PETRARCA and McGAIR, INC. ATTORNEYS

797 BALD HILL ROAD
WARWICK, RI 02886

401-821-1330
FAX 401-823-0970
E-MAIL: jjm@petrarcamcgair.com
www.petrarcamcgair.com

April 25, 2012

Mr. Timothy J. Brown
General Manager/Chief Engineer
Kent County Water Authority
P.O. Box 192
West Warwick, RI 02893

Re: Board Meeting Minutes of March 15, 2012
Special Board Meeting Minutes of April 3, 2012

Dear Mr. Brown:

Enclosed you will find the original Board meeting minutes of March 15, 2012 and Special Board meeting minutes of April 3, 2012 together with the Executive Session Minutes of April 3, 2012. Please be advised that the Executive Session Minutes are for your eyes only and pursuant to statute at this time are not subject to records request to be kept in the vault with the other original minutes.

If you have any further questions, please feel free to contact me.

Very truly yours,

Joseph J. McGair

JJM:maf
Enc.

Agenda

KCWA

Kent County Water Authority

Agenda

BOARD MEETING AGENDA
MARCH 15, 2012 – 3:30 P.M.
OFFICES OF KENT COUNTY WATER AUTHORITY

Approval - Minutes of Meeting:		Board Meeting – February 16, 2012
Guests:	3:30 p.m.	High Service Requests: - 47 Sharon Drive, Mr. Petrocelli
Interviews:		Qualification Statements
	3:45 p.m.	- Matrix Consulting Group
	4:00 p.m.	- Kahn, Litwin, Renza & Co.
Legal Counsel:		Legal Matters
Director of Finance Report:		Cash Report February 2012 January Closing

Point of Personal Privilege & Communication:

General Manager/Chief Engineer's Report:

Old Business:	Bond Refinancing (Status)
New Business:	Bid Awards: ▪ Quaker Booster Station Upgrade AWWA Infrastructure Report Review Capital Improvement Program Update (Approval) Engineering Report Planning Next 2 Years
Capital Projects:	CIP-1C Mishnock Well Treatment Plant (Construction Status) CIP-1B Mishnock Transmission (Bid ¼ of main, Opening April 5, 2012) CIP-7c, 7d, 8a Read School House Water Main (Change Order # 3 Execution)
Infrastructure Projects:	IFR 2009B (April Start-up) Quaker Lane P. S. Design (Bid Award) IFR 2010 Design (Status 2010B on hold) Tech Park Storage Tank Painting (Legal Action) SCADA Upgrade, (Addition to Quaker Lane P. S. IFR Upgrade) Water Street Replacement (Spring Construction Start Town Re-Bid)

PO Box 192
West Warwick, RI 02893-0192
401-821-9300
www.kentcountywater.org

Petrarca and McGair, Inc.

From: Open Meetings Admin [openMeetings@sos.ri.gov]
Sent: Thursday, March 08, 2012 3:39 PM
To: jjm@petrarcamcgair.com; openMeetings@sos.ri.gov
Subject: SOS Open Meetings : Meeting Notice

March 08, 2012

This is your electronic confirmation for the electronic filing of meeting notice for the Kent County Water Authority. The meeting notice filed is for the meeting on: March 15, 2012 3:30:00 pm.

This notice was electronically filed on the Secretary of State Open Meetings Website on: March 08, 2012 03:39:08 pm.

Please retain this message as your official proof of electronic filing.

Sincerely,

The Open Meetings Team at
Office of Secretary of State A. Ralph Mollis State House Room 38 Providence, RI 02903
(401) 222-2357
(401) 222-1404
TTY: 711
openmeetings@sos.ri.gov
sos.ri.gov

Petrarca and McGair, Inc. Minutes and Exhibits A-C

From: Open Meetings Admin [openMeetings@sos.ri.gov]
Sent: Friday, April 20, 2012 3:50 PM
To: jjm@petrarcamcgair.com; openMeetings@sos.ri.gov
Subject: SOS Open Meetings : Meeting Minutes

April 20, 2012

This is your electronic confirmation for the electronic filing of meeting minutes for the Kent County Water Authority. The meeting minutes filed are in for the meeting held on: March 15, 2012 15:30:00.

This notice was electronically filed on the Secretary of State Open Meetings Website on: April 20, 2012 03:49:54 pm.

Please retain this message as your official proof of electronic filing.

Sincerely,

The Open Meetings Team at
Office of Secretary of State A. Ralph Mollis State House Room 38 Providence, RI 02903
(401) 222-2357
(401) 222-1404
TTY: 711
openmeetings@sos.ri.gov
sos.ri.gov

Petrarca and McGair, Inc. Exhibit D Part 1

From: Open Meetings Admin [openMeetings@sos.ri.gov]
Sent: Friday, April 20, 2012 3:48 PM
To: jjm@petrarcamcgair.com; openMeetings@sos.ri.gov
Subject: SOS Open Meetings : Meeting Minutes

April 20, 2012

This is your electronic confirmation for the electronic filing of meeting minutes for the Kent County Water Authority. The meeting minutes filed are in for the meeting held on: March 15, 2012 15:30:00.

This notice was electronically filed on the Secretary of State Open Meetings Website on: April 20, 2012 03:47:58 pm.

Please retain this message as your official proof of electronic filing.

Sincerely,

The Open Meetings Team at
Office of Secretary of State A. Ralph Mollis State House Room 38 Providence, RI 02903
(401) 222-2357
(401) 222-1404
TTY: 711
openmeetings@sos.ri.gov
sos.ri.gov

Petrarca and McGair, Inc. Exhibit D Part 2

From: Open Meetings Admin [openMeetings@sos.ri.gov]
Sent: Friday, April 20, 2012 3:46 PM
To: jjm@petrarcamcgair.com; openMeetings@sos.ri.gov
Subject: SOS Open Meetings : Meeting Minutes

April 20, 2012

This is your electronic confirmation for the electronic filing of meeting minutes for the Kent County Water Authority. The meeting minutes filed are in for the meeting held on: March 15, 2012 15:30:00.

This notice was electronically filed on the Secretary of State Open Meetings Website on: April 20, 2012 03:45:43 pm.

Please retain this message as your official proof of electronic filing.

Sincerely,

The Open Meetings Team at
Office of Secretary of State A. Ralph Mollis State House Room 38 Providence, RI 02903
(401) 222-2357
(401) 222-1404
TTY: 711
openmeetings@sos.ri.gov
sos.ri.gov

Petrarca and McGair, Inc. Exhibits E-G

From: Open Meetings Admin [openMeetings@sos.ri.gov]
Sent: Friday, April 20, 2012 3:35 PM
To: jjm@petrarcamcgair.com; openMeetings@sos.ri.gov
Subject: SOS Open Meetings : Meeting Minutes

April 20, 2012

This is your electronic confirmation for the electronic filing of meeting minutes for the Kent County Water Authority. The meeting minutes filed are in for the meeting held on: March 15, 2012 15:30:00.

This notice was electronically filed on the Secretary of State Open Meetings Website on: April 20, 2012 03:35:07 pm.

Please retain this message as your official proof of electronic filing.

Sincerely,

The Open Meetings Team at
Office of Secretary of State A. Ralph Mollis State House Room 38 Providence, RI 02903
(401) 222-2357
(401) 222-1404
TTY: 711
openmeetings@sos.ri.gov
sos.ri.gov

KENT COUNTY WATER AUTHORITY

BOARD MEETING MINUTES

March 15, 2012

The Board of Directors of the Kent County Water Authority held its monthly meeting in the Joseph D. Richard Board Room at the office of the Authority on March 15, 2012.

Chairman, Robert B. Boyer opened the meeting at 3:30 p.m. Board Members, Mr. Gallucci, Mr. Giorgio, Mr. Inman and Mr. Masterson were present together with the General Manager, Timothy J. Brown, Director of Administration and Finance, Jo-Ann Gershkoff and Legal Counsel, Joseph J. McGair. Board Member Masterson led the group in the pledge of allegiance.

The minutes of the Board meeting minutes of February 16, 2012 were moved for approval by Board Member Giorgio and seconded by Board Member Masterson and were unanimously approved.

Guests:

3:30 p.m. High Service Request

47 Sharon Drive, Mr. Petrocelli

James Petrocelli appeared before the Board. The General Manager stated that a suspended service is already in place and his has been a health problem and tie in will be ready.

It was moved by Board Member Inman and seconded by Board Member Masterson to conditionally approve the applicant, James's Petrocelli's request for water supply to service a single family home with the following conditions in lieu of a moratorium:

1. The Kent County Water Authority (KCWA) is not a guarantor of water supply for this or any other approval and KCWA can only supply water reasonably available to it and therefore any applicant/customer of KCWA understands that any third party commitments made by a applicant/customer are subject to the reasonable availability of water supply and limits of the existing infrastructure to support service.

2. A deficient condition associated with accelerated commercial and residential development exists in the area serviced by the KCWA, the KCWA is in the process of planning for additional water supply and therefore delays or diminution in service may occur if the water supply is

unavailable or unable to produce water sufficient to service the customers of KCWA.

3. Ventures, commitments or agreements are at the applicant's sole risk if supply or existing infrastructure is found to be insufficient to support service. The applicant may afford the Authority with system improvements to facilitate adequate service.

4. The applicant shall file a formal single family home application. The applicant/customer understands that any undetected error in the application or an increase or change in demand as proposed, which materially affects the ability to supply water to the site, will be the responsibility of the applicant/customer and not the KCWA.

5. Only conservation-wise plumbing fixtures are to be installed including but not limited to low flow shower heads, low flow toilets and low flow aerators on faucets.

6. If irrigation systems are installed, they must be supplied by a private well. Xeriscape landscaping technique and/or proper planting bed (high water holding capacity) soil preparation shall be employed throughout the project.

And it was unanimously,

VOTED: To conditionally approve the applicant, James Petrocelli's request for water supply to service a single family home with the following conditions in lieu of a moratorium:

1. The Kent County Water Authority (KCWA) is not a guarantor of water supply for this or any other approval and KCWA can only supply water reasonably available to it and therefore any applicant/customer of KCWA understands that any third party commitments made by a applicant/customer are subject to the reasonable availability of water supply and limits of the existing infrastructure to support service.

2. A deficient condition associated with accelerated commercial and residential development exists in the area serviced by the KCWA, the KCWA is in the process of planning for additional water supply and therefore delays or diminution in service may occur if the water supply is unavailable or unable to produce water sufficient to service the customers of KCWA.

3. Ventures, commitments or agreements are at the applicant's sole risk if supply or existing infrastructure is found to

be insufficient to support service. The applicant may afford the Authority with system improvements to facilitate adequate service.

4. The applicant shall file a formal single family home application. The applicant/customer understands that any undetected error in the application or an increase or change in demand as proposed, which materially affects the ability to supply water to the site, will be the responsibility of the applicant/customer and not the KCWA.

5. Only conservation-wise plumbing fixtures are to be installed including but not limited to low flow shower heads, low flow toilets and low flow aerators on faucets.

6. If irrigation systems are installed, they must be supplied by a private well. Xeriscape landscaping technique and/or proper planting bed (high water holding capacity) soil preparation shall be employed throughout the project.

Interviews: Qualification Statements

3:45 Matrix Consulting Group

A proposal from Matrix Consulting Group is evidenced and attached as "**A**". Richard Brady, President and Gary Goelitz, Vice President appeared before with Board and reviewed its proposal with the Board. Mr. Brady stated that Matrix is a national company which, also, has offices in Waltham, Massachusetts. Mr. Goelitz would be the Chief Analyst. After a presentation, the Board had questions answered. In answer to Board Member Gallucci question regarding if it was a $15,000 to $23,000 range of fees which was answered in the affirmative. Board Member Masterson made inquiry regarding research done on Kent County Water Authority for interview purposes and he asked whether this study was even necessary. Board Member Inman reiterated that their home base was California and in answer Matrix could start in a few weeks pursuant to Board Member Giorgio's question. Board Member Gallucci queried if they were going to review operations and Mr. Goelitz replied all must be reviewed. Mr. Brady said they had no PUC experience in Rhode Island. The Chairman requested interviews for the system and distribution growth for best practices for the future needs of the customers.

4:00 p.m. Kahn, Litwin, Renza & Co.

Michael Tousignant, Director of Accounting and Auditing appeared before the

Board and stated it was Rhode Island's largest accounting/consulting firm with 170 business professionals. The business consulting company assists businesses in making their companies better with various skills, e.g. technology and recruiting. Kahn, Litwin, Renza & Co. founded the cutting edge which allowed bringing the best together to assist each other and provide resources without national overhead.

The General Manager queried about lines of reporting, internal controls and general business practices. Mr. Tousignant discussed the initial plan of action and would meet with the Kent County Water Authority Board as to the plan of attack on issues in order to prioritize from the scope of action. He stated practicality is the key to action. The Chairman questioned the numbers of interviewees and he said it would depend. Board Gallucci said that a detailed RFP may be the key for a scope of action. Board Member Gallucci stated that the company should be progressive in regard to the funding by PUC. Discussion ensued regarding a previous management study and its current applicability. Mr. Tousignant stated a scope of action is necessary for pricing and scoping would be a minimal cost of a few thousand dollars. Mr. Tousignant stated they could start in two to three weeks to commence scope of action. Thorough discussion ensued with the Board. The General Manager stated that any action in this regard must be approved by the PUC. The Chairman commended the General Manager for his efforts and Kent County Water Authority needs to be ready for the future.

LEGAL MATTERS

Harris Mills

The company has gone into receivership. Kent County Water Authority is owed $3,676.58. Legal Counsel will monitor for proof of claim filing. A permanent receiver was appointed. A proof of claim prepared and forwarded to the General Manager for signature on September 17, 2008 and will be filed in the Kent County Superior Court and sent to the receiver. Proof of Claim was filed and sent to Received on September 19, 2008. The proof of claim deadline was December 1, 2008. Legal counsel will continue to monitor for payment on claim. As of May 12, 2009, there has been no change in status. Petition to sell was filed by Receiver in Kent County Superior Court on June 5, 2009. Offer to property made which will allow for partial payment of claims. Legal Counsel will monitor progress of sale.

There has been no further progress regarding the sale of the Harris Mill complex in the receivership matter. Legal Counsel to contact the Receiver for a status report. New offers to purchase have come in which could allow Kent County Water Authority claim in this matter to be paid out of the receivership proceeds. As of September 14, 2009 the previous offer did not materialize. A new offer is being pursued. Legal Counsel will continue to monitor the progress of the sale. The receivership case is in the Supreme Court. On October 1, 2010 the Court approved the sale of the property and the allowed disbursements including payment of Kent County Water Authority bill. This office will continue to monitor payment. On May 13, 2011 Legal Counsel sent a

letter to Counsel for potential buyer inquiring as to the status of the sale. Legal Counsel followed up with counsel for Buyer on June 14, 2011 regarding response to May 13, 2011 correspondence. On July 18, 2011 Legal Counsel was informed by Buyer's Counsel that the sale is on hold pending resolution of Supreme Court Appeals in receivership case. There has been no further word as of March 13, 2012.

Hope Mill Village Associates

The company is in receivership. Kent County Water Authority is owed $1,632.44. Legal Counsel to prepare and file Proof of Claim. Proof of Claim was prepared and was forwarded to the General Manager for signatures. Proof of Claim was filed in Kent County Superior Court and was sent to the receiver on August 28, 2008 and as of this date this case is still pending. Hope Mill filed Chapter 11 Bankruptcy on August 20, 2008. Kent County Water Authority was not listed as a creditor. The proof of claim was prepared and signed by the General Manager on November 14, 2008 and was filed with the Bankruptcy Court on November 18, 2008, The proof of claim filing deadline was the end of November, 2008. Pursuant to the plan of reorganization filed by Debtor on November 22, 2008, Kent County Water Authority will be paid in full upon confirmation of the plan by the Bankruptcy Court and Legal Counsel will continue to monitor. As of February 17, 2009 the Court has not scheduled a hearing for confirmation of plan. Debtor will be filing an Amended Plan in March 2009. Legal Counsel will continue to monitor. As of July 16, 2009 the Debtor has not filed an Amended Plan.

The Bankruptcy Court hearing was to be held on August 19, 2009 regarding a motion filed by Hope Mill to convert Chapter 11 to Chapter 7. Legal counsel will monitor the hearing and how the disposition of the hearing will affect the claim of Kent County Water Authority. The hearing was held on December 17, 2009. Assets purchased pursuant to Asset Purchase Agreement. Kent County Water Authority charges to be paid pursuant to Asset Purchase Agreement. Legal Counsel will follow up regarding timetable of payment to Kent County Water Authority. Legal Counsel spoke with Attorney DeAngelis on February 17, 2010 for status on payment to Kent County Water Authority.

Legal Counsel spoke with Attorney DeAngelis on May 13, 2010 and Mr. DeAngelis stated that a final closing has yet to be scheduled, but should be scheduled in the near future. There has been no progress on scheduling a closing as of March 13, 2012.

West Greenwich Technology Tank/Rockwood

This matter may be in litigation in that Rockwood Corporation had failed to take any steps and continually denied Kent County Water Authority efforts to take any steps in the painting issues inside of the tank and on February 16, 2009 their surety, Lincoln General Insurance Company, denied the claim as well. The matter was reviewed between the General Manager and Legal Counsel. Rockwood sent a proposal to Legal Counsel on March 31, 2009 and the General Manager weighed the same and a

response was sent to Rockwood on April 24, 2009. On May 2, 2009 Rockwood sent another proposal and the General Manager responded to the same on May 8, 2009 requesting a written remedial plan proposal within ten days. On May 8, 2009 Rockwood responded by asking the General Manager to reconsider his position. On May 12, 2009 the General Manager sent correspondence to Rockwood stating the Authority will await Rockwood comments to KCWA letter of May 8, 2009. On May 13, 2009 Rockwood provided an additional response to the KCWA letter of May 8, 2009 with questions. On May 13, 2009 the General Manager sent correspondence agreeing to provide Rockwood with more time to complete a plan of remediation for an additional 10 days. On May 14, 2009, Rockwood sent a response and the General Manager, Merithew and Rockwood to have an informal meeting to work out details. The meeting took place and the Authority is monitoring the efforts of Rockwood to remedy the situation. The tank was recently dry inspected and the vendor remediated the same. Kent County Water Authority is awaiting final inspection of the tank with respect to the remediation. Rockwood has performed work at the site and it is necessary to have a final inspection after the tank has been filled. The tank has been filled and inspection is moving forward. This has been concluded. However, inspection followed which disclosed that there were more paint issues. On July 22, 2010, Legal Counsel notified the Bonding Company regarding action to correct. This will be further discussed by the General Manager in IFR projects. This matter is being discussed which may include litigation and KCWA is awaiting final restoration plans from the vendor. On March 16, 2011 and March 17, 2011, the General Manager received email communications from Rockwood requesting KCWA response to Rockwood performing its February 18th proposal on March 21, 2011. Further, the email stated that Mr. Northrop is no longer with Lincoln and provided an alternate contact for forwarding of the claim of KCWA.

On March 29, 2011 Legal Counsel sent correspondence to Mr. Northrop's successor, Paul Poppish pursuant to Mr. Law of Rockwood. After receiving no reply, Legal Counsel sent a follow up letter to Mr. Poppish on April 13, 2011. On May 16, 2011, Legal Counsel called Lincoln General and Mr. Poppish is no longer with the company and was directed to Mr. Bob Griffith and Legal Counsel spoke with him and was asked to send the correspondence to him which was accomplished on even date. No response was received from Mr. Griffith and Legal Counsel sent a follow up letter on June 9, 2011.

On July 14, 2011 Legal Counsel had a telephone conference with Bob Griffith from Lincoln General who stated that he would get something out to Legal Counsel the beginning of the week of July 18, 2011 and a letter was received on July 17, 2011 stating that he would discuss it with his insured and would respond thereafter. On August 5, 2011, Legal Counsel sent a follow up letter to Mr. Griffith since no response was received. A second follow up letter was sent to Mr. Griffith on November 16, 2011 since there has been no response.

A complaint was filed in Kent County Superior Court and served on Defendants Rockwood Corporation and Lincoln General Insurance Company on February 23, 2012.

Defendants requested an extension to answer per Stipulation and must answer by April 2, 2012.

Spectrum Properties, The Oaks, Coventry, Rhode Island

Legal Counsel for the developer forwarded on July 13, 2009 to Kent County Water Authority Legal Counsel for comment on the proposed form of easement deeds with respect to the residential subdivision. On July 29, 2009, Legal Counsel for Kent County Water Authority sent a response to Attorney William Landry setting forth comments to the proposed form of deeds. Legal Counsel received revised deeds from Attorney Landry on September 10, 2009 and they have been forwarded to the General Manager for review and have been approved by the General Manager. On September 24, 2009, Legal Counsel forwarded to Attorney Landry correspondence starting that the form of easement deed has been approved by Kent County Water Authority and for Attorney Landry to forward the original executed deeds to Kent County Water Authority for execution of acceptance. Legal Counsel has not received the deeds to date therefore Legal Counsel forwarded status inquiry correspondence to Attorney Landry on November 18, 2009. Attorney Landry replied to Legal Counsel on November 23, 2009 stating that the developer is in the midst of scheduling a final approval hearing with the Town and Attorney Landry will provide Legal Counsel for KCWA with the anticipated timetable for final approval and recording of the deeds upon Mr. Landry's receipt of this information.

Legal Counsel was pursuing Attorney Landry for status of his receipt of timetable for municipal approvals. Legal Counsel telephoned Attorney Landry and left a voicemail message as to status and subsequently forwarded correspondence to Attorney Landry on March 11, 2010. On May 11, 2010, Legal Counsel forwarded subsequent correspondence to Attorney Landry inquiring as to the status of the matter. The Developer contacted Legal Counsel directly and informed her that final approvals have not been received. Sanford J. Resnick, Esq. forwarded correspondence on September 17, 2010 to the Chairman informing of his representation of the developer and a request to appear before the Board to discuss inspection fees.

Mr. Resnick appeared at the May 19, 2011 Board Meeting and the staffs are working together with the Developer and Legal Counsel. Mr. Resnick will draft agreements with respect to flushing and constructing the water line. On August 15, 2011 Legal Counsel left a message with Mr. Resnick for status update and as of March 12, 2012 Legal Counsel has not received a response.

DPUC – Gregory Decubellis

Legal Counsel received from the DPUC on March 12, 2012 an entry of appearance for John A. Pagliarini.

Director of Finance Report:

Jo-Ann Gershkoff, Finance Director, explained and submitted the financial report. Statement of Revenues, Expenditures and Change in Fund Balance as of February, 2012, Cash Location FY 2011-2012 and Cash Receipts and Disbursements FY 2011-2012 attached as **"B"**, and after thorough discussion with regard to the sales and revenue. The restricted accounts were all funded for the period and collections have been somewhat normalized.

Board Member Gallucci moved and seconded by Board Member Masterson to accept the reports and attach the same as an exhibit and that the same be incorporated by reference and be made a part of these minutes and it was unanimously,

> VOTED: That the financial report and Statement of Revenues, Expenditure and Change in Fund Balance as of February, 2012, Cash Location FY 2011-2012 and Cash receipts and Disbursements FY 2011-2012 attached as **"B"** be approved as presented and be incorporated herein and are made a part hereof.

Point of Personal Privilege and Communications:

None.

GENERAL MANAGER/CHIEF ENGINEER'S REPORT
Old Business:

Bond Refinancing (Status)

The General Manager spoke with financial advisors which will require a Moody's rating and are awaiting for word on fees from them.

New Business:
Bid Award – Quaker Booster Station Upgrade

The General Manager stated there were two (2) bids for the Quaker Booster Station Upgrade pursuant to the C & E Engineering report dated March 5, 2012 as evidenced and attached as "**C**". The General Manager stated that C & E Engineering determined that the two bids (Hart Engineering Corporation for $2,807,000 and Process Engineers and Constructors Inc. for $3,460,950) were in general conformance with the contract bidding requirements. The General Manager noted that there was a $653,950 difference between Hart Engineering Corporation and Process Engineers and Constructors Inc. The General Manager stated that there was an owner's discretion issue with regard to Hart Engineering Corporation in its not naming the proposed subcontractors and their qualifications which Hart Engineering Corporation corrected.

The General Manager stated that the subcontractors were well qualified as to amounts of similar projects and years of experience. The General Manager said that it was his recommendation that the Board exercise its discretion and award the bid to Hart Engineering Corporation in the amount of $2,807,000.

It was moved by Board Member Masterson and seconded by Board Member Gallucci to award the proposal to Hart Engineering Corporation which is in the best interest of Kent County Water Authority and the Board exercises its owner's discretion in the amount of $2,807,000 as evidenced and attached as "**C**" and it was unanimously,

> VOTED: To award the proposal to Hart Engineering Corporation which is in the best interest of Kent County Water Authority and the Board exercises its owner's discretion in the amount of $2,807,000 as evidenced and attached as "**C**".

AWWA Infrastructure Report Review

The General Manager gave a presentation and memorandum on this matter together with the American Water Works Association study which had been sent to the PUC as evidenced and attached as "**D**".

Capital Improvement Program Update (Approval)

This matter will be discussed at the next meeting due to a meeting at the Governor's office on March 16, 2012 on this subject.

Engineering Report Planning Next 2 Years

The General Manager presented the required report as attached as "**E**".

CAPITAL PROJECTS:

CIP-7c, 7d, 8a Read School House Water Main (Change Order #3 Execution)

The General Manager recommended the approval of Change Order No. 3 by C.B. Utility Co. for a credit in the amount of $3,400 for as built only and it was recommended by the General Manager as fair and reasonable as evidenced and attached as **"F".**

It was moved by the Board Masterson and seconded by Board Member Giorgio to approve Change Order No. 3 and to have the Chairman execute Change Order No. 3 on behalf of Kent County Water Authority in the amount of $3,400 as evidenced and attached as "**F**" and it was unanimously,

VOTED: To approve Change Order No. 3 and to have the Chairman execute Change Order No. 3 on behalf of Kent County Water Authority in the amount of $3,400 as evidenced and attached as "**F**".

INFRASTRUCTURE PROJECTS

All other Capital and Infrastructure Projects were addressed by the General Manager and described to the Board by the General Manager with general discussion following and are evidenced and attached as "**G**".

Board Member Giorgio made a Motion to adjourn, seconded by Board Member Inman and it was unanimously voted by the Board Members present,

VOTED: To adjourn the meeting at 5:10 p.m.

Secretary Pro Tempore

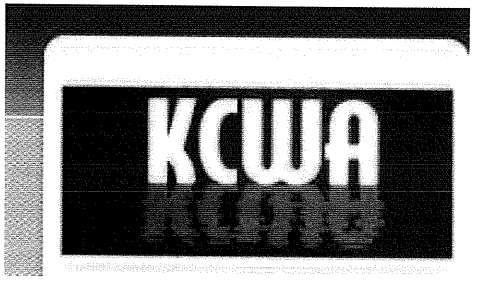
EXHIBIT A

Kent County Water Board Meeting

March 15, 2012

Proposal to Conduct a Review and Evaluation of the Organization, Internal Controls and Business Practices

Kent County Water Authority



matrix
consulting group

"A"

Introduction to the Matrix Consulting Group

- Members of the team have provided management consulting services to local government for more than 30 years.
- We have conducted over 100 studies of public utilities – including a number of recent engagements in New England.
- We are a 'fact based' firm, utilizing extensive 'stakeholder' input, detailed data collection and analysis as the basis for our projects.
- Our rates of implementation are exceptional, generally over 85% of recommendations made.
- The firm is headquartered in California with a Massachusetts Office.

KCWA

matrix consulting group

Experience That Sets Us Apart

- Public Utilities and Public Works projects are a core business practice of the Matrix Consulting Group.
- One of our team members is a prior executive manager with a utility district.
- We consult to local government only. Recent clients include:

Alexandria, Virginia	**Lee's Summit, Missouri**
Denton, Texas	**Montpelier, Vermont**
Evans, Colorado	**Napa County, California**
Falmouth, Massachusetts	**Santa Clara Valley Water, California**
Gloucester, Massachusetts	**South Coast Water District, California**
Haverhill, Massachusetts	**Springfield, Massachusetts**

KCWA

matrix consulting group

Our Project Team

Team Member	Background	Project Role
Richard Brady	Matrix CG President	Project Manager and principal contact. 30 years of consulting experience. QC for each project task
Gary Goelitz	Matrix CG Vice President	Lead Analyst with responsibility for analysis of overall operations and management. 37 years of analytical experience
Greg Mathews	Matrix CG Vice President	Project Analyst with responsibility for organization analysis of operations and staffing. 25 years of analytical experience, including management of a utility.

KCWA

matrix consulting group

Project Scope of Work

- Structure and organization of the Authority.
- Appropriate lines of authority, responsibility and accountability.
- Management approaches and management culture.
- Appropriateness of all internal controls.
- Conformance to 'best management practices' and peers to enhance the efficiency and effectiveness of operations.
- Operational efficiency, resources, work processes and staffing levels.

KCWA

matrix consulting group

Overall Project Approach

- **Develop an initial understanding of the unique operating environment in KCWA –** through extensive interviews.
- **Maximize input and interaction with Authority staff –** to obtain staff perceptions and keep staff appraised regarding the study.
- **Develop a detailed profile of operations –** to comprehensively document management, operations, organization and costs.
- **Best practices and comparative analysis –** to identify areas where practices meet or do not meet efficiency standards.
- **Detailed analysis of improvement opportunities –** to evaluate efficiency and cost effectiveness of services.

KCWA

matrix consulting group

Project Task Plan (1)

Task	Issues Addressed
1 Project Initiation	What are the key issues in the study? What are the expectations of key 'stakeholders'? What recent service trends underscore this study? How will the Authority and consultant work together?
2 Descriptive Profile	How is the Authority organized and staffed? What are workloads and service levels? What are costs and revenues? What management systems are in place? How is performance measured?
3 Comparative Assessment	How does the Authority compare to public utilities 'best management practices'? How do they compare to other water utilities? What opportunities arise from identified issues?

KCWA

matrix consulting group

Project Task Plan (2)

Task	Issues Addressed
4 Organization	Are spans of control appropriate? Are functions appropriately grouped? Is the plan of management staffing appropriate for an organization of this size and complexity?
5 Staffing and Operations	Are service levels adequate? Are the levels of PM appropriate? Are crew sizes appropriate? Does work output meet guidelines? Are there opportunities to outsource or in-source any functions? Are maintenance management systems adequate to plan and monitor operations? Are other technological tools needed?
6 Draft and Final Report	What prioritized changes should be implemented? Who should be responsible for implementation? What would be their impacts? How should the success of change be monitored?

KCWA

matrix consulting group

Why Select the Matrix Consulting Group?

- An experienced project team whose careers range from 10 – 30+ years in the public utilities analytical area, mostly working on projects together during that period.
- Extensive prior utilities project experience in New England and nationally encompassing over 100 utilities projects with high rates of recommendation implementation.
- An analytical approach which is 'fact based', in depth and interactive with KCWA staff and Board.
- Industry leader in the use of benchmarks and 'best practices'.

KCWA

matrix consulting group

EXHIBIT B

Kent County Water Board Meeting

March 15, 2012

Kent County Water Authority
STATEMENT OF REVENUES, EXPENDITURES AND CHANGES IN FUND BALANCE
AS OF 01/2012

ACCOUNT DESCRIPTION	CURRENT MONTH BUDGET	CURRENT MONTH ACTUAL	CURRENT MONTH ACTUAL OVER/ UNDER BUDGET	YEAR-TO-DATE BUDGET	YEAR-TO-DATE ACTUAL	YEAR-TO-DATE ACTUAL OVER/ UNDER BUDGET
REVENUES						
1-4150 MERCHANDISING & JOBBING	416.66	-490.19	-906.85	2916.62	3671.41	754.79
1-4160 M & J COSTS & EXPENSES	1500.00	1204.10	-295.90	10500.00	8374.54	-2125.46
1-4190 INTEREST & DIVIDEND INC.	7500.00	-1003.49	-8503.49	52500.00	26267.59	-26232.41
1-4210 MISC. NON-OPER. INCOME	2083.33		-2083.33	14583.31	17113.86	2530.55
TOTALS FOR OTHER INCOME	11499.99	-289.58	-11789.57	80499.93	55427.40	-25072.53
1-461A METERED SALES - GC	1136282.83	876691.08	-259591.75	7953979.81	9152331.23	1198351.42
1-461B METERED SALES - IC	290093.66	189712.09	-100381.57	2030655.62	2083112.62	52457.00
1-4620 PRIVATE FIRE PROTECTION		-1883.31	-1883.31	96224.50	92568.84	-3655.66
1-4630 PUBLIC FIRE PROTECTION				651109.00	650830.22	-278.78
1-4640 SALES -PUBLIC AUTHORITIES	62229.08	24514.55	-37714.53	435603.56	485482.06	49878.50
1-4660 SALES FOR RESALE				50000.00	91798.50	41798.50
1-4710 MISC. SERVICE REVENUE	14172.16	15536.02	1363.86	99205.12	109574.50	10369.38
1-4740 OTHER WATER REVENUES	3750.00	2937.06	-812.94	26250.00	26836.06	586.06
TOTALS FOR OPERATING REVENUE ACCTS.	1506527.73	1107507.49	-399020.24	11343027.61	12692534.03	1349506.42
TOTALS FOR REVENUES	1518027.72	1107217.91	-410809.81	11423527.54	12747961.43	1324433.89
EXPENDITURES						
1-6020 PURCHASED WATER	402500.00	331244.29	71255.71	2817500.00	2820534.72	-3034.72
1-6140 MAINTENANCE OF WELLS	20.00		20.00	140.00	489.98	-349.98
TOTALS FOR SOURCE OF SUPPLY EXPENSES	402520.00	331244.29	71275.71	2817640.00	2821024.70	-3384.70
1-6210 FUEL FOR PUMPING	95.83		95.83	670.81	100.52	570.29
1-6230 POWER PURCHASED	36500.00	29203.99	7296.01	255500.00	181059.81	74440.19
1-624A PUMPING LABOR	3333.33	4861.96	-1528.63	23333.31	34714.55	-11381.24
1-624B PUMPING EXPENSES	289.16	769.13	-479.97	2024.12	2416.48	-392.36
1-6310 MAINT STRUCT & IMPROVE	2358.33	2027.76	330.57	16508.31	34051.29	-17542.98

11 B 11

ACCOUNT DESCRIPTION	CURRENT MONTH BUDGET	CURRENT MONTH ACTUAL	CURRENT MONTH ACTUAL OVER/ UNDER BUDGET	YEAR-TO-DATE BUDGET	YEAR-TO-DATE ACTUAL	YEAR-TO-DATE ACTUAL OVER/ UNDER BUDGET
1-6330 MAINT PUMPING EQUIPMENT	3166.66	4841.68	-1675.02	22166.62	18638.26	3528.36
TOTALS FOR PUMPING EXPENSES	45743.31	41704.52	4038.79	320203.17	270980.91	49222.26
1-6410 CHEMICALS	13775.00	8381.34	5393.66	96425.00	69434.43	26990.57
1-642A OPERATION LABOR	6391.66	5756.77	634.89	44741.62	40852.52	3889.10
1-642B OPERATION EXPENSES	3041.66	5079.47	-2037.81	21291.62	25309.22	-4017.60
1-6520 MAINT WATER TREAT EQUIP	133.33	769.14	-635.81	933.31	2303.00	-1369.69
TOTALS FOR WATER TREATMENT EXPENSES	23341.65	19986.72	3354.93	163391.55	137899.17	25492.38
1-662A T & D LABOR	2108.33		2108.33	14758.31	10880.73	3877.58
1-662B T & D SUPPLIES & EXP	5354.16	7977.50	-2623.34	37479.12	35271.78	2207.34
1-663A T & D METER LABOR	3829.16	2967.59	861.57	26804.12	22615.87	4188.25
1-663B T & D METER SUPP & EXP	1095.83	4002.91	-2907.08	7670.81	12788.23	-5117.42
1-6650 T & D MISC	937.50	160.16	777.34	6562.50	1663.87	4898.63
1-6710 MAINT STRUCT & IMPROV	520.83		520.83	3645.81	4999.00	-1353.19
1-6720 MAINT RESERVOIR & STDPIPE	1041.66	95.56	946.10	7291.62	11123.44	-3831.82
1-6730 MAINT T & D MAINS	48893.75	27236.83	21656.92	342256.25	324824.34	17431.91
1-6750 MAINT SERVICES	47355.33	45181.52	2173.81	180605.31	143250.44	37354.87
1-6760 MAINT METERS	6060.83	16644.95	-10584.12	42425.81	71156.21	-28730.40
1-6770 MAINT HYDRANTS	7250.00	23751.28	-16501.28	50750.00	66339.31	-15589.31
1-6790 TRANSFER TO CONSTRUCTION	-927.91	-250.22	-677.69	-6495.37	-497.27	-5998.10
TOTALS FOR TRANS. & DISTR. EXPENSES	123519.47	127768.08	-4248.61	713754.29	704415.95	9338.34
1-902A METER READING LABOR	10516.75	6865.91	3650.84	73617.25	49892.65	23724.60
1-902B METER READING SUPP & EXP	186.25		186.25	1303.75	216.73	1087.02
1-903A CUSTOMER RECORDS LABOR	15557.66	14371.39	1186.27	104235.62	106739.60	-2503.98
1-903B CUSTOMER RECORDS SUPP	5683.33	4737.24	946.09	39783.31	30565.06	9218.25
TOTALS FOR CUSTOMER ACCT. EXPENSES	31943.99	25974.54	5969.45	218939.93	187414.04	31525.89

