

---

# Evacuation Time Estimates for Areas Near the Site of Indian Point Power Plants

---

prepared for the  
**Power Authority  
of the State of New York  
and Consolidated Edison  
of New York, Inc.**

prepared by  
**Parsons Brinckerhoff Quade & Douglas, Inc.**

---

January 31, 1980

8002050 507

Table of Contents

	<u>Page</u>
I Introduction	1
II Evacuation Sectors and Evacuation Areas	1
III Assumptions and Methodology	7
IV Special Facilities	12
V Evacuation Time Estimates	17
VI Local Official Commentary	23

Appendix

- A Nuclear Regulatory Commission Letter of November 29, 1979
- B Roadway Capacity Methodology
- C Local and State Officials Commentary
- D State Office of Disaster Preparedness Letter

## I. INTRODUCTION

- a. On November 29, 1979, the Nuclear Regulatory Commission (NRC) requested that the power reactor licensees (Consolidated Edison Company of New York, Inc. and the Power Authority of the State of New York) prepare evacuation time estimates for the Indian Point 2 and Indian Point 3 power plants. The information requested was contained in an enclosure to the NRC's letter of November 29, 1979; the enclosure was entitled "Request for Evacuation Time Estimates (After Notification) for Areas Near Nuclear Power Plants." (Copy of the letter and enclosure are attached in the Appendix.)
- b. This document presents the estimate of the time required to implement evacuation of areas near the nuclear power plants. The areas for which evacuation estimates are given have an outer boundary of approximately 10 miles radius, basically corresponding to the plume exposure emergency planning zone (EPZ). See Figure 1.

## II. EVACUATION SECTORS AND EVACUATION AREAS

Based on the format specified in the November 29, 1979 letter from the NRC, an evacuation area within a circle with approximately a 10-mile radius was defined. As can be seen from Figure 2, the irregularly shaped evacuation area is, in many places, considerably larger than the area included within the 10-mile radius. These irregularities occur because the perimeter of the evacuation area was constructed to follow either natural or political boundaries to the extent possible. Further, efforts were taken to avoid bisecting communities and densely populated areas.

Within this evacuation area, ten internal sectors were developed in conformance with the NRC requirements. The internal sectors include: two 180° sectors within a two-mile radius of the power plant; four 90° quadrants in the area between the two- and five-mile radii; and four 90° quadrants between the five- and ten-mile radii. Similar to the outer 10-mile boundary, the boundaries of the ten internal sectors also follow natural or political boundaries wherever possible. As a result, in many cases there is an overlap in the areas covered by adjacent sectors.

Because it is assumed that coterminous inner sectors will always be evacuated simultaneously with the outer sectors, an evacuation area is defined as the combination of sectors that would be evacuated in different situations. For example, if Sector 5 is to be evacuated, the evacuation area would include Sectors 2 and 5. Evacuation of Sector 7 would also require the evacuation of Sectors 1 and 3. The list below identifies the sectors which comprise the evacuation areas which are identified as A through J.

As indicated in the list, Evacuation Area K includes all ten sectors. In this case, the internal boundaries and, hence, the overlapping

areas are eliminated as this situation requires evacuation of the entire area.

Following is the list of the evacuation sectors in each evacuation area and the figure on which each evacuation area is shown.

<u>Figure</u>	<u>Evacuation Area</u>	<u>Evacuation Sectors</u>
3	A	1
4	B	2
5	C	1,3
6	D	1,3,7
7	E	1,4
8	F	1,4,8
9	G	2,5
10	H	2,5,9
11	I	2,6
12	J	2,6,10
13	K	1 through 10

A brief description of the perimeter boundary of each evacuation area follows:

Evacuation Area A (Sector 1) (Figure 3)

East side of Hudson River -- at western tip of Crugers, on Cruger Station Road to Ferris Court Road to U.S. Rte 9, U.S. Rte 9 south to Watch Hill Rd., Watch Hill Rd. northeast to Washington Street. North on Washington Street to the southern boundary of the Blue Mountain Reservation. Follow park boundary around to the north to Maple Avenue. At Maple Avenue, follow Peekskill city boundary counterclockwise around city to the point where it crosses Mountain Bridge Road (U.S. Rte 202). Follow U.S. Rte 202 west to point where it crosses Camp Smith boundary. From Camp Smith boundary, straight across Hudson River to confluence of Snake Hole Creek (in Bear Mountain State Park) and Hudson River. From Snake Hole Creek south along west shoreline of Hudson River to Stony Point State Park southern boundary and across river to Cruger Station Road.

Evacuation Area B (Sector 2) (Figure 4)

On west shore of Hudson River, at confluence of Snake Hole Creek (in Bear Mountain State Park) with Hudson River, across park in an arc along 2-mile radius to park boundary at Tomkins Lake. At Tomkins Lake, south on Lakeview Drive, then Hillside Drive to Buckberg Road (Co. Rd. 78) to U.S. Rte 202. Around U.S. Rte 202 south to Park Road, then Battlefield Road to the southern boundary of Stony Point State Park. Across river to east bank at Crugers Station Road at western tip of Crugers. Crugers Station Road to Ferris Court Road to U.S. Rte 9. U.S. Rte 9 south to Watch Hill Road. Watch Hill Road northeast to Washington Street. North on Washington Street to Peekskill city boundary. City boundary to shore of Hudson River at Lents Cove. North along shoreline to point just south of Fish Island. Across river at Fish Island to Snake Hole Creek.

Evacuation Area C (Sectors 1, 3) (Figure 5)

From east bank of Hudson River at Station Square Road in Garrison to Co. Rd. 12. Co. Rd. 12 to State Rte 403. State Rte 403 (Forsonville Rd.) south to U.S. Rte 9. South on U.S. Rte 9 to Old West Point Road and south to Co. Rd. 13. South on Co. Rd. 13 to Aqueduct Road. Aqueduct Road to Traverse Road and along Traverse Road to Philipstown/Putnam Valley line. South on town line to Westchester/Putnam County line. Follow county line east to Cortlandt/Yorktown line. South on town line to Jacob Street. Jacob Street to Croton Avenue and Croton Avenue south to Maple Avenue. Maple Avenue west to Blue Mountain Reservation western boundary. Follow park boundary south to Washington Street. South on Washington Street to Watch Hill Road. Watch Hill Road southwest to U.S. Rte 9. U.S. Rte 9 north to Ferris Court Road to Cruger Station Road at western tip of Crugers. Across river to southern boundary of Stony Point Park on west bank of river. North along west bank of river to southern boundary of Village of Highland Falls at shoreline and across to east bank of river. On east bank, north along railroad tracks to Station Square Road in Garrison.

Evacuation Area D (Sectors 1, 3, 7) (Figure 6)

On west bank of Hudson, follow Cornwall/Hudson town line west to U.S. Rte 9W. South on U.S. Rte 9W to the southern boundary of the military reservation. Follow military reservation boundary east to the Hudson River. South along the west bank of the Hudson River to the southern boundary of Stony Point State Park. Across the River to Cruger Station Road at the western tip of Crugers. Cruger Station Road to Ferris Court Road to U.S. Rte 9. U.S. Rte 9 south to Watch Hill Road. Watch Hill Road northeast to Washington Street. North on Washington Street to the southern boundary of the Blue Mountain Reservation. Follow park boundary around to the north to Maple Avenue. Maple Avenue east to Croton Avenue. North on Croton Avenue to Jacob Street. East on Jacob Street to Hunter Brook Road. South on Hunter Brook Road to White Hill Road. White Hill Road east to Mohansic Ave. and east to Baldwin Road. Baldwin Road to U.S. Rte 202/State Rte 35. East on U.S. Rte 202/State Rte 35 to Amawalk Reservoir. Follow reservoir north to State Rte 118. North on State Rte 118 to Westchester/Putnam County line. West on county line to Muscoot Creek. Follow creek north to State Rte 6N. State Rte 6N north to Secor Lake Road. West on Secor Lake Road to Putnam Valley/Carmel town line. Town line north to Peekskill Hollow Road/Taconic State Parkway intersection. Taconic State Parkway north to State Rte 301. West on State Rte 301 to Village of Nelsonville. Follow northern boundary of Nelsonville to northern boundary of Cold Spring to the river. Across Hudson River to Cornwall/Highlands town line.

Evacuation Area E (Sectors 1, 4) (Figure 7)

From southern boundary of Stony Point State Park, north along west bank of river to confluence of Snake Hole Creek (in Bear Mountain State Park) and Hudson River. Across river to point where U.S. Rte 202 crosses the Camp Smith boundary. Follow U.S. Rte 202 to point where it crosses Peekskill city boundary. Follow city boundary clockwise to U.S. Rte

202 (Crompond Road). East on U.S. Rte 202 to Yorktown/Cortlandt line. South along town line to State Rte 129. State Rte 129 west and south to Village of Croton-on-Hudson. Follow village boundary south to Hudson River/Croton Bay. Around Croton Point peninsula shoreline and continue north along east shoreline of Hudson River to Senasqua Park in Croton-on-Hudson and across river to point on shoreline in Haverstraw directly east of New Main Street. North along west bank of Hudson to southern boundary of Stony Point State Park.

Evacuation Area F (Sectors 1, 4, 8) (Figure 8)

From northern boundary of Village of Upper Nyack at the Hudson River across river to Ossining/Mt. Pleasant town line. Follow town line to eastern boundary of Village of Briarcliff Manor. Follow village boundary to Washburn Road. East on Washburn Road to Chappaqua Road. East on Chappaqua Road to New Castle/Mt. Pleasant town line and east on line to Hardscrabble Road. North on Hardscrabble Road to Quaker Street. West on Quaker Street to Seven Bridge Road. North on Seven Bridge Road to Yorktown/New Castle line. East, then north on town line across New Croton reservoir. East along north shore of reservoir to Moseman Avenue. North on Moseman Avenue to Wood Street to Amawalk Road. Amawalk Road to western boundary of Amawalk Reservoir. Follow western boundary north to Granite Springs Road. West on Granite Springs Road to State Rte 35/U.S. Rte 202. West on State Rte 35/U.S. Rte 202 to Peekskill city boundary. Follow city boundary counter-clockwise around city to point where it crosses Mountain Bridge Road (U.S. Rte 202). Follow U.S. Rte 202 west to point where it crosses Camp Smith boundary. From Camp Smith boundary straight across river to confluence of Snake Hole Creek (in Bear Mountain State Park) and Hudson River. South along west bank of Hudson River to Haverstraw/Clarkstown line at point where it crosses U.S. Rte 9W. South on U.S. Rte 9W to northern boundary of Village of Upper Nyack. East on village boundary to Hudson River.

Evacuation Area G (Sectors 2, 5) (Figure 9)

At the southern boundary of Stony Point State Park, across river to east bank at Crugers Station Road at western tip of Crugers. Crugers Station Road to Ferris Court Road to U.S. Rte 9. U.S. Rte 9 south to Watch Hill Road. Watch Hill Road northeast to Washington Street. North on Washington Street to Peekskill city boundary. City boundary to shore of Hudson at Lents Cove. North along shoreline to Roa Hook Road/Camp Smith boundary. Follow Camp Smith boundary east and north to Westchester/Putnam County line. County line west to Military Road. North on Military Road to Manitou Road. Manitou Road north to State Rte 9D. North on State Rte 9D to road at BM 10 in Philipstown on east bank of Hudson River. Across river to southern boundary of Village of Highland Falls. South along shore line to the Harriman State Park/U.S. Military Reservation boundary. Follow boundary west to point where park boundary meets Highlands/Woodbury town line. Town line south to Seven Lakes Parkway. Parkway west to Woodbury/Tuxedo town line. Southeast on town line to Orange/Rockland County line. Southwest on county line to Tiorati Brook Road. Tiorati Brook Road southeast to Lake Tiorati Brook. Lake Tiorati Brook to Co. Rd. 81 (Cedar Flats

Road). North on Co. Rd. 81 to Co. Rd. 69 (Bulsontown Road). East on Co. Rd. 69 to Co. Rd. 79 (Mott Farm Rd.). Co. Rd. 79 north and east to Co. Rd. 78 (Buckberg Rd.). Co. Rd. 78 south to U.S. Rte 202. U.S. Rte 202 south to Park Road. East on Park Road, then on Battlefield Road to the southern boundary of Stony Point State Park.

