# Managing Water in Connecticut

## A Report on the Study of Water Resources Planning in the State

In accordance with Section 3 of Public Act No. 07-4 of the June Special Session
An Act Implementing the Provisions of the Budget Concerning General Government

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## Executive Summary

Connecticut's water supports a wide range of functions and uses. Many of these are critical to the health and well-being of the state's citizens, the economy and environment, including drinking water supplies, sewage disposal, agriculture and aquaculture, wildlife habitat, flood protection, energy production, transportation, fire suppression, and recreational activities. Some are not as critical. Unfortunately, the amount of water available in some places is not always sufficient to satisfy competing demands, and shortfalls may be more frequent or more severe in the future.

A goal of the state's water planning efforts is to prevent a deficit between the demand for water and its supply. We cannot do so solely by diverting more water from current sources or by developing new supplies. We must manage our demand for water in a manner that will sustain and meet the critical needs.

Many state agencies have roles in managing Connecticut's water, with the Department of Environmental Protection (DEP), Department of Public Health (DPH) and Department of Public Utility Control (DPUC) directly regulating the supply and use of water. The Office of Policy and Management (OPM) also has a key water management role, since it is required to prepare periodic revisions to the Conservation and Development Policies Plan for Connecticut. Together, DEP, DPH, DPUC and OPM comprise the Water Planning Council (WPC).

The WPC was established pursuant to Public Act 01-177 "to address issues involving the water companies, water resources and state policies regarding the future of the state's drinking water supply." A surprisingly wide range of human activities affect our supply and use of water. Similarly, our efforts to protect and manage water resources can have an impact on a surprisingly wide range of activities.

Much of the public attention on water seems to focus on some narrow public health, environmental or economic concerns, but the scope of water management is demonstrated by the diverse state agencies that have an interest. In addition to the WPC agencies, the Department of Agriculture (DOAg), Department of Economic & Community Development (DECD), Department of Emergency Management & Homeland Security (DEMHS), Department of Transportation (DOT), Office of Consumer Counsel (OCC) and others have a role in water resources management. The breadth of private sector interest is just as broad.

The broad reach of water planning is also illustrated by some of the WPC's current efforts. The WPC's Advisory Group (WPCAG) has established workgroups to research and provide recommendations for specific topics critical for managing water resources. One workgroup recently provided its recommendations regarding water company land concerns and other workgroups are completing their work regarding water company rate structures, drought planning and response, outdoor conservation and the freedom of information process for water company information. The findings and recommendations of the workgroups will influence the state's water planning efforts.

The controversy surrounding DEP's minimum stream flow regulation effort is an indication of the strong reaction that can result from changing how we manage the state's waters. The effort was highly publicized during the past year and will be discussed further in this report. The intensity of the support for and opposition to the proposed regulations illustrate the inherent challenges of managing the competing demands for the state's water.

**Introduction:**

This report is OPM's fourth annual report on the study of water resources planning in Connecticut, as required by Section 3 of Public Act 07-4 of the June Special Session (the Act). The Act specifically requires OPM to:

- Review and prioritize the recommendations and the goals of the Water Planning Council developed prior to October 1, 2007;

- Compile information from other reports or studies regarding water resources planning in the state;

- Establish a mechanism to perform an in-depth analysis of existing statutes and regulations of the Department of Environmental Protection, the Department of Public Health and the Department of Public Utility Control for areas of overlapping and conflicting or inefficient procedures;

- Review and summarize other states' regulatory programs and structures, relating to water resource planning, including, but not limited to, their approaches to water allocation;

- Identify processes and funding needs for the evaluation of existing water diversion data and approaches to basin planning projects and coordinate water data collection from, and analysis among, the Department of Environmental Protection, the Department of Public Health, the Department of Public Utility Control, the Office of Policy and Management and the United States Geological Survey, and recommend supplemental data collection, as appropriate;

- Evaluate existing water conservation programs and make recommendations to enhance water conservation programs to promote a water conservation ethic and to provide for appropriate drought response and enforcement capabilities; and

- Identify funding requirements and mechanisms for ongoing efforts in water resources planning in the state.

Rather than organize this report according to those seven tasks, the report is instead organized to reflect current planning activities. Those seven tasks will figure in those discussions. Each current activity addresses some or all of the Act's tasks and it is hoped that, by framing the discussion around specific issues, it will allow for a more cohesive explanation.

It is also important to note the changing system of water management in Connecticut, with the pending merger of DPUC and DEP into the new Department of Energy and Environmental Protection (DEEP). Although the focus of public attention has been primarily on energy issues, the consolidation could have significant consequences for water resources, depending on the ultimate relationship between the new agency's water planning and regulatory programs.

**Water is Everyone's Concern**

Connecticut is one of fifty states trying to solve various water problems. Each state faces a unique set of concerns, based on the nature of its water resources, its economy, the structure of its water governance and other characteristics. They differ in the details, but the underlying problem everywhere is that sufficient quantities of water are not always located where they are most needed. The result is oftentimes disagreement over the appropriate uses of water and prioritizing those uses.

Society tends not to value all functions of water equally. Many consider water for direct human consumption to have an especially high value, but relatively little of Connecticut's public water supply is used for direct human consumption or other purposes having an especially high public health or economic value. Similarly, many view the dwindling number of streams supporting wild brook trout as having especially high environmental value, but relatively few of the state's waters are home to or could be home to wild trout.

There are many different points of view about water resources and those differences are reflected in the sometimes contradictory efforts of our state agencies. There are significant differences of opinion regarding whom or what should benefit from our water and at what cost. Those responsible for the state's water-related spending, planning efforts and regulatory actions are attempting to address the inherent conflicts. It is important that we go beyond a simplistic weighing of people against the environment and deciding that one or the other must always win.

