UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

Before the Atomic Safety and Licensing Board

In the Matter of	)	
LONG ISLAND LIGHTING COMPANY	)	Docket No. 50-322-OL-3 (Emergency Planning)
(Shoreham Nuclear Power Station, Unit 1)	)	

DIRECT TESTIMONY OF PHILIP B. HERR
ON BEHALF OF SUFFOLK COUNTY
REGARDING EMERGENCY PLANNING CONTENTION 22.D --
INADEQUACY OF LILCO'S EPZ

Q. Please state your name and occupation.

A. My name is Philip B. Herr. I am an Associate Professor of City Planning in the Department of Urban Studies and Planning, Massachusetts Institute of Technology and the prinicipal of Philip B. Herr and Associates. A resume describing my qualifications was admitted into evidence in this proceeding with my testimony on Contention 65. (Tr. 2909).

Q. What is the purpose of this testimony?

A. The purpose is to address Contention 22.D which reads as follows:

Preamble to Contention 22. 10 CFR Section 50.47(a)(1) prohibits the NRC from issuing an operating license absent a finding that emergency preparedness exists for the offsite area surrounding a nuclear power plant. The Commission must find that the state of emergency preparedness provides "reasonable assurance that adequate protective measures can and will be taken in the event of a radiological emergency." Id.

A major source of radiation exposure in the event of a radiological emergency is that received as a result of direct contact with a radioactive plume and/or from inhalation of radioactive gases and particles within the plume. Thus, the NRC requires the development of a plume exposure EPZ around each plant as the basis for planning for a radiological emergency. 10 CFR Sections 50.47(b)(10), 50.47(c)(2) and Appendix E, Sections II.N.2 and IV.

"EPZs are defined as the areas for which planning is needed to assure that prompt and effective actions can be taken to protect the public in the event of an accident." NUREG 0654, Section I.D.2. The "overall objective" is to provide planning and a state of preparedness that will permit implementation of protective actions if exposure to the public is projected to be above the EPA's Protective Action Guides ("PAGs"). 10 CFR Section 50.47(b)(10) requires that planning for protective actions must be consistent with Federal guidance such as the PAGs. Under the PAGs, protective actions should be commenced in the event of potential exposure of members of the public in the range of one to five rems. NUREG 0654, Section I.D.1.

Under the NRC's rules, plume exposure EPZs are generally 10 miles in radius. However,

the 10-mile size is not an absolute: "[t]he exact size and configuration of the EPZs surrounding a particular nuclear power reactor shall be determined in relation to local emergency response needs and capabilities as they are affected by such conditions as demography, topography, land characteristics, access routes, and jurisdictional boundaries." 10 CFR Section 50.47(c)(2). See also NUREG 0654, Section I.D.2.

. . .

Contention 22.D 10 CFR Section 50.47(c)(2) provides that two elements essential to defining the configuration of an EPZ are the location of local jurisdictional boundaries and demographic conditions. Thus, it is good emergency planning practice to include, if possible, the entire area of a local municipality within the boundaries of an EPZ. At a minimum, an EPZ should avoid dividing major population centers within a local municipality. See NUREG 0654, Section I.D.a.

LILCO's EPZ fails to meet the criteria of 10 CFR Section 50.47(c)(2) and NUREG 0654 because the proposed LILCO EPZ runs through and divides the villages of Port Jefferson and Terryville and the town of Riverhead. The EPZ should be extended to include all of Port Jefferson and Terryville and additional portions of Riverhead (those portions in the area 1-2 miles to the immediate east of the proposed EPZ which contain dense population and Riverhead's business district).

Thus, the concern expressed in Contention 22.D is that the Shoreham EPZ established by LILCO has violated basic planning principles because its boundaries in the areas of Riverhead,

Port Jefferson and Terryville fail to account for existing physical, demographic and jurisdictional conditions. As a result, both the public and emergency workers may not acknowledge the location or validity of the EPZ boundary, either intentionally or unintentionally which, in turn, would lead to an impaired emergency response.

