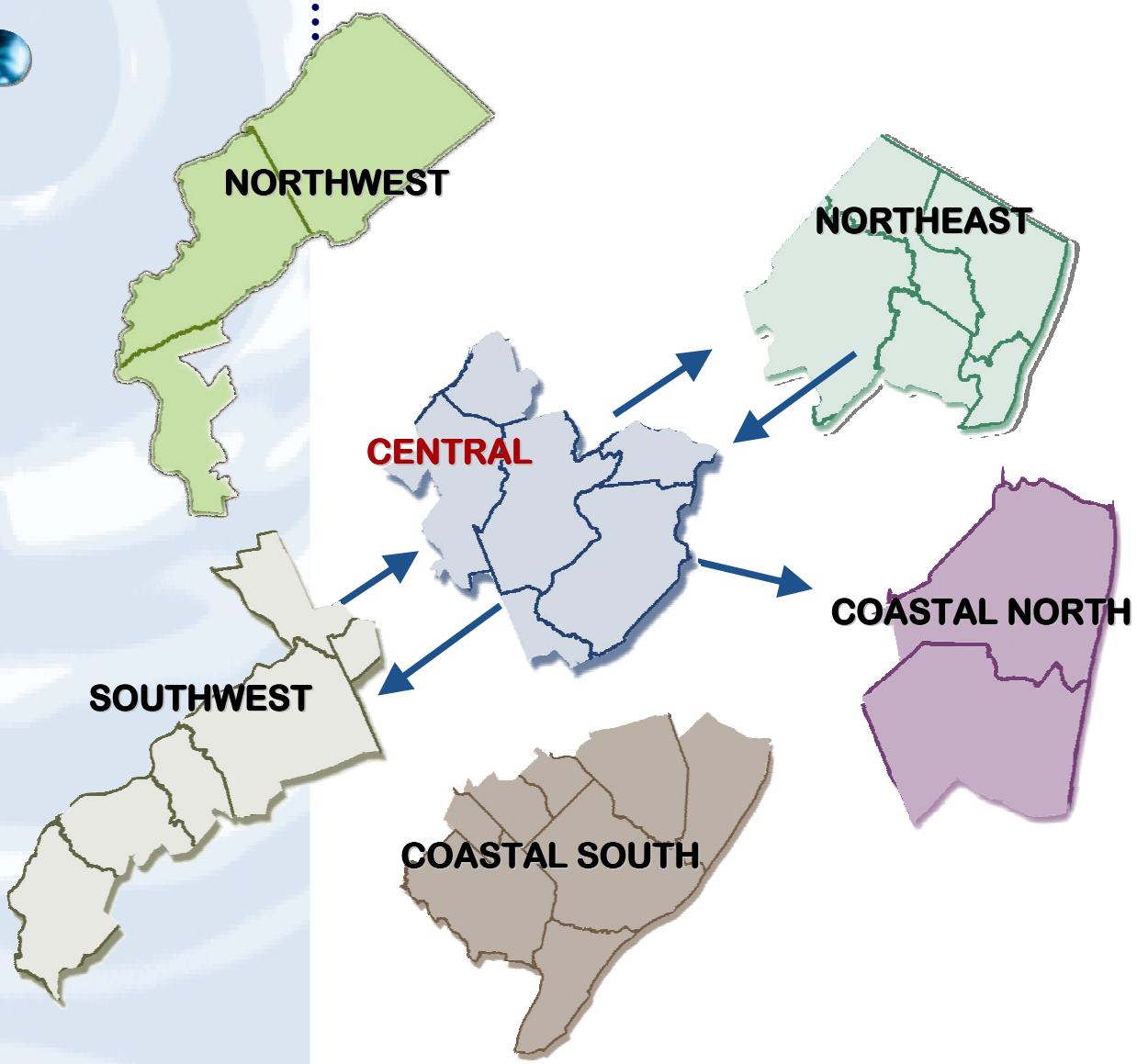
new jersey department of environmental protection
nidep

