SWMI GRANT REPORT SUMMARIES

Project Proponent: Town of Medway
Project Description: Feasibility cost/benefit analysis of SWMI minimization, mitigation and offsets
Report Author: Kleinfelder consultants
Project Cost: $99,197 state

This report describes how Medway's water, sewer and stormwater systems could be upgraded and meet SWMI requirements under the Water Management Act. The report summarizes all potential SWMI options the town could take, and rates them as poor, fair or good. The town is close to pumping its baseline volume and is anticipating needing additional water for industrial and/or commercial development. Demand management, wastewater, and stormwater offsets are expected to mitigate the increase.

The town has four gravel-packed wells in the Charles River basin, two on the mainstem and two on a tributary. Increased pumping capacity and SWMI optimization/minimization requirements could be achieved by increasing pumping from a well on the Charles River mainstem if its capacity is restored through refurbishment, satellite wells and/or a replacement well. Pumping more from the mainstem and less from tributaries could be considered optimization. The report includes a seasonal pumping schedule to shift summertime withdrawals from the tributary to the mainstem.

Medway's Unaccounted for Water is above the standard of 10%. A water audit may identify opportunities for saving water, and conservation giveaway programs (aerators, showerheads, rain barrels, etc.) may reduce residential demand. The report also recommends that the town initiate non-residential demand management and to retrofit public buildings with low-flow fixtures. The town has had outdoor water use restrictions for years and as a result their Residential Gallons per Capita Day (RGPCD) is below the stand of 65 gallons. Recently installed radio-read meters resulted in a drop in RGPCD due to more accurate measurements.

The report also recommends that the town continue implementing its existing NPDES MS4 stormwater requirements, proceed with the Phase II IWRMP stormwater and wastewater needs and capital cost analyses, and continue discussions about creating a stormwater utility.

Project Proponent: Town of Kingston
Project Description: Develop supply management protocol
Report Author: CEI consultants
Project Cost: $74,000 state

The Town of Kingston has two pressure zones, a high pressure zone supplied solely by the Trackle Pond well and a low pressure zone supplied by five other wells. Due to their proximity to the Jones River, the low pressure zone wells are more likely to impact streamflow than pumping the Trackle Pond well. Therefore, it would appear to be environmentally beneficial to shift pumping from the low pressure zone wells to the Trackle Pond well during low streamflow periods (i.e. summertime).

Elevated manganese in the Trackle Pond well has limited its use to about 0.3 MGD, significantly less than its approved rate of 1.44 MGD. A manganese removal treatment plant (now under construction) will allow increased pumping of the Trackle Pond well, which in turn will allow the transfer of water from the high pressure zone to the low pressure zone. Water from the high pressure zone may need to be de-chlorinated before it enters the low pressure zone water.

A hydraulic model of Kingston's pumping and distribution system simulated several pumping scenarios to evaluate the hydraulic and water quality effects of transferring water from the high pressure zone to the low pressure zone. Infrastructure modifications may be required such as installing a flow control valve, de-chlorinating high pressure zone water and removing a booster pump. A supply management protocol gives priority to transferring water from the high zone to the low zone from May through October. This could reduce the pumping of the low zone wells by as much as 1 MGD from the rate of recent years, thus reducing the potential impacts of pumping on the Jones River during seasonally low-streamflow periods.

Project Proponent: Town of Franklin
Project Description: Well Pumping and Recharge Strategies for Streamflow Augmentation
Report Author: Horsley Witten Group in partnership with the Charles River Watershed Assoc.
Project Cost: $75,000 state

The Town of Franklin is entirely supplied by its ten wells in the Charles River basin, nine on tributaries and one on the mainstem. This study examined pumping optimization scenarios to reduce streamflow impacts and operating costs. These scenarios included using only the existing infrastructure, adding a new well and hypothetically transferring surface water across subbasins during periods of high flow to recharge groundwater. The study also evaluated site-specific options for infiltrating stormwater to augment streamflow and reduce phosphorous TMDLs.

