

City of Salem, Massachusetts

Water Conservation Planning Report

June 2006

Report



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June 29, 2006

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Subject: EOEA FY 2006 Smart Growth Technical Assistance Grant - ENV 06 POL 01
Final Project Report for the Salem Water Conservation Plan

Dear Mr. Gaertner:

On behalf of the City of Salem's Department of Planning and Community Development, we are pleased to present you with a copy of the final project report of the *Salem Water Conservation Planning Report, June 2006* prepared by CDM for the city through the Executive Office of Environmental Affairs (EOEA) Smart Growth Technical Assistance Grant (ENV 06 POL 01).

In accordance with the grant contract between the city and the EOEA, executed on December 22, 2005, please find herein two paper copies of the report and one digital copy on CD-ROM in Adobe Acrobat .pdf format. It is our understanding that the city has previously forwarded to you the May 2006 progress report. At this time all EOEA contract tasks (1 through 4), with the exception Task 3f (holding a public meeting), have been accomplished and the deliverables are included in the final report. Once a public meeting date and location are finalized by the city, the information will be forwarded to you.

If you have questions, please contact me at 617-452-6654 or govelh@cdm.com or Kathleen Winn of Salem's Department of Planning and Community Development at 978-745-9595.

Very truly yours,

Lisa H. Gove, P.E., BCEE
Principal
Camp Dresser & McKee Inc.

cc: Kathleen M. Winn, Salem Department of Planning and Community Development
Bruce Thibodeau, Salem Department of Public Services
Eric Hove, Executive Office of Environmental Affairs

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Executive Summary

This Salem Water Conservation Planning Report was prepared by CDM through the Executive Office of Environmental Affairs (EOEA) Smart Growth Technical Assistance Grant. In accordance with EOEA grant contract guidelines and the engineering Task Order 19-2006 scope of work, CDM submitted a progress report in May 2006, and now having completed all task work, is pleased to submit this final report.

Salem Water Conservation Planning

Public Education

According to the EOEA and MWRC's Water Conservation Standards, "education of the public at large, municipal officials and the water suppliers is crucial to generating an understanding of the issues, and implementing and creating acceptance of water conservation activities." The following actions are suggested to enhance Salem's public education program.

School Outreach

It is suggested that the city of Salem actively encourage teachers and school administrators to take advantage of the available opportunities and resources to incorporate water conservation into school curriculums for primary and secondary education. City officials could provide educators with information through public meetings, presentations and informative bulletins.

The EPA provides an Environmental Education Grant to eligible parties for the purpose of providing seed money to support education projects that increase the public's environmental awareness. Any local education agency is eligible for the grant; however, individual teachers are not eligible. It is recommended that the Salem Public School Department prepare a conservation education program according to grant specifications and apply for the 2007 grant.

Showcasing Successes

Salem installed water saving devices in all public buildings in 2004, therefore adding signage would be a low-cost way to publicize Salem's conservation efforts and its success. Signage would explain how the retrofit device works, the water, energy and cost savings, and how to obtain or purchase a similar device for household use. At a minimum, signage should be placed in the City Hall and at Salem High School.

"Spreading the Word"

An effective way to educate and encourage water conservation is "spreading the word". A public education brochure was prepared as part of this report and will be mailed to all water users as a bill stuffer in the 2006 billing cycle. The brochure will also be made available at public schools and city hall. Additional bill stuffers and

public service announcements may be added to the public education program as funding becomes available.

Retrofit Programs

If an enhanced water conservation plan is implemented under the draft modified withdrawal permit, the city is required, at a minimum, to provide water saving devices such as faucet aerators, low flow shower heads, and toilet displacement bottles or dams to customers at cost and rebates or incentives for water and energy appliances.

Rebate Program

Rebate programs were considered as a mechanism for encouraging water conservation. Because a rebate program requires additional staff time and financial resources to manage it, a rebate program is not recommended at this time.

Retrofit Devices

Salem currently provides retrofit devices (supplied by the DEP) including shower and faucet aerators, leak detection tablets and garden hose automatic shut off nozzles to consumers free of cost. Salem also provides 55-gallon rain barrels with a screened intake port to keep out mosquitoes, insects and debris. The rain barrel comes equipped with a brass spigot that can connect to a regular hose. The rain barrels are provided to customers at a discounted price. It is recommended that Salem provide additional retrofits to customers at cost.

Leak Detection and System Repairs

A system wide leak detection program is recommended every two years. The draft modified withdrawal permit requires that a city wide leak detection survey be completed every year where unaccounted for water is greater than 10% of total water used. In addition, the permit requires leaks be fixed as soon as possible and within 7 days of detection.