INTERCONNECTION STUDY MITIGATION OF WATER SUPPLY EMERGENCIES
EXECUTIVE SUMMARY

Public Version



Gannett Fleming BLACK & VEATCH

Executive Summary

The New Jersey Department of Environmental Protection (NJDEP) issued a Request for Proposal (RFP) in 2004 to complete an Interconnection Study. The RFP included the following statement:

> "The study shall evaluate the existing primary water transmission infrastructure in New Jersey. Both physical (interconnections and major transmission routes) and financial (contracts and operational costs) will be evaluated to provide recommendations with estimated costs to:
>
> - Optimize current water diversions and transfers to avert and mitigate drought related water supply emergencies.
> - Mitigate the effects during water supply emergencies due to catastrophic loss.
> - Optimize current water diversions under 'normal operation'."

The goals of the Interconnection Study are threefold. First, the Study will develop recommendations on how to optimize current water diversions and transfers between systems in an effort to avert and mitigate drought related water supply emergencies. Second, the Study will identify procedures to lessen the impacts on the State's water supply systems due to catastrophic losses. Third, the Study will attempt to optimize the existing system interconnections during "normal operations" to help increase overall water transmission efficiencies across the State.

Similar to the 1986 Water Resources Interconnection Feasibility Study, this Interconnection Study is divided into six (6) tasks. The tasks were defined in the original RFP dated May 2004. Each task and the manner in which they were addressed are described below.

<u>Task 1 – Physical Infrastructure & Capacity Evaluation</u>

In this task the status and capacity of the existing Primary Water Transmission and Interconnection Infrastructure was determined. Primary Water Transmission Infrastructure has been defined as:

- Interconnections between water systems at least 12 inches in diameter and any pump station/pumping equipment that is integral to the operation of the interconnection.
- The RFP required water mains that are at least 24 inches in diameter or water main networks capable of transmitting a flow rate of 20 million gallons per day (mgd) under normal operating pressures. In many cases 16-inch mains were included. This is described in more detail in Chapter 2.

The goals of the Interconnection Study are to develop recommendations on how to optimize current water diversions and transfers between systems in an effort to avert and mitigate

drought related water supply emergencies. The Study will identify procedures to lessen the impacts on the State's water supply systems due to catastrophic losses, and to identify deficiencies in existing interconnection infrastructure and recommend improvements and additional infrastructure. The Study will attempt to optimize the existing system interconnections during "normal operations" to help increase overall water transmission efficiencies across the State.

This task included the identification of deficiencies, including operational status, hydraulic restrictions, and contractual limitations in the existing interconnection infrastructure.

In completing this task, a list of information was developed that was required to complete this task as well as Tasks 2 - 6. The information was assembled from the Department archives and individual systems.

Task 2 – Hydraulic Model

This task requires the development of a hydraulic model of the existing primary interconnections and transmission routes in New Jersey. The model was developed from data collected in Task 1 and was utilized in Tasks 1, 3, 4, and 5.

Task 3 – Optimizing Existing Water Diversions During Drought Conditions

This task involves the evaluation of existing water diversions and operational conditions to identify what changes can be made to avert drought related water supply emergencies. As part of this task, a decision support tool was developed that can be used by the NJDEP to assist in making drought related decisions in the future. The process of developing the decision support tool is described in Chapter 6.

Task 4 – Catastrophic Infrastructure Failure

This task is intended to address both security and reliability concerns from a statewide perspective. The primary elements of this task involve the evaluation of community systems under a variety of catastrophic "what-if" scenarios and the subsequent determination of recommended improvements, in cases where the communities are deemed to be at risk as a result of the catastrophic scenarios.

The purpose of the evaluation is to identify a classification for each system for each of the what-if scenarios to assess a system's vulnerability to the respective catastrophic event.

Task 5 – Optimize Diversions During Normal Conditions

This task is intended to identify areas for possible improvement in water-supply planning during normal conditions. During normal conditions, optimization is focused on management and preparation for drought at the local level — within water systems.