Q. Do you agree with Contention 22.D?

A. Yes. In Riverhead, Port Jefferson and Terryville, the proposed implementation of the LILCO Plan clearly would be impaired as a result of the design of the EPZ boundary which goes directly through, and divides, populated sections of those villages. Map I attached hereto shows the EPZ boundary as presently defined.

Q. Please explain your concerns.

A. According to NUREG 0654, the EPZ is the area for which detailed planning is required "to assure that prompt and effective actions can be taken to protect the public in the event of an accident." (NUREG 0654 at 10). Thus, the boundary of the EPZ marks significant differences in operational readiness for a radiological emergency. NUREG 0654 requires both planning for a variety of emergency functions and protective actions,

and preparedness to implement those plans, for the area inside the EPZ. (See NUREG 0654, Section II). In contrast, NUREG 0654 envisions that planning and preparedness for protective actions outside the EPZ will be on an ad hoc basis. (See NUREG 0654 at 12). NUREG 0654 emphasizes that because of the differences in planning and preparedness on either side of the EPZ boundary, it is important that a boundary line be chosen which defines areas with real physical or jurisdictional differences. (See NUREG 0654 Section I.D.). In particular, the boundary should not divide population centers within a local jurisdiction. Instructions that people on either side of a boundary are supposed to take different actions will not be obeyed unless those instructions appear to have a rational basis. Several fundamental principles have therefore evolved to assist in identifying boundaries -- whether those boundaries are for zoning districts, environmental impact statements or EPZs. LILCO, however, has ignored these principles in adopting its present EPZ.

Q. What are the principles which LILCO has ignored?

A. First, use wide separators. Where taking different actions on opposite sides of a designated boundary is important but not easily enforced, as is true with evacuation or

sheltering advisories to residents in the EPZ, it is essential that the rationale for that boundary be as clear and as self-explanatory as possible. Wide separators such as waterbodies or reserved open space make good boundaries for several reasons. First, they are easily recognized. Second, the risks or conditions existing on opposite sides of a wide separator are truly different; that distance may, for example, mean a significantly different probability of receiving any given radiation dose level on either side of the boundary. With a narrow separator that is neither true, nor likely to be perceived as true.

In Riverhead, Port Jefferson and Terryville, the location of LILCO's EPZ boundary ignores this principle. Wide separators such as Indian Island County Park, Flanders Bay, and Flanders County Parkland have been ignored by LILCO in favor of of an EPZ boundary which follows zigzagging, narrow streets. In my opinion, the rationale for the LILCO EPZ boundary in these areas will not be understood by the public and thus will result in confusion and impaired emergency response.

The second important principle of drawing boundaries is related to the first -- <u>avoid use of narrow streets</u>. Dissimilar treatment of locations on opposite sides of the same

street (other than a very wide one, such as a limited-access expressway) invites conflict, confusion and non-compliance, and is widely considered to be bad planning practice. In land use planning and zoning, for example, district boundaries are considered to be best when unrelated to streets. Use of a common street for servicing activity on one side but not the other causes conflict. In land use planning that is one reason why zone boundaries ought not to cause industry and homes to face one another across a shared street.

If the concern is implementation of emergency response plan operations, the need to avoid narrow streets as zone boundaries is even greater. Imagine being a member of the public who resides on the east side of Osborn Avenue, which runs through the middle of the village of Riverhead and forms the eastern boundary of the LILCO EPZ. (See Map II attached hereto). In the event of a radiological emergency requiring an evacuation out to the EPZ boundary, your neighbors across the street would be advised to evacuate while you would be advised not to evacuate. Imagine hearing sirens or perhaps loudspeaker vehicles going up and down your street, and autos and emergency buses driving past your door evacuating your immediate neighbors across the street, while your orders are not to join the evacuees since you are safe -- supposedly because you are a

street width more distant from the risk source than are those being evacuated. That type of situation invites anxiety, confusion, and non-compliance with protective action recommendations. In Riverhead, Port Jefferson and Terryville, the principle of avoiding street-centered boundaries has been violated. Besides Osborn Avenue in Riverhead, relatively narrow roads also form the EPZ boundary in Port Jefferson (Main Street) and Terryville (Jayne Boulevard and Old Town Road). (See Map III attached hereto).