Evacuation Area H (Sectors 2, 5, 9) (Figure 10)

On west bank of Hudson River, along Cornwall/Highlands town line to U.S. Rte 9W. North on U.S. Rte 9W to Co. Rd. 9 (Angola Road). South on Co. Rd. 9 to Long Hill Road. South on Long Hill Road to Woodbury/Cornwall town line. Continue west, then south on Woodbury line to western boundary of Village of Harriman. Continue around Harriman to Woodbury/Monroe town line. South on Woodbury/Monroe line and east on Woodbury/Tuxedo line to the NYS Thruway (I-87). Thruway south to Orange/Rockland County line. North on county line to Tiorati Brook Road. Tiorati Brook Road south to Lake Tiorati Brook. Lake Tiorati Brook to Co. Rd. 81 (Cedar Flats Road). North on Co. Rd. 81 to Co. Rd. 69 (Bulsontown Road). East on Co. Rd. 69 to Co. Rd. 79 (Mott Farm Road). Co. Rd. 79 north and east to Co. Rd. 78 (Buckberg Road). Co. Rd. 78 south to U.S. Rte 202. U.S. Rte 202 south to Park Road. East on Park Road, then Battlefield Road to southern boundary of Stony Point State Park. From park, across river to east bank at Crugers Station Road at western tip of Crugers. Crugers Station Road to Ferris Court Road to U.S. Rte 9. U.S. Rte 9 south to Watch Hill Road. Watch Hill Road northeast to Washington Street. North on Washington Street to Peekskill city boundary. City boundary to shore of Hudson River at Lents Cove. North along shoreline to Roa Hook Road/Camp Smith boundary. Follow Camp Smith boundary east and north to Westchester Putnam County line. County line west to Military Road. North on Military Road to Manitou Road. Manitou Road north to State Rte 9D. North on State Rte 9D to road at BM10 in Philipstown on east bank of Hudson River. Across river to southern boundary of Village of Highland Falls. North along west bank of Hudson River to Cornwall/Highlands town line.

Evacuation Area I (Sectors 2, 6) (Figure 11)

From west bank of Hudson River, west on Haverstraw/Clarkstown boundary line to Palisades Parkway. North on Palisades Parkway to Co. Rd. 84 (Willow Grove Road), continuing west on Co. Rd. 85 (Gate Hill Road) and Co. Rd. 86 to the Rockland/Orange County line. Follow county line to Tiorati Brook Road. Straight across Bear Mountain State Park along 90° axis to park boundary north of Bulsontown. Along park boundary east to Tomkins Lake. From park boundary at Tomkins Lake in an arc (along 2 mile radius) across Bear Mountain State Park to Snake Hole Creek at its confluence with the Hudson River. Across the river to a point on the shore just south of Fish Island. South along shore line to Peekskill city boundary at Lents Cove. Follow city boundary south along Washington Street to intersection with Watch Hill Road. Watch Hill Road southwest to U.S. Rte 9. North on U.S. Rte 9 to Ferris Court Road. Ferris Court Road west to Cruger Station Road. Cruger Station Road to Battery Place on Hudson River. South along east bank of river to Senasqua Park. Across river to point on shoreline in Haverstraw directly east of New Main Street. South along west shore of river to Haverstraw/Clarkstown line.

Evacuation Area J (Sectors 2, 6, 10) (Figure 12)

At the Woodbury/Tuxedo town line, follow NYS Thruway (I-87) south to Orange/Rockland County line. East on county line to Haverstraw town line. Across Town of Ramapo in a straight line (south of Pine Meadow Lake) to Sky Meadow Drive. Sky Meadow Drive to U.S. Rte 202 at Wesley Chapel. U.S. Rte 202 west to Co. Rd. 106 (Viola Road) east to Union Road. Union Road south to Co. Rd. 107 (Eckerson Road). East on Co. Rd. 107 to Clarkstown/Ramapo town line. South, then west on town line to Spring Valley village line. Follow village line to Ramapo/Clarkstown line. South on town line to NYS Thruway (I-87). Follow Thruway east to Village of Nyack boundary line. North on village line to the Village of Upper Nyack line. East on Upper Nyack village line to river and north along shoreline to northern boundary of the Village of Upper Nyack. Across river to Ossining/Mt. Pleasant town line. North along east bank of river to Crugers Station Road at western tip of Crugers. Crugers Station Road to Ferris Court Road to U.S. Rte 9. U.S. Rte 9 south to Watch Hill Road. Watch Hill Road northeast to Washington Street. North on Washington Street to Peekskill city boundary. City boundary to shore of Hudson River at Lents Cove. North along shoreline to point just south of Fish Island. Across river at Fish Island to confluence of Snake Hole Creek (in Bear Mountain State Park) and Hudson River. From Snake Hole Creek, across Bear Mountain State Park in an arc (along 2 mile radius) to park boundary at Tomkins Lake. Park boundary west and south to a point just north of Bulsontown. Straight across Bear Mountain State Park (along 90° axis) to Rockland/Orange County line at Tiorati Brook Road. Northeast on county line to Woodbury/Tuxedo town line. West on town line to NYS Thruway.

Evacuation Area K (Sectors 1-10) (Figure 13)

On west bank of Hudson River, along Cornwall/Highlands town line to U.S. Rte 9W to Co. Rd. 9 (Angola Road). South on Co. Rd. 9 to Long Hill Road. South on Long Hill Road to Woodbury/Cornwall town line. West, then south on Woodbury line to western boundary of Village of Harriman. Continue around Harriman to Woodbury/Monroe town line. South on Woodbury/Monroe line and east on Woodbury/Tuxedo line to the NYS Thruway (I-87). Follow NYS Thruway (I-87) south to Orange/Rockland County line. East on county line to Haverstraw town line. Across Town of Ramapo in a straight line (south of Pine Meadow Lake) to Sky Meadow Drive. Sky Meadow Drive to U.S. Rte 202 at Wesley Chapel. U.S. Rte 202 west to Co. Rd. 106 (Viola Road). Co. Rd. 106 east to Union Road. South on Union Road to Co. Rd. 107 (Eckerson Road). East on Co. Rd. 107 to Clarkstown/Ramapo town line. South, then west on town line to Spring Valley line. Follow village line to Ramapo/Clarkstown line. South on town line to NYS Thruway (I-87). Follow Thruway east to Village of Nyack boundary line. North on village line to the Village of Upper Nyack line. East on Upper Nyack village line to river and north along shoreline to northern boundary of the Village of Upper Nyack. Across river to Ossining/Mt. Pleasant town line. Follow town line to eastern boundary of Village of Briarcliff Manor. Follow village boundary to Washburn Road. East on Washburn Road to Chappaqua Road. East on Chappaqua Road to Briarcliff Road, then to New Castle/Mt. Pleasant town line and east on line to Hardscrabble Road. North on Hardscrabble

to Quaker St. West on Quaker St. to Millwood Road, then Seven Ridges Road. North on Seven Ridges Rd. to Yorktown/New Castle line. East, then north on town line across New Croton Reservoir. East along north shore of reservoir to Moseman Ave. North on Moseman Avenue to Wood Street to Amawalk Road. Amawalk Road to western boundary of Amawalk Reservoir. Follow western boundary north to State Rte 118. North on State Rte 118 to Westchester/Putnam County line. West on county line to Muscoot Creek. Follow creek north to State Rte 6N. State Rte 6N north to Secor Lake Road. West on Secor Lake Road to Putnam Valley/Carmel town line. Town line north to Peekskill Hollow Road/Taconic State Parkway intersection. Taconic State Parkway north to State Rte 301. West on State Rte 301 to Village of Nelsonville. Follow northern boundary of Nelsonville to northern boundary of Cold Spring to the river. Across Hudson River to Cornwall/Highlands town line.

### III. ASSUMPTIONS AND METHODOLOGY

#### a. Population

The population for the area covering the 10-mile radius, as well as each of the sectors, was derived from the 1970 U.S. Department of Commerce Census and updated by the 1976 Population Estimates and Projections issued January 1979 by the U.S. Department of Commerce Census.

The overall area was divided into ten sectors with each sector extending beyond its quadrant limits and thereby creating overlapping areas. The total area was identified as the 11th Sector. Each sector was subdivided into varying numbers of subsectors.

Subsector perimeters were determined by any or a combination of the following: census tract delineations, town boundaries, park boundaries, highways or roads. The population of the subsectors was determined from census tracts when the full area of the tract was equal to the area of the subsector. When a subsector was less than or greater than the area of the census tract, block statistics were used to compile the population. In some instances where block statistics were unavailable, house counts were made on the New York State Department of Transportation planimetric maps and a predetermined number of occupants per household based on 1970 U.S. Census was used to determine the population. The sector population is the aggregate of the subsectors' population. The population of the total area (11th Sector) is not the sum of Sectors 1 through 10's population because of the overlapping boundaries.

Based on the 1970 Census data of households with automobiles, a ratio was established to determine the number of people with automobiles. Dividing the number of people with automobiles by the number of people per household determined the number of automobiles.

The following table shows 1976 population estimates.

<u>Evacuation Area</u>	<u>Evacuation Sector</u>	<u>1976 Population Estimates</u>
A	1	32,112
B	2	12,191
C	1,3	48,167
D	1,3,7	101,378
E	1,4	44,436
F	1,4,8	100,002
G	2,5	13,229
H	2,5,9	32,178
I	2,6	53,410
J	2,6,10	127,267
K	1 through 10	282,344

Source: 1970 U.S. Department of Commerce Census, updated by 1976 Population Estimates and Projections, U.S. Department of Commerce Census, January, 1979.

b. Evacuation Time Estimates Methodology

To estimate the time required to evacuate the areas surrounding the nuclear power plants, the evacuation process for each sector was simulated. A process was developed whereby evacuation was analyzed for each evacuation area and used as a basis for estimating the time to evacuate the area population. The evacuation analysis estimated the time for evacuation of the area population through the use of existing transportation facilities.

Of primary concern was to minimize the number of primary evacuation routes and to utilize available public bus transit and special vehicles located either within the ten mile limit or in close proximity. This process was used to determine a best estimate and adverse weather estimate of evacuation times for the general population and special facilities. Subsectors within the sectors were disaggregated into smaller areas (zones) of population concentrations which would produce trips using the major roadways. Upon completion of the sector disaggregation to zones, the following steps were executed in estimating the time to evacuate a particular zone and, subsequently, the sectors and evacuation areas.

- Step 1 - Zonal Trip Generation
- Step 2 - Transportation Facility Identification
- Step 3 - Capacity Determination
- Step 4 - Modal Trip Assignment
- Step 5 - Evacuation Time Estimation

The process required a certain amount of feedback and iteration within the five steps.

### Zonal Trip Generation

This step of the process consists of converting population into vehicle trips at a zonal level. For this purpose the zonal population was divided into general population without vehicles and general population with vehicles. Additionally, the populations of special facilities were identified so that separate evacuation plans could be developed.

When estimating the vehicle trips for the general population with vehicles, it was assumed that one vehicle trip would be generated by each family in evacuating the area. Using average family statistical data, the number of vehicles generated by the general population with vehicles was estimated for each zone.

For the general population without vehicles, both school buses and transit buses with capacities of 40 and 50 persons, respectively, were used. The mixture of transit vehicles depended largely on the estimate of time (best estimate or adverse weather) being made. The number of bus trips estimated were converted to passenger car equivalents (PCE) for purposes of assigning the trips jointly with auto trips to the selected routes. For the adverse weather estimate, school bus trips were determined and also converted to PCEs for assignment purposes. A factor of two was used to convert school and transit buses to passenger car equivalents.

Vehicles generated by special facilities were also estimated and where buses were needed these were converted to PCE. Special facilities often required a mix of ambulances, wheel chair vehicles and buses for evacuation.

The net result of the trip generation process was the estimation of equivalent passenger vehicles for each zone in the ten mile area.

### Transportation Facility Identification

Identification of existing transportation facilities required a determination of the primary evacuation routes and an inventory of the existing transit facilities in or around the ten mile limits.

Based on information provided by the New York State Office of Disaster Preparedness, County Officials, field reconnaissance, information on file, and general familiarity with the area, the primary and secondary evacuation routes were selected. Each of the selected routes, as well as others, were traveled in order to assess sufficiency for evacuation purposes and to determine the physical characteristics (number of lanes, lane and shoulder widths) needed for capacity computations.

Information regarding transit facilities and special vehicles available for evacuation was obtained through personal contact with transit operators, school districts, emergency vehicle operators, and the special facilities.

#### Capacity Determination

A critical element in determining the amount of time needed to evacuate any given area is the capacity of the existing roadways to accommodate the anticipated vehicular volumes generated during evacuation. The procedure used in determining the primary evacuation roadway capacities was based on the Federal Highway Administration's Highway Capacity Manual - 1965 Edition. Capacities were estimated at roadway Levels of Service D and E for use in computing travel times for the adverse weather and best estimate conditions, respectively. A more detailed explanation of the method used in determining these capacities is included in the appendix. The New York State Department of Transportation and the Office of Disaster Preparedness were consulted with regard to using these capacities for the time estimates and concur fully with the approach (see C.P. Kolé letter to R.W. Tweedie dated January 25, 1980 in the Appendix).

#### Modal Trip Assignment

The next step in the process is to assign the trips generated by each zone to the selected fixed routes for evacuation. A computer program was developed which would receive as input a description of all the roadway characters (i.e. free flow speed, link length, and capacity) for the selected evacuation routes, the selected evacuation routes for each zone and the zonal trip generation and terminal time; the program output was a summary of travel times and delays for the evacuation routes and other statistical information which could be used in evaluating the evacuation route selection. In some cases, several computer runs were made for an evacuation area to arrive at the best balance between number of evacuation routes and evacuation time.