Task 6 – Financial Infrastructure

This task is intended to address the impact on purveyors' financial condition when the State adopts regulations which change water diversions, water conservation measures, and transmission of water to confront water supply emergencies. The primary focus of this task is evaluating the existing financial infrastructure of the parties involved to determine if it will be necessary to propose changes in order to avoid disproportionate financial hardship or profits.

Organization of the Chapters of this Report

During this project and the development of this report it was determined that it would be better to organize them in the following fashion:

Chapter 2	Task 1 – Physical Infrastructure & Capacity Evaluation
Chapter 3	Task 2 – Hydraulic Model
Chapter 4	Task 4 – Catastrophic Infrastructure Failure
Chapter 5	Water Supply Management Decision Support Tool
Chapter 6	Task 3 – Optimizing Existing Water Diversions
Chapter 7	Task 5 – Optimize Diversions During Normal Conditions
Chapter 8	Evaluation of Recommendations
Chapter 9	Task 6 – Financial Infrastructure

Water Supply Prioritization & Recommendations

New Jersey, because of its relatively small size and extended potable water systems, has a unique opportunity to integrate most of their major water sources throughout the state. NJDEP's support for interconnections between regions will allow the potable water systems to have multiple redundancies at their disposal to address all types of catastrophes.

The recommendations of this report are as follows:

1. It is recommended that the NJDEP institute the Advisory Curve and Water Supply Management Decision Support Tool (WSMDST) as described in Chapter 6. This will require the Drought Management Rules be amended to give the NJDEP powers under a Drought Advisory similar to the powers under a Drought Warning (Water Supply Allocation Rules 7:19-11.6) which include, among other parameters, the ability for the NJDEP to mandate water transfers. These rules and the potential pricing arrangements are discussed in Chapter 9.

2. The greatest opportunity for demand transfer involves the New Jersey American Water Company (NJAWC)-Elizabethtown – Newark-North Jersey District Water Supply Commission (NJDWSC): These 3 systems are interconnected through the [NAME REACTED]. NJDWSC has conducted preliminary

investigations of an operational procedure change to provide a continuous supply of 10 mgd from the Elizabethtown system to the NJDWSC system via the Virginia Street Pumping Station. Their investigations indicate that if this had been in place between 1990 and 2003, the number of days the Wanaque Reservoir was below the drought warning curve would have been reduced from 221 days to only 29 days. This study identifies this interconnection as a critical reducing the length of droughts in the Northeast Region. This option merits support by the NJDEP.

3. It is recommended the NJDEP and United Water begin discussions to evaluate the potential for additional water supply. Based on the analysis in this study United Water was identified as a purveyor in deficit in six of the seven drought simulations. In addition, the United Water interconnection with Jersey City and NJDWSC were identified as the limiting interconnections during non-simulated drought emergencies.

4. It is recommended that [NAME REDACTED] and [NAME REDACTED] evaluate options that would allow them to be rated higher than vulnerable in the catastrophic infrastructure analysis. Both systems are classified as large systems serving more than 50,000 people, are somewhat isolated and have limited existing options. There are some nearby options that could assist that should be investigated.

5. It is recommended that NJDEP update their statewide Drought Management Plan to redefine roles of various state and local agencies during a drought emergency, to establish minimum requirements of local plans, and to provide guidance to local agencies for drought response. An updated statewide drought management plan will insure that agencies throughout the state implement consistent responses to the Drought Indicator System, thus encouraging an equitable distribution of hardship during drought emergencies. This plan should include, among other things, statewide conservation goals and minimum water use restrictions for each sector during each drought stage.