Third, boundaries should avoid dividing functional systems such as interrelated traffic facilities or school districts where those systems play an important role in the operation for which the boundary is relevant -- in this case an emergency response. This is what often happens, however, when boundaries run through population centers. Violation of this rule in the Shoreham EPZ is most evident in Riverhead. For instance, detailed planning for traffic management during a Shoreham emergency is crucial in Riverhead since it is the nexus through which all North Fork and some South Fork traffic will flow. The roadway system in Riverhead during a radiological emergency will be expected to serve any east-bound evacuees from the EPZ, as well as west-bound "shadow" evacuees. The EPZ incorporates only the western third of the town center. However, a majority

of the key intersections and road links in or near Riverhead are left outside of the EPZ, for example, all those involving Cross River Drive. (See Map II). That means that planning and operational support for the eastern two-thirds of the Riverhead traffic system will not exist during a radiological emergency. Thus, there is likely to be congestion and confusion just outside the EPZ, having the potential to affect at least the Riverhead portion of the EPZ. If the EPZ were extended into the eastern two thirds of downtown Riverhead and detailed planning were accomplished, then the potential would exist to avoid some of these problems. (This testimony assumes for the sake of argument that LILCO is capable of implementing its traffic control strategies).

Similarly, the easternmost traffic guides in Riverhead, whose task is in part to discourage west-bound traffic, (see Appendix A at IV-8) are proposed by the LILCO Plan to be located at Peconic and Main Streets, Main Street and Osborn Avenue, and Main and Court Streets. Assuming for the sake of argument that motorists were to obey the LILCO traffic guides (but see Suffolk County testimony on Contention 65), the traffic guides at these locations, in the heart of Riverhead, will cause a chaotic tangle as cars encounter the control points, then try to revise routes in order to avoid either the EPZ or the

traffic guides managing EPZ access. Those route revisions will involve unexplained turning or even backing up on relatively narrow and congested streets. Cross River Drive, further to the east, presents a far better opportunity to manage traffic.

Schools are another of the functional systems which have been arbitrarily divided by the Shoreham EPZ. While some division of school districts may be necessary, the tortured configuration of the Shoreham EPZ results in a very large number of district bifurcations. The Riverhead boundary zig zags, seemingly intentionally, so that it abuts but excludes, one elementary school, one junior high, and one parochial high school. (See Map II). The boundary also passes within sight of, but excludes, the public high school. (See Map II). The Terryville boundary abuts, but excludes, one elementary school and a high school. The Port Jefferson boundary runs between two schools, leaving the high school just 1,000 feet outside the boundary and leaving an elementary school just 1,000 feet inside it. (See Map III). One consequence of this type of arbitrary line drawing is confusion and reluctance to acknowledge the validity of the boundaries. (See, e.g., Testimony of Dr. George Jeffers and Mr. Anthony R. Rossi, Tr. 3161-3165).

Fourth, if there cannot be compliance with the other planning principles discussed above, the EPZ boundary should at a minimum be located in a low-density area in an effort to minimize the problems caused by failing to follow those principles. In low density areas relatively few people are likely to be near the boundary and therefore relatively few people would be affected by the stress, confusion and non-compliance discussed above. Choosing low-density areas for zone boundaries also helps in less obvious ways. Functional district boundaries such as discussed above are more likely to be cut by an arbitrary line through a high-density area than by such a line through a low-density area. Once again, this principle is abrogated by the EPZ boundary at Port Jefferson, Terryville, and Riverhead. In all three cases, the EPZ boundary cuts directly through high population density areas. (See Maps II & III).

The fifth and sixth princples, are easy boundary recognition by the public and feasibility of minimizing unwarranted entry into the EPZ. These principles are especially applicable in designing Emergency Planning Zones. It is important that the EPZ boundary be readily recognized and its validity and reasonableness acknowledged by the public, both inside and outside the EPZ, so people near that boundary will know whether

protective action advisories apply to them, and so others can plan their travel and other activities to avoid interdicted areas. Yet, at Riverhead, the EPZ boundary jogs in a complex pattern difficult to describe verbally and even more difficult to visualize from such a description. (See, e.g., EBS messages describing EPZ boundaries in OPIP 3.8.3 at 33-38; see also, Map II). Clearly, the principle of boundary recognition was ignored by LILCO in defining the EPZ boundary through Riverhead, as is evident from its decision to divide an urban center with that boundary.