The USGS stream deplete (StrmDepl) model was used to simulate the lag time of pumping impacts on streamflow, taking into account aquifer characteristics, distance from wells to streams, and monthly pumping rates. The StrmDepl simulations indicate that changing the pumping schedule of existing wells could results in streamflow improvements (i.e. decrease the percent alteration of August streamflow) while at the same time reducing energy costs. The StrmDepl modeling also indicates a new well could further reduce streamflow impacts and energy costs. The town is in the initial stages of assessing the feasibility of a new well.

Optimization using storage structures and/or increased conservation could also reduce August streamflow impacts, although storage structures are expensive and most likely not cost-effective. Aquifer Storage and Recovery (ASR) could be used to pump water from the Charles River to upgradient aquifers during periods of high streamflow. This would reduce the impact on August streamflow, but high cost and uncertain permitting would likely prohibit this option in the foreseeable future.

Five candidate locations in Franklin were identified for stormwater retrofit structures that would allow infiltration of 18 total acres of impervious surface. The infiltration would increase the baseflow of the streams of their respective subbasins, thus potentially reducing the relative impact of pumping on streamflow. The stormwater recharge structures could infiltrate 14 million gallons of stormwater annually, equivalent to 5.4 days of town-wide water use.

Project Proponent: Town of Amherst in partnership with UMass, Amherst College and Amherst Regional School System
Project Description: Wastewater treatment facilities plan and effluent reuse
Report Author: CDM Smith
Project Cost: $105,527 state

The Town of Amherst Wastewater treatment facility (WWTF) serves 93% of the town, all of UMass and a small portion of the town of Hadley. The study assesses design upgrades to the WWTF in anticipation of more stringent NPDES requirements with a focus on improving environmental sustainability through wastewater reuse, energy efficiency, alternative energy and sustainable design.

Treatment process alternatives were evaluated for their ability to meet both regulatory requirements and end user water quality requirements for wastewater reuse, particularly at UMass. Upgrade alternatives include the ability to remove nitrogen to 8, 5 and 3 mg/L.

Currently UMass operates a trailer-mounted reverse osmosis (RO) plant to treat effluent from the Amherst WWTF, which it uses for boiler feed water and generator makeup water at its Central Heating Plant. UMass is applying to use up to 200,000 gallons per day of additional RO-treated wastewater for its cooling towers.

UMass is interested in using treated wastewater from Amherst's WWTF for irrigating ten athletic fields located adjacent to the WWTF. This would replace summertime use of the town's potable supply for irrigation, thus reducing summertime streamflow impacts from pumping. Amherst College and the Amherst Regional Public School System are also interested in using reclaimed water for irrigation of athletic fields and other potential uses such as toilet flushing. The report recommends that the WWTF upgrades include the ability to produce Class A reclaimed water supply for the adjacent UMass campus.

Project Proponent: Town of Hopkinton
Project Description: Stormwater recharge and infiltration planning
Report Author: Weston & Sampson
Project Cost: $58,989 state

The Town of Hopkinton is expecting to seek an increase in its Water Management Act authorized withdrawal from the Concord River basin to meet anticipated growth. This study identified potential locations in Hopkinton for stormwater recharge, which under SWMI is one option for offsetting increased withdrawals.

A GIS site-screening analysis was used to identify candidate locations for stormwater recharge infrastructure, considering the following variables: depth to water; soil permeability; aquifer transmissivity; sensitive environmental receptors; proximity to wetlands; proximity to Zone IIs; HUC-14 subbasin water mass balance and; land ownership. In GIS the entire town was divided into 35 x 35 meter areas, each of which was ranked for stormwater recharge favorability according to the variables. GIS-identified potential recharge sites were visited to collect site-specific data such as impervious surface and stormwater infrastructure. GIS was updated with the field data to produce a more accurate characterization of each site.

Annual total runoff depth was estimated using the SIMPLE and TR-55 methodologies, utilizing 42 years of precipitation data from the Worcester airport. The annual total precipitation depth was multiplied by the impervious surface area at each site to estimate the potential annual capacity of stormwater BMPs. The GIS analysis and field visits identified several candidate sites for constructing stormwater recharge infrastructure. Town-owned parcels were given high ranking for constructing stormwater BMPs.