Conflicts over water in other states often converge around large regional rivers, such as the Chattahoochee, Colorado and Rio Grande. Some famous rivers even run dry due to the magnitude of diversions and groundwater pumping. In Connecticut, on the other hand, we seem to pay little attention to the amount of water passing by in our larger rivers unless they flood. Our skirmishes arise instead over the Pootatuck, Shepaug and other rivers little-known beyond their immediate neighborhood. The contrast between Connecticut and other states is striking.

Connecticut is unique in that our public health code prohibits waters receiving wastewater discharges from being used as public water sources. Our larger streams and rivers are likely to be downstream of such a discharge and, therefore, cannot be public water sources. Instead, we take our water supply from our smaller and more pristine streams and discharge our treated wastewater to the rivers people are familiar with. Tapping smaller water sources, however, heightens the potential for conflict between public water demands and the needs of sensitive aquatic habitats, even as hundreds of millions of gallons of water flow through the state every day in its larger rivers.

In addition to seeking appropriate balances between different water needs, Connecticut, like other states, also faces the results of generations of inadequate funding for maintenance and replacement of water system infrastructure. If there were simple or inexpensive solutions, these problems would not be so universal. The rest of this report will describe some of the broad problems being addressed, how we are working towards solutions and how we might improve our efforts. It will be a long process and we must align our planning, regulatory and funding mechanisms to help in these solutions.

**Water System Infrastructure**

The threat posed by aging water infrastructure is well publicized, in large part because of the magnitude of the potential costs to correct the problems. For instance, the American Society of Civil Engineers has estimated that at least $20 billion per year of additional spending is required for US water and wastewater infrastructure to meet system demands and water quality requirements.

Many water systems are burdened by decades of inadequate capital funding for their aging infrastructure. Water mains can last for a remarkably long time, a century or more for the piping commonly used in the late 1800s. However, water rates have been too low to accumulate the funding necessary to pay for system replacement.

Various state agencies have a role in assessing how water companies plan for and do the work necessary to maintain their systems. In part through the intervention of those agencies, some water companies that previously did not adequately invest in their systems have changed their fiscal operations or have been acquired by companies with a better track record. A recent change to Connecticut's rate regulation process has also removed an impediment that had discouraged private water companies from being more proactive in rebuilding infrastructure.

The General Assembly added CGS Section 16-262w in 2007, which creates a process for prioritizing certain private water company infrastructure projects by making them eligible for expedited cost recovery via a rate surcharge. The result is the "Water Infrastructure Conservation Adjustment" (WICA). Four private water companies have taken the initial step to using this program and two of those have replaced 54,213 feet of water main at a cost of $13,428,349 and 57,763 feet of water main at a cost of $9,917,978, respectively, as of late 2010.

WICA has been designed for private water companies subject to state rate regulation, but deferred maintenance tends to be a greater problem for the state's municipal and other non-investor owned water companies. Investor-owned water companies have little incentive to set rates at a level less than what it is necessary to fund their capital improvement needs. Other water suppliers, however, must answer to municipal officials, home-owner associations or others who often demand that rates be as low as possible in the short-term, no matter the long-term consequences for the water system. Some municipal water companies are also subject to ordinances limiting what costs can be considered in establishing water rates. Recognizing the tendency to under-invest in infrastructure, the Massachusetts Collectors and Treasurers Association manual for municipal treasurers says,

> Deferring infrastructure maintenance and improvement, of course, only compounds municipal financial woes, enormously increasing the cost of performing such work in the future. Inescapably, such delay leads inevitably to a diminution in the scope and quality of public services. Every city and town owes to the future the maintenance of its infrastructure in the present.

Treasurer's Manual, Massachusetts Collectors and Treaururers Association, pg 10-1
http://mcta.virtualtownhall.net/pages/MCTA_TreasurersManual/TreasurersManualRev0309.pdf

The public does not benefit if paying lower rates now leads to service problems and much higher rates in the future. Although the WICA program only applies to the private water companies subject to DPUC rate regulation, the underlying logic of enacting immediate rate

increase the pace of critical infrastructure work makes sense for other water companies too. In late 2009, Massachusetts established a Water Infrastructure Finance Commission (WIFC) and directed the commission to develop a water infrastructure finance plan for the state and its municipalities. The legislative Act creating the WIFC said:

> ...the commission shall make it a priority to examine the technical and financial feasibility of sustaining, integrating and expanding public water systems, conservation and efficiency programs, wastewater systems and storm water systems of municipalities and the commonwealth, including regional or district systems.

As indicated, the Massachusetts WIFC is not limited to public water system infrastructure but instead is also required to consider wastewater and stormwater systems. In particular, it is to:

- examine the water infrastructure needs of the commonwealth for the next 25 years as they relate to the funding gap between the water infrastructure needs of the commonwealth and the existing, available sources of funding;
- develop mechanisms for additional funding for water infrastructure by increasing investment in critical water, wastewater, storm water and water conservation infrastructure;
- provide mechanisms for improvements in the handling and management of water programs;
- examine the potential threats to public health and public safety from the existing shortfalls in funding for water infrastructure;
- examine and develop recommendations on ways in which the commonwealth and its municipalities may meet operation and maintenance and capital improvement and reconstruction needs for the next 25 years including, without limitation, recommendations regarding debt reduction, enhancing existing sources of revenues, developing new sources of revenues, establishing new incentives for public-private partnerships in the development of real property resources and funding resources;
- and examine the expanded use of full accounting systems and enterprise funding, asset management systems and best management practices, compliance with chapter 21G of the General Laws, the Massachusetts water policy and current federal and state funding programs.