Long Island is rich in place names with clear identities: people know, for instance, where Port Jefferson ends and East Setauket begins. Boundary recognition would clearly be aided by the use of easily recognized jurisdictional boundaries (i.e. by using place names rather than urban streets to describe areas included within, or excluded from the EPZ). A protective action recommendation keyed to the presently proposed EPZ boundaries would certainly confuse many people. This would be likely to result in lack of compliance with protective action recommendations, and substantial difficulty in the proposed implementation of the LILCO Plan.

It is necessary to minimize the entry of traffic into the EPZ during an incident in order to avoid public exposure to a high-risk area and, in the event of evacuation, relocation, or area interdiction, in order to improve the security of unattended properties. This is recognized by NUREG 0654 Section II.J.10.j. and by LILCO in its Plan. (Appendix A at IV-8). Many people from the East End will seek to move westward during an evacuation and, of those, many may attempt to enter the EPZ on the way west. (See Testimony of Zeigler and Johnson on Contention 23 at 32-33). To be completely effective at all in discouraging the entry of traffic into the EPZ, there must be information at each entry point about the risks of proceeding further. Once informed, there must also be a reasonable way for drivers who do not wish to proceed to change direction. The way the EPZ is presently configured, however, there are about 15 streets which enter it north of the Peconic in the Riverhead area. Yet, LILCO calls for only four of those points to be manned. Moving the EPZ boundary eastward at Riverhead so it does not cut through the center of a complex traffic pattern, would reduce substantially the number of cross streets entering the EPZ.

At the Port Jefferson portion of the EPZ boundary, north of Route 347, there are about two dozen street entrances into

the EPZ which present an even more formidable problem of boundary security than at Riverhead. LILCO has failed to take this into account: only two or three of them are proposed for traffic control points. Again, locating the EPZ boundary so it does not go through such a populated area could reduce this problem somewhat.

