OR ANY OTHER COMMISSION?

A. No.

Q. PLEASE STATE YOUR EDUCATIONAL AND PROFESSIONAL BACKGROUND.

A. I received a B.A. degree with emphasis in Accounting from Georgia Southern University in 2000, and I received a M.S. degree in Human Resources Development from Villanova University in 2017. I am a certified Professional in Human Resources with the Society of Human Resource Management. I have been employed by American Water Works ("AWW") since 2011. I began as human resource Business Partner with TAWC until 2013 when I was promoted to human resources Director, responsible for Missouri, Indiana, Illinois, Iowa, Michigan, Tennessee and Kentucky. In November 2015, I accepted the position of President for TAWC. I serve on the boards of the Tennessee Chamber of Commerce and Industry, the Chattanooga Area Chamber of Commerce's Board of Directors, Executive Committee Secretary, and Foundation Committee. I am also on the University of Chattanooga College of Business Dean's Advisory Board, the Tennessee Aquarium's Board of Trustees and Executive Committee Secretary and River City

Company Board of Directors. In 2018, Governor Haslam appointed me to the Tennessee TN H2O Steering Committee. I am an alumna of Leadership Tennessee and a graduate of the St. Louis Chamber of Commerce Diversity Initiative Fellows Program.

Q. WHAT ARE YOUR DUTIES AS PRESIDENT?

A. As President, I am responsible for the overall operating and financial performance of TAWC, which includes leading a team of water professionals who oversee the Company's efforts related to safety and employee engagement, field customer service, distribution, water quality, environmental excellence and growth. Additionally, I reinforce customer, regulatory and governmental relationships, as the principal officer of the company.

Q. WHAT IS THE PURPOSE OF YOUR TESTIMONY TODAY?

A. The purpose of my testimony is to support the Joint Petition filed by TAWC and Thunder Air Inc. d/b/a Jasper Highlands Development, Inc. ("Thunder Air Inc.") for the approval of the purchase of the assets that make up the water system owned and operated by Thunder Air Inc. by TAWC and grant a Certificate of Public Convenience and Necessity to TAWC, with its accompanying privilege and franchise, to serve the Thunder Air Inc. development. The Asset Purchase Agreement between TAWC and Thunder Air Inc. (the "Purchase Agreement") is attached to the Joint Petition as **Exhibit A.**

Q. CAN YOU PROVIDE A BRIEF OVERVIEW OF TAWC'S SERVICE AREA?

A. TAWC has owned and operated the water system in our current footprint since 1887 and represents approximately 80,670 customer connections in Chattanooga, Tennessee including surrounding areas of Hamilton County and North Georgia. Moreover, in 2007, Suck Creek was purchased by TAWC. Of the total number of customer connections, approximately 228 are located in Suck Creek. In 2014, the City of Whitwell was acquired

by TAWC. Of the total number of customer connections, there are currently about 2,768 customer connections in the City of Whitwell.

Q. WERE THE NEGOTIATIONS BETWEEN TAWC AND THUNDER AIR INC. CONDUCTED UNDER YOUR SUPERVSION?

A. Yes.

Q. WHAT WAS THE NATURE OF THE NEGOTIATIONS?

A. TAWC Director of Operations, Kevin Kruchinski, began to discuss the potential sale of Thunder Air Inc. water assets to TAWC in 2017. TAWC and Thunder Air Inc. continued conversations about a potential acquisition into 2018. The owner of Thunder Air Inc. desires to sell and transfer the Thunder Air Inc.'s assets to a credible entity with professionals in the water industry who possesses knowledge and expertise to own and operate the water system. Ultimately, it was agreed that the acquisition of Thunder Air Inc.'s water assets would be mutually beneficial to both parties. TAWC Witness Kevin Kruchinski will provide more details regarding the negotiations.

Q. WAS THE ASSET PURCHASE AGREEMENT ("APA") DEVELOPED BASED ON ARMS-LENGTH NEGOTIATIONS?

A. Yes. The Pre-filed Testimony of TAWC Witness Kevin Kruchinski will support the arms-length nature of the negotiations.

Q. AS BEST THAT YOU RECALL, HOW DID THE DISCUSSIONS BETWEEN TAWC AND THUNDER AIR INC.START?

A. As a leading water provider in Tennessee, from time to time TAWC reaches out to others in the water provider community for a host of reasons, including discussions related to certain challenges and opportunities for the water industry going forward. Sometimes these discussions include or lead to conversations regarding potential interests in considering operating and management arrangements and even sales. In certain circumstances, we are aware that consolidating water systems can produce meaningful benefits to all involved.