ACCOUNT DESCRIPTION	CURRENT MONTH BUDGET	CURRENT MONTH ACTUAL	CURRENT MONTH ACTUAL OVER/ UNDER BUDGET	YEAR-TO-DATE BUDGET	YEAR-TO-DATE ACTUAL	YEAR-TO-DATE ACTUAL OVER/ UNDER BUDGET
1-9200 ADM & GENERAL SALARIES	32511.41	29370.14	3141.27	190157.87	180441.65	9716.22
1-9210 OFFICE SUPPLIES & EXP	11083.33	17022.13	-5938.80	77583.31	80399.13	-2815.82
1-9230 OUTSIDE SERVICES	10416.66	10622.83	-206.17	72916.62	69846.05	3070.57
1-9240 PROPERTY INSURANCE				234287.00	177205.23	57081.77
1-9250 INJURIES & DAMAGES	50.83		50.83	355.81	102.38	253.43
1-9260 EMPLOYEE PENSION & BENEF	54868.58	51614.68	3253.90	606080.10	640706.18	-34626.08
1-9280 REGULATORY COMM EXP	5625.00		5625.00	39375.00	53179.26	-13804.26
1-930B MISC GENERAL EXPENSE	1125.00	1250.00	-125.00	7875.00	8781.09	-906.09
1-930C MISC GENERAL EXPENSE	3000.00		3000.00	21000.00		21000.00
1-932A MAINT GENERAL PLANT	9166.66	11868.61	-2701.95	64166.62	71679.37	-7512.75
1-932B MAINT VEHICLES	12416.66	12549.53	-132.87	86916.62	107363.64	-20447.02
1-9330 UNASSIGNED TIME VAC HOL	17901.91	46679.90	-28777.99	125313.37	174077.31	-48763.94
TOTALS FOR ADM. & GENERAL EXPENSES	158166.04	180977.82	-22811.78	1526027.32	1563781.29	-37753.97
1-4030 DEPRECIATION EXPENSE	96666.66	96666.67	-.01	676666.62	676666.69	-.07
1-4080 TAXES OTHER THAN INCOME	12541.66	27489.14	-14947.48	87791.62	166353.53	-78561.91
1-4270 INTEREST-LONG TERM DEBT	107157.00	107157.00		750099.00	750099.00	
1-4280 AMORTIZATION OF DEBT DISC	5833.33	5833.33		40833.31	40833.31	
TOTALS FOR OTHER EXPENSES	222198.65	237146.14	-14947.49	1555390.55	1633952.53	-78561.98
TOTALS FOR EXPENDITURES	1007433.11	964802.11	42631.00	7315346.81	7319468.59	-4121.78
EXCESS OF REVENUE OVER EXPENDITURES FOR general	510594.61	142415.80	-368178.81	4108180.73	5428492.84	1320312.11

KENT COUNTY WATER AUTHORITY
CASH RECEIPTS & DISBURSEMENTS
FY 2011 - 2012

		JULY 2011	AUGUST 2011	SEPTEMBER 2011	OCTOBER 2011	NOVEMBER 2011	DECEMBER 2011	JANUARY 2012	FEBRUARY 2012	MARCH 2012	APRIL 2012	MAY 2012	JUNE 2012
BEGINNING MONTH BALANCE		37,726,775	34,181,115	34,175,000	34,235,508	35,184,171	35,514,748	34,910,053	34,978,412				
CASH RECEIPTS:													
Collections		1,966,570	1,533,789	1,507,240	3,333,369	1,967,940	1,472,113	2,290,840	1,468,633				
Interest Earned		24,595	287	312	265	300	1,577	242	281				
Other													
TOTAL CASH RECEIPTS		39,717,940	35,715,191	35,682,553	37,569,141	37,152,410	36,988,438	37,201,135	36,447,326	-	-	-	-
CASH DISBURSEMENTS:													
Purchased Water		619,643	317,621	298,557	849,466	298,580	331,457	393,445	331,244				
Electric Power		24,408	25,012	34,274	37,769	27,363	27,356	29,204	30,268				
Payroll		143,753	186,550	149,225	134,783	166,162	141,808	245,253	161,782				
Operations		67,012	78,251	42,183	75,936	78,684	94,784	39,473	55,983				
Employee Benefits		282,802	109,906	53,346	57,148	55,556	54,861	54,971	56,985				
Legal		2,856	1,765	2,715	3,634	4,039	2,570	3,514	3,109				
Materials		166,404	129,947	51,562	79,855	77,651	46,567	33,319	47,385				
Insurance		60,983	122,022	1,048		-		-					
Sales Taxes		27,682	12,489	11,623	40,586	14,062	11,067	28,412	10,047				
Refunds		251	7,874	547	1,607	564	1,427	394	461				
Rate Case													
Conservation													
Pilot		8,265											
Capital Expenditures (Other)					91,750				117,664				
Mishnock Well/Storage/Pump/T	221C	7,666	8,257	12,282	32,458	35,551	51,146	71,167	52,459				
Mishnock Treatment Facility	230A				378,429	358,196	365,857	366,452	581,119				
Read School House	234C			148,807									
CIP Update	235A				780	1,020	2,550	1,235	2,773				
Read School House Tank	236C						177,925						
Quaker Lane	240C				2,490	11,920		332					
2007 Infrastructure	284B	213,665											
2009 A Infrastructure	243C	270,845											
2009 B Infrastructure	248C	316,733	488,950	590,595	485,362	444,797	723,483	317,886	4,771				
2010 Infrastructure Design	249C				2,575			1,020	2,487				
Water Street EG	250C						3,016		124				
U. S. Bank - Debt Service (P. & I.)		3,264,328						616,556					
Water Protection		59,527.62	51,547	50,282	110,342	63,517	42,511	20,089	56,263				
TOTAL DISBURSEMENTS		5,536,825	1,540,191	1,447,045	2,384,971	1,637,663	2,078,385	2,222,722	1,514,925	-	-	-	-
BALANCE END OF MONTH		34,181,115	34,175,000	34,235,508	35,184,171	35,514,748	34,910,053	34,978,412	34,932,401	-	-	-	-
		-								-	-		

	RATE REVENUE FY 10-11	RATE REVENUE FY 11-12
JUL	1,608,840	1,458,444.12
AUG	1,588,117	1,422,222.99
SEP	3,697,980	3,425,570.55
OCT	1,740,472	1,773,750.10
NOV	1,193,207	1,293,229.87
DEC	2,315,872	2,252,906.16
JAN	977,667	1,145,952.53
FEB	943,649	1,054,939.90
MAR	1,879,971	
APR	1,119,045	
MAY	912,317	
JUN	2,042,267	

CASH LOCATION
FISCAL YEAR 2011-2012

	JUL 2011	AUG 2011	SEP 2011	OCT 2011	NOV 2011	DEC 2011	JAN 2012	FEB 2012	MAR 2012	APR 2012	MAY 2012	JUN 2012
CASH LOCATION:												
Citizens Bank - Payroll	$ 40,000.00	40,000.00	40,000.00	40,000.00	40,000.00	40,000.00	40,000.00	40,000.00				
Fleet Bank - Deposit	305,831.16	64,248.86	150,908.96	1,046,044.68	78,477.24	165,309.32	670,726.30	55,436.12				
Fleet Bank - Checking	156,293.32	3,350.65	199,148.91	73,321.40	136,350.06	202,743.97	144,229.70	159,183.79				
	502,124.48	107,599.51	390,057.87	1,159,366.08	254,827.30	408,053.29	854,956.00	254,619.91	0.00	0.00	0.00	0.00
U. S Bank - Project Funds												
Revenue	1,431,740.63	1,456,433.84	1,131,621.93	1,041,850.80	2,658,199.96	2,298,204.62	2,391,272.32	2,841,214.72				
Infrastructure Fund	8,424,924.93	8,428,020.46	8,319,036.54	8,362,425.08	8,214,922.08	7,998,651.81	8,174,706.13	8,624,773.65				
Operation Reserve Allowance	364,593.01	388,900.55	413,208.33	437,516.25	461,824.40	486,132.68	510,440.96	534,750.09				
Operation & Maintenance Reserve	2,367,556.27	2,367,576.41	2,367,596.56	2,373,447.05	2,373,467.19	2,373,486.69	2,373,506.87	2,373,527.02				
Renewal & Replacement Fund	343,057.93	351,394.00	359,730.18	368,066.47	239,442.31	247,778.17	256,113.62	139,315.30				
Renewal & Replacement Reserve	786,143.95	786,150.71	786,157.49	1,023,851.04	1,023,858.05	1,023,866.59	1,023,876.57	1,023,885.25				
Debt Service Fund - 2001	94,044.99	159,660.15	225,273.46	290,887.12	358,053.57	424,056.43	339,057.44	405,060.83				
Debt Service Reserve - 2001	781,148.43	781,148.43	781,148.43	781,148.43	781,148.43	781,148.43	781,148.43	781,148.43				
General Project - 2002	15,562,632.13	15,562,764.25	15,414,089.25	15,035,787.90	14,578,687.11	14,035,284.92	13,668,955.12	13,087,954.94				
Debt Service Fund - 2002	213,944.89	370,804.93	527,660.62	684,517.42	840,975.75	997,735.24	748,973.71	905,734.28				
Debt Service Reserve - 2002	1,823,614.72	1,823,614.72	1,823,614.72	1,823,614.72	1,823,614.72	1,823,614.72	1,823,614.72	1,823,614.72				
Debt Service Fund - 2004	182,706.53	288,050.43	393,390.58	498,731.55	602,740.26	707,749.68	752,728.91	857,739.91				
Debt Service Reserve - 2004	1,302,166.08	1,302,882.73	1,302,921.82	1,302,960.91	1,302,986.97	1,304,289.97	1,279,061.84	1,279,061.84				
	$ 34,180,398.97	34,175,001.12	34,235,507.78	35,184,170.82	35,514,748.10	34,910,053.24	34,978,412.64	34,932,400.89	0.00	0.00	0.00	0.00

EXHIBIT C

Kent County Water Board Meeting

March 15, 2012

C&E ENGINEERING
CIVIL ENGINEERS. ENVIRONMENTAL PROJECTS.

342 Park Ave. Woonsocket, RI 02895
Phone: 401 762-1711 Fax: 401 235-9088
www.ceengineer.com

March 5, 2012

Mr. Timothy J. Brown, P.E.
General Manager and Chief Engineer
Kent County Water Authority
1072 Main Street
P.O. Box 192
West Warwick, RI 02893-0192

RE: **Kent County Water Authority**
Bid Proposal Evaluation
Rehabilitation of the Quaker Lane Booster Pump Station
C&E Project No. J0713.02

Dear Mr. Brown:

C&E Engineering Partners, Inc. (C&E) has completed an evaluation of the bids received February 29, 2012 relative to the above captioned project and for which the following assessment is provided. The Authority provided a copy of each contractor's complete bid package proposal to C&E on February 29, 2012. In total, two (2) bid proposals were received for the project. The apparent low bid proposal was received from Hart Engineering Corporation (Hart) of Cumberland, Rhode Island at a total of $2,807,000.00. The second bid was received from Process Engineers and Constructors, Inc. (PEC) of Cranston, Rhode Island at a total of $3,460,950.00, which is $653,950.00 above the apparent low bid total amount. A tabulation of the bid proposals with regard to completeness and noted discrepancies in the bid submission process has been completed by C&E and is provided herewith as Attachment No. 1.

Upon review, the two bid proposals were determined to be in general conformance with contract bidding requirements, in that each submitted a properly completed and executed Bid Form, Bid Security, acknowledgement of addenda, supervisor qualifications and relative qualifications and experience. C&E reviewed the Bid Bonds from both Bidders to verify that the underwriters appear on the U.S Federal Securities Listing – Circular 570 for incorporation in the State of Rhode Island. All Bid Bond underwriters meet this requirement of incorporation in Rhode Island. In addition, both of the Bidders had proper representation at the *mandatory* pre bid conference of February 15, 2012, which was a prerequisite for submission of a bid proposal.

Due to the potential for subcontractor's performing "critical" portions of the work (i.e. electrical, instrumentation and control, temporary by pass pump system, mechanical, etc.), bidders are instructed under Section 00100 Instruction to Bidders, Subsection 7.10 Additional Bid Information to "Include the names of all subcontractors and the portions of work they will perform", and this subsection further states that "Failure to comply with these stipulations will be grounds for disallowing Bids at the Owner's discretion". Contrary to these instructions, no subcontractors were named in the Supplements to Bid Form included in the bid proposal submitted by Hart.

Section 00100, Subsection 5.02.A states that "The Owner reserves the right to reject a proposed Subcontractor of reasonable cause", but the Authority is not able to consider suitability without proposed subcontractors being identified by the bidder. Accordingly, C&E issued a letter request to Hart on March 2, 2012 in order to establish a clarification regarding major subcontractors that would be participating in the work. Hart responded and provided a listing of proposed

subcontractors that is included as Attachment No. 2 to this evaluation. A general review of the identified subcontractors, including C&E's experience on previous projects with these firms as applicable, indicates that those firms proposed for the listed portions of the work possess the necessary qualifications and experience required for the project. No further inquiry was performed in regard to the subcontractors Hart proposes.

The bidding instructions stipulate that the successful bidder must have completed at least three similar projects within the last five years. Hart provided evidence of performance of extensive infrastructure projects related to construction of water and wastewater pumping and treatment facilities rehabilitation and other specialty projects. C&E personnel have previous direct construction related experience with Hart in which satisfactory performance in the completion of similar projects was demonstrated, whereby contacting additional references provided with the bid to corroborate their experience and qualifications is not deemed necessary. Additionally, Hart is the contractor for the Authority's Mishnock Treatment Facility project currently under construction.

The bidding instructions also require ten years of experience in potable water supply and transmission facilities projects as the qualifications for the on site construction supervisor proposed for the project. The information provided by Hart indicates that the proposed on site supervisor has over 22 years experience in the construction of water and wastewater facilities, including experience as project superintendent on various projects since 2001. The submitted qualifications and experience of the on site construction supervisor indicate satisfactory experience and qualification as required for the project.

Based on our investigations and evaluation of the available information, we affirm Hart as the "lowest responsible bidder" on the project. This is premised on their low dollar bid proposal, meeting the contractual bidding requirements and submitting documentation and experience, and the Authority's discretion on failure to comply with Section 00100 Subsection 7.10. Further, there is documented evidence of past satisfactory project performance, construction expertise related to waterworks projects, financial stability, all of which was substantiated from various sources.

We will retain the copy of the bid packages utilized in this evaluation for our records. Should you have any questions, or require additional information, please feel free to contact this office.

Sincerely,

Jonathan S. Gerhard, P.E.
Senior Project Engineer

enclosures: Attachments No. 1 and No. 2

cc: Russell L. Houde, Jr., P.E., C&E

3-05-12Bid EvalLetter_amended.doc

ATTACHMENT NO. 1

BID TABULATION SUMMARY SPREADSHEET

Kent County Water Authority
Rehabilitation of the Quaker Lane Pump Station
C&E Project #J0713

Bid Evaluation
For Bids Due: 2/29/2012

Prepared: 3/5/2012

Bid Item	Description	Unit	Quanity	Hart Engineering Corp. Cumberland, RI		Process Engineers & Constructors, Inc. Cranston, RI	
				Unit Price	Total	Unit Price	Total Cost
1.01	Rehabilitation of the Quaker Lane Pump Station, Complete in Place	L.S.	1	$2,429,475.00	$2,429,475.00	$3,063,675.00	$3,063,675.00
1.02	Replacement Site Retaining Wall System, Complete in Place	L.S.	1	$100,000.00	$100,000.00	$100,000.00	$100,000.00
1.03	Open Rock Excavation and Disposal	C.Y.	50	$100.00	$5,000.00	$175.00	$8,750.00
1.04	Trench Rock Excavation and Disposal	C.Y.	25	$125.00	$3,125.00	$290.00	$7,250.00
1.05	Excavation of Unsuitable Materials	C.Y.	25	$40.00	$1,000.00	$29.00	$725.00
1.06	Test Pits	EA.	5	$400.00	$2,000.00	$120.00	$600.00
1.07	Removal and Disposal of Petroleum Contaminated Soil	TON	10	$100.00	$1,000.00	$150.00	$1,500.00
1.08	Additional Cast In Place Concrete, Complete in Place	C.Y.	25	$300.00	$7,500.00	$465.00	$11,625.00
1.09	Crushed Stone	C.Y.	25	$40.00	$1,000.00	$35.00	$875.00
1.10	Replacement Pump Drives Clinton Avenue Pump Station	L.S.	1	$145,000.00	$145,000.00	$150,000.00	$150,000.00
1.11	I&C Work Remote SCADA Sites Ethernet High Speed	EA.	18	$1,275.00	$22,950.00	$1,500.00	$27,000.00
1.12[a]	*I&C Work Quaker Lane Pump Station Head End by KCWA Integrator*	*L.S.*	*1*	*$14,630.00*	*$14,630.00*	*$14,630.00*	*$14,630.00*
1.13[a]	*I&C Work Clinton Ave Pump Station Modifications by KCWA Integrator*	*L.S.*	*1*	*$3,800.00*	*$3,800.00*	*$3,800.00*	*$3,800.00*
1.14[a]	*I&C Work Head End Ethernet Cable Communications by KCWA Integrator*	*L.S.*	*1*	*$20,520.00*	*$20,520.00*	*$20,520.00*	*$20,520.00*
1.15[a]	*Utility Services Application Fee Reimbursement*	*L.S.*	*1*	*$50,000.00*	*$50,000.00*	*$50,000.00*	*$50,000.00*
Sum Total Bid Amount					**$2,807,000.00**		**$3,460,950.00**

1. Math Errors in Bid:	No	No
2. Acknowledgement of Addenda 1:	Yes	Yes
3. Signature and Seal on Bid:	Yes	Yes
4. Bid Bond @ 5%:	Yes	Yes
5. Submitted Qualifications and Experience:	Yes	Yes
6. Subcontractor List:	No[b]	Yes
7. Comments:		

a. Bid Items 1.12 through 1.15 are lump sum fixed price allowance items
a. Subcontractors not identified on Supplements to Bid Form. Subcontractor list provided upon request subsequent to bid.

ATTACHMENT NO. 2

REQUEST FOR ADDITIONAL INFORMATION & CONTRACTOR RESPONSE

C&E ENGINEERING
CIVIL ENGINEERS. ENVIRONMENTAL PROJECTS.

342 Park Ave. Woonsocket, RI 02895
Phone: 401 762-1711 Fax: 401 235-9088
www.ceengineer.com

March 2, 2012

Mr. David F. Rampone, President
Hart Engineering Corporation
800 Scenic View Drive
Cumberland, Rhode Island 02864

RE: **Kent County Water Authority**
Rehabilitation of Quaker Lane Pump Station
Bid Proposal Evaluation
(C&E Project No. J0713)

Dear Mr. Rampone:

On behalf of the Kent County Water Authority, C&E Engineering Partners, Inc. is requesting that Hart Engineering Corporation provide additional information in order to assist the Authority in their consideration for award of the above referenced contract in regard to assessing the experience and qualification of the bidders. Section 00310-2.00.C of the Bid Form requires that Section 00400 Supplements to Bid Form be submitted by all bidders, however, Page 00400-2 as provided within the Hart Engineering Corporation bid dated February 29, 2012 does not identify the name and contact information for proposed subcontractors for the listed work sections. Section 00310-2.00.A of the Bid Form allows for the Authority to make such investigations as deemed necessary to determine the ability of the bidder to perform the work, and that the bidder shall furnish all such information and data for this purpose as may be requested. Accordingly, please identify the subcontractors that you anticipate would be utilized to perform the work of Sections 02722, 13320, 13321, 15400, 15600, and Division 16 as listed on Page 00400-2 of the Supplements to Bid Form. We understand that a final determination in regard to specific subcontractors may not have been made at this time, in which case more than one proposed subcontractor can be identified for the various work Sections as may be necessary.

This additional information is necessary for the Authority to assess the eligibility of the Hart Engineering Corporation bid in consideration for awarding the subject contract. The listing of proposed subcontractors must be received by C&E Engineering Partners, Inc. no later than 12:00 pm on March 6, 2012 in order for this information to be incorporated into the bid evaluation.

Should you have any questions, please contact the undersigned in writing at above address.

Respectfully,
C&E ENGINEERING PARTNERS, INC.

Jonathan S. Gerhard, P.E.
Senior Project Engineer

cc: Timothy J. Brown, P.E., KCWA

Jon Gerhard

From: Ramos, James [JRamos@hartcompanies.com]
Sent: Friday, March 02, 2012 11:42 AM
To: jgerhard@ceengineer.com
Cc: Mulligan, Robert
Subject: FW: Scanned from a Xerox multifunction device
Attachments: Scanned from a Xerox multifunction device001.pdf

Importance: High

Jon:

As requested, see attached for our subs/vendors for this project.

Regards,
Hart Engineering Corp., Inc.
800 Scenic View Drive
Cumberland, RI 02864
401-658-4600 ext. 127
401-640-1902 cellular
401-658-4609 fax
jramos@hartcompanies.com <mailto:jramos@hartcompanies.com>

James M. Ramos, P.E.

-----Original Message-----
From: donotreply@hartcompanies.com [mailto:donotreply@hartcompanies.com]

Sent: Friday, March 02, 2012 11:43 AM
To: Ramos, James
Subject: Scanned from a Xerox multifunction device

Please open the attached document. It was scanned and sent to you using a Xerox multifunction device.

Attachment File Type: pdf

multifunction device Location: machine location not set
Device Name: XRX0000AAD3A4A8

For more information on Xerox products and solutions, please visit http://www.xerox.com

#J0713
09/11

APPENDIX A

Herewith is the list of Subcontractors referenced in the Bid submitted by:

(Bidder) HART ENGINEERING CORP., INC.

Kent County Water Authority
(Owner)

dated 2/29/2012 and, which is an integral part of the Bid Form.

The following work will be performed (or provided) by the following Subcontractors, and coordinated by us:

SECTION OF WORK	NAME / CONTACT
Sections02722 – Temporary Bypass Pumping System	BAKER CORP.
Sections13320 and 13321 Instrumentation & Controls	RE ERICKSON
Section 15400 – Plumbing	AERO MECHANICAL
Section 15600 - HVAC	AERO MECHANICAL
Division 16 - Electrical	E.W. AUDET

Attach a listing of relevant qualifications and experience on similar projects.

MEMO

To: **Board**
From: **Timothy Brown**
Subject: **Infrastructure Report – American Water Works Association**
Date: **February 27, 2012**

Attached is a small report from American Water Works Association which deals with the investments needed over the next few decades to upgrade the water infrastructure and how burdensome this will be. Their estimate is one trillion dollars between now and 2035 in infrastructure rehabilitation to the water system. It certainly is an eye opener and something the Board should be aware of. In our particular case I think we are well ahead of the curve. As you know we invest 5.4 million dollars each year on a pay as you go basis and over the next 23 years we will be investing without any adjustments or changes, 124 million dollars in our infrastructure. If we can continue to invest as we have been in our infrastructure we will not be in the position that this report is predicting for our infrastructure. Again it points to our long-term program, our planning and our efforts to upgrade the systems prior to their ultimate demise. It also points to how effective the state infrastructure act is if the programs are followed. Certainly if the Rhode Island Water Systems follow their infrastructure programs and develop them for replacement in accordance with the regulations they will also be ahead of the curve and this state could be a model for good planning and foresight. We are beginning to see changes in our system where the infrastructure has been replaced. Continuing with our 5.4 million dollar program will advance us well into the future and avoid any potential infrastructure deterioration and catastrophes that may occur. Again the Board should take credit for their foresight into this planning and into the support of these programs. Again I think this report will emphasize how serious this is to this country but we should also take pride in the fact that we have addressed this.

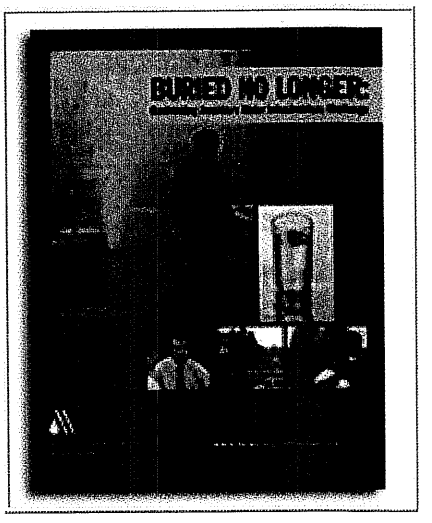
11 D 4

Timothy Brown

From: American Water Works Association [custsvc@awwa.org]
Sent: Monday, February 27, 2012 6:02 AM
To: Timothy Brown
Subject: AWWA News: Infrastructure needs top $1trillion

American Water Works Association
The Authoritative Resource on Safe Water®

AWWA infrastructure report issues call to action



The massive investment needed for buried drinking water infrastructure in the United States totals more than $1 trillion between now and 2035. The cost of that investment to repair and expand US drinking water infrastructure will be met primarily through higher water bills and local fees, costing some households in small communities as much as $550 more a year, according to a new AWWA report.

"Because pipe assets last a long time, water systems that were built in the latter part of the 19th century and throughout much of the 20th century have, for the most part, never experienced the need for pipe replacement on a large scale," the report says. Replacement needs account for about 54 percent of the national total, with the balance attributable to population changes over that period.

"Buried No Longer: Confronting America's Water Infrastructure Challenge" is a call to action for utilities, consumers and policy makers and recognizes that the need to replace pipe in the ground "puts a growing stress on communities that will continue to increase for decades to come." They will be affected in different ways depending on their size and geography. Many small communities will face the greatest challenges because they have fewer people to support the expenses.

The required national-level investment will double from roughly $13 billion a year today to almost $30 billion (in 2010 dollars) annually by the 2040s. This level of investment will have to be sustained for many years to maintain current levels of water service.

The new report extends the study of AWWA's seminal 2001 report, "Dawn of the

Replacement Era," which anticipated the extended wave of costs to replace drinking water infrastructure as it reaches the end of its service life.

"Water is a basic necessity of life," said AWWA President Jerry Stevens, general manager of West Des Moines (Iowa) Water Works. "Water utilities are committed to finding fair and equitable rate designs that address affordability issues as they face the increased cost of infrastructure replacement. The good news is that there is still time to act. 'Buried No Longer' helps us recognize the challenge ahead. Together, we can take the necessary steps to meet that challenge."

The new report analyzes many factors, including timing of water main installation and life expectancy, materials used, replacement costs and shifting demographics.

Some of the key findings in "Buried No Longer" include:

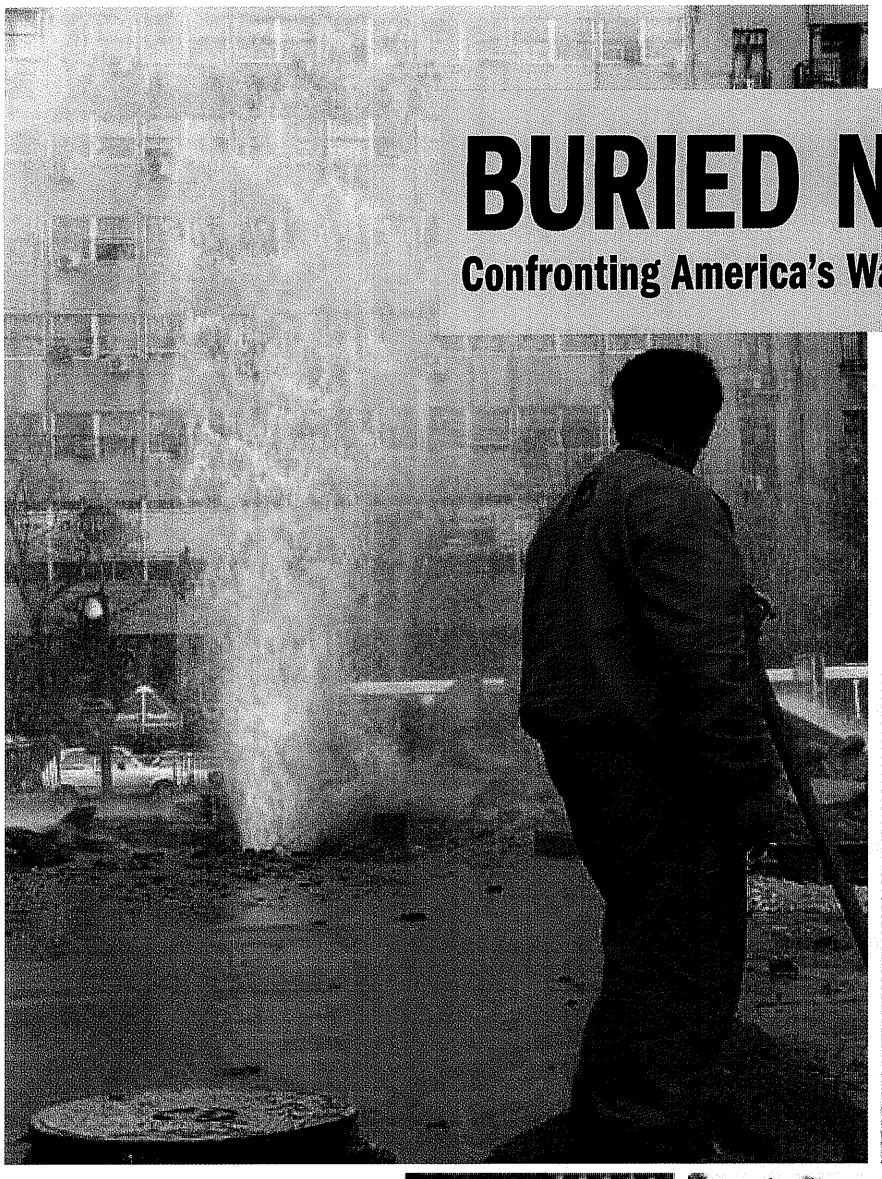
- **The needs are large.** The cost of replacing pipes at the end of their useful lives will total more than $1 trillion nationwide between 2011 and 2035 and exceed $1.7 trillion by 2050.
- **Household water bills will go up.** Although water bills will vary by community size and geographic region, for some communities the infrastructure costs alone could triple the size of a typical family's bill.
- **The costs keep coming.** Infrastructure renewal investments are likely to be incurred each year over several decades. For that reason, many utilities may choose to finance infrastructure replacement on a "pay-as-you-go" basis rather than through debt financing.

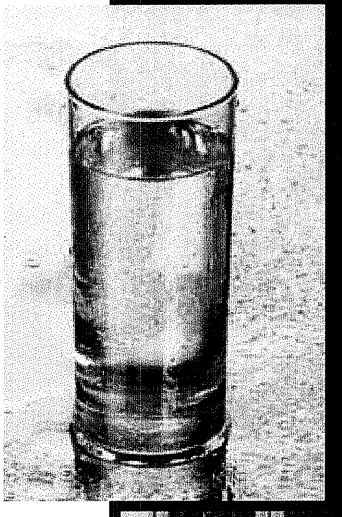
"The needs uncovered in 'Buried No Longer' are large, but they are not insurmountable," said AWWA Executive Director David LaFrance. "When you consider everything that tap water delivers — public health protection, fire protection, support for the economy, the quality of life we enjoy — we owe it to future generations to confront the infrastructure challenge today."

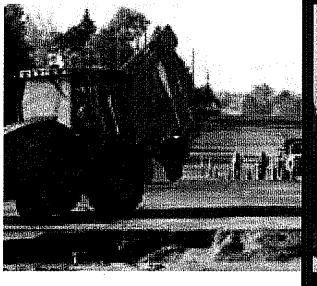
The report and related information are available on the AWWA website. The report includes more than 35 tables and graphs detailing information by region and utility size. For example, the graphs for utilities in the West show that the investment for growth is consistently greater than that required for replacement through 2050, while just the opposite is true for utilities in the Northeast.

BURIED NO LONGER:

Confronting America's Water Infrastructure Challenge



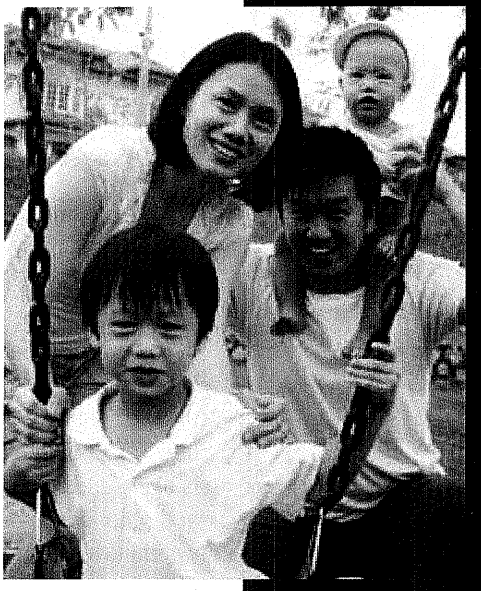




American Water Works Association

The Authoritative Resource on Safe Water®

Introduction. A new kind of challenge is emerging in the United States, one that for many years was largely buried in our national consciousness. Now it can be buried no longer. Much of our drinking water infrastructure, the more than one million miles of pipes beneath our streets, is nearing the end of its useful life and approaching the age at which it needs to be replaced. Moreover, our shifting population brings significant growth to some areas of the country, requiring larger pipe networks to provide water service.



As documented in this report, restoring existing water systems as they reach the end of their useful lives and expanding them to serve a growing population will cost at least $1 trillion over the next 25 years, if we are to maintain current levels of water service. Delaying the investment can result in degrading water service, increasing water service disruptions, and increasing expenditures for emergency repairs. Ultimately we will have to face the need to "catch up" with past deferred investments, and the more we delay the harder the job will be when the day of reckoning comes.

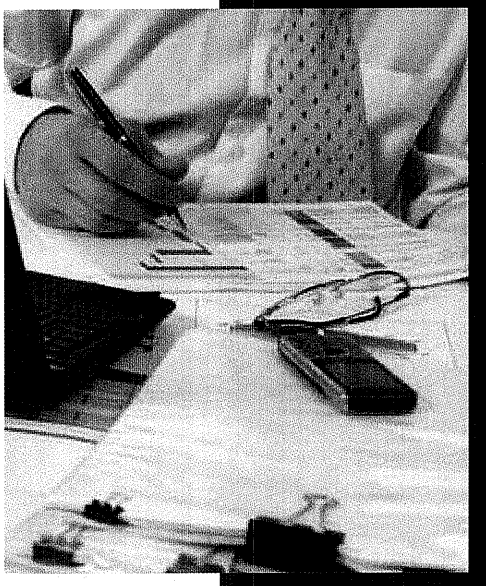
In the years ahead, all of us who pay for water service will absorb the cost of this investment, primarily through higher water bills. The amounts will vary depending on community size and geographic region, but in some communities these infrastructure costs alone could triple the size of a typical family's water bills. Other communities will need to collect significant "impact" or development fees to meet the needs of a growing population. Numerous communities will need to invest for replacement **and** raise funds to accommodate growth at the same time. Investments that may be required to meet new standards for drinking water quality will add even more to the bill.

Although the challenge to our water infrastructure has been less visible than other infrastructure concerns, it's no less important. Our water treatment and delivery systems provide public health protection, fire protection, economic prosperity and the high quality of life we enjoy. Yet most Americans pay less than $3.75 for every 1,000 gallons of safe water delivered to their taps.

This report demonstrates that as a nation, we need to bring the conversation about water infrastructure above ground. Deferring needed investments today will only result in greater expenses tomorrow and pass on a greater burden to our children and grandchildren. It's time to confront America's water infrastructure challenge.

The Era of Infrastructure Replacement. More than a decade ago the American Water Works Association (AWWA) announced that a new era was dawning: the replacement era, in which our nation would need to begin rebuilding the water and wastewater systems bequeathed to us by earlier generations. Our seminal report–*Dawn of the Replacement Era*–demonstrated that significant investments will be required in coming decades if we are to maintain the water and wastewater systems that are so essential to our way of life.

This analysis is based on the insight that there will be "demographic echoes" in which waves of reinvestment are driven by a combination of the original patterns of pipe investment, the pipe materials used, and local operating environments. The report examines the reinvestment demands implied by these factors, along with population trends, in order to estimate needs for pipe replacement and concurrent investment demands to accommodate population growth.



Although this report does not substitute for a careful and detailed analysis at the utility level as a means of informing local decisions, it constitutes the most thorough and comprehensive analysis ever undertaken of the nation's drinking water infrastructure renewal needs. The keys to our analysis include the following:

1. Understanding the original timing of water system development in the United States.
2. Understanding the various materials from which pipes were made, and where and when the pipes of each material were likely to have been installed in various sizes.
3. Understanding the life expectancy of the various types and sizes of pipe ("pipe cohorts") in actual operating environments.
4. Understanding the replacement costs for each type and size of pipe.
5. Developing a probability distribution for the "wear-out" of each pipe cohort.

Methodology

For this report, we differentiated across four water system size categories*:

- Very small systems (serving fewer than 3,300 people, representing 84.5% of community water systems).
- Small systems (3,300 to 9,999 served, representing 8.5% of community water systems).
- Medium-size systems (10,000 to 49,999 served, representing over 5.5% of systems). And,
- Large systems (serving more than 50,000 people, representing 1.5% of community water systems).