Hopkinton's general and stormwater bylaws were reviewed and workshops were conducted with town departments to discuss issues related to stormwater recharge. A video was produced documenting Hopkinton's planning for stormwater management relative to SWMI, including interviews, GIS maps, and stakeholder meetings.

Project Proponent: Town of Pembroke
Project Description: Stormwater recharge siting study
Report Author: Weston & Sampson
Project Cost: $54,980 state

Pembroke's increase in its Water Management Act permitted withdrawal will require minimization and/or mitigation. One mitigation option is to increase stormwater infiltration to the aquifer from which Pembroke withdraws groundwater. This study identified potential sites for stormwater recharge, predicted the impacts of infiltration using numerical groundwater modeling, and provided the town with a strategy for implementing SWMI requirements.

Pembroke is supplied entirely by groundwater sources, but is in an aquifer that contains other PWS supply wells and Great Sandy Bottom Pond, a surface water supply for the Abington/Rockland Joint

Water Works. In 2004 a DEP-sponsored USGS regional groundwater flow model simulated the impact of these water supply withdrawals on surface water and ground water. The stormwater recharge volumes identified in this study were added to the USGS groundwater flow model values to simulate the effects of stormwater infiltration.

GIS information was developed to identify sites where infiltration of stormwater to the aquifer from impervious surface were most viable, based on hydrogeologic, environmental and wetland criteria. The study identified 98 sites (14 commercial/industrial parcels, 43 municipal parcels, and 39 existing stormwater catchments) that are good candidates for stormwater BMPs. The 98 sites were ranked in order of preference based on the rate of recharge capture. In addition, potential stormwater infiltration from all residential impervious cover in the study area was estimated to be as much as 450,000 gallons per day, more than twice the rate from the 98 individual sites. The study included a matrix of 17 stormwater BMPs with their descriptions and unit costs.

Groundwater modeling indicates that the stormwater infiltration would allow higher pumping rates because of the additional water added to the aquifer. Particle tracking in the numerical model determined that there would be at least a 1-year travel time from each of the 98 potential recharge sites.

Project Proponent: City of Worcester and Town of Shrewsbury
Project Description: Poor Farm Pond Dam removal feasibility study
Report Author: CDM Smith
Project Cost: $138,300 state

This study assessed the feasibility of partially or completely removing Poor Farm Pond Dam, which is owned by the City of Worcester and located in Shrewsbury, near the municipalities' boundary. Removal of the dam will eliminate existing cost and liability issues and will restore a more natural flow condition to Poor Farm Brook. Shrewsbury and/or Worcester may get mitigation credit for improvement to riparian habitat.

The study assessed pertinent aspects of the impact of the dam removal, including existing dam structure, sedimentation behind the dam, ecological and human health risk, sediment transport and hydraulic and hydrologic analyses. The report includes detailed site plans, wetland delineation, results of sediment sampling and sediment transport, photographs of the pond and dam, results of hydraulic and hydrologic analyses, and cost estimates.

Two alternatives were assessed: partial dam removal (leaving some of the dam structure in place, but restoring the natural stream channel) and full removal of the dam. Both alternatives are feasible; the estimated cost for full removal is $980,000 and for partial removal is $880,000. These costs could vary depending on more extensive sediment testing and decisions regarding sediment transport. The report provides a list of potential federal and state funding sources that Worcester could pursue for removal of the dam.

Project Proponent: Town of Scituate, North and South Rivers Watershed Assoc., Mass. Bays Program
Project Description: Feasibility of dam modifications and fish passage improvements, First Herring Brook
Report Author: EA Engineering, Science and Technology, Inc.
Project Cost: $55,380 state

The Town of Scituate is supplied by six wells and one reservoir (Old Oaken Bucket Pond) in the South Coastal watershed. Reservoir Dam Pond is upstream of Old Oaken bucket Pond, and the watershed of these two ponds includes a herring run. The level of Reservoir Dam Pond influences the availability of water for herring passage and for water supply. This study assessed options for improving seasonal herring fish passage by raising the level of Reservoir Dam Pond.