Like our WPC, the Massachusetts WIFC has created workgroups, however, its workgroups are tightly focused on infrastructure concerns:

- Current water infrastructure needs and long term challenges
- Municipal Utility and water district financing
- Innovative Systems, Technologies, and Infrastructure
- State and Federal finance and investment practices

Workgroups looking at state support of municipal water system infrastructure funding are considering that municipal water companies be required to have a capital improvement plan, enterprise fund, full cost accounting or other mechanisms to ensure the long-term viability of their system. Since DPUC does not regulate municipal water companies' finances, DPH is the primary Connecticut agency having oversight of non-investor owned water companies' infrastructure management. As DPH states on its website,

*While it is important to take care of the infrastructure needs facing [public water systems] now, it is equally important for water systems to establish technical, financial and managerial capacity development programs to achieve sustainability and prevent drinking water problems in the future. The Drinking Water Section's DWSRF program places a strong emphasis on preventing contamination problems through source water protection and encourages better system operations through enhanced water systems management. Asset management programs allow water systems to properly plan capital improvement projects, establish an annual budget that takes into account infrastructure depreciation, and help to effectively communicate the need for water rate adjustments with their customers, regulating agencies and elected officials.*

Water systems need to charge enough to fully fund their long-term capital needs as well as their day-to-day operational costs. Those that do will save money in the long run and can avoid water supply disruptions. The many water providers that do not account for all are living off the inheritance left to them by those who originally developed the systems. The durability of the original water mains enabled such underfunding to continue for generations.

As more water mains in Connecticut and elsewhere exceed their typical life expectancy, the problem will reveal itself with increasing outages and increasing calls for state or federal bailouts. Given the pervasiveness of the problem, it is not clear that much support can be expected from outside sources. Water outages and water quality concerns will inevitably increase if water rates are only high enough to fund current operations. As DPH states, water providers should improve their asset management programs and "communicate the need for water rate adjustments with their customers, regulating agencies and elected officials".

Customers of both investor-owned and municipal water companies are inherently skeptical of a water company's claim that rates must be increased to meet system needs. However, there is a fundamental difference between the two types of water companies when such rate change proposals are considered. Investor-owned water companies have an orderly process for determining appropriate rates. A company builds its case for a rate increase, the Office of Consumer Council evaluates it from the perspective of the water company's customers and DPUC staff analyzes the financial and technical basis for the rates. There is a procedure for public participation and, in the end, DPUC commissioners determine the appropriate rates based on all available information.

No comparable process exists when it is a municipal water company that seeks a rate increase. Instead, a municipal water company must persuade municipal leaders, who are aware that voters will experience a rate increase before the next election, while most of the benefits will occur in the more distant future. Furthermore, ordinances often limit rates and municipal water company companies are frequently expected to provide free service for municipal uses. It is no wonder that many municipal water companies grapple with frequent equipment failures and other system problems.

**Managing Peak Summer Demand for Water**

In addition to recognizing how the long-term viability of water systems is harmed by inadequate water rates, it is also important to consider how rate structures affect the availability of water. Residential water consumption increases during summer and the increase can be enormous in some areas – particularly in suburbanized areas. In 2002, the WPC's Water Utility Management Subcommittee wrote:

> In Connecticut, seasonal peak demands can more than double mainly as a result of automatic sprinklers, lawn irrigation, and other outdoor water use. In urban areas, hydrant opening can represent a significant portion of summertime water demand. Exterior water use dramatically exceeds that of in-home use. A typical 4-6 gallons per minute lawn sprinkler will use as much water in an hour as will be used otherwise within the home in an entire day (water use for an average household of four people is about 200 gallons per day. Of that, 2-5 gallons/person are used for drinking and cooking purposes.) Since outdoor usage is so high, even a slight reduction typically exceeds the savings that could be expected from a substantial reduction in any "in-home" water use category. In addition, since exterior use occurs mostly during the summer, the benefits from conservation are achieved when water resources are typically under the greatest withdrawal stress.

Irrigating just ⅛ acre of lawn with the recommended 1" of water per week requires 3,400 gallons of water per week. That is more than two weeks of indoor water use for a family of four. At five gallons per minute, it would take 11 hours to water a 1/8 acre lawn, with the sprinkler being moved around for full coverage. The increasing number of automatic sprinklers in use can easily apply that much water over even larger areas, without requiring anyone's attention.

Seasonal outdoor water demands not only increase the stress on sensitive ecosystems, as will be discussed later in this report, such demands also lead to water rates being structured in a manner that makes water companies depend on peak demands and forces water systems to be over-built to handle those demands. Even then, systems might strain to handle the demand.

The summers of 2008 and 2009 were relatively wet and some water companies experienced serious shortfalls in revenue. Summer water use returned with a vengeance in the hot and dry summer of 2010. In fact, one of the state's largest water companies faced unprecedented demands. Interestingly, those demands were in the middle of night, when few people use water but automatic lawn sprinkler systems are operating.

**Effects of Water Rates on Water Use**

If water rates reflected the short-term costs of most water companies, customers would pay a large fixed amount to be provided access to water, plus a small additional amount that is based on the amount of water actually used. Unlike natural gas and electric utilities, water companies don't pay a market price for their commodity. They do not pay less for it in times of abundance or more in times of shortage. The water is free, but the infrastructure to operate a water company – the land and facilities to collect, store, treat and convey water to customers – is expensive. Energy, chemical and other costs do vary with the amount of water sold but, as long as a system can handle peak demands, the short-term costs to operate a water system change relatively little with ordinary variations in water demand.

It was once common for Connecticut water companies to charge a fixed amount for water service, no matter what the customer actually used. It was a reasonably good match for companies' cost structure, especially considering the simplicity of billing. With no financial constraint on water consumption, however, customers had little incentive to conserve water and water companies faced the never-ending need for expensive expansions to facilities and water sources.