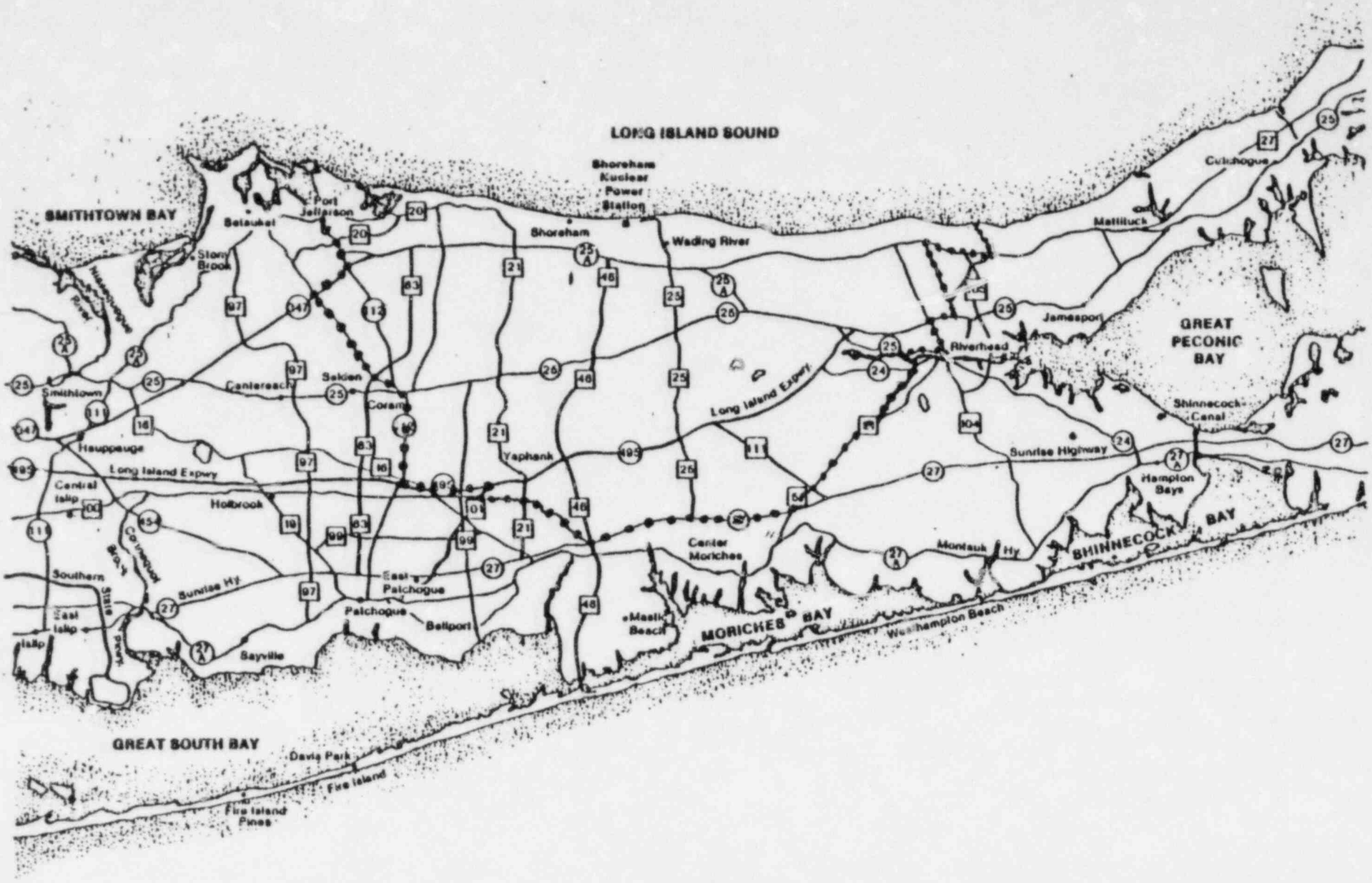
Traffic turning away from the EPZ will in many cases want to reverse direction away from the EPZ or, in other cases, to move roughly parallel to the EPZ border (for instance, from Riverhead, south along Rte. 51). Achieving either of those movements is especially difficult in a high-density congested center, such as Riverhead. Given LILCO's EPZ boundary, traffic from the east must enter the urban center of Riverhead before encountering the EPZ boundary or traffic guides (who in some cases are on the boundary (e.g., Osborn and West Main), in other cases just east of it (e.g., the Peconic Circle)). The result is sure to be more confusion and traffic congestion than would be the case if the boundary were drawn outside that urban center -- for instance, further to the east along Cross-River Drive where routes facilitating reversal or travel along parallel routes are more readily available.

Similarly, in Port Jefferson, given the current EPZ boundary, Main Street would be called upon to handle not only pre-evacuation and evacuation traffic, but also the movements of traffic which first encounters the EPZ boundary there and as a result, tries to change direction, back up, or otherwise evade either perceived risk or traffic guides. If the EPZ boundary were not located in the middle of such a congested urban area, these problems could be avoided or at least lessoned.