Water Evaluation and Planning (WEAP) modeling of reservoir operations for water supply and environmental flow releases was done for five Reservoir Dam Pond elevations. A stage-storage curve was created for Reservoir Dam Pond and a stage-discharge curve was created for its spillway. The WEAP modeling indicates that multiple scenarios are feasible that will allow spring and fall fish migration while minimizing the number of days of outdoor water bans.

Cost estimates and WEAP modeling were done for various spillway and fishway modifications necessary to better manage flows and fish migration. Raising the elevation of Reservoir Dam Pond would impact properties around the pond, including homes and septic systems. Higher pond levels would result in greater impacts to property and thus higher cost to implement. The study concluded that the most cost-effective solution was to raise the pond elevation by 1 foot, minimizing the impact on private property, and lower the fish exit channel to facilitate fish migration. Total estimated cost for this option is $1,335,000.

Project Proponent: Dedham-Westwood Water District, Neponset River Watershed Assoc., Metropolitan Area Planning Council.
Project Description: Neponset Water Management Act Planning Project
Report Authors: Weston and Sampson, NRWA, MAPC
Project Cost: $116,332

This study looked at potential SWMI implementation options for seven municipal public water suppliers with sources in the Neponset River basin: Canton, Dedham-Westwood Water District, Foxborough, Medfield, Sharon, Stoughton and Walpole. Future water use was estimated for each supplier/community. The report summarized each supplier's existing status in meeting standard WMA permit requirements for Unaccounted-for-Water (UAW), Residential Gallons per Capita Day (RGPCD), seasonal limits on outdoor water use, and water conservation standards. The report also estimated potential water savings in each community through implementation of water conservation measures.

SWMI categorized conditions based on the impacts of impervious cover and reduced streamflow from groundwater pumping. Returning wastewater to the ground via septic systems keeps water in the basin

and reduces the impact to streamflow, and reducing sewer system infiltration/inflow reduces the volume of groundwater diverted out of the basin. The report characterizes the study communities' existing on-site septic systems and sewer systems utilizing GIS and town records. The study report provides septic return annual flow volumes for each town and for each SWMI subbasin. The study also provides estimated cost and potential I/I reduction for the sewer systems in each town and subbasin.

SWMI will require many suppliers to analyze their systems for the potential to optimization their existing sources to reduce streamflow impact, consider alternative sources with lower streamflow impact, and evaluate the potential for surface water releases to improve streamflow. For each of the study towns the report summarizes the options for optimization of sources, interconnections with regional suppliers, and opportunities, if any, for surface water releases.

The study evaluated options for recharging stormwater in the study area at the parcel level. It identified approximately 120 public and commercial parcels where soil conditions and impervious cover provide an opportunity for stormwater recharge. The report summarizes the SWMI minimization and mitigation options for each of the communities, based on the potential increase above their baseline volume.

Project Proponent: Town of Halifax
Project Description: Monponsett Pond and Silver Lake Water Use Operations and Improvement
Report Authors: Princeton Hydro, LLC
Project Cost: $79,346

This study evaluated part of the City of Brockton's water supply, which is supplied in part by Silver Lake, Monponsett Pond and Furnace Pond. The Town of Halifax undertook the study to assess the impacts of Brockton's water supply practices on Stump Brook, the outlet to Monponsett Pond, which is located in Halifax. The report summarizes the infrastructure, legislative and water use history of Brockton's water supply, dating back to the 1800's. The report also describes the hydrogeology, climate and water budget of the region.

A water budget was constructed using a mass balance approach. Water budget summary charts for each of the three reservoirs depict monthly water input and output. The water budget analysis indicates that the natural stream flow regimes have been altered by diversions from Monponsett Pond and Furnace Pond to Silver Lake.

The study also analyzed pollutant loading to the three Brockton surface water sources. The USEPA Unit Area load (UAL) model was used to estimate phosphorous loading by multiplying the area of various land uses by phosphorous loading coefficients for each land use. Trophic state modeling of Silver Lake, Monponsett Pond and Furnace Pond was done to predict the growth of algae and aquatic plants based on the effects of hydrology and nutrient loading.