It only costs substantially more to supply additional water if the water system's capacity must be expanded. With fixed rate billing, the need for additional supply is handled by paying whatever it costs to expand system capacity, socializing the cost among all users and then doing the same again when more capacity is required. The alternative is to send a strong price signal to customers that use more water. Doing so encourages conservation and can delay or prevent the need for costly system expansions. There is a long history in support of that strategy. Middletown, for example, metered its system in 1915 and cut water consumption by 50%.

Some people oppose the idea of using water rates to encourage conservation, but a century of experience has shown that water bills must provide a disincentive for higher use to avoid the need for expanded system capacity, which increases the cost for everyone. Furthermore, the most productive and most cost-effective water sources were developed first and much of their water is spoken for. Water from the untapped sources that can be developed in the future will undoubtedly cost more than water from existing sources. We can avoid or delay the need for them by setting prices at appropriate levels now.

> *...current ratepayers are underpaying the hypothetical cost of future supplies*.
>
> St Johns River Water Management District (Florida)
> Revenue and Cost Recovery Alternatives for Utilities Implementing Water Conservation, pg. 5
> http://www.sjrwmd.com/technicalreports/pdfs/SP/SJ2011-SP1.pdf

To be a significant financial incentive for conservation, the variable portion of a water company's rates, the part based on a customer's actual water use, must be increased well beyond the amount it costs a typical water provider to supply additional water from an existing system. That increase is balanced by reducing the fixed portion of the bill. Therefore, not only can a conservation rate structure reduce the need for new or expanded water supplies and distribution facilities, it can also reduce the cost for those people, often with lower incomes, who use less water. By reducing the demand for water, especially the more discretionary summer water uses, conservation rate structures also reduce stress on sensitive habitats.

Conservation rates have been very effective for energy utilities, but those utilities have certain advantages over water utilities. People tend to pay much more for electricity or natural gas than for water and, because of that, gas and electric meters tend to be read more frequently. The combination of a higher cost and quick feedback regarding usage make such rates more effective at reducing consumption. With water, on the other hand, feedback regarding higher summer water use might not arrive until fall, too late to influence that water use.

Although conservation rates offer some advantages, they can have disadvantages. Although the combined amount paid by all customers remains the same, those who use more water than others will pay significantly more. As previously noted, lawn irrigation is a major factor in residential water use and, whatever one's opinion of devoting so much of our water and water system capacity to lawns, many homeowners, water companies and nursery and landscaping businesses are heavily invested in this intense use of water.

**Outdoor Water Use**

The WPCAG's outdoor conservation workgroup is compiling information on best management practices (BMPs) and on how best to communicate information on plantings and outdoor water use to residents. Among other things, they will provide new BMPs for:

- everyday water use by agriculture and nurseries/greenhouses
- drought period water use by agriculture and nurseries/greenhouses
- every day landscape water use by residential and commercial property owners
- drought period landscape water use by residential and commercial property owners

Recent experience in Georgia and elsewhere has shown that the landscape and nursery industry is especially vulnerable to drought and can suffer devastating economic consequences. Not only do water use restrictions cause landscaping sales and services to plunge in the short-term, fear of future restrictions discourage people from spending on future plantings because of concern about the next drought.

Some of Connecticut's landscaping and nursery businesses might benefit from a transition away from conventional lawns, because it offers the potential for increased sales of other plants and services. This is especially important in a state like ours with a large nursery grower industry. Moderating our summer water use can also help protect us from future water shortfalls and reduce the threat of outdoor water use restrictions. A gradual transition to a landscape that requires less water will reduce the economic disruption to the water, nursery, landscaping and associated industries. If the transition is too gradual, however, there is a higher probability of experiencing a severe drought in the interim, with outdoor water use restrictions and the resulting economic impacts that landscaping and nursery businesses experienced in Georgia.

In encouraging conservation rate structures, a primary consideration should be to avoid disrupting economically productive water uses. Water providers typically offer very low rates for industrial water customers, because the economy of scale and their consistent demands make them good customers. Given their broader economic importance to the state and municipalities, their large use of water justifies different treatment. In fact, encouraging conservation by other uses can ensure water is available for industry.

In 2005, a large pharmaceutical company looking to expand its manufacturing capacity asked a Rhode Island water provider to guarantee it 800,000 gallons of water per day. The water company initially said, before state intervention, that it could not provide a guarantee for that much water because it would not have an adequate margin of safety between its supply of water and its peak demands. It can be hard to visualize 800,000 gallons of water per day – it is more than an Olympic swimming pool – but 206 acres of lawns with automatic sprinklers could have the same impact on a water provider's margin of safety. Conservation rate structures can help ensure that public water systems can provide water to the types of uses providing the greatest public benefit.

**Water Rates and Water Company Viability**

An easily overlooked consequence of conservation rate structures is their effect on the stability of water company cash revenues. With conservation rate structures, as previously noted, a water provider's revenues increase more quickly than costs as demand rises above normal, but fall more quickly than costs as demand declines.

Once DPUC, a water commission, or other entity sets a price for a water company, small changes in sales will have a large impact on net income. Every water company faces a powerful financial disincentive against reducing sales and, because of the power of that disincentive, it is remarkable how open most water companies are to conservation initiatives. Nevertheless, the disincentive is real and it was a factor in the reception of some water companies to the 2010 state drought advisory. Designing rates differently can remove that pressure. It also reduces the risk borne by water companies, justifying a smaller return on equity when establishing rates.

In its ongoing review of rate options, the WPCAG's rates workgroup is looking at the experiences other areas have had with alternative water rate structures. They are also looking at energy utility rate practices because, as previously described, energy utilities have more experience with alternative rate structures, including here in Connecticut.