Metering and Replacement Programs

A large percent of Salem's residential meters are nearing the end of their 10 to 15 year life cycle. According to the 2005 Annual Statistical Report, Salem has 10,322 single family service connections. Based on the current funding, it would take nearly 70 years to replace all of residential meters at a rate of 150 meters per year. The city should consider a comprehensive residential meter replacement program. Further details of the meter replacement program will be investigated as part of the Salem and Beverly Capital Improvements Plan.

Water Audits

Salem plans to conduct a city wide water audit in 2007 and follow recommendations, as is cost effective, to reduce water loss in the system. Water audits can require paper reviews, field work, or a combination of both. As such, the cost of the water audit will vary depending on the specifications of the audit performed.

Water Rates

Salem currently charges the full cost of water to its users. It is suggested that as system management and water conservation measures are added and repair costs increase, the water rate also increase to ensure the rate continues to cover the cost of distribution, maintenance and repair. Under the draft modified withdrawal permit, the city may be required to evaluate the effectiveness of an increasing block water rate or a seasonal water rate and apply changes to the rate structure to promote conservation. In an increasing block rate, the unit charge increases with the amount of water used. It is important that the difference between each unit change block is large enough to provide conservation incentive.

Enterprise Accounting

The City of Salem currently manages an enterprise account for water costs and revenues. This should not change but any anticipated capital improvements and/or changes in staffing or operation costs should be included in this account.

System Management

It is suggested that Salem hire a water conservation administrator to run the city's water conservation plan. EOEAs and MWRC's Water Conservation Standards encourages suppliers to hire a water conservation coordinator if a comprehensive water conservation effort is desired. Having a staff member solely responsible for the conservation program is beneficial because staff is overloaded by current demands and responsibilities. The staff member may be hired part time and shared between local communities.

Recommendations

The following list summarizes the recommended actions for the city of Salem.

- Apply for the 2007 EPA Environmental Education Grant (funds required will depend on the project proposal).
- Promote water conservation curriculum through city outreach.
- Distribute public education information through quarterly bill stuffers and monthly public service announcements.
- Provide retrofits, at cost, to the community.
- Conduct a city wide leak detection survey every two years.
- Investigate a comprehensive residential meter replacement program as part of the Salem and Beverly Capital Improvements Plan.
- Conduct a city wide water audit every three years.

- Change fee structure to an increasing block water rate and reevaluate rates to ensure system costs are covered.
- Hire a part time water conservation administrator.

The estimated budget value for the above recommended actions is approximately \$60,000 annually. Pending City Council approval of the proposed annual funding, the city of Salem can begin implementation of the water conservation plan.

Section 1

Introduction

1.1 Salem Water Supply Background

The Salem and Beverly Water Supply Board receives water from four surface water sources: Wenham Lake, Putnamville Reservoir, Longham Reservoir and the Ipswich River Canal. The withdrawal of water is subject to the Massachusetts General Law (M.G.L.) c 21G Modified Water Withdrawal Permit (Appendix F). Although this permit is currently being negotiated, the water conservation plan presented herein takes into consideration draft modified permit requirements in anticipation of future implementation once all terms are finalized and executed.

According to the draft modified permit, in any year, beginning with the calendar year 2004, if the residential per capita water use is greater than 65 gallons per day or Salem's summer water use (May 1st to September 30th) exceeds 6.03 MGD the enhanced water conservation plan is required. Under the enhanced water conservation plan, a report documenting all actions taken to implement that plan must be submitted along with the Annual Statistical Report. Additional actions are required and outlined in the modified permit (Appendix F).

1.2 EOEA Smart Growth Grant

The city of Salem was awarded a Smart Growth Technical Assistance Grant from the Executive Office of Environmental Affairs (EOEA) to conduct four water conservation planning tasks. On December 28, 2005, the city of Salem, Massachusetts contracted CDM to perform this work in accordance with EOEA guidelines and Task Order 19-2006 scope of work.

The scope of work includes:

- Task 1 - Existing Conditions Review (and Form preparation)
- Task 2 – Water Conservation Options
- Task 3 – Water Conservation Recommendations (and Public Education Brochure)
- Task 4 – Reporting Requirements

CDM met with the Department of Public Works to discuss former and existing measures for water conservation, as well as plans to collect data for water demand and consumption in the city of Salem. Subsequently, CDM compiled the information and developed a comprehensive water conservation plan that is presented in this report.

