Regulatory Discussion

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Cross County Water Transmission

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Abstract

The water supply and transmission structure on Long Island historically has been composed of individual water purveyors providing the production and distribution of drinking water for their local residents. Groundwater contamination in such supply areas is handled locally as well through on-site groundwater remediation technologies. Saltwater intrusion increasingly is becoming a water supply contamination issue for many coastal water suppliers whose main source of supply is threatened by such intrusion. Also, many Long Island water suppliers maintain emergency interconnection agreements with neighboring suppliers, some of which are informal and unmetered. A possible solution to the issues facing individual water suppliers across Nassau and Suffolk Counties is a regional structure which links water suppliers across county lines using centralized pumping and distribution facilities. Groundwater modeling across the region could be utilized as a tool for mapping contamination plumes and assessing aquifer sustainability under the regional approach.

Introduction

Unlike many parts of the country that have relied on distant water sources (consisting of either large well fields or surface impoundments) and long distance transmission to the points of consumption, Long Island water suppliers have relied on localized supply and distribution of water. It was recognized early on that an abundant fresh water supply exists below the ground virtually anywhere on Long Island and the most economical and efficient method of providing water to an expanding Long Island population was to acquire land, construct wells as needed in response to population trends, and to interconnect these multiple local sources of supply with appropriately-sized pipes for local distribution. The existing water supply infrastructure reflects this practice. Even in areas where regional-scale groundwater contamination has been a problem, such contamination has, for the most part, been handled using a similar localized approach. Beginning in the 1970s, Volatile Organic Chemical (VOC) contamination affected numerous wells throughout Nassau and Suffolk Counties. Such contamination has been addressed through the installation of Granular Activated Carbon (GAC) adsorption units or air strippers installed at individual well fields.

Mains supplying water on Long Island are typically 12” to 16” in diameter and are designed to accommodate flows up to several thousand gallons per minute. Well fields are located within 1 to 2 miles of each other in populated areas. This practice has allowed for local control and local resolution to distribution-related problems. The manifestation of this local approach has been the formation of

numerous water purveyors supplying water to a relatively small geographic area. Nassau County exemplifies this localized approach, with 46 community public water systems serving a 287 square mile area. In Suffolk County, this practice has been modified somewhat, with the formation of the Suffolk County Water Authority (SCWA), which today serves approximately 85% of Suffolk residents. Even so, Suffolk County historically has had a multitude of small to medium-sized water purveyors serving many parts of the County. Over time, the SCWA has acquired the majority of them. Despite these acquisitions, there still currently are more than 30 other community public water systems and over 200 non-community systems located throughout Suffolk County. This preponderance of small municipal and private suppliers has suppressed the implementation of a more regional approach to water supply, such as large centralized pumping centers and/or large diameter, high-capacity transmission mains. The purpose of this report is to discuss the benefits and concerns of transferring bulk water across county lines or between public water supplier boundaries within a county.

History and Background

Since the 1960s, numerous studies of the groundwater and drinking water resources of Long Island have been prepared. Virtually every one of them has included discussions and recommendations relating to the transfer of water from a source other than the groundwater underlying a supplier's specific service area. In general, these reports identified issues with salt water intrusion in coastal communities as well as the potential for over-pumping the aquifers beneath Nassau County. The following is a partial listing of some of these studies and the recommendations of each with regard to long-distance transmission of water.

Comprehensive Public Water Supply Study CPWS-24, 1970 (Holzmacher, McLendon, and Murrell)

This report predicted a water deficiency in Nassau County of 40 million gallons per day (mgd) by 1980 and 200 mgd by 2020 (p. 179). Two possible plans for transmitting water from central and eastern Suffolk County to Nassau County were analyzed. Plan A would export 120 mgd to Nassau County until 2015 and 80 mgd thereafter, until the year 2020. Implementation would require 80 well fields, approximately 7,000 ft. apart, each with 2 wells with capacities of 2 mgd each, 55 miles of new transmission main (16" to 60" diameter) along the Long Island Expressway corridor, and 2 booster stations to maintain water pressure in the mains (p. 180). Plan B would provide for the export of 80 mgd to Nassau County until the year 2020 using 70 well fields, 48 miles of new transmission main, and 2 booster stations (p. 181). The cost of these scenarios in 1970 was estimated at $1.9 billion for Plan A and $1.8 billion for Plan B (p. 237). Adjusted to 2016 with inflation, this equates to $12 billion and $11 billion, respectively. Given the additional costs involved in well and pump station construction today that were not a factor in 1970 (such as additional contaminant sampling and environmental review), these inflation-adjusted costs could easily double or triple.

