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UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

Before the Atomic Safety and Licensing Board

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In the Matter of
LONG ISLAND LIGHTING COMPANY
(Shoreham Nuclear Power Station,
Unit 1)

Docket No. 50-322-OL-3
(Emergency Planning)

DIRECT TESTIMONY OF SARAH J. MEYLAND
ON BEHALF OF THE STATE OF NEW YORK
REGARDING LILCO'S PROFFERED EVIDENCE OF JANUARY 11

Q. Please state your name and business address.

A. My name is Sarah J. Meyland. My address is 43 South
Middle Neck Road, Great Neck, New York 11021.

Q. By whom are you employed, and what position do you
hold?

A. I am the Co-Executive Director of the New York State
Legislative Commission on Water Resource Needs of Long Island.
The Commission was established pursuant to Chapter 50 of the
Laws of New York for 1979, which, as amended, empower the
Commission: (1) to investigate and evaluate studies and reports
which indicate that the water supply and water resources of
Suffolk and Nassau Counties may be in jeopardy; (2) to make

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recommendations for provisions to be made for the regulation and supervision of activities that deplete, defile, damage or otherwise adversely affect the waters of Suffolk and Nassau Counties, and the land resources associated therewith; (3) to determine where uncontaminated or virgin sources of water exist; and (4) to recommend legislative or administrative activities that are required to preserve and protect such resources for future use. The Commission has six members, all of whom are appointed from the body of the New York State Legislature, with three members each from the State Senate and Assembly. Attachment 1 to this testimony is a copy of Chapter 50 of the Laws of 1979, as subsequently amended.

Q. Please describe your qualifications and educational background.

A. I have been the Co-Executive Director of the Commission for five years. I have also served on the Technical Advisory Committee to the New York State Department of Environmental Conservation's Long Island Groundwater Management Program, and I am presently a member of the Technical Advisory Committee for the Suffolk County Comprehensive Water Resources Management Plan. I am an elected member of the New York State Board of Directors of the American Water Resources Association, a society of professionals interested in the protection, management and development of the country's water resources. I hold a Bachelors of Science degree in Geological Oceanography (California State - Humboldt, 1972), a Bachelors of Science degree in Biology, with

specialization in Marine Zoology (California State -Humboldt, 1972), and a Masters degree in Water Resource Management (Texas A&M, 1978). A statement of my qualifications and experience is Attachment 2 to this testimony.

Q. Please briefly describe the purpose of the New York Department of Environmental Conservation's Long Island Groundwater Management Program.

A. The New York State Department of Environmental Conservation's Long Island Groundwater Management Program was a federally-funded project initiated by the New York Department of Environmental Conservation ("DEC") to study and obtain recommendations regarding future groundwater management on Long Island. In the spring of 1984, the DEC completed its review and issued a draft report. The Executive Summary of that report is Attachment 3 to this testimony, and demonstrates the importance of groundwater to Long Island. In addition, the report sets forth some of the current Long Island groundwater problems and issues. Some salient points from the DEC's report are that approximately six million New York State residents (approximately one-third of the State's population) depend upon groundwater. Of this total, approximately three and a quarter million people depend upon the groundwater underlying Brooklyn, Queens, and Nassau and Suffolk Counties. This vast aquifer is the only source of drinking water for this population and has therefore been designated by the Federal government as a sole source aquifer.

Already, groundwater contamination on Long Island has resulted from commercial, industrial, agricultural and residential development of the land surface directly above the aquifer. In addition, the possibility of additional contamination reaching the aquifer system is increased by the porous nature of Long Island's soils. Once a contaminant reaches the aquifer, it tends to remain in the groundwater system for many years and clean-up may be technically or economically impossible.

Q. What is the purpose of this testimony?

A. The purpose of this testimony is to address LILCO's proffered evidence of January 11, 1985 concerning LILCO's proposal to use the Nassau Coliseum to monitor and decontaminate evacuees in the event of an emergency at the Shoreham nuclear power plant.

Q. Are you familiar with the evidence proffered by LILCO?

A. Yes. I have reviewed LILCO's evidence and am familiar with its contents.

Q. What is your opinion regarding LILCO's proposed use of the Nassau Coliseum?

A. In my opinion, there could be serious problems with LILCO's proposal.

Q. What are these problems?

A. First, LILCO's proposal to decontaminate evacuees and their vehicles at the Nassau Coliseum may pose a risk to the groundwater supply of Nassau County, Long Island, where the Coliseum is located.

Q. Are you familiar with the groundwater supply at Mitchel Field?

A. Yes. I am very familiar with the Mitchel Field area through both my job as Co-Executive Director of the New York State Legislative Commission on Water Resource Needs of Long Island and my membership on the Advisory Committee to the DEC's Long Island Groundwater Management Program. In addition, in response to the final Generic Environmental Impact Statement ("GEIS") for the Mitchel Field area prepared in October 1984 by the Nassau County Planning Commission, I submitted extensive comments concerning the findings of the GEIS with respect to water quality and quantity in the area.

Q. What risks to the groundwater supply at Mitchel Field from LILCO's proposed use of the Nassau Coliseum are of particular concern to you?

A. It is my understanding that LILCO is proposing to perform decontamination procedures in the event of a Shoreham emergency at the Nassau Coliseum and the surrounding property. For example, the exterior of vehicles, if found to be contaminated, would be sprayed with water and, if necessary, scrubbed with a detergent. LILCO Plan, OPIP 3.9.2, Attachment 7. The water used in the decontamination process, which is to be performed in the parking lots at the Nassau Coliseum, would, along with any radioactive contamination, run off the parking lot surface, percolate through the soil, and eventually reach the groundwater supply.

Mitchel Field is located in one of the primary groundwater recharge areas for Nassau County and Long Island. A primary recharge area is one which resupplies the principal underground aquifer, the Magothy, by the percolation of precipitation through the ground surface. See generally Attachment 3, at page 3, for a description of groundwater flow patterns on Long Island.

Mitchel Field lies within an area which has been classified as hydrogeologic "Zone 1" in the Long Island Comprehensive Water Treatment Management Plan, also known as the "208 Plan," prepared by the Long Island Regional Planning Board in 1978. This classification system, which has been adopted by the DEC, means that stringent measures must be taken to protect the water quality of the area, since water recharged in the area is crucial to the replenishment of Long Island's groundwater supply. Put another way, the Mitchel Field area lies in a deep flow recharge area of Long Island. Outside a deep flow recharge area, groundwater flow patterns tend to be more shallow and to move outward and toward the ocean. Groundwater flow patterns, however, in the Mitchel Field area tend to be downward into the deeper aquifers, including the Magothy, Long Island's (and especially Nassau County's) primary source of public water supply. The quality of recharge water in the Mitchel Field area must therefore be stringently protected from contamination, since contamination released in a deep flow recharge area is a greater threat to the deeper aquifer than is contamination released in peripheral "shallow flow" recharge areas.

It is the deep flow recharge pattern of water within the Mitchel Field area, as well as the inability of the sandy soils of Long Island to filter out contaminants, which make the area very sensitive to surface contamination, and the Nassau Coliseum an inappropriate location for LILCO's proposed decontamination procedures. Any contaminants that are released into the ground and recharged along with the water in the area would ultimately move through the shallow upper glacial aquifer and into the deeper Magothy aquifer, which provides more than 90% of all water used in Nassau County. Moreover, since the Coliseum is in a deep recharge area, surface contamination would eventually move into the Magothy aquifer, which is where most public water supply wells draw their water. Thus, any possible contamination to the groundwater supply in the area of the Nassau Coliseum would pose a potential risk to the water supply of Nassau County.

Q. Do you have any other concerns regarding LILCO's proposed use of the Nassau Coliseum?

A. Yes. The Mitchel Field area is already seriously environmentally stressed, with the groundwater in parts of the area already contaminated by toxic chemical pollution from several severely contaminated areas. One of these, the "Purex" site (which is inside Mitchel Field), is one of the most severely contaminated sites known to exist in Nassau County or Long Island. Two public water supply wells located at Mitchel Field in the Uniondale Water District are already directly threatened by the Purex contamination. The contamination is moving toward the wells and may already have reached the well sites.

Q. In what way could the proposed activities at the Nassau Coliseum have an environmental impact on the Mitchel Field area?

A. In the event that decontamination activities took place in the parking areas surrounding the Coliseum, it is conceivable that there could be radiologically contaminated runoff from the water used to wash cars and other purposes. The runoff would likely flow into drywells (cement collectors of surface water with a storage capacity of approximately 400 cubic feet) in the parking lot or directly to recharge basins (man-made depressions in the ground which vary in size but may be as large as several acres), several of which exist within Mitchel Field.^{1/} Recharge in the drywells and recharge basins would be relatively rapid, because of the excellent percolation quality of the soil and the short distance between the land surface and the upper glacial aquifer (i.e., the water table), which is only 20 to 30 feet underground. Thus, the contaminated water would easily and quickly reach the water table, and once there, could not easily be removed. Over time, the contamination plume (the body of pollution) would continue to migrate, and could conceivably intercept a public water supply. It is strongly suspected that the contamination from the Purex site was conducted to the groundwater by drywells.

^{1/} The drywells, which collect runoff and allow it to percolate into the ground, are connected to piping systems that discharge into recharge basins in the event of overflows at the drywells. Mitchel Field contains a number of recharge basins (see Attachment 4 to this testimony) into which runoff, the water from storm drainage pipes, and the overflow from the drywells are collected and allowed to leach into the ground. Thus, runoff water at Mitchel Field is eventually recharged to the ground.

Q. Are there any public water supply wells located close to the Coliseum?

A. Yes. There are nine public water supply wells within one mile of the Mitchel Field area, and Mitchel Field supply wells # 5 and # 4 are located approximately 1,000 and 2,000 feet respectively to the north of the Nassau Coliseum. Well # 5 is located in a grassy "y" where an approach road to the Coliseum branches from Lindberg Boulevard. Well # 4 is located south of Lindberg Boulevard, near the Meadowbrook Parkway. The proximity of these two wells to the Coliseum and the volume of water withdrawn from these wells could potentially impact the spread of any groundwater pollution caused by LILCO's use of the Coliseum, including drawing the contamination toward the well sites.

Q. What, generally, is the pattern of water withdrawal in the Mitchel Field area?

A. There is a major problem in Nassau County with excessive water withdrawal. According to Nassau County statistics, there are 15 districts to the south and west of Mitchel Field that are presently drawing more water out of the ground than is safe. The two wells in western Mitchel Field are actually part of the Uniondale Water District, which is one of the 15 water districts which are overdrawing. Two new wells just north of the Coliseum are not yet operational, but will be part of the Mitchel Field Water Supply Area, which is permitted by New York State to draw a maximum of 3.5 million gallons per day. These 15 water

districts supply water to approximately one-half the population of Nassau County.

Q. Are there other water resources that could be threatened by LILCO's proposed use of the Nassau Coliseum?

A. Yes. Meadowbrook Creek, which runs close to the Coliseum, is fed by groundwater in the area. In addition, overflows from the recharge basins in the area are directed to Meadowbrook Creek.