** Note that the water system size categories used in this analysis are not identical to the size categories USEPA uses for regulatory purposes. Note also that although data were analyzed based on these four size categories, some of the graphs that accompany this report combine medium-size and small systems. This is done for simplicity in the visual presentation, when the particular dynamics being represented are closely similar for medium-size and small systems.*

Figure 3: Aggregate Replacement Value of Water Pipes by Pipe Material and Utility Size (millions 2010 $s)

Region	CI	CICL	DI	AC	PV	Steel	PCCP	TOTAL
Northeast Large	48,958	8,995	5,050	2,308	1,875	335	0	67,522
Northeast Medium & Small	66,357	61,755	28,777	26,007	16,084	5,533	6,899	211,411
Northeast Very Small	14,491	15,992	10,661	7,281	7,937	329	462	57,152
Midwest Large	37,413	9,151	3,077	2,504	1,098	784	512	54,539
Midwest Medium & Small	74,654	92,106	51,577	37,248	30,506	8,682	11,152	305,925
Midwest Very Small	37,597	28,943	25,464	12,428	19,720	601	828	125,581
Southeast Large	30,425	28,980	29,569	21,229	14,936	9,337	7,227	141,703
South Medium & Small	54,772	98,608	140,079	103,659	102,804	21,394	17,160	538,475
South Very Small	43,183	24,998	49,791	34,529	47,823	1,461	1,244	203,028
West Large	15,448	16,055	28,949	14,774	14,723	7,443	6,215	103,607
West Medium & Small	15,775	50,145	70,355	50,541	48,885	12,276	9,806	257,782
West Very Small	16,344	11,199	17,910	13,166	17,245	545	453	76,862
Total	455,416	446,927	461,258	325,674	323,637	68,719	61,957	2,143,589

CI: cast iron; CICL: cast iron cement lined; DI: ductile iron; AC: asbestos cement; PV: polyvinyl chloride; PCCP: prestressed concrete cylinder pipe

Finally, we used historical data on the production and use of seven major types of pipe with 14 total variations (Figure 4) to estimate what kinds of pipe were installed in water systems in particular years. This was validated by field checking with a sample of water utilities as well as checking against the original Nessie analysis. Together these steps resulted in the development of 16 separate inventories (four regions with four utility sizes in each region), with seven types of pipe in each inventory, *thus providing the most comprehensive picture of the nation's water pipe inventory ever assembled.* Note that in some of the report's graphs, "long-" and "short-lived" versions of certain pipe materials are combined, for purposes of visual simplicity in the presentation.

In order to consider growth, it was also necessary to examine population trends across rural, suburban, and urban settings over the past century. US Census Bureau

Figure 4: Historic Production and Use of Water Pipe by Material

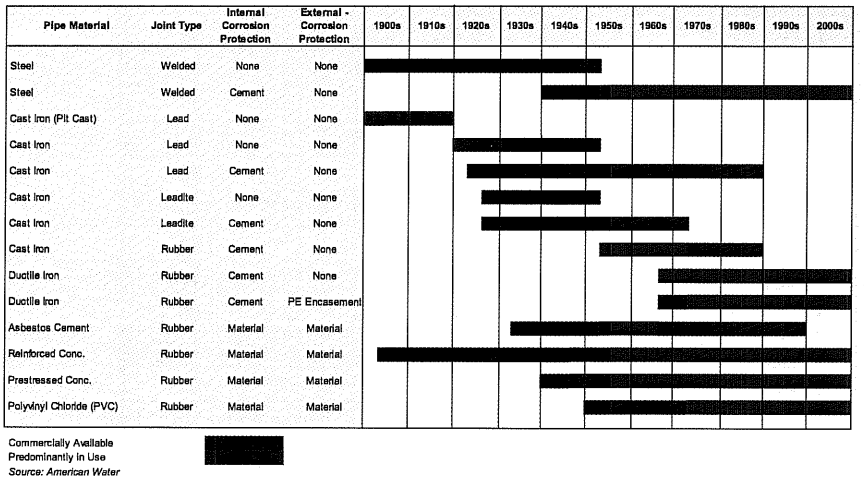
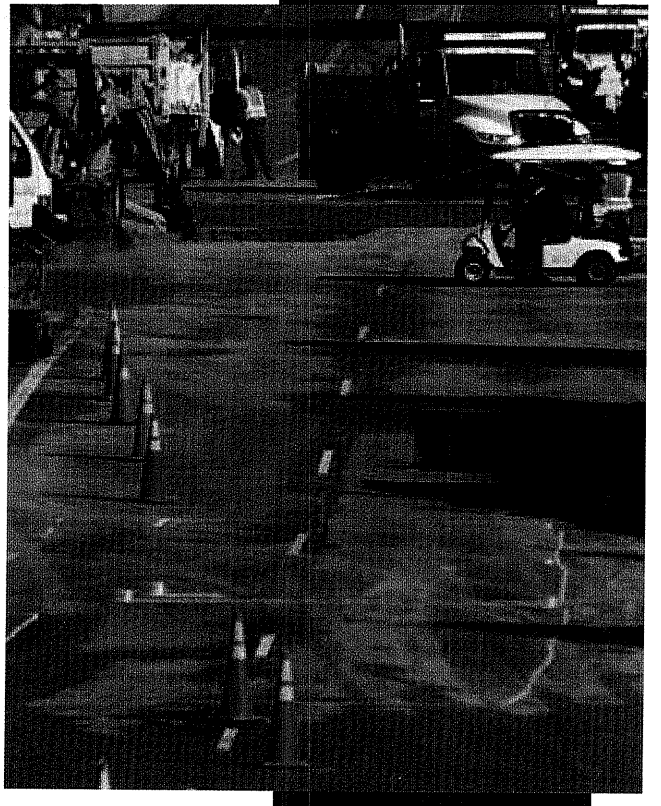


Figure 6: Aggregate Needs for Investment in Water Mains Through 2035 and 2050, by Region

2011-2035 Totals			
(2010 $M)	Replacement	Growth	Total
Northeast	$92,218	$16,525	$108,744
Midwest	$146,997	$25,222	$172,219
South	$204,357	$302,782	$507,139
West	$82,866	$153,756	$236,622
Total	**$526,438**	**$498,285**	**$1,024,724**

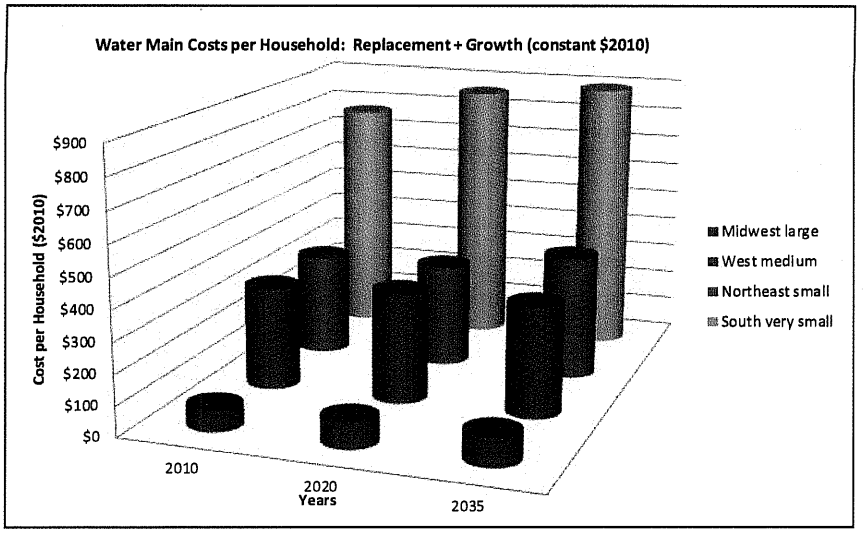
2011-2050 Totals			
(2010 $M)	Replacement	Growth	Total
Northeast	$155,101	$23,200	$178,301
Midwest	$242,487	$36,755	$279,242
South	$394,219	$492,493	$886,712
West	$159,476	$249,794	$409,270
Total	**$951,283**	**$802,242**	**$1,753,525**

reflected in Figure 5. Note that the *actual* lives of pipes may be quite different in a given utility. Because pipe life depends on many important local variables as well as upon utility practices, predicting the actual life expectancy of any given pipe is outside the scope of this study. Many utilities will have pipes that last much longer than these values suggest while others will have pipes that begin to fail sooner. However, these values have been validated as national "averages" by comparing them to actual field experience in a number of utilities throughout the country. The model also includes estimates of the indicative costs to replace each size category of pipe, as well as the cost to repair the projected number of pipe breaks over time according to pipe size.



The analysis of pipe replacement needs is compiled in the Nessie Model by combining the demographically based pipe inventories with the projected effective service lifetimes for each pipe type. This yields an estimate of how much pipe of each size in each region must be replaced in each of the coming 40 years. Factoring in the typical cost to replace these pipes, we derive an estimate of the total investment cost for each future year. The model then derives a series of graphs (the Nessie curves) that depict the amount of spending required in each future year to replace each of the different pipe types by utility size and region. Aggregating this information, we derived the dollar value of total drinking water infrastructure replacement needs over the coming 25 and 40 years for each utility size category per region, and for the United States.

Figure 8: Costs per Household for Water Main Replacement Plus Growth



With respect to the cost of growth, other caveats are important. Many communities expect growth to pay or help pay for itself through developer fees, impact fees, or similar charges. In such communities, established residents will not be required to shoulder the cost of population growth to the extent that these fees recover those costs. *But regardless of how the costs of replacement and growth are allocated among builders, newcomers, or established residents, the total cost that must be borne by the community will still rise.*

3. There Are Important Regional Differences. The growing national need affects different regions in different ways. In general, the South and the West will face the steepest investment challenges, with total needs accounting for considerably more than half the national total (see Figures 6 and 9). This is largely attributable to the fact that the population of these regions is growing rapidly. In contrast, in the Northeast and Midwest, growth is a relatively small component of the projected need. However, the population shifts away from these regions complicate the infrastructure challenge, as there are fewer remaining local customers across whom to spread the cost of renewing their infrastructure.

Figure 9: Water Main Replacement Costs per Region

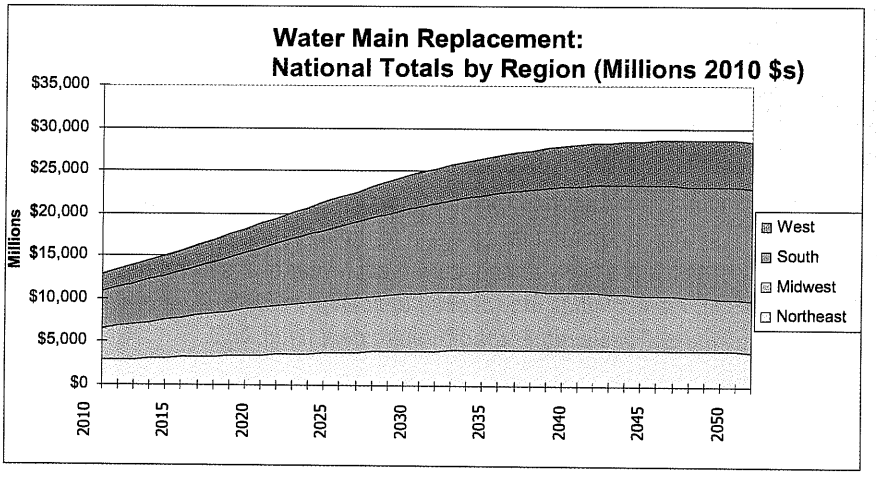
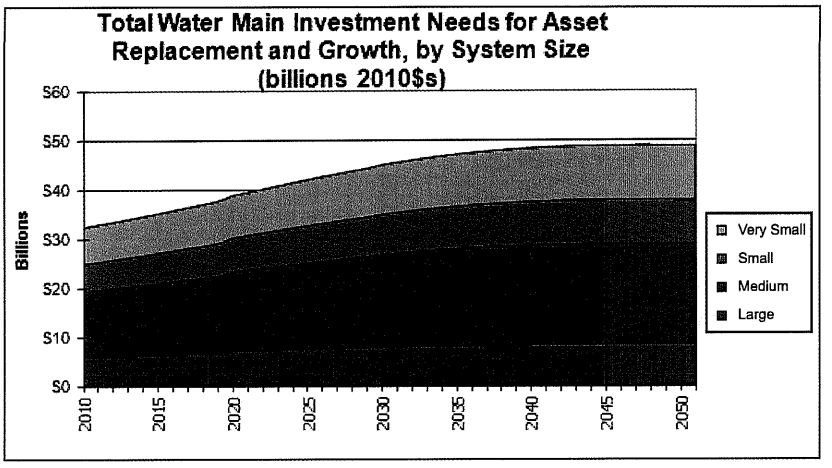


Figure 10: Total Water Main Replacement and Growth Needs by System Size



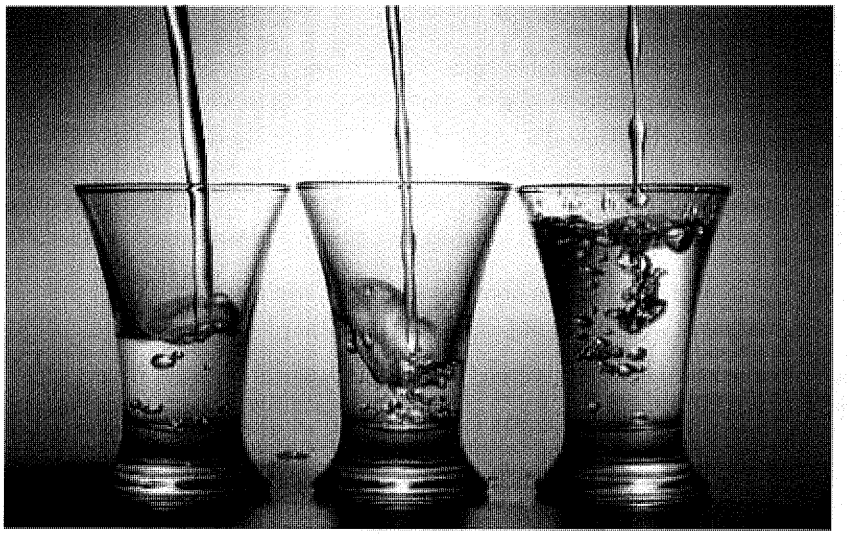
6. Postponing Investment Only Makes the Problem Worse.

Overlooking or postponing infrastructure renewal investments in the near term will only add to the scale of the challenge we face in the years to come. Postponing the investment steepens the slope of the investment curve that must ultimately be met, as shown in Figure 11 (next page). It also increases the odds of facing the high costs associated with water main breaks and other infrastructure failures. The good news is that *not all of the $1 trillion investment through 2035 must be made right now.* There is time to make suitable plans and implement policies that will help address the longer-term challenge. The bad news is that the required investment level is growing, as more pipes continue to age and reach the end of their effective service lives.

As daunting as the figures in this report are, the prospect of not making the necessary investment is even more chilling. Aging water mains are subject to more frequent breaks and other failures that can threaten public health and safety (such as compromising tap water quality and fire-fighting flows). Buried infrastructure failures also may impose significant damages (for example, through flooding and sinkholes), are costly to repair, disrupt businesses and residential communities, and waste precious water resources. These maladies weaken our economy and undermine our quality of life. As large as the cost of reinvestment may be, **not** undertaking it will be worse in the long run by almost any standard.

This suggests that a crucial responsibility for utility managers now and in the future is to develop the processes necessary to continually improve their understanding of the "replacement dynamics" of their own water systems. Those dynamics should be reflected in an Asset Management Plan (AMP) and, of course, in a long-term capital investment plan. The 2006 AWWA Report *Water Infrastructure at a Turning Point* includes a full discussion of this issue.

It is clear the era AWWA predicted a decade ago—the replacement era—has arrived. The issue of aging water infrastructure, which was buried for years, can be buried no longer. Ultimately, the cost of the renewal we face must come from local utility customers, through higher water rates. However, the magnitude of the cost and the associated affordability and other adverse impacts on



communities—as well as the varying degrees of impact to be felt across regions and across urban and rural areas—suggest that there is a key role for states and the federal government as well. In particular, states and the federal government can help with a careful and cost-effective program that lowers the cost of necessary investments to our communities, such as the creation of a credit support program—for example, AWWA's proposed Water Infrastructure Finance and Innovation Authority (WIFIA).

Finally, in many cases, difficult choices may need to be made between competing needs if water bills are to be kept affordable. Water utilities are willing to ask their customers to invest more, but it's important this investment be in things that bring the greatest actual benefit to the community. Only in that spirit can we achieve the goal to which we all aspire, the reliable provision of safe and affordable water to all Americans.

Estimated Distribution of Mains by Material Over Time
Northeast & Midwest Regions

	CI	CICL (LSL)	CICL (SSL)	DI (LSL)	DI (SSL)	AC (LSL)	AC (SSL)	PVC	CI	CICL (LSL)	CICL (SSL)	DI (LSL)	DI (SSL)	AC (SSL)	AC (LSL)	PVC	CI	CICL (LSL)	CICL (SSL)	DI (LSL)	AC (LSL)	Steel	Conc & PCCP
	<6 inch diameter								6-10 inch diameter								>10 inch diameter						
1870	100%								100%								100%						
1880	100%								100%								100%						
1890	100%								100%								100%						
1900	100%								100%								100%						
1910	100%								100%								100%						
1920	100%								100%								100%						
1930	50%	30%	20%						50%	30%	20%						50%	30%	20%				
1940	20%	60%	20%						20%	60%	20%						20%	40%	20%			20%	
1950		60%				20%	20%			60%				20%	20%			40%			10%	20%	30%
1960		50%			10%	20%	20%			50%			10%	20%	20%			35%		5%	10%	20%	30%
1970		20%			40%			40%		20%			40%			40%				50%		20%	30%
1980				25%	30%			45%				25%	35%			40%				60%		15%	25%
1990				50%	5%			45%				50%	5%			45%				60%		15%	25%
2000				55%				45%				55%				45%				60%		15%	25%
2010				55%				45%				55%				45%				60%		15%	25%
2020				55%				45%				55%				45%				60%		15%	25%
2030				55%				45%				55%				45%				60%		15%	25%

Steel and PCCP pipe not in widespread use in sizes under 10 inches.

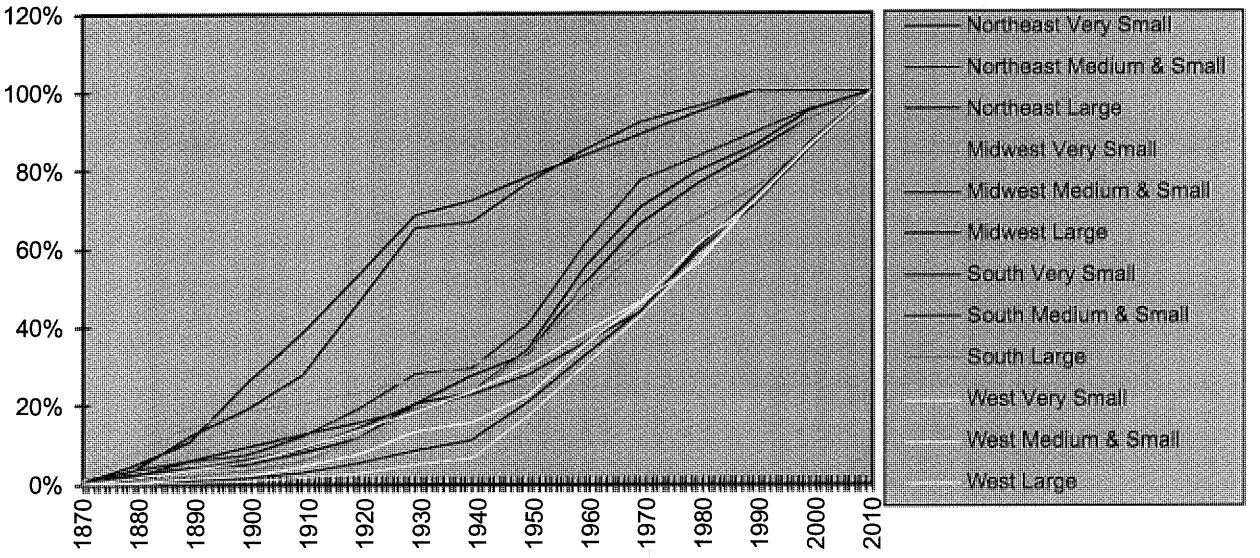
CI: cast iron; CICL: cast iron cement lined; DI: ductile iron; AC: asbestos cement; PV: polyvinyl chloride; PCCP: prestressed concrete cylinder pipe

The regions are combined because they share similar dynmaics for this distribution.

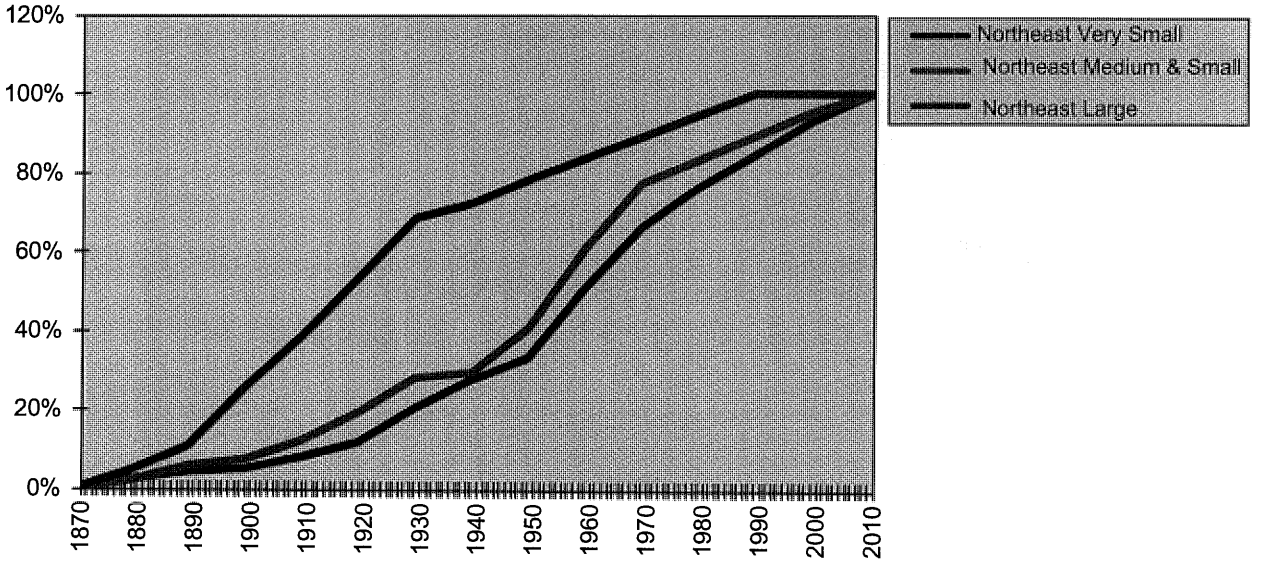
Note:
"LSL" indicates a relatively long service life for the material resulting from some combination of benign ground conditions and evolved laying practices etc.

"SSL" indicates a relatively short service life for the material resulting from some combination of harsh ground conditions and early laying practices etc.

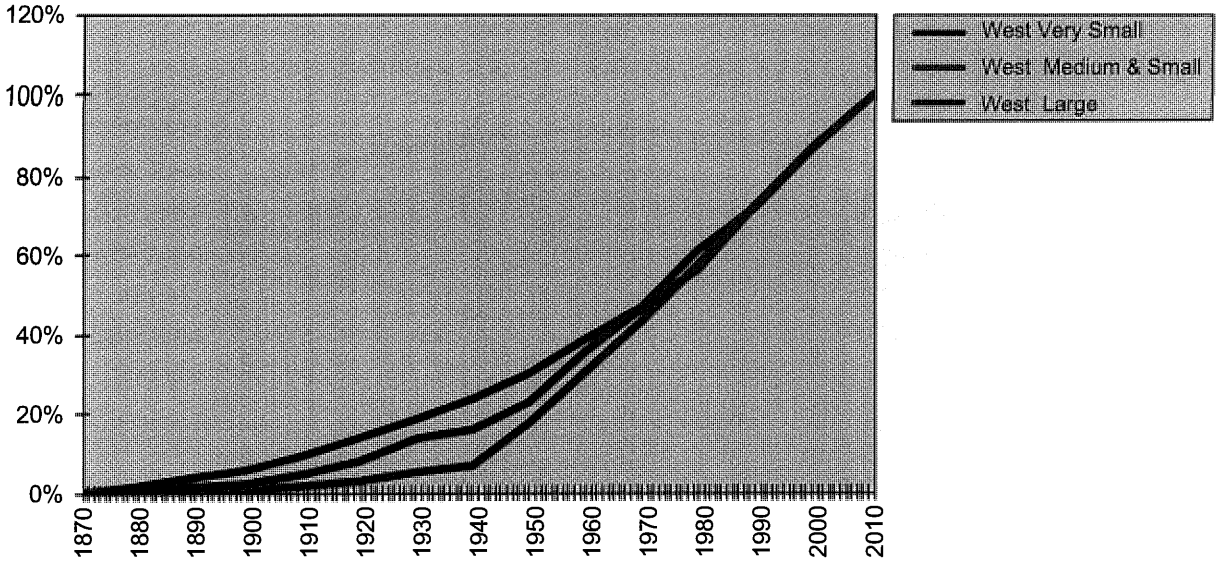
Proportion of Current System Built by Decade: All Regions



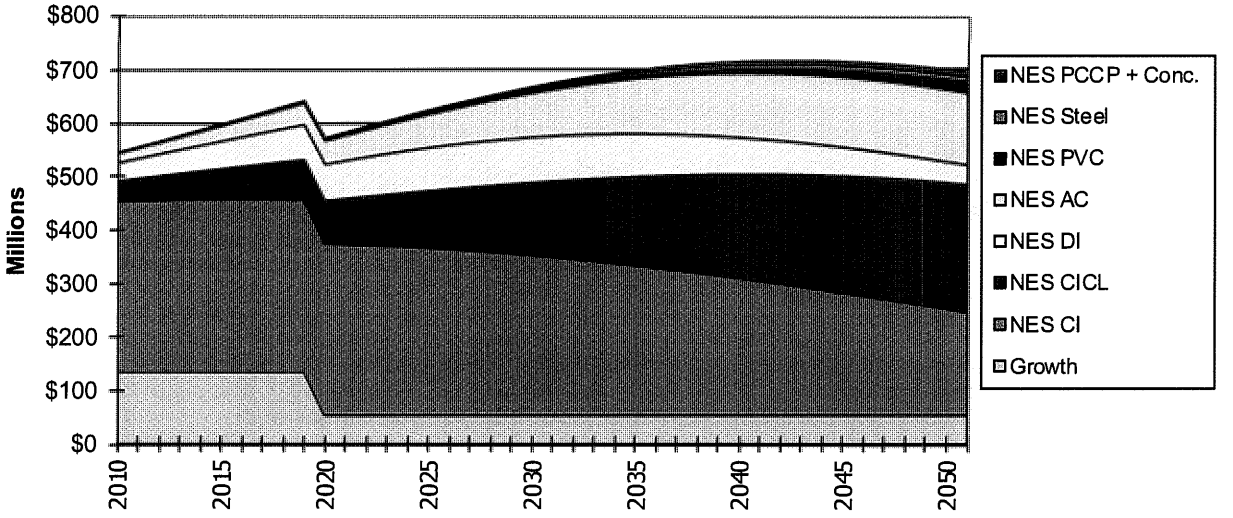
Proportion of Current System Built by Decade: Northeast



Proportion of Current System Built by Decade: South

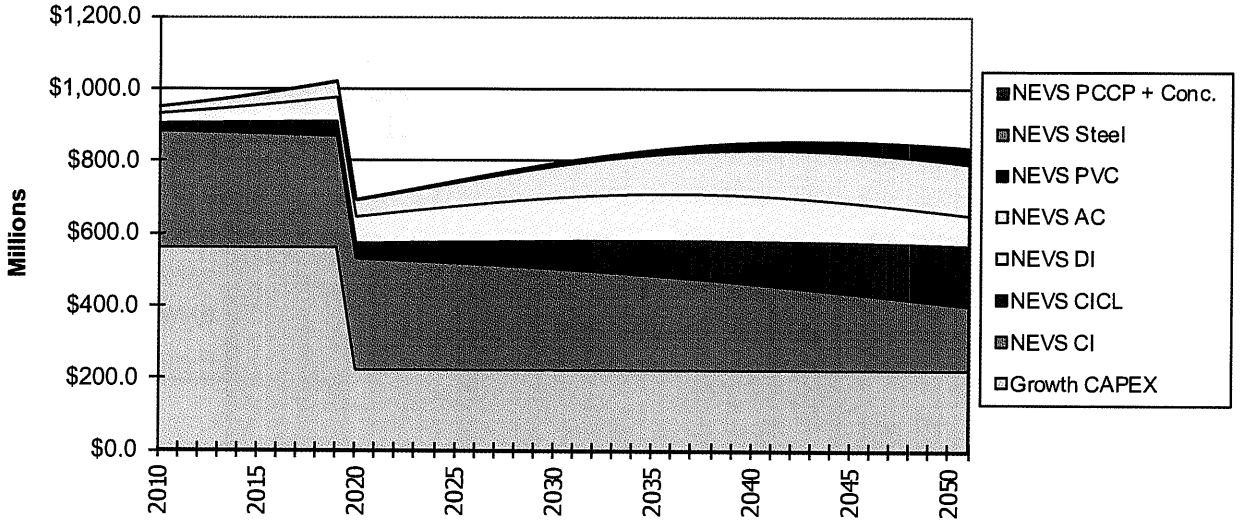


Investment for Replacement & Growth
Northeast Small



CI: cast iron; CICL: cast iron cement lined; DI: ductile iron; AC: asbestos cement; PV: polyvinyl chloride; PCCP: prestressed concrete cylinder pipe

Investment for Replacement & Growth
Northeast Very Small

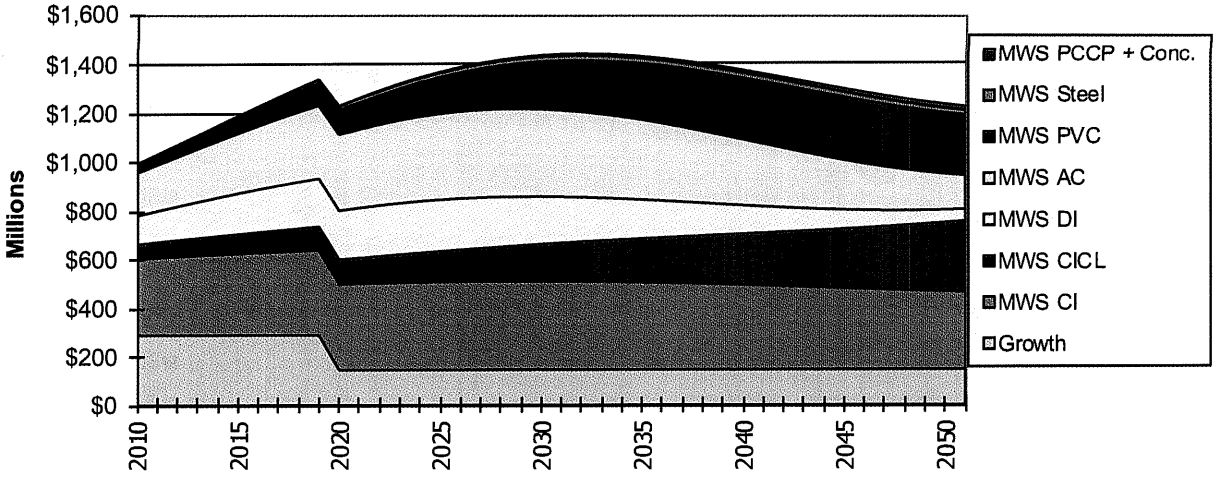


CI: cast iron; CICL: cast iron cement lined; DI: ductile iron; AC: asbestos cement; PV: polyvinyl chloride; PCCP: prestressed concrete cylinder pipe

The charts show needs for replacement of particular types of pipe and for growth (see the keys below and to the right of the chart). An artifact of the model and US Census data result in an apparent upward or downward "spike" in growth-related needs between certain decades. In reality, the apparent sudden shift in growth-related needs will be spread more evenly over the years bridging each decade to the next.

Investment for Replacement & Growth

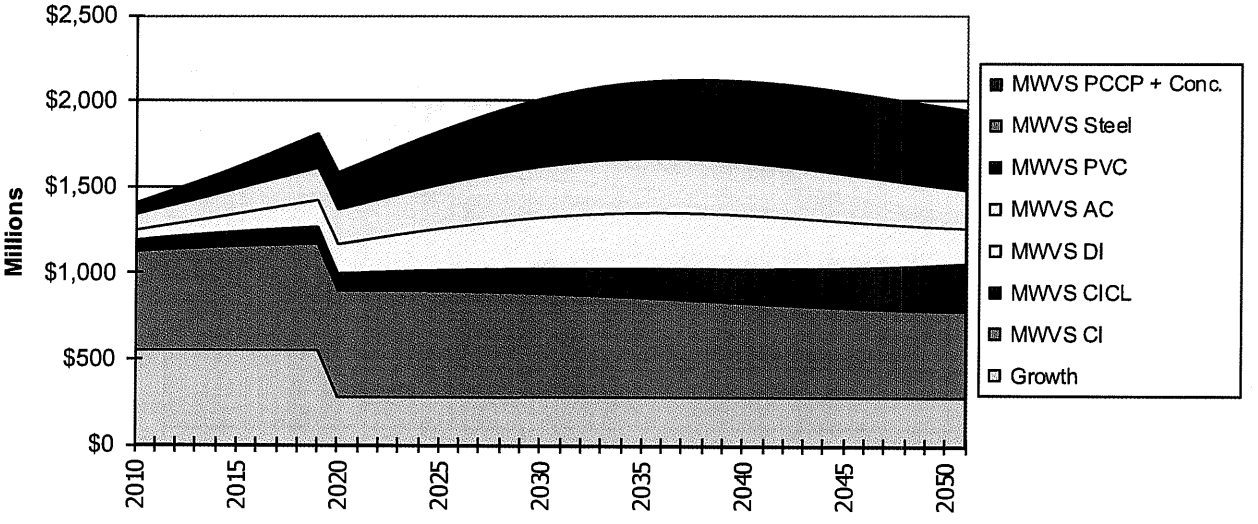
Midwest Small



CI: cast iron; CICL: cast iron cement lined; DI: ductile iron; AC: asbestos cement; PV: polyvinyl chloride; PCCP: prestressed concrete cylinder pipe

Investment for Replacement & Growth

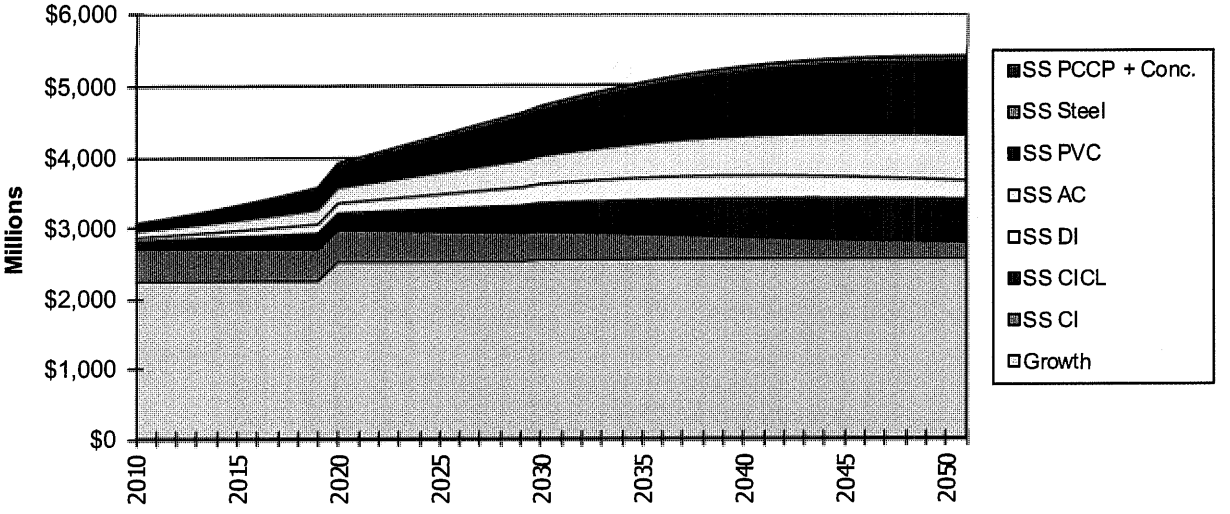
Midwest Very Small



CI: cast iron; CICL: cast iron cement lined; DI: ductile iron; AC: asbestos cement; PV: polyvinyl chloride; PCCP: prestressed concrete cylinder pipe

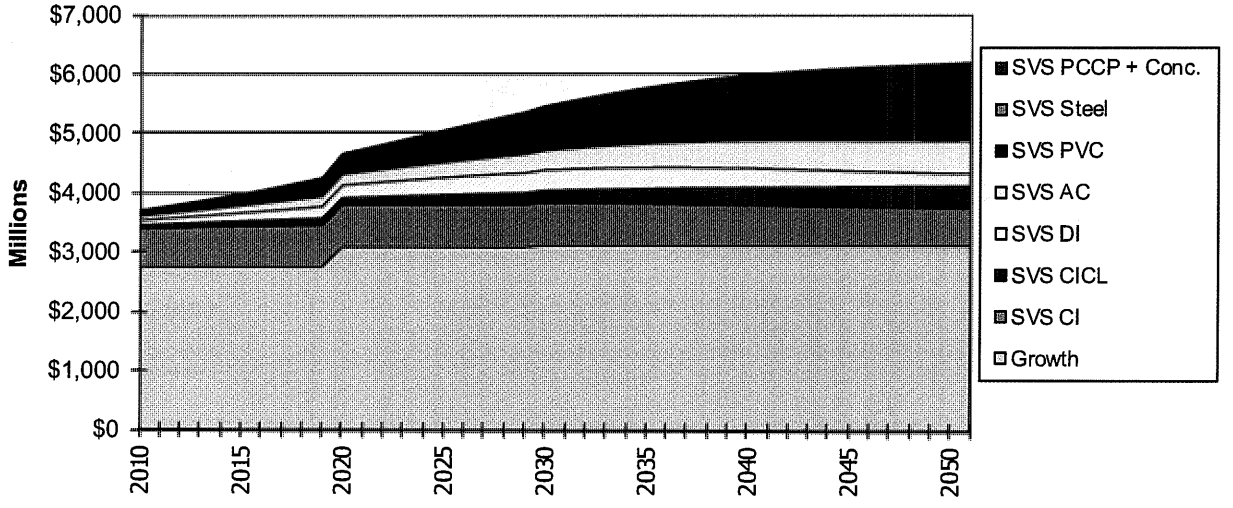
The charts show needs for replacement of particular types of pipe and for growth (see the keys below and to the right of the chart). An artifact of the model and US Census data result in an apparent upward or downward "spike" in growth-related needs between certain decades. In reality, the apparent sudden shift in growth-related needs will be spread more evenly over the years bridging each decade to the next.