Q. CAN ACQUISITIONS PROVIDE OVERALL BENEFITS?

A. Yes. Strategic, quality acquisitions can provide immediate revenue benefits for both utilities (the buyer and the seller) and therefore for both customer bases as well (existing customers and the newly acquired customers). Consolidating systems provides a larger customer base on which to distribute fixed costs, provides opportunities for operating efficiencies and utilization of economies of scale, and serves to mitigate future rate increase impacts. TAWC is in a unique position within the State of Tennessee as a part of American Water. American Water, with its solid financial performance, has access to capital necessary for infrastructure investments. American Water, through its economies of scale and nationally recognized expertise in water treatment and distribution, provides that same level of service and expertise to all of its customers no matter how large or small the individual system.

Q. CAN THIS ACQUISITION BE EFFICIENTLY INTEGRATED INTO THE COMPANY?

A. Yes. Thunder Air Inc.'s geographical location allows for easy access from the Whitwell water system operations. Shared resources through management and operations of the system creates efficiencies that are passed along to customers through expense saving. Thunder Air Inc. will benefit from TAWC economies of scale.

Q. CAN YOU FURTHER ELABORATE ON THE BENEFITS TO TAWC'S CUSTOMERS FOR THE COMPLETION OF THIS TRANSACTION?

A. Yes. TAWC continuously seeks opportunities for efficiencies through reduced costs, increased revenues, or otherwise enhance its business to keep ratepayer costs low and minimize rate increases. Strategically expanding TAWC's customer base, particularly by providing service in areas within close geographic proximity to current TAWC operations, supports the interests of both TAWC and its existing customers.

Q. CAN YOU FURTHER EXPLAIN THE BENEFITS TO THUNDER AIR INC. CUSTOMERS FOR THE COMPLETION OF THIS TRANSACTION?

A. Yes. Customers of Thunder Air Inc. will benefit through the professional management, long-term planning, and sustained investment by TAWC. TAWC has the ability to immediately respond to customer and system needs due to Thunder Air Inc.'s close proximity to the Whitwell and Chattanooga water systems. TAWC will bring the necessary expertise of managing and operating water systems, which is essential to the continued and full development of Thunder Air Inc.

Q. DOES TAWC HAVE THE FINANCIAL AND MANAGERIAL EXPERTISE TO OPERATE THE THUNDER AIR INC. SYSTEM?

A. Yes. As the official records of the agency reveal, TAWC has a proven history of providing safe, reliable drinking water to its customers. TAWC proudly employs over 100 water professionals with experience in the areas of operations, finance and engineering. They bring the necessary knowledge to manage and operate Thunder Air Inc.'s water system. During its 131 years of operation, TAWC has never received a United States Environmental Protection Agency notice of violation of any type (water quality or documentation). TAWC invests around $20 million in capital on a yearly basis. The capital plan is developed and managed by a group of high level and skilled engineering professionals. I have complete confidence in all employees at TAWC to provide excellent customer service, while delivering high quality affordable water to our customers.

Q. IS THIS PROPOSED TRANSACTION IN THE PUBLIC INTEREST?

A. Yes. In addition to the benefits that I have already outlined in my testimony water utilities are one of the most capital intensive utilities in the industry. In properly maintaining and supporting a water system, any owner and operator thereof is regularly confronted with pressures to address, including increasing costs, enhanced water quality regulations and the ever-recurring need for capital investments. Aging infrastructure and technological advances must be consistently studied and appropriately addressed. TAWC has a long history of successfully providing safe, reliable drinking water to its customers. This transaction will benefit the customers of the System through the sustained investment, professional management, and long-term planning by TAWC. The approval of the petition

and the issuance of a CCN are necessary and appropriate for the public convenience and to properly conserve and protect the public interest.

Q. DOES THIS CONCLUDE YOUR TESTIMONY?

A. Yes.

STATE OF Tennessee)
)
COUNTY OF Hamilton)

BEFORE ME, the undersigned authority, duly commissioned and qualified in and for the State and County aforesaid, personally came and appeared Valoria V. Armstrong, being by me first duly sworn deposed and said that:

She is appearing as a witness on behalf of Tennessee-American Water Company before the Tennessee Public Utility Commission, and if present before the Commission and duly sworn, her testimony would be as set forth in her pre-filed testimony in this matter.

Valoria V. Armstrong

Sworn to and subscribed before me
this 6 day of September, 2018.

Kathryn Hart
Notary Public

My Commission Expires: 9-27-2020

KATHRYN HART
STATE OF TENNESSEE NOTARY PUBLIC
HAMILTON COUNTY

43993257.v1

BEFORE THE TENNESSEE PUBLIC UTILITY COMMISSION
NASHVILLE, TENNESSEE

DOCKET NO. 18- _____

DIRECT TESTIMONY OF
DANE BRADSHAW

Q: PLEASE STATE YOUR NAME AND PLACE OF RESIDENCE.

A: My name is Dane Bradshaw. I am the President of Thunder Air Inc. d/b/a Jasper Highlands Development, Inc. ("Thunder Air Inc."). Accordingly, I am personally familiar with the underlying background associated with Tennessee-American Water Company's ("TAWC") purchase of the water system owned by Thunder Air Inc. (the "System").

Q: WHAT IS THE PURPOSE OF YOUR TESTIMONY TODAY?