Section 2

Water Conservation Form

2.1 Form Preparation

The *Commonwealth of Massachusetts Water Conservation Plan for Public Suppliers Form, July 2000* is included in this section. The *Water Conservation Plan Form* was completed with backup documentation as evidence of the city's water conservation efforts to date. The *Plan Form* includes the following:

- Unaccounted for Water
- Public Education
- Leak Detection and Repair
- Metering
- Pricing
- Demand Management and Emergency Planning

References used in form preparation were:

- Annual Statistical Report (2005)
- Energy New England water audit report
- Public building retrofit notice
- Thurber leak detection report
- Water ban ordinance

Section 3

Water Conservation Options

Many different water conservation measures exist; however, a successful water conservation program enlists both water users and providers. The water loss reduction and conservation options described in this section are aimed at: encouraging new water habits and the use of low-flow water fixtures; identifying system infrastructure defects; and developing policies to support and/or enforce these efforts. A municipality may choose to implement individual or multiple measures based on the support and funding available.

CDM met with Salem's water administrators to discuss all of the options below and discuss the best conservation initiatives for the city. The final list of recommended actions for the city of Salem is included in Section 5.

3.1 Public Education Methods

Public education informs and involves community water users in conservation efforts. Public service announcements, outreach programs, bill stuffers, information centers, public space advertising, and promotion of conservation products are all effective education tools when catered to meet the needs and resources of each community.

3.1.1 School Outreach

Integrating water conservation into the public school curriculum in the form of hands-on projects, field trips, and science fairs is an effective method to reach the younger demographic. The city could sponsor awards for student projects that exemplify the spirit of conservation.

Curriculum for water conservation education is well established. There are several resources available through well known associations such as the American Water Works Association (AWWA), the Massachusetts Water Resources Authority (MWRA), and the U.S. Environmental Protection Agency (EPA). These organizations provide materials such as presentations, teacher training workshops, facility tours, and curriculum guides. Information is available at the following websites:

AWWA:

www.awwa.org/Advocacy/learn/education/WaterEducationResources.cfm

MWRA: <http://www.mwra.state.ma.us/02org/html/sti.htm>

EPA: www.epa.gov/region01/students/teacher/groundw.html

Additionally, Project WET (Water Education for Teachers) is a non profit national education program that distributes classroom-ready teacher kits to promote

awareness, appreciation, knowledge and stewardship of water resources. Information and resources can be found at <http://www.projectwet.org/>.

3.1.2 Showcase Buildings

Municipalities can set an example by installing water saving devices in high profile public buildings. Posting signs by each device that explain the water and cost savings as well as how to obtain retrofit kits for their own homes are the most successful. If adequate signage accompanies water saving devices, public buildings can become a showcase for the city's efforts.

In 2004, the city of Salem installed water saving devices in all public buildings. A combination of faucet aerators, low flow shower heads, and toilet dams were installed based on the building facilities (Appendix C). Based on the 2004 program, Salem High School and City Hall are examples of high profile public buildings where signage could be added.

3.1.3 “Spreading the Word”

The benefits of water conservation can be publicized through fliers, bill stuffers, and public announcements. Public information may include environmental benefits, indoor and outdoor conservation options, and long term saving benefits from conservation efforts.

Salem's bill stuffers and/or educational brochures could raise awareness and promote individual conservation efforts by addressing the following issues:

- Potential long term cost savings from reduced water bills, reduced energy bills, and the extended life of the water treatment and distributions system.
- Methods for conserving water around the home including the installation of retrofit devices, purchase of water an energy efficient appliances, and altering water use habits.
- Methods for reducing outdoor water use such as: installing irrigation sensors or timers, installing automatic shutoff hose nozzles, using rain water for landscaping.
- The environmental impacts of high water demand on the Ipswich River Basin, Salem's watershed.

CDM has prepared a Salem Water Conservation brochure (Section 4) that highlights the advantages of water conservation measures. This brochure is recommended as a bill stuffer and for distribution at City Hall and the public schools.

3.1.4 Other Community Outreach

Other options for community outreach include partnering with local landscaping firms to offer advice, brochures, demonstrations and general information on xeriscaping and water efficient landscaping practices. Xeriscaping employs water

efficient landscaping including the incorporation of local plants that require minimal maintenance. Additionally, Salem could also partner with local hardware stores and department stores to advertise and stock retrofits (faucet aerators, toilet dams, hose nozzles etc), water and energy efficient appliances, and other conservation devices.

3.2 Retrofit Programs

A retrofit program focuses on water saving devices including low-flow shower heads and toilets, faucet aerators, toilet displacement devices, leak detection kits, nozzles for outdoor hoses, and front loading washing machines. Information on how and why to install such devices is detailed in the Massachusetts Water Resource Authority's (MWRA's) website at <http://www.mwra.state.ma.us/>.

3.2.1 Rebate Program

Typically, programs that provide rebates for retrofit devices are successful because they reduce water consumption while also reducing customers' water and energy bills. Additionally, benefits continue throughout the life of the water saving devices without incurring further costs. The rebate funding source as well as the administration time associated with tracking and issuing the rebate checks are added to the municipalities cost of water.