Q. Could LILCO's proposed use of the Nassau Coliseum have any impact on the sanitary sewage system?

A. Yes. The discharge of radiologically contaminated water would go into the sanitary sewage piping and treatment facilities of sewer district # 3. This would include waste water from showering and washing activities, but the impact of radiologically contaminated urine and feces from evacuees should not be overlooked. The disruption of sewage treatment by a radiological impact on the bacteria necessary for such treatment needs to be studied for any adverse impacts. To my knowledge, neither LILCO nor Nassau County has considered these kinds of impact from LILCO's proposed use of the Coliseum.

Q. Does that conclude your testimony?

A. Yes.

LEGISLATIVE COMMISSION ON WATER RESOURCE NEEDS OF LONG ISLAND

(CHAP 50)

The legislature hereby finds and declares that the state has the sovereign power to regulate and control the water resources of this state, including the counties of Nassau and Suffolk and an adequate and suitable water supply for two such counties for water supply, domestic, municipal, industrial, agricultural and commercial uses, power, irrigation, transportation, fire protection, sewage and water assimilation, the growth of the forest, maintenance of fish and wildlife, recreational enjoyment and other uses is essential to the health, safety and welfare of the people and economic growth and prosperity of two said counties.

Recent studies and reports have been made which indicate that due to many diverse reasons, the water supply and water resources of the two said counties may be in jeopardy.

Accordingly, a legislative commission is hereby established (a) to investigate and evaluate said reports; (b) to make recommendations for provisions to be made for the regulation and supervision of activities that deplete, defile, damage or otherwise adversely affect the waters of the two said counties, and the land resources associated therewith; (c) to determine where uncontaminated or virgin sources of water exist in both counties; and (d) to recommend legislative or administrative actions that are required to preserve and protect such resources for future use.

Such Commission shall consist of six members to be appointed as follows: two members of the Senate shall be appointed by the temporary president of the Senate; two members of the Assembly shall be appointed by the Speaker of the Assembly; leader of the Senate; and one member the Assembly. Any vacancy that occurs in the Commission shall be filled in the same manner in the original appointment was made. Co-Chairmen of the Commission shall be designated by the President Pro-tem of the Senate and the Speaker of the Assembly respectively. No member, officer, or employee of the Commission shall be disqualified from holding and other public office or employment, nor shall he forfeit any such office or employment by reason of his appointment hereunder, notwithstanding the provisions of any general, special, or local law, ordinance, or city charter.

The Commission may employ personnel required and fix their compensation within the amount appropriated therefore. The Commission may meet within and without the state; hold public and private hearings and otherwise have all of the powers of a legislative committee under the legislative law. The members of the Commission shall receive no compensation for their services but shall be allowed their actual and necessary expenses incurred in the performance of their duties hereunder.

The Commission may request and shall receive from any subdivision, department, board, bureau, commission, office agency or other instrumentality of the state or of any political subdivision thereof, such facilities, assistance and data as it deems necessary or desirable for the proper execution of its powers and duties.

The Commission is hereby authorized and empowered to make and sign any agreements, and to do and perform any acts that may be necessary, desirable or proper to carry out the purposes and objectives set forth herein.

The Commission shall submit a report to the Governor and the Legislature containing its findings on or before March thirty-first, nineteen-hundred eighty-five. The Commission shall continue in existence until March thirty-first, nineteen-hundred eighty-five.

SENATOR CAESAR TRUNZO
CO-CHAIRMAN
STATE OFFICE BUILDING
HAUPPAUGE NEW YORK 11787
516 879-5336
GEORGE PROIOS
CO-EXECUTIVE
DIRECTOR



NEW YORK STATE
LEGISLATIVE COMMISSION
ON WATER RESOURCE NEEDS
OF LONG ISLAND

ATTACHMENT 2
ASSEMBLYMAN MATTHEW HIGGS
CO-CHAIRMAN
435 HOLLISTON ROAD
GREAT NECK NEW YORK 11021
516 462-1722
SARAH J. MEYLAND
CO-EXECUTIVE
DIRECTOR

BIOGRAPHY

SARAH J. MEYLAND
Co-Executive Director

Have been involved in water resource issues for 14 years --

Training includes degrees in

- English (BA, University of North Carolina)
- Geological Oceanography (BS - California State - Humboldt, 1972)
- Bachelors of Science in Biology with specialization in Marine Zoology (BS - California State - Humboldt, 1972)
- Masters Degree in Water Resource Management (MS - Texas A & M, 1978)

Presently serve as chief administrator for the Legislative Commission. The Commission is active in many areas including:

- The preparation and introduction of legislation
- The development of programs to protect Long Island water resources
- The dissemination of information about watershed protection, pollution control, and land use impacts
- The promotion of increased awareness about water resource issues by local decision makers.

Have served on a number of committees including

- Technical Advisory Committee to the Long Island Groundwater Management Program
- Pine Barrens Pesticide and Fertilizer Project
- The Pesticide Steering Committee
- The Pine Barrens Planning Council
- Technical Advisory to the North West Nassau 201
- Board of Directors, New York Section of American Water Resources Association

Executive Summary

DRAFT LONG ISLAND GROUNDWATER MANAGEMENT PROGRAM



New York State Department of Environmental Conservation
Commissioner: Henry G. Williams

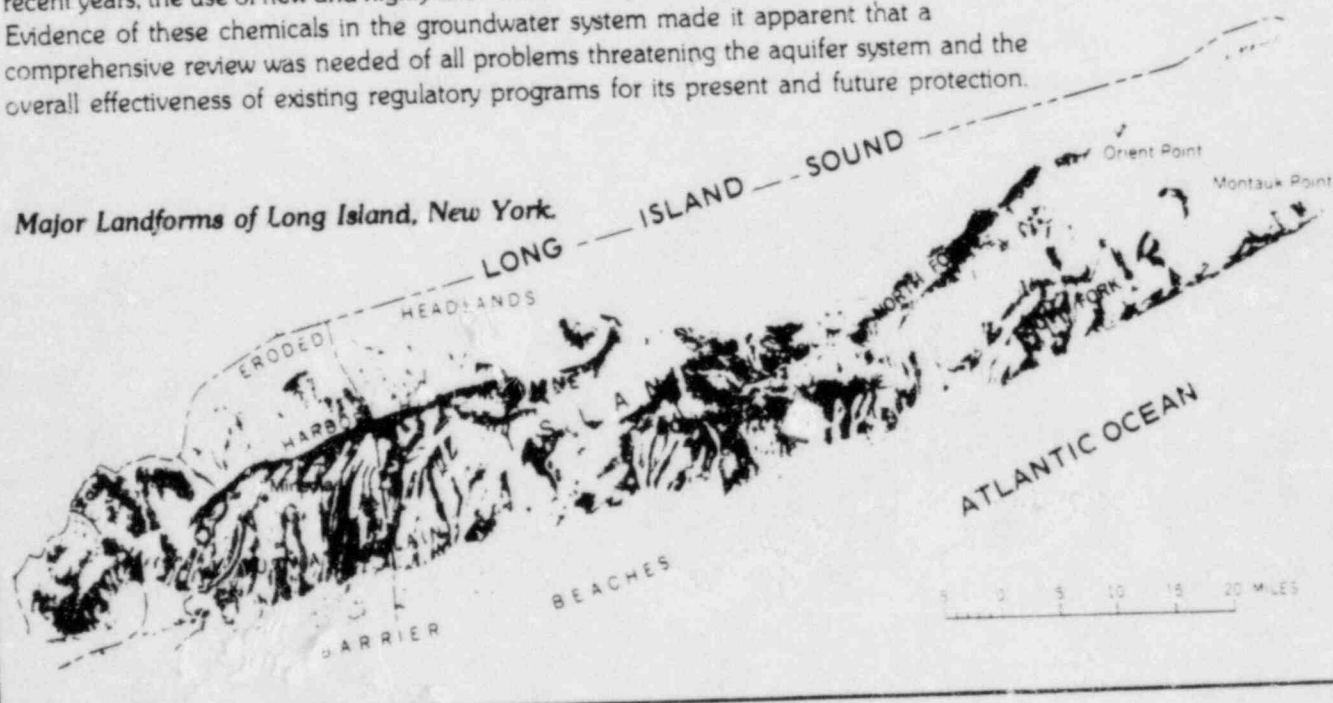
INTRODUCTION

The largest and most important groundwater resource in New York State is the vast aquifer which underlies Long Island, including all of Nassau and Suffolk Counties and the New York City boroughs of Brooklyn and Queens. It is the only source of drinking water for over three million people, and the entire aquifer system from Brooklyn and Queens to eastern Suffolk has been designated as a sole source aquifer by the U.S. Environmental Protection Agency (EPA) under provisions of the Federal Safe Drinking Water Act.

Groundwater contamination on Long Island has resulted from a long period of commercial, industrial, agricultural and residential development on the land surface directly above the aquifer. Some level of contamination is unavoidably associated with human development, particularly the dense development which characterizes much of Long Island. The possibility of contamination reaching the aquifer system is increased by the porous nature of Long Island's soils. A porous soil permits liquids to easily pass through it and, on Long Island, contaminants released at the land surface will eventually be transported down into the aquifer. As is characteristic with all aquifers, water within the aquifer moves very slowly through it as compared to the flow in a river or stream. Consequently, once a contaminant reaches an aquifer, it tends to remain there for many years. Once an aquifer is contaminated, cleanup may not be technically or economically feasible and treatment may be required before the water can be used for drinking water supply.

The aquifer is also very sensitive to quantity stresses. Important quantity effects include water table declines (resulting in saltwater intrusion, drying up of wetlands and reduction of surface stream flows) and, conversely, high water table elevations caused by cessation of pumpage (resulting in localized flooding problems). Groundwater pumpage also influences groundwater flow and, therefore, can quicken the movement of contamination through an aquifer system.

On Long Island, the importance of the groundwater resource has long been recognized. There is also a long history of management efforts to deal with problems with the resource, usually instituted as a case-by-case response to specific problems and threats. In recent years, the use of new and highly toxic chemicals by industry and society has increased. Evidence of these chemicals in the groundwater system made it apparent that a comprehensive review was needed of all problems threatening the aquifer system and the overall effectiveness of existing regulatory programs for its present and future protection.