In making an assignment of PCEs to the evacuation routes, it was assumed that all trips would be on the route at the same instant. This approach is somewhat conservative since all people do not react alike and, hence, the distribution of evacuees that would more likely occur would not result in all trips on the routes simultaneously.

#### Evacuation Time Estimates

Best estimates and adverse weather estimates of evacuation times were made separately for the general population (with and without vehicles) and for special facilities. The estimates of evacuation times for each of these categories were comprised of the following.

- a) Terminal time, which in the case of vehicles departing from home accounts for the time to drive from the home via feeder streets to the primary evacuation route. For buses and special vehicles (such as ambulances and wheelchair vehicles), terminal time represents the time it takes a driver to go from the bus garage or storage area to its assigned evacuation pick-up area.
- b) Roadway travel time is the time it takes a vehicle to traverse the entire length of the evacuation route. This time is a function of the roadway free flow speeds and roadway delays owing to conditions where the vehicle volumes approach or exceed the capacity of the roadway at a particular location. Hence, the roadway travel time is the sum of the time for the first vehicle to traverse the evacuation route, assuming free flow speeds, and the delay time (computed at Level of Service E capacity for the best estimate and Level of Service D capacity for the adverse weather condition).
- c) Adverse weather delay time penalty of twenty minutes was added to the evacuation times to account for unpredictable isolated delays associated with adverse weather conditions.
- d) General population mobilization time amounting to twenty minutes was added to the estimated evacuation times to account for mobilization at the home end. This was in accordance with the New York State Office of Disaster Preparedness' (ODP) recommended mobilization time for the general population only (as per ODP Report entitled Evacuation Analysis, Ten Mile Radius, Indian Point Nuclear Reactors Site dated December 1979).
- e) Multiple trip time for special facilities where a number of round trips were required by ambulances and wheelchair vehicles. In these cases, the roadway travel time included travel time beyond the evacuation limits to a point of destination for all but the last trip, return time to the special facility for as many round trips as were required, and time for loading and unloading passengers. Where the facility administrators estimated a mobilization time greater than the roadway travel time, the mobilization time plus travel time to the evacuation area limits became the evacuation time.

It should be noted that the times to evacuate general population without vehicles and ambulatory patients in special facilities assumed use of bus facilities only. The use of railroad facilities in the area was not considered. Where feasible, use of the existing rail facilities would be expected to reduce evacuation times.

c. Notification and Confirmation

The NRC's November 29, 1979 request for evacuation times relates primarily to the time required to implement an evacuation as opposed to the times required for notification or confirmation that an evacuation has taken place. The local civil defense directors have furnished the notification and confirmation times listed in Section VI of this document. These estimates are based on the notification and confirmation systems presently in use in the area.

d. Future Efforts

It is anticipated the evacuation time estimates could be refined as an evacuation plan is detailed. The development of details such as implementation of improved public notification systems, EPZ refinements, use of rail facilities during evacuation, and additional input from state and local agencies could all affect to some extent, very probably decreasing, the times presented in this document.

IV. SPECIAL FACILITIES

All the important special facilities within the plume exposure EPZ have been considered in the analysis. Note that elementary, middle and high schools have been considered as part of the general population rather than as special facilities. The following nine special facilities have been determined to take the longest times to evacuate:

<u>Special Facility</u>	<u>Location</u>	<u>Reference Designation on Figs. 3-13</u>
FDR Veterans Administration Hospital	Montrose, Westchester	H1
Community Hospital of Peekskill	Westchester	H2
Rockland County Health Center	Pomona, Rockland	H3
Letchworth Village Developmental Center	Thiells, Rockland	H4
Helen Hayes Rehabilitation Hospital	West Haverstraw, Rockland	H5
Palisades Interstate Park System	Orange and Rockland	R
Camp Smith	Westchester	I1

<u>Special Facility</u>	<u>Location</u>	<u>Reference Designation on Figs. 3-13</u>
West Point Military Reservation	Orange	I2
Ossining Correctional Facility	Ossining, Westchester	P

- a. Following is a brief discussion of the nine facilities based on data furnished by the administrators of each of the facilities.

FDR Veterans Administration Hospital - Montrose, Westchester County (H1)

Providing psychiatric and rehabilitation services to a maximum inpatient population of 1403, the VA Hospital currently has 1215 patients and averages approximately 1200. Of these, about 300 would require wheelchairs during evacuation and 150 would require transport by ambulance. An inventory of hospital-owned vehicles shows no ambulances; there are 3 buses (two 20-passenger and one 28-passenger), 10 passenger cars, one 8-passenger van and three 3/4-ton trucks which the hospital administrator feels could be used to transport patients.

The number of staff on duty ranges from a high of 742 on 7:30 AM-3:30 PM weekday shifts to a low of 99 during the 11:30 PM to 7:30 AM weekday shifts. Weekend staff numbers between 336 on day shifts to 104 at night. All numbers indicate staff assigned to the patient wards except during day shifts when somewhat more than half of the staff is comprised of non-patient care and building and grounds staff. As most staff drive or carpool, they could self-evacuate.

Estimated time to ready patients and load them into vehicles would be less than one hour during daytime shifts and approximately half again as long at night. The administrator feels it might not be feasible to take patients' records as some are voluminous files compiled over many years. Staff to patient ratio would be adequate at 1 or 2 staff people to each busload of patients while an ambulance attendant would be sufficient for the non-ambulatory patients.

Community Hospital of Peekskill - Westchester County (H2)

While Peekskill Community Hospital has a maximum capacity for 116 patients, the average is 104 of which, currently, 62 are ambulatory, 26 are wheelchair-bound and 16 are stretcher-bound. The staff is far greater during the day-shift with 183 (including 48 nurses) than in the evening with 40 (28 nurses) or at night with 26 (21 nurses).

The required staff to patient ratio is 2 or 3 staff members to each busload of 40 patients and 1 or 2 staff members for each ambulance. If given a 1- or 1½-hours notice to evacuate during the day or at night, respectively, readying and loading of the patients into vehicles could be accomplished in 2 to 3 hours.

The hospital has only one vehicle, a station wagon; all staff drive to work and could, therefore, self-evacuate.

Rockland County Health Center - Pomona, Rockland County (H3)

The Rockland County Health Center, also referred to as the Summit Park Complex, houses both inpatient and outpatient services of the Health and Hospitals, Mental Health, and Social Services Departments, the Office of the Aged, and Meals on Wheels. Currently 398 inpatients are distributed as follows: 360 in the Summit Park Hospital, 28 in the Psychiatric In-Patient Unit, and 10 in the Alcoholic In-Patient Unit. Forty patients who are wheelchair-bound and 20 who are stretcher-bound are all located in the hospital. Additionally, an average of approximately 325 outpatients per day visit the hospital, mental health facility, social services buildings, and office of the aged.

The number of staff ranges from 916 spaced over the hours between 7A.M. and 5P.M. to a low of 145 between 12A.M. and 7A.M. About 95% of the employees drive or carpool while the remaining 5% rely on public transportation.

The longest evacuation time estimate at the complex is for the hospital and is 6 hours during the day. At night, the evacuation time estimate is also 6 hours once the required staff is notified and arrives.

The complex has approximately 60 vehicles, more than half of which could carry passengers and includes one ambulance. It is conceivable, therefore, that a large number of the ambulatory patients could be evacuated with the available vehicles although high density vehicles might prove more efficient.

Letchworth Village Developmental Center - Thiells, Rockland County (H4)

Letchworth Village provides treatment and rehabilitation services to mentally retarded children and adults, currently numbering 2,207. Of this number, 258 are non-ambulatory including 50 patients who are stretcher bound. Required staff to patient ratios are 1 to 6 for ambulatory patients and 1 to 5 for the non-ambulatory. Day shift staff numbers 1742; 924 are support staff, at least 75% of whom could self-evacuate. Of the 818 patient care day-shift staff, 376 would be required to effectuate patient evacuation; again, at least 75% of the other 442 staff members could self-evacuate. Of the 500 evening-shift staff, 376 would be required for patient evacuation; the remaining staff could all self-evacuate. Finally, the night staff, numbering 272, would all be required to assist in the evacuation.

The vehicle inventory indicates an inadequate capacity for self-evacuation. With only one 2-stretcher ambulance and a variety of vans and buses, some of which can accommodate wheelchairs, the facility's vehicles can transport only 513 of the total number -- patients and some staff -- to be evacuated.

It is estimated that about 4 or 6 hours, for day/evening or night evacuations, respectively, would be required if sufficient vehicles were available.

A few additional vehicles would be required to transport records and vital supplies, including medication, to the host facility. Ideally, a hospital or similar facility with the necessary equipment and supplies should serve as Letchworth Village's host facility.

Approximately 10 families, all of whom could self-evacuate, live on the grounds.

Helen Hayes Rehabilitation Hospital - West Haverstraw, Rockland County (H5)

A patient census of Helen Hayes Hospital indicates a current maximum capacity of 150 with an additional 32 beds to be provided as of Summer 1980. Of the current number of patients, all require wheelchairs except approximately 15 to 20 patients who are bedridden. This latter group, at least, would require ambulance transport. A deficiency in vehicles for evacuation exists as the hospital has only one 2-stretcher ambulance; it also has 2 vans which accommodate 5 wheelchairs each, 1 bus for 30 wheelchairs, and 4 station wagons.

Total staff numbers 500, 100 of whom live on the hospital grounds. Numbers of staff during day, evening, and night shifts are 300, 150, and 50, respectively, all of whom could self-evacuate or would accompany patients during evacuation. With a staff to patient ratio of 1 to 5, patients could be readied and put into vehicles in 2 hours during the day and 3 hours at night. The latter time estimate assumes that staff living on the grounds would assist the 50 night-shift employees in evacuating the patients.

Palisades Interstate Park System - Orange and Rockland Counties (R)

Fourteen recreational facilities are located within 10 miles of the Indian Point power plants. On a peak Sunday, total attendance reaches 68,100; the fifth highest one-day attendance figure during one year is approximately 53,450 while on a winter weekday, attendance is only 2,895.

Also located within the 10 mile area are summer camps whose total attendance during the months of July and August is 5000. No disaggregated figures are available for the summer camps.

The Palisades Park system has no notification system in place. A vehicle inventory shows 119 vehicles of various types ranging from passenger cars to dump trucks; total estimated passenger capacity of these vehicles is 435.

Camp Smith (I1)

Located in the vicinity of Peekskill, Camp Smith is a year round military facility for the training of Army reservists, primarily, and of county police, FBI, and other similar personnel. Reserve training is scheduled along two time patterns. For approximately 47 weekends throughout the year, from Friday to Sunday evenings, an average of 2000 people are on base. This includes reservists, all support staff and may occasionally reach the maximum capacity of 2700. From early spring through fall,

15 day training periods are held with the population on base averaging 1000. In case of an emergency at any time, the base could self-evacuate as the vehicles transporting all personnel remain on base for the duration of the reservists' stay. The vehicles number approximately 300 private autos and 60 military transport on weekends and half that amount during 15 day training periods.

Additionally, 250 government employees work at Camp Smith, Mondays through Fridays, 8 AM to 4 PM. During the same hours, a number of training schools are attended -- except in adverse winter weather conditions -- by an average of 100 FBI people, county police and others; the maximum capacity of these schools is approximately 200. All employees and school attendees could self-evacuate by private autos, averaging 250 and 100 in number, respectively.

Thus, the average population which might be expected at Camp Smith is 2000 on weekends (with 300 cars and 60 military transport), 1350 during 15 day training periods (500 cars and 30 military transport), and 350 on weekdays when no training periods are in session (350 cars).

#### West Point Military Reservation - Orange County (I2)

The West Point Military Reservation intends to take responsibility for its own evacuation, using its own vehicles and military transport. Assuming normal highway speeds on roads free of other traffic, three trips by each vehicle, and assuming that students attending Highland High School will be returned to West Point for evacuation with their families, West Point officials estimated that evacuation would require from 5 to 7½ hours, best to worst scenarios. The worst case scenario is assumed to be graduation day in June, while a football weekend evacuation could be accomplished in 6½ hours.

#### Ossining Correctional Facility - Ossining, Westchester County (P)

The distance of this facility from the site is approximately 9.5 miles and the design of the buildings makes sheltering preferable to evacuation.

- b. Analysis of the time to evacuate the special facilities has shown the following:
  - With sheltering used as the protective action for the Ossining Correctional Facility, the special facility requiring the longest time to evacuate is the VA Hospital in Montrose (H1). This facility is within the area considered for evacuation for each of the evacuation areas, A through K. Therefore, except for those evacuation areas in which Letchworth Village is located, the VA Hospital is the facility which controls the time for evacuation.

V. EVACUATION TIME ESTIMATES

a. Notification And Confirmation Time Estimates

The following table indicates the times required to notify the public of a need for evacuation and the time required to confirm that evacuation has taken place.