A rebate program could benefit Salem by encouraging conservation practices while educating the public. The cost of rebates is generally offset by the decreased consumption of water. For example, CDM worked recently with the town of Reading, Massachusetts who established a rebate program and issued rebates for low flush toilets (\$120), high efficiency washing machines (\$200), and irrigation rain sensors (\$25). Based on an estimated water savings of 3.5 million gallons per year, the rebate program cost is approximately \$0.02/gallon or \$0.16/100 cubic feet.

If Salem were to establish a similar program, based on the current water rate (that reflects system costs) of \$2.22/100 cubic feet, the cost of the rebate program represents 7% of the current cost of water distribution and repairs.

3.2.2 Retrofit Devices

Salem obtained DEP provided hose nozzles and retrofit kits that include a low flow shower head, a sink aerator, and leak detection die tablets. These kits are available to any water user who requests them, and are advertised as part of the current water conservation program. Customers can also buy 55-gallon rain barrels from the city at a discounted price. The rain barrels are screened to prevent mosquitoes, insects or debris and contain a brass spigot that can connect directly to a regular hose.

The city can provide additional retrofit devices to consumers at cost. Table 3-1 provides cost estimates for various conservation retrofit devices.

Table 3-1 Retrofit Device Prices

Device	Quantity	Cost/Item	Description
Faucet Aerators	50-499	\$1.07	1.5 GPM laminar flow. Water saving and energy efficient faucet aerators increase spray velocity & reduce splash. Dual threaded to fit male and female threaded faucets.
	500-1000	\$0.93	
Low Flow Shower Head	360-720	\$3.14	Water and energy saving, non-aerating spray reduces head loss and increases comfort. Several spray settings, maintenance free.
Toilet Displacement	100-399	\$2.89	The Toilet Tummy™ hangs on the inside of the toilet tank wall displacing 0.63 gallons of water per flush.
	Fixed Unit Price	\$1.95*	Saves 0.8 gallons per flush
Flush Valve Repair Kit	175-350	\$4.39	Includes replacement flush valve seat that eliminates leaks which result from worn or damaged flush valve seats and early closure flapper. Gives maximum flushing power with minimum water usage.
Adjustable Flapper	50+	\$1.60*	Fits standard flapper toilet. 5-year warranty.
Dye Tablets	100-3999	\$0.66	The leak detection dye tablets to identify toilet leaks. Leaks can waste thousands of gallons of water annually. They are non-corrosive, non-staining and effervescent.
	4000-8000	\$0.30	
	Fixed Unit Price	\$0.20*	
Drip Counter	1-249	\$2.99	Leaky faucets can waste thousands of gallons of water and energy. The Drip Counter® is a fast, easy way to calculate just how much water is being wasted by leaky faucets.
	250-500	\$0.52	
Moisture Meter	1-95	\$4.99	The Moisture Meter promotes healthier lawns, gardens, shrubs by measuring the moisture in the soil at the root level. No batteries required.
	96-192	\$3.09	
	288-576	\$2.74	
Rain Gauge	1-99	\$3.49	To prevent over watering, lawn and garden rain gauge measures the volume of water or rain accumulated.
	100-249	\$2.09	
Irrigation Rain Sensors	Fixed Unit Price	\$30.00	Irrigation rain sensors by various manufacturers. Prices may vary.
Hose Nozzle	1-71	\$3.33	The spray hose nozzle (five spray settings) uses water more efficiently. An unrestricted garden hose can waste > 12 gallons per minute.
	72-144	\$2.49	
Hose Timer	48-96	\$7.26	The hose timer allows watering to have automatic start and shutoff.
Rain Sensors for Irrigation Systems	Fixed Unit Price	\$27.00	Rain sensor ensures that automatic sprinkler systems do not water during and after rain storms.
Water Conservation Kit	300-600	\$15.99	The kit includes all products listed below, delivery, packing, trucking, and fulfillment. (1) 2.5 GPM Showerhead, (1) 1.5 GPM Bath Aerator, (1) Toilet Tummy, (1) Leak Detection Dye Tables, Install Instructions, Packaging
	900-1500	\$6.70	

Source: AM Conservation Group Inc. <http://amconservationgroup.com/default.aspx>
and USA Landlord (when indicated with asterisk) <http://usalandlord.com>

3.3 Leak Detection and System Repairs

Water system leak repairs can provide a large return, especially in older systems. During repairs, a municipality can work with local media to highlight street crews and outcomes as part of the public education program. According to EOEА and MWRC's Water Conservation Standards, leak detection should be performed every two years with the full cost of detection and repairs included in the water rate pricing system. Regularly trained, in-house teams are suggested. It may be beneficial for neighboring communities to work together share both the equipment and personnel to reduce costs.