Investment for Replacement & Growth
South Small



CI: cast iron; CICL: cast iron cement lined; DI: ductile iron; AC: asbestos cement; PV: polyvinyl chloride; PCCP: prestressed concrete cylinder pipe

Investment for Replacement & Growth
South Very Small

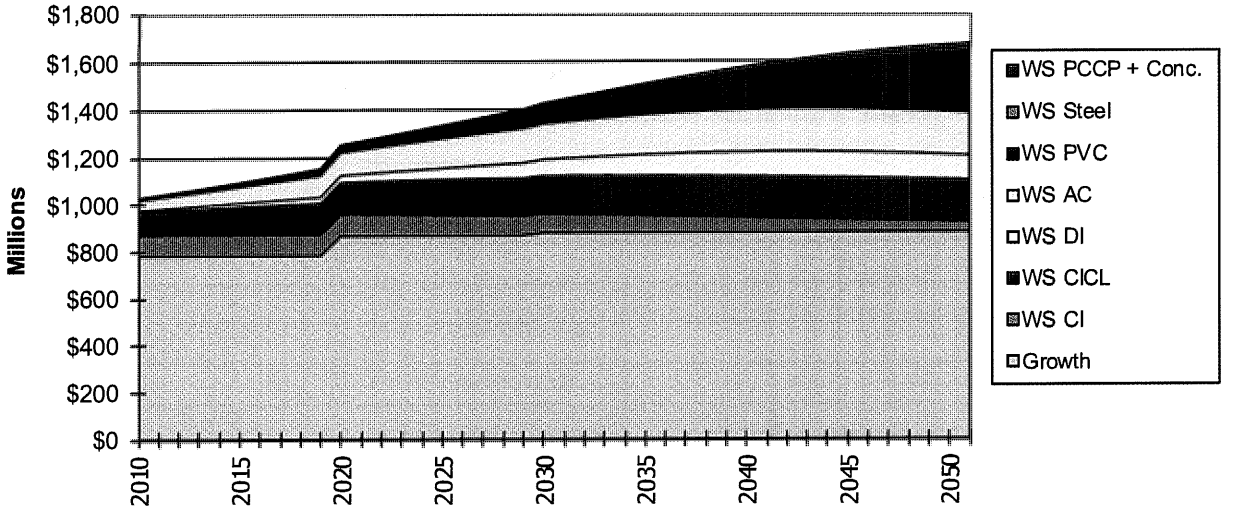


CI: cast iron; CICL: cast iron cement lined; DI: ductile iron; AC: asbestos cement; PV: polyvinyl chloride; PCCP: prestressed concrete cylinder pipe

The charts show needs for replacement of particular types of pipe and for growth (see the keys below and to the right of the chart). An artifact of the model and US Census data result in an apparent upward or downward "spike" in growth-related needs between certain decades. In reality, the apparent sudden shift in growth-related needs will be spread more evenly over the years bridging each decade to the next.

Investment for Replacement & Growth

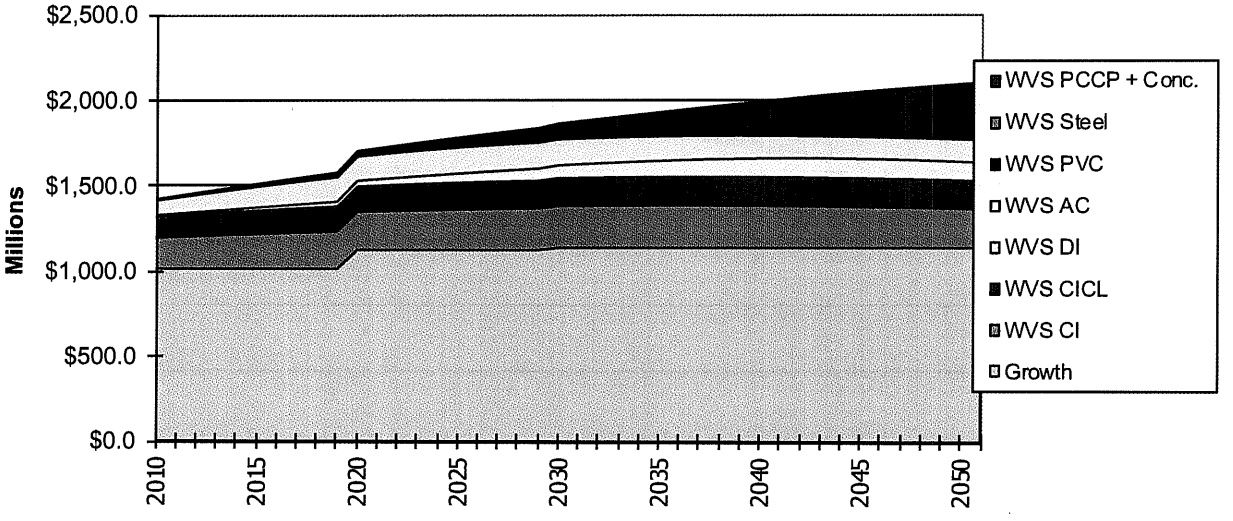
West Small



CI: cast iron; CICL: cast iron cement lined; DI: ductile iron; AC: asbestos cement; PV: polyvinyl chloride; PCCP: prestressed concrete cylinder pipe

Investment for Replacement & Growth

West Very Small

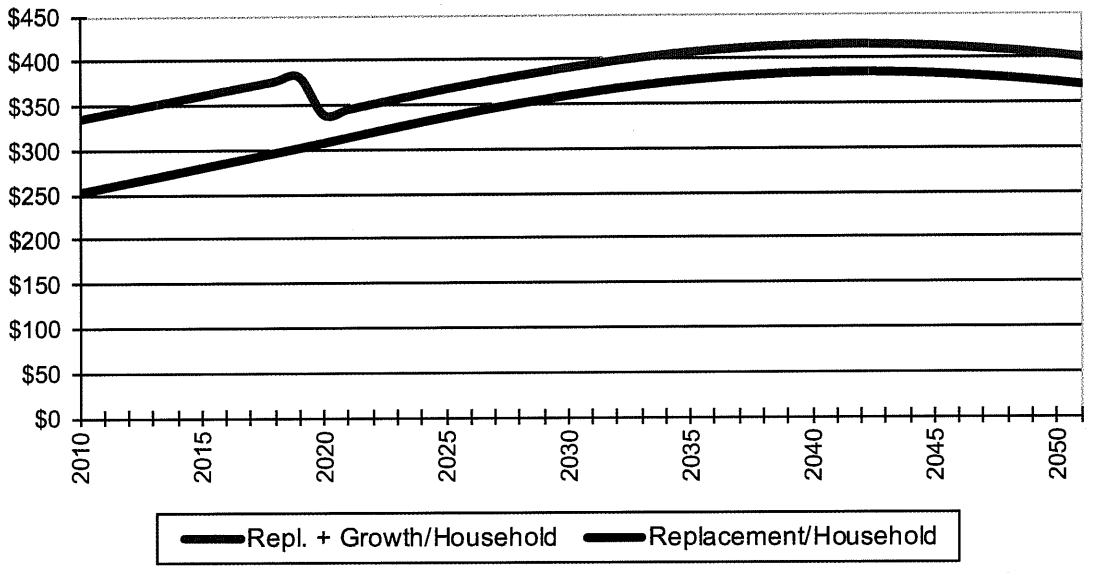


CI: cast iron; CICL: cast iron cement lined; DI: ductile iron; AC: asbestos cement; PV: polyvinyl chloride; PCCP: prestressed concrete cylinder pipe

The charts show needs for replacement of particular types of pipe and for growth (see the keys below and to the right of the chart). An artifact of the model and US Census data result in an apparent upward or downward "spike" in growth-related needs between certain decades. In reality, the apparent sudden shift in growth-related needs will be spread more evenly over the years bridging each decade to the next.

Household Cost of Needed Investment for Replacement Plus Growth*

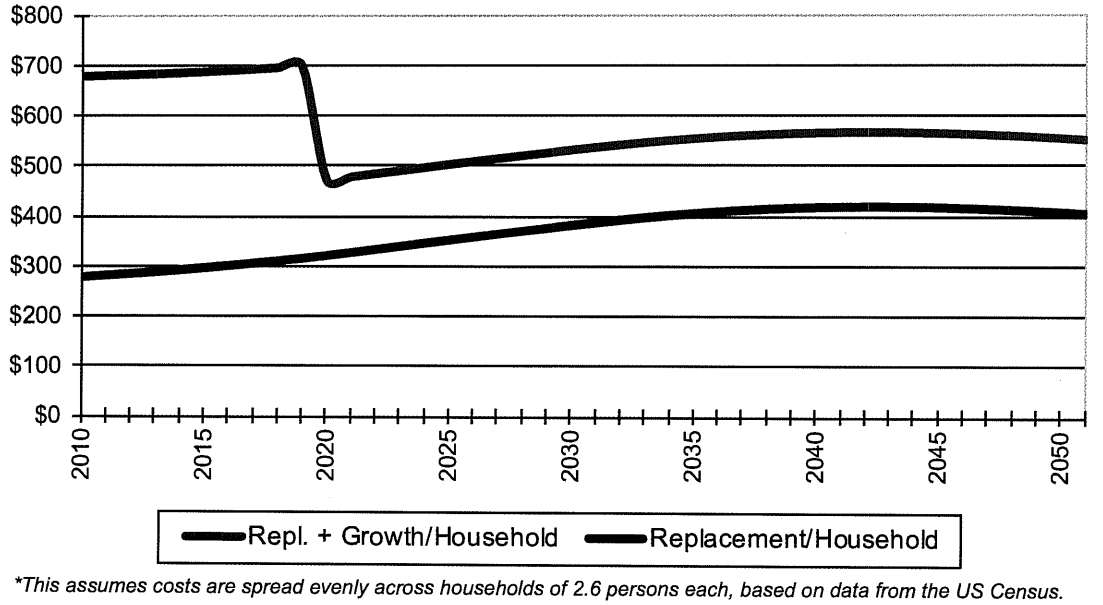
Northeast Small



**This assumes costs are spread evenly across households of 2.6 persons each, based on data from the US Census.*

Household Cost of Needed Investment for Replacement Plus Growth*

Northeast Very Small

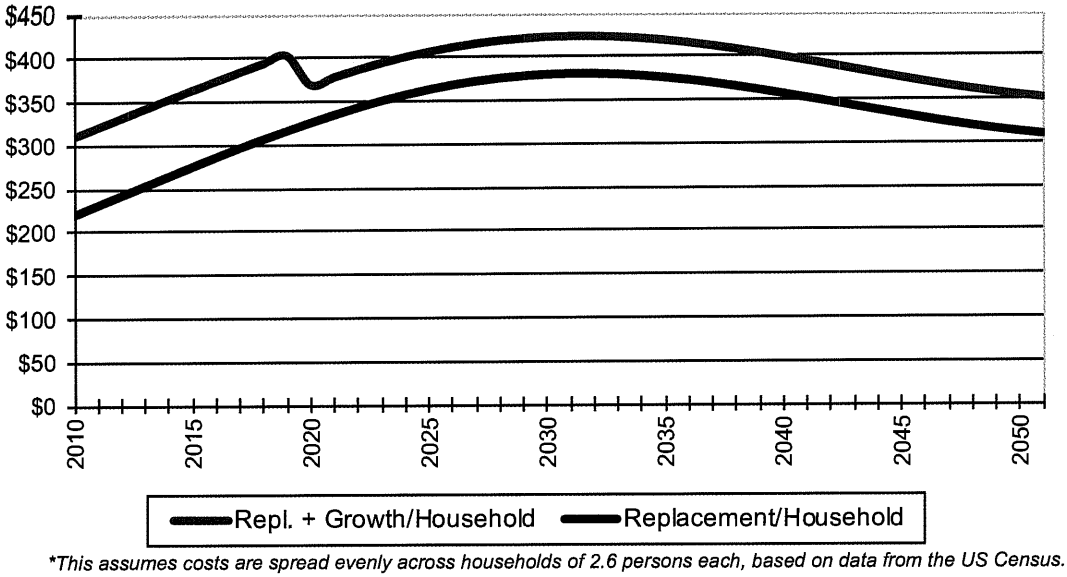


**This assumes costs are spread evenly across households of 2.6 persons each, based on data from the US Census.*

The charts show per household costs for replacement, and for replacement plus growth. The model assumes costs are spread evenly over households averaging 2.6 persons per household in accordance with US Census data. An artifact of the model and US Census data result in an apparent upward or downward "spike" in growth-related needs between certain decades. In reality, the apparent sudden shift in growth-related needs will be spread more evenly over the years bridging each decade to the next."

Household Cost of Needed Investment for Replacement Plus Growth*

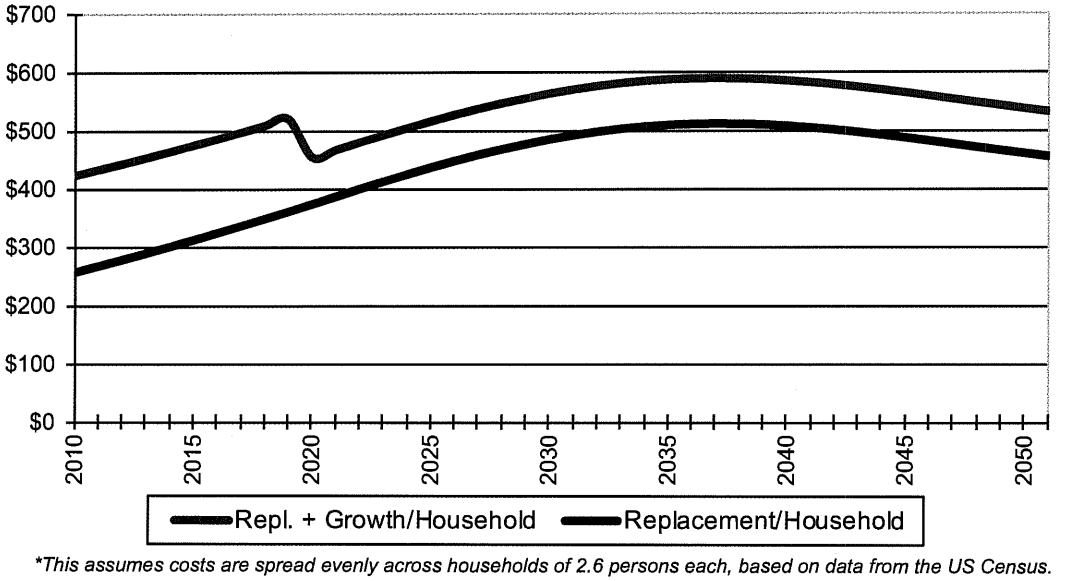
Midwest Small



**This assumes costs are spread evenly across households of 2.6 persons each, based on data from the US Census.*

Household Cost of Needed Investment for Replacement Plus Growth*

Midwest Very Small

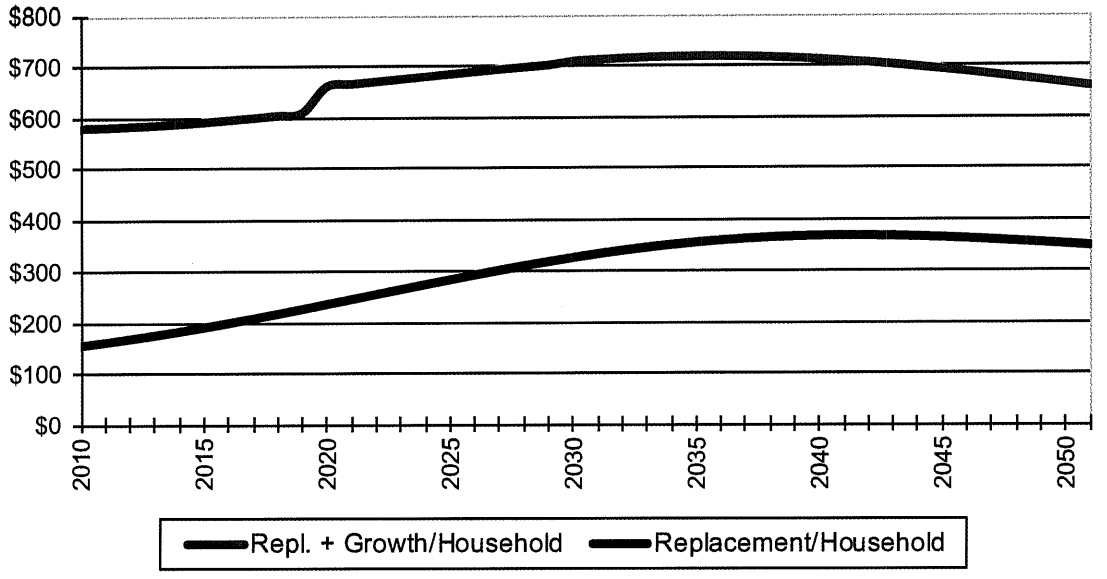


**This assumes costs are spread evenly across households of 2.6 persons each, based on data from the US Census.*

The charts show per household costs for replacement, and for replacement plus growth. The model assumes costs are spread evenly over households averaging 2.6 persons per household in accordance with US Census data. An artifact of the model and US Census data result in an apparent upward or downward "spike" in growth-related needs between certain decades. In reality, the apparent sudden shift in growth-related needs will be spread more evenly over the years bridging each decade to the next."

Household Cost of Needed Investment for Replacement Plus Growth*

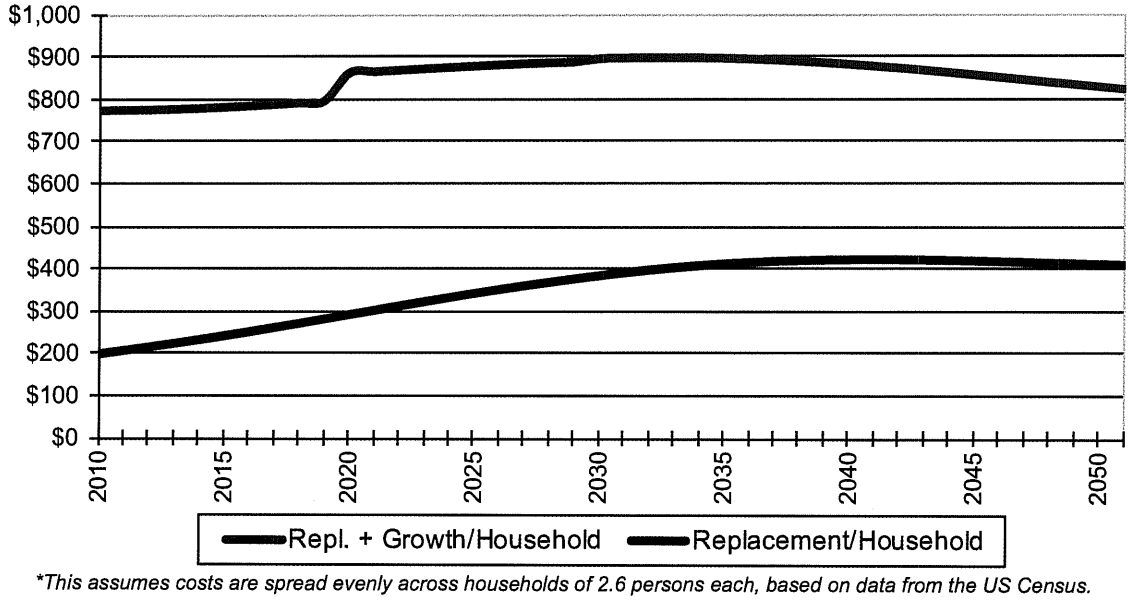
South Small



This assumes costs are spread evenly across households of 2.6 persons each, based on data from the US Census.

Household Cost of Needed Investment for Replacement Plus Growth*

South Very Small

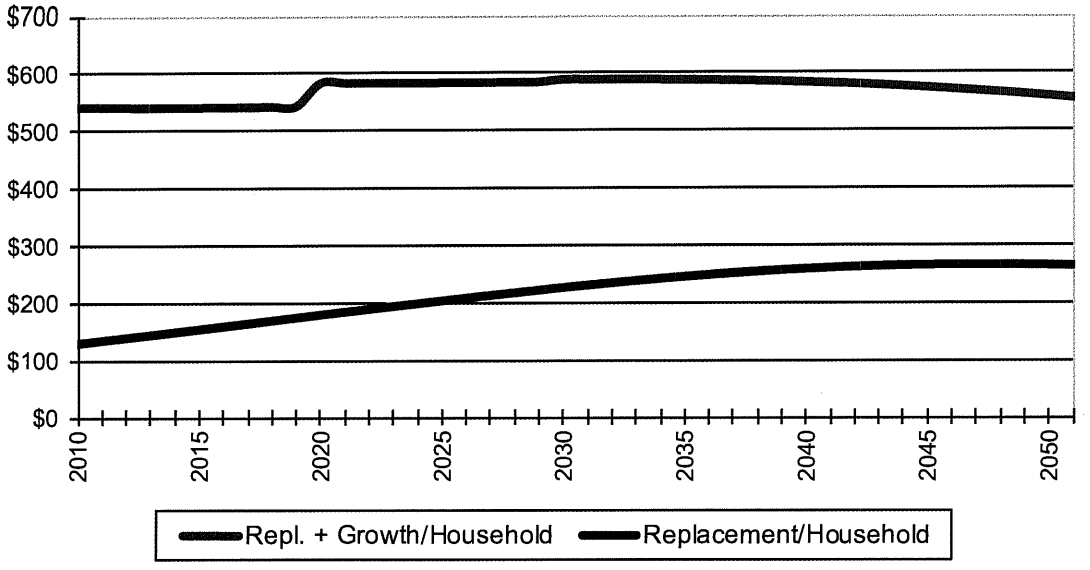


This assumes costs are spread evenly across households of 2.6 persons each, based on data from the US Census.

The charts show per household costs for replacement, and for replacement plus growth. The model assumes costs are spread evenly over households averaging 2.6 persons per household in accordance with US Census data. An artifact of the model and US Census data result in an apparent upward or downward "spike" in growth-related needs between certain decades. In reality, the apparent sudden shift in growth-related needs will be spread more evenly over the years bridging each decade to the next."

Household Cost of Needed Investment for Replacement Plus Growth*

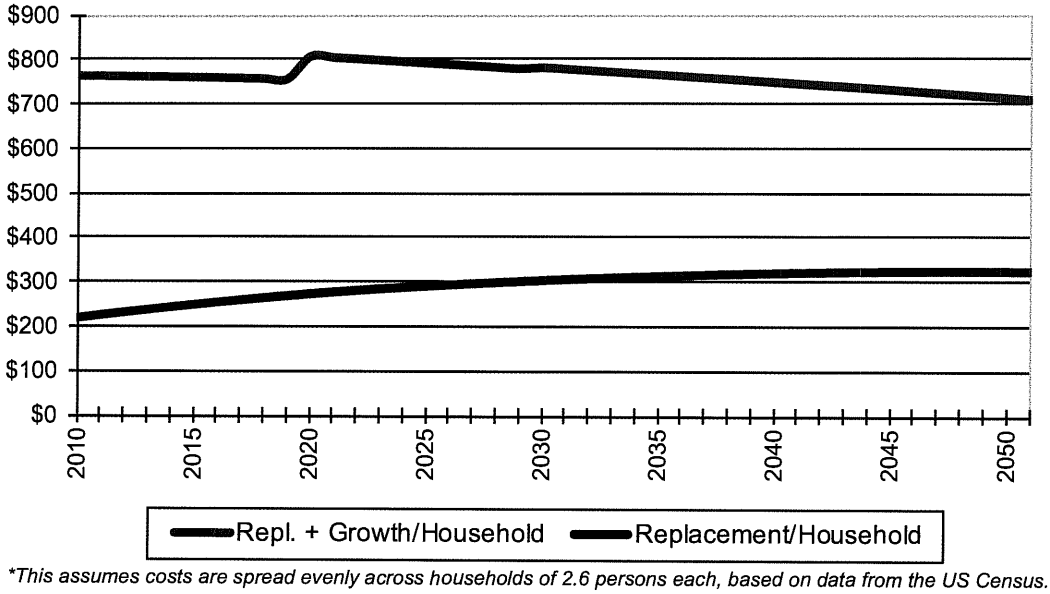
West Small



**This assumes costs are spread evenly across households of 2.6 persons each, based on data from the US Census.*

Household Cost of Needed Investment for Replacement Plus Growth*

West Very Small



**This assumes costs are spread evenly across households of 2.6 persons each, based on data from the US Census.*

The charts show per household costs for replacement, and for replacement plus growth. The model assumes costs are spread evenly over households averaging 2.6 persons per household in accordance with US Census data. An artifact of the model and US Census data result in an apparent upward or downward "spike" in growth-related needs between certain decades. In reality, the apparent sudden shift in growth-related needs will be spread more evenly over the years bridging each decade to the next."

EXHIBIT E

Kent County Water Board Meeting

March 15, 2012

REQUIRED PROGRAMMING

MARCH 2012

WSSMP — **STATUTORY REQUIREMENT**

Contract Issued September 2006 'PARE'
Submitted August 2007
Resubmitted February 2008
Approved (WRB) May 12, 2008

Deadline for submission of Revised WSSMP – August 2012

Must include – DMS (Demand Management Strategy)
Issue contract approximately 6 months – March/April 2012
Budget $25,000 – Available out of Engineering Studies, Cost of Service ($25,000/year)

IFR — **STATUTORY REQUIREMENT**

Contract Issued February 5, 2008
Submitted February 2009
Approved (Department of Health) October 20, 2009

Deadline for submission of Revised IFR – February 2014

Issue contract approximately 6 months, September 2013
Budget $18,000 - $20,000 – Available out of Engineering Studies, Cost of Service ($25,000/yr)

CIP UPDATE — **NOT STATUTORY/BOND REQUIRED**

Completed February 2012 - Budget $6,500.00
Available out of Engineering Studies, Cost of Service ($25,000/yr)

COMPUTER MODEL UPGRADE/RECALIBRATION — **NOT STATUTORY/SYSTEM REQUIRED**

Need RFP/3-4 month completion
Will review new demands and model/GIS Calibration
Budget $30,000 IFR Funding

TANK INSPECTION/ENGINEERING REPORT-(SYSTEM//WATER QUALITY REQUIRED)

Fall 2012 – Add to Budget 2012/2013
Considered Maintenance Activity

Budget $40,000 Tank Maintenance Budget

"E"

EXHIBIT F

Kent County Water Board Meeting

March 15, 2012

CHANGE ORDER

No. 3

DATE OF ISSUANCE March 5, 2012 EFFECTIVE DATE

OWNER: Kent County Water Authority
CONTRACTOR: C.B. Utility Co., Inc.
Contract: Flat River Road (Route 117) / Read School House Road Water Mains & Drain Line
Project:
OWNER's Contract No.: CIP 7C, 7D & 8A ENGINEER's Contract No.:
ENGINEER: Garofalo & Associates, Inc.

You are directed to make the following changes in the Contract Documents:

Description (Include itemized (~~increase~~) decrease price of work):
C.B. Utility Co. is not able to perform certain portions of work associated with the as-built requirements in the Contract Documents. Therefore; CBU will issue a credit to KCWA for the following items:

- Digital AutoCAD Files $3,400.00

Reason for Change Order:
C.B. Utility Co. is not able to perform certain portions of work associated with the as-built requirements in the Contract Documents. Therefore; CBU will issue a credit to KCWA for those particular items.

Attachments: (List documents supporting change)

CHANGE IN CONTRACT PRICE:
Contract Price prior to this Change Order: $ 3,291,922.97
Net (~~increase~~) decrease of this Change Order: $ 3,400.00
Contract Price with all approved Change Orders: $ 3,288,522.97

CHANGE IN CONTRACT TIMES:
Contract Times prior to this Change Order: Substantial Completion: May 29, 2009 Ready for final payment: (days or dates)
Net increase (decrease) this Change Order: Substantial Completion: 0 day Ready for final payment: (days)
Contract Times with all approved Change Orders: Substantial Completion: May 29, 2009 Ready for final payment: (days or dates)

RECOMMENDED:
By: Matthew Coto
ENGINEER (Authorized Signature)
Date: 3-5-12

APPROVED:
By:
OWNER (Authorized Signature)
Date: 3/15/12

ACCEPTED:
By:
CONTRACTOR (Authorized Signature)
Date: 3-7-12

~~FUNDING AGENCY APPROVAL (Changes are not effective until signed by Agency)~~

~~By:~~
~~AGENCY (Authorized Signature)~~

~~Title:~~

~~Date:~~

EJCDC 1910-8-B (1996 Edition)
Prepared by the Engineers Joint Contract Documents Committee and endorsed by The Associated General Contractors of America and the Construction Specifications Institute.

GAROFALO

Garofalo & Associates, Inc.
85 Corliss Street
PO Box 6145
Providence, RI 02940
Telephone (401) 273-6000 Fax (401) 273-1000

LETTER OF TRANSMITTAL

Date 3-8-12	Job No 6149
Attention: John	
Re: Read School House Road	
Change Order #3	

TO: **John Duchesneau**
Kent County Water Authority
P.O. Box 192, 1072 Main Street
West Warwick, RI 02893

WE ARE SENDING YOU ☒ Attached ☐ Under separate cover via _____ the following items:

☐ Shop drawings ☐ Prints ☐ Plans ☐ Samples ☐ Specifications

☐ Copy of Letter ☐ Change Order ☐ _____

COPIES	DATE	NO.	DESCRIPTION
3	3/8/12		Change Order #3

THESE ARE TRANSMITTED as checked below:

☒ For approval ☐ Approved as submitted ☐ Resubmit___ copies for approval

☒ For your use ☐ Approved as noted ☐ Submit___copies for distribution

☒ As requested ☐ Returned for Corrections ☐ Return___corrected prints

☐ FOR BIDS DUE 2012 ☐ Prints Returned After Loan to us

REMARKS:

John,

Attached is change order #3 that has been signed by both Joe Britto Jr. and myself. This change order was developed per the meeting that Tim and Joe had last week.

Please call me if you have any questions.

COPY TO: File

SIGNED: Matthew Cote

Matthew W. Cote, P.E.

EXHIBIT G

Kent County Water Board Meeting

March 15, 2012

As of March 8, 2012

PLANNING DOCUMENT $25,000/YEAR ALLOCATION	
PROJECT	**STATUS**
Water Supply System Management Plan WSSMP	**Approved**
Hunt River Interim Management & Action Plan	**Approved**
2008 CIP Program Plan	**Approved**
Clean Water Infrastructure Plan 2008	**Approved**
UPDATED CIP PROJECTS BOND FUNDING	
PROJECT	**STATUS**
Mishnock Well Field (new wells) CIP - 1A	Construction Ongoing
Mishnock Transmission Mains CIP - 1B	Funding will be critical to plant operation, 1/4 Bid
Mishnock Treatment Plant CIP - 1C	Construction Ongoing
East Greenwich Well Treatment Plant – CIP-2	Preliminary Design Report Completed
Clinton Avenue Pump Station Rehabilitation CIP - 7A	**Completed**
Read School House Road Tank CIP - 7B	**Completed**
Read School House Road Main CIP 7c, 7d, 8a	Change Order #3 Approval
IFR FUNDED PROJECTS	
PROJECT	**STATUS**
IFR 2005	**Completed C. O. # 1 Asphalt Adjustment**
IFR 2006 A	**Closed out, Paving Issue West Warwick, Need Resolution**
IFR 2006 B / IFR 2007	**Closed Out**
IFR 2009 A	**2009 A - Closed Out**
2009 B	2009 B, April Start-up
IFR 2010	Design Separation 2010A Spring Start-up, 2010B On Hold
Prospect Street	**Completed**
PWSB 78" / Johnson Blvd. P.S. Modification	**Completed**
Greenwich Avenue Replacement	**Completed**
Hydraulic Tank Evaluation	**Completed**
Quaker P. S. Design	Bid Award
Tech Park Tank Recoating	Legal Action Proceeding
Tiogue Tank Re-Service	**Completed**
Hydrant Painting	April Start-up
SCADA Upgrade	Added to Quaker P. S. Construction
Water Street Replacement	Joint Project E. G., Town Re-Bidding

EXHIBIT A

Kent County Water Board Meeting

March 15, 2012

Proposal to Conduct a Review and Evaluation of the Organization, Internal Controls and Business Practices

Kent County Water Authority

KCWA

matrix
consulting group

"A"

Introduction to the Matrix Consulting Group

- Members of the team have provided management consulting services to local government for more than 30 years.
- We have conducted over 100 studies of public utilities – including a number of recent engagements in New England.
- We are a 'fact based' firm, utilizing extensive 'stakeholder' input, detailed data collection and analysis as the basis for our projects.
- Our rates of implementation are exceptional, generally over 85% of recommendations made.
- The firm is headquartered in California with a Massachusetts Office.

KCWA

matrix consulting group

Experience That Sets Us Apart

- Public Utilities and Public Works projects are a core business practice of the Matrix Consulting Group.
- One of our team members is a prior executive manager with a utility district.
- We consult to local government only. Recent clients include:

Alexandria, Virginia	**Lee's Summit, Missouri**
Denton, Texas	**Montpelier, Vermont**
Evans, Colorado	**Napa County, California**
Falmouth, Massachusetts	**Santa Clara Valley Water, California**
Gloucester, Massachusetts	**South Coast Water District, California**
Haverhill, Massachusetts	**Springfield, Massachusetts**

KCWA

matrix consulting group

Our Project Team

Team Member	Background	Project Role
Richard Brady	Matrix CG President	Project Manager and principal contact. 30 years of consulting experience. QC for each project task
Gary Goelitz	Matrix CG Vice President	Lead Analyst with responsibility for analysis of overall operations and management. 37 years of analytical experience
Greg Mathews	Matrix CG Vice President	Project Analyst with responsibility for organization analysis of operations and staffing. 25 years of analytical experience, including management of a utility.

KCWA

matrix consulting group

Project Scope of Work

- Structure and organization of the Authority.
- Appropriate lines of authority, responsibility and accountability.
- Management approaches and management culture.
- Appropriateness of all internal controls.
- Conformance to 'best management practices' and peers to enhance the efficiency and effectiveness of operations.
- Operational efficiency, resources, work processes and staffing levels.

KCWA

matrix consulting group

Overall Project Approach

- **Develop an initial understanding of the unique operating environment in KCWA** – through extensive interviews.
- **Maximize input and interaction with Authority staff** – to obtain staff perceptions and keep staff appraised regarding the study.
- **Develop a detailed profile of operations** – to comprehensively document management, operations, organization and costs.
- **Best practices and comparative analysis** – to identify areas where practices meet or do not meet efficiency standards.
- **Detailed analysis of improvement opportunities** – to evaluate efficiency and cost effectiveness of services.

KCWA

matrix consulting group

Project Task Plan (1)

Task	Issues Addressed
1 Project Initiation	What are the key issues in the study? What are the expectations of key 'stakeholders'? What recent service trends underscore this study? How will the Authority and consultant work together?
2 Descriptive Profile	How is the Authority organized and staffed? What are workloads and service levels? What are costs and revenues? What management systems are in place? How is performance measured?
3 Comparative Assessment	How does the Authority compare to public utilities 'best management practices'? How do they compare to other water utilities? What opportunities arise from identified issues?

KCWA

matrix consulting group

Project Task Plan (2)

Task	Issues Addressed
4 Organization	Are spans of control appropriate? Are functions appropriately grouped? Is the plan of management staffing appropriate for an organization of this size and complexity?
5 Staffing and Operations	Are service levels adequate? Are the levels of PM appropriate? Are crew sizes appropriate? Does work output meet guidelines? Are there opportunities to outsource or in-source any functions? Are maintenance management systems adequate to plan and monitor operations? Are other technological tools needed?
6 Draft and Final Report	What prioritized changes should be implemented? Who should be responsible for implementation? What would be their impacts? How should the success of change be monitored?

KCWA

matrix consulting group

Why Select the Matrix Consulting Group?

- An experienced project team whose careers range from 10 – 30+ years in the public utilities analytical area, mostly working on projects together during that period.
- Extensive prior utilities project experience in New England and nationally encompassing over 100 utilities projects with high rates of recommendation implementation.
- An analytical approach which is 'fact based', in depth and interactive with KCWA staff and Board.
- Industry leader in the use of benchmarks and 'best practices'.