<u>Evacuation Area</u>	<u>Notification</u> <sup>1</sup>	<u>Confirmation</u> <sup>1</sup>
A	1 hr.	Not Available
B	1 hr. 30 min.	2 hrs.
C	1 hr.	1 hr. 15min.
D	1 hr. 30 min.	2 hrs.
E	1 hr.	Not Available
F	1 hr.	Not Available
G	1 hr. 30 min.	2 hrs.
H	1 hr. 30 min.	2 hrs.
I	1 hr. 30 min.	2 hrs.
J	1 hr. 30 min.	2 hrs.
K	1 hr. 30 min.	2 hrs.

<sup>1</sup> The notification and confirmation times indicated are, in every case, either the longest or the only time estimates supplied by the appropriate local officials. For the individual responses in each evacuation area, see Appendix C.

b. Evacuation Time Estimates and Route Descriptions

The following table summarizes the estimated evacuation times for each of the eleven evacuation areas (A-K). As shown, evacuation times were estimated separately assuming two conditions, a best estimate and adverse weather estimate. The best estimate assumes a summer night at 3:00 A.M. when the family is together at home. The adverse weather estimate assumes a winter condition occurring during a weekday mid-afternoon when children are in school, businesses are in operation and the roads, although cleared of any recent snowfall, have reduced capacity and operating speeds. The best estimate and adverse weather estimate have been computed for both general population and special facilities.

Of major significance in estimating the general population times was the capacity constriction on Route 9A south of the Verplanck, Montrose and Buchanan area in Westchester County. Since this area is incorporated in all the evacuation areas, the delay on Route 9A is the controlling factor in estimating the evacuation times for all evacuation areas east of the Hudson River, and evacuation areas B, G, and H west of the Hudson River. The expected delay on Route 202 just east of the Palisades Interstate Parkway in Rockland County is the determining factor in computing the evacuation times for evacuation areas I, J and K.

**INDIAN POINT POWER PLANTS  
EVACUATION TIME ESTIMATES**

Evacuation Area	General Population					Special Facilities (5)(6)	
	Additional Notification Time (1)	Best Estimate		Adverse Weather		Best Estimate	Adverse Weather
		Travel Time (2)	Total (3)	Travel Time (2)	Total (4)		
A	45 min	3 hrs 20 min	4 hrs 5 min	5 hrs 30 min	6 hrs 15 min	7 hrs 10 min	10 hrs 10 min
B	1 hr 15 min	3 hrs 20 min	4 hrs 35 min	5 hrs 30 min	6 hrs 45 min	7 hrs 10 min	10 hrs 10 min
C	45 min	3 hrs 20 min	4 hrs 5 min	5 hrs 30 min	6 hrs 15 min	7 hrs 10 min	10 hrs 10 min
D	1 hr 15 min	3 hrs 20 min	4 hrs 35 min	5 hrs 30 min	6 hrs 45 min	7 hrs 10 min	10 hrs 10 min
E	45 min	3 hrs 20 min	4 hrs 5 min	5 hrs 30 min	6 hrs 15 min	7 hrs 20 min	10 hrs 20 min
F	1 hr 15 min	3 hrs 40 min	4 hrs 55 min	5 hrs 40 min	6 hrs 55 min	7 hrs 30 min	10 hrs 30 min
G	1 hr 15 min	3 hrs 20 min	4 hrs 35 min	5 hrs 30 min	6 hrs 45 min	7 hrs 10 min	10 hrs 10 min
H	1 hr 15 min	3 hrs 20 min	4 hrs 35 min	5 hrs 30 min	6 hrs 45 min	7 hrs 10 min	10 hrs 10 min
I	1 hr 15 min	3 hrs 40 min	4 hrs 55 min	5 hrs 50 min	7 hrs 5 min	7 hrs 10 min	10 hrs 10 min
J	1 hr 15 min	3 hrs 40 min	4 hrs 55 min	6 hrs	7 hrs 15 min	7 hrs 10 min	10 hrs 10 min
K	1 hr 15 min	3 hrs 40 min	4 hrs 55 min	6 hrs	7 hrs 15 min	7 hrs 30 min	10 hrs 30 min

- (1) These figures include the additional notification time above fifteen minutes.
- (2) Includes general population mobilization time (20 minutes) and the roadway travel time.
- (3) Calculated as the sum of the Additional Notification Time plus the Best Estimate Travel Time.
- (4) Calculated as the sum of the Additional Notification Time plus the Adverse Weather Travel Time.
- (5) For special facilities it is assumed that notification will occur within fifteen minutes and that mobilization and evacuation will begin immediately thereafter.
- (6) All times reflect those for the FDR Veterans Administration Hospital, Montrose.

A similar condition exists with regard to the special facilities. The two primary facilities requiring the longest time to evacuate are the FDR Veterans Administration Hospital in Montrose, Westchester County and Letchworth Village Developmental Center in Thiells, Rockland County. The Montrose facility is present in all eleven evacuation areas; Letchworth Village is only present in evacuation areas I, J and K. Computation of evacuation times shows that the Montrose facility will take a greater amount of time to evacuate than the combined evacuation of Letchworth Village and Helen Hayes Rehabilitation Hospital which are in the same sector. Hence, the time estimates for special facilities shown in the table reflect the time for the Montrose facility to evacuate beyond the evacuation area limits in all evacuation areas.

The following are descriptions of the selected primary evacuation routes for each of the eleven evacuation areas.

Evacuation Area A (Sector 1) (Figure 3)

The primary routes used in evacuating the two mile area east of the Hudson River are:

- o Routes 9 and 9A south from Verplanck, Buchanan and Montrose
- o Route 9 north from the Peekskill area
- o Routes 6 and 202 east from the Peekskill area.

Evacuation Area B (Sector 2) (Figure 4)

The primary evacuation routes for this area are:

- o Routes 9 and 9A south from Verplanck, Buchanan and Montrose.
- o Route 9W/202 southbound, located west of the Hudson River.

Evacuation Area C (Sectors 1, 3) (Figure 5)

From Peekskill and communities north to the five mile limit the following routes are used for evacuation:

- o Route 9 and Bear Mountain Bridge Road to Route 9D north from Peekskill
- o Routes 6 and 202 east from Peekskill
- o Gallows Hill Road (Dogwood Road) and Oregon Road (Conklin Avenue) in a northerly direction.

From Verplanck, Buchanan and Montrose, Routes 9 and 9A are the evacuation routes for southbound evacuation to the two mile limit.

Evacuation Area D (Sectors 1,3,7) (Figure 6)

The primary evacuation routes to the ten mile limit from Peekskill and communities north and east (Philipstown, Putnam Valley, Yorktown, etc.) are:

- o Route 9 and Bear Mountain Bridge Road to Route 9D north from Peekskill
- o Routes 6 and 202 east from Peekskill
- o Gallows Hill Road and Oregon Road in a northerly direction
- o Taconic State Parkway, Route 35, Granite Springs' Road and Route 6/6N from communities east of Peekskill
- o Canopus Hollow Road and Peekskill Hollow Road (Putnam County Route 21) in a northerly direction.

From Verplanck, Buchanan and Montrose to the two mile limit, Routes 9 and 9A provide a southbound exit.

Evacuation Area E (Sectors 1,4) (Figure 7)

The following evacuation routes are used for travel from the Peekskill area to the two mile limit and from communities south and east of Buchanan and Peekskill to the five mile limit:

- o Routes 9 and 9A south from Verplanck, Buchanan and Montrose to the five mile limit
- o Route 9 north from the Peekskill area to the two mile limit
- o Route 6 east from the Peekskill area
- o Maple Avenue, Furnace Dock Road, Mount Airy Road southeasterly to the five mile limit.

Evacuation Area F (Sectors 1,4,8) (Figure 8)

The primary routes used in evacuating the Peekskill area are north to the two mile limit and the areas south and east of Peekskill evacuate southeast to the ten mile limit as follows:

- o Route 9 north from the Peekskill area to the two mile limit
- o Routes 9 and 9A south from Verplanck, Buchanan and Montrose through Croton-on-Hudson and parts of Ossining to the ten mile limit
- o Maple Avenue, Route 202/35 easterly to the Taconic State Parkway northbound from Furnace Woods east to Yorktown, to the ten mile limit

- o Granite Springs Road, Routes 202/35/118 from Yorktown east of the Taconic State Parkway through Yorktown Heights to the ten mile limit
- o Route 129 east to the Taconic State Parkway from communities north of the Croton Reservoir
- o Route 134 east to Mount Kisco or the Taconic State Parkway south from communities south of the Croton Reservoir
- o Route 6 east from the Peekskill area
- o Furnace Dock Road, Mount Airy Road southeasterly to Taconic State Parkway.

Evacuation Area G (Sectors 2,5) (Figure 9)

For the evacuation of the five mile area north and west of the power plants, the primary routes used are:

- o Routes 9 and 9A south from Verplanck, Buchanan and Montrose to the two mile limit
- o Route 9W southbound to the Palisades Parkway are used by residents of Fort Montgomery
- o Westbound Route 6 and Seven Lakes Parkway serve as evacuation routes for Stony Point, Fort Montgomery and areas west
- o Palisades Parkway north to the five mile limit
- o Bear Mountain Bridge Road and Route 9D north will serve as an evacuation route for Camp Smith.

Evacuation Area H (Sectors 2,5,9) (Figure 10)

The primary routes used in the evacuation of this ten mile area north and west of the power plants includes:

- o Route 9W/202 northbound and southbound to the ten mile limit from Highland Falls, Stony Point and West Point
- o Palisades Interstate Parkway northbound and Route 6 westbound for residents west of the Hudson River, Tomkins Cove, the northerly portion of Stony Point and areas as far north as Fort Montgomery
- o Routes 6 and 17 westbound for residents in Central Valley and Harriman.

On the east side of the Hudson River, Montrose, Buchanan and Verplanck will be evacuated to the south using Routes 9 and 9A to the two mile limit. In addition, Camp Smith will be evacuated to the northern ten mile limit using Route 9D and Bear Mountain Bridge Road.

Evacuation Area I (Sectors 2,6) (Figure 11)

The primary evacuation routes are as follows:

- o Routes 9 and 9A south from Verplanck, Buchanan and Montrose to the two mile limit
- o Routes 9W/202 in Rockland County south to Route 77 westbound to the Palisades Interstate Parkway northbound to the evacuation limits for residents in Tomkins Cove and the northerly portions of Stony Point up to the Palisades Interstate Parkway
- o Filors Lane, Suffern Lane and Route 202 west to the Palisades Interstate Parkway for most of Stony Point and communities as far as the High Tor State Park.

Evacuation Area J (Sectors 2,6,10) (Figure 12)

The primary routes used in the evacuation of the area include:

- o Routes 9 and 9A south from Verplanck, Buchanan and Montrose to the two mile limit
- o Route 9W/202 in Rockland County south to Route 77 westbound to the Palisades Interstate Parkway northbound to the evacuation limits for residents in Tomkins Cove and the northerly portions of Stony Point up to the Palisades Interstate Parkway
- o Route 210 west towards the Ramapo River for residents west of the Palisades Interstate Parkway and north of Willow Grove
- o Filors Lane, Suffern Lane and Route 202 west to the Palisades Interstate Parkway and the ten mile limit for most of Stony Point and communities as far as the High Tor State Park
- o Route 202 west for residents of Pomona and other communities located west of the Palisades Parkway
- o Routes 9W, 303, 304 and 45, Middletown Road, Kings Highway and the Palisades Parkway provide the southerly exit paths for residents south of High Tor State Park.

Evacuation Area K (Sectors 1-10) (Figure 13)

This evacuation area encompasses the entire (360 degrees) area surrounding the power plants within the ten mile limits and includes the following primary evacuation routes:

- o Routes 9 and Bear Mountain Bridge Road to Route 9D north from Peekskill to the ten mile limit in Putnam County
- o Routes 6 and 202 east from Peekskill to the ten mile limit

- o Gallows Hill Road and Oregon Road in a northerly direction
- o Taconic State Parkway, Route 35, Granite Springs Road and Route 6/6N from communities east of Peekskill
- o Canopus Hollow Road and Peekskill Hollow Road (Putnam County Route 21) in a northerly direction
- o Routes 9 and 9A south from Verplanck, Buchanan and Montrose through Croton-on-Hudson and parts of Ossining to the ten mile limit
- o Maple Avenue, Route 202/35 easterly to the Taconic State Parkway northbound from Furnace Woods east to Yorktown
- o Route 6 east from the Peekskill area
- o Furnace Dock Road and Mount Airy Road southeasterly to the Taconic State Parkway
- o Granite Springs Road, Routes 202/35 and 118 from Yorktown east of the Taconic State Parkway through Yorktown Heights to the ten mile limit
- o Route 129 east to the Taconic State Parkway southbound, from communities north of the Croton Reservoir
- o Route 134 east to Mount Kisco or the Taconic State Parkway southbound from communities south of the Croton Reservoir
- o Route 9W/202 northbound and southbound to the ten mile limit from Highland Falls, Stony Point, West Point and Haverstraw
- o Palisades Interstate Parkway northbound and Route 6 westbound for residents west of the Hudson River, Tomkins Cove, the northerly portion of Stony Point and areas as far north as Fort Montgomery
- o Routes 6 and 17 westbound for residents in Central Valley and Harriman
- o Route 210 west towards the Ramapo River for residents west of the Palisades Interstate Parkway and north of Willow Grove
- o Filors Lane, Suffern Lane and Route 202 west to the Palisades Interstate Parkway for most of Stony Point and communities as far as High Tor State Park
- o Route 202 west for residents of Pomona and other communities located west of the Palisades Interstate Parkway
- o Routes 9W, 303, 304 and 45, Middletown Road, Kings Highway and the Palisades Parkway provide the southerly exit paths for residents south of High Tor State Park.