City of Long Beach, Nassau County, New York Master Water Plan, 1971-1985 (Holzmacher, McLendon, and Murrell)

This report recognized resource limitations and the distribution capacity problems of the Long Beach water supply system at that time and suggested the City "seek and support a county program of providing supplemental water…from new supplies in Suffolk County and from New York City…" (p.2). The report also recommended upgraded interconnections to adjacent suppliers to facilitate the wholesale purchase of water from them and also mentioned the possibility of other interconnections to the main body of Nassau County (p. 120).

Comprehensive Public Water Supply, County of Nassau, State of New York, 1971 (Greeley and Hanson)

This report summarized numerous other studies, all of which mention predicted deficiencies within Nassau County and possible supplemental supplies, including both Suffolk County and New York City (p.50). One particular report that was referenced mentioned the potential for a 50 mile-long aqueduct from upstate reservoirs within the Hudson River watershed to Nassau County, to provide 60 to 106 mgd by the year 2000 (p.52). Another report referenced in this study suggested linking New York City and Long Island water supplies together as well as importing water from Suffolk County into Nassau County (pp. 53-54).

Long Island Groundwater Management Program, 1986 (New York State Department of Environmental Conservation [NYSDEC])

Portions of this report mention that the transfer of water from areas of abundance to areas with inadequate supply is an important alternative to consider in supplying these deficient areas (pp. III-62). The report later suggests interconnection of systems for greater flexibility and better emergency preparedness (p. IV-75). It also suggests that Nassau County purchase the 72" diameter aqueduct that runs along Sunrise Highway, and incorporate it into a county-wide transmission system (p. IV-78).

While the overall scope of each of the referenced studies was not exactly the same, similar conclusions and recommendations were made throughout the decades. The following is a brief summary of the most relevant conclusions and recommendations:

- Importation of water from Suffolk County or New York City to Nassau County to reduce pumping in Nassau County and/or to supplement its water supply
- Interconnections and agreements between Nassau County water suppliers to assist smaller water suppliers most susceptible to saltwater intrusion or other sustainability issues
- Formation of a Nassau County Water Authority to manage the locations of aquifer withdrawals county-wide
- Shutdown of the Jamaica Water Supply system and connect it to the New York City (NYC) surface water supply system
- Installation of centralized drinking water wells and transmission mains to provide water to smaller water suppliers most susceptible to saltwater intrusion or other sustainability issues
- Purchase of and rehabilitation of the 72-inch aqueduct along Sunrise Highway

Some of the above conclusions and recommendations have been realized while others have not. A recent attempt to import water from the SCWA into the Village of Farmingdale was unsuccessful due to political objections. Interconnections now exist between all neighboring water suppliers. However, formal agreements may not exist in all cases. The formation of a Nassau County Water Authority has been met with political resistance. The former Jamaica Water Supply wells have been removed from service; however, NYC is currently pursuing the idea of returning these wells to service for possible drought protection. The concept of centralized wells and transmission mains has not been implemented.

Evaluation

Since construction of a long-distance water transmission main has never been attempted before on Long Island, developing an accurate cost estimate for such a specific project is difficult. Fortunately, the SCWA has investigated the concept of long-distance water transmission through relatively large-diameter water mains in two areas affected by elevated nitrate levels.

One such estimate consisted of over 88,000 ft. (16.8 miles) of water main ranging in size from 12" to 30" diameter. This main would originate in the Dix Hills area and connect to the Northport, East Northport, and Huntington areas, all of which have wells with elevated nitrate levels. This main is designed to transmit approximately 12,000 gallons per minute (gpm), at an estimated cost of $20.5 million or $1.22 million per mile (about $231 per linear foot). The second transmission main project investigated by the SCWA involves construction of a water main connecting Greenport to Orient in the Town of Southold. It would consist of over 17,000 ft. (3.36 miles) of 12" diameter pipe. With a design flow of approximately 500 gpm, its estimated cost is approximately $3.84 million or approximately $1.14 million per mile (about $216 per linear foot). There is remarkable similarity in price between the two project estimates, despite the fact that they are quite different in terms of quantity of water, size, and length.

Other area water suppliers have investigated the concept of long-distance water transmission as well. In a recent project under design, the Westchester Joint Water Works (WJWW) has investigated the use of the New York City Department of Environmental Protection Delaware Aqueduct (Shafts 20 and 22) as replacement water for its Rye Lake water source. The cost estimate for the transmission mains, which include mains from 12" to 60" in diameter, ranges from $200 per linear foot for 12" mains up to $3,000 per linear foot for 60" mains.

The WJWW also is investigating the feasibility of a 16" diameter transmission main project. The project design is done by modeling and involves 9,800 feet of 16" inch main. The cost estimate is approximately $5,000,000 or $510 per linear foot. The cost includes a bridge crossing and approximately 8 utility crossings.