KCWA

matrix
consulting group

EXHIBIT D

Kent County Water Board Meeting

March 15, 2012

MEMO

To: **Board**
From: **Timothy Brown**
Subject: **Infrastructure Report – American Water Works Association**
Date: **February 27, 2012**

Attached is a small report from American Water Works Association which deals with the investments needed over the next few decades to upgrade the water infrastructure and how burdensome this will be. Their estimate is one trillion dollars between now and 2035 in infrastructure rehabilitation to the water system. It certainly is an eye opener and something the Board should be aware of. In our particular case I think we are well ahead of the curve. As you know we invest 5.4 million dollars each year on a pay as you go basis and over the next 23 years we will be investing without any adjustments or changes, 124 million dollars in our infrastructure. If we can continue to invest as we have been in our infrastructure we will not be in the position that this report is predicting for our infrastructure. Again it points to our long-term program, our planning and our efforts to upgrade the systems prior to their ultimate demise. It also points to how effective the state infrastructure act is if the programs are followed. Certainly if the Rhode Island Water Systems follow their infrastructure programs and develop them for replacement in accordance with the regulations they will also be ahead of the curve and this state could be a model for good planning and foresight. We are beginning to see changes in our system where the infrastructure has been replaced. Continuing with our 5.4 million dollar program will advance us well into the future and avoid any potential infrastructure deterioration and catastrophes that may occur. Again the Board should take credit for their foresight into this planning and into the support of these programs. Again I think this report will emphasize how serious this is to this country but we should also take pride in the fact that we have addressed this.

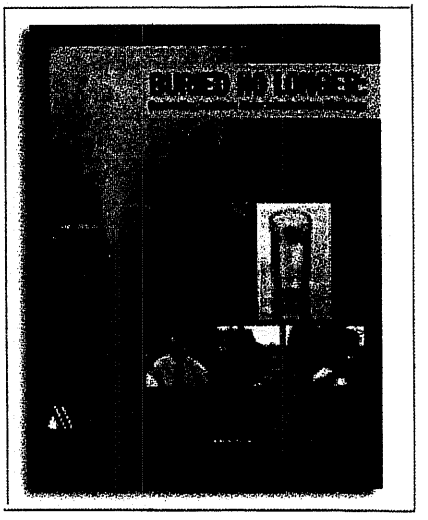
11 D 4

Timothy Brown

From: American Water Works Association [custsvc@awwa.org]
Sent: Monday, February 27, 2012 6:02 AM
To: Timothy Brown
Subject: AWWA News: Infrastructure needs top $1trillion

American Water Works Association
The Authoritative Resource on Safe Water®

AWWA infrastructure report issues call to action



The massive investment needed for buried drinking water infrastructure in the United States totals more than $1 trillion between now and 2035. The cost of that investment to repair and expand US drinking water infrastructure will be met primarily through higher water bills and local fees, costing some households in small communities as much as $550 more a year, according to a new AWWA report.

"Because pipe assets last a long time, water systems that were built in the latter part of the 19th century and throughout much of the 20th century have, for the most part, never experienced the need for pipe replacement on a large scale," the report says. Replacement needs account for about 54 percent of the national total, with the balance attributable to population changes over that period.

"Buried No Longer: Confronting America's Water Infrastructure Challenge" is a call to action for utilities, consumers and policy makers and recognizes that the need to replace pipe in the ground "puts a growing stress on communities that will continue to increase for decades to come." They will be affected in different ways depending on their size and geography. Many small communities will face the greatest challenges because they have fewer people to support the expenses.

The required national-level investment will double from roughly $13 billion a year today to almost $30 billion (in 2010 dollars) annually by the 2040s. This level of investment will have to be sustained for many years to maintain current levels of water service.

The new report extends the study of AWWA's seminal 2001 report, "Dawn of the

Replacement Era," which anticipated the extended wave of costs to replace drinking water infrastructure as it reaches the end of its service life.

"Water is a basic necessity of life," said AWWA President Jerry Stevens, general manager of West Des Moines (Iowa) Water Works. "Water utilities are committed to finding fair and equitable rate designs that address affordability issues as they face the increased cost of infrastructure replacement. The good news is that there is still time to act. 'Buried No Longer' helps us recognize the challenge ahead. Together, we can take the necessary steps to meet that challenge."

The new report analyzes many factors, including timing of water main installation and life expectancy, materials used, replacement costs and shifting demographics.

Some of the key findings in "Buried No Longer" include:

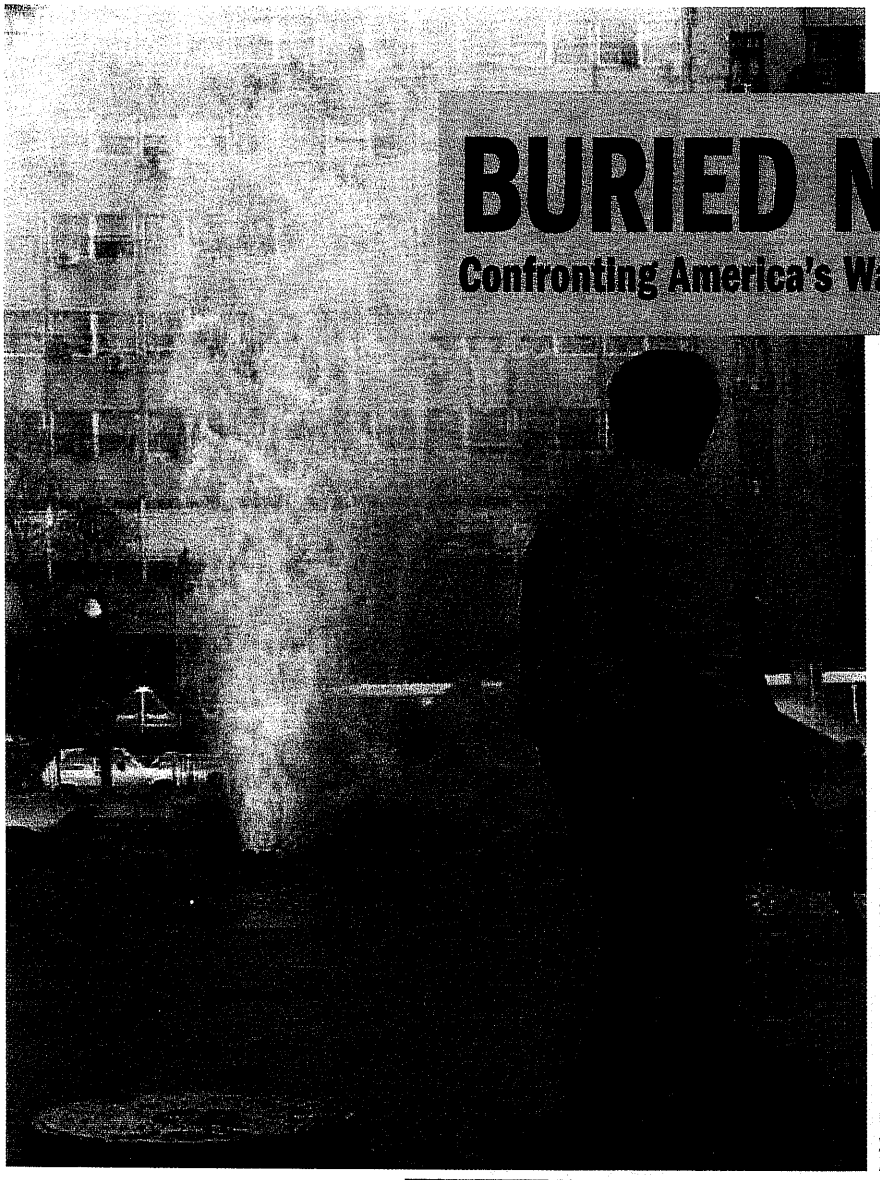
- **The needs are large.** The cost of replacing pipes at the end of their useful lives will total more than $1 trillion nationwide between 2011 and 2035 and exceed $1.7 trillion by 2050.
- **Household water bills will go up.** Although water bills will vary by community size and geographic region, for some communities the infrastructure costs alone could triple the size of a typical family's bill.
- **The costs keep coming.** Infrastructure renewal investments are likely to be incurred each year over several decades. For that reason, many utilities may choose to finance infrastructure replacement on a "pay-as-you-go" basis rather than through debt financing.

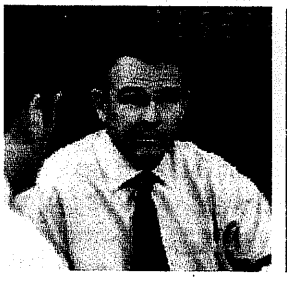
"The needs uncovered in 'Buried No Longer' are large, but they are not insurmountable," said AWWA Executive Director David LaFrance. "When you consider everything that tap water delivers — public health protection, fire protection, support for the economy, the quality of life we enjoy — we owe it to future generations to confront the infrastructure challenge today."

The report and related information are available on the AWWA website. The report includes more than 35 tables and graphs detailing information by region and utility size. For example, the graphs for utilities in the West show that the investment for growth is consistently greater than that required for replacement through 2050, while just the opposite is true for utilities in the Northeast.

BURIED NO LONGER:

Confronting America's Water Infrastructure Challenge





American Water Works Association

The Authoritative Resource on Safe Water®

Acknowledgments

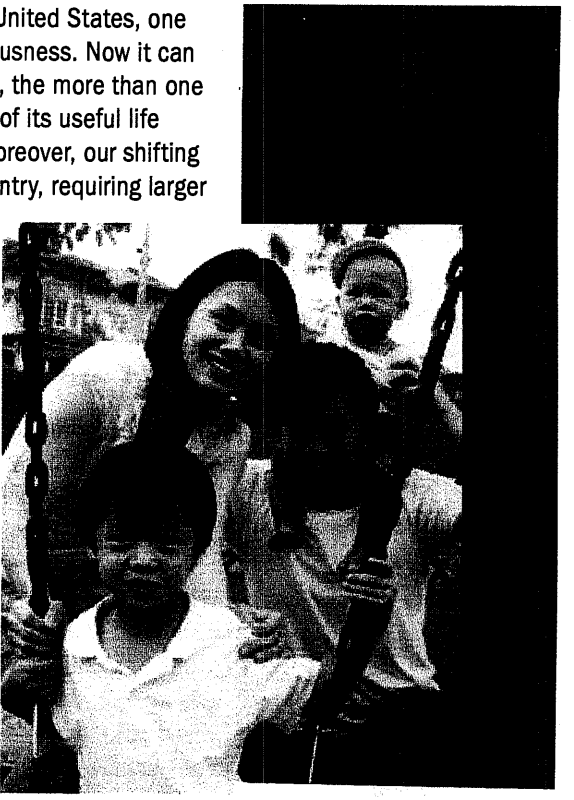
This report was developed by the American Water Works Association under the direction of its Water Utility Council, through Stratus Consulting in Boulder, Colorado. Significant portions of the analyses described in this report were initiated or developed by John Cromwell, who unfortunately passed away before this project was completed. John was a true visionary, a wonderful friend and colleague, and an ardent believer in promoting sound management of water system infrastructure. We hope this report does proper service to John's intent, integrity and passion. Special recognition is also due to Bob Raucher, who completed the work with great attention to detail, patience and outstanding professionalism.

Haydn Reynolds is the developer of the Nessie Model and managed all the empirical investigations in this report. His continued engagement in the development of this report has been exemplary, as has been his willingness to address the many questions involved in the transition of the final report preparation from John Cromwell to Bob Raucher and others at Stratus Consulting. Finally, but not least, a number of AWWA utility members did significant work on this project, including Dave Rager (who chairs the Water Utility Council), Mike Hooker (who was WUC chair when the report was initiated), Aurel Arndt (who chairs the advisory work group on this project), and Joe Bella, John Sullivan, Richard Talley, Robert Walters, and Dave Weihrauch, all of whom made significant contributions as members of the advisory work group.

Project Funding

Funding for this project was provided by the Water Industry Technical Action fund (WITAF). WITAF is funded through AWWA organizational member dues. It supports activities, information, and analysis to advance sound and effective drinking water legislation, regulation and policy.

Introduction. A new kind of challenge is emerging in the United States, one that for many years was largely buried in our national consciousness. Now it can be buried no longer. Much of our drinking water infrastructure, the more than one million miles of pipes beneath our streets, is nearing the end of its useful life and approaching the age at which it needs to be replaced. Moreover, our shifting population brings significant growth to some areas of the country, requiring larger pipe networks to provide water service.



As documented in this report, restoring existing water systems as they reach the end of their useful lives and expanding them to serve a growing population will cost at least $1 trillion over the next 25 years, if we are to maintain current levels of water service. Delaying the investment can result in degrading water service, increasing water service disruptions, and increasing expenditures for emergency repairs. Ultimately we will have to face the need to "catch up" with past deferred investments, and the more we delay the harder the job will be when the day of reckoning comes.

In the years ahead, all of us who pay for water service will absorb the cost of this investment, primarily through higher water bills. The amounts will vary depending on community size and geographic region, but in some communities these infrastructure costs alone could triple the size of a typical family's water bills. Other communities will need to collect significant "impact" or development fees to meet the needs of a growing population. Numerous communities will need to invest for replacement **and** raise funds to accommodate growth at the same time. Investments that may be required to meet new standards for drinking water quality will add even more to the bill.

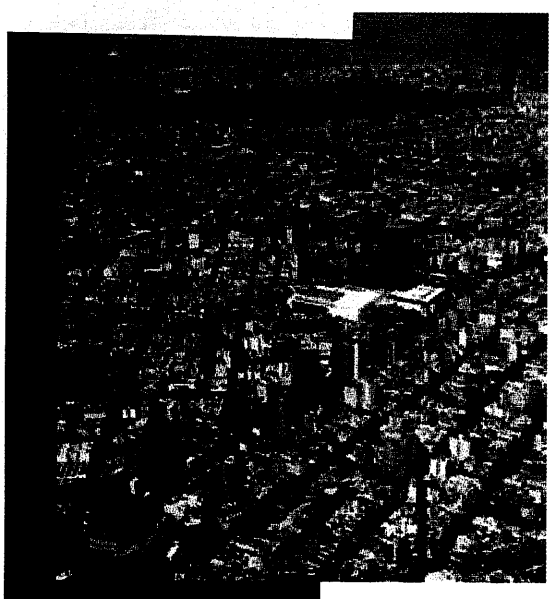
Although the challenge to our water infrastructure has been less visible than other infrastructure concerns, it's no less important. Our water treatment and delivery systems provide public health protection, fire protection, economic prosperity and the high quality of life we enjoy. Yet most Americans pay less than $3.75 for every 1,000 gallons of safe water delivered to their taps.

This report demonstrates that as a nation, we need to bring the conversation about water infrastructure above ground. Deferring needed investments today will only result in greater expenses tomorrow and pass on a greater burden to our children and grandchildren. It's time to confront America's water infrastructure challenge.

The Era of Infrastructure Replacement. More than a decade ago the American Water Works Association (AWWA) announced that a new era was dawning: the replacement era, in which our nation would need to begin rebuilding the water and wastewater systems bequeathed to us by earlier generations. Our seminal report–*Dawn of the Replacement Era*–demonstrated that significant investments will be required in coming decades if we are to maintain the water and wastewater systems that are so essential to our way of life.

he *Dawn* report examined 20 water systems, using a relatively new technique o build what came to be called a "Nessie Curve" for each system. The Nessie ;urve, so called because the graph follows an outline that someone likened to a ;ilhouette of the Loch Ness Monster, revealed that each of the 20 water systems aced unprecedented needs to rebuild its underground water infrastructure—its ›ipe network. For each system, the future investment was an "echo" of the demographic history of the community, reflecting succeeding generations of ›ipe that were laid down as the community grew over many years. Most of those generations of pipe were shown to be coming to an end of their useful service lives in a relatively compressed period. Like the pipes themselves, the need for this massive investment was mostly buried and out of sight. But it threatens our future if we don't elevate it and begin to take action now.

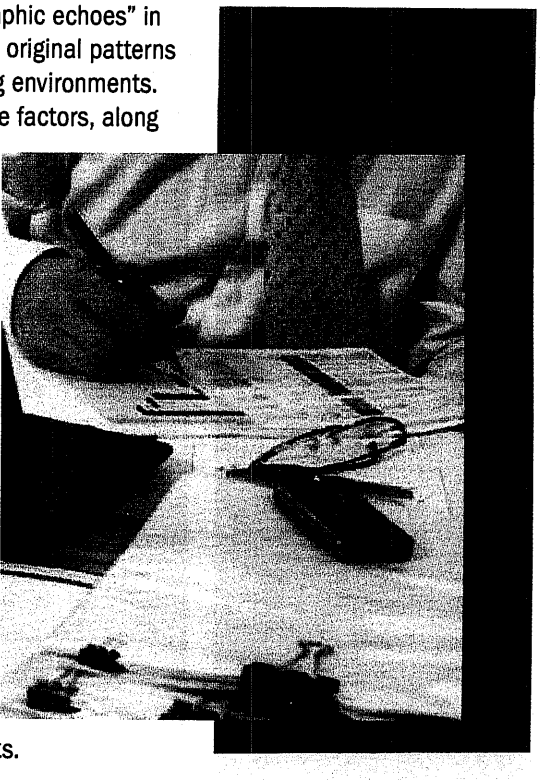
The present report was undertaken to extend the *Dawn* report beyond those 20 original cities and encompass the entire United States. The results are startling. They confirm what every water utility professional knows: we face the need for massive reinvestment in our water infrastructure over the coming decades. The pipe networks that were largely built and paid for by earlier generations—and passed down to us as an inheritance—last a long time, but they are not immortal. The nation's drinking water infrastructure—especially the underground pipes that deliver safe water to America's homes and businesses—is aging and in need of significant reinvestment. Like many of the roads, bridges, and other public assets on which the country relies, most of our buried drinking water infrastructure was built 50 or more years ago, in the post-World War II era of rapid demographic change and economic growth. In some older urban areas, many water mains have been in the ground for a century or longer.



Given its age, it comes as no surprise that a large proportion of US water infrastructure is approaching, or has already reached, the end of its useful life. The need to rebuild these pipe networks must come on top of other water investment needs, such as the need to replace water treatment plants and storage tanks, and investments needed to comply with standards for drinking water quality. They also come on top of wastewater and stormwater investment needs which—judging from the US Environmental Protection Agency's (USEPA) most recent "gap analysis"—are likely to be as large as drinking water needs over the coming decades. Moreover, both water and wastewater infrastructure needs come on top of the other vital community infrastructures, such as streets, schools, etc.

Prudent planning for infrastructure renewal requires credible, analysis-based estimates of where, when, and how much pipe replacement or expansion for growth is required. This report summarizes a comprehensive and robust national-level analysis of the cost, timing, and location of the investments necessary to renew water mains over the coming decades. It also examines the additional pipe investments we can anticipate to meet projected population growth, regional population shifts, and service area growth through 2050.

This analysis is based on the insight that there will be "demographic echoes" in which waves of reinvestment are driven by a combination of the original patterns of pipe investment, the pipe materials used, and local operating environments. The report examines the reinvestment demands implied by these factors, along with population trends, in order to estimate needs for pipe replacement and concurrent investment demands to accommodate population growth.



Although this report does not substitute for a careful and detailed analysis at the utility level as a means of informing local decisions, it constitutes the most thorough and comprehensive analysis ever undertaken of the nation's drinking water infrastructure renewal needs. The keys to our analysis include the following:

1. Understanding the original timing of water system development in the United States.
2. Understanding the various materials from which pipes were made, and where and when the pipes of each material were likely to have been installed in various sizes.
3. Understanding the life expectancy of the various types and sizes of pipe ("pipe cohorts") in actual operating environments.
4. Understanding the replacement costs for each type and size of pipe.
5. Developing a probability distribution for the "wear-out" of each pipe cohort.

Methodology

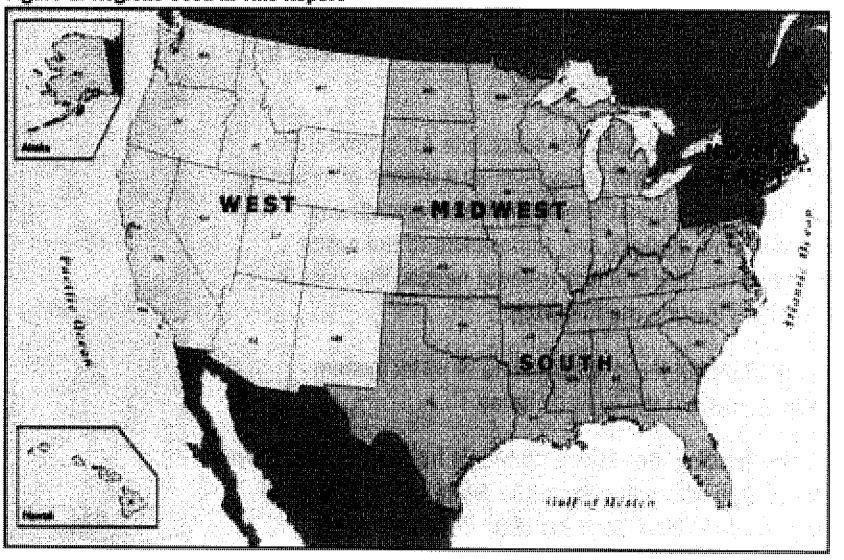
For this report, we differentiated across four water system size categories*:

- Very small systems (serving fewer than 3,300 people, representing 84.5% of community water systems).
- Small systems (3,300 to 9,999 served, representing 8.5% of community water systems).
- Medium-size systems (10,000 to 49,999 served, representing over 5.5% of systems). And,
- Large systems (serving more than 50,000 people, representing 1.5% of community water systems).

** Note that the water system size categories used in this analysis are not identical to the size categories USEPA uses for regulatory purposes. Note also that although data were analyzed based on these four size categories, some of the graphs that accompany this report combine medium-size and small systems. This is done for simplicity in the visual presentation, when the particular dynamics being represented are closely similar for medium-size and small systems.*

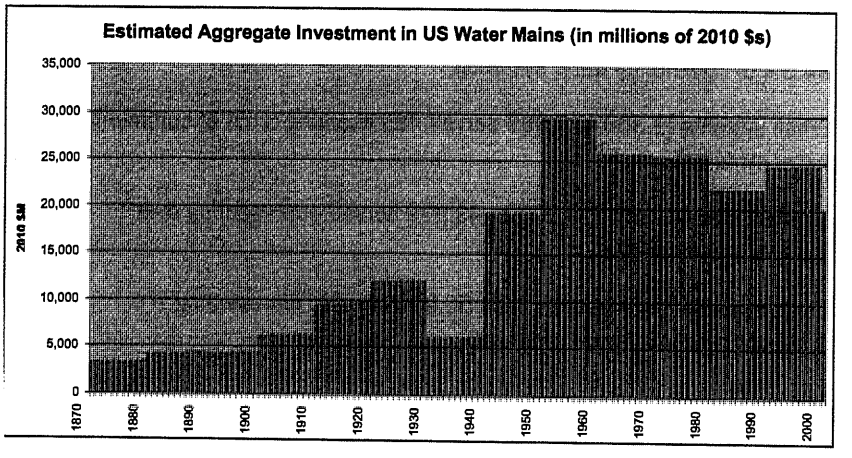
Next, we divided the country into four regions (Northeast, Midwest, South, and West), as shown in Figure 1. These regions are not equal in population, but they roughly share certain similarities, including their population dynamics and the

Figure 1: Regions Used in This Report



historical patterns of pipe installation driven by those dynamics. Data published by USEPA, the water industry, and the US Census Bureau were tapped to obtain a solid basis for regional pipe installation profiles by system size and pipe diameter. The US Census Bureau has produced a number of retrospective studies of the changes in urban and rural circumstances between 1900 and 2000 that proved especially useful in this analysis. The report also used the AWWA Water/Stats database, the USEPA Community Water Supply Survey, and data from the 2002 Public Works Infrastructure Survey (PWIS) as essential inputs in the analysis.

Figure 2: Historic Investment Profile for All US Water Systems, 1850-2000



In addition, we conducted a limited survey of professionals in the field concerning pipe replacement issues and other relevant "professional knowledge." The national aggregate for the original investment in all types and sizes of pipes is shown in Figure 2, while Figure 3 shows the aggregate current replacement value of water pipes by pipe material and utility size, totaling over $2.1 trillion.

Figure 3: Aggregate Replacement Value of Water Pipes by Pipe Material and Utility Size (millions 2010 $s)

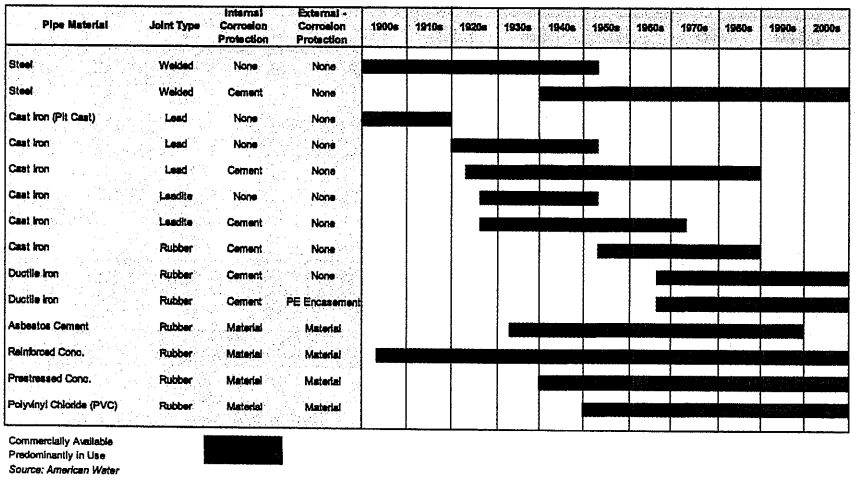
Region	CI	CICL	DI	AC	PV	Steel	PCCP	TOTAL
Northeast Large	48,958	8,995	5,050	2,308	1,875	335	0	67,522
Northeast Medium & Small	66,357	61,755	28,777	26,007	16,084	5,533	6,899	211,411
Northeast Very Small	14,491	15,992	10,661	7,281	7,937	329	462	57,152
Midwest Large	37,413	9,151	3,077	2,504	1,098	784	512	54,539
Midwest Medium & Small	74,654	92,106	51,577	37,248	30,506	8,682	11,152	305,925
Midwest Very Small	37,597	28,943	25,464	12,428	19,720	601	828	125,581
Southeast Large	30,425	28,980	29,569	21,229	14,936	9,337	7,227	141,703
South Medium & Small	54,772	98,608	140,079	103,659	102,804	21,394	17,160	538,475
South Very Small	43,183	24,998	49,791	34,529	47,823	1,461	1,244	203,028
West Large	15,448	16,055	28,949	14,774	14,723	7,443	6,215	103,607
West Medium & Small	15,775	50,145	70,355	50,541	48,885	12,276	9,806	257,782
West Very Small	16,344	11,199	17,910	13,166	17,245	545	453	76,862
Total	455,416	446,927	461,258	325,674	323,637	68,719	61,957	2,143,589

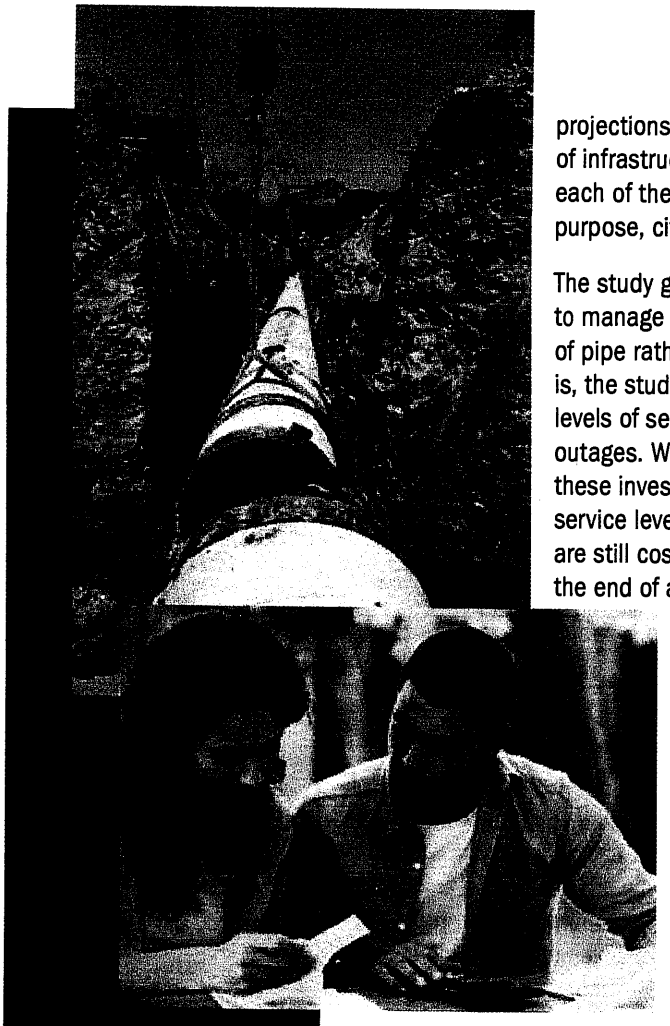
CI: cast iron; CICL: cast iron cement lined; DI: ductile iron; AC: asbestos cement; PV: polyvinyl chloride; PCCP: prestressed concrete cylinder pipe

Finally, we used historical data on the production and use of seven major types of pipe with 14 total variations (Figure 4) to estimate what kinds of pipe were installed in water systems in particular years. This was validated by field checking with a sample of water utilities as well as checking against the original Nessie analysis. Together these steps resulted in the development of 16 separate inventories (four regions with four utility sizes in each region), with seven types of pipe in each inventory, *thus providing the most comprehensive picture of the nation's water pipe inventory ever assembled.* Note that in some of the report's graphs, "long-" and "short-lived" versions of certain pipe materials are combined, for purposes of visual simplicity in the presentation.

In order to consider growth, it was also necessary to examine population trends across rural, suburban, and urban settings over the past century. US Census Bureau

Figure 4: Historic Production and Use of Water Pipe by Material





projections of demographic trends allowed the development of infrastructure need profiles for growth through 2050 in each of the regions and utility size categories (for the latter purpose, city size was used as a proxy for utility size).

The study generally assumes that utilities continue efforts to manage the number of main breaks that occur per mile of pipe rather than absorb increases in pipe failures. That is, the study assumes utilities will strive to maintain current levels of service rather than allow increasing water service outages. We assume that each utility's objective is to make these investments at the optimal time for maintaining current service levels and to avoid replacing pipes while the repairs are still cost-effective. Ideally, pipe replacement occurs at the end of a pipe's "useful life"; that is, the point in time when replacement or rehabilitation becomes less expensive in going forward than the costs of numerous unscheduled breaks and associated emergency repairs.

With this data in hand and using the assumptions above, we projected the "typical" useful service life of the pipes in our inventory using the "Nessie Model"™. The model embodies pipe failure probability distributions based on many utilities' current operating experiences, coupled with insights from extensive research and professional experiences with typical pipe conditions at different ages and sizes, according to pipe material. The analysis used seven different types of pipe in three diameters and addressed pipe inventories dating back to 1870. Estimated typical service lives of pipes are

Figure 5: Average Estimated Service Lives by Pipe Materials (average years of service)

Derived Current Service Lives (Years)	CI	CICL (LSL)	CICL (SSL)	DI (LSL)	DI (SSL)	AC (LSL)	AC (SSL)	PVC	Steel	Conc & PCCP
Northeast Large	130	120	100	110	50	80	80	100	100	100
Midwest Large	125	120	85	110	50	100	85	55	80	105
South Large	110	100	100	105	55	100	80	55	70	105
West Large	115	100	75	110	60	105	75	70	95	75
Northeast Medium & Small	115	120	100	110	55	100	85	100	100	100
Midwest Medium & Small	125	120	85	110	50	70	70	55	80	105
South Medium & Small	105	100	100	105	55	100	80	55	70	105
West Medium & Small	105	100	75	110	60	105	75	70	95	75
Northeast Very Small	115	120	100	120	60	100	85	100	100	100
Midwest Very Small	135	120	85	110	60	80	75	55	80	105
South Very Small	130	110	100	105	55	100	80	55	70	105
West Very Small	130	100	75	110	60	105	65	70	95	75

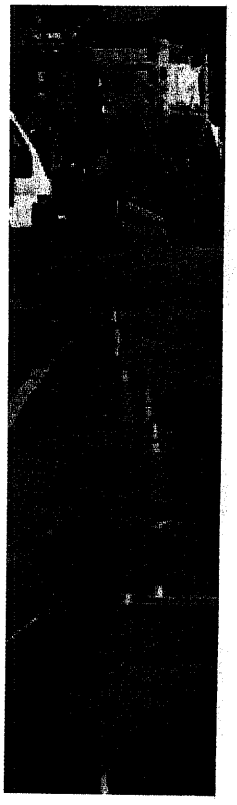
LSL indicates a relatively long service life for the material resulting from some combination of benign ground conditions and evolved laying practices etc.
SSL indicates a relatively short service life for the material resulting from some combination of harsh ground conditions and early laying practices, etc.

Figure 6: Aggregate Needs for Investment in Water Mains Through 2035 and 2050, by Regio

2011-2035 Totals			
(2010 $M)	Replacement	Growth	Total
Northeast			
Midwest			
South	$204,357	$302,782	$507,139
West	$82,866	$195,503	$278,369
Total	**$526,438**	**$498,285**	**$1,024,724**

2011-2050 Totals			
(2010 $M)	Replacement	Growth	Total
Northeast			
Midwest			
South	$394,219	$492,493	$886,712
West	$160,476	$309,749	$470,225
Total	**$951,283**	**$802,242**	**$1,753,525**

reflected in Figure 5. Note that the *actual* lives of pipes may be quite different ir given utility. Because pipe life depends on many important local variables as we as upon utility practices, predicting the actual life expectancy of any given pipe outside the scope of this study. Many utilities will have pipes that last much longer than these values suggest while others will have pipes that begin to fail sooner. However, these values have been validated as national "averages" by comparing them to actual field experience in a number of utilities throughout the country. The model also includes estimates of the indicative costs to replace each size category of pipe, as well as the cost to repair the projected number of pipe breaks over time according to pipe size.



The analysis of pipe replacement needs is compiled in the Nessie Model by combining the demographically based pipe inventories with the projected effective service lifetimes for each pipe type. This yields an estimate of how much pipe of each size in each region must be replaced in each of the coming 40 years. Factoring in the typical cost to replace these pipes, we derive an estimate of the total investment cost for each future year. The model then derives a series of graphs (the Nessie curves) that depict the amount of spending required in each future year to replace each of the different pipe types by utility size and region. Aggregating this information, we derived the dollar value of total drinking water infrastructure replacement needs over the coming 25 and 40 years for each utility size category per region, and f the United States.

Key Findings

1. The Needs Are Large. *Investment needs for buried drinking water infrastructure total more than $1 trillion nationwide over the next 25 years,* assuming pipes are replaced at the end of their service lives and systems are expanded to serve growing populations. Delaying this investment could mean either increasing rates of pipe breakage and deteriorating water service, or suboptimal use of utility funds, such as paying more to repair broken pipes than the long-term cost of replacing them. Nationally, the need is close to evenly divided between replacement due to wear-out and needs generated by demographic changes (growth and migration).

Over the coming 40-year period, *through 2050, these needs exceed $1.7 trillion.* Replacement needs account for about 54% of the national total, with about 46% attributable to population growth and migration over that period.

Figure 6 (previous page) shows aggregate needs for investment in water mains through 2050, due to wear-out and population growth.

2. Household Water Bills Will Go Up. Important caveats are necessary here, because there are many ways that the increased investment in water infrastructure can be allocated among customers. Variables include rate structures, how the investment is financed, and other important local factors. But the level of investment required to replace worn-out pipes and maintain current levels of water service *in the most affected communities could in some cases triple household water bills.* This projection assumes the costs are spread evenly across the population in a "pay-as-you-go" approach (See "The Costs Keep Coming" below). Figures 7 and 8 illustrate the increasing cost of water that can be expected by households for replacement, and for replacement plus growth, respectively. The utility categories shown in these figures are presented to depict a range of household cost impacts, from the least-to-the-most affected utilities.