Salem conducted leak detection in the 2004 fiscal year and will conduct a city wide leak detection survey in 2007. Additionally, Salem owns leak detection equipment and performs this work as schedules allow, which has greatly increased Salem's ability to identify and fix leaks on a continuous basis.

3.4 Metering and Replacement Programs

Accurate meters ensure a municipality is billing for the full amount of water used and allow water loss and consumption pattern tracking. An ideal water system is 100% metered with a regular maintenance program including calibration, repair, replacement, and identification of tampering or illegal connections. The installation of an automatic exterior meter reading device enhances the efficiency of the metering system. Meter expenditures are then included in the water operations budget and paid through water rates. In order to promote education, billing can be used to inform the customer of their water use trends based on current and past meter readings.

The city of Salem meters 100% of their public and private water users. Meters are replaced on an as needed basis. Meter readers identify broken meters and the city replaces them in a timely manner as funds are available. A large percent of Salem's residential meters are nearing the end of their life cycle (10 to 15 years for residential meters) and the city is investigating options for replacement. There is no calibration program as the city does not currently have adequate resources. Most commercial meters can be read remotely from a hand-held device. Approximately 100 residential meters can be read in the same manner.

3.5 Water Audits

According to the EOEА and MWRC's Water Conservation Standards, system wide water audits should be conducted annually to track a municipality's usage and to aid future resource management development.

Salem evaluates water use each billing cycle to identify and resolve unusually high water usage. Furthermore, in 2004 Energy New England audited the Salem Housing Authority (728 apartments) and determined that new low flow shower heads and

aerators were needed throughout and 600 low flow toilets were recommended. Of the 728 apartments audited, 75 received retrofits at no cost to the consumer; the city was billed for the cost of parts and installation. The Energy New England water audit findings are attached in Appendix B.

3.6 Water Rates

An increasing block water rate is a popular mechanism for educating customers about the “true” cost of water and encouraging conservation. If rates reward low usage, users will have a financial incentive to implement conservation practices. The contributing “cost of water” expenses could include but are not limited to: watershed purchase and protection; distribution system operation; treatment and associated treatment plant costs; purchase and installation of water conservation devices; education program; leak detection and repairs; pumping; meter and system maintenance; staff and administration costs; and electricity and fuel. Ideally, all expenses required to run the water system would be borne by the users in a unit price per 100 cubic feet of water consumed.

To discourage excessive outdoor water use, outdoor water could carry a sewer fee or be charged at a higher rate. Currently, Salem has a sewer rate tied to indoor water use but not outdoor water use.

According to Salem officials, all current system operation costs are included in their flat rate fee structure. Revenue is used for system maintenance. Implementation of new conservation efforts will likely increase the operations budget; therefore, the rates and the rate structure may need to be reevaluated.

3.6.1 Enterprise Account

A municipality can establish an enterprise account to administer water rate revenues to fund water system maintenance and improvements. Enterprise accounts are described in Massachusetts General Laws (M.G.L), Chapter 44, Section 53F ½ Enterprise Funds.

The city of Salem currently has a Water Enterprise Account.

3.7 System Management

According to EOE and MWRC’s Water Conservation Standards the goal of system management is “to increase system efficiency and to integrate conservation measures into long-term water supply planning and management.” In order to increase efficiency, the city may decide to hire an administrator or create a water conservation commission to manage all of the city’s water conservation efforts.

The administrator would develop and run municipal wide conservation efforts, maintain a water use database, perform water data evaluations, identify new water saving projects, and keep the program up to date with new technologies and practices. Coordination with federal, state and regional officials may be necessary to

keep up with new policies, to identify potential grants, loans and funding opportunities; and to administer the paperwork submittals when funding is obtained. Some conservation efforts may require legal avenues such as regulations, by-laws, ordinances and/or other strategies; coordinating legal documents could be the responsibility of the administrator.

Section 4

Educational Materials

4.1 Conservation Brochure

CDM developed an educational brochure highlighting actions that individuals can take to conserve water inside and outside their homes. In addition, the brochure advertises the retrofit kits available at City Hall.

The public education brochure will be distributed in the public schools, at City Hall and be included as a bill stuffer during the 2006 billing cycle. A copy of the brochure is included at the end of this section.

4.2 Public Relations Packets

CDM obtained, on the city's behalf, public relations packets from the New England Water Works Association (NEWWA) called "PR in a Packet". The packet provides media releases with conservation tips about lawn care, plumbing, kitchen, laundry and bathroom use. The information is organized into public information articles to be issued in local newspapers and local radio and public service announcements to be shown on cable television stations.