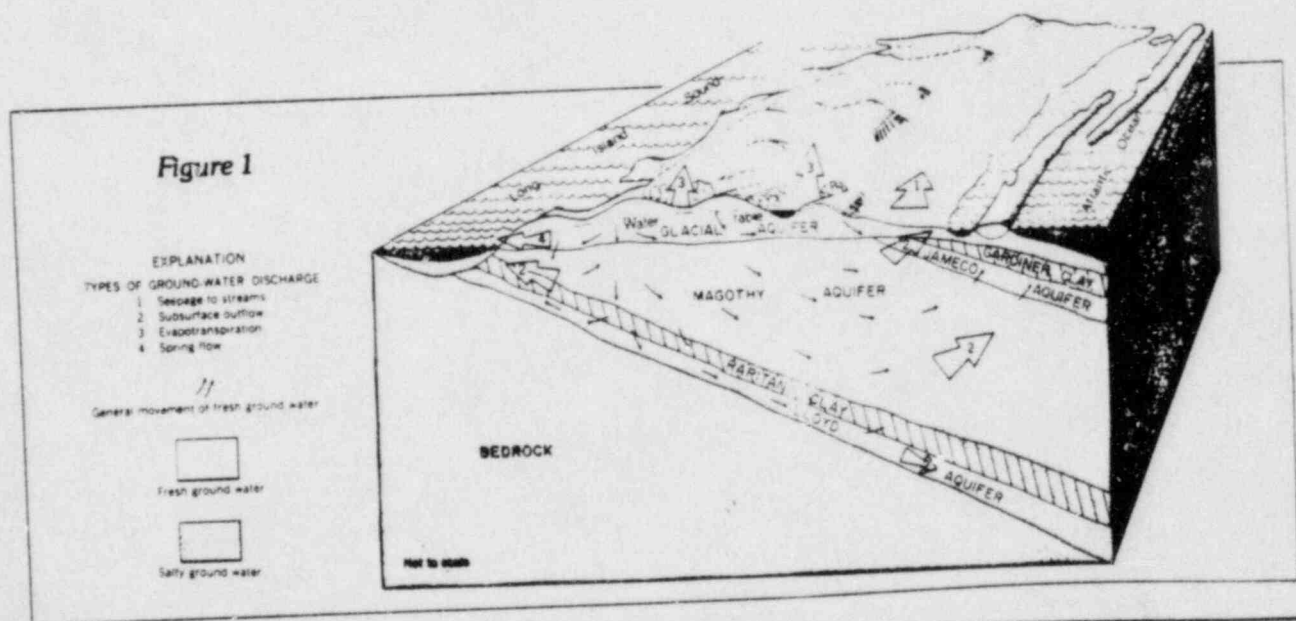
In cooperation with several other federal, state and local agencies involved in the management of Long Island's groundwater, DEC has recently completed this review and issued a draft report. This *Executive Summary* highlights the major findings of that review and recommendations for future groundwater management.

THE AQUIFER SYSTEM

Geologically, Long Island is made up of layers of sand, gravel and clay on top of bedrock. Figure 1 is a representative geologic cross section as viewed from a westerly direction. The bedrock slopes gently from northwest to southeast. The overlying unconsolidated material varies in thickness from zero in the northwest to a maximum thickness of over 2,000 feet in the south-central part of the Island. The sand and gravel layers are moderately to highly porous, while the silt and clay layers are highly impermeable and tend to retard water movement in some areas.

Four of the major geologic formations illustrated in Figure 1 — the *Upper Glacial*, the *Magothy*, the *Jameco* and the *Lloyd* — are the major aquifers which store Long Island's groundwater resources. Tens of trillions of gallons of fresh water are amassed in this underground reservoir. All of this water comes from precipitation. The average annual precipitation is 44 inches, which provides a natural recharge in the main portion of the Island of one million gallons per day per square mile. Part of this recharged water contributes to surface water in the form of streams and ponds, part flows deep underground and is discharged under bays and the ocean and another part is withdrawn for use by the population.

Figure 2 illustrates the groundwater flow patterns for the aquifer system which underlies Long Island. Groundwater recharge which enters through the land surface between points Z and Z' flows generally downward into the deeper aquifers (*Magothy* and *Lloyd*). These flow patterns in the central portion of the Island identify the *deep flow* recharge areas. Outside of the deep flow recharge areas, the groundwater flow patterns tend to be outward and upward toward the ocean.



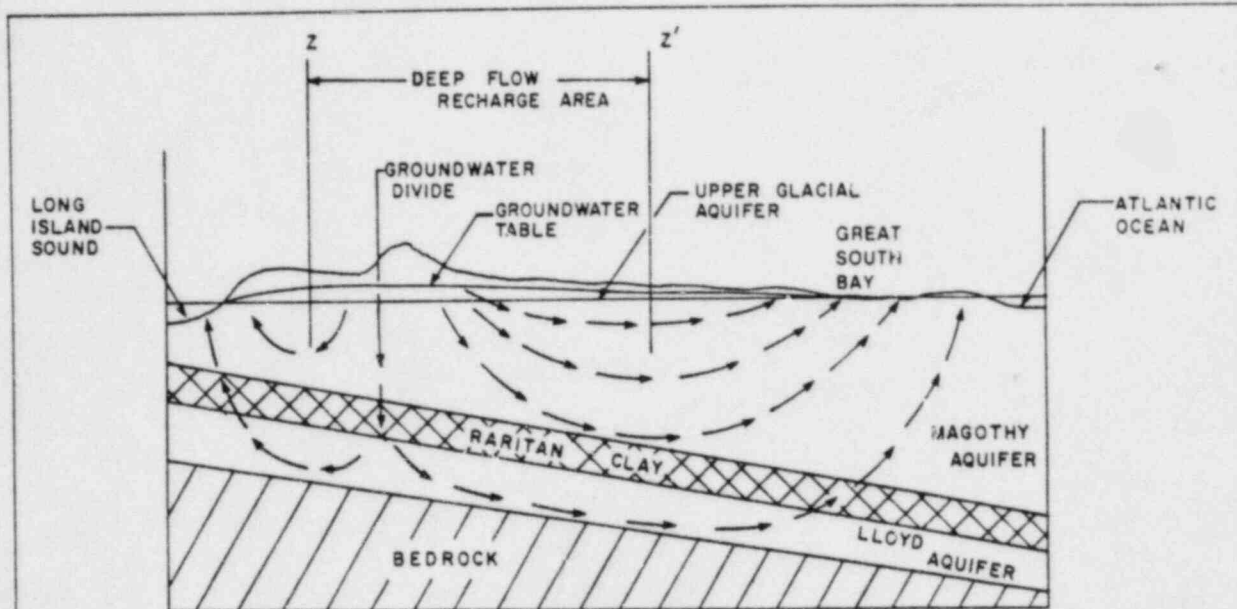


Figure 2 Typical Groundwater Flow Patterns on Long Island

The Magothy aquifer is presently the prime source of public water supply and is likely to remain so in the future.

Man's activities at the land surface affect the quality of recharge water to the aquifer system. Once introduced into the groundwater, contamination tends to migrate along with the flow of water in the system. Thus, surface contamination released in the deep flow recharge area is a greater threat to the deeper aquifers than is contamination released in the peripheral "shallow flow" recharge areas.

Figure 3 shows hydrogeologic zones, a concept first advanced in the Long Island Comprehensive Waste Treatment Plan (Nassau-Suffolk Section 208 Plan). The hydrogeologic zones are based on the groundwater flow patterns described above, and identify the land areas which recharge the deep flow and shallow flow portions of the aquifer system. On Figure 3, Zones I, II, and III are deep flow recharge zones while Zones IV-VIII are shallow flow recharge areas. Proposed modifications to these zones for Brooklyn, Queens, and the South Fork are discussed later in this document and are illustrated in Figure 8.

GROUNDWATER USE

In New York State, all fresh groundwater is classified by the state's Groundwater Quality Standards for a best usage of potable water supply. This expresses the state's fundamental management objective that groundwater be maintained safe for use as drinking water.

Table 1 shows that approximately six million New York State residents depend upon groundwater. Of this total, three and a quarter million people depend upon the groundwater underlying Brooklyn, Queens, Nassau and Suffolk. This means that more than half the people in New York State who depend on groundwater live on less than three percent of the state's total land surface area.

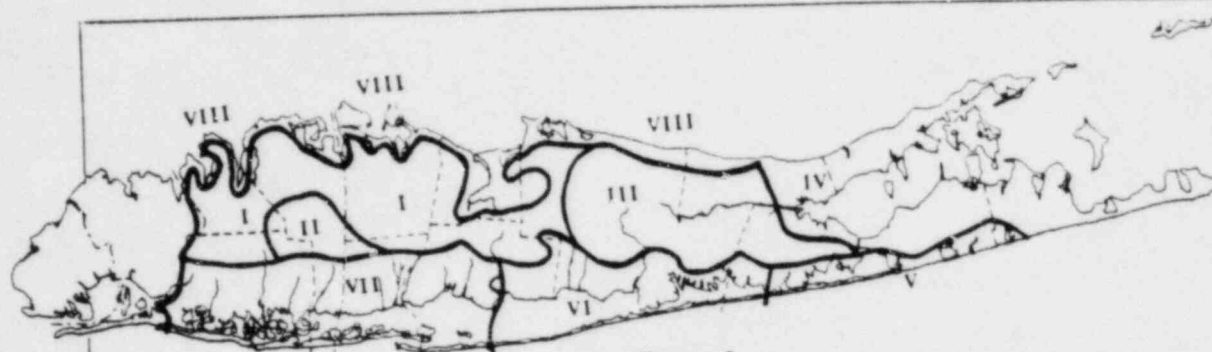


Figure 3
Hydrogeologic Zones in the Nassau-Suffolk 208 Study Area

TABLE 1

Population Dependent on Groundwater in New York State

Region	Individual Supplies	Community Water Systems	Total
Nassau and Suffolk	304,500	2,450,000	2,754,500
New York City	-----	518,300	518,300
Upstate New York	1,958,800	950,900	2,909,700
Totals	2,263,300	3,919,200	6,182,500

To fully appreciate the importance of groundwater to Long Island and to understand current Long Island groundwater problems and issues, it is useful to review past and present groundwater use.

Brooklyn and Queens were originally completely dependent on groundwater. Extensive use of the aquifer resulted in lowering the water table, intrusion of saltwater and the gradual abandonment of the Brooklyn portions of the aquifer system. Subsequently, use of groundwater increased in Queens and Nassau. By the early 1960s, water table levels in Brooklyn were recovering and severe declines were evident in Queens.

Over time, New York City has increased its use of upstate surface supplies, leaving a large portion of Queens served by groundwater. Groundwater withdrawals within the eastern section of Queens remain intensive, and groundwater levels are currently below sea level.

As urban development moved eastward through Nassau County and into Suffolk County, development of groundwater supplies generally followed the pattern of population growth. The entire population of Nassau and Suffolk Counties (nearly three million people) is solely dependent on groundwater for potable water as well as industrial, commercial and agricultural uses. Groundwater pumpage is concentrated near the areas of higher population densities, leaving other portions of the resource less developed. This has created an east-west imbalance in the distribution of pumpage, with much greater pumpage per unit of land area in the western portions.

Today, virtually all of Nassau County is highly developed and densely populated. All of Nassau County's population, plus the groundwater dependent population of Queens, is supplied public water by 50 independent community supplies. The large number of independent water districts limits flexibility to distribute groundwater pumpage geographically. There are very few private residential drinking water wells in Nassau and none in Queens and Brooklyn.