One rate-based concept under discussion is water rate decoupling, which was the subject of a bill proposed this year. That bill did not get out of committee, but there is support for the idea from utilities and from environmental advocates. There will likely be pushback because of the association of alternative rate structures with energy deregulation. Nevertheless, at least one water company has submitted a rate proposal to DPUC that includes such a mechanism, although a very limited one, and the water company believes such mechanisms are viable in Connecticut.

Although only investor-owned water companies are subject to DPUC rate regulation, any innovations originating with those companies might inspire Connecticut's municipal water and other public providers to consider similar rate structures.

It should be noted that Rhode Island took a step towards solving some of its water concerns by passing the Water Use and Government Efficiency Act in 2009. This act has a financial focus and, of note, the act changed sections of Rhode Island statutes addressing the finances of and the rates charged by regulated water companies and by municipal water suppliers. In particular, it requires that the rates charged by water suppliers be "...adequate to pay for all costs associated with the water supply..." including:

- Acquisition, treatment, transmission, distribution and availability of water;
- System administration and overhead, including the prudent cost and/or value of all services and facilities provided by the city or town to the water supplier including, but not limited to, testing, operation, maintenance, replacement, repair, debt service, and associated with, but not limited to, supply, production, treatment, transmission, administration facilities, and metering and billing;
- Programs for the conservation and efficient use of water, including costs of developing, implementing, enforcing and evaluating such conservation programs and including conservation pricing as described in subsection (d);

- Sufficient operating reserves, revenue stabilization funds, debt service reserves, and capital improvement/infrastructure replacement funds to implement water supply system management plans.

It can be financially and politically expedient to keep water rates lower than what is needed to sustain a water system in the short run, with little regard to long term consequences. Municipal water companies are generally considered to be especially susceptible to this. A water company must be able to fund its long-term obligations, but it might not be necessary to recover the full amount from rate payers. For instance, by fostering economic activity in a densely developed community center, a municipal water company might generate benefits even for members of the community who do not have direct access to the water system. If public benefits can be demonstrated, a municipality might be able to justify not recovering all utility costs from rate payers, but it must make up the difference with revenue from the broader public.

In addition to attempting to ensure that water rates are adequate, the Rhode Island Water Use and Government Efficiency Act also requires that rates be equitable. Except for service charges and certain other charges, water rates:

- Shall be based on metered usage and fairly set among and within the classes and/or types of users;
- Shall provide that within any class of users the full cost of system capacity, administration, operation, and water supply costs for peak and seasonal use is borne by the users that contribute to such peak and seasonal use; and
- May provide a basic residential use rate for water use that is designed to make a basic level of water use affordable. Rates may require implementation of demand management practices, consistent with the standards and guidelines of the water resources board, established pursuant to subdivision 46-15.8-5(1), by wholesale and retail customers.

The second point is especially noteworthy. A water utility's infrastructure and water supply must be adequate to meet its peak demands, which are typically inflated by outdoor water use. Peak demands can have a disproportionate effect on a water system's costs, especially when additional capacity is required to handle existing or predicted peak demands. Rhode Island is attempting to ensure that the financial costs of peak demands are not socialized among all users but instead are borne by users creating peaks in use.

Further research regarding possible rate structure options in Connecticut will continue under the purview of the WPCAG's rates workgroup.

**Changing the Economics of Water – proceed with caution**

This and preceding sections of this report describe how water rates are intertwined with water demand and with water companies' ability to maintain their infrastructure. It is tempting to think of increased water rate changes as being the solution to a number of water concerns, but we should not ignore the old saying:

*Be careful when trying to kill two birds with one stone; you might miss both birds*

That was expressed in economic terms by Tinbergen's Rule, which says:

*Achieving a multiple number of independent policy targets requires an equal number of policy instruments*

Making a single change, such as increasing the amount paid for higher rates of water use, will not simultaneously solve capital funding deficiencies, long-term water supply uncertainties and revitalize degraded streams. Water rates have been shown to have a significant impact on each of those, as previously noted, but do not have the same effect on each. That brings us to Mundell's Rule, which elaborates on Tinbergen's Rule by saying:

*Each policy instrument should be assigned to a policy target on which it has greatest relative effect.*

Changing an economic mechanism like a rate structure without changing the overall price will likely have its greatest impact on the stability of water company income. Changing the price will have its greatest impact on the amount of water company income and the availability of funding for capital improvement work. The existing rate structures and prices charged by many water providers certainly have had a strong effect on those factors. That is especially true for municipal water companies, whose rates typically provide for little capital improvement funding.

Water prices and rate structures also effect water consumption, but those effects appear to be smaller than the effect on water company income. Changing rate designs to stabilize water company income and increasing prices to generate the revenue necessary for adequate capital improvement funding will have positive impacts on conservation, but that should not be the immediate goal of those changes.

**Drought**

As previously noted, the state issued a Drought Advisory in 2010, only the second time the state has done so since adopting the Connecticut Drought Preparedness and Response Plan in 2003. The 2003 Drought Plan was based on plans adopted by other states and is the framework for an organized response to drought. Two Drought Advisories and a tabletop drought response exercise have revealed some shortcomings in the plan and the WPCAG's drought workgroup has been evaluating the plan and the state's needs.

The state drought plan does not stand alone; water companies also develop drought plans, which are included in water supply plans submitted to DPH and other agencies. While the state's and water companies' plans share terminology regarding drought stages, there are inconsistencies between them.