Factors affecting the current status of water transmission on Long Island are as follows:

1. Many, if not all, Nassau and Suffolk County suppliers have emergency interconnections in place currently. However, formal agreements for the exchange of water do not exist at all interconnections. Further, many of these interconnections are not metered.
2. Many coastal water suppliers are vulnerable to the impacts of salt water intrusion and would most likely be among the first public water suppliers to consider importing water from neighboring water suppliers. These agreements should be incentivized and implemented.
3. Water suppliers which are impacted by large contamination sources may benefit from importing water from neighboring water suppliers. A cost analysis will be required to determine whether this is beneficial. Further, the potential impact to the movement of the contamination plume must be understood. Groundwater modeling is required prior to implementing this policy.
4. Prior to moving large volumes of water from county to county or from supplier to supplier, research must be conducted in several areas:
    a. Impacts to the aquifer from the supplier providing the water by over-pumping a well or well field that could potentially change aquifer flow patterns and draw in contamination that may affect other supplier's sources.
    b. Jurisdictional boundaries set by state law (franchise territory) when districts and/or authorities were created that prohibit that district or authority from operating or managing systems outside of their coverage area.
    c. Studies, reports, and hydraulic models should be referenced or conducted when investigating the effects of moving large volumes of water from one geographic area to another.
    d. Development of a regional groundwater model is required to fully understand the sustainability of the aquifer(s). A full understanding of pumpage versus recharge is required in order to make sound policy decisions. Data must be collected on a continuous basis in order to maintain the model into the future.
    e. A thorough cost analysis must be done. Such an analysis must include the actual cost of installing water mains of appropriate diameter as well as any land acquisition and booster stations that may be needed. The cost of any additional wells to supply water into the transmission mains must also be calculated. Ancillary costs, such as environmental studies, engineering, and laboratory sampling, must also be included.

Additional Considerations

Routing

Numerous factors go into the decision on the exact route of a transmission main. Construction-related factors include the road opening permits that may be required from different municipalities (and the resulting necessary restoration), the proximity to wetlands and the mitigation that will be required, the depth to groundwater and any dewatering that may be necessary during construction (including the discharge and/or disposal of the pumped water), and the requirements for jacking or horizontal directional drilling for long underground crossings of creeks or highways. Overall planning-related factors influencing the route include elevation changes and the number and severity of any bends in the pipeline, both of which dictate head losses along the route of the pipeline and the possible requirement for booster pumps. In order to recover the head loss due to friction and provide water at the proper pressure and at the proper elevation, several booster pumps undoubtedly will be required. Acquiring land for booster pumps as well as the electricity to operate the pumps will add substantially to the overall costs of any transmission project. All of these factors add to the expense of the overall project to a degree indeterminate at this time.

Hydrogeologic Impacts

In addition to the recommendations regarding the infrastructure and facilities required for long distance transmission, more recent studies have attempted to evaluate the potential hydrogeologic impacts of this practice. Since all the water in any scenario involving long distance transmission will be used and

recharged a substantial distance from its source, it will be permanently lost from the groundwater system in the area from which it is pumped. This could result in the long-term lowering of the water table in coastal plain ponds and wetlands within sensitive areas (such as the Pine Barrens). The impacts of this hydrologic imbalance will need to be investigated to see if they meet permit criteria. Groundwater models are excellent tools for investigating and quantifying such impacts. In consideration of its transmission proposal as described above, the SCWA utilized the Suffolk County Groundwater Model in order to obtain a rough "order of magnitude" estimate of the hydrologic impacts of a hypothetical scenario involving consumptive pumping from the Pine Barrens area. In this simulation, five pumping centers were chosen each with a pumping rate of 2 mgd, for a total of 10 mgd of total additional pumpage. Each well was simulated to be screened in the middle Magothy aquifer, in order to minimize impacts to the water table. The simulations resulted in water table drawdowns of up to 3 feet in some portions of the Pine Barrens at the simulated rate of 10 mgd. Some mitigating measures undoubtedly would be necessary to prevent long term impacts to surface waters and wetlands. The NYSDEC would be best to comment on the feasibility of and mitigations required for a project of this size and scope.

Permitting

A cross county water transmission proposal would require a coordinated review by local health departments, water suppliers affected, the New York State Department of Health, the NYS DEC, and possibly the United States Environmental Protection Agency. A process for evaluation and approval would need to be developed by those involved regulatory entities. As a minimum, it would include the preparation of an engineering report, engineering plans, obtaining public comment, and potentially an Environmental Impact Statement. There would be a host of issues that would have to be addressed in the engineering report including the source and quality of the treated water, the protection of the water supply, storage and pumping, source and distribution system controls, pressure, flow and water quality monitoring, etc.

Conclusions and Recommendations

The following conclusions and recommendations are offered:

1. Incentivize the implementation of intermunicipal agreements for water transfer to water suppliers which are threatened by salt water intrusion or other major sources of contamination. This includes the purchase and transmission of water from both New York City and Suffolk County into Nassau County.
2. Fund the development of a regional groundwater model to be used for planning purposes.
3. Evaluate the potential costs involved.

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