

Water Efficiency for Rhode Island: Assessing Proposed State Efficiency Rule on a Local Level

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May 2011

Executive Summary

Though fortunate to have plentiful annual precipitation, excessive and wasteful consumption of Rhode Island's water resources hinders economic growth and puts stress on the environment. To address this problem and ensure a sustainable and readily available future water supply, the General Assembly passed the Water Use and Efficiency Act in 2009. The purpose of the act is to manage water demand, reinvest in water infrastructure and supply and protect the aquatic environment. The Act requires the Rhode Island Water Resources Board, a state agency, to set water efficiency targets and methods to achieve these targets. In late 2010, the Board approved for public hearing the proposed Water Use and Efficiency Rule for Major Public Suppliers, hereafter, Rule.

In this thesis, I assess the proposed efficiency Rule. I begin my evaluation with a description and analysis of major sections of the proposed Rule, to identify issues that I believe require further resolution in order to fully and effectively implement the 2009 law. I assess the reliability and accuracy of using an annual residential average 65 gallons per capita per day (GPCD) as a target for efficiency, by evaluating the quality of data reported by public water suppliers. I found that the supplier-reported total population of Rhode Island residents served by public water supply matches USGS and state-reported totals for number of people supplied by public water suppliers. I also calculated the average GPCD of major public suppliers—67 GPCD. Next, I suggest a method, using U.S. Census data, for suppliers who have an increase in summer population to calculate this increase, as required by the proposed Rule.

The Rule provides a menu of required and recommended methods for achieving the efficiency targets; I evaluate two of these methods: one inch per week lawn irrigation and public education. Working in partnership with the North Kingstown Water Department, I used a sample of the town's automatic meter reading (AMR) accounts to assess the two methods. From June through September 2010, I read 1,164 AMR accounts monthly using the town's radio frequency collection unit. The town of North Kingstown's water use and demand management programs are a part of a pilot study (HAP Pilot) of the Water Resources Board. North Kingstown needs to reduce its summer peak water demand to allow enough water for economic growth, fire suppression and to protect the local streams that are already running low.

Using a group of 766 North Kingstown residential AMR accounts, I tested the one inch per week recommendation, by comparing the actual summer 2010 outdoor use to the potential use if irrigating up to one inch plus rainfall. I found that the 766 accounts used a total 23 million gallons outside from June to September 2010; however, if using up to one inch (including

rainfall) these same accounts have the potential to use 65 million gallons, or about three times more, outdoors for the same time period.

The role of public education as a water conservation tool was discussed at length during the rule-drafting process and 15 March 2011 public hearing for the proposed Rule. I used a case-control study as to test the impacts of public education on a local level.

For my case-control study, I divided the 1,164 AMR accounts into two sets—case and control, based on the initial June 2010 read. The AMR sample was representative of all single family residential accounts, from 2006-2009, by +/- 6%. The case set received two monthly water use feedback letters and two educational pamphlets from the North Kingstown Water Department. Feedback letters and educational material were sent in July (to show June water use) and August (to show July water use). The feedback letters included a graph with a comparison of the residential account use to the average monthly use of the AMR sample, a normative message and an emoticon (either smiling or frowning, depending on their comparison to the average). The controls received just the two educational pamphlets. I evaluated the effectiveness of feedback by comparing the consumption of the case versus the control sets. Since the letters were sent in July and August, I expected that any impact as a result of feedback would be evident in the August and September monthly reads.

I expected that the feedback letters would cause the case group as a whole to decrease water use more than the control. In August and September, the case group used 10.29 million gallons, while the control accounts used a total of 10.25 million gallons. Case-control consumption was within less than 1% post-feedback letters. As a method for achieving water efficiency in North Kingstown, feedback was not successful in reducing the consumption of the case group as a whole.

Next, by providing a comparison to the average, I expected the case accounts below the average to stay below and use less water than the matching controls; while I expected case accounts above the average to reduce water use and also use less than the controls. To test this, I divided the case-control accounts into four groups, based on the initial June monthly read average. For each of the four groups, I compared the gallons per day (GPD) per account water use of the cases versus controls in August and September. I found that the feedback letters did not have an effect on the water use of the case accounts in groups one and two. For accounts over the average, I found that feedback did have an effect on the behavior of the case accounts in group three, in September, and group four, in August. The case accounts in group three used 17% less than the controls in September, and the case accounts in group four used 6% less water than the controls in August. Considering a +/- 3% error rate, these differences are significant. Overall, I could not find a consistently significant difference in consumption post-feedback letters for all four groups, leading me to conclude that feedback altogether was not effective

To assess the impact of distributing educational pamphlets to the entire 1,164 AMR sample, I compared GPD per account water use of the sample to the billed summer 2010 GPD per account use of all North Kingstown single family residential accounts. I found that the AMR sample used 14% more water than all single family residential accounts. It is unclear what actually caused this increase. As a result, I concluded that education as a tool for efficiency did not reduce water use. Overall, my results suggest that voluntary conservation, through feedback and public education, alone are not effective and should not be the only methods used to improve

efficiency in North Kingstown. The results of my case-control study can help the Board evaluate one option for efficiency and influence future policy decisions. This study, along with future demand management program results, can assist North Kingstown in continuing the HAP Pilot.

After assessing the proposed Rule and conducting my case-control study, I make several recommendations to the Water Resources Board and the Town of North Kingstown, which include—

- First, I recommend North Kingstown collect AMR data next year, monthly, from June through September 2011. The water department can use this data to evaluate the impact of the new twice per week irrigation restriction and the fourth tier block rate. If the town cannot collect AMR data for all 1,164 accounts, I recommend they collect data for groups three and four from my case-control study. Group three case accounts used significantly less water than the controls post-feedback, which indicates that this group of water users is most likely to change their behavior as a result of a demand management program. Also, the accounts in group four are the high water users—162 of 1,164 accounts used 44% of the total water used from June through September 2010. Group four would have the most potential for savings and will be the accounts impacted by the new fourth tier rate.
- Next, I recommend North Kingstown look into purchasing and installing a more advanced antenna system. After using the drive-by radio read equipment in summer 2010, I found there were some accounts that I was unable to read at all, or would have to pass by the house twice to record the read. A stronger antenna might help alleviate missed reads or back-tracking in the future.
- When moving forward with the proposed efficiency Rule, I recommend the Water Resources Board consider the role of public education as just one of many options for efficiency. The results of my study suggest that public education is not effective at reducing water demand.
- Fourth, I believe it is the duty of the Board to establish the legitimacy of using a 65 GPCD target. I recommend the Board conduct a public outreach campaign to assist the public water suppliers notify the public of the 65 GPCD target, using per capita water use estimates from trusted sources like the EPA and American Water Works Association.
- Fifth, I recommend the Board consider a baseline indoor efficiency target of 45 GPCD. As a target, “indoor and outdoor efficiency” alone is not a measurable benchmark to be able to assess progress in the future.
- Next, I recommend the Board reconsider the potential effects of a one inch per week lawn irrigation recommendation as a method of achieving efficiency in the proposed Rule. In North Kingstown, watering up to one inch per week, including rainfall, may actually cause an increase in residential water use by three times the amount used outdoors in summer 2010, and thus, not encourage efficiency.
- Seventh, I recommend the Board suggest a method to the four affected suppliers to estimate their fluctuation in population served during the summer. In my analysis, I suggest a simple method to account for such an increase using U.S. Census data.

- I suggest the Board hold an outreach meeting with all major water suppliers to review expectations of the proposed Rule and what would be required as a result of promulgating the Rule. Establishing a working relationship with the major public water suppliers is necessary to be able to effectively implement the Rule.