A: The purpose of my testimony is to support the Joint Petition, which seeks the approval of the purchase of the assets that make up the System and the grant of a Certificate of Public Convenience and Necessity to TAWC. The Asset Purchase Agreement between TAWC and Thunder Air Inc. (the "Purchase Agreement") is attached to the Joint Petition as **Exhibit A**.

Q: PLEASE GIVE THE COMMISSION A BRIEF HISTORY OF THUNDER AIR INC.'S WATER SYSTEM.

A: Thunder Air Inc.'s residential mountaintop community is part of a 9,000 acre mountain atop the Cumberland Plateau with 21.3 miles of bluff frontage. While well water is not necessarily uncommon in this region, Thunder Air Inc. felt that finding a solution to provide a community water supply was in the best interest of the development and its future residents. With no access to tax incremental financing ("TIF's") or like thereof, Thunder Air Inc. privately funded and successfully executed the launch of the System. Thunder Air Inc. owns the System that provides water services to customers within its growing development. While Thunder Air owns and oversees the System, the System is operated by Jasper Highlands Property Owners Association. The location of the development and the System are generally shown on the map attached to the Joint Petition as **Exhibit B**.

Approximately 600 lots have been sold to a wide range of property owners representing 38 different states and the development plans, in terms of platted lots, are still less than half

complete. Over 100 homes have either been built or are currently under construction. All of these customers are served and will be served by the System.

Q. PLEASE EXPLAIN THE EVENTS THAT LED UP TO THE NEGOTIATIONS BETWEEN THUNDER AIR INC. AND TAWC IN REGARD TO THE TRANSFER OF THE ASSETS OF THE SYSTEM.

A. In the fall of 2017, TAWC held a reception at Thunder Air Inc.'s scenic Pat's Summitt Pavilion and was invited on a follow up tour of the System. After being very impressed with the up to date infrastructure, new water tank, and overall quality of the system, our conversations continued. After multiple site visits and due diligence, both parties were able to find a win/win scenario leading to the current asset purchase agreement that has been submitted.

The core business of Thunder Air Inc. is real estate development. The core business of TAWC is the provision of safe and reliable water. In the long-run, a well-established, professionally run utility, like TAWC, whose core business is water, is in an excellent position to make the necessary capital investments that will be required in the future and to properly manage the assets while keeping rates reasonably low to support our community for years to come. Preparing Thunder Air Inc. d/b/a Jasper Highlands Development Inc. for the future is the basic premise behind this transaction.

There were numerous meetings and discussions between TAWC and representatives of Thunder Air Inc. over the terms and conditions of the Purchase Agreement. These were arms-length negotiations and both parties were represented by attorneys. The Purchase Agreement went through numerous drafts during the negotiations process, and there was significant give and take by both TAWC and Thunder Air Inc.

Q: WHAT ASSETS ARE BEING ACQUIRED BY TAWC FROM THUNDER AIR INC. UNDER THE PURCHASE AGREEMENT?

A: The assets that are the subject of the Purchase Agreement include all of Thunder Air Inc.'s assets that are or could constitute part of the transmission and distribution infrastructure and equipment that comprise the System, such as real property, tangible personal property, records, permits and intangible rights and property utilized in the operation of the System. These assets are set forth in Section 2.1 of Article 2 of the Purchase Agreement.

Q: IN YOUR OPINION, IS THE ACQUISITION BY TAWC OF THE SYSTEM AND THE GRANT OF A CCN TO TAWC BOTH IN THE PUBLIC INTEREST?

A: Yes. The Purchase Agreement and the Certificate of Convenience and Necessity to TAWC are necessary and proper for the public convenience and properly conserves and protects the public interest both today and in the future. On behalf of Thunder Air Inc., I am requesting that the Commission approve the Joint Petition, including the granting of a

Certificate of Convenience and Necessity to TAWC to serve all of the customers currently served by the System and to serve future customers of the System.

Q. DOES THIS CONCLUDE YOUR TESTIMONY?

A. Yes it does.

STATE OF Tennessee)
)
COUNTY OF Hamilton)

BEFORE ME, the undersigned authority, duly commissioned and qualified in and for the State and County aforesaid, personally came and appeared Dane Bradshaw, being by me first duly sworn deposed and said that:

He is appearing as a witness on behalf of Thunder Air Inc. d/b/a Jasper Highlands Development Inc. before the Tennessee Public Utility Commission, and if present before the Commission and duly sworn, his testimony would be as set forth in his pre-filed testimony in this matter.

Dane Bradshaw

Sworn to and subscribed before me
this 6th day of September, 2018.

Notary Public

My Commission Expires: 01/12/2019

MAGGIE K. LEWIS
STATE OF TENNESSEE
NOTARY PUBLIC
COUNTY OF HAMILTON
MY COMMISSION EXPIRES: JANUARY 12, 2019

44012266.v1

PETITIONER'S EXHIBIT RKK-1

TENNESSEE-AMERICAN WATER COMPANY, INC.