In addition to the evacuation of land areas, the Hudson River must be evacuated within the limits (2, 5 or 10 miles) of the evacuation areas. From discussions with the Rockland and Putnam County Sheriffs' Offices, it was learned that water patrol in the ten mile evacuation area is done by the Rockland County Sheriff's Office, a voluntary Coast Guard Auxiliary force and the West Point Military Police. The Rockland County Sheriff's Office, which patrols both sides of a 35 mile stretch of the Hudson River during a six month period, indicated that area boaters and the immediate shore area could be notified within twenty minutes using megaphones. They also said that about one half-hour would be required to sweep the area for confirmation of evacuation.

#### VI. LOCAL OFFICIAL COMMENTARY

Several meetings were held with the New York State Office of Disaster Preparedness and with each of the local civil defense directors for Westchester, Putnam, Rockland and Orange Counties and the City of Peekskill relative to the NRC's November 29th request.

The input of those agencies has been invaluable in the development of the information in this document.

The Appendix contains copies of the comments of those agencies to the evacuation estimates and the assumptions and methods used.

Appendix A

*Lambert / resident*



UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
WASHINGTON, D. C. 20555

*Dec 1/31/80*

*T 1/17/80*

November 29, 1979

*IP-79-174*  
*JAF-79-164*  
*[Signature]*

ALL POWER REACTOR LICENSEES

*NOTE DEC 6 1979*

Gentlemen:

This letter, which is being sent to all licensees authorized to operate a nuclear power reactor and to all applicants for a license to operate a power reactor (FSAR docketed), is a request for information regarding estimates for evacuation of various areas around nuclear power reactors. The requested information is in addition to that requested by the October 10, 1979 letter to all power reactor licensees from Darrell G. Eisenhut, Acting Director, Division of Operating Reactors, Office of Nuclear Reactor Regulation.

Although evacuation time estimates are expected to be prepared in the course of the upgrading of the state of emergency preparedness as specified in the October 10, 1979 letter, submission of these estimates to the NRC is being requested on an accelerated time scale so that the NRC can identify those instances in which unusual evacuation constraints exist and special planning measures should be considered. In some cases of extreme difficulty where a large population is at risk, special facility modifications may also be appropriate. The requested information will also enable the NRC to be responsive to a recommendation from the Environment, Energy and Natural Resources Subcommittee of the House Committee on Government Operations. The information requested in the enclosure should be submitted no later than January 31, 1980.

The October 10, 1979 letter indicated that efforts to develop a model plan were continuing. It now appears that the model plan will not be completed on a schedule which will be of use in developing upgraded plans for the requested January 1, 1980 submittal. The upgraded plan development should therefore proceed on a site-specific basis.

Sincerely,

*[Handwritten Signature]*

Brian K. Grimes, Director  
Emergency Preparedness Task Group  
Office of Nuclear Reactor Regulation

Enclosure:  
Request for Evacuation Time  
Estimates

cc w/enclosure:  
Service List

REQUEST FOR  
EVACUATION TIME ESTIMATES (AFTER NOTIFICATION)  
FOR AREAS NEAR NUCLEAR POWER PLANTS

Background

Prior to recent NRC requests that means for prompt notification to the public be installed around each nuclear power plant site, a significant component of evacuation time estimates was the time required to notify the public of a need for evacuation. Studies of actual evacuations that have taken place generally do not distinguish between the time required for notification, the time required to implement the evacuation, and the time required to confirm that an evacuation has taken place.<sup>1/</sup> The estimates for time required for evacuations now requested relate primarily to the time to implement an evacuation as opposed to the time required for notification. These estimates may be based on previous local experiences (e.g., chemical spills or floods) or may be based on studies related to population density, local geography and road capacities. No standard method for making such estimates is identified for use at this time. The basis for the method chosen should be described in the response. As an independent check on the evacuation time estimates, agreement with or comments on the time estimates made should be obtained from the principal local officials responsible for carrying out such evacuations. Such agreement should be documented or the areas of disagreement indicated in the submittal.

The format given below is appropriate for reporting to the NRC estimates of the time required to implement evacuation of areas near nuclear power plants. These estimates, are to be made for the primary purpose of making available, to those officials who would make evacuation decisions in an emergency situation, knowledge of the time required to complete one of the protective action options (evacuation) available for a particular potentially affected segment of the population. A second purpose of these estimates is to identify to all concerned those instances in which unusual evacuation constraints exist and that special planning measures should be considered. In some cases of extreme difficulty where a large population is at risk, special facility modifications may also be considered.

Given a decision to evacuate rather than shelter in an actual event, fewer or more sectors or different distances than given in the reporting format might be evacuated should this be the chosen protective action. For example, three 22-1/2° sectors might be initially evacuated in a downwind direction (the sector containing the plume and an adjacent sector on each side), followed by the evacuation of other sectors as a precautionary measure.

<sup>1/</sup> Hans, J. M., Jr., and T. C. Sell, 1974 Evacuation Risks - An Evaluation, U. S. Environmental Protection Agency, National Environmental Research Center, Las Vegas, EPA-520/6-74-002.

Format for Reporting Information

The areas for which evacuation estimates are required must encompass the entire area within a circle of about 10 miles radius, and have outer boundaries corresponding to the plume exposure EPZ. These areas are as follows:

<u>Distance</u>	<u>Area</u>
2 miles	two 180° sectors
5 miles	four 90° sectors
about 10 miles	four 90° sectors

Estimates for the outer sectors should assume that the inner adjacent sectors are being evacuated simultaneously. To the extent practical, the sector boundaries should not divide densely populated areas. Where a direction corresponding to the edges of areas for which estimates have been made is thought not to be adequately represented by the time estimates for adjacent areas, an additional area should be defined and a separate estimate made for this case. The format for submittal should include both a table and a figure (overlaid on a map) which each give the information requested in items 1 and 2, below. Additional material may be provided in associated text.

Required Information

1. Two estimates are requested in each of the areas defined in item 1 for a general evacuation of the population (not including special facilities). A best estimate is required and an adverse weather estimate is required for movement of the population.
2. The total time required to evacuate special facilities (e.g., hospitals) within each area must be specified (best estimate and adverse weather).
3. The time required for confirmation of evacuation should be indicated. Confirmation times may consider special instructions to the public (e.g., tying a handkerchief to a door or gate to indicate the occupant has left the premises).
4. Where plans and prompt notification systems have not been put in place for areas out to about 10 miles, estimates of the times required to evacuate until such measures are in place for the plume exposure emergency planning zone (EPZ) should also be given. Notification times greater than 15 minutes should be included in the evacuation times and footnoted to indicate the notification time.

5. Where special evacuation problems are identified (e.g., in high population density areas), specify alternative protective actions, such as sheltering, which would reduce exposures and the effectiveness of these measures.
6. A short background document should be submitted giving the methods used to make the estimates and the assumptions made including the routes and methods of transportation used. This document should also note the agreement or areas of disagreement with principal local officials regarding these estimates.

Parsons Brinckerhoff Quade & Douglas, Inc. Engineers • Planners

January 25, 1980

Mr. Ronald W. Tweedie, Director  
Transportation Data Services Bureau  
New York State Department of Transportation  
1220 Washington Avenue  
Albany, New York 12226

Dear Ron:

Confirming the conclusions reached during our telephone conference which included Ron Tadross (PBQ&D), Joe Hein (ODP), Dick Herskowitz (ODP), and ourselves, we shall proceed with the evacuation time estimate for Indian Point and Oswego as follows:

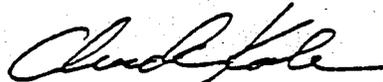
- 1) The optimum, fair weather evacuation time estimate will be derived based on the capacities described in the attached memo entitled Indian Point and Oswego Nuclear Power Plant Evacuation Plans Roadway Capacity Estimates dated 1/25/80. We all agree that this estimated time reflects an optimal program and conditions prior to and during the evacuation period.
- 2) We will use the Level of Service D capacities as determined in the referenced memo to estimate the adverse weather condition evacuation time.

It was also agreed by all parties that these time estimates are based on what are presently considered reasonable assumptions of a plan and program for evacuation which must subsequently be developed in particular detail.

I am forwarding copies of this letter to the other participants for their information and record.

Yours very truly,

Parsons Brinckerhoff Quade & Douglas, Inc.



Charles P. Kole

CPK/tf

cc: R.A. Herskowitz

J. Hein

~~R.E. Tadross~~

Indian Point and Oswego  
Nuclear Power Plant Evacuation  
Roadway Capacity Estimates

1/25/80

Introduction

A critical element in determining the amount of time needed to evacuate any given area is the capacity of the existing roadways to accommodate the anticipated vehicular volumes generated during evacuation. In determining evacuation times with regard to the Indian Point and Oswego Nuclear Facilities, the capacities of these roadways comprising the evacuation routes in the area ten miles from the plants had to be derived. Subsequent to the capacity estimates, the roadway traveltime and congestion delay time occurring during evacuation can be computed.

The procedure used in determining the Indian Point and Oswego evacuation area roadway capacities was based on the Federal Highway Administration's Highway Capacity Manual - 1965 Edition. Definitions of specific technical terminology referred to throughout the subsequent paragraphs can be found in the Highway Capacity Manual.

Methodology

The roads and highways in the two evacuation areas were categorized into three basic groupings for purposes of capacity computations:

- two lane, two-way roadways
- four and six lane, two-way undivided highways
- four and six lane, two-way divided highways with controlled access.

For each of these groupings, a base capacity at Level of Service D and Level of Service E was calculated. However, the base capacity was modified by a factor(s) which takes into account the impact on traffic operation caused by existing roadway width and shoulder area. Other standard capacity inhibiting factors such as passing sight distances, percent trucks, type of terrain, etc. were considered irrelevant for the emergency evacuation condition. All applicable factors and Level of Service E capacity have been abstracted from the Highway Capacity Manual as per the tables cited.

### Two Lane, Two-Way Roadways

- 1) Table 10.7 of the Highway Capacity Manual (Pages 302 and 303) shows the maximum service volume under ideal conditions for passenger cars traveling in both directions on a two lane highway as 2000 vehicles per hour.
- 2) The working value for restricted average highway speed of 40 miles per hour for Level of Service D operating characteristics, (considered reasonable speed and operation for drivers during emergency evacuation conditions) with no restraint created by limited passing sight distance is 0.58 of 2000 vehicles per hour or 1160 vehicles per hour, two ways.
- 3) It is anticipated that during an emergency evacuation the traffic demand will approximate 90 percent in the direction of outbound movements, i.e. for each 100 vehicles, 90 will be going in one direction and 10 in the other. In the interest of providing a conservative yet realistic capacity estimate, 80 percent of the capacity has been assigned to the outbound direction. Thus 0.80 of 1160 (928 vehicles per hour) is the basic Level of Service D capacity for the primary direction of two lane roads.
- 4) Each segment of the evacuation roadway network may have individual characteristics which will further reduce that segments' ability to meet the demand volume. From Table 10.8 of the Highway Capacity Manual, values for these effects are applied to the basic Level of Service D value to derive the segments capacity. For example, a segment with two twelve foot wide travel lanes and no shoulders, the basic 928 capacity is multiplied by (W) 0.88 to produce a capacity for the segment of 817 vehicles per hour at Level of Service D.

Thus, from the above derivation, the Level of Service D and E capacities for evacuation traffic are computed as shown below:

$$\begin{array}{l} \text{Segment } LOS_D \text{ Capacity} = 928 \times W \text{ factor} \\ \text{" } LOS_E \text{ Capacity} = 2000 \times 0.80 \times W \text{ factor} \end{array}$$

Note, Level of Service E anticipates 30 MPH operating speed.

### Four Lane and Six Lane Two-Way, Undivided Highways

Table 10.1 indicates a Maximum Service Volume of 4000 vehicles per hour is the ideally available capacity for each direction of travel on four lane undivided highways

(6000 on six lane undivided highways). At Level of Service D and a 50 MPH operating speed, 2800 vehicles per hour is the indicated capacity (0.7 X 4000) for the four lane highways.