Suffolk County is now heavily developed in its western portions but comparatively undeveloped toward the eastern end of the Island. Although there are 72 private and municipal water suppliers in the county, the Suffolk County Water Authority is by far the largest and accounts for 75 percent of the public water supply pumpage. Because the Suffolk Water Authority covers much of the county, it has much greater flexibility in locating wells and distributing groundwater pumpage geographically than is the case in Nassau County. Another important difference in water supplies between Suffolk and Nassau Counties is the number of private residential drinking water wells. There are approximately 70,000 such wells presently in use in Suffolk County.

Groundwater for public water supply in Nassau and Queens Counties is withdrawn mostly from the Magothy aquifer. Proceeding eastward through Suffolk County, more demand is placed on the Upper Glacial aquifer.

The availability of safe and adequate supplies of groundwater for use as drinking water is, in some areas of the Island, becoming questionable because of both quality and quantity problems as outlined below. Future demand for water is expected to increase, not only on Long Island, but also across the entire New York City metropolitan region. As shown on Table 2, all of the surrounding areas of southwestern New York State and northern New Jersey have projected water supply deficits for the year 2000. Thus, for the foreseeable future, Long Island's water supply problems must be solved on Long Island; the alternatives for supplementing the Island's water supply from other sources are indeed limited.

TABLE 2

Estimated Water Supply Deficits
for Year 2000
Southeast New York and Northern New Jersey

Area	Projected Deficit in Millions of Gallons Per Day
Mid Hudson	206
Northern New Jersey	161
New York City Total	126
Nassau County	13
Suffolk County	0

In addition to water supply, other important groundwater uses include agricultural irrigation, industrial process and cooling water applications. Important natural functions supported by groundwater include the maintenance of wetlands and the recharge of surface streams during dry periods. These streams, together with groundwater underflow, have a major impact on the salinity levels and other ecological conditions of the bays and harbor areas of Long Island. Management of groundwater for man's uses must take into account these important natural constraints.

GROUNDWATER PROBLEMS

Government resources for solving environmental problems are limited, and it is imperative that the most serious problems be identified for priority attention. The most significant groundwater problems on Long Island today are:

- Contamination by synthetic organic chemicals including solvents, degreasers, petroleum products and agricultural pesticides.
- Nitrogen/nitrate contamination from sewage disposal and fertilizer use, both agricultural and domestic.
- Groundwater quantity problems including aquifer depletion, saltwater intrusion and flooding, often associated with regional imbalances of water demand.

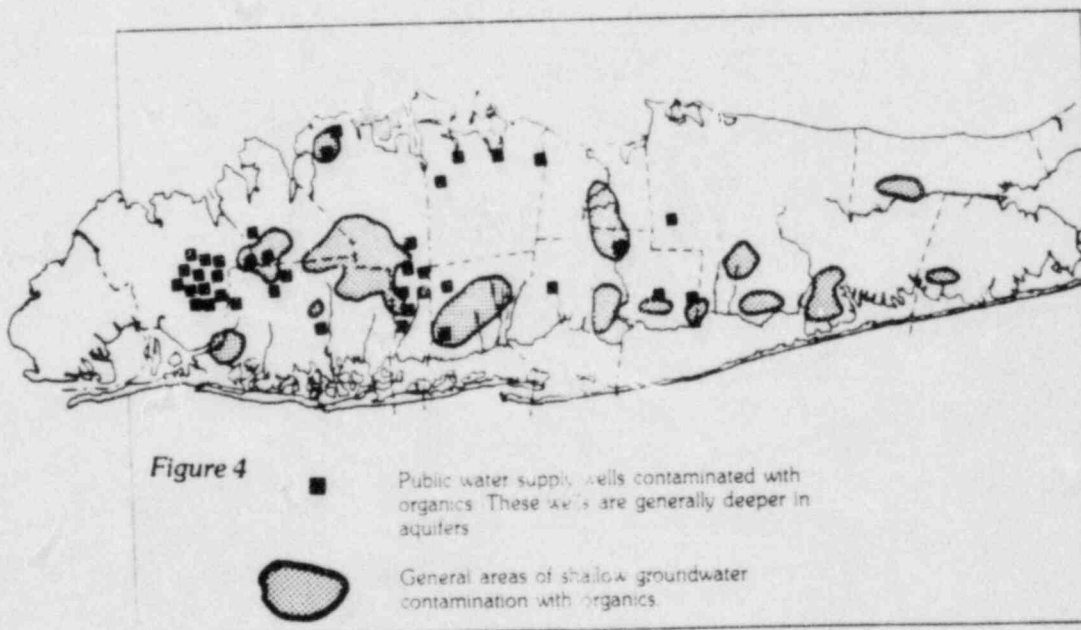
The following highlights the nature and extent of each priority problem.

Synthetic Organic Chemicals

Contamination by synthetic organic chemicals is the highest priority threat to Long Island groundwaters at the present time and is likely to remain so. The three major categories of organic contaminants are:

- industrial/commercial solvents and degreasers;
- gasoline and petroleum products; and
- pesticides and herbicides

During the mid-1970s, growing concern for synthetic organics in groundwater led to monitoring programs to detect these contaminants. Also at that time, improved sampling and analytical techniques and equipment were developed, and water quality standards were established for a limited number of organic compounds.



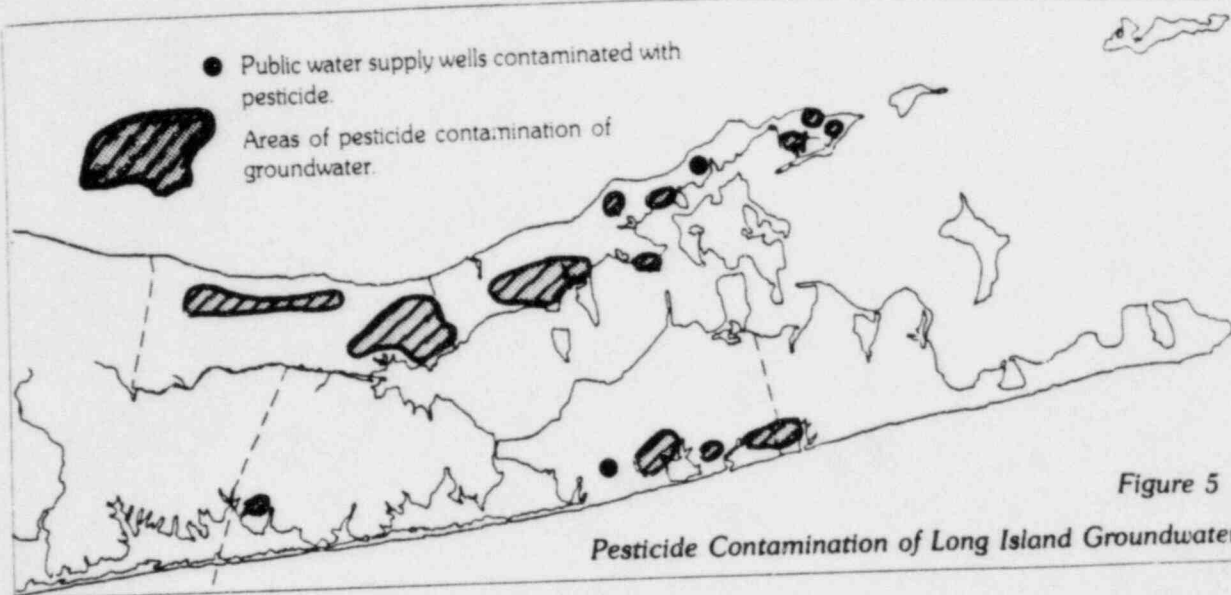


Figure 5

Pesticide Contamination of Long Island Groundwater

At this time, more than 700 specific synthetic organic chemicals have been identified in drinking water supplies in the United States. Chemicals which have been most frequently detected on Long Island include trichloroethane, trichloroethylene, tetrachloroethylene; gasoline and petroleum products including the constituents benzene, xylene, and toluene; plus certain agricultural pesticides.

Figure 4 shows public water supply wells on Long Island which have been closed because of synthetic organic contamination and also the approximate areas where sampling has indicated shallow well contamination in excess of organics standards. Areas of pesticide contamination are shown separately on a subsequent map (Figure 5).

To date, some 20 percent of public water supply wells in the Jamaica area of New York City have exceeded New York State Department of Health (DOH) guidelines for synthetic organics. Six percent of the Nassau County's public water supply wells have exceeded guidelines, and four percent of Suffolk County public wells have exceeded guidelines. Many other wells also show some contamination currently below DOH guidelines.

Solvents and degreasers

Solvents and degreasers are utilized in various commercial operations and industrial processes such as commercial laundries, furniture stripping plants, metal processing plants, machine shops, food and beverage processing plants and cleansing of transportation vehicles and their parts.

The State Pollutant Discharge Elimination System (SPDES) is intended to control point source wastewater discharges of these synthetic organics and other potentially toxic or hazardous chemicals. Nevertheless, discharges do occur from facilities subject to SPDES permits in the form of permit violations and discharges of materials for which there are no present standards and, therefore, are not included in the permit. However, spills, leaks and improper handling of synthetic organic chemicals at industrial and commercial sites may ultimately represent a greater threat to Long Island groundwaters than do permitted

wastewater discharges. Solvents and degreasers are also commonly used for cleaning and/or unclogging sewer lines and cesspools and in various other consumer products used in the home and which can enter the groundwater through individual household subsurface disposal systems. Some septic tank cleaning products are banned by state and Suffolk County laws. In Queens, exfiltration of these materials from sewers is also a likely source of groundwater contamination.

Petroleum

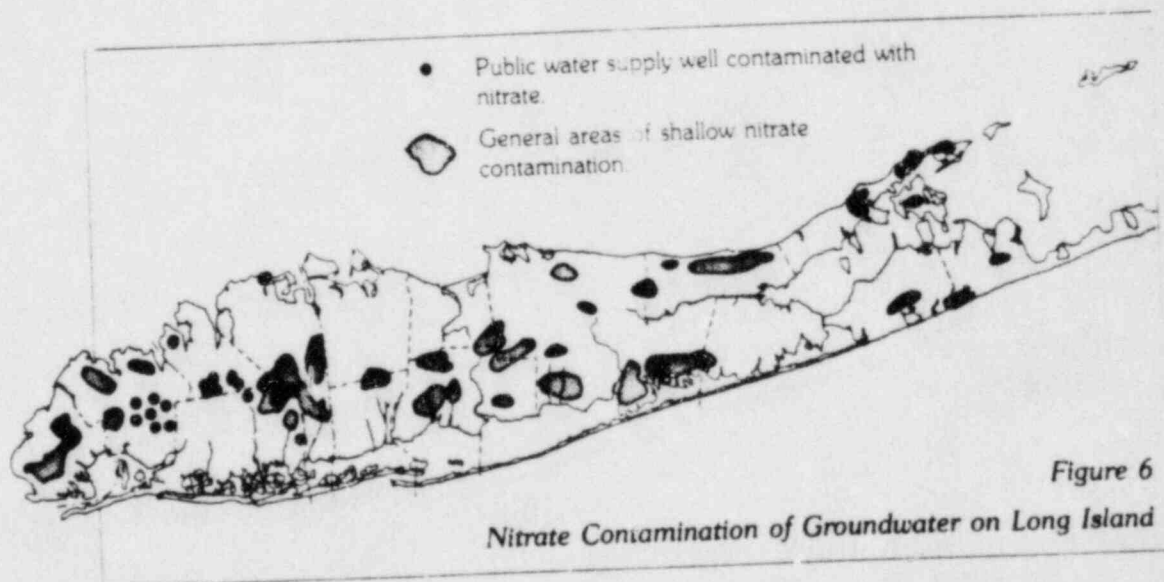
The three primary causes of petroleum contamination are leaks, spills and stormwater runoff. For the period of 1981 through 1982, nearly 1,000 spills were reported to DEC for Nassau and Suffolk Counties alone. Over 75 percent were inland spills or leaks of underground storage tanks. In Brooklyn and Queens, more than 50 documented cases of groundwater contamination by petroleum have occurred since 1978, including the 22-million-gallon pool found underneath Greenpoint, Brooklyn. Unfortunately, clean-up operations are tremendously expensive and often only marginally effective in the sandy soil of Long Island.