Figure 7: Costs per Household for Water Main Replacement by Utility Size and Region

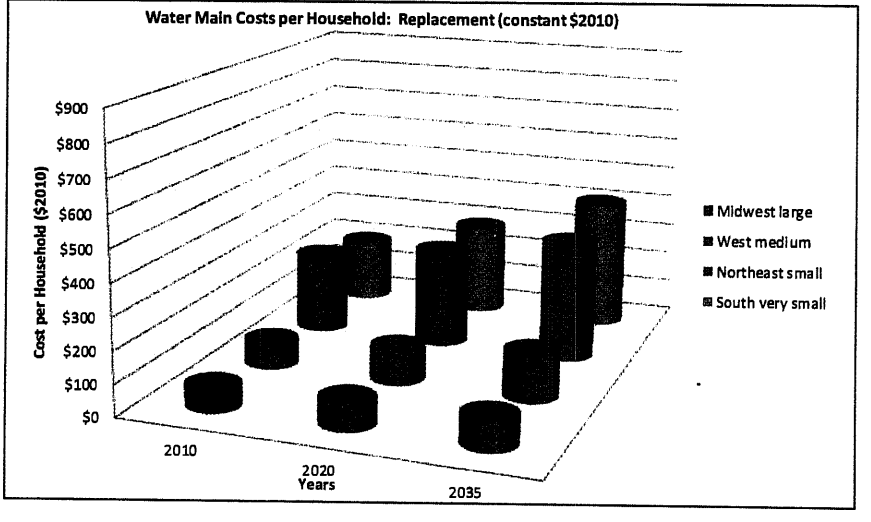
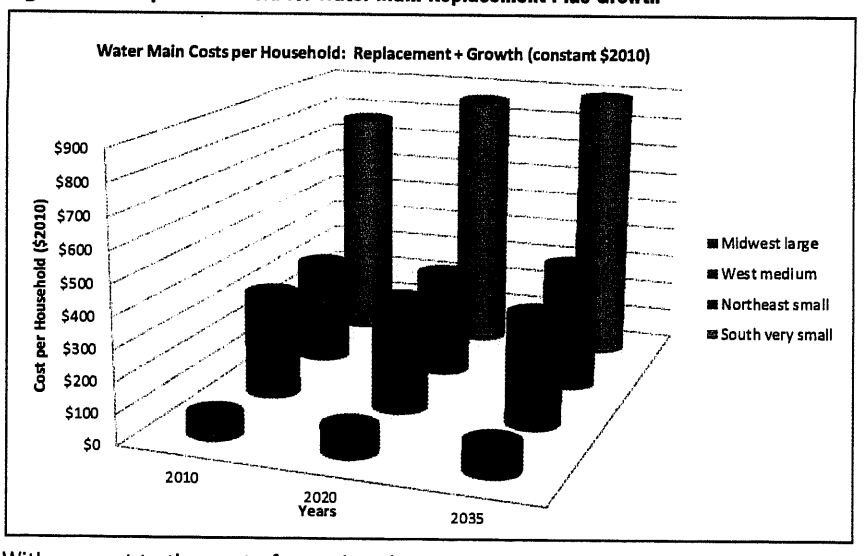


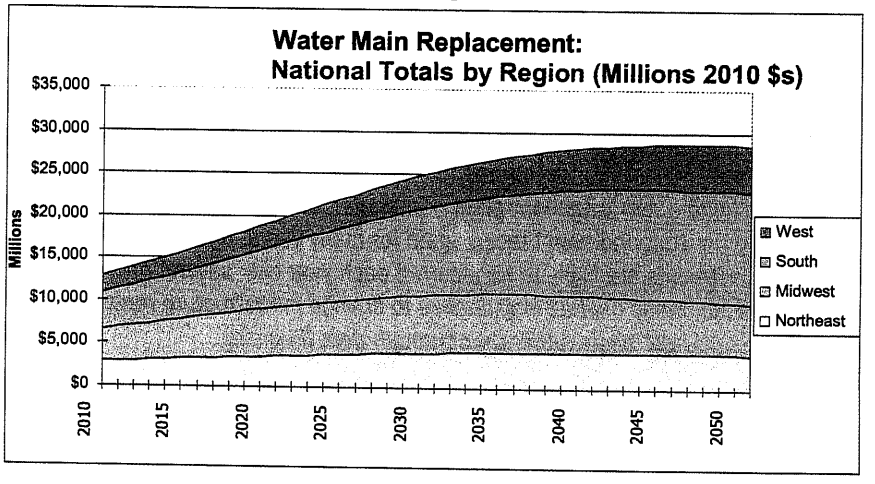
Figure 8: Costs per Household for Water Main Replacement Plus Growth



With respect to the cost of growth, other caveats are important. Many communities expect growth to pay or help pay for itself through developer fees, impact fees, or similar charges. In such communities, established residents will not be required to shoulder the cost of population growth to the extent that these fees recover those costs. *But regardless of how the costs of replacement and growth are allocated among builders, newcomers, or established residents, the total cost that must be borne by the community will still rise.*

3. There Are Important Regional Differences. The growing national need affects different regions in different ways. In general, the South and the West will face the steepest investment challenges, with total needs accounting for considerably more than half the national total (see Figures 6 and 9). This is largely attributable to the fact that the population of these regions is growing rapidly. In contrast, in the Northeast and Midwest, growth is a relatively small component of the projected need. However, the population shifts away from these regions complicate the infrastructure challenge, as there are fewer remaining local customers across whom to spread the cost of renewing their infrastructure.

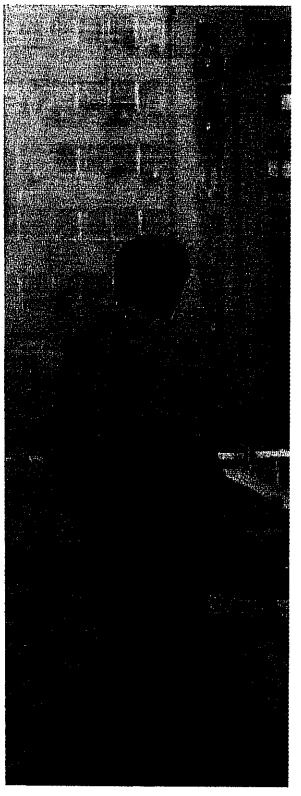
Figure 9: Water Main Replacement Costs per Region



This regional perspective reveals the inherent difficulty of managing infrastructure supply and demand. Although water pipes are fixed in place and long-lasting, the population that drives the demand for these assets is very mobile and dynamic. People move out of one community, leaving behind a pipe network of fixed size but with fewer customers to support it. They move into a new community, requiring that the water system there be expanded to serve the new customers.

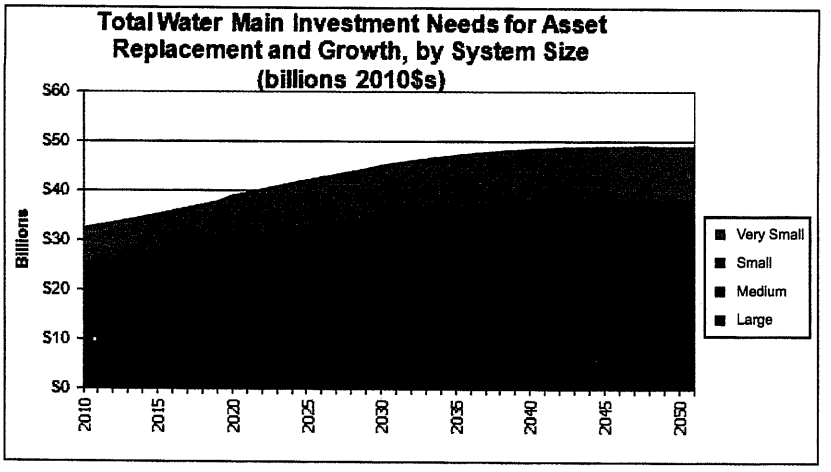
4. There Are Important Differences Based on System Size. As with many other costs, *small communities may find a steeper challenge ahead on water infrastructure.* Small communities have fewer people, and those people are often more spread out, requiring more pipe "miles per customer" than larger systems. In the most affected small communities, the study suggests that a typical three-person household could see its drinking water bill increase by as much as $550 per year above current levels, simply to address infrastructure needs, depending as always on the caveats identified above.

In the largest water systems, costs can be spread over a large population base. Needed investments would be consistent with annual per household cost increases ranging from roughly $75 to more than $100 per year by the mid-2030s, assuming the expenses were spread across the population in the year they were incurred. Figure 10 illustrates the differing total costs of required investment by system size.



5. The Costs Keep Coming. The national-level investment we face will roughly double from about $13 billion a year in 2010 to almost $30 billion annually by the 2040s for replacement alone. If growth is included, needed investment must increase from a little over $30 billion today to nearly $50 billion over the same period. This level of investment must then be sustained for many years, if current levels of water service are to be maintained. *Many utilities will have to face these investment needs year after year, for at least several decades.* That is, by the time the last cohort of pipes analyzed in this study (predominantly the pipes laid between the late 1800s and 1960) has been replaced in, for example, 2050, it may soon thereafter be time to begin replacing the pipes laid after 1960, and so on. In that respect, these capital outlays are unlike those required to build a new treatment plant or storage tank, where the capital costs are incurred up front and aren't faced again for many years. Rather, infrastructure renewal investments are likely to be incurred each year over several decades. For that reason, *many utilities may choose to finance infrastructure replacement on a "pay-as-you-go" basis rather than through debt financing.*

Figure 10: Total Water Main Replacement and Growth Needs by System Size



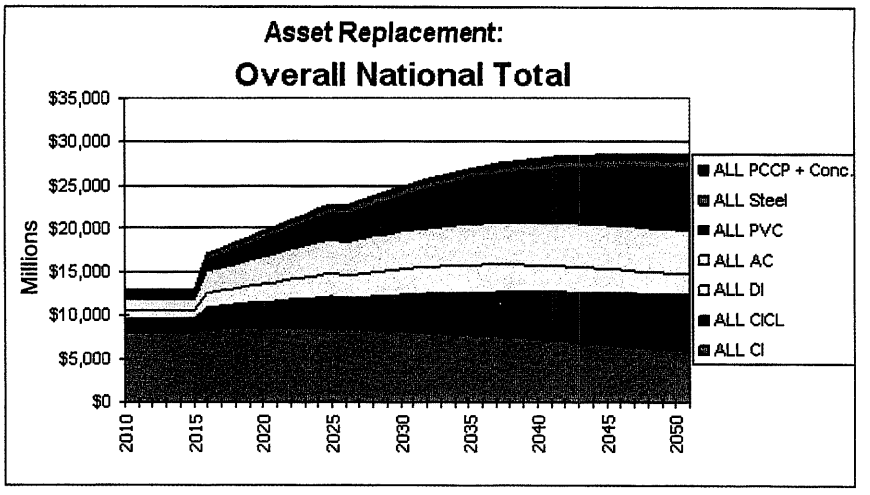
6. Postponing Investment Only Makes the Problem Worse.

Overlooking or postponing infrastructure renewal investments in the near term will only add to the scale of the challenge we face in the years to come. Postponing the investment steepens the slope of the investment curve that must ultimately be met, as shown in Figure 11 (next page). It also increases the odds of facing the high costs associated with water main breaks and other infrastructure failures. The good news is that *not all of the $1 trillion investment through 2035 must be made right now.* There is time to make suitable plans and implement policies that will help address the longer-term challenge. The bad news is that the required investment level is growing, as more pipes continue to age and reach the end of their effective service lives.

As daunting as the figures in this report are, the prospect of not making the necessary investment is even more chilling. Aging water mains are subject to more frequent breaks and other failures that can threaten public health and safety (such as compromising tap water quality and fire-fighting flows). Buried infrastructure failures also may impose significant damages (for example, through flooding and sinkholes), are costly to repair, disrupt businesses and residential communities, and waste precious water resources. These maladies weaken our economy and undermine our quality of life. As large as the cost of reinvestment may be, **not** undertaking it will be worse in the long run by almost any standard.

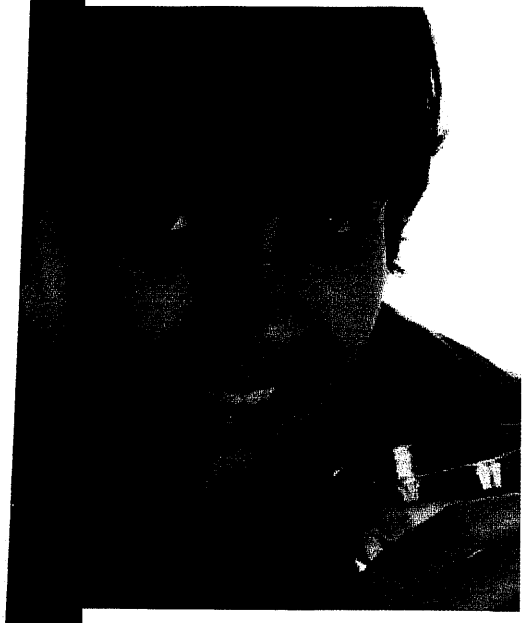
This suggests that a crucial responsibility for utility managers now and in the future is to develop the processes necessary to continually improve their understanding of the "replacement dynamics" of their own water systems. Those dynamics should be reflected in an Asset Management Plan (AMP) and, of course, in a long-term capital investment plan. The 2006 AWWA Report *Water Infrastructure at a Turning Point* includes a full discussion of this issue.

Figure 11: Effect of Deferring Investment Five Years with a Ten-Year Make-Up Period



Conclusion

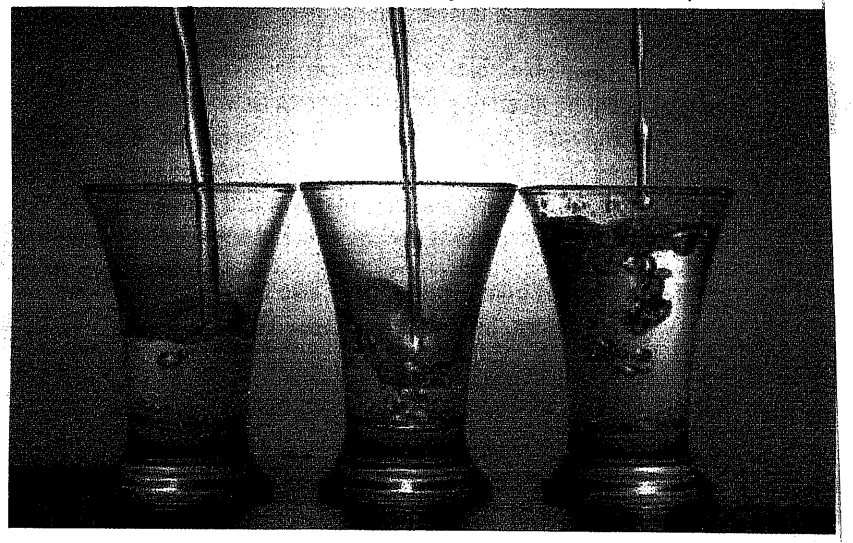
Because pipe assets last a long time, water systems that were built in the latter part of the 19th century and throughout much of the 20th century have, for the most part, never experienced the need for pipe replacement on a large scale. The dawn of the era in which these assets will need to be replaced puts a growing financial stress on communities that will continually increase for decades to come. It adds large and hitherto unknown expenses to the more apparent above-ground spending required to meet regulatory standards and address other pressing needs.



It is important to reemphasize that there are significant differences in the timing and magnitude of the challenges facing different regions of the country and different sizes of water systems. But the investments we describe in this report are real, they are large, and they are coming.

The United States is reaching a crossroads and faces a difficult choice. We can incur the haphazard and growing costs of living with aging and failing drinking water infrastructure. Or, we can carefully prioritize and undertake drinking water infrastructure renewal investments to ensure that our water utilities can continue to reliably and cost-effectively support the public health, safety, and economic vitality of our communities. AWWA undertook this report to provide the best, most accurate information available about the scale and timing of these needed investments.

It is clear the era AWWA predicted a decade ago—the replacement era—has arrived. The issue of aging water infrastructure, which was buried for years, ca be buried no longer. Ultimately, the cost of the renewal we face must come fro local utility customers, through higher water rates. However, the magnitude of the cost and the associated affordability and other adverse impacts on



communities—as well as the varying degrees of impact to be felt across regions and across urban and rural areas—suggest that there is a key role for states and the federal government as well. In particular, states and the federal government can help with a careful and cost-effective program that lowers the cost of necessary investments to our communities, such as the creation of a credit support program—for example, AWWA's proposed Water Infrastructure Finance and Innovation Authority (WIFIA).

Finally, in many cases, difficult choices may need to be made between competing needs if water bills are to be kept affordable. Water utilities are willing to ask their customers to invest more, but it's important this investment be in things that bring the greatest actual benefit to the community. Only in that spirit can we achieve the goal to which we all aspire, the reliable provision of safe and affordable water to all Americans.

Additional Information and Resources.

A full and robust infrastructure analysis is an indispensable tool for decision making by water and wastewater utilities. This report does not substitute for such detailed local analysis for purposes of designing an infrastructure asset management program for individual utilities.

Additional information is available from AWWA concerning asset management. Particular attention should be given to the WITAF reports *Dawn of the Replacement Era, Avoiding Rate Shock, Thinking Outside the Bill* and *Water Infrastructure at a Turning Point.* In addition, Manual M1, *Principles of Water Rates, Fees, and Charges,* and the AWWA Utility Management Standards may be helpful. For more information, visit the AWWA Bookstore at **www.awwa.org/store.**

A number of graphs and figures from this report are also available through the AWWA website at **www.awwa.org/infrastructure.** They include:

Estimated Distribution of Mains by Material
Northeast and Midwest
South and West

Proportion of 2010 Systems Built by Year
Northeast
Midwest
South
West

Investment for Replacement Plus Growth, by Region and Size of Utility

Northeast
Large
Medium
Small
Very Small

Midwest
Large
Medium
Small
Very Small

South
Large
Medium
Small
Very Small

West
Large
Medium
Small
Very Small

Household Cost of Needed Investment by Region and Size of Utility

Northeast
Large
Medium
Small
Very Small

Midwest
Large
Medium
Small
Very Small

South
Large
Medium
Small
Very Small

West
Large
Medium
Small
Very Small

www.awwa.org/infrastructure

Estimated Distribution of Mains by Material Over Time
Northeast & Midwest Regions

	CI	CICL (LSL)	CICL (SSL)	DI (LSL)	DI (SSL)	AC (LSL)	AC (SSL)	PVC	CI	CICL (LSL)	CICL (SSL)	DI (LSL)	DI (SSL)	AC (SSL)	AC (LSL)	PVC	CI	CICL (LSL)	CICL (SSL)	DI (LSL)	AC (LSL)	Steel	Conc & PCCP
	<6 Inch diameter								6-10 Inch diameter								>10 inch diameter						
1870	100%								100%								100%						
1880	100%								100%								100%						
1890	100%								100%								100%						
1900	100%								100%								100%						
1910	100%								100%								100%						
1920	100%								100%								100%						
1930	50%	30%	20%						50%	30%	20%						50%	30%	20%				
1940	20%	60%	20%						20%	60%	20%						20%	40%	20%			20%	
1950		60%				20%	20%			60%				20%	20%			40%			10%	20%	30%
1960		50%			10%	20%	20%			50%			10%	20%	20%			35%		5%	10%	20%	30%
1970		20%			40%			40%		20%			40%			40%				50%		20%	30%
1980				25%	30%			45%				25%	35%			40%				60%		15%	25%
1990				50%	5%			45%				50%	5%			45%				60%		15%	25%
2000				55%				45%				55%				45%				60%		15%	25%
2010				55%				45%				55%				45%				60%		15%	25%
2020				55%				45%				55%				45%				60%		15%	25%
2030				55%				45%				55%				45%				60%		15%	25%

Steel and PCCP pipe not in widespread use in sizes under 10 inches.

CI: cast iron; CICL: cast iron cement lined; DI: ductile iron; AC: asbestos cement; PV: polyvinyl chloride; PCCP: prestressed concrete cylinder pipe

The regions are combined because they share similar dynmaics for this distribution.

Note:
"LSL" indicates a relatively long service life for the material resulting from some combination of benign ground conditions and evolved laying practices etc.

"SSL" indicates a relatively short service life for the material resulting from some combination of harsh ground conditions and early laying practices etc.

Estimated Distribution of Mains by Material Over Time
South & West Regions

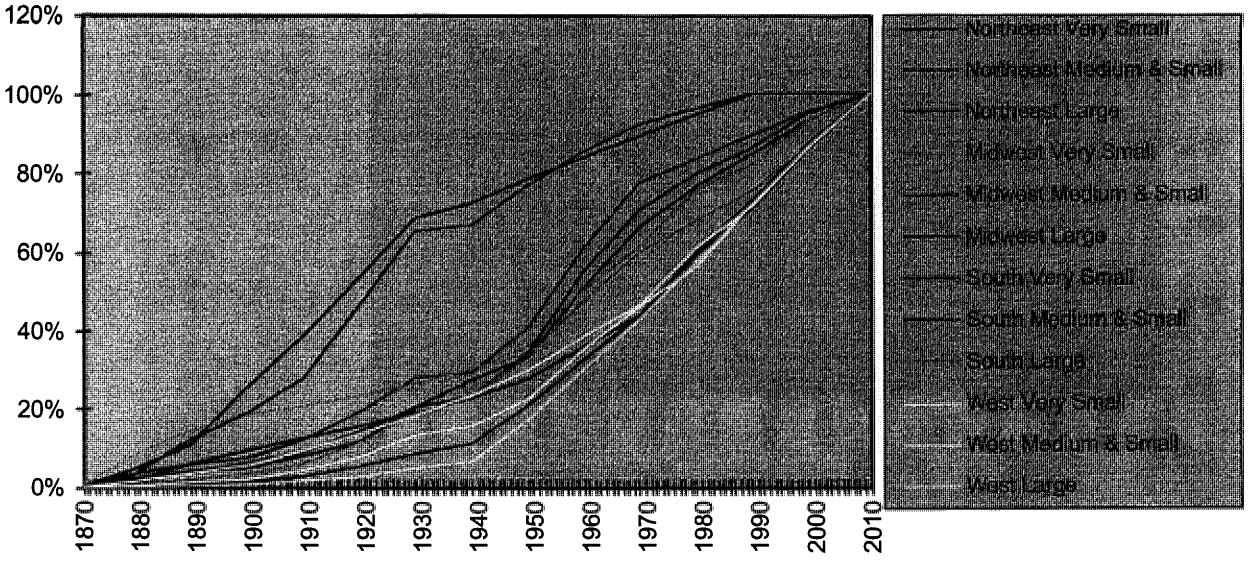
	CI	CICL (LSL)	CICL (SSL)	DI (LSL)	DI (SSL)	AC (LSL)	AC (SSL)	PVC	CI	CICL (LSL)	CICL (SSL)	DI (LSL)	DI (SSL)	AC (LSL)	AC (SSL)	PVC	CI	CICL (LSL)	CICL (SSL)	DI (LSL)	AC (LSL)	Steel	Conc & PCCP
	<6 inch diameter								6-10 inch diameter								>10 inch diameter						
1870	100%								100%								100%						
1880	100%								100%								100%						
1890	100%								100%								100%						
1900	100%								100%								100%						
1910	100%								100%								100%						
1920	100%								100%								100%						
1930	50%	30%	20%						50%	30%	20%						50%	30%	20%				
1940		70%	30%							70%	30%							50%	30%			20%	
1950		25%				40%	35%			25%				40%	35%			40%			15%	25%	20%
1960		25%		2%	3%	40%	30%			25%		2%	3%	40%	30%			40%		5%	10%	25%	20%
1970		10%		10%	10%	40%		30%		10%		10%	10%	40%		30%				45%	10%	25%	20%
1980				25%	25%			50%				30%	30%			40%				60%		20%	20%
1990				45%	5%			50%				50%	5%			45%				60%		20%	20%
2000				50%				50%				50%				50%				60%		20%	20%
2010				50%				50%				50%				50%				60%		20%	20%
2020				50%				50%				50%				50%				60%		20%	20%
2030				50%				50%				50%				50%				60%		20%	20%
Steel and PCCP pipe not in widespread use in sizes under 10 inches.																							
CI: cast iron; CICL: cast iron cement lined; DI: ductile iron; AC: asbestos cement; PV: polyvinyl chloride; PCCP: prestressed concrete cylinder pipe																							

The regions are combined because they share similar dynmaics for this distribution.

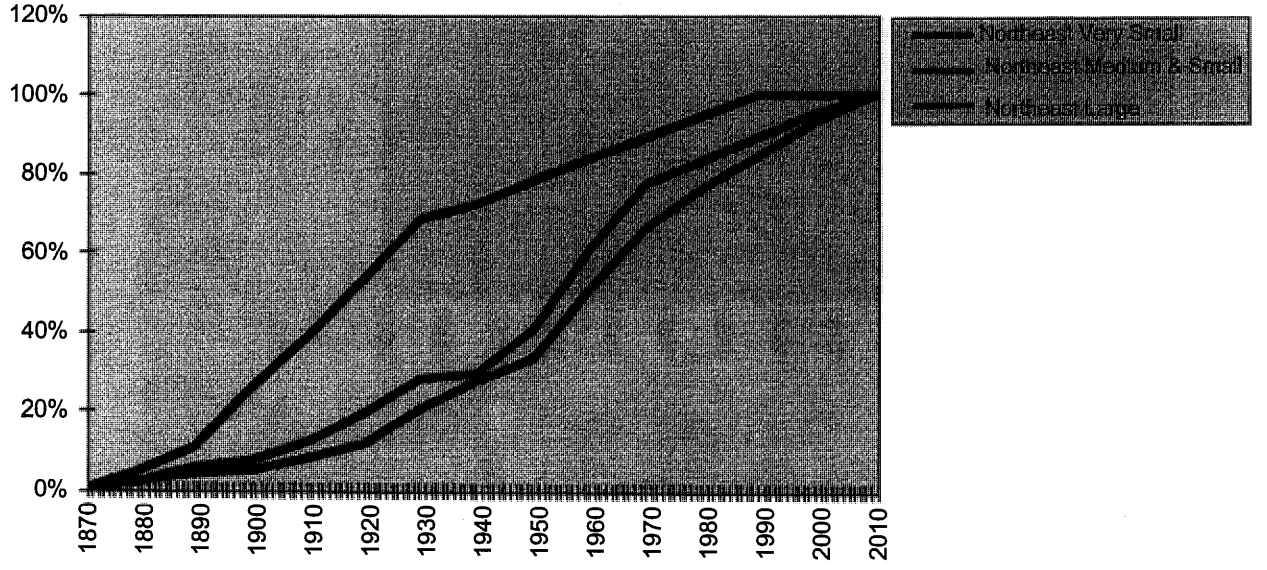
Note:
"LSL" indicates a relatively long service life for the material resulting from some combination of benign ground conditions and evolved laying practices etc.

"SSL" indicates a relatively short service life for the material resulting from some combination of harsh ground conditions and early laying practices etc.

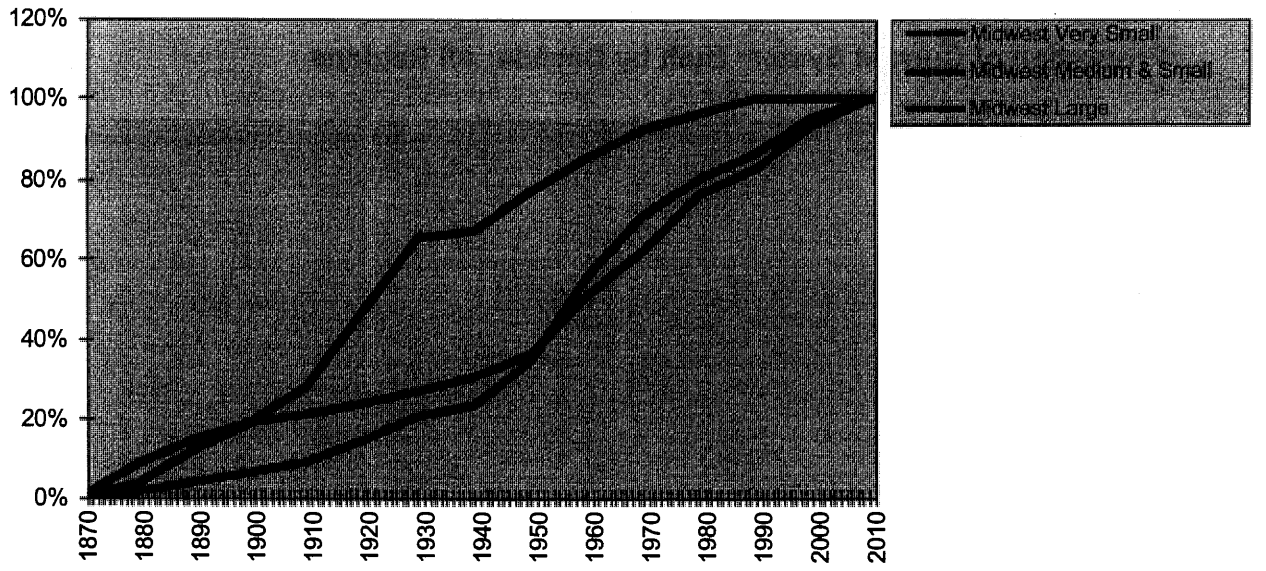
Proportion of Current System Built by Decade: All Regions



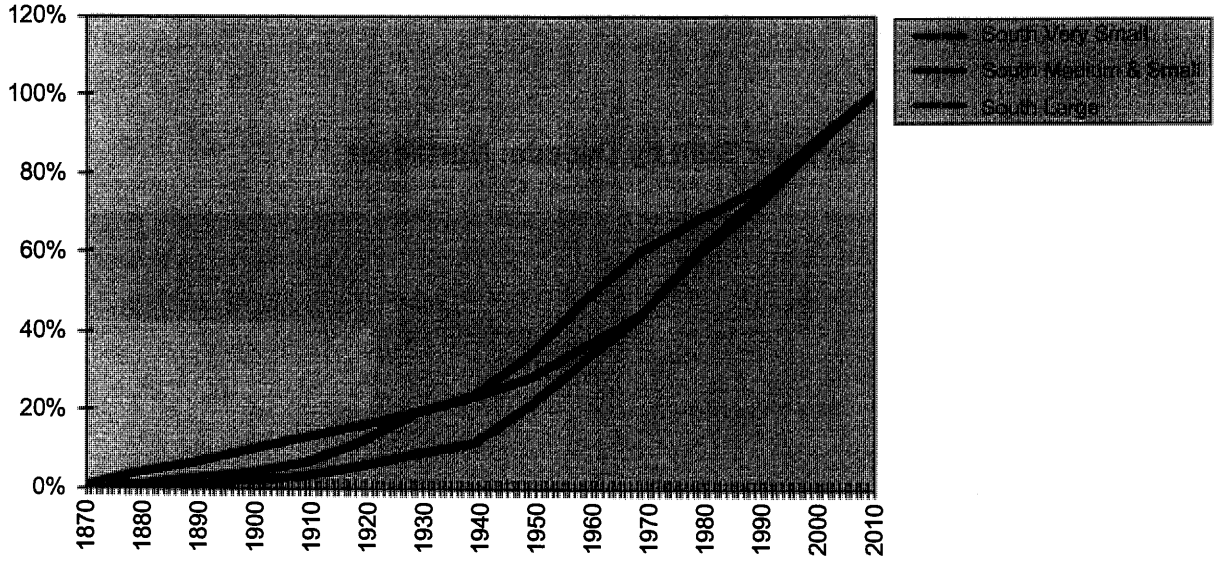
Proportion of Current System Built by Decade: Northeast



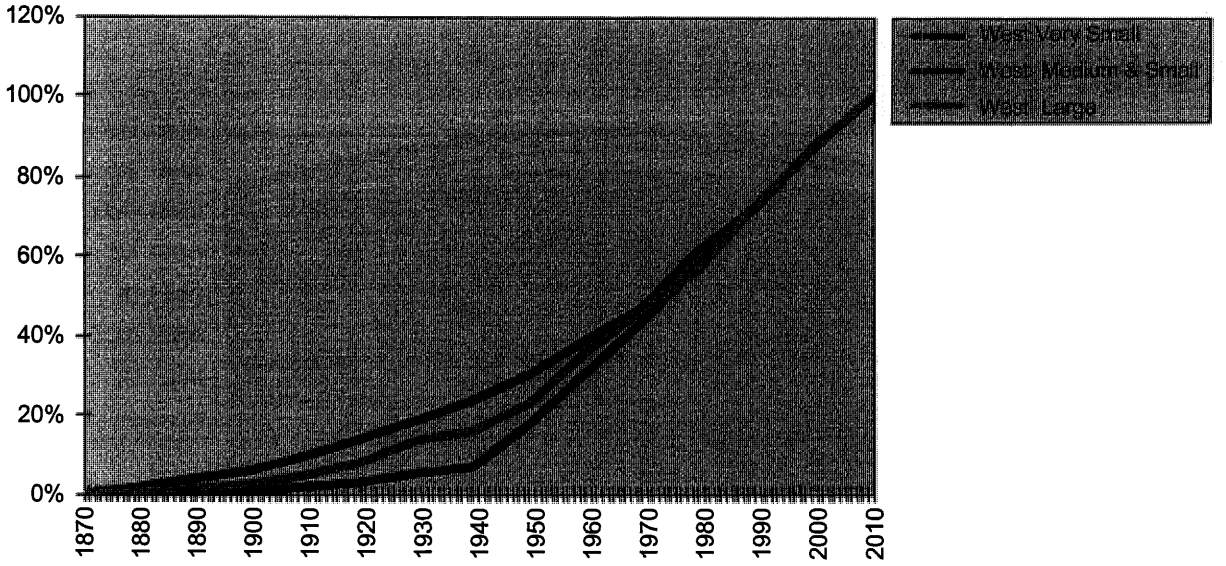
Proportion of Current System Built by Decade: Midwest



Proportion of Current System Built by Decade: South

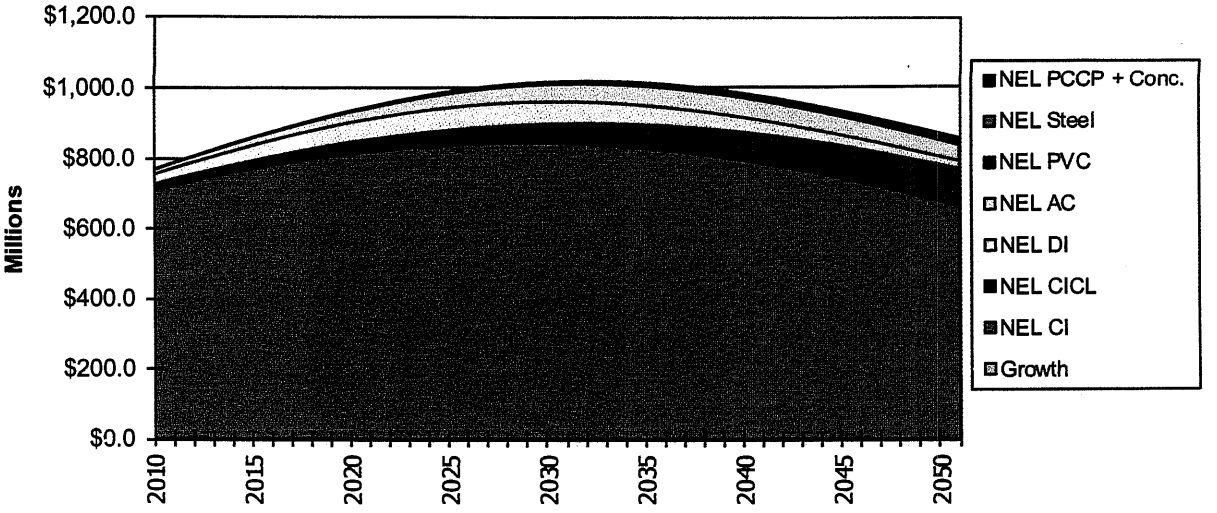


Proportion of Current System Built by Decade: South



Investment for Replacement & Growth

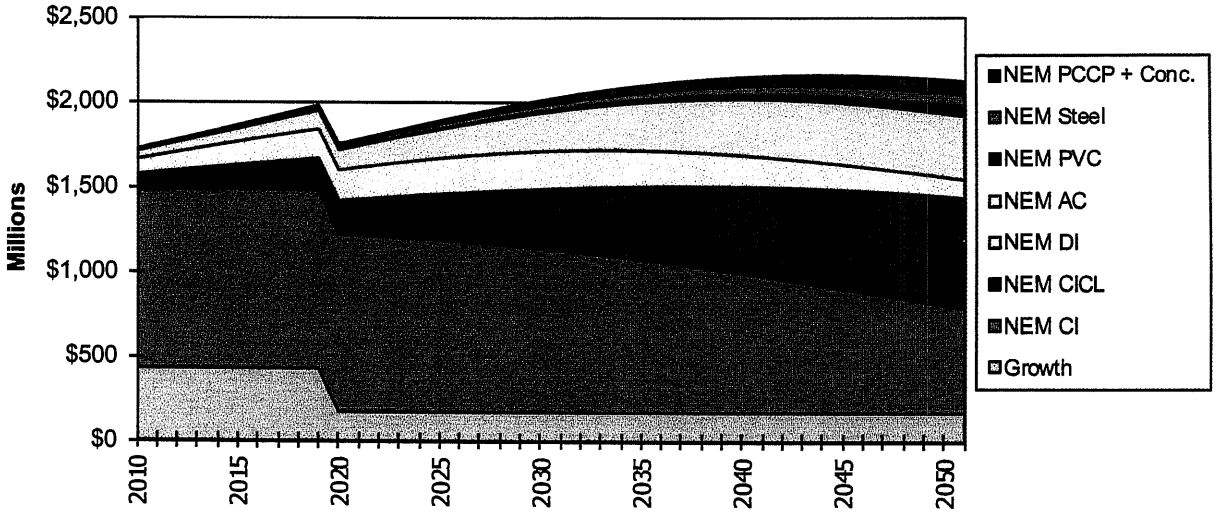
Northeast Large



CI: cast iron; CICL: cast iron cement lined; DI: ductile iron; AC: asbestos cement; PV: polyvinyl chloride; PCCP: prestressed concrete cylinder pipe

Investment for Replacement & Growth

Northeast Medium

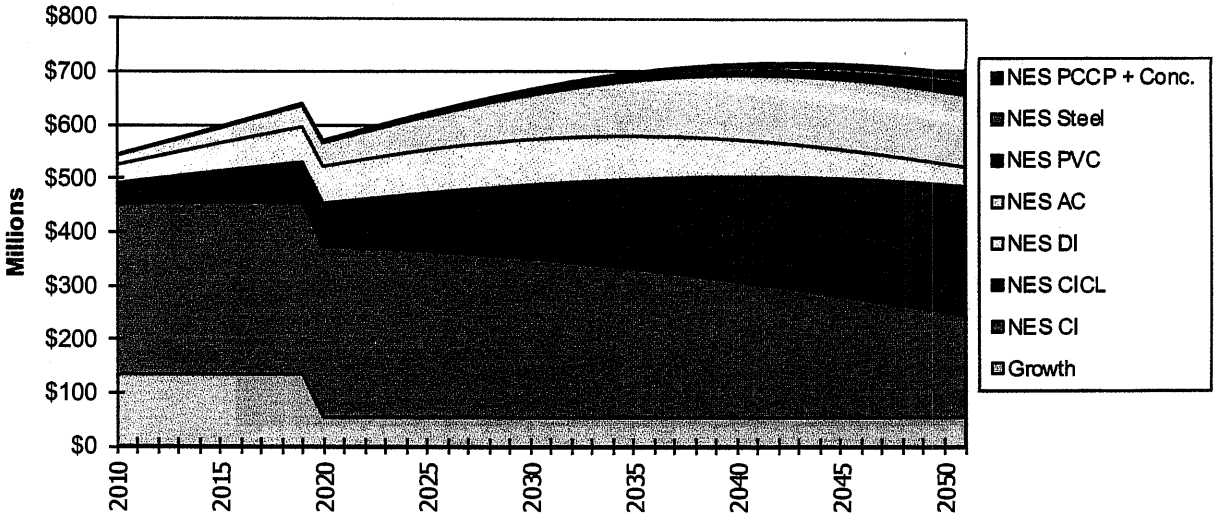


CI: cast iron; CICL: cast iron cement lined; DI: ductile iron; AC: asbestos cement; PV: polyvinyl chloride; PCCP: prestressed concrete cylinder pipe

The charts show needs for replacement of particular types of pipe and for growth (see the keys below and to the right of the chart). An artifact of the model and US Census data result in an apparent upward or downward "spike" in growth-related needs between certain decades. In reality, the apparent sudden shift in growth-related needs will be spread more evenly over the years bridging each decade to the next.