6. Reclaimed Water for Beneficial Reuse (RWBR) is a proven water supply management tool that has been used extensively in other areas of the country and shows great potential as a water supply management tool for New Jersey. As NJDEP continues to develop and promote its RWBR program, they should develop a strategic plan and long-term goals for the program. This plan should identify goal volumes of reuse to be achieved in the state as a whole and in individual regions, according to regional water needs. To better position themselves to meet their long term goals, New Jersey might consider establishing a program to provide financial incentives for agencies to evaluate the benefits and possibilities of reuse.

7. The distribution networks of the NJAWC's Elizabethtown and Short Hills systems currently are interconnected, and part of the Short Hills system demand is met with water from the Elizabethtown system. Modeling shows benefits of strengthening the connections between these 2 regions. The Short Hills system has an average demand of just under 40 mgd, about 30 of which is met with supplies in the Northeast Region. If this demand could be met with supplies from the Central Region, about 30 mgd of supply might be made available to meet demands in the Northeast Region on a regular basis. More detailed investigations are needed to determine the economic and political feasibility of this option.

8. Additional studies are also recommended to evaluate the feasibility, costs, and benefits of source optimization and demand transfer between surface water and groundwater within the Middlesex Water, NJAWC-Western and Sayreville systems.

9. Aquifer Storage and Recovery (ASR) appears to have great potential as a water supply management tool in New Jersey. It is recommended that NJDEP continue to promote ASR through programs that encourage utilities to incorporate ASR into their water supply planning. The current permitting process and monitoring requirements are extensive, intimidating and can take years to navigate, the discharge permit being the most difficult hurdle. Therefore, it is recommended that NJDEP review the process and consider streamlining these processes as much as possible, and assist in coordinating permitting activities among the various DEP Bureaus. It is further recommended that NJDEP encourage more utilities to pilot and hopefully adopt ASR for multi-year water storage or "banking". This technology provides drought management through the transfer of demand from year to year, storing during wet years and recovering during dry years.

10. NJDEP is interested in establishing standard recommendations even regulations for evaluating water losses and in determining the demand reduction that could be realized if systems are optimized. To this end, it is recommended that NJDEP require all utilities to conduct annual water audits using the IWA/AWWA Water Audit Method and to implement a leakage control plans. Once a uniform system for auditing and reporting water losses water is implemented statewide, it is recommended that NJDEP commission a detailed study and cost benefit analysis. This study would evaluate the potential for demand reduction that could be realized through enhanced water loss control and determine if the benefits of the reductions balance the cost of implementing control programs. The NJDEP could then use the results of this study to establish or modify their goal ILI based on achieving some desired level of demand reduction.

Financial Recommendations and Guidelines

In our initial discussions with the NJDEP it was considered that water transfers during a drought situation should be priced at the bulk purchase rate (bulk rate) in existing contracts or below so that supplying water systems would not profit from the drought situation. However, an alternative view was expressed during discussions with water purveyors. The consensus was that if the transfer of water during a drought was priced at bulk rate or below, there would be no incentive for water systems that habitually fall into a drought situation earlier than others due to inadequate water supply to set up long term contracts with the neighboring suppliers or to invest in alternative sources of water. It was a concern that these systems would always get "bailed out" at the expense of the supplying systems and their customers that funded the infrastructure in order to have an adequate water supply. On the other hand, if the supplying water systems are guaranteed a high rate for their water in a drought situation, these supplying systems may not have motivation to sign a long-term contract at a lower rate than their General Metered Service (GMS) rate. The following recommendations address these issues.

1. In preparation for emergencies, we recommend that the NJDEP, during the permitting process, enforce the requirement that water purveyors with physical interconnections with other water purveyors have an Emergency Water Transfer Pricing Schedule in place at all times, including a bulk rate for those systems that expect diversions over .1 mgd. These prices can be in accordance with the criteria outlined in the Water Supply Allocation Rules and would be used in case of a water transfer to a water system not currently engaged in a long term contract with the supplying water system.