Pesticides

Contamination of Long Island groundwaters with synthetic organic pesticides has become a serious problem over the last decade.

In 1978, wells on both the North and South Forks were sampled for the pesticide aldicarb which had been extensively used on eastern Suffolk County potato farms between 1975 and 1979. An initial sampling survey of 330 wells in the area adjacent to the farms detected aldicarb in concentrations exceeding the DOH recommended guideline in 23 percent of the wells.

In 1979, the manufacturer requested EPA to revise the label for Temik (the commercial name of aldicarb), and, thus, effectively ban its use on Long Island. As a result, aldicarb is no longer being applied. Residents whose private wells exceeded the guideline were advised not to use the water and were subsequently provided with activated carbon filtration systems at the expense of the manufacturer. The village of Greenport also installed activated carbon treatment on one municipal well.



In 1980, more than 8,000 wells in eastern Suffolk were sampled in areas where aldicarb contamination was suspected. Thirteen percent of the private wells, seven percent of the community water supply wells and eight percent of non-community supplies (restaurants, hotels, etc.) exceeded DOH guidelines.

The extent of aldicarb contamination on eastern Long Island is illustrated in *Figure 5*.

The Suffolk County Department of Health Services has continued to monitor for other pesticides used in the agricultural areas of eastern Suffolk. Other pesticides detected to date include Carbofuran, Dacthal, 1,2 dichloropropane, Dinoseb, Methomyl, Paraquat, Oxamyl and Carbaryl. Although none of these have been found as extensively as aldicarb, this evidence nonetheless points to the extreme sensitivity of Long Island soils as regards leaching of organic pesticides to groundwater.

Nitrogen

Contamination from nitrogen in the form of nitrate is another important quality problem on Long Island, particularly in heavily developed areas and agricultural areas. The major sources of nitrate contamination include septic systems and both domestic and agricultural fertilizer use. Other sources which may be important in some locations are sewage treatment plant effluent, landfills and improper disposal of sewage sludge.

Groundwater monitoring data indicates that nitrate/nitrogen contamination is widespread on Long Island. Nitrate concentrations are increasing in the major public water supply aquifers (Magothy) for most of the developed and agricultural areas. *Figure 6* is a map showing public water supply wells contaminated by nitrate and approximate areas where nitrate in the shallow aquifers exceeds the 10-milligram-per-liter standard.

It is important to evaluate the monitoring data carefully, especially historical trends in concentrations of contamination, in order to identify the most significant present-day sources of nitrate/nitrogen.

In the sewered portion of Nassau County, for example, nitrate concentrations appear to be decreasing in the Upper Glacial aquifer and increasing in the deeper Magothy. These trends probably reflect a significant long-term reduction in the amount of nitrate released at the land surface, due to discontinuation of agriculture in the area as well as sewerage of the area with wastewater discharge to the ocean. The concentrations in the deeper aquifers may be increasing simply because past contamination is slowly migrating downward through the Magothy. Despite sewerage, other sources, such as turf and lawn fertilization, continue to contribute some nitrate contamination to the Upper Glacial aquifer. Also, sewerage is not always a panacea for this problem. In Brooklyn and Queens, aging and leaking sewers are considered to be a source of nitrogen contamination to the aquifer.

Groundwater Quantity Problems

Simply stated, a groundwater quantity problem occurs when there is too little groundwater (depletion) or too much groundwater (flooding) in a localized area relative to some "normal" groundwater condition or some existing level of human development.

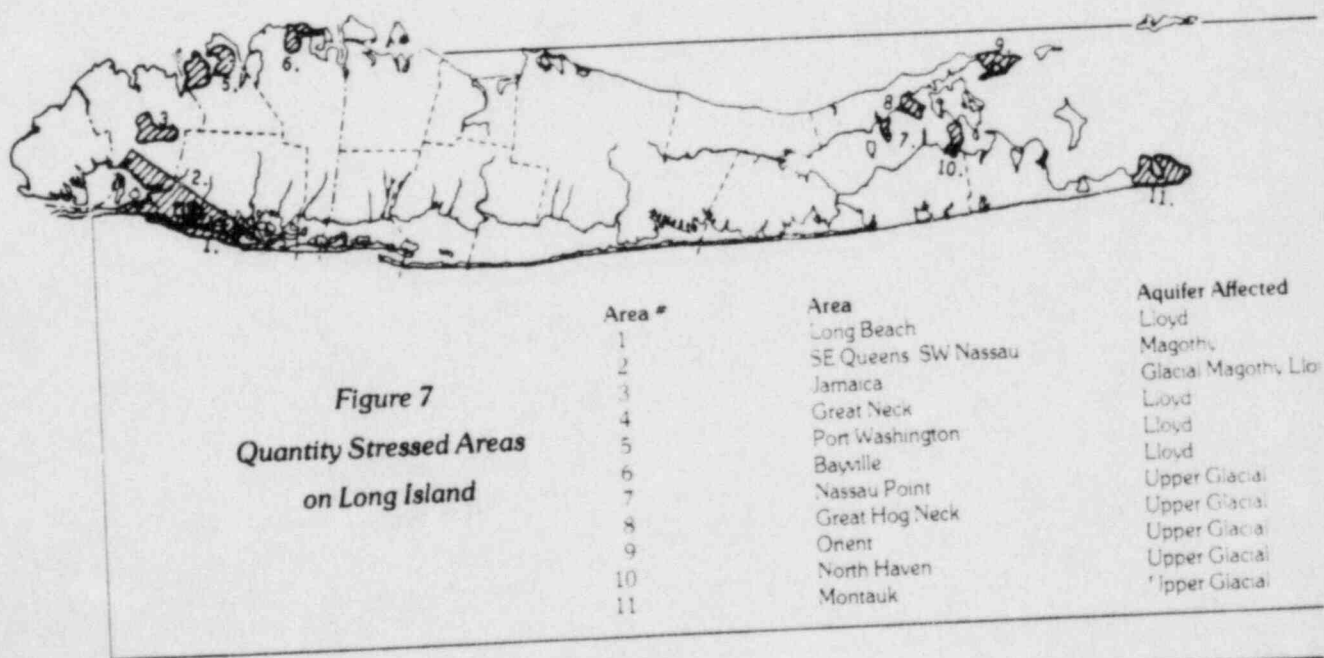
Since all fresh groundwater on Long Island originates from precipitation and since there have been no significant changes in the normal precipitation in the region, the quantities of groundwater available in any local area are subject to depletion trends or flooding trends primarily as a result of human activity.

Trends toward lower water table elevations are generally caused by the activities of man, which pump the available groundwater faster than it can be replenished by natural recharge or which block or divert the natural recharge (e.g., storm drainage systems discharging to surface waters) from reaching the groundwater.

In the densely populated portions of Queens and Nassau, the potential for over-pumping the aquifer is significantly increased, due to the very heavy local water supply demand. In the peninsular areas of the Island, groundwater depletion is most often associated with the much smaller quantities of fresh groundwater locally available. Figure 7 illustrates presently identified areas of groundwater stress caused by over-pumpage.

Currently, depressed water table elevations in central Queens are a direct consequence of public water supply pumpage in the Jamaica area. Pumpage in the area exceeds recharge to the groundwater, resulting in a loss of storage in the groundwater reservoir (groundwater mining). Water table elevations are below sea level throughout a large area including parts of Queens and Nassau. Minimum levels have been as low as 10 feet below sea level, increasing the potential for saltwater intrusion into the aquifer system.

Problems associated with high water table elevations include flooding of roadways, basements, subways, conduits and cesspools. Groundwater flooding problems have become particularly prevalent in portions of Brooklyn and Queens where pumpage has been terminated due to contamination. These areas are now supplied from New York City's upstate surface water sources. Previously below-normal water table levels have now returned to normal levels and caused flooding of structures built in the interim period. The dewatering of subways in Brooklyn accounts for the withdrawal (and discharge to tidewater) of over 24 million gallons per day from three sites



ASSOCIATION OF PROBLEMS AND CAUSES

Table 2 summarizes the priority groundwater problems on Long Island and the most important causes of each. The right-hand column provides a thumbnail sketch of the human activities which are the most significant contributors to the groundwater problems on Long Island. To effectively utilize governmental resources available for groundwater protection, programs which control these human activities must be emphasized.

TABLE 3

Long Island Groundwater Problems

Major Problems
Solvents and Degreasers

Most Significant Sources
Leaks — Product Storage
Spills & Accidents & Facility
Housekeeping
Landfills
Improper Industrial Hazardous or
Residual Waste Disposal
Improper Industrial Wastewater
Disposal
On-site Domestic Sewage Systems —
Consumer Products
On-site Domestic Sewage Systems —
Septic Tank Cleaners

Gasoline & Petroleum Products

Leaks — Product Storage
Spills & Accidents & Facility
Housekeeping

Nitrate/Nitrogen

On-site Domestic Sewage Systems
Sewage Treatment Plant Effluent
Improper Scavenger Waste Disposal
Landfills
Fertilizer: Turf, Home,
Agricultural Use

Pesticides & Herbicides

Agricultural Use

Quantity Management Problems
Saltwater Intrusions
Depletion of Aquifer Segments
Reduction of Wetlands &
Streams
Localized Groundwater Flooding

Overpumping
Sewage Collection & Remote Disposal
Inadequate Construction Codes
Cessation of Pumping

EXISTING REGULATORY PROGRAMS

Groundwater management, particularly on Long Island, is extremely complex. Correspondingly, there are a variety of agencies and programs at all levels of government to carry out the many different tasks needed to protect the resource.

Concern for groundwater on Long Island is not new. The long-standing importance of groundwater within the overall water resource picture has always influenced the application of public health, water supply and environmental programs. Many of the existing programs derive much of their statutory authority from federal and state levels. Traditionally, these programs have focused on specific types of threats such as municipal and industrial wastewater discharges and landfills. As an environmental or public health threat was recognized, a program to correct or abate the problem was developed and put into action. Over many years, the number of these programs has grown. Rarely, however, have agencies viewed the entire array of programs and activities as an integrated package with respect to the groundwater resource.