Investment for Replacement & Growth

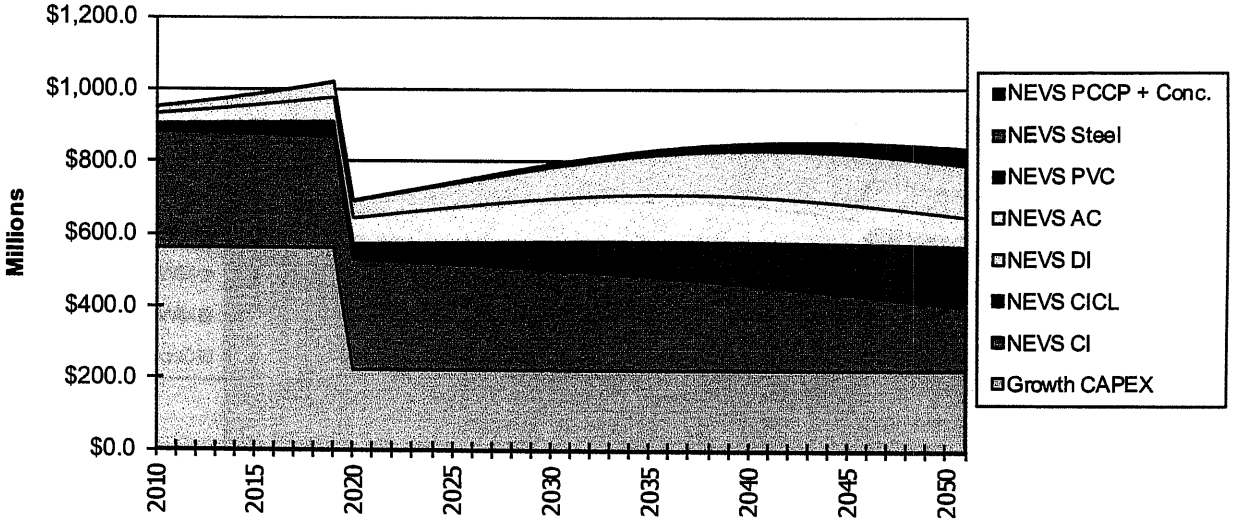
Northeast Small



CI: cast iron; CICL: cast iron cement lined; DI: ductile iron; AC: asbestos cement; PV: polyvinyl chloride; PCCP: prestressed concrete cylinder pipe

Investment for Replacement & Growth

Northeast Very Small

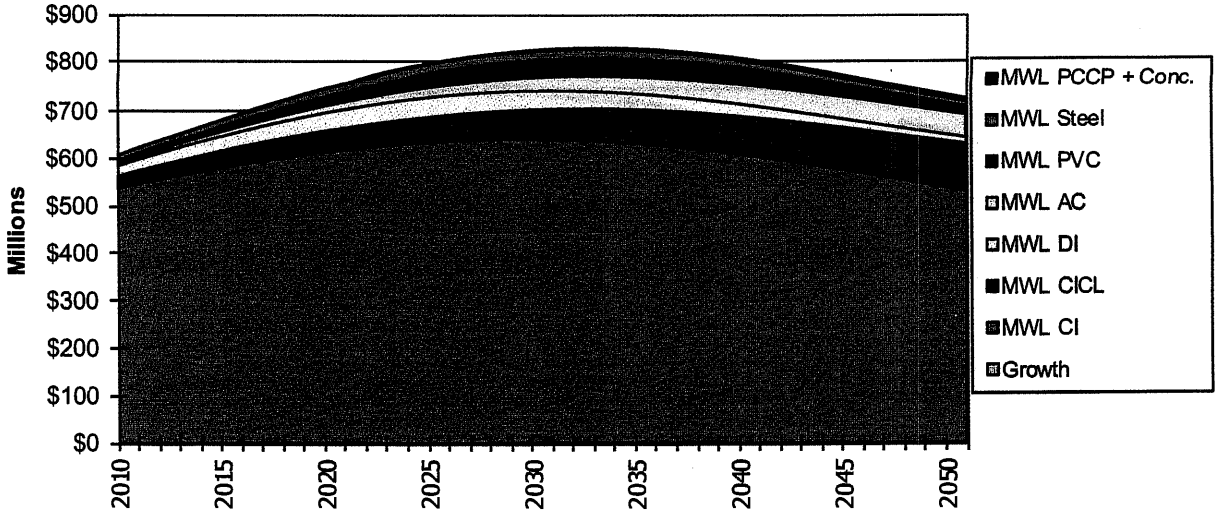


CI: cast iron; CICL: cast iron cement lined; DI: ductile iron; AC: asbestos cement; PV: polyvinyl chloride; PCCP: prestressed concrete cylinder pipe

The charts show needs for replacement of particular types of pipe and for growth (see the keys below and to the right of the chart). An artifact of the model and US Census data result in an apparent upward or downward "spike" in growth-related needs between certain decades. In reality, the apparent sudden shift in growth-related needs will be spread more evenly over the years bridging each decade to the next.

Investment for Replacement & Growth

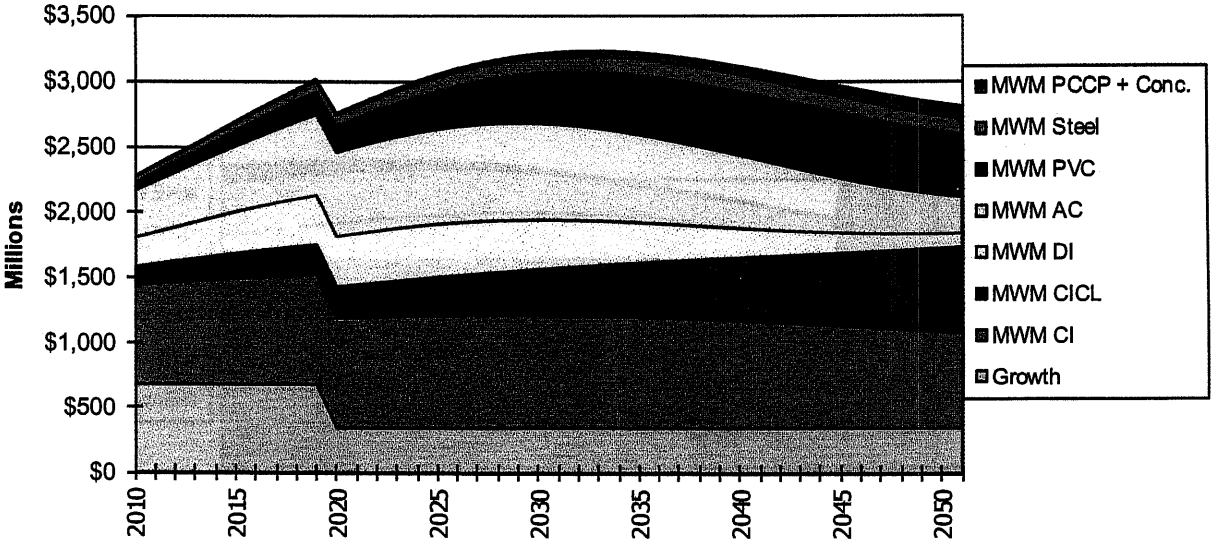
Midwest Large



CI: cast iron; CICL: cast iron cement lined; DI: ductile iron; AC: asbestos cement; PV: polyvinyl chloride; PCCP: prestressed concrete cylinder pipe

Investment for Replacement & Growth

Midwest Medium

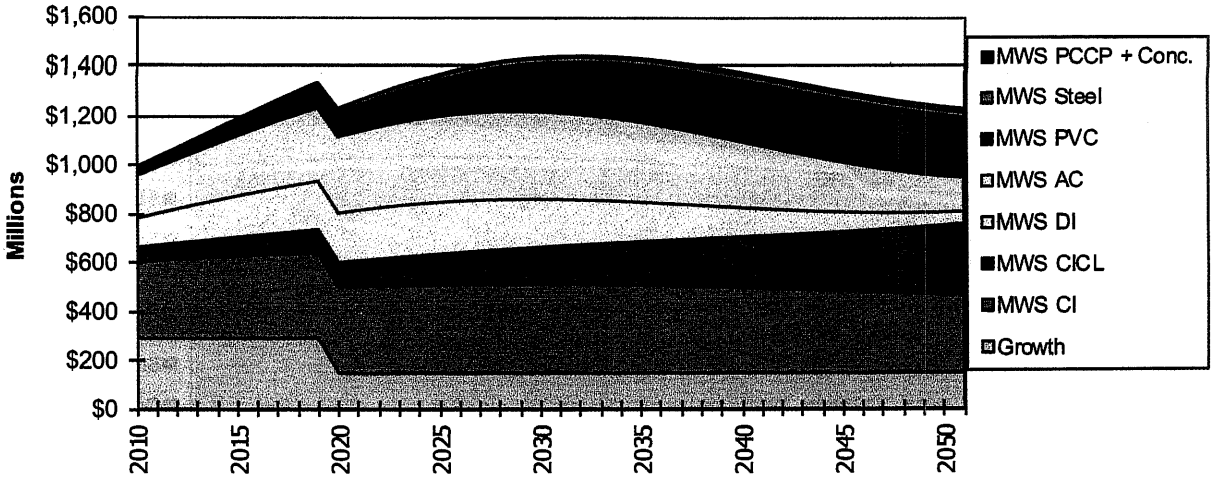


CI: cast iron; CICL: cast iron cement lined; DI: ductile iron; AC: asbestos cement; PV: polyvinyl chloride; PCCP: prestressed concrete cylinder pipe

The charts show needs for replacement of particular types of pipe and for growth (see the keys below and to the right of the chart). An artifact of the model and US Census data result in an apparent upward or downward "spike" in growth-related needs between certain decades. In reality, the apparent sudden shift in growth-related needs will be spread more evenly over the years bridging each decade to the next.

Investment for Replacement & Growth

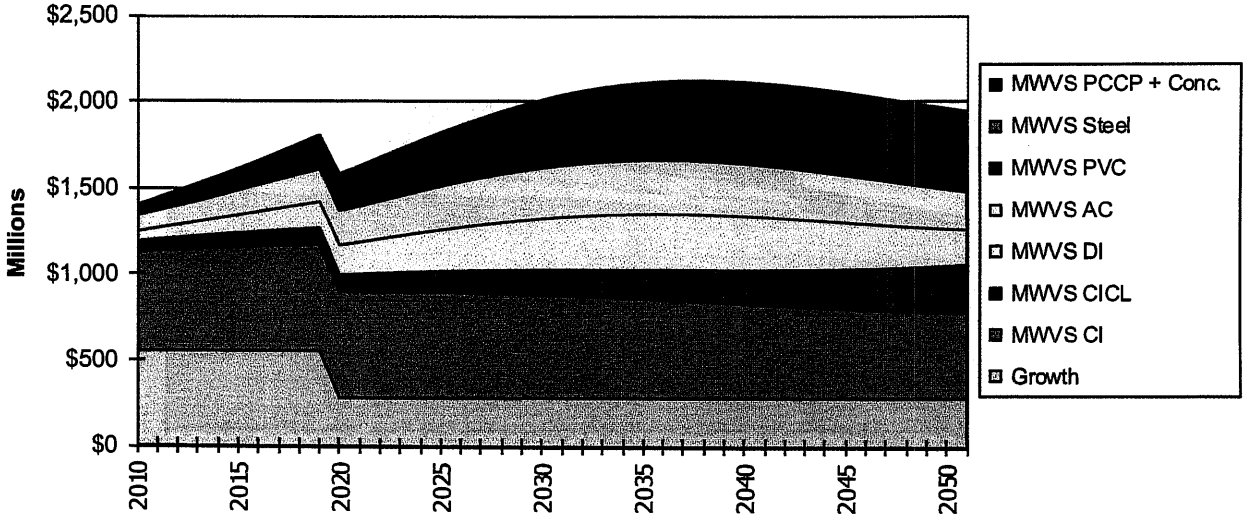
Midwest Small



CI: cast iron; CICL: cast iron cement lined; DI: ductile iron; AC: asbestos cement; PV: polyvinyl chloride; PCCP: prestressed concrete cylinder pipe

Investment for Replacement & Growth

Midwest Very Small

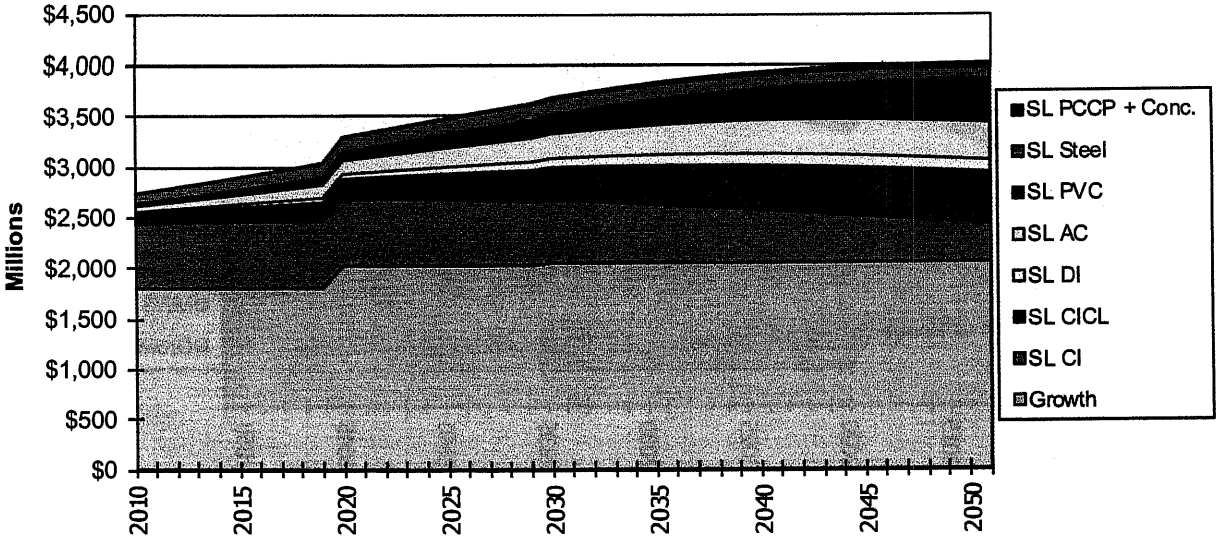


CI: cast iron; CICL: cast iron cement lined; DI: ductile iron; AC: asbestos cement; PV: polyvinyl chloride; PCCP: prestressed concrete cylinder pipe

The charts show needs for replacement of particular types of pipe and for growth (see the keys below and to the right of the chart). An artifact of the model and US Census data result in an apparent upward or downward "spike" in growth-related needs between certain decades. In reality, the apparent sudden shift in growth-related needs will be spread more evenly over the years bridging each decade to the next.

Investment for Replacement & Growth

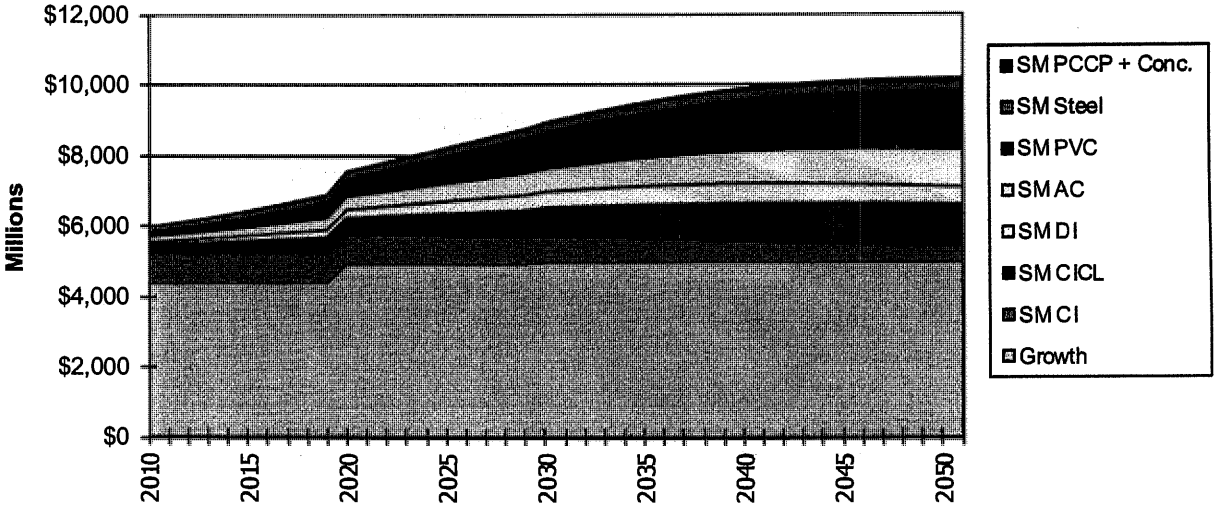
South Large



CI: cast iron; CICL: cast iron cement lined; DI: ductile iron; AC: asbestos cement; PV: polyvinyl chloride; PCCP: prestressed concrete cylinder pipe

Investment for Replacement & Growth

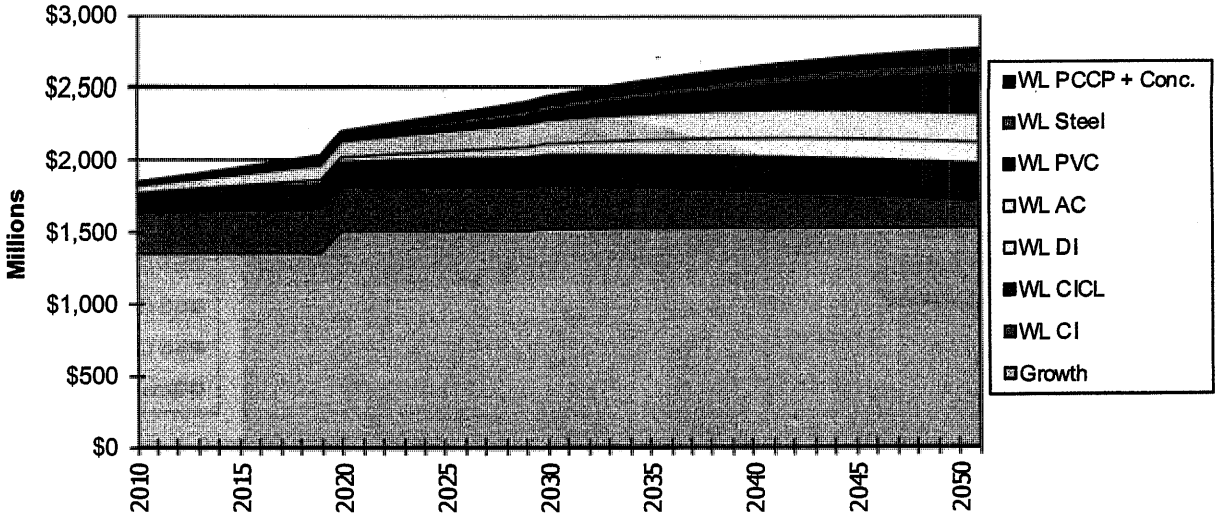
South Medium



CI: cast iron; CICL: cast iron cement lined; DI: ductile iron; AC: asbestos cement; PV: polyvinyl chloride; PCCP: prestressed concrete cylinder pipe

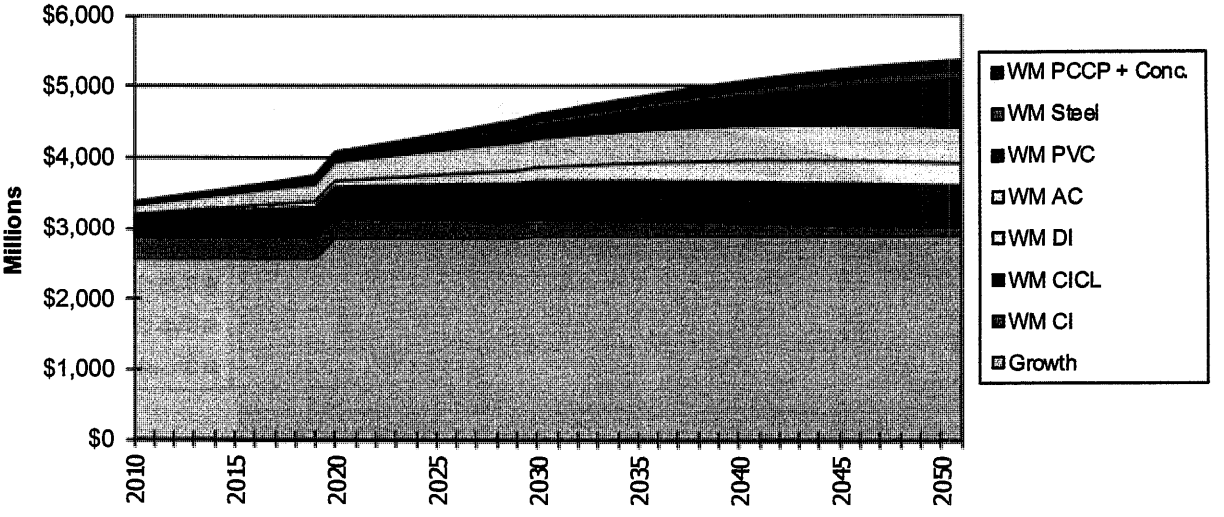
The charts show needs for replacement of particular types of pipe and for growth (see the keys below and to the right of the chart). An artifact of the model and US Census data result in an apparent upward or downward "spike" in growth-related needs between certain decades. In reality, the apparent sudden shift in growth-related needs will be spread more evenly over the years bridging each decade to the next.

Investment for Replacement & Growth
West Large



CI: cast iron; CICL: cast iron cement lined; DI: ductile iron; AC: asbestos cement; PV: polyvinyl chloride; PCCP: prestressed concrete cylinder pipe

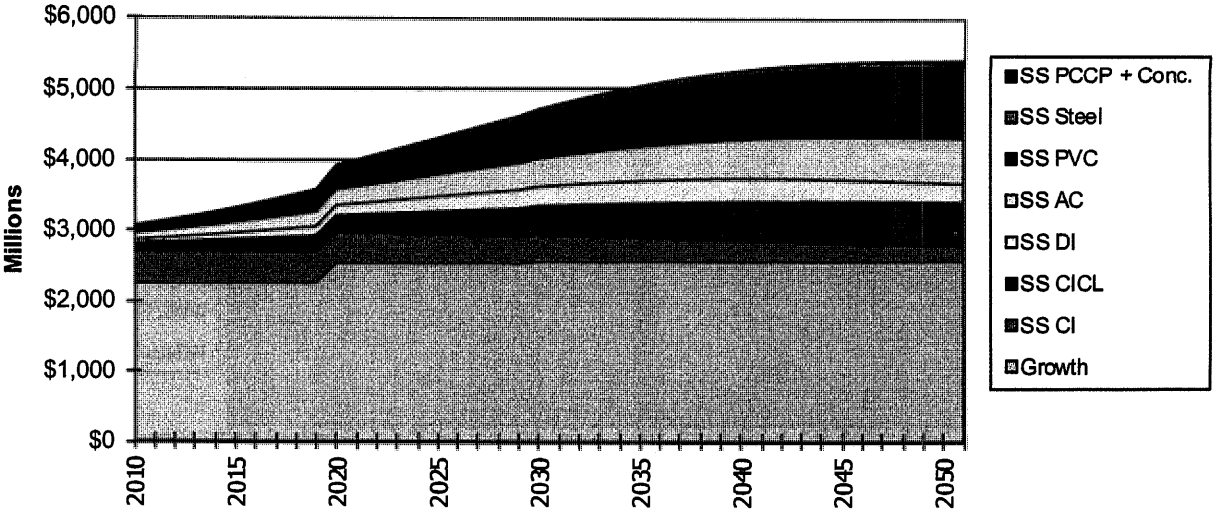
Investment for Replacement & Growth
West Medium



CI: cast iron; CICL: cast iron cement lined; DI: ductile iron; AC: asbestos cement; PV: polyvinyl chloride; PCCP: prestressed concrete cylinder pipe

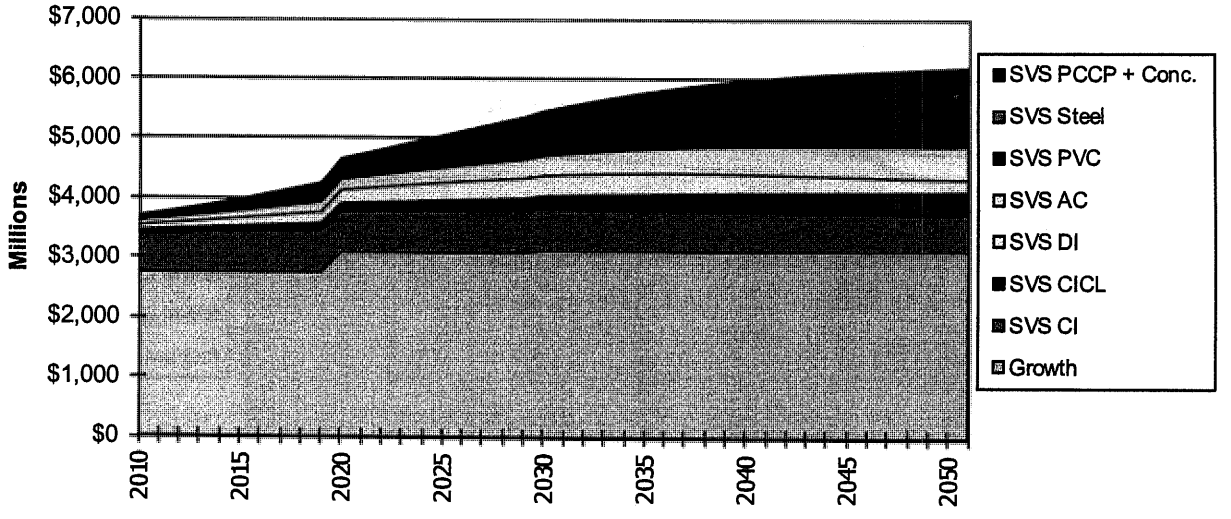
The charts show needs for replacement of particular types of pipe and for growth (see the keys below and to the right of the chart). An artifact of the model and US Census data result in an apparent upward or downward "spike" in growth-related needs between certain decades. In reality, the apparent sudden shift in growth-related needs will be spread more evenly over the years bridging each decade to the next.

Investment for Replacement & Growth
South Small



CI: cast iron; CICL: cast iron cement lined; DI: ductile iron; AC: asbestos cement; PV: polyvinyl chloride; PCCP: prestressed concrete cylinder pipe

Investment for Replacement & Growth
South Very Small

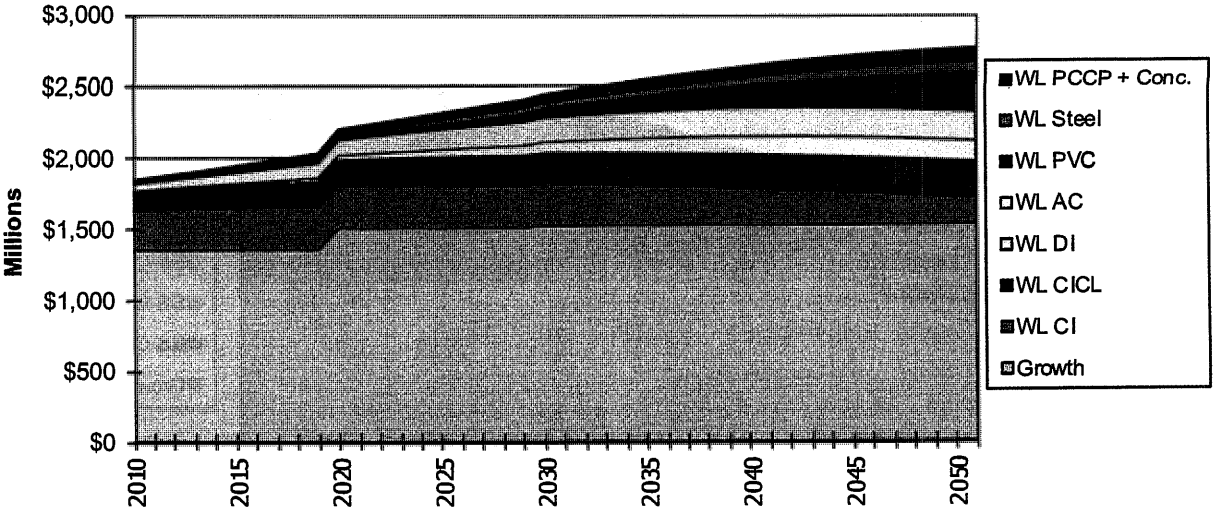


CI: cast iron; CICL: cast iron cement lined; DI: ductile iron; AC: asbestos cement; PV: polyvinyl chloride; PCCP: prestressed concrete cylinder pipe

The charts show needs for replacement of particular types of pipe and for growth (see the keys below and to the right of the chart). An artifact of the model and US Census data result in an apparent upward or downward "spike" in growth-related needs between certain decades. In reality, the apparent sudden shift in growth-related needs will be spread more evenly over the years bridging each decade to the next.

Investment for Replacement & Growth

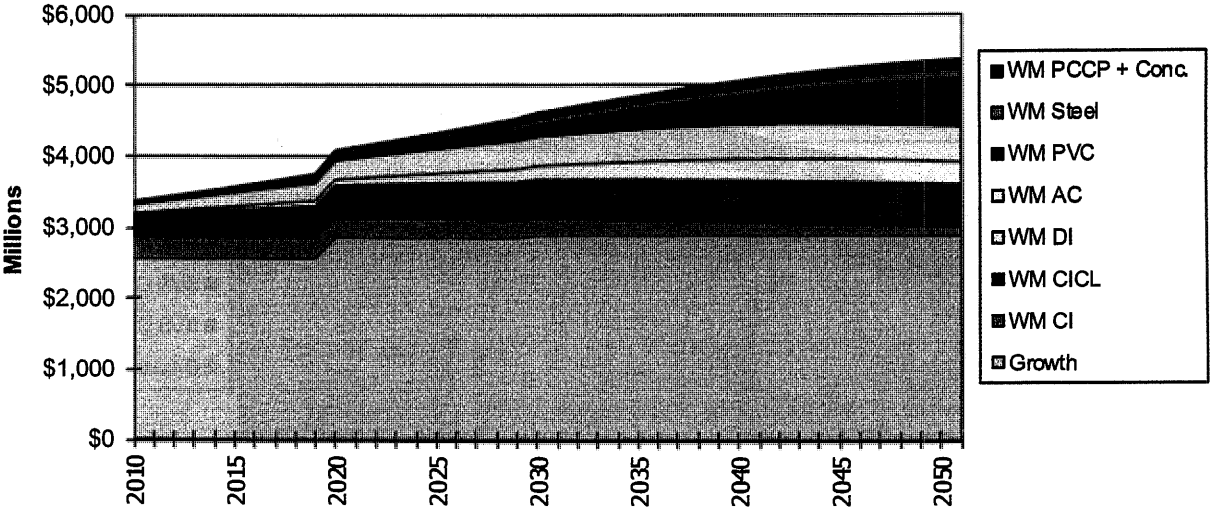
West Large



CI: cast iron; CICL: cast iron cement lined; DI: ductile iron; AC: asbestos cement; PV: polyvinyl chloride; PCCP: prestressed concrete cylinder pipe

Investment for Replacement & Growth

West Medium

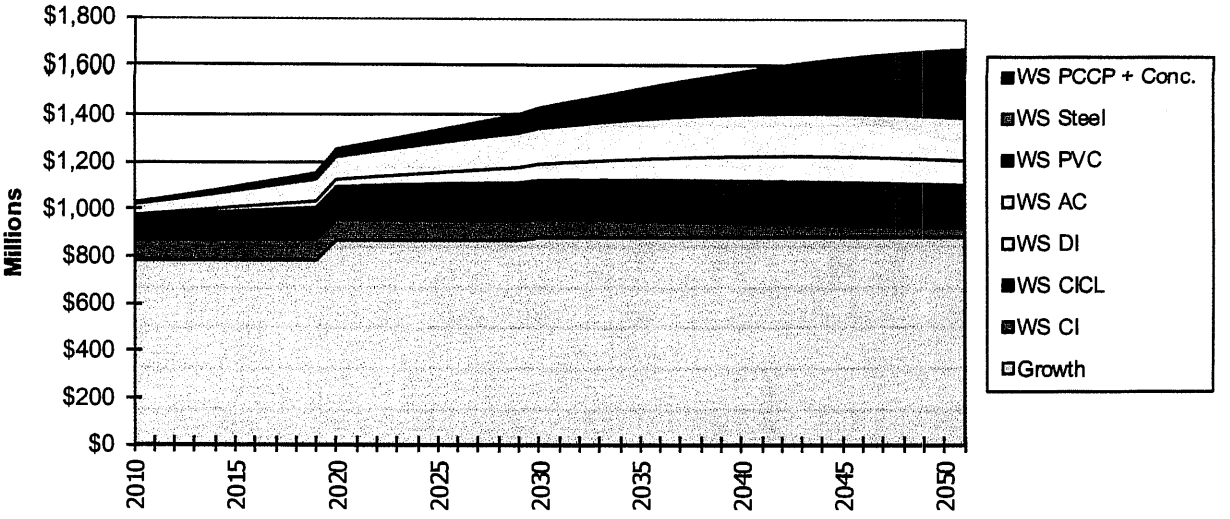


CI: cast iron; CICL: cast iron cement lined; DI: ductile iron; AC: asbestos cement; PV: polyvinyl chloride; PCCP: prestressed concrete cylinder pipe

The charts show needs for replacement of particular types of pipe and for growth (see the keys below and to the right of the chart). An artifact of the model and US Census data result in an apparent upward or downward "spike" in growth-related needs between certain decades. In reality, the apparent sudden shift in growth-related needs will be spread more evenly over the years bridging each decade to the next.

Investment for Replacement & Growth

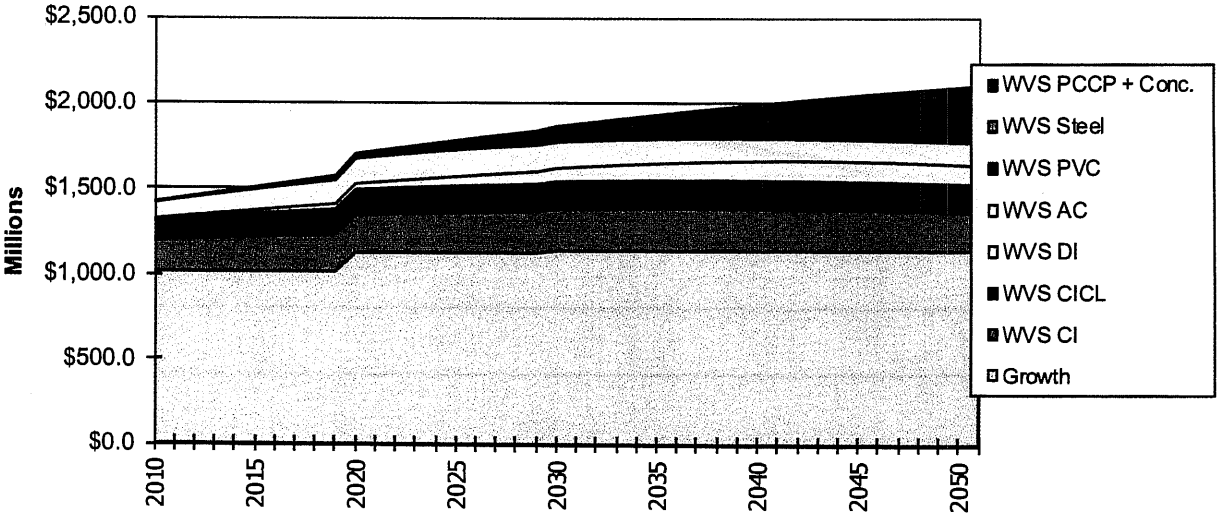
West Small



CI: cast iron; CICL: cast iron cement lined; DI: ductile iron; AC: asbestos cement; PV: polyvinyl chloride; PCCP: prestressed concrete cylinder pipe

Investment for Replacement & Growth

West Very Small

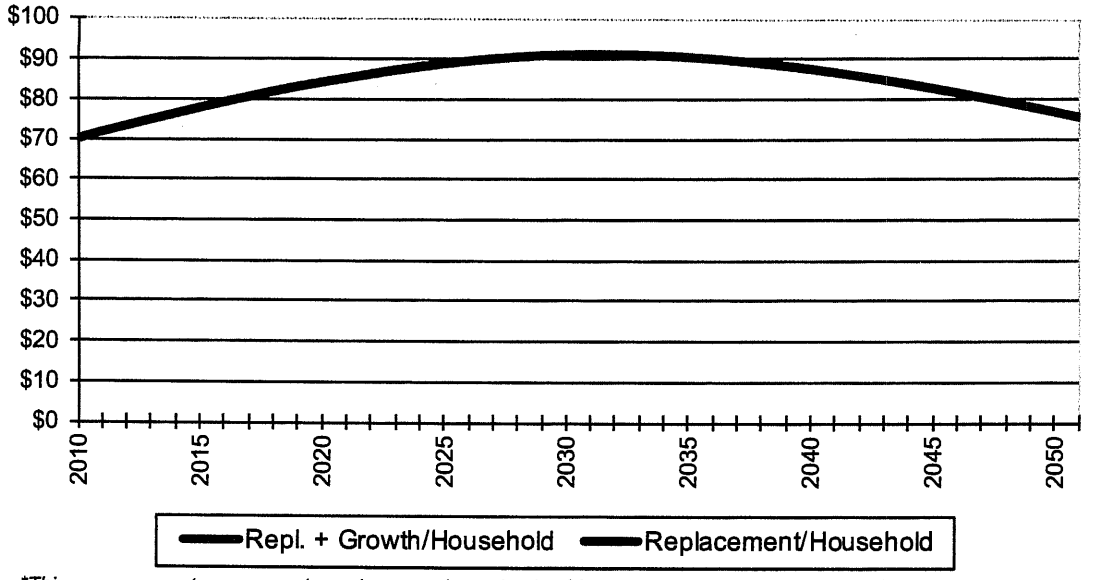


CI: cast iron; CICL: cast iron cement lined; DI: ductile iron; AC: asbestos cement; PV: polyvinyl chloride; PCCP: prestressed concrete cylinder pipe

The charts show needs for replacement of particular types of pipe and for growth (see the keys below and to the right of the chart). An artifact of the model and US Census data result in an apparent upward or downward "spike" in growth-related needs between certain decades. In reality, the apparent sudden shift in growth-related needs will be spread more evenly over the years bridging each decade to the next.