4.2.1 Bill Stuffers

Bill stuffers allow information to be regularly distributed throughout the community. The NEWWA public information article provides quotes and conservation tips. It is suggested that a half or full page bill stuffer with graphics and water saving tips be included in each quarterly billing.

CDM has organized a schedule of bill stuffers based on the NEWWA information to maximize consumer participation in Salem. The information is organized by water saving category. It is suggested that a category be chosen per billing cycle and that the category rotates quarterly. Information is compiled from the NEWWA packet which is provided in Appendix G.

Outdoor Water Use

Watering:

- Water your lawn during the cooler times of the day (early morning/late evening) when evaporation is minimal.
- Do not over water lawns and plants (approximately one-inch of water a week is sufficient). This allows plants and grass to develop deep root systems, require less water, and resist disease more readily.

Sprinklers/Hoses/Irrigation:

- Install a shut-off nozzle on your hose to save 10 gallons or more per minute.

- Adjust the timer on automatic sprinklers according to seasonal water demands and weather conditions or install a rain sensor to automatic sprinkler systems.
- Install a drip-irrigation system that allows water to flow slowly into the soil and encourages strong root systems. Because water is not sprayed, this will also reduce the amount of water lost to evaporation.
- Use gray water or rain water for outdoor water uses such as watering lawns and gardens. Rain water can be collected with rain barrels at the base of roof downspouts.
- Only water lawns and gardens when needed. Use rain gauges or moisture sensors to monitor the needs of your lawn and garden.
- Plant indigenous species that are adapted to local climates and will require minimal watering and maintenance. (The city could distribute more detailed information about xeriscaping practices and benefits).

Mowing:

- Keep your clippings on your lawn for fertilizer. Clippings are 85% water.
- Keep grass at least three inches high to retain moisture.

Kitchen

Dishes:

- Select a water and energy saving dishwasher when purchasing a new machine.
- Fill a basin or the sink with water when doing dishes by hand, instead of letting the water run.

Food Preparation:

- Defrost food in the refrigerator, not with running water.
- Compost food scraps instead of using the garbage disposal. This will save water and energy as well as provide good fertilizer for your lawn and garden.

Kitchen Plumbing:

- Install faucet aerators in the kitchen sink and reduce flow by 25%.
- Insulate hot water pipes and electric heaters to save water and energy.
- Check for faucet and pipe leaks.

Laundry Room

- Only run your washing machine when it is full. Typical washing machines use 30-60 gallons of water per load.

- When purchasing a new washing machine, select an energy and water efficient model such as horizontal axis machines.

Bathroom

- Check your toilet for leaks; a leaky toilet can waste 100 gallons of water per day.
- Put displacement devices (weighted plastic bottles or toilet dams) in the tank. This could save thousands of gallons of water a year.
- Consider purchasing a low flush toilet and reduce your toilet water consumption by 25%.
- Install low-flow showerheads that can save 20-40 gallons of water in one 10-minute shower.
- Install a low flow faucet aerator that can reduce faucet flow by 25%.

4.2.2 Public Announcements

It is suggested that a conservation quote or tip is included monthly in local newspapers or as public service announcements on local cable television and/or radio stations. The NEWWA packet provides guidelines for issuing public service announcements.

Section 5

Recommendations

5.1 Public Education

According to the EOEPA and MWRC's Water Conservation Standards, "education of the public at large, municipal officials and the water suppliers is crucial to generating an understanding of the issues, and implementing and creating acceptance of water conservation activities." The following actions are suggested to enhance Salem's public education program.

5.1.1 School Outreach

It is suggested that the city of Salem actively encourage teachers and school administrators to take advantage of the available opportunities and resources (as outlined in Section 3) to incorporate water conservation into school curriculums for primary and secondary education. City officials could provide educators with information through public meetings, presentations and informative bulletins.

The EPA provides an Environmental Education Grant to eligible parties for the purpose of providing seed money to support education projects that increase the public's environmental awareness. Any local education agency is eligible for the grant; however, individual teachers are not eligible. The city is required to match at least 25% of the total cost of the grant. Grants up to \$50,000 are received by the EPA regional offices. Larger grants, not greater than \$150,000, are processed by EPA headquarters. A copy of the 2006 grant application instructions and solicitation notice are attached in Appendix H.