The only factor applied to this capacity is taken from Table 10.2 which recognizes both lane width and lateral clearance impacts on the capacity. This table also includes a small factor to compensate for opposing traffic left turns.

Therefore, the calculation for capacities are:

<u>Four Lane Undivided Highway</u>	<u>Six Lane Undivided Highway</u>
LOS <sub>D</sub> Capacity = 2800 X W	LOS <sub>D</sub> Capacity = 4200 X W
LOS <sub>E</sub> Capacity = 4000 X W	LOS <sub>E</sub> Capacity = 6000 X W

Where W is the factor from Table 10.2

No other normally applied factor has been used to decrement the capacity because the influence of an emergency evacuation will tend to create a condition of mass usage in a single direction which effectively will mask other considerations. Traffic signals are presumed to be operating in the emergency flashing mode which gives the right-of-way to the main street on a flashing amber signal only at key intersections.

Four Lane and Six Lane Two-Way Highway, with Limited Access

Tables 9.1 and 9.2 have been used for this category road segment. The derivation of Level of Service D capacity assumes that, for emergency evacuation conditions, 0.95 is an appropriate peak hour factor, since the demand will be high and virtually constant during the evacuation period. Thus, as per table 9.1, 4000 Capacity at LOS<sub>E</sub> X 0.90 (reduction for speed impediment) X 0.95 (PHF) = 3420 or Capacity D. Factors from Table 9.2, lane and shoulder widths, applied to Capacity D will yield the segment capacity at Level of Service D. Therefore, the calculated capacities for four and six lane divided highway segments with limited access are:

<u>Four Lane Divided Highways</u>	<u>Six Lane Divided Highways</u>
LOS <sub>D</sub> Capacity = 3420 X W	LOS <sub>D</sub> Capacity = 5130 X W
LOS <sub>E</sub> Capacity = 4000 X W	LOS <sub>E</sub> Capacity = 6000 X W

Where W is the factor found in Table 9.2

Appendix C

DATE	1/17/80	JOB NO	3145S001
ATTENTION			
RE			
Evacuation Time Estimates,			
Indian Point Power Plants			

Mr. Philip Schmer  
 Department of Civil Defense  
 Orange County  
 Orange County Government Center

255-275 Main Street

Goshen, N. Y. 10924

GENTLEMEN:

WE ARE SENDING YOU  Attached  Under separate cover via \_\_\_\_\_ the following items:

Shop drawings       Prints       Plans       Samples       Specifications

Copy of letter       Change order       Evacuation Time Estimates

COPIES	DATE	NO.	DESCRIPTION
2	-		Draft copies of the evacuation time estimates for the areas within your jurisdiction.

THESE ARE TRANSMITTED as checked below:

- For approval       Approved as submitted       Resubmit \_\_\_\_\_ copies for approval
- For your use       Approved as noted       Submit \_\_\_\_\_ copies for distribution
- As requested       Returned for corrections       Return \_\_\_\_\_ corrected prints
- For review and comment       \_\_\_\_\_
- FOR BIDS DUE \_\_\_\_\_ 19 \_\_\_\_\_  PRINTS RETURNED AFTER LOAN TO US

REMARKS In accordance with the Nuclear Regulatory Commission's instructions, we have prepared both best estimates and adverse weather estimates separately for the general population and for special facilities.

We would like to meet with you within the next week to obtain your comments on the evacuation time estimates. Also, we would like you to furnish the times required for notification, for mobilization of emergency work staff and to confirm evacuation given the existing emergency systems in place; please furnish a separate estimate for each of the evacuation areas in your jurisdiction.

COPY TO B. W. Deist, PASNY

SIGNED: \_\_\_\_\_

COMMENT/RESPONSE SHEET

EVACUATION AREA:

1. Please fill in the information requested based on your estimate of the required times and utilizing the present existing emergency systems in your jurisdiction.

TIME REQUIRED TO

<u>Notify the Public to Evacuate</u>	<u>Mobilize Emergency Work Staff</u>	<u>Confirm Evacuation of the Public</u>
Cannot comment at this time. This jurisdiction does not have an evacuation plan & this problem must be dealt with by all concerned including key officials at local level.	15 minutes at this level of government. Unknown at the local level at this time.	Cannot comment at this time. Work sessions must be scheduled with all concerned.

2. Please list your comments relative to the evacuation time estimates.

Comments will be forthcoming in the very near future. Work copies have been forwarded to our County Planning Department and Superintendent of Highways, to insure we are in agreement with your estimates particularly in the worse case situations.

COMMENT/RESPONSE SHEET

EVACUATION AREA:

1. Please fill in the information requested based on your estimate of the required times and utilizing the present existing emergency systems in your jurisdiction.

TIME REQUIRED TO

<u>Notify the Public to Evacuate</u>	<u>Mobilize Emergency Work Staff</u>	<u>Confirm Evacuation of the Public</u>
Cannot comment at this time. This jurisdiction does not have an evacuation plan & this problem must be dealt with by all concerned including key officials at local level.	15 minutes at this level of government. Unknown at the local level at this time.	Cannot comment at this time. Work sessions must be scheduled with all concerned.
2. Please list your comments relative to the evacuation time estimates.		

Comments will be forthcoming in the very near future.

Work copies have been forwarded to our County Planning Department and Superintendent of Highways, to insure we are in agreement with your estimates particularly in the worse case situations.

COMMENT/RESPONSE SHEET

EVACUATION AREA:

1. Please fill in the information requested based on your estimate of the required times and utilizing the present existing emergency systems in your jurisdiction.

TIME REQUIRED TO

Notify the  
Public to  
Evacuate

Cannot comment at this time. This jurisdiction does not have an evacuation plan & this problem must be dealt with by all concerned including key officials at local level.

Mobilize  
Emergency  
Work Staff

15 minutes at this level of government. Unknown at the local level at this time.

Confirm  
Evacuation of  
the Public

Cannot comment at this time. Work sessions must be scheduled with all concerned.

Please list your comments relative to the evacuation time estimates.

Comments will be forthcoming in the very near future.

Work copies have been forwarded to our County Planning Department and Superintendent of Highways, to insure we are in agreement with your estimates particularly in the worse case situations.

COMMENT/RESPONSE SHEET

EVACUATION AREA:

1. Please fill in the information requested based on your estimate of the required times and utilizing the present existing emergency systems in your jurisdiction.

TIME REQUIRED TO

<u>Notify the Public to Evacuate</u>	<u>Mobilize Emergency Work Staff</u>	<u>Confirm Evacuation of the Public</u>
Cannot comment at this time. This jurisdiction does not have an evacuation plan & this problem must be dealt with by all concerned including key officials at local level.	15 minutes at this level of government. Unknown at the local level at this time.	Cannot comment at this time. Work sessions must be scheduled with all concerned.
2. Please list your comments relative to the evacuation time estimates.		

Comments will be forthcoming in the very near future.

Work copies have been forwarded to our County Planning Department and Superintendent of Highways, to insure we are in agreement with your estimates particularly in the worse case situations.



copy SWD (c)  
RET  
FLR

CITY OF PEEKSKILL  
POLICE DEPARTMENT  
PEEKSKILL, N. Y. 10566  
737-8000

January 22, 1980

rec'd 2/24

Parsons Brinckerhoff Quade & Douglas, Ins.  
One Penn Plaza  
New York, New York 10001

Attn: Mr. Bruce E. Podwal, PE

Re: Your memo dated January 17, 1980

Dear Mr. Podwal:

This department cannot make the estimations as to times for notification, mobilization of emergency work staff and the confirmation of evacuation based on the information contained in your draft copy. The areas in Peekskill referred to in your draft are not clearly identified.

Furthermore, it seems that you have Route 202 going in both east to west and north to south directions. Where in N.Y. 90? How does it relate to Peekskill? Boundaries are not clearly identified when referring to areas such as Camp Smith, et cetera.

Using the present existing emergency systems within our jurisdiction this department estimates that it would take one hour to notify the public to prepare for an evacuation; one hour to mobilize all emergency personnel; 45 minutes for public preparation and 1½ hours to evacuate the city.

Very truly yours,

Walter D. Kirkland,  
Commissioner

WDK:vz

LETTER OF TRANSMITTAL

DATE	1/17/80	JOB NO	3145S001
ATTENTION			
RE			
Evacuation Time Estimates,			
Indian Point Power Plants			

Mr. Michael Scalpi  
 Department of Civil Defense  
 Putnam County

Main Street

Carmel, New York 10512

GENTLEMEN:

WE ARE SENDING YOU  Attached  Under separate cover via \_\_\_\_\_ the following items:

- Shop drawings       Prints       Plans       Samples       Specifications  
 Copy of letter       Change order       Evacuation Time Estimates

COPIES	DATE	NO.	DESCRIPTION
2	-		Draft copies of the evacuation time estimates for the areas within your jurisdiction.

THESE ARE TRANSMITTED as checked below:

- For approval       Approved as submitted       Resubmit \_\_\_\_\_ copies for approval  
 For your use       Approved as noted       Submit \_\_\_\_\_ copies for distribution  
 As requested       Returned for corrections       Return \_\_\_\_\_ corrected prints  
 For review and comment       \_\_\_\_\_  
 FOR BIDS DUE \_\_\_\_\_ 19 \_\_\_\_\_       PRINTS RETURNED AFTER LOAN TO US

REMARKS In accordance with the Nuclear Regulatory Commission's instructions, we have prepared both best estimates and adverse weather estimates separately for the general population and for special facilities.

We would like to meet with you within the next week to obtain your comments on the evacuation time estimates. Also, we would like you to furnish the times required for notification, for mobilization of emergency work staff and to confirm evacuation given the existing emergency systems in place; please furnish a separate estimate for each of the evacuation areas in your jurisdiction.

COPY TO B. W. Deist, PASNY

SIGNED: \_\_\_\_\_

If enclosures are not so noted, kindly notify us at once. Bruce E. Podwal

COMMENT/RESPONSE SHEET

EVACUATION AREA:

1. Please fill in the information requested based on your estimate of the required times and utilizing the present existing emergency systems in your jurisdiction.

TIME REQUIRED TO

Notify the  
Public to  
Evacuate

Best Time: 15 min.  
Adverse Time: 1 hr.

Mobilize  
Emergency  
Work Staff

Best Time: 30 min.  
Adverse Time: 1 hr.

Confirm  
Evacuation of  
the Public

Best Time: 45 min.  
Adverse Time: 1 hr. & 15 min.

2. Please list your comments relative to the evacuation time estimates.

COMMENT/RESPONSE SHEET

EVACUATION AREA:

1. Please fill in the information requested based on your estimate of the required times and utilizing the present existing emergency systems in your jurisdiction.

TIME REQUIRED TO

Notify the  
Public to  
Evacuate

Best Time: 30 min.  
Adverse Time: 1 hr. &  
30 min.

Mobilize  
Emergency  
Work Staff

Best Time: 30 min.  
Adverse Time: 1 hr.

Confirm  
Evacuation of  
the Public

Best Time: 1 hr.  
Adverse Time: 2 hrs.

2. Please list your comments relative to the evacuation time estimates.

The sheriff has a 24 hour patrol in this area (western part of Putnam County). He would add five more men and cars with loud speaker capability in less than thirty minutes.

The Putnam Valley police has a 24 hour patrol and could add four more cars with outside speakers in thirty minutes.

The Carmel police has the same as above and could overlap the Putnam Valley police. In addition, the Garrison, Continental Village, North Highlands, Cold Spring and Nelsonville fire departments can use their trucks and equipment to assist in warning the western section.

The Putnam Valley fire department and their substation can do the same in the central area.

The fire companies on the northern perimeter can come south to assist in the warnings.

By the end of the first 30 minutes the volunteer firemen will be in place for an emergency work and rescue force.

It is assumed that the EOC will be in operation from the fan out warning system and government will run the operation from there coordinating the effort. All heads of departments are assigned there.

COMMENT/RESPONSE SHEET

EVACUATION AREA:

1. Please fill in the information requested based on your estimate of the required times and utilizing the present existing emergency systems in your jurisdiction.

TIME REQUIRED TO

Notify the  
Public to  
Evacuate

Best Time: 15 min.  
Adverse Time: 30 min.

Mobilize  
Emergency  
Work Staff

Best Time: 30 min.  
Adverse Time: 1 hr.

Confirm  
Evacuation of  
the Public

Best Time: 30 min.  
Adverse Time: 1 hr.

2. Please list your comments relative to the evacuation time estimates.

# Parsons Brinckerhoff

Parsons Brinckerhoff Quade & Douglas, Inc. Engineers • Planners

3145

January 28, 1980

Mr. Rudy Hazucha  
Rockland County  
Office of Emergency Services  
County Office Building  
New Hempstead Road  
New City, New York 10956

Re: Indian Point Evacuation Time Analysis

Dear Mr. Hazucha:

This is to confirm the time estimates you supplied on Friday, January 25, 1980 for that part of Rockland County located within the Indian Point evacuation analysis area. As we understand, the figures represent time estimates for the affected area of Rockland County in its entirety and not for the discrete evacuation areas defined for the evacuation time analysis.