Household Cost of Needed Investment for Replacement Plus Growth*

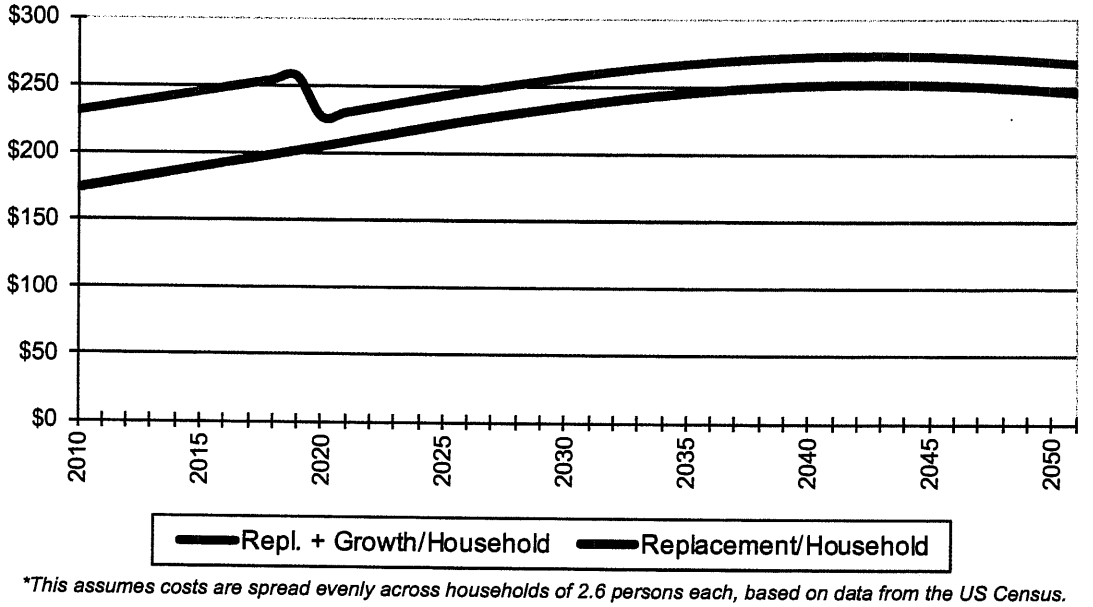
Northeast Large



**This assumes costs are spread evenly across households of 2.6 persons each, based on data from the US Census.*

Household Cost of Needed Investment for Replacement Plus Growth*

Northeast Medium

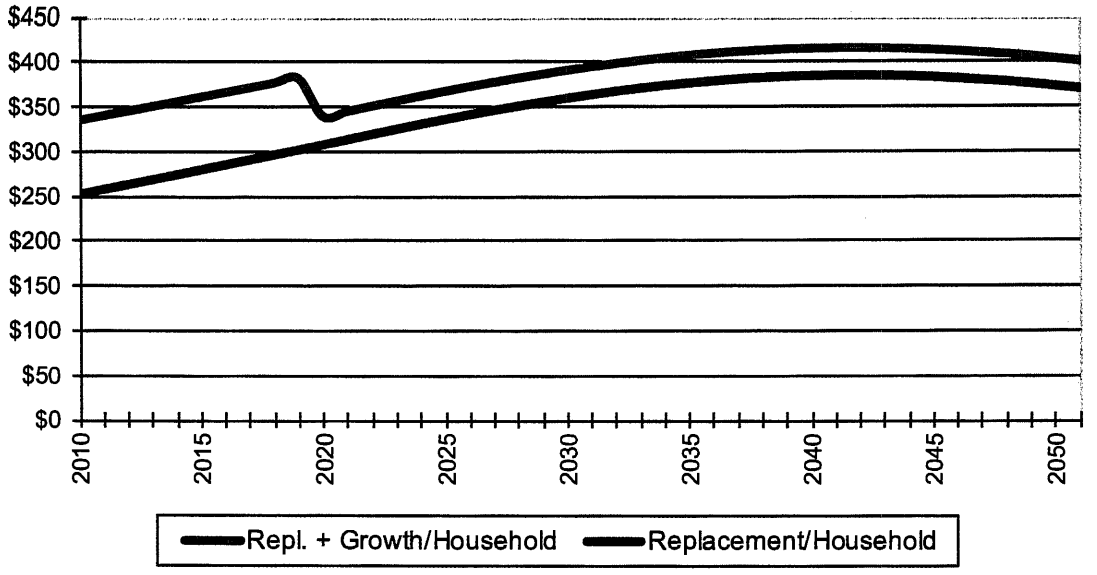


**This assumes costs are spread evenly across households of 2.6 persons each, based on data from the US Census.*

The charts show per household costs for replacement, and for replacement plus growth. The model assumes costs are spread evenly over households averaging 2.6 persons per household in accordance with US Census data. An artifact of the model and US Census data result in an apparent upward or downward "spike" in growth-related needs between certain decades. In reality, the apparent sudden shift in growth-related needs will be spread more evenly over the years bridging each decade to the next."

Household Cost of Needed Investment for Replacement Plus Growth*

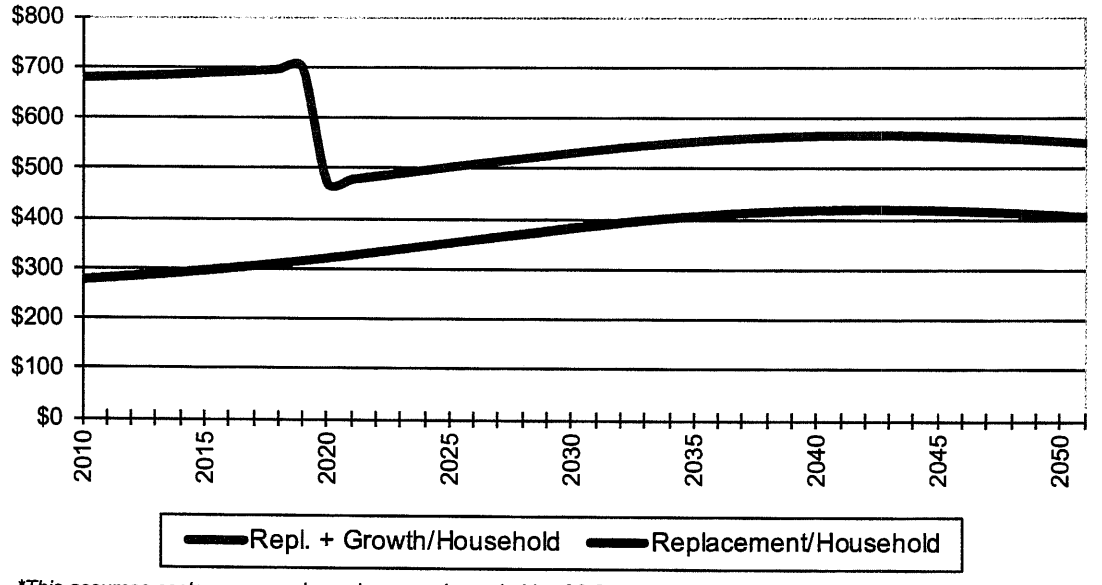
Northeast Small



**This assumes costs are spread evenly across households of 2.6 persons each, based on data from the US Census.*

Household Cost of Needed Investment for Replacement Plus Growth*

Northeast Very Small

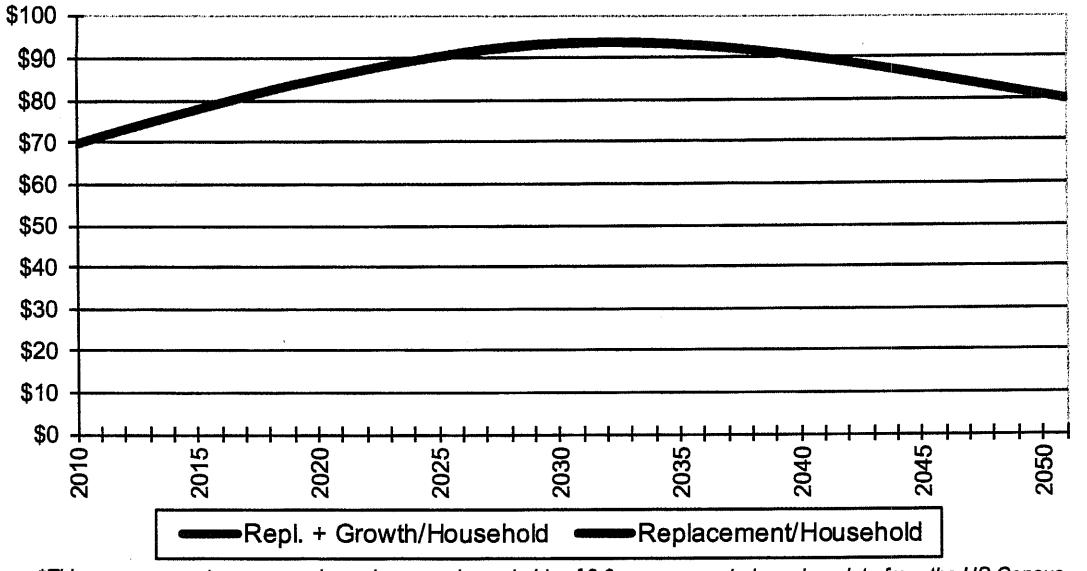


**This assumes costs are spread evenly across households of 2.6 persons each, based on data from the US Census.*

The charts show per household costs for replacement, and for replacement plus growth. The model assumes costs are spread evenly over households averaging 2.6 persons per household in accordance with US Census data. An artifact of the model and US Census data result in an apparent upward or downward "spike" in growth-related needs between certain decades. In reality, the apparent sudden shift in growth-related needs will be spread more evenly over the years bridging each decade to the next."

Household Cost of Needed Investment for Replacement Plus Growth*

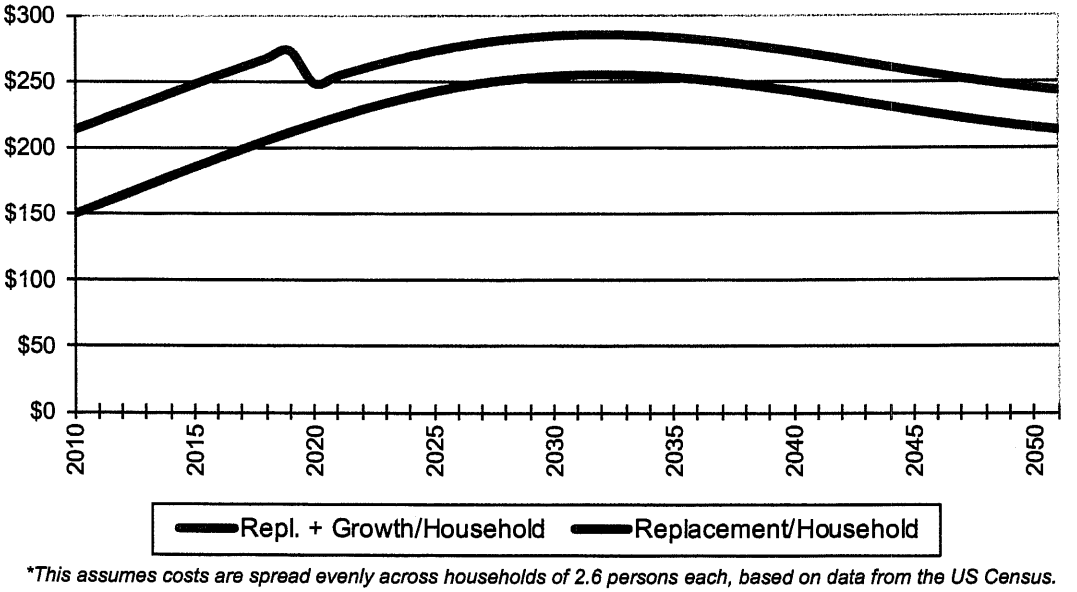
Midwest Large



**This assumes costs are spread evenly across households of 2.6 persons each, based on data from the US Census.*

Household Cost of Needed Investment for Replacement Plus Growth*

Midwest Medium

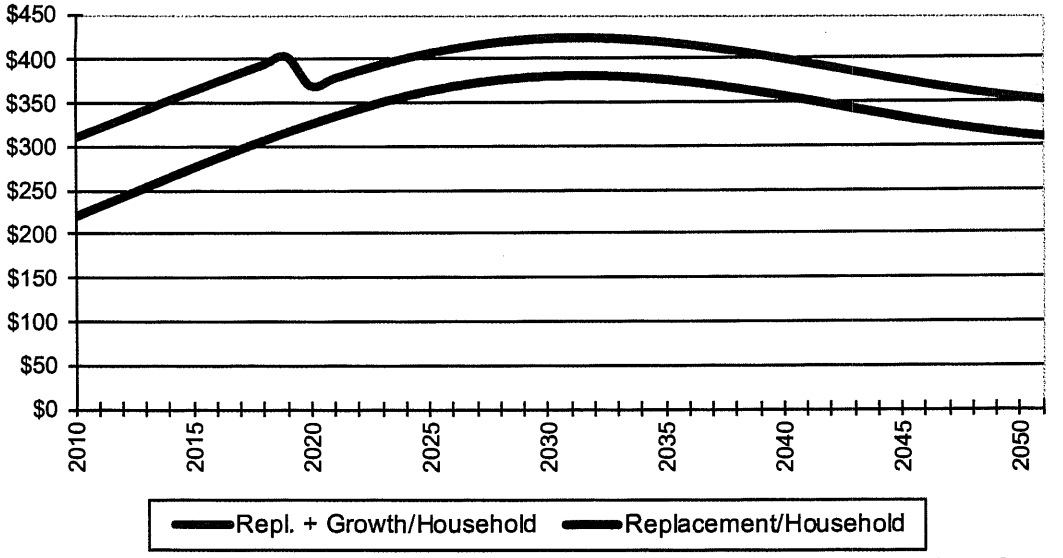


**This assumes costs are spread evenly across households of 2.6 persons each, based on data from the US Census.*

The charts show per household costs for replacement, and for replacement plus growth. The model assumes costs are spread evenly over households averaging 2.6 persons per household in accordance with US Census data. An artifact of the model and US Census data result in an apparent upward or downward "spike" in growth-related needs between certain decades. In reality, the apparent sudden shift in growth-related needs will be spread more evenly over the years bridging each decade to the next."

Household Cost of Needed Investment for Replacement Plus Growth*

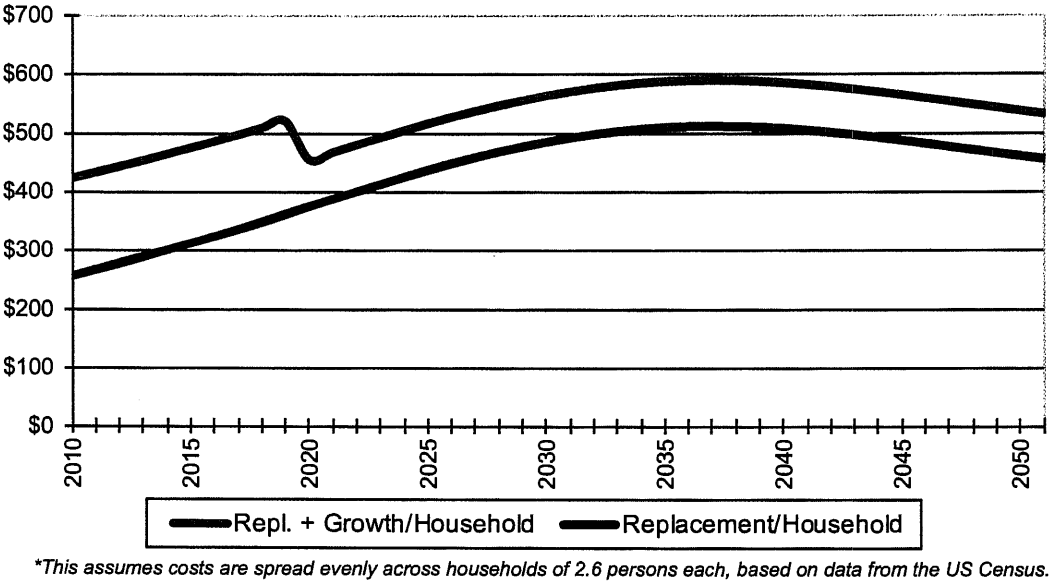
Midwest Small



**This assumes costs are spread evenly across households of 2.6 persons each, based on data from the US Census.*

Household Cost of Needed Investment for Replacement Plus Growth*

Midwest Very Small

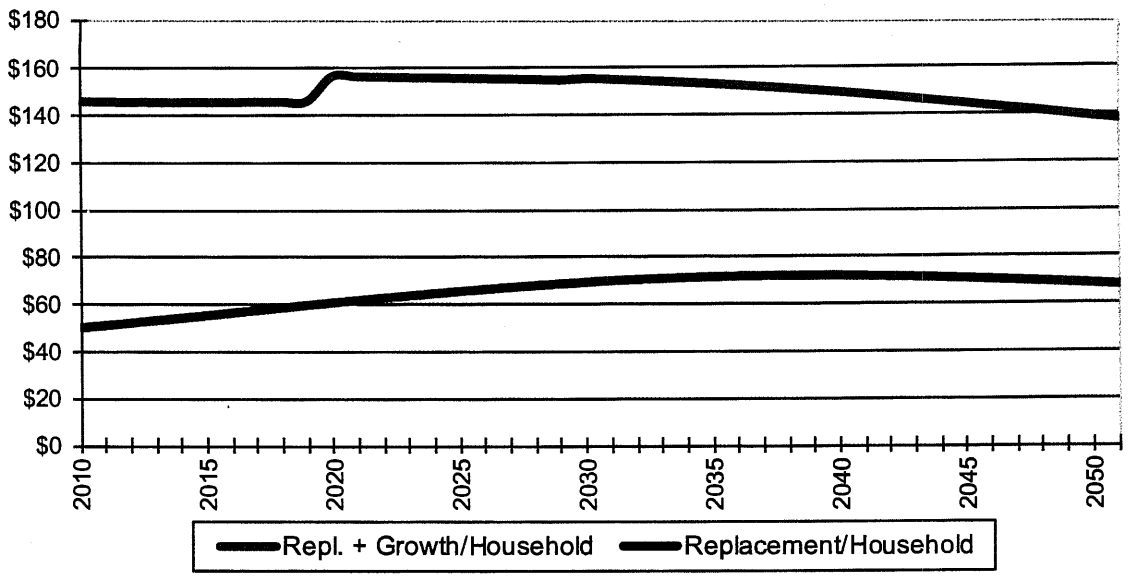


**This assumes costs are spread evenly across households of 2.6 persons each, based on data from the US Census.*

The charts show per household costs for replacement, and for replacement plus growth. The model assumes costs are spread evenly over households averaging 2.6 persons per household in accordance with US Census data. An artifact of the model and US Census data result in an apparent upward or downward "spike" in growth-related needs between certain decades. In reality, the apparent sudden shift in growth-related needs will be spread more evenly over the years bridging each decade to the next."

Household Cost of Needed Investment for Replacement Plus Growth*

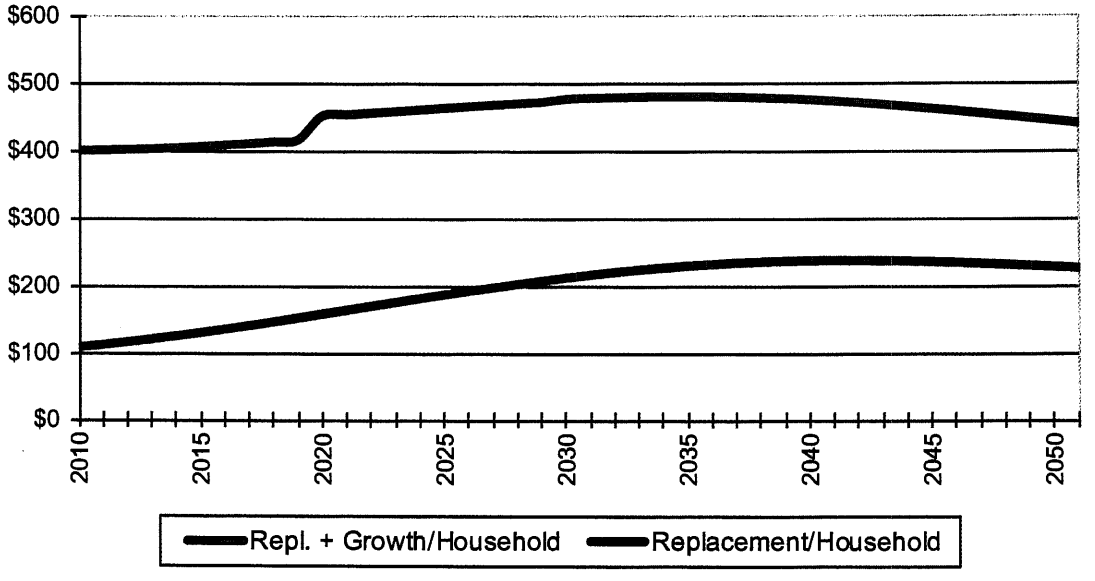
South Large



**This assumes costs are spread evenly across households of 2.6 persons each, based on data from the US Census.*

Household Cost of Needed Investment for Replacement Plus Growth*

South Medium

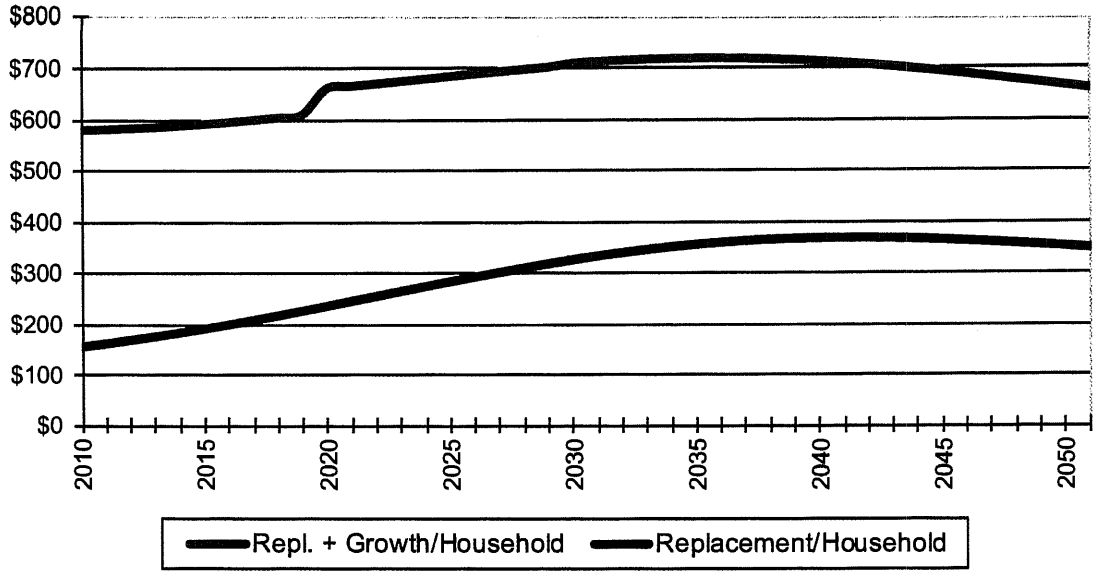


**This assumes costs are spread evenly across households of 2.6 persons each, based on data from the US Census.*

The charts show per household costs for replacement, and for replacement plus growth. The model assumes costs are spread evenly over households averaging 2.6 persons per household in accordance with US Census data. An artifact of the model and US Census data result in an apparent upward or downward "spike" in growth-related needs between certain decades. In reality, the apparent sudden shift in growth-related needs will be spread more evenly over the years bridging each decade to the next."

Household Cost of Needed Investment for Replacement Plus Growth*

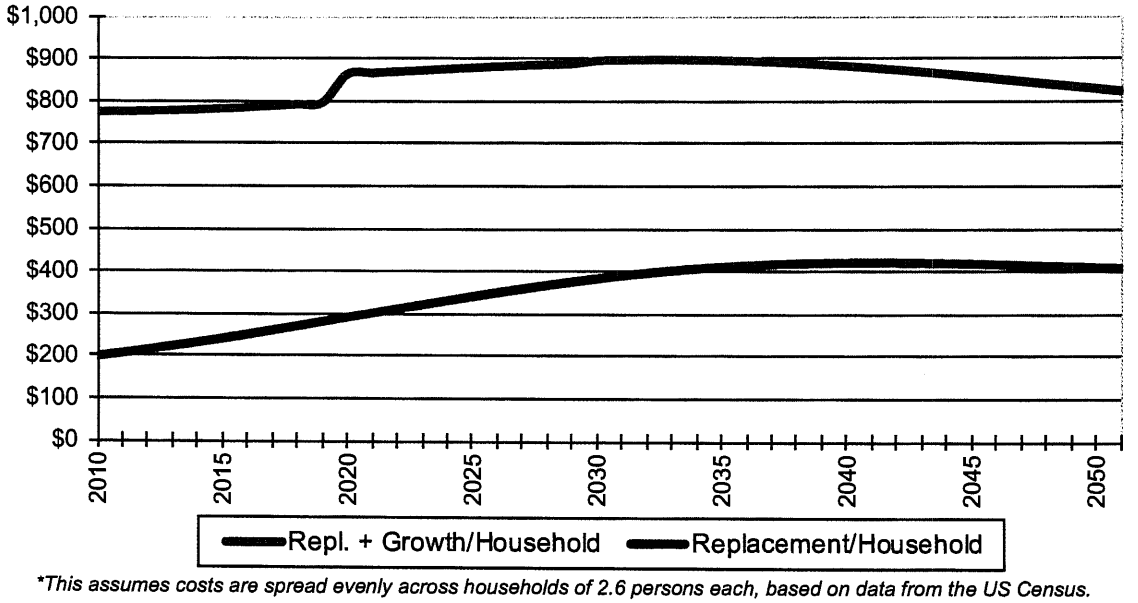
South Small



**This assumes costs are spread evenly across households of 2.6 persons each, based on data from the US Census.*

Household Cost of Needed Investment for Replacement Plus Growth*

South Very Small

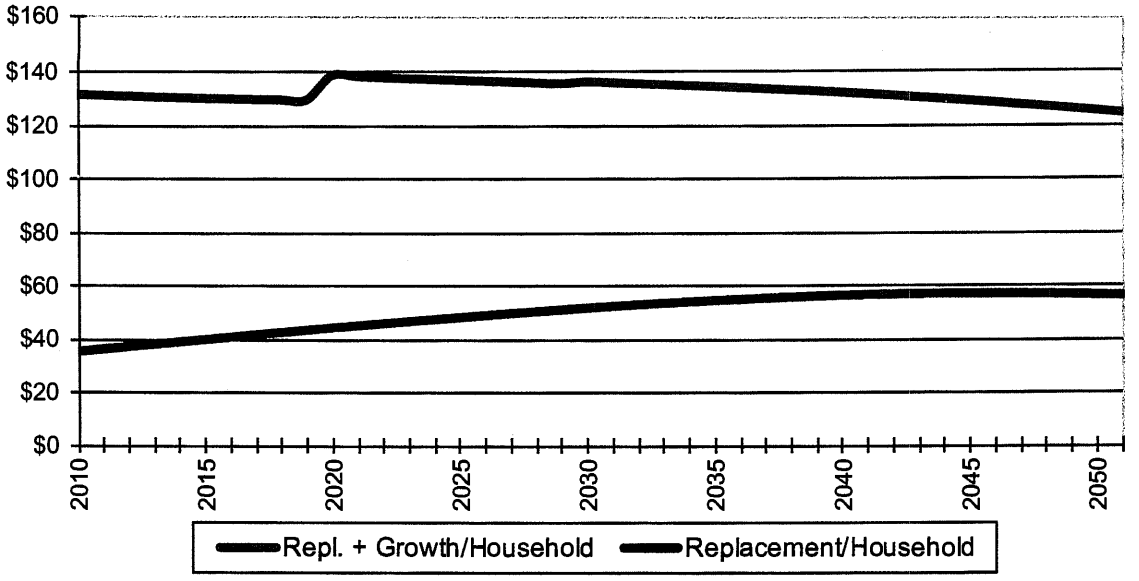


**This assumes costs are spread evenly across households of 2.6 persons each, based on data from the US Census.*

The charts show per household costs for replacement, and for replacement plus growth. The model assumes costs are spread evenly over households averaging 2.6 persons per household in accordance with US Census data. An artifact of the model and US Census data result in an apparent upward or downward "spike" in growth-related needs between certain decades. In reality, the apparent sudden shift in growth-related needs will be spread more evenly over the years bridging each decade to the next."

Household Cost of Needed Investment for Replacement Plus Growth*

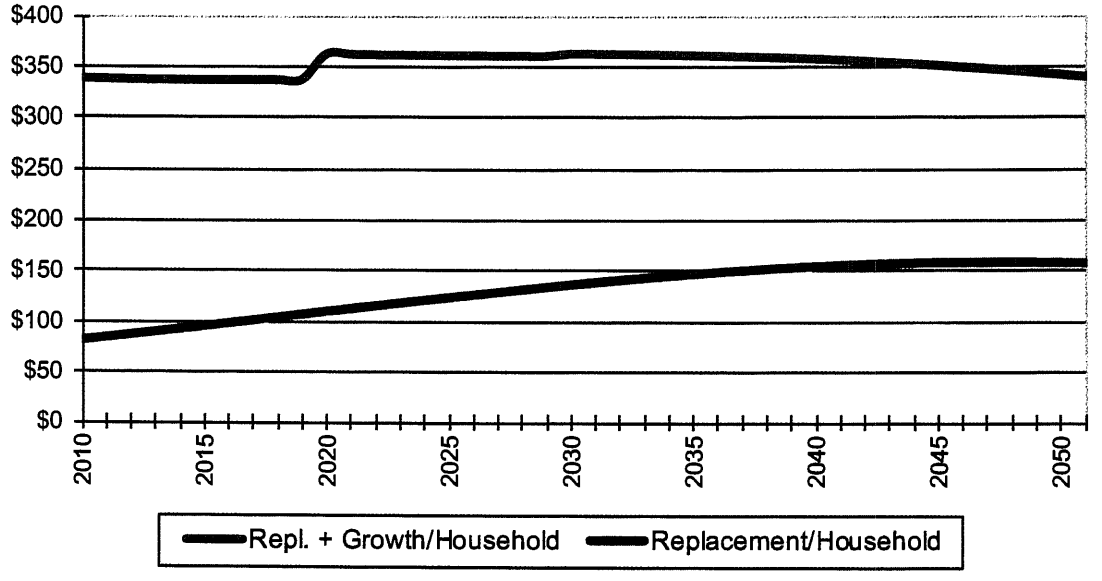
West Large



**This assumes costs are spread evenly across households of 2.6 persons each, based on data from the US Census.*

Household Cost of Needed Investment for Replacement Plus Growth*

West Medium

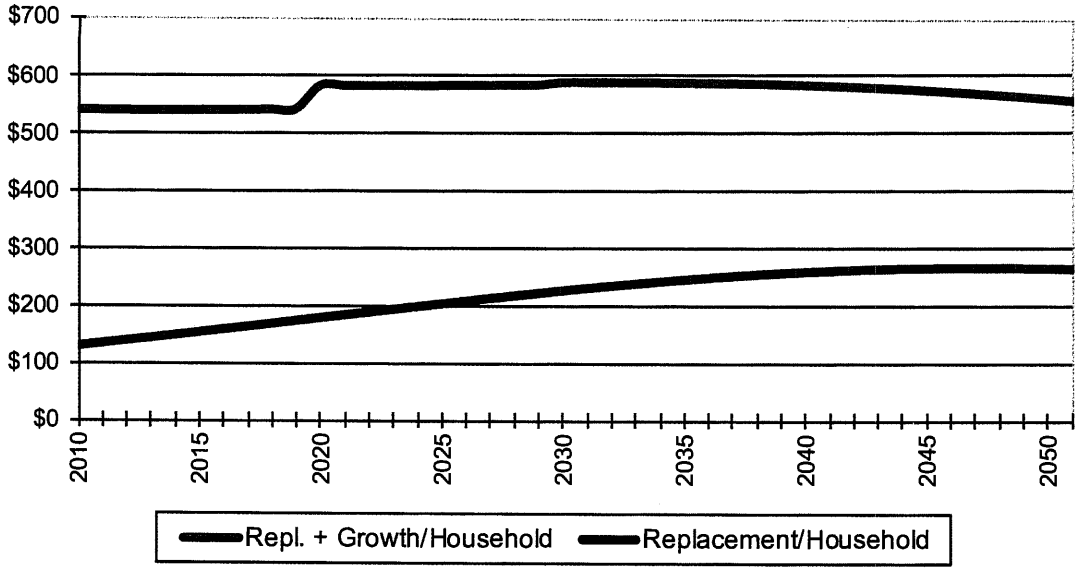


**This assumes costs are spread evenly across households of 2.6 persons each, based on data from the US Census.*

The charts show per household costs for replacement, and for replacement plus growth. The model assumes costs are spread evenly over households averaging 2.6 persons per household in accordance with US Census data. An artifact of the model and US Census data result in an apparent upward or downward "spike" in growth-related needs between certain decades. In reality, the apparent sudden shift in growth-related needs will be spread more evenly over the years bridging each decade to the next."

Household Cost of Needed Investment for Replacement Plus Growth*

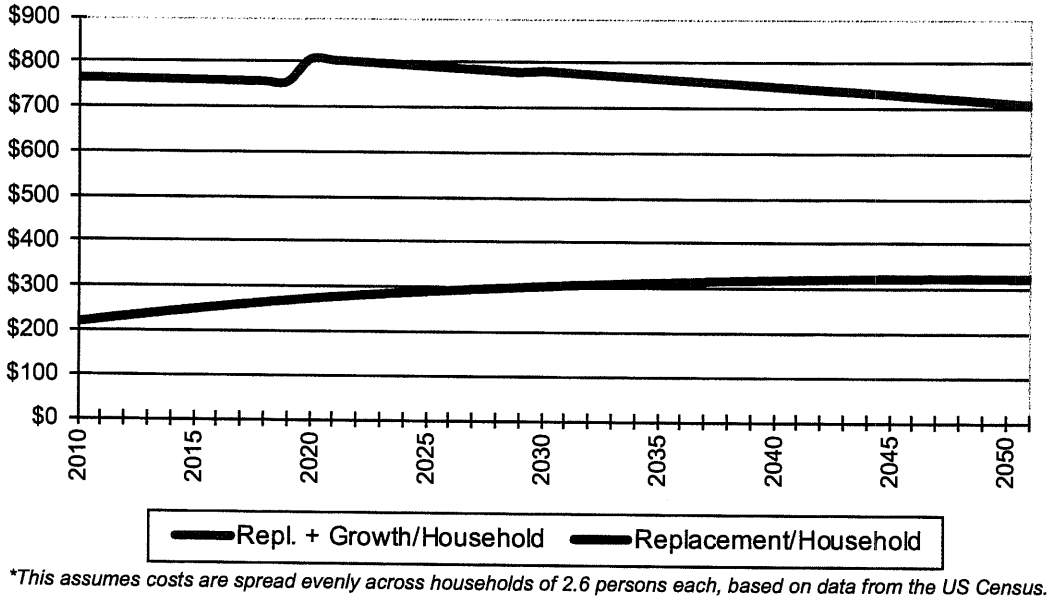
West Small



**This assumes costs are spread evenly across households of 2.6 persons each, based on data from the US Census.*

Household Cost of Needed Investment for Replacement Plus Growth*

West Very Small



**This assumes costs are spread evenly across households of 2.6 persons each, based on data from the US Census.*

The charts show per household costs for replacement, and for replacement plus growth. The model assumes costs are spread evenly over households averaging 2.6 persons per household in accordance with US Census data. An artifact of the model and US Census data result in an apparent upward or downward "spike" in growth-related needs between certain decades. In reality, the apparent sudden shift in growth-related needs will be spread more evenly over the years bridging each decade to the next."