Historically, the local health agencies have carried out the largest portion of the activities within the overall groundwater program on Long Island. They have carried out various local programs and, through delegation, administer major portions of state environmental and public health efforts. Long Island has been fortunate in having strong local agencies which have tailored the administration of many state and federal program activities to best meet local groundwater resource management needs.

Table 3 illustrates current program elements relating to groundwater management on Long Island and the pattern of agency roles and responsibilities.

- The five agencies that have major statutory authority and carry out most of the regulatory activities in the areas of standards setting, contaminant source controls, water quantity regulation, public water supply regulation and regulatory enforcement are: DEC, DOH, the Nassau and Suffolk County Health Departments and the New York City Department of Health.
- Other federal, state, and regional agencies have important roles in the current program. These include EPA, the United States Geological Survey, DOT, the Long Island Regional Planning Board, the Nassau County Department of Public Works, the New York City Departments of Environmental Protection and Planning. Many of these agencies have critical roles in one or more program elements.
- Cities, towns and villages have the major statutory authority for zoning and land use control — a crucial area where the major state, county and federal agencies lack authority. Local jurisdictions also play a major role in constructing and operating facilities and in responding to contamination incidents such as hazardous materials spills.

It is apparent from Table 3 that programs currently in operation do much of the work needed to protect and conserve Long Island's groundwater for future generations. Adequate funding for major preventive regulatory programs, such as those which control municipal and industrial wastewater discharges and solid and hazardous waste disposal is an essential

TABLE 4

Summary of Existing Programs Related to Major Groundwater Management Agencies

PROGRAM AREA	Agency/Organization															
	US EPA	USGS	NYSDEC	NYS DOH	NYS DOT	NYS Ag. & Markets	Coastal Comm.	NYS PSE	EDP	ECW	NYS DOH	NYS DEC	SCDH	NYC	SCDP	NEDR
Resource Management																
Standards and Classifications	●		●	●												
Planning and Review																
Monitoring, Data Collection and Manipulation		●	●						●		●		●			
Environmental Review (SEQR, Sole Source)											●		●			
Regulatory Program Direction			●	●												
Source Control																
Hazardous Material Storage/Handling					●						●		●			
Industrial/Commercial and Hazardous Waste	●		●								●		●			
Municipal Solid Waste			●								●		●			
Sewage Treatment			●								●		●			
Industrial/Commercial Wastewater			●								●		●			
On-Site Sanitary Waste			●								●		●			
Pesticide/Fertilizer	●		●			●										
Zoning and Land Development Controls														●		
Water Supply																
Well Permits and Driller Registrations			●								●		●			
Public Water Supply			●	●							●		●			
Response and Remediation																
Contamination Response/Superfund	●		●		●						●		●			
Contaminated Aquifer Management																
Well Head Treatment																
Sewering			●								●		●			
Regional Water Distribution and Importation																
Public Education and Participation																
Research																
Regulatory Enforcement			●	●							●		●			

LEGEND:

● Primary Program Role

□ Participating Program Role

□ Little or No Role

theme of the program recommendations below. Additionally, in the areas of storage and handling of hazardous materials, the management of groundwater withdrawals and local government regulation of land use, the program recommends substantial strengthening and expansion of existing activities.

PROPOSED PROGRAM ACTIONS

The groundwater management program recommendations outlined below were developed with two basic considerations in mind — the problems and the programs already in place to address these problems. Collectively, the recommendations form a balanced and cohesive program which will provide an effective framework for groundwater management activities in the future. It is neither a state nor a local program, but rather a regional program blending the activities of several independent state and local agencies. Long Island agencies, acting either under their own authority or as agents of the state, should do most of the day-to-day work needed to administer regulatory programs.

In total, the *Long Island Groundwater Management Report* contains about 120 recommended actions — the most important of which are summarized in the following pages.

In the absence of adequate funding to allow for their implementation, the proposed actions do not represent individual agency commitments. A companion to the full report is a separate *Resource Assessment Document* which estimates costs, identifies scheduling and priority ranking and lead implementation agencies for the individual program actions.

REGULATORY PROGRAM DIRECTION

Good management needs current information. DEC, DOH, and the Suffolk, Nassau and New York City Departments of Health should participate in annual meetings to review the status of the program and any new issues which may have surfaced during its operation. This regular exchange of information among agency decision makers will allow the regulatory agencies to make appropriate changes in the program. A groundwater problem inventory, including summary information on major public well closures, contamination incidents and hazardous materials leaks and spills should be prepared by DEC from information supplied by the participating agencies and used to provide feedback on program effectiveness.

Any workable program must be able to respond to changing conditions. This requires feedback on how well the program is accomplishing what it was intended to do. DEC, in consultation with the participating agencies, should develop a system for a yearly evaluation of program performance. New information and program adjustments should be formally incorporated every three years in an update of the *Long Island Groundwater Management Program*.

STANDARDS AND CLASSIFICATIONS

One of the cornerstones of both surface and groundwater quality management is a system of best usage classifications and associated water quality standards. These provide

enforceable quality targets in that they prescribe the best use of the groundwater in any locality and the maximum allowable concentration of various pollutants according to its intended best use.

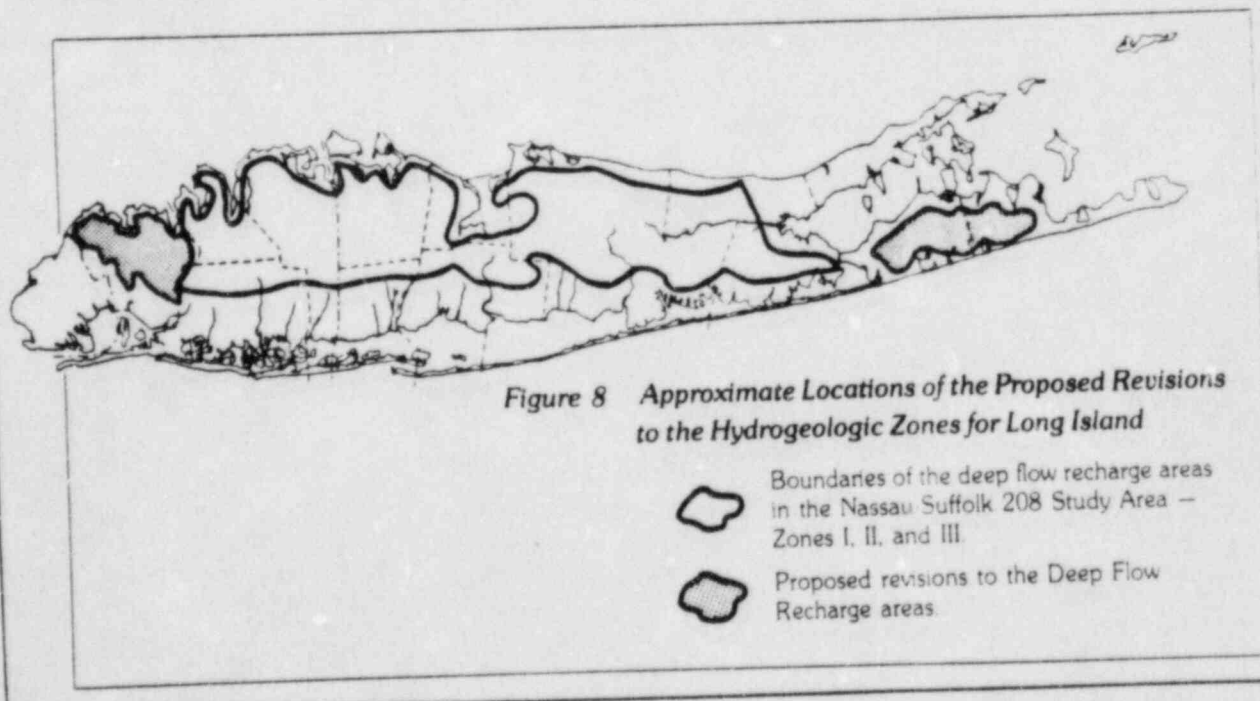
Under the existing system of groundwater quality standards and classifications in New York State, the best use of all groundwater is for drinking water supply.

An issue of major importance for groundwater management on Long Island and elsewhere is the increasing evidence of toxic chemicals — particularly synthetic organic chemicals — in the environment. The inability of the standards setting process to keep pace with an ever-expanding universe of toxic chemicals adds significantly to the management problem. Development of standards for new chemicals is a very lengthy and resource-intensive process and depends on the availability of defensible health effects data.

New York State believes that strong federal (EPA) action is needed to establish *National Drinking Water Standards* for toxic chemicals commonly found in groundwater, not only on Long Island but in the rest of the state and nation as well. In the absence of appropriate federal action, DEC and DOH should continue efforts to establish sound and defensible guidelines and/or standards for industrial chemicals commonly in use on Long Island which pose a threat to groundwater quality.

GEOGRAPHICAL TARGETING OF PROGRAM EMPHASIS

In order to provide a consistent basis for groundwater management, the agencies should adopt the hydrogeologic zone concept, which describes the Island's deep flow recharge areas and its shallow recharge areas. Deep flow areas replenish the waters in the deep aquifers which are considered to be the principal long-term source of drinking water. The program should extend the hydrogeologic zones into Brooklyn and Queens and should establish a new deep flow recharge zone on the South Fork of the Island as shown in Figure 6. Where available regulatory program resources (funding and staffing) are limited, program activities to protect the deep flow recharge areas should receive higher priority.



Three other types of geographical areas have been identified to receive special management attention. They are:

1. Industrial/commercial areas where there is concentrated storing and handling of hazardous chemicals;
2. Special groundwater protection areas, which are undeveloped (or relatively undeveloped) recharge areas where protection of the land surface is vital in maintaining high-quality water recharge; and
3. Quantity-stressed areas where water withdrawals currently exceed safe groundwater yield.

Programs to address the special management needs in these areas are discussed under *Site-as-a-System management*, *Special Groundwater Recharge Area Protection* and *Groundwater Quantity Management*.

HAZARDOUS MATERIAL STORAGE AND HANDLING

A major threat to groundwater comes from spills and leaks of hazardous substances which are not wastes and consequently have not been subjected to traditional regulatory programs. These include petroleum products as well as industrial products such as solvents and degreasers.

There is a strong need to fill the program gap that exists on the control of hazardous materials. As part of a more intensive surveillance effort, there must be increased attention to good industrial housekeeping, spill prevention and institution of industrial/commercial best management practices for materials handling.

Suffolk County, through County Sanitary Code-Article 12, has taken strong steps to control these threats. It is proposed that Nassau County and New York City adopt similar programs covering toxics and hazardous materials storage and handling.

DEC should enforce the requirements of the state's new *Petroleum Bulk Storage Law* and continue to make available reports DEC has recently developed to guide and aid the public and communities in the safe storage of petroleum products.