DOCKET NO. 18-_____

DIRECT TESTIMONY

OF

R. KEVIN KRUCHINSKI

ON

JOINT PETITION OF TENNESSEE-AMERICAN WATER COMPANY AND THUNDER AIR, INC. D/B/A/JASPER HIGHLANDS DEVELEOPMENT, INC. FOR THE APPROVAL OF AN ASSET PURCHASE AGREEMENT AND FOR THE ISSUANCE OF A CERTIFICATE OF CONVENIENCE AND NECESSITY

Q. PLEASE STATE YOUR NAME AND PLACE OF EMPLOYMENT.

A. My name is Kevin Kruchinski. I am the Director of Operations for Tennessee American Water Company ("TAWC").

Q. HAVE YOU PREVIOUSLY FILED TESTIMONY BEFORE THIS OR ANY OTHER COMMISSION?

A. No.

Q. PLEASE STATE YOUR EDUCATIONAL AND PROFESSIONAL BACKGROUND.

A. I received a B.S. degree in Natural Resource Conservation-Management from the University of Kentucky in 2001, and I received a Master of Business degree from Sullivan University in 2011. I earned a Utility Management Professional certification from Western Kentucky University and Kentucky Rural Water Association in 2007. While working in Kentucky, I also earned a Grade IV-A water treatment license and a Grade IV water distribution system operator license.

Upon graduation from the University of Kentucky I started work with the City of Danville in Kentucky. I worked for the city engineer and my role was to establish a geographic information systems department and map all of the utility infrastructure. My role evolved over about five years, transitioning from engineering to operating the water plant to eventually serving as the assistant superintendent of the system. I began working with Kentucky American Water Company ("KAWC") in 2006 as Operations Specialist. My primary role was to support plant, distribution, and wastewater operations in Lexington and Owenton, Kentucky. In 2009 I was promoted to Operations Supervisor and established as the operations lead on one of American Water's single largest capital projects. In this

role, I was responsible for starting up and staffing a new 20 million gallon per day water treatment facility and commissioning a 31 mile pipeline, including a 20 mgd pump station along the route. In 2011 I was promoted to Operations Superintendent II, responsible for KAWC's Northern Division. In this role, I was responsible for production, distribution, wastewater, and customer service operations in Owenton, Kentucky. I had both operations and managerial responsibilities along with managing relationships with key stakeholders, elected officials, and regulators. In 2012 I was promoted to Operations Superintendent I in Lexington, KY. In this position, I was responsible for two of KAWC's largest treatment facilities along with wastewater responsibilities. While in this role, I was part of the team that integrated the City of Millersburg water and sewer operations into KAWC following an acquisition by KAWC of the City of Millerburg's assets. In 2015 I served as an interim Senior Manager in Gary, Indiana for Indiana American Water and later that year I was promoted to Director of Operations for TAWC. I am a board member on the Tennessee Underground Damage Enforcement Board and Chattanooga's Habitat for Humanity. I am a past member of the Ohio River Sanitation Commission's, Water Users Advisory council.

Q. WHAT ARE YOUR DUTIES AS DIRECTOR OF OPERATIONS?

A. My primary responsibilities are managing and supporting water quality, field operations, production, and maintenance operations within the state. In this role, I have six direct reports that manage the different areas of the operation and am responsible for 100 employees in the day-to-day operations of TAWC. I provide strategic and tactical responsibility for all operations and financials.

Q. WHAT IS THE PURPOSE OF YOUR TESTIMONY TODAY?

A. The purpose of my testimony is to provide information to support the Joint Petition filed by TAWC and Thunder Air, Inc. d/b/a Jasper Highlands Development, Inc. ("Thunder Air Inc."), in Kimball, Tennessee for the approval of the purchase of the assets that make up Thunder Air Inc.'s water system (the "System") and the grant of a Certificate of Public Convenience and Necessity to TAWC. I have been actively involved in and am familiar with TAWC's proposed purchase of the Thunder Air Inc.'s water system. The Asset Purchase Agreement between TAWC and Thunder Air Inc. (the "Purchase Agreement") is attached to the Joint Petition as **Exhibit A**.

Q. CAN YOU SUMMARIZE THUNDER AIR INC.'S CURRENT SERVICE AREA?

A. Yes. Thunder Air Inc., an upscale mountain community development, encompasses nearly 9,000 acres on the Cumberland Plateau half an hour west of Chattanooga and twenty miles from our Whitwell operation. The location of the system is generally shown on the map attached to the Joint Petition as **Exhibit B** (collectively the "System").

Q. CAN YOU PROVIDE A BRIEF DESCRIPTION OF THE SYSTEM?

A. Yes, the development, located in Kimball, TN, has two fully equipped pump houses, one well, one underground tank, one hundred water meters, a 262,000 gallon above ground water tank, fifteen fire hydrants and approximately sixteen miles of water main. There are approximately 100 water customers located within the system with several new homes under construction. The system purchases all of its water from South Pittsburg Board of Water Works and Sewers.