It is recommended that the Salem Public School's prepare a conservation education program according to grant specifications and apply for the 2007 grant. The environmental education grant project must be used to enhance problem-solving and decision making skills and address one of the following educational priorities:

- **Capacity Building** – developing effective leaders and organizations that design, implement and link environmental education programs to deliver sustainable coordinated environmental education across the state or multiple states
- **Education Reform** – changes in curriculum, instruction, assessment or school organization
- **Community Issues** – designing and implementing model projects to educate the public of community scale environmental issues
- **Health** – educating teachers, students, parents, and/or community leaders about human-health threats from environmental pollution

- **Teaching Skills** – educating educators (i.e. through workshops) how to enhance their environmental education teaching skills
- **Career Development** - educating students about environmental issues to encourage environmental careers

5.1.2 Showcase Buildings

Salem installed water saving devices in all public buildings in 2004, therefore adding signage would be a low-cost way to publicize Salem’s conservation efforts. Signage should explain how the retrofit device works, the water, energy and cost savings, and how to obtain or purchase a similar device for household use. It is recommended that signage be placed, at a minimum, in two prominent public buildings such as the City Hall and Salem High School.

As records indicate (Appendix C), there are 12 faucet aerators and 12 low flow shower heads installed in the High School. There are also 6 faucet aerators and 7 toilet displacement dams installed in City Hall. It is suggested that a sign be posted near each toilet dam and shower head. Because faucets are usually in clusters, it is suggested that one sign be posted for every 2 or 3 faucets in large facilities. The cost of fiberglass or aluminum signs with text ranges from \$10 to \$50. A suggested budget is \$1,000 (approximately \$30 per sign). This is a one time cost with little maintenance requirements after initial installation.

5.1.3 “Spreading the Word”

A public education brochure was designed by CDM and will be mailed to all water users as a bill stuffer in the 2006 billing cycle and made available at public schools and city hall. Additional bill stuffers and public service announcements as described in Section 4 may be added to the public education program as funding becomes available.

5.2 Retrofit Programs

If an enhanced water conservation plan is implemented under the draft modified withdrawal permit, the city is required, at a minimum, to provide water saving devices such as faucet aerators, low flow shower heads, and toilet displacement bottles or dams to customers at cost and rebates or incentives for water and energy appliances.

5.2.1 Rebate Program

Because rebate programs require staff time and financial resources to manage the program, a rebate program is not recommended at this time.

5.2.2 Retrofit Devices

Salem currently provides retrofit devices (supplied by the DEP) including shower and faucet aerators, leak detection tablets and garden hose automatic shut off nozzles to

consumers free of cost. Salem also provides 55-gallon rain barrels with a screened intake port to keep out mosquitoes, insects and debris. The rain barrel comes equipped with a brass spigot that can connect to a regular hose. The rain barrels are provided to customers at a discounted price. It is recommended that Salem provide additional retrofits to customers at cost.

Retrofit devices depending on type, model and features range between \$0.20 and \$16. A suggested budget for retrofits is \$3,000 per year; this would include enough leak detection dye tablets to send to all water users in their water bill as well as a variety of other retrofit devices that would complement the DEP provided kits.

5.3 Leak Detection and System Repairs

A system wide leak detection program is recommended every two years. The draft modified withdrawal permit requires that a city wide leak detection survey be completed every year where unaccounted for water is greater than 10% of total water used. In addition, the permit requires leaks be fixed as soon as possible and within 7 days of detection.

Annual budget estimate to implement leak detection in 1/2 of the city each year is \$7,500 (\$15,000 per city wide leak detection program). This does not include the cost of leak repair.

5.4 Metering and Replacement Programs

The current annual budget for meter replacement is \$15,000. On average, that can be used to purchase approximately 150 residential meters per year, excluding the labor costs to install them. Additionally, a large percent of Salem's residential meters are nearing the end of their 10 to 15 year life cycle. According to the 2005 Annual Statistical Report, Salem has 10,322 household service connections. Based on the current funding, it would take nearly 70 years to replace all of residential meters at a rate of 150 meters per year. The city of Salem is investigating a more comprehensive residential meter replacement program. Further details of the meter replacement program will be investigated as part of the Salem and Beverly Capital Improvements Plan.

5.5 Water Audits

Salem plans to conduct a city wide water audit in 2007 and follow recommendations, as is cost effective, to reduce water loss in the system. Water audits can require paper reviews, field work, or a combination of both. As such, the cost of the water audit will vary depending on the specifications of the audit performed. An estimated annual budget of \$20,000 is suggested to appropriate adequate funds for annual city wide audits.

5.6 Water Rates

Salem currently charges the full cost of water to its users. It is suggested that as system management and water conservation measures are added and repair costs increase, the water rate also increase to ensure the rate continues to cover the cost of distribution, maintenance and repair. Under the draft modified withdrawal permit, the city may be required to evaluate the effectiveness of an increasing block water rate or a seasonal water rate and apply changes to the rate structure to promote conservation. In an increasing block rate, the unit charge increases with the amount of water used. It is important that the difference between each unit change block is large enough to provide conservation incentive.