State and individual water company drought plans differ in their trigger levels, since the state considers a number of broad criteria, including regional or state-wide precipitation, crop moisture, stream flow, groundwater and reservoir levels. Individual water companies, on the other hand, focus on the availability of their specific sources of water. This can lead to inconsistencies such as during the 2010 Drought Advisory, when state-wide conditions justified a drought advisory but the water sources of many water companies had not declined to a level that would trigger a drought advisory in their individual drought plan. The inconsistency can go in the opposite direction too, with individual water companies triggering drought stages in advance of the state.

The state and most water companies lack authority to enforce water use restrictions. The state's 2007 Drought Advisory highlighted the need for municipalities to have a prearranged

procedure for restricting water use when needed. This led to the creation of the State Of Connecticut Model Water Use Restriction Ordinance, which was distributed to all municipalities. The WPCAG's drought workgroup is also evaluating the model ordinance with the perspectives provided by municipal and water company representatives on the workgroup. The workgroup is completing its first report and set of recommended actions for the WPC.

It is not necessary to delve into the details of the drought plan here but, basically, it describes the criteria for four drought response stages: Advisory, Watch, Warning and Emergency. They represent an increasing level of drought severity and the plan specifies responses expected for each stage. A Drought Advisory, for example, calls for a voluntary 10% reduction in water use and a Watch calls for a 15% voluntary reduction.

Few people have a good understanding of how much water is required for different uses and, therefore, it is hard for them to know what might provide significant savings. People do not measure how much water they use in the shower or flush down the toilet and many appliances use water out of sight.

In Connecticut's communities where household water use soars in summer, a 10% reduction could still allow consumption to be twice or more than winter consumption. Such a reduction, while potentially large in terms of the actual number of gallons saved, imposes little inconvenience. Communities lacking extensive irrigated lawns, pools and other discretionary water uses, on the other hand, tend to have very low per capita water use with only a minimal summer peak. There is very little room for reduction and, in fact, some have such a small summer peak that achieving even a 10% reduction would require curtailing basic indoor water uses. The relatively small amounts of water to be saved there would require greater sacrifice.

The state drought plan calls for deeper reductions of water use with each succeeding drought stage and reductions become mandatory at the Drought Warning stage, which calls for a mandatory 20% reduction. The plan does authorize bans against non-essential water use, but does not specify criteria for them. Such bans would save more than half of the water used in some locations and essentially nothing elsewhere. Attempts to reduce water consumption during drought might be more effective if they focus earlier on large discretionary water uses rather than target all users, many of whom use little water.

The WPCAG's drought workgroup includes representatives of water companies, environmental organizations, the landscape and nursery industry and state, regional and municipal government. It has been looking at how the state drought plan was implemented in 2007 and 2010 and how it can be improved, based on the wide range of perspectives provided by the group's membership. The workgroup is also considering the experience gained from a tabletop drought exercise in late 2008 and the consultant who oversaw that exercise is also participating in the workgroup.

**Stream Flow**

DEP developed its stream flow regulation proposal in response to 2005's PA 05-142. A goal of those regulations is to ensure that the flow of streams is adequate to avoid damaging sensitive stream habitats, especially during the period when natural stream flows tend to be lowest and public water consumption is at its highest. The regulations were designed to do so by requiring that those diverting water ensure that no less than a minimum flow of water remains after their diversion. The minimum flow required would vary according to the time of the year and the characteristics of the stream.

Stream flow regulations are controversial throughout the world because diversions were originally allowed with little or no consideration of environmental needs. Most water laws developed with a perspective of encouraging economic development and protecting existing economic uses. Wherever they are proposed, stream flow regulations are controversial because of the potential effect on diverters and the costs that might result to change water supply systems. There also is much disagreement regarding the magnitude of the problem to be solved and whether regulations are the best approach to solving the problem.

This report has already described the economic advantages of reducing water consumption, especially during summer months, and the environmental benefits are also important. Water for public water supplies must be taken from somewhere and inevitably has some effect on the environment. DEP is in the midst of a multi-year effort to develop minimum stream flow regulations intended to limit the damage to the most sensitive aquatic habitats. The General Assembly's Regulation Review Committee twice rejected proposed regulations in 2010 and DEP plans to reach out to various parties in 2011 to work out compromise language.

As previously noted, public water consumption often increases dramatically during the hot and dry periods. Unfortunately, those periods of peak public water demand coincide with the times that the natural flow of streams is typically lowest. The combination of increased demand and decreased natural flow can even dewater a stream, as notably happened to the Fenton River in 2005 due to pumping from UConn's nearby wells.

Diverting water from smaller streams or the groundwater that feeds them not only reduces the flow of water in the stream; the water remaining will have larger temperature swings and will be less oxygenated at critical times. Some of our highly-prized aquatic species cannot tolerate such conditions. This problem of low flows is the focus for much of the current struggle over Connecticut water resources, even for those whose primary interest has little to do with public water supply or with brook trout.

One of the most contentious issues regarding DEP's minimum stream flow regulation proposal was the inclusion of ground water diversions. Ground water diversions are different, but sometimes the difference is slight. UConn dewatered the Fenton River with its wells, not with a surface diversion. The connection between ground and surface waters can be complicated, but it should not be ignored.

> *The only books that separate ground water and surface water are our law books.*
> Duane Smith, Executive Director, Oklahoma Water Resources Board

The steady flow of a small stream during dry periods is maintained by water which was previously able to soak into the ground and become groundwater. Like all water, groundwater flows downhill and eventually emerges in surface waters or wetlands. Groundwater, however, moves much more slowly than water flowing across the surface and its temperature is much more stable. Water that can easily flow across the land reaches streams much more quickly. Instead of sustaining the flow of streams during dry periods like groundwater, surface runoff only increases their flow during and after storms.