Q. PLEASE IDENTIFY A BRIEF HISTORY OF THE STEPS THAT LED UP TO THE EXECUTION OF THE PURCHASE AGREEMENT THAT IS PENDING FOR APPROVAL BEFORE THE COMMISSION.

A. My team and I have fairly regular interactions with most of the neighboring water providers around the Chattanooga area to discuss common issues and opportunities. However, we were unfamiliar with Thunder Air Inc.'s water system. So, when an opportunity presented itself to visit the system and meet with their water manager I took the opportunity. TAWC initially met with the owner and operator of Thunder Air Inc. in 2017. After several meetings between the parties, it was determined that an acquisition of Thunder Air Inc.' water assets could be mutually beneficial to both parties. Because of their close geographic proximity to current TAWC operations, we believe there is an opportunity to incrementally provide economies of scale and efficiencies for Thunder Air Inc. over the long-term operations, while developing a larger customer base for fixed costs and help mitigate future rate increases.

Q. WHAT DUE DILIGENCE HAS TAWC UNDERTAKEN AS PART OF THE DECISION TO ENTER INTO THE ASSET PURCHASE AGREEMENT?

A. Among other things, TAWC inspected the System assets to confirm their condition and to ensure alignment with their assets list. We reviewed their environmental regulatory information as reported to TDEC. TAWC also reviewed all financial information associated with the System. Finally, TAWC evaluated its ability to operate the System efficiently, particularly given its close proximity to TAWC's Whitwell operations.

Q. PLEASE EXPLAIN WHAT TYPES OF UPGRADES ARE NEEDED TO ADDRESS ANY DEFICIENCIES THAT THE SYSTEM CURRENTLY HAS.

A. The System was constructed within the last five years, and the assets are in good operating condition. The manual read meters will be replaced with an automated meter reading style such that TAWC can efficiently read the meters without immediately needing to hire any additional staffing. The supervisory control and data acquisition (SCADA) system will also be upgraded consistent with Whitwell's system. This will allow remote operation from TAWC's nearby Whitwell operation and eliminate the need to maintain duplicate systems.

Q. HOW DOES TAWC INTEND TO OPERATE THE SYSTEM?

A. The Thunder Air Inc.'s system purchases all of its water from the South Pittsburg Board of Water Works and Sewer under a purchase water contract. TAWC will continue this arrangement. TAWC will provide field services support from its Whitwell operations, including meter reading, maintenance of distribution system assets, and water quality compliance. Management oversight will be provided from both the Chattanooga and Whitwell offices.

Q. WILL TAWC HIRE ANY NEW EMPLOYEES TO OPERATE THE SYSTEM?

A. No. Thunder Air Inc. does not currently have any employees dedicated to the operation and management of the water system. The current employees of Thunder Air Inc. that, in addition to their other respective duties, support the operations and management of the System will be retained by Thunder Air Inc. and continuing performing their other regular responsibilities for Thunder Air Inc.. TAWC will provide operations and management of the System with existing TAWC employees as an expansion of their current duties.

Q. WHAT IS THE PURCHASE PRICE OF THE THUNDER AIR INC. SYSTEM?

A. $1,500,000.

Q. HOW DID TAWC ARRIVE AT THE PURCHASE PRICE?

A. In late May of 2018 we began discussing the details of an asset purchase which involved back and forth discussions about priorities, the importance of managing customer rates, and the long term development of the area. After several discussions and meetings representing arms-length negotiations, we arrived at a purchase price of $1,500,000. The purchase price is supported by the current water rates and is less than the depreciated book value of the system. TAWC will adopt the current rates as charged by Thunder Air Inc.

Q. DOES TAWC HAVE THE FINANCIAL, MANAGERIAL, AND TECHNICAL EXPERTISE TO OPERATE THE THUNDER AIR INC. SYSTEM?

A. As the Director of Operations, I am responsible for the day-to-day operations of all of our production and field services employees in TAWC. As reflected in the agency's official records, TAWC has the financial, managerial and technical expertise to operate the System. TAWC proudly employs over 100 water professionals with experience in the areas of operations, finance and engineering. They bring the necessary knowledge to manage and operate Thunder Air Inc.'s water system. During its 131 years of operation, TAWC has never received a United States Environmental Protection Agency notice of violation of any type (water quality or documentation).

Q. ARE YOU AWARE OF ANY OPPOSITION OR OBJECTIONS TO TAWC'S REQUEST FOR A CERTIFICATE OF CONVENIENCE AND NECESSITY FROM THOSE CURRENTLY SERVED BY THE SYSTEM.