Notify the Public to Evacuate:	1 to 1-1/2 hours
Mobilize Emergency Work Staff:	1-1/2 to 2 hours
Confirm Evacuation of the Public:	1-1/2 to 2 hours

You also indicated that, in your judgment, the evacuation time estimates developed by Parsons Brinckerhoff seem realistic and acceptable to you on the basis of available information.

If this letter accurately reflects your time estimates and your opinion of the Parsons Brinckerhoff time estimates, it will be incorporated as an appendix to the evacuation time analysis submitted on January 31, 1980 to the Nuclear Regulatory Commission.

Thank you for your time and consideration.

Very truly yours,

PARSONS BRINCKERHOFF QUADE & DOUGLAS, INC.

*Bruce E. Podwal*  
Bruce E. Podwal

BEP/rw

TELEPHONE CONVERSATION MEMORANDUM

Project Indian Point Evacuation Job No. 3145 Date 1/28/80  
Time Analysis (Use Complete Number)

From Judith Versenyi Talked to Tony Marasco, Director  
Office of Disaster and Emergency  
Services, Westchester County

Indicate Department, Field Office, etc. for "In House" calls.  
Indicate agency or firm for other than "In House" calls.

Item Discussed Notification and Confirmation time estimates for  
evacuation areas within Westchester County

Information Obtained Mr. Marasco was unable to provide notification and  
confirmation time estimates and dictated the following for  
inclusion in the January 31, 1980 submittal to the Nuclear Regulatory  
Commission:

Unable to comment until further information is  
supplied and a simulated drill is conducted.

Action Required \_\_\_\_\_

Distribution: 

BEP	PLR				
-----	-----	--	--	--	--

By: *Judith H Versenyi*

DISASTER RESPONSE

Notification and Mobilization Time Estimates

<u>Action</u>	<u>Minimum</u>	<u>Maximum</u>
NFO to SWP	3 min.	10 min.
SWP to BRH	3 min.	20 min.
BRH to NFO	3 min.	10 min.
BRH discuss w/NFO	2 min.	5 min.
BRH to SWP	0 min.	3 min.
SWP to ODP	3 min.	15 min.
ODP to Local Authority	5 min.	15 min.
Local Authority to Scene	10 min.	30 min.
Organ. of Emergency Forces on the Scene	<u>0 min.</u>	<u>10 min.</u>
	29 min.	118 min.

Legend: NFO - Nuclear Facility Operator  
SWP - State Warning Point  
BRH - NYS Bureau of Radiological Health  
ODP - NYS Office of Disaster Preparedness

Typed from a handwritten communication received  
January, 1980, from the New York State Office of  
Disaster Preparedness, Nuclear Protection Planning.



STATE OF NEW YORK  
DIVISION OF MILITARY AND NAVAL AFFAIRS  
PUBLIC SECURITY BUILDING  
STATE CAMPUS  
ALBANY, NEW YORK 12226

HUGH L. CAREY  
GOVERNOR

VITO J. CASTELLANO  
MAJOR GENERAL  
CHIEF OF STAFF TO THE GOVERNOR

MNDP

29 January 1980

Mr. Bruce E. Podwal  
Assistant Vice President  
Parsons Brinckerhoff  
One Penn Plaza  
New York, NY 10001

Dear Mr. Podwal:

The State Office of Disaster Preparedness concurs in your evacuation analysis time estimates for the Indian Point Emergency Planning Zone (EPZ) for the plume pathway as described in NUREG-0396. We do this albeit your maximum time for evacuating this EPZ is one-hour less than the Office of Disaster Preparedness Nuclear Civil Protection Planning Section's analysis estimate. However, this is acceptable for concurrence as this time difference is not due to any significant deviance from our assumptions or methodology, but rather is due mainly to a different scenario with regard to the definition of adverse weather. The Office of Disaster Preparedness time estimates are based on highway capacity level of service D less 20% to account for the most adverse weather where vehicular movement is still possible. The Office of Disaster Preparedness highway capacity methodology was concurred in by the New York State Department of Transportation. Your estimates based on an assumption of less severe weather for a planning basis utilizes level of service D highway capacities. In addition, your highway capacities differ from ours to a lesser degree due to your elimination of standard capacity inhibiting factors which you believe are not applicable in evacuation conditions. The New York State Department of Transportation also concurs in the Parsons Brinckerhoff estimates based on their adverse weather scenario and the elimination of capacity inhibiting factors.

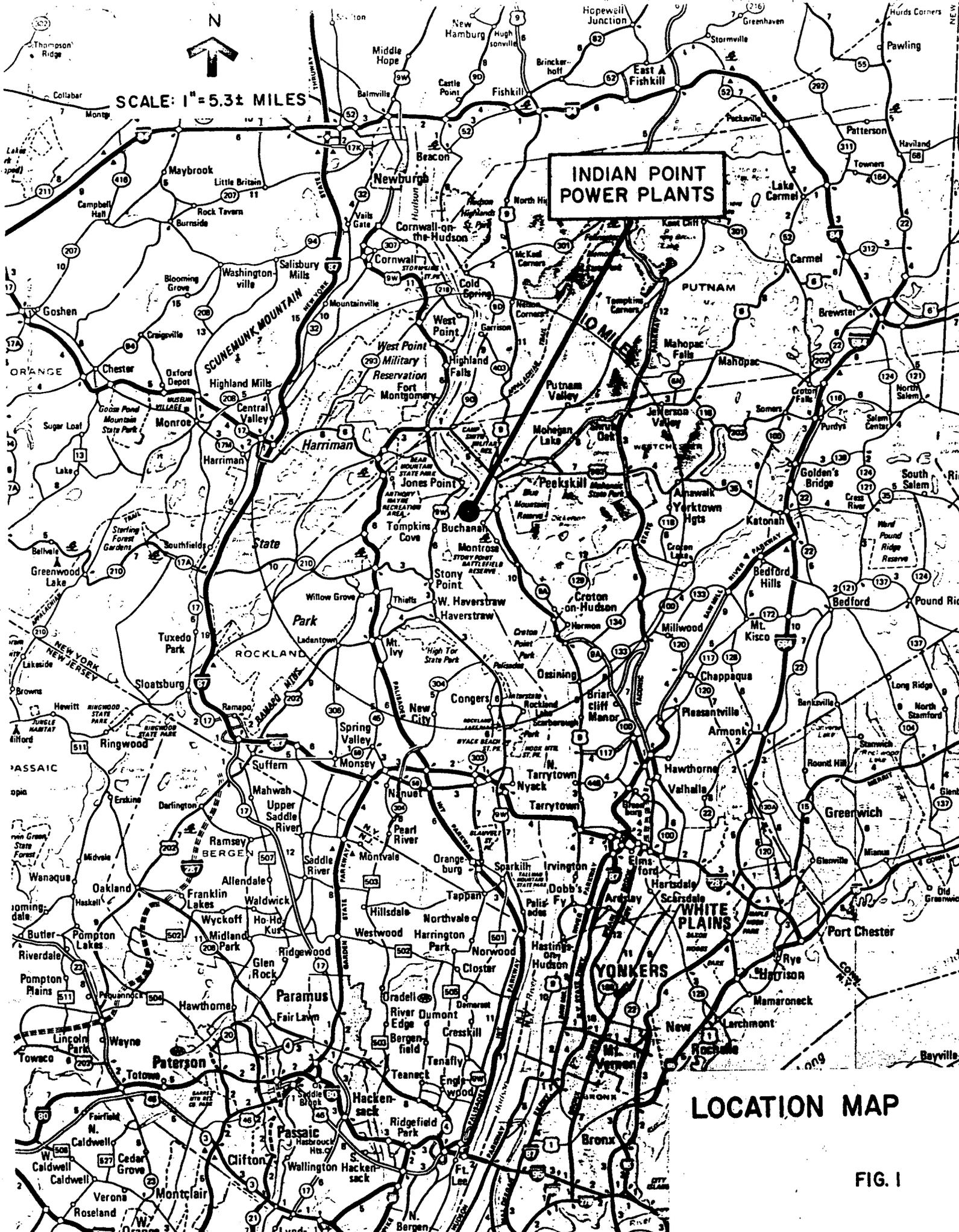
Parsons Brinckerhoff has also submitted "best estimate" times which appear reasonable and realistic within your definition of "best estimate" (i.e., optimum time).

Sincerely,

A handwritten signature in cursive script, appearing to read 'Arnold W. Grushky'.