Landscape changes that decrease the infiltration of groundwater increase the risk of flooding during wet periods and will reduce the flow of streams in the critical period of late summer, even if no one diverts any water. This was a concern raised about the proposed stream flow regulations. Justifiably, water companies were concerned that the regulations would have

burdened them with an obligation to improve stream flow reductions resulting from land use changes made by others.

While diversions warrant increased oversight, we must acknowledge that direct diversions by water companies and others are not the only cause of unnaturally low stream flows. They are the most easily recognized cause and the easiest to explain, but others factors are also important. DEP has tried to solve the problem through its relatively narrow authority regarding diversions, but a broader approach might be appropriate.

Massachusetts' Water Policy notes how drainage and wastewater management decisions can influence stream flow:

> *We also need to rethink where the water that we use goes. Existing infrastructure often transports precipitation away from where it lands instead of letting it infiltrate. Transporting dirty water far from its source made sense historically, but today, with significant improvements in wastewater treatment techniques and standards, treatment levels often make the water available for reuse or recharge, thereby replenishing the natural stream flows and aquifers in the basin or sub-basin.*
>
> *An important subset of wastewater is stormwater—that is, precipitation that does not seep into the ground but runs off the surface. Traditional development patterns allow stormwater to travel across roads, parking lots, and other impervious surfaces into sewers and detention areas far away. Techniques to keep stormwater local and prevent it from becoming contaminated have been developed, including local infiltration via vegetative areas and rain gardens.*

Unless specifically designed, constructed and maintained to do so, buildings, pavement and other features of the built landscape do not allow water to reach the soil. Such impermeable cover has a large effect on nearby and downstream water bodies. Grading and drainage to speed the flow of water from the landscape and the trenches of subsurface utilities can increase the problem.

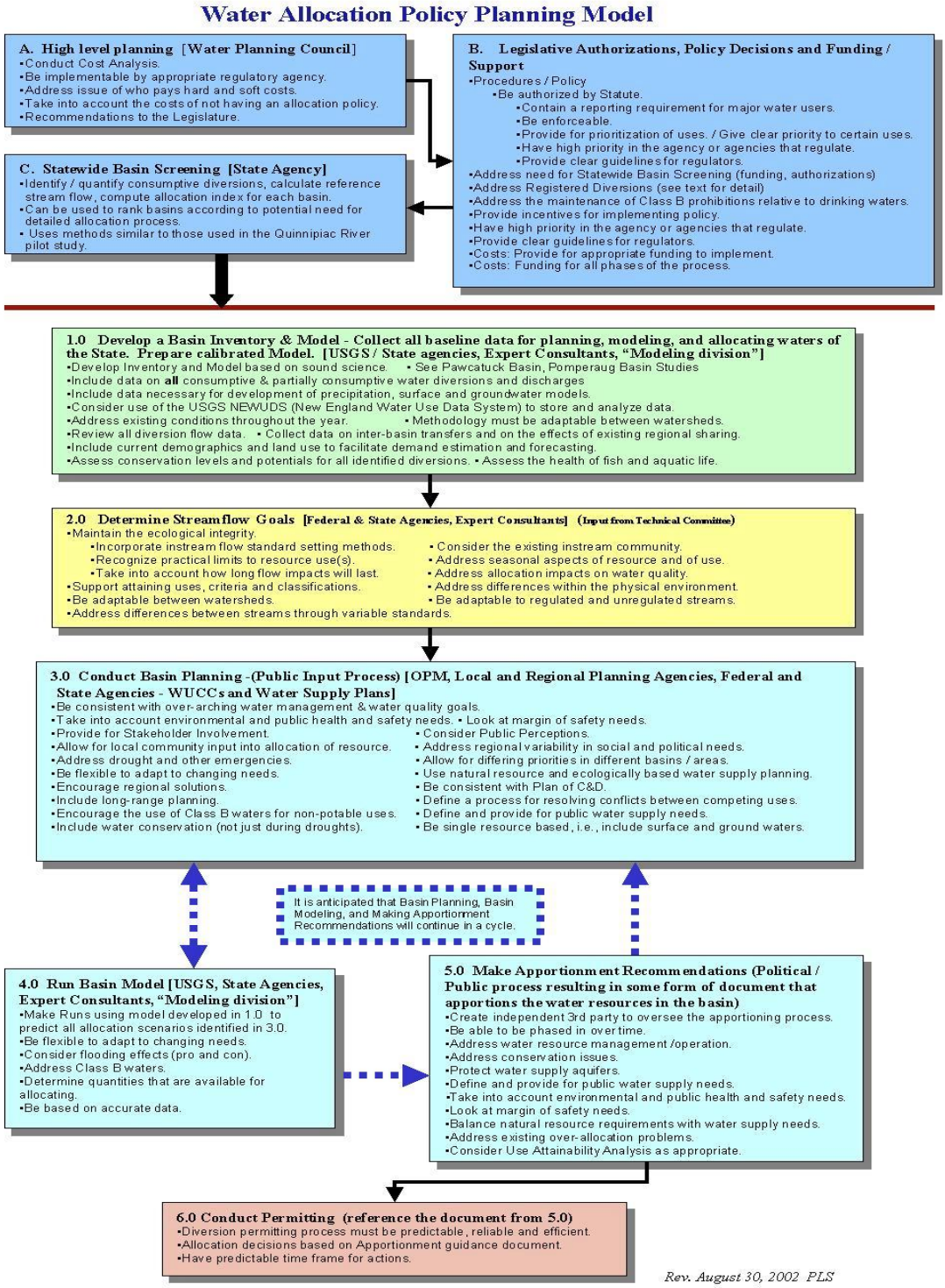
The Jordan Cove Watershed Project in Waterford was a ten-year study comparing how a subdivision constructed using standard practices and one using low-impact development (LID) practices affect the flow of water and potential pollutants. The LID subdivision greatly reduced stormwater runoff. The swales, permeable paving and other features used in that subdivision can maintain the recharge of groundwater as they reduce the risk of flooding and contamination in downstream areas.