Q. Please summarize your testimony.

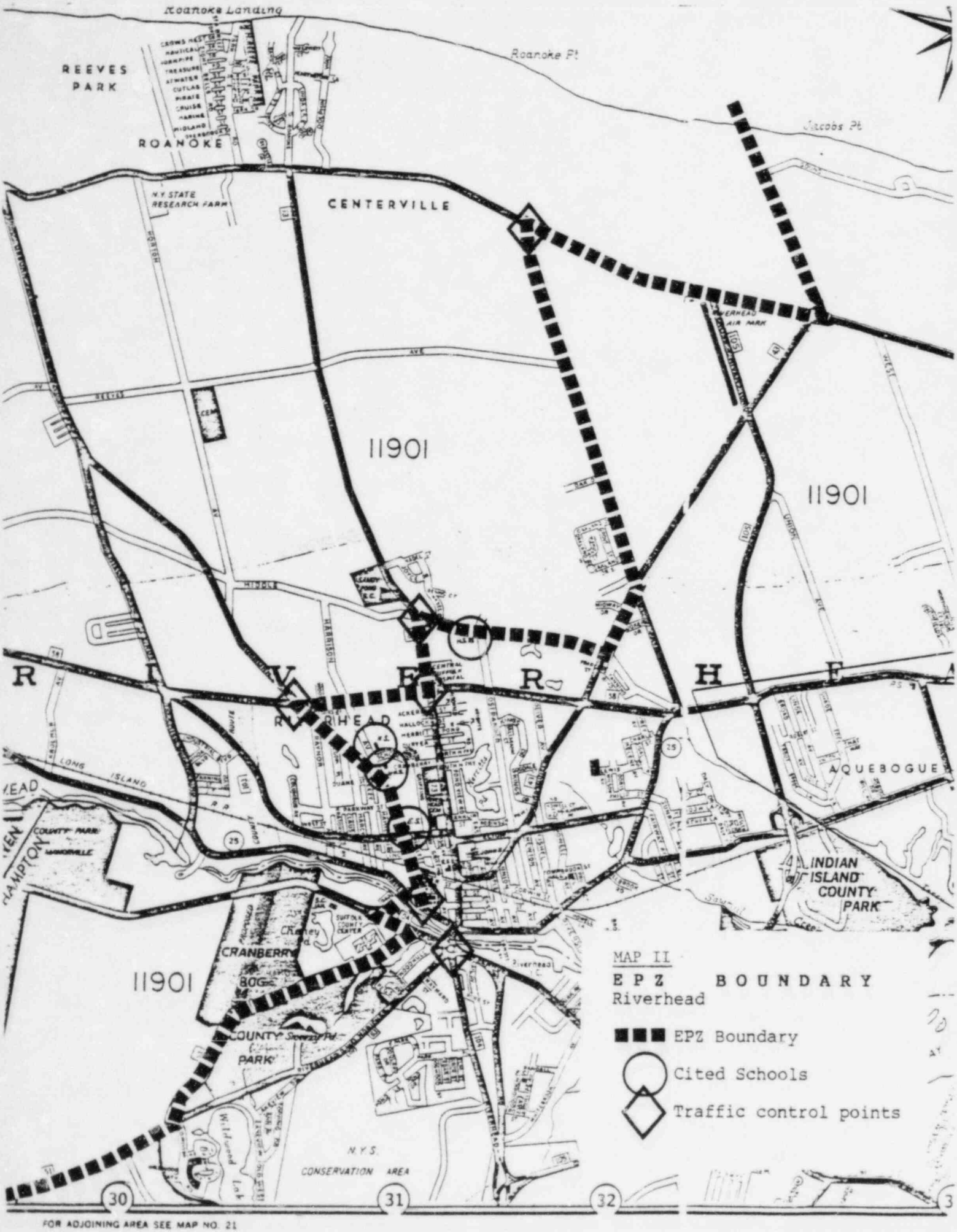
A. LILCO has established the boundaries of the Shoreham EPZ in violation of basic planning principles by having the boundary run arbitrarily through the populated centers of Riverhead, Port Jefferson and Terryville following various narrow local roads. The current EPZ configuration would cause confusion and lack of compliance with protective action recommendations in the event of a radiological emergency since its boundaries would not be recognized, understood, considered rational, or acknowledged by the public to be valid. As a result, implementation of LILCO's Plan could be substantially impaired.

MAP I


LONG ISLAND SOUND
Shoreham Nuclear Power Station
SMITHTOWN BAY
Setauket
Port Jefferson
Shoreham
Wading River
Mattituck
Cutchogue
Stony Brook
Jamesport
GREAT PECONIC BAY
Riverhead
Smithtown
Centereach
Selden
Coram
Long Island Expwy
Shinnecock Canal
Hauppauge
Yaphank
Sunrise Highway
Hampton Bays
Central Islip
Holbrook
Center Moriches
Montauk Hy
SHINNECOCK BAY
Southern State Pkwy
Sunrise Hy
East Patchogue
Patchogue
Bellport
Mastic Beach
MORICHES BAY
Westhampton Beach
Sayville
GREAT SOUTH BAY
Davis Park
Fire Island
Fire Island Pines