These reports are:

- *State-of-the-Art Technology Manual*;
- *Facility Siting Manual*; and
- *Model Ordinance for Siting Bulk Storage Facilities*.

SITE-AS-A-SYSTEM MANAGEMENT

For special management areas involving major, complex industrial facilities or dense clusters of commercial/industrial facilities, a system of interdisciplinary review and inspection should be evaluated for use by DEC and local health departments. This system should examine all potential contamination sources such as chemical storage and handling practices as well as wastewater discharges at specific industrial/commercial sites. It should also coordinate the efforts of existing regulatory programs with a strong emphasis on prevention of contamination.

Suffolk County's efforts under Article 12, which utilizes interdisciplinary site inspections, represent significant progress in the direction of this type of integrated preventive management. The expansion of this effort to other areas and agencies needs to be evaluated.

WASTEWATER DISCHARGES

Municipal, industrial and commercial wastewater discharges are regulated through the SPDES system. DEC's approach to administering the SPDES program in the face of limited resources has been to prioritize SPDES permit surveillance and compliance activities by size and type of discharge, with emphasis on control of toxic discharges and other significant industrial and municipal discharges.

On Long Island, DEC should also utilize the following geographic/hydrologic priorities to further guide program emphasis:

- Special Groundwater Protection Areas (see Figure 9)
- Areas of High Intensity Industrial/Commercial Development (See Site-As-A-System Management)
- Deep Flow Recharge Areas
- Shallow Flow Recharge Areas

As part of a statewide effort to improve administration and enforcement of SPDES permits, DEC has made the following commitments:

- To write an enforcement policy governing water, air and solid waste regulatory programs. This policy will specify types and levels of penalties and establish formal enforcement procedures.
- To hire four more attorneys to assist in water program enforcement. As of September 1, 1983, four assistant regional attorneys have been hired, including a fulltime attorney for Region 1.
- To increase the number of technical seminars and workshops on enforcement for DEC staff.
- To establish a quality assurance program to improve the accuracy and reliability of testing processes by DEC and dischargers. As of September 1, 1983, a quality assurance/quality control (QA/QC) plan has been developed and will be in operation April 1, 1984.
- To support a bill requiring certification of laboratories doing analytical work for the state. The laboratory certification bill was enacted into law by the legislature during 1983.
- To hire 12 more inspectors statewide to enforce SPDES permit requirements. As of September 1, 1983, hiring of the surveillance staff had begun. Four of the new positions have been assigned to DEC Regions 1 and 2, which cover Long Island.
- To expand electronic data processing to provide quicker access to information on SPDES permits, self-monitoring and surveillance.
- To develop a technical manual to guide permit-issuing staff in setting permit limits for chemicals and establishing monitoring schedules for dischargers. A decision matrix for SPDES permit requirements has been developed and adopted by DEC.

HAZARDOUS WASTES

This program area is characterized by intense public interest and dramatic regulatory program changes. It is of critical importance to develop management programs for these

wastes on the basis of verifiable needs rather than on popular fears which may not be founded in fact. The most pressing need is to establish sound, verifiable data on the quantities and types of wastes and the geographical point of generation of hazardous wastes.

DEC will complete its evaluations of first year data from the hazardous waste manifest system, the generator annual reports and the Part 360 permit annual reports. The department will issue its findings to the Legislature. DEC should propose program modifications to close any industrial waste or hazardous waste management deficiencies indicated by the data.

The Suffolk and Nassau County Health Departments and the New York City Department of Environmental Protection should conduct detailed hazardous waste generation surveys covering representative industrial/commercial areas within their respective jurisdictions and prepare reports on the types and amounts of wastes generated, including the amount of such wastes generated by small (under 100 kilograms/month) generators. DEC should act as the coordinating agency for this work.

The state Hazardous Waste Siting Task Force should examine the newest information regarding the need for hazardous waste treatment facilities in the state and recommend a policy and process for developing any needed treatment capacity.

MUNICIPAL SOLID WASTE

New state legislation applicable to Nassau and Suffolk Counties prohibits any new or expanded landfill in the deep flow recharge zones immediately and prohibits operation of existing landfills in the same zones after seven years (1990). Specific exemptions are provided for emergency situations and for landfills receiving residue from resource recovery, incineration or composting. The same law imposes conditions on the operation of landfills outside the deep flow recharge zones.

With the assistance of local health departments, DEC should evaluate every landfill on Long Island and establish a priority list and schedule for all sites to be closed. In cooperation with the Long Island Regional Planning Board, DEC should complete the Long Island regional solid waste management plan to reflect phasing out of all landfill areas in the deep flow recharge areas and all other sites significantly threatening the environment. In addition, the department will assist programming of alternative solid waste management solutions. DEC should promote resource recovery as the best long-term solid waste disposal alternative. Schedules for the development of resource recovery projects should be coordinated with the priority listing for landfill closures.

PESTICIDES

Under the federal *Insecticide, Fungicide, Rodenticide Act* (FIFRA), EPA registers pesticides for use. FIFRA pesticide screening procedures have recently been revised for new pesticides. EPA should aggressively implement the new procedures to make certain that chemicals that can leach into groundwater are not issued federal registrations. Monitoring to determine the impact of pesticide use will continue.

New pesticides proposed for use in eastern Suffolk County should require, where merited, groundwater monitoring at the expense of the manufacturer as a condition of state registration.

Agencies representing the agricultural community, aided by Cornell University and the Cooperative Extension Service, should research and develop alternative agricultural methods to reduce the current use of chemicals in eastern Suffolk County.

ZONING AND LAND-USE CONTROLS

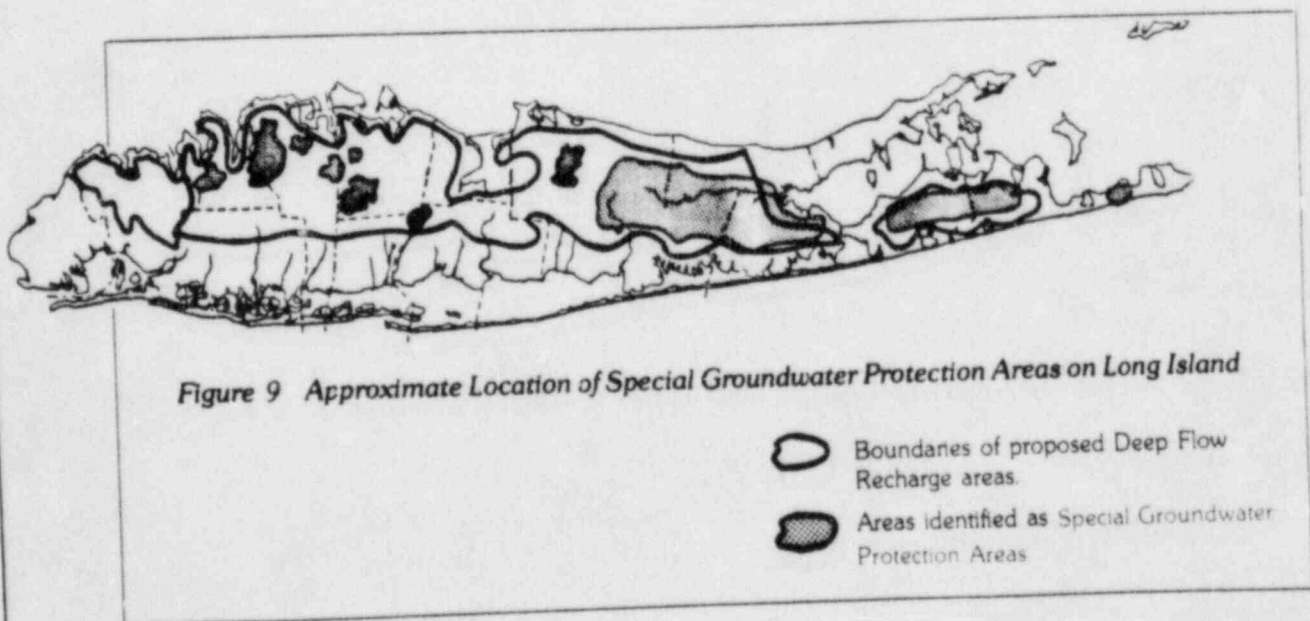
Regulation of how the land is used and what is built on it is an integral factor in protecting groundwater. In New York State, land-use control authority is reserved for local governments under the home rule doctrine. It is, therefore, essential that local governments exercise their jurisdiction in land-use issues, mindful of the need to protect groundwater, as prudently as possible.

Nitrate contamination associated with septic systems and residential fertilizer use in newly developed areas is often best controlled by limiting population densities. Zoning to properly locate industrial/commercial development is an essential supplement to the regulatory programs previously discussed for reducing contamination threats to critical aquifer recharge areas.

The Long Island Regional Planning Board (LIRPB) should develop model local zoning provisions and site development guidelines to reduce the impact of development on groundwater and advise local governments on their use.

SPECIAL GROUNDWATER RECHARGE AREA PROTECTION

Special Groundwater Protection Areas are defined as significant, largely undeveloped or sparsely developed geographic areas of Long Island which recharge portions of the deep flow aquifer system (see Figure 7). A primary example is the sparsely developed portion of the Long Island Pine Barrens in eastern Suffolk County.



Special management attention must be given to these areas to maintain them as sources of high quality, uncontaminated recharge to the deep flow aquifer system.

The Regional Planning Board and DEC should work with local governments to designate all Special Groundwater Protection Areas as "environmentally sensitive areas" under the State Environmental Quality Review Act (SEQR). Such designation will mean all actions in these areas will be more likely to receive a thorough environmental impact review.

Watershed management strategies should be prepared for Special Groundwater Protection Areas by DEC, LIRPB, the county health agency and local government. Each strategy should include consideration of:

1. Land use and zoning
 - existing and proposed land use
 - existing and recommended zoning
 - land purchase and preservation
2. Regulation of contaminant sources
 - prohibition of toxic materials storage or use
 - control of point discharges

Work has already started on these strategies with federal grant funds made available to the LIRPB by DEC.

DEC and the Joint Legislative Commission on Water Resources Needs of Long Island should develop and propose federal and state legislation to provide funds for planning and land acquisition to preserve Special Groundwater Protection Areas.

GROUNDWATER QUANTITY MANAGEMENT

Figure 5 illustrates known areas of existing quantity stress on Long Island. There is evidence that additional areas may become stressed in the future. The Long Island Well Permit Program and Water Supply Permit Program, as presently funded and supported by current policy and technical assistance, do not adequately prevent adverse quantity impacts on the aquifer system.

DEC should refine and utilize the Long Island Well Permit and Water Supply Permit Programs to institute a prevention-oriented groundwater quantity management program for all of Long Island. A basic technical foundation should be the development of safe yield estimates — that amount of water which can be pumped out of the ground in a given area without seriously depleting the volume of water in storage or inducing other negative environmental impacts. Long Island should be mapped for areas of existing quantity stress and impending quantity stress. DEC and DOH, working with local health departments, should develop groundwater quantity/water supply strategies for these areas. Management options such as mandatory water conservation, increased groundwater recharge, water treatment, water importation and local population/development controls should be included.