Any development can increase the demand for water from a public supply or local aquifer but, unlike an LID development, standard development practices will also reduce groundwater recharge. In addition to reducing the supply of water for human activities during dry periods, reduced groundwater recharge also reduces the availability of water needed to sustain streams at those times.

**A Comprehensive Approach for Managing Water**

Much of our focus is on the concept of water allocation, a framework outlined in Connecticut's Water Allocation Policy Planning Model (WAPPM). Unfortunately, the word "allocation" can be polarizing. Whether someone approaches water from the perspective of an "average state resident" or has a special interest such as that of a trout fisherman, a farmer, or someone with a

large irrigated lawn, people cannot help but worry about where “their” water might be allocated. This might be especially true in Connecticut because a previous water allocation initiative gave away so much of the state’s water, by way of water diversion registrations, while asking essentially nothing in return.



Those who benefit from the existing system do not want a new allocation system that might take some of what they already have. At some level, there is broad agreement that our water allocation system needs improvement, but there is also broad recognition that any major overhaul will be expensive, even if there is agreement as to what should be done. The data collection, analysis and modeling requirements identified in the WAPPM will depend on significant investment in Connecticut's streamgaging network and other data collection efforts. As we've seen in recent years, it has been a challenge just to avoid losing more of our existing data collection capabilities, let alone consider adding more as contemplated in the WAPPM.

This report has focused on state water resources planning, but other planning efforts and funding or development decisions also have a large effect on our water resources. Although the aging of our water infrastructure gets more publicity, the layout of that infrastructure can be equally problematic. The pattern of our water infrastructure dates back to before WW II, when the state's commerce, industry and population were concentrated in the cities and towns. Water was collected and stored in lightly populated rural areas and transmitted to and distributed within urban areas.

The population of formerly rural areas exploded with the construction of highways, particularly the Interstate Highway System after WW II, but our water infrastructure still reflects the pattern of the state's economy in the early part of the last century. People, businesses and water demand have dispersed to suburbs and rural areas, but infrastructure cannot be moved and the cost to replicate such service in areas of low population density is prohibitive. At the same time, some urban water companies face the financial pressure of a declining customer base at the same time their water sources are threatened by development pressure in rural areas.

Rural areas still rely in large part on private wells and onsite wastewater disposal, so continued growth places the water interests of rural residents in conflict with the water interests of urban residents. If rural growth were to continue unabated, the supply of water suitable for public consumption may decrease significantly and this will exacerbate the effects of the conflict between rural and urban interests.

Growth or hopes for growth routinely lead to appeals for federal or state funds to create or expand water and sewer systems in rural areas. Households and businesses no longer use tens of gallons of water per day - they use hundreds - so individual wells and septic systems cannot support the level of density needed for a village-scale rural center. Properly sized and operated community water supply and wastewater disposal systems can support such a center, but building too large of a system or extending a line from another system can also potentially induce decentralized development patterns.

Current development practices make water allocation even more difficult by reducing the actual supply of water while increasing peak demands for it. Such concerns were raised during the past year's minimum stream flow regulation discussions. Water utilities are concerned that they might have to release water to make up for the inadequate stream flow of a stream, even if reduced dry season flow has resulted in part from development in the watershed. Limiting the withdrawal of water is an inadequate tool for protecting the flow of a stream when flows are also degraded by other activities. Effective water resources planning will require a comprehensive approach and we should try to avoid our tendency to consider economic, environmental, infrastructure or public health factors in isolation.

Massachusetts' Water Policy (2004) says:

> *Addressing the Commonwealth's many water resource challenges will require that the state work more effectively with our municipal partners on a number of resource management fronts. The water policy recommendations include development and refinement of planning, tools and strategies to promote efficient use of water, measures to promote proper infrastructure maintenance, wastewater reuse and recharge, stormwater recharge, water supply development, resource protection and restoration strategies, and permit streamlining...*
>
> *Overall, the water policy recommendations on resource management move the state from a posture of reacting to problems to that of proactively working with local and regional partners to solve or avoid problems. Similarly, the recommendations complement the smart growth strategy of articulating and promoting more efficient local land use and more thoughtful designs rather than that of mitigating the negative impacts of development. Sustainable water use and effective pollution strategies (such as addressing non-point sources) will require more active pursuit of sustainable development practices - in essence, protection of critical resource areas, targeted resource restoration, higher-density growth, and more up-to-date designs and landscaping...*
>
> available at http://www.mass.gov/Eoeea/docs/eea/water/waterpolicy_2004.pdf

Massachusetts struggles with the same regulatory and financial hurdles as Connecticut in attempting to address stream flow, infrastructure and other concerns. The Massachusetts Water Policy elevates *Increase treated wastewater recharge and reuse* and *Promote stormwater recharge close to its site of origin* to the same level of consideration given concerns such as stream flow. That is a proactive approach because reusing water and recharging groundwater help reduce our impact on water resources, but making those things happen requires going beyond the traditional boundaries of public water management.

A comprehensive strategy is needed to guide state agency actions that affect or depend on water resources. The Conservation and Development Policies Plan for Connecticut (State C&D Plan) provides a framework for managing state resources. Significant changes are needed in the 2013-2018 State C&D Plan revision to address our system of water resources management, which has proven inadequate for current conditions. The next couple of years provide a significant opportunity for the state to develop a comprehensive water strategy and to break from its past. As has been said about many things:

> *The very definition of insanity is to keep doing the same thing over and over again, expecting different results.*