2. In addition, the Emergency Water Transfer Pricing rules could be amended to include the stipulation that if a water purveyor is in a drought situation and is buying from a supplier who is not under water use restrictions, that the purchasing water supplier pay its own GMS rate and the difference between the bulk rate charged by the supplying system and its own GMS rate would then be used as a funding source for the State to supplement the 1981 bond fund and used for State sponsored projects. This structure could potentially create a funding source for needed projects but must be carefully considered as to not create a hardship situation for the purchasing water purveyor. However creative solutions between water purveyors should be encouraged, such as the use of standby fees and/or long-term contracts that would supersede the Emergency Water Transfer Pricing rules.

3. It is proposed that the water systems with interconnections develop a standby agreement which pays the supplying water purveyor a fee to have an assured source of water at a bulk rate price in an emergency (including drought) rather than being subject to the Emergency Transfer Pricing rules. This fee should be priced to compensate the rate payers of the supplying system for the investment in infrastructure. The consumption charge for the actual use could then be set to the

incremental cost of supplying the water or a bulk rate since the fixed costs have already been paid through the standby fee. Potentially, these standby fees could evolve to a steady purchase of water by the water systems in need, which could help mitigate water shortages under drought conditions.

4. If a water purveyor does not develop a contract as recommended above for an emergency, it is recommended that NJDEP impose an alternative based on the Emergency Water Transfer Price criteria. In this case, the water purveyor in need of water during a period of water restriction and without long term contracts with water suppliers would risk the price of water equal to the supplying water purveyors' GMS rate or its own GMS rate depending on the regulations. This risk may encourage the development of an alternative pricing strategy, the development of an alternate water source, or even prevent the water purveyor in need from buying the water, choosing instead to impose further restrictions on water use for its customers. In the long run, this approach may force an open dialogue with the rate payers. The water purveyor could describe the options and costs related to a long term contract, development of a new water supply and expanded water restrictions. In some cases the rate payers will accept rate increases to reduce the need for restrictions. In others the rate payers will prefer the restrictions to higher rates.

   This strategy could also create the impetus for the supplying water purveyor to be open to negotiation of terms. If the supplying water purveyor is aware that the water system in need is going through an evaluation of the alternatives they may be more inclined to consider negotiation in the terms when confronted with the risk of losing the opportunity altogether.

5. In addition, the Drought Management Rules should be amended to compensate intermediary water systems that “wheel” the water from one system to another. As stated earlier in this report, the fee should be based upon the allocated cost of pumping and transmission for the wheeling water system. However, absent a long term contract, the NJDEP should recommend a wheeling fee that equals the difference between the wheeling system's GMS rate and its Sales for Resale rate. In some instances the NJBPU may have to be included in these discussions.

6. Most importantly, we recommend that the Drought Management Rules be amended to give the NJ DEP powers under a Drought Advisory similar to the powers under a Drought Warning (Water Supply Allocation Rules 7:19-11.6) which include, among other parameters, the ability for the NJ DEP to mandate water transfers. The pricing mechanism is not discussed in the Water Allocation Rules for a Drought Warning, however we recommend using the Emergency Water Transfer Pricing rules and criteria if another contract is not in place. In addition, the Drought Management Rules should be amended to stipulate that if an agreement is not already in place the water purveyor in need of the water transfer (as indicated by the model referenced in this report) should pay any costs related to the rehabilitation

and activation of interconnections between water systems and completion of the interconnection flow tests.

7. Finally, it is also recommended that the NJDEP work with the water suppliers, public and private, who have take or pay contracts with other water purveyors to add flexibility to the use of the water supply. The purchasing water purveyor should be reimbursed for some or all of its contractual allocation of water if it is used by another water purveyor whose source of water is more limited. This reimbursement must be at least equal to the price paid for water via an alternate source used. This would allow for a more efficient distribution of water in a potential drought situation. NJDWSC is one of the largest water suppliers in the State and maintains take or pay contracts with various water purveyors. The Commission has indicated that the water purveyors on its system, through a series of contracts, have a mechanism to be reimbursed for their water allocation if it is used by another water purveyor in times of water shortages.