In order to provide an Island-wide regional perspective for such strategies, DEC and DOH should seek funding to prepare a groundwater quantity/water supply plan for all of Long Island.

The U.S. Geological Survey should provide ongoing technical/hydrogeologic support for this quantity management program through a cooperative agreement and financial support from DEC.

WATER CONSERVATION

Water conservation is a basic element of good water management and is particularly important in a sole source aquifer area like Long Island where portions of the aquifer system are, or may experience, quantity stress. Water conservation should be promoted for all areas of Long Island. For known areas of quantity stress, DEC should require water conservation measures as a condition of Long Island Well Permits and Water Supply Permits.

In areas with aging water distribution systems such as in Brooklyn and Queens, studies should be undertaken to evaluate the effects of system leakage on the total volumes of water withdrawn for use.

CONTAMINATION RESPONSE AND REMEDIATION

The overall emphasis of programs to protect and conserve Long Island's groundwater for the future must be preventative rather than reactive. It is easier and cheaper to prevent contamination than to clean up after contamination has occurred. Nevertheless, a reasonable level of program effort must be devoted to contamination response and technically feasible, cost-effective remediation.

- DEC, DOH, and the Nassau, Suffolk and New York City Health Departments should maintain a capacity to perform contamination incident response, including trackdown to identify contamination sources. Where trackdown is possible, these agencies should use their enforcement authority to recover remediation costs from responsible parties.
- DEC should continue to identify, evaluate and clean up all existing hazardous waste disposal sites on Long Island. These efforts should include using state and federal Superfund authority combined with the other enforcement capabilities of all federal, state and local agencies, including DEC's new Division of Environmental Enforcement. First priority should be to force site evaluation and remediation by responsible individuals and firms.
- DEC, in cooperation with the Suffolk, Nassau and New York City Departments of Health should develop and update (on a three-year cycle in accord with Long Island Groundwater Program updates) a document which identifies, describes and maps all known contaminated segments. The above agencies should, in response to direct existing or potential impact on water supply wells, develop response strategies for contaminated aquifer segments. This document is a significant part of the problem inventory referenced in the *Regulatory Program Direction* section.
- DOH should prepare and maintain up-to-date guidance for water suppliers on the availability, approvability and costs of wellhead treatment methods. DOH should identify, for possible funding, projects to develop and demonstrate new technology.
- DEC, in consultation with DOT and the Comptroller's Office, should prepare a manual to guide state and local agencies on petroleum and hazardous materials

spills and cleanups. The manual should include notification procedures, agency responsibilities, clean-up procedures and enforcement requirements.

REGULATORY ENFORCEMENT

Enforcement of applicable regulations is an integral part of all environmental quality regulatory programs, including those relating to hazardous chemical storage and handling, wastewater discharges, solid and hazardous wastes and pesticides.

There is a need to establish a clear-written policy on enforcement and to increase the amount of regulatory program resources devoted to enforcement.

Several recent DEC commitments to improve the enforcement of the SPDES program have been described above (see *Wastewater Discharges*). It can be seen that these commitments actually relate to the enforcement of all environmental quality regulatory programs administered by the department.

There is no illusion that these initiatives will totally meet all the long-term needs, but they are a step forward. There will be a continuing need to emphasize rigorous enforcement and to assign adequate resources to enforcement activities. Success should be reviewed on an ongoing basis through the annual regulatory management oversight function.

PUBLIC EDUCATION AND PARTICIPATION

DEC will conduct a public participation program for the Long Island Groundwater Management Program.

An educational program should be developed by the participating agencies to inform the general public about Long Island's water resources. This should include development and implementation of an educational curriculum for use in public schools as suggested by the New York State Legislative Commission on Water Resource Needs of Long Island.

CONCLUSION

Strong, well-designed management programs to protect the quality and quantity of Long Island's groundwater resources are essential for the future social and economic vitality of the region. The recently completed draft *Long Island Groundwater Management Report* has been prepared specifically to assess the scope of management needs and identify the full range of governmental activities required to properly manage this vital source of water supply for the future.

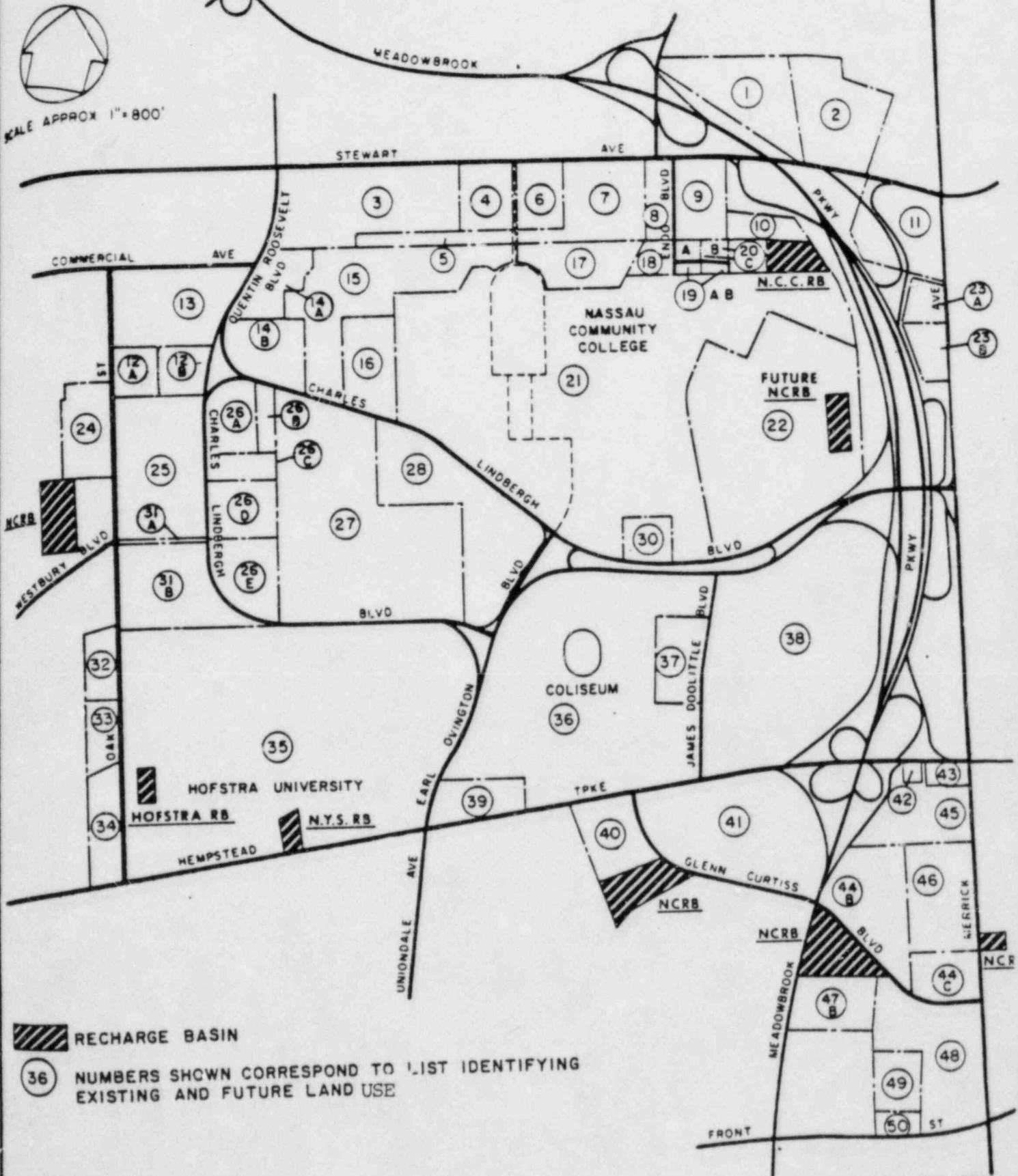
This executive summary is a synopsis of the most salient facts, issues and recommendations from that draft report.

In the development of governmental programs, it is important that the suggestions and concerns of all segments of society be properly considered. We would greatly appreciate any concerns, comments or suggestions you may have. Comments should be forwarded to

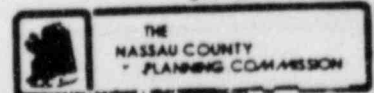
Daniel Halton
Director, Bureau of Water Resources
New York State Department of Environmental Conservation
50 Wolf Road, Rm. 328
Albany, New York 12233

MITCHEL FIELD STUDY AREA RECHARGE BASINS

ATTACHMENT 4



DATE-DEC.1983



UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

Before the Atomic Safety and Licensing Board

DOCKETED
USNRC

'85 FEB 22 A11:47

In the Matter of)

LONG ISLAND LIGHTING COMPANY)

(Shoreham Nuclear Power Station
Unit 1))

OFFICE OF SECRETARY
DOCKETING & SERVICE
BRANCH

Docket No. 50-322-OL-3
(Emergency Planning)

CERTIFICATE OF SERVICE

I hereby certify that copies of:

1. DIRECT TESTIMONY OF LEON CAMPO ON BEHALF OF SUFFOLK COUNTY REGARDING LILCO'S PROFFERED EVIDENCE OF JANUARY 11
2. DIRECT TESTIMONY OF JAMES H. JOHNSON, JR. ON BEHALF OF SUFFOLK COUNTY REGARDING LILCO'S PROFFERED EVIDENCE OF JANUARY 11
3. DIRECT TESTIMONY OF EDWARD P. RADFORD ON BEHALF OF SUFFOLK COUNTY REGARDING LILCO'S PROFFERED EVIDENCE OF JANUARY 11
4. DIRECT TESTIMONY OF DEPUTY CHIEF INSPECTOR RICHARD C. ROBERTS ON BEHALF OF SUFFOLK COUNTY REGARDING LILCO'S PROFFERED EVIDENCE OF JANUARY 11
5. DIRECT TESTIMONY OF CHARLES E. KILDUFF ON BEHALF OF NEW YORK STATE REGARDING LILCO'S PROFFERED EVIDENCE OF JANUARY 11
6. DIRECT TESTIMONY OF LANGDON MARSH ON BEHALF OF THE STATE OF NEW YORK REGARDING LILCO'S PROFFERED EVIDENCE OF JANUARY 11
7. DIRECT TESTIMONY OF SARAH J. MEYLAND ON BEHALF OF THE STATE OF NEW YORK REGARDING LILCO'S PROFFERED EVIDENCE OF JANUARY 11

have been served on the individuals identified below on this 19th day of February, 1985 by U.S. mail, first-class, except as otherwise noted.

*Morton B. Margulies
Administrative Law Judge
Atomic Safety and Licensing Board
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

*Dr. Jerry R. Kline
Atomic Safety and Licensing Board
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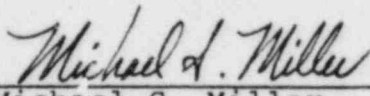
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