Salem currently uses a flat rate fee structure of \$2.22 per 100 cubic feet of water. Additionally, all residential water users (3/4" meters) are charged at a minimum of 1,000 cubic feet of water by council order. Larger meters have larger minimum use charges (i.e. 2" meters have a 6,000 cubic feet minimum). This system does not promote conservation practices. It is suggested that the minimum charge should be lowered or eliminated; this recommendation is consistent with the City Council's request.

The draft Salem and Beverly withdrawal permit requires enhanced conservation practices if the city's per capita usage exceeds 65 gallons per capita day (gpcd). As such, Salem water rate blocks could be set to reward users who use less than the equivalent 65 gpcd. The associated fees should be confirmed by the city and evaluated to ensure Salem receives adequate revenue for the water system. The following fee structure alternatives are recommended. Any Salem rate changes must be approved by the governing body.

Table 5-1 Residential Rate Structure Alternative

Block	Water Usage Range (cubic feet)		Rate (per 100 cubic feet)
A	0	800	\$1.72
B	800	1,600	\$2.22
C	1,601	3,000	\$3.22
D	3,001	+	\$4.72

The suggested increasing block rate fee structure has four usage blocks targeting four different user types. Block A is targeted for fixed income residents who use minimal water. Block B is targeted for the average household (2.24 people per Salem's US Census data) and block C is targeted for 3-4 person households with the same per capita target. All blocks are set with a target usage of 65 gallons per capita per day. Block D is for households with unusually high water usage.

The associated rates are based on the current Salem water charge of \$2.22 per 100 cubic feet. This rate is set to block B, the average household water usage. According to

EOEA and MWRC's Water Conservation Standards, the price difference between blocks must be large enough to provide conservation incentives. The recommended rate structure (Table 5-1) increases by \$0.50, \$1.00, and \$1.50 per 100 cubic feet from the previous block. It is suggested that after rates are evaluated by the city, the rate structure be followed with nonlinear cost increases.

5.6.1 Enterprise Account

The city of Salem currently manages an enterprise account for water costs and revenues.

5.7 System Management

It is suggested that Salem hire a water conservation administrator to run the city's water conservation plan. EOEA and MWRC's Water Conservation Standards encourages suppliers to hire a water conservation coordinator if a comprehensive water conservation effort is desired. Having a staff member solely responsible for the conservation program is beneficial because staff is overloaded by current demands and responsibilities. The staff member may be hired part time and shared between local communities.

The role of the water conservation coordinator would be to implement actions described in this report and continue to expand the water conservation efforts throughout the city. Particular responsibilities could include:

- Ensure compliance with enhanced water withdrawal permit, if/when executed.
- Perform water audits and analyze water use data if/when executed.
- Analyze fee structure and water rates for increasing block rate.
- Create and distribute bill stuffers, fliers or public service announcements.
- Distribute and track distribution of retrofit devices. Prepare paperwork to sponsoring agencies (DEP).
- Create a program for the Environmental Education Grant and complete application. If grant is received, manage the project and ensure deliverables are met.
- Conduct presentations to educate various groups including schools and businesses.
- Answer public inquiries.
- Administer and enforce local water regulations and restrictions.

The estimated salary for a water conservation administrator is \$13,000/year. This is estimated based on a rate of \$25/hour for 10 hours per week. This cost estimate

includes direct salary costs only, and does not include any benefits that the administrator might be entitled to as a city employee.

5.8 Summary of Recommendations

The following actions are recommended for the city of Salem. Table 5-2 summarizes the suggested annual budget values to implement the recommendations.

- Apply for the 2007 EPA Environmental Education Grant (funds required will depend on the project proposal).
- Promote water conservation curriculum through city outreach.
- Distribute public education information through quarterly bill stuffers and monthly public service announcements.
- Provide retrofits, at cost, to the community.
- Conduct a city wide leak detection survey every two years.
- Investigate a comprehensive residential meter replacement program as part of the Salem and Beverly Capital Improvements Plan.
- Conduct a city wide water audit every three years.
- Change fee structure to an increasing block water rate and reevaluate rates to ensure system costs are covered.
- Hire a part time water conservation administrator.

Table 5-2 Cost Summary of Recommendations

<i>Recommendation</i>	<i>Estimated Cost (Year 1)</i>	<i>Estimated Annual Cost (Year 2+)</i>
Signage in Public Buildings	\$1,000	\$0
Retrofit Device Program	\$3,000	\$3,000
Leak Detection Program (biannually)	\$7,500	\$7,500
Meter Replacement Program	\$15,000	\$15,000
Water Audits (annually)	\$20,000	\$20,000
Water Conservation Administrator	\$13,000	\$13,000
Total	\$59,500	\$58,500