ARNOLD W. GRUSHKY  
Director, Disaster Preparedness  
Program

eam



**INDIAN POINT  
POWER PLANTS**

SCALE: 1" = 5.3± MILES

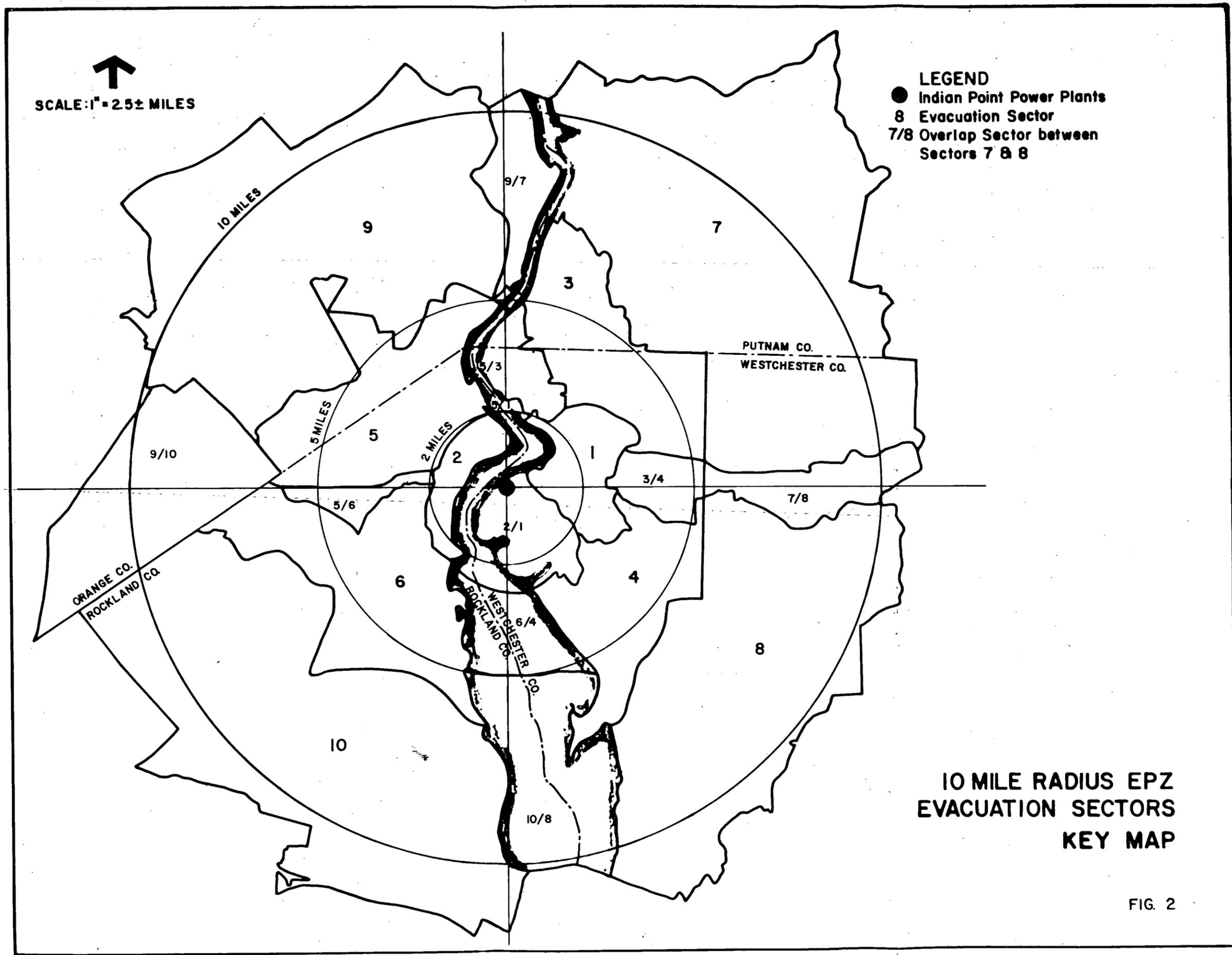


**LOCATION MAP**

FIG. 1

↑  
SCALE: 1" = 2.5 ± MILES

**LEGEND**  
● Indian Point Power Plants  
8 Evacuation Sector  
7/8 Overlap Sector between Sectors 7 & 8



10 MILE RADIUS EPZ  
EVACUATION SECTORS  
KEY MAP

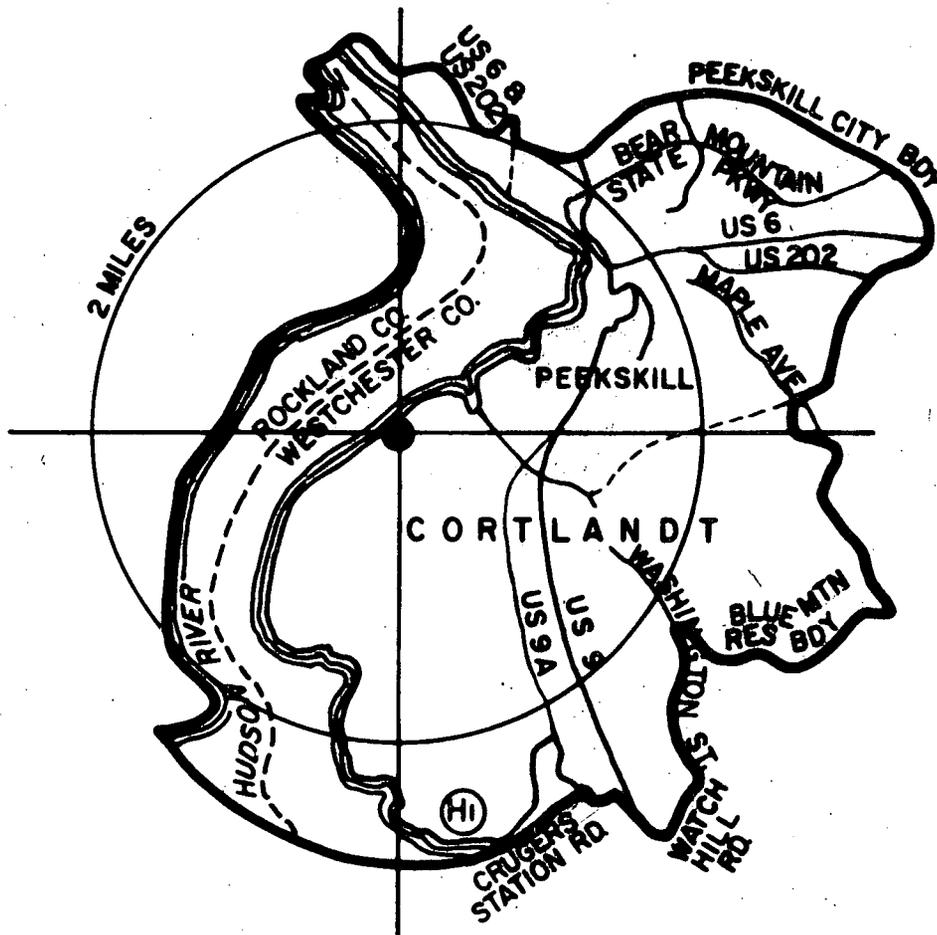
FIG. 2

**LEGEND :**

- Indian Point Power Plants
- Ⓜ FDR Veterans Administration Hospital



SCALE: 1" = 1.3 ± MILES



**EVACUATION AREA A  
(SECTOR I)**

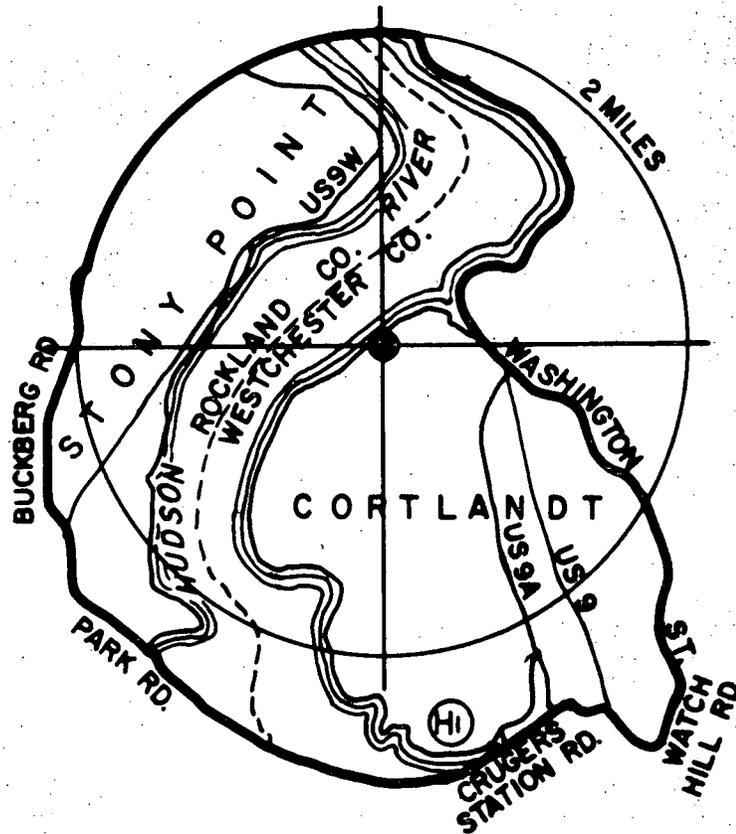
**FIG. 3**

**LEGEND :**

- Indian Point Power Plants
- Ⓜ FDR Veterans Administration Hospital



SCALE: 1" = 1.3 ± MILES



**EVACUATION AREA B  
(SECTOR 2)**

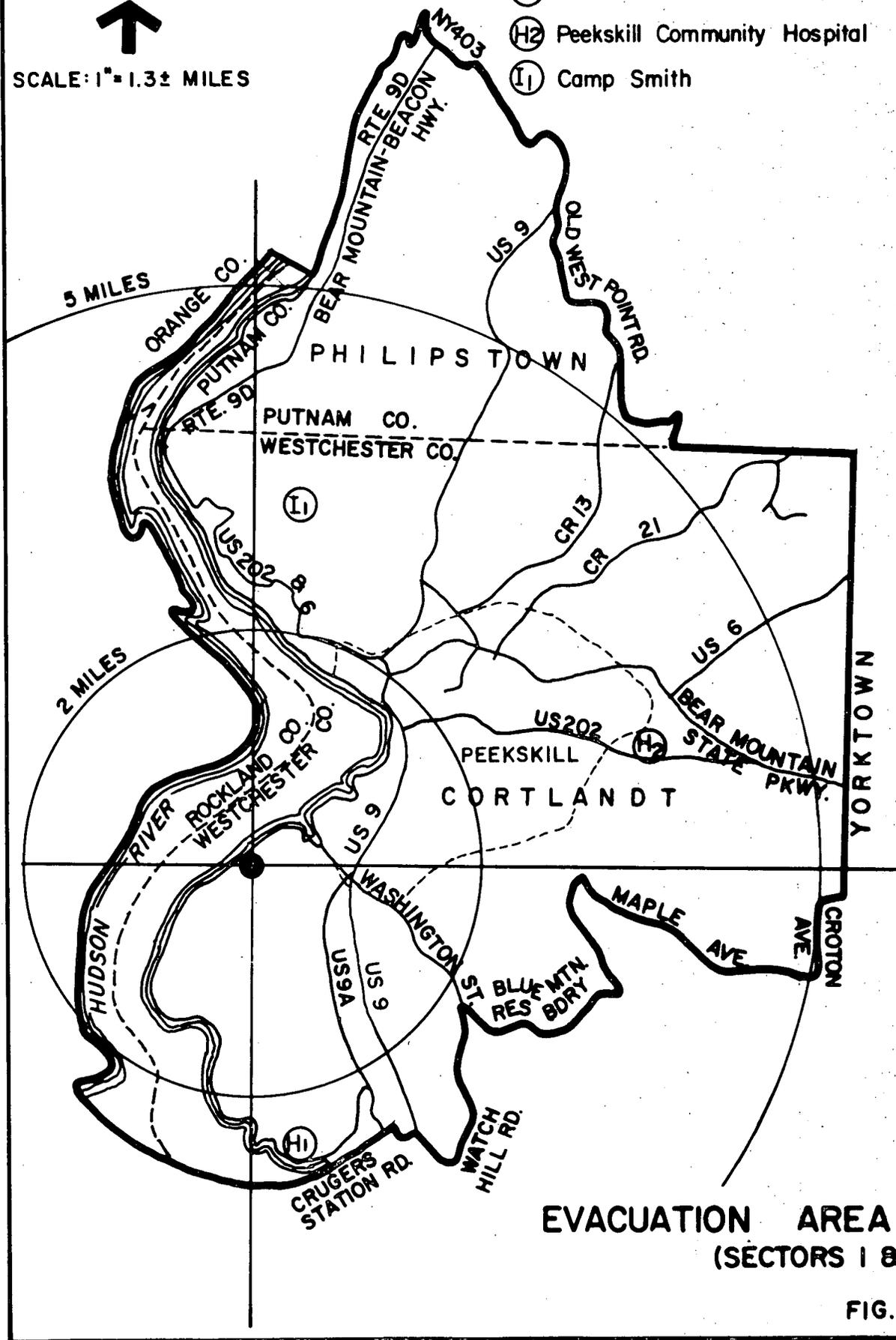
**FIG. 4**

**LEGEND :**

- Indian Point Power Plants
- (H1) FDR Veterans Administration Hospital
- (H2) Peekskill Community Hospital
- (I1) Camp Smith



SCALE: 1" = 1.3 ± MILES



**EVACUATION AREA C  
(SECTORS 1 & 3)**

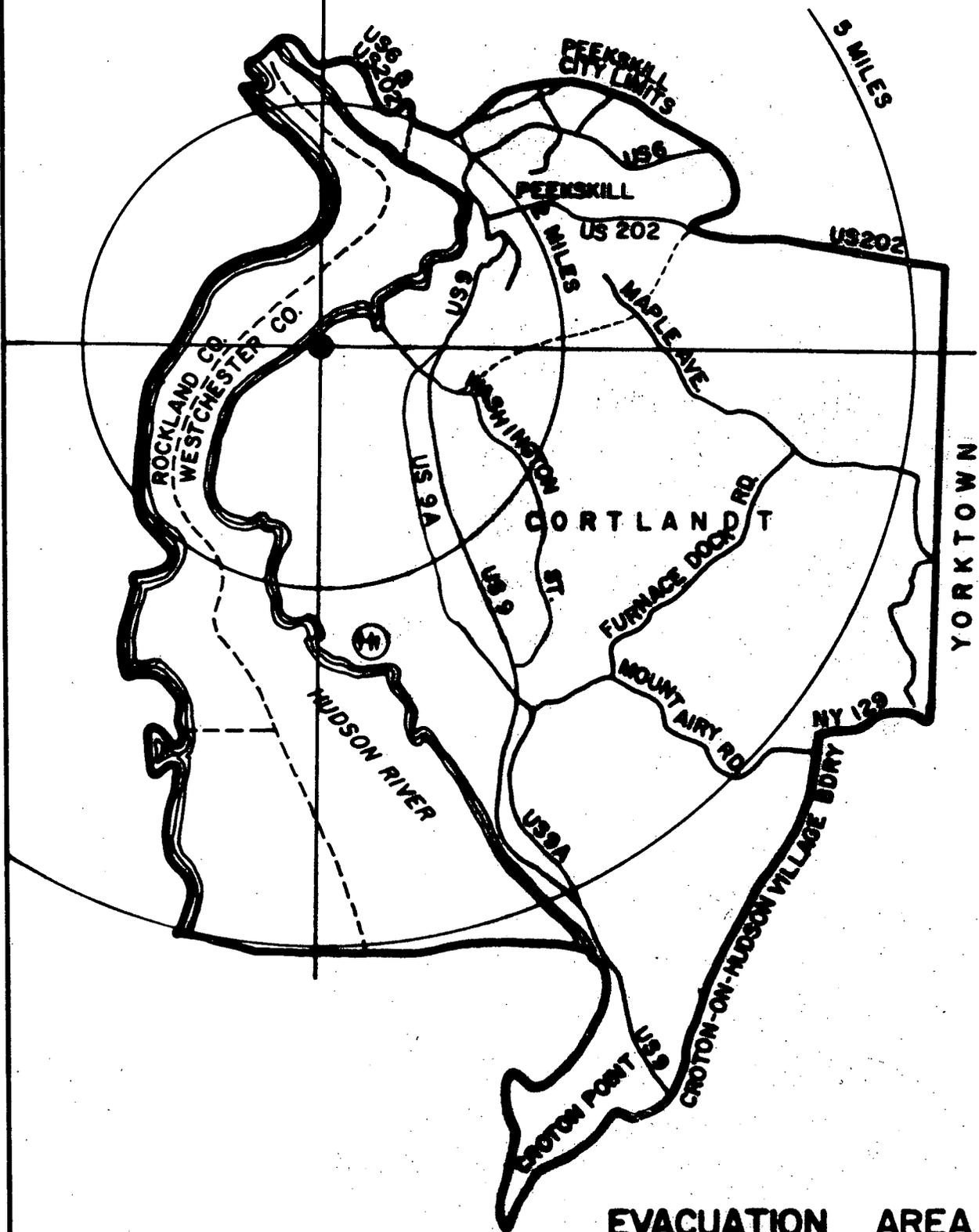