A. No, I am not.

Q. WILL THE APPROVAL OF THIS PETITION SERVE THE PUBLIC INTEREST?

A. Yes. Water utilities are one of the most capital intensive utilities in the industry. In properly maintaining and supporting a water system, the owner and operator thereof is confronted with a host of pressures, primary of which are increasing costs, enhanced water quality regulations and the ever-recurring need for capital investments. Aging infrastructure and technological advances must be consistently studied and appropriately addressed. Regulations concerning water treatment continue to evolve with emerging contaminants on an ongoing basis. This transaction provides economies of scale for both TAWC and Thunder Air Inc. customers, and will provide professional management, long-term planning, specialized water treatment and operations expertise, and sustained investment by TAWC for the System that it may not otherwise be able to afford as a stand alone water system. The approval of the petition is in the public interest.

Q. Q. WHAT DO YOU RECOMMEND WITH REGARD TO THIS PETITION?

A. I recommend that the Petition be approved.

Q. DOES THIS CONCLUDE YOUR DIRECT TESTIMONY?

A. Yes.

STATE OF Tennessee)
)
COUNTY OF Hamilton)

BEFORE ME, the undersigned authority, duly commissioned and qualified in and for the State and County aforesaid, personally came and appeared R. Kevin Kruchinski, being by me first duly sworn deposed and said that:

He is appearing as a witness on behalf of Tennessee-American Water Company before the Tennessee Public Utility Commission, and if present before the Commission and duly sworn, his testimony would be as set forth in his pre-filed testimony in this matter.

R. Kevin Kruchinski

Sworn to and subscribed before me
this 5 day of September, 2018.

Kathryn Hart
Notary Public

My Commission Expires: 9-27-2020

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PETITIONER'S EXHIBIT LCB-1

TENNESSEE-AMERICAN WATER COMPANY, INC.

DOCKET NO. 18-_____

DIRECT TESTIMONY

OF

LINDA C. BRIDWELL

ON

JOINT PETITION OF TENNESSEE-AMERICAN WATER COMPANY AND THUNDER AIR, INC. D/B/A/JASPER HIGHLANDS DEVELEOPMENT, INC. FOR THE APPROVAL OF AN ASSET PURCHASE AGREEMENT AND FOR THE ISSUANCE OF A CERTIFICATE OF CONVENIENCE AND NECESSITY

Q. PLEASE STATE YOUR NAME AND BUSINESS ADDRESS.

A. My name is Linda C. Bridwell and my business address is 2300 Richmond Road, Lexington, Kentucky 40502.

Q. BY WHOM ARE YOU EMPLOYED AND IN WHAT CAPACITY?

A. I am employed by American Water Works Service Company ("AWW") as Senior Manager of Rates and Regulation for Tennessee and Kentucky.

Q. HAVE YOU PREVIOUSLY FILED TESTIMONY BEFORE THIS OR ANY OTHER COMMISSION?

A. Yes. I provided written testimony before the Tennessee Public Utility Commission ("TPUC" or "Commission") in TPUC Docket No. 12-00049 and TPUC Docket No. 15-00001, and both written and oral testimony in TPUC Docket No. 14-00121, 15-00029, 15-00111, 15-00131, 16-00022, 16-00126, 16-00148, 17-0002, 17-00124, 18-00009 AND 18-00022 and I've provided written testimony in TPUC Docket No. 18-00022. I have also provided both written and oral testimony in at least seventeen different proceedings before the Kentucky Public Service Commission ("PSC"), including rate cases, special investigations, and applications for a Certificate of Public Convenience and Necessity.

Q. PLEASE STATE YOUR EDUCATIONAL AND PROFESSIONAL BACKGROUND.

A. I received a B.S. degree in Civil Engineering from the University of Kentucky in 1988, and I received a M.S. degree in Civil Engineering from the University of Kentucky in 1992, with an emphasis in water resources. I completed a Masters of Business Administration from Xavier University in Cincinnati, Ohio in 2000. I am a registered Professional Engineer in the Commonwealth of Kentucky.

I have been employed by American Water ("AW") since 1989. I began as a distribution supervisor for Kentucky American Water ("KAWC") until 1990 when I was promoted to Planning Engineer. Following that I was promoted to Engineering Manager, and later Director of Engineering in 1998. In July 2004, I accepted the position of Project Delivery and Developer Services Manager for the Southeast Region of AWW, responsible for Kentucky, Tennessee, and West Virginia. In 2008, I became the KAWC Project Delivery Manager for the construction of a new water treatment plant, booster station, and transmission main in Kentucky. This project was the largest project completed by American Water, in any of its regulated businesses, at $164 million. Upon completion of the project in October 2010, I became the Director of Environmental Compliance and Water Quality for KAWC and in February of 2012 I accepted my current position. I am an active member of the American Water Works Association (AWWA), served as president of the local chapter and state section of the American Society of Civil Engineering (ASCE), and served as an officer in the local chapter of the National Society of Professional Engineers (NSPE) and as a State officer. I have served periodically as an Adjunct Professor at the University of Kentucky in the Civil Engineering Department, teaching "Water Quality and Pollution Control" and the "Introduction to Environmental Engineering." I served as a member of the Civil Engineering Industrial Advisory Committee at the University of Kentucky from 2005 until 2012. I served as a Commissioner on the Kentucky Water Resources Development Commission established by Governor Patton and on the Kentucky State Board of Licensure for Professional Engineers and Land Surveyors. I currently serve as Vice Chairman of the Board of Directors for the Kentucky Infrastructure Authority.