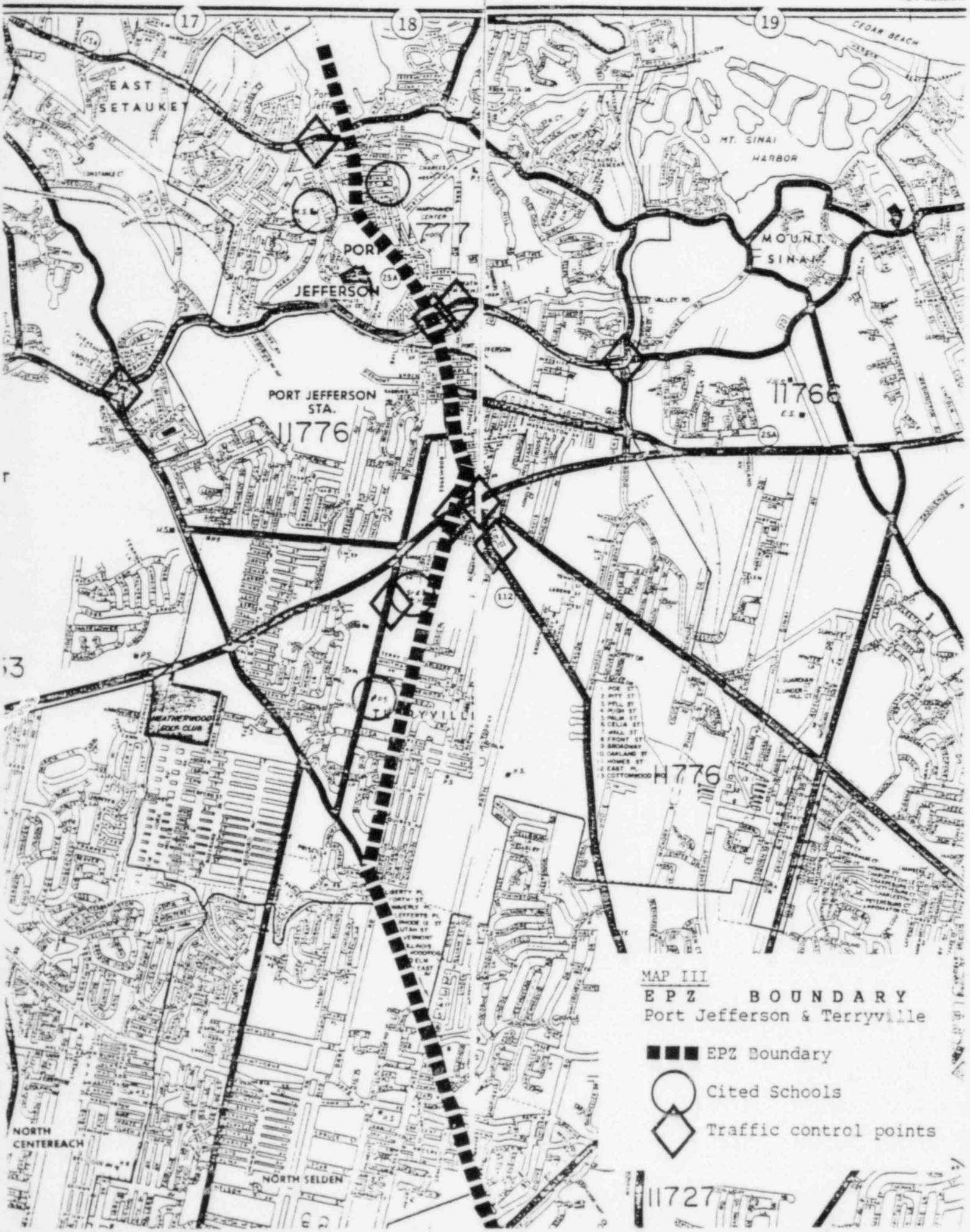
MAP I

MAP II



FOR ADJOINING AREA SEE MAP NO. 21

MAP III



MAP III

EPZ BOUNDARY

Port Jefferson & Terryville

■■■ EPZ Boundary

Cited Schools

Traffic control points