Q. WHAT ARE YOUR DUTIES AS SENIOR MANAGER OF RATES AND REGULATION?

A. My primary responsibilities encompass the coordination of regulatory issues in Tennessee and Kentucky. This includes coordinating all reports and filings, working with regulatory staff to make sure that all information produced addresses the requirements or requests, and overseeing the preparation and filing of rate cases and tariff changes. I work with the senior management in both states on planning. I am also responsible for keeping abreast of changes in regulation, or trends in regulatory oversight across the United States that may impact our local operations. I report to the Presidents of Tennessee American Water ("Tennessee American," "TAWC" or "Company") and KAWC dually. I am located in Kentucky, but work closely with the TAWC staff in Tennessee as well.

Q. WHAT IS THE PURPOSE OF YOUR TESTIMONY?

A. The purpose of my testimony is to support the Joint Petition filed by TAWC and Thunder Air, Inc. d/b/a Jasper Highlands Development, Inc. ("Thunder Air Inc.") for the approval of the purchase of the assets that make up the water system owned Thunder Air Inc. by TAWC and a Certificate of Public Convenience and Necessity to TAWC, with its accompanying privilege and franchise, to serve the Thunder Air Inc. development. The Asset Purchase Agreement between TAWC and Thunder Air Inc. (the "Purchase Agreement") is attached to the Joint Petition as **Exhibit A**, and the map of the Thunder Air Inc. System is attached to the Joint Petition as **Exhibit B**.

Q. ARE YOU SPONSORING ANY EXHIBITS?

A. No, I am not sponsoring any Exhibits specifically attached to my testimony. I was responsible for the preparation of the proposed tariff sheets attached to the joint petition as **Exhibit C**.

Q. WAS THE EXHIBIT MENTIONED ABOVE PREPARED BY YOU OR UNDER YOUR DIRECTION AND SUPERVISION?

A. Yes.

Q. WHAT WERE THE SOURCES OF THE DATA USED TO PREPARE THE PETITIONER'S EXHIBITS LISTED ABOVE?

A. The data used to prepare the exhibits was acquired from the books of account and business records of Tennessee American and Thunder Air Inc., the officers and associates of Tennessee American and Thunder Air Inc., with knowledge of the facts based on their job responsibilities and activities, and other internal sources which I examined in the course of my investigation of the matters addressed in this testimony. The joint Petitioners' filings in this TPUC Docket are complete and accurate to the best of my knowledge and belief.

Q. DO YOU CONSIDER THIS DATA TO BE RELIABLE AND OF A TYPE THAT IS NORMALLY USED AND RELIED ON IN YOUR BUSINESS FOR SUCH PURPOSES?

A. Yes.

Q. IF AN ACQUISITION ADJUSTMENT WAS RECORDED, CAN YOU EXPLAIN TAWC'S PROPOSED REGULATORY TREATMENT OF THIS ACQUISITION ADJUSTMENT OR ANY OTHER RELATED MATTERS?

A. TAWC proposes no utility plant acquisition adjustment with this transaction. TAWC is, however, seeking authorization for future recovery of various external costs necessary to

complete due diligence and promulgate the closing of this transaction. TAWC estimates these costs to be between $5,000 and $15,000. TAWC is proposing that these expenses be deferred until closing, not to exceed $10,000, and upon closing be accounted for as a regulatory asset to be amortized over ten years. TAWC recognizes that the authorization would not be an approval of the costs themselves for immediate inclusion into rate base, as such approval would be necessary after review in TAWC's next rate case.

Q. WHY IS TENNESSEE AMERICAN PROPOSING A REGULATORY ASSET FOR THE DUE DILIGENCE AND CLOSING COSTS?

A. TAWC believes these expenses are a legitimate and appropriate cost of acquiring the capital assets. TAWC recognizes that any regulatory guidance provided on establishing the regulatory asset does not represent approval of the costs in a future rate case. While there may be a number of ways to address these costs, TAWC is proposing a method that is fair to both ratepayers and the Company, while providing an opportunity for full review of the costs themselves in a future rate case as well.

TAWC reviewed the record in Docket No. 12-00157 related TAWC's acquisition of the assets of the City of Whitwell, TN. Specifically, TAWC reviewed both the concerns expressed by the Consumer Protection and Advocate Division and the Order issued by the TPUC. In an effort to address some of those concerns, TAWC is proposing to defer the due diligence and closing costs to a regulatory asset. The costs will be incurred during the closing to safeguard the assets of the Company, thus protecting the interests of both the shareholders and ratepayers. In the manner TAWC is proposing, the costs in excess of $10,000 will be funded solely by the shareholders, thus limiting the expense funded by ratepayers.

Q. HOW DOES TENNESSEE AMERICAN PROPOSE TO ADDRESS THE AMORTIZATION OF THE DEFERRED ASSET?

A. Once expenses are deferred, they are essentially moved to an account on the balance sheet as a regulatory asset. One method to address that regulatory asset is then to credit a small amount of the balance each month as an expense, or amortize it. The amortization takes place over a defined length of time. This means that the costs are spread evenly over a longer period of time rather than a one-time expense. In this instance, Tennessee American is proposing two things – the first is to cap the amount deferred at $10,000. That means that Tennessee American will immediately expense any amount above $10,000. Additionally, Tennessee American is further proposing to begin amortization of the costs of $10,000 or less immediately upon closing, with only the unamortized balance of the regulatory asset to be addressed in the next rate case. Therefore any amount for consideration during the future rate case will be only the unamortized portion of the $10,000 (or less) regulatory asset. Again, Tennessee American believes that the deferral of these expenses, as legitimate costs of the assets, is an appropriate method of addressing these costs. If Tennessee American were to construct the assets as part of its existing system improvements or extensions, external costs for due diligence and closing costs would be capitalized as a part of the cost of the project. By proposing to defer the costs to a regulatory asset, the unamortized balance of the regulatory asset can be essentially considered as a cost of the assets for ratemaking purposes in the next rate case. Tennessee American believes this proposed method allows for a shared funding of the expenses as legitimate and appropriate costs related to the acquisition.

Q. ARE THERE ANY OTHER ACCOUNTING ADJUSTMENTS BEING PROPOSED POST-CLOSING?

A. Yes. TAWC proposes to adopt the current TAWC's depreciation rates and CIAC amortization rates as approved by the Commission for Thunder Air Inc. upon closing.

Q. WHAT IS THE RATE STRUCTURE THAT IS PROPOSED BY TAWC ONCE IT ACQUIRES THE SYSTEM?

A. The Purchase Agreement provides that TAWC will continue to provide service to Thunder Air Inc.'s customers at the meter and volumetric rates they are paying now, until such time as different rates may be submitted to and approved by the Commission. TAWC is adopting the Thunder Air Inc. rates. TAWC would apply all other ordinary fees that are applicable to all TAWC customers including any late fees, service activation fees, disconnect fees, private fire service rates and returned check fees. These would be consistent with TAWC's existing tariff for the sake of billing consistency. All other TAWC rates would also be applied to Thunder Air Inc. customers including the Capital Recovery Riders and the Production Costs and Other Pass-Throughs Rider. TAWC fully expects to address several tariff issues related to Thunder Air Inc. customers in future filings with the Commission, such as the implementation of a meter charge based on the size of the meter, and separate rate schedules for customers of different customer classifications.

Q. WILL THE ACQUISITION OF THE SYSTEM IMPACT THE RATES OF CURRENT TAWC RATEPAYERS?

A. No. The System will be kept separate and apart from the TAWC's existing system for purposes of accounting and ratemaking. TAWC may propose to combine the rates for both

the Thunder Air Inc. and the other portions or the balance of the TAWC system as appropriate at a future rate proceeding. The Thunder Air Inc. system will be operated by TAWC as a separate business unit in the TAWC accounting system.

A. **IS THE MERGER OF TENNESSEE AMERICAN WATER AND THE THUNDER AIR INC. SYSTEMS IN THE PUBLIC INTEREST?**

Yes. Water utilities are extremely capital intensive. The owner and operator of a water or wastewater system is constantly needing to address increasing costs, enhanced water quality regulations and the ever-recurring need for capital investments. The need to address aging infrastructure and technological advances consistently requires ongoing study and expertise. TAWC has a proud 131 year history of providing safe, reliable drinking water to its customers. During its 131 years of operation, TAWC has never received a United States Environmental Protection Agency notice of violation of any type (water quality or documentation). This transaction will benefit the customers of the System through the professional management, long-term planning, and sustained investment by TAWC. The approval of the petition is necessary and proper for the public convenience and to properly conserve and protect the public interest.

Q. **WHAT DO YOU RECOMMEND WITH REGARD TO THIS PETITION?**

A. I recommend that the Petition be approved.

Q. **DOES THIS CONCLUDE YOUR DIRECT TESTIMONY?**

A. Yes. I reserve the ability to submit further testimony as is appropriate.

STATE OF Kentucky)
)
COUNTY OF Fayette)

BEFORE ME, the undersigned authority, duly commissioned and qualified in and for the State and County aforesaid, personally came and appeared Linda C. Bridwell, being by me first duly sworn deposed and said that:

She is appearing as a witness on behalf of Tennessee-American Water Company before the Tennessee Public Utility Commission, and if present before the Commission and duly sworn, her testimony would be as set forth in her pre-filed testimony in this matter.

Linda C. Bridwell

Linda C. Bridwell

Sworn to and subscribed before me
this 6th day of September, 2018.

Notary Public

My Commission Expires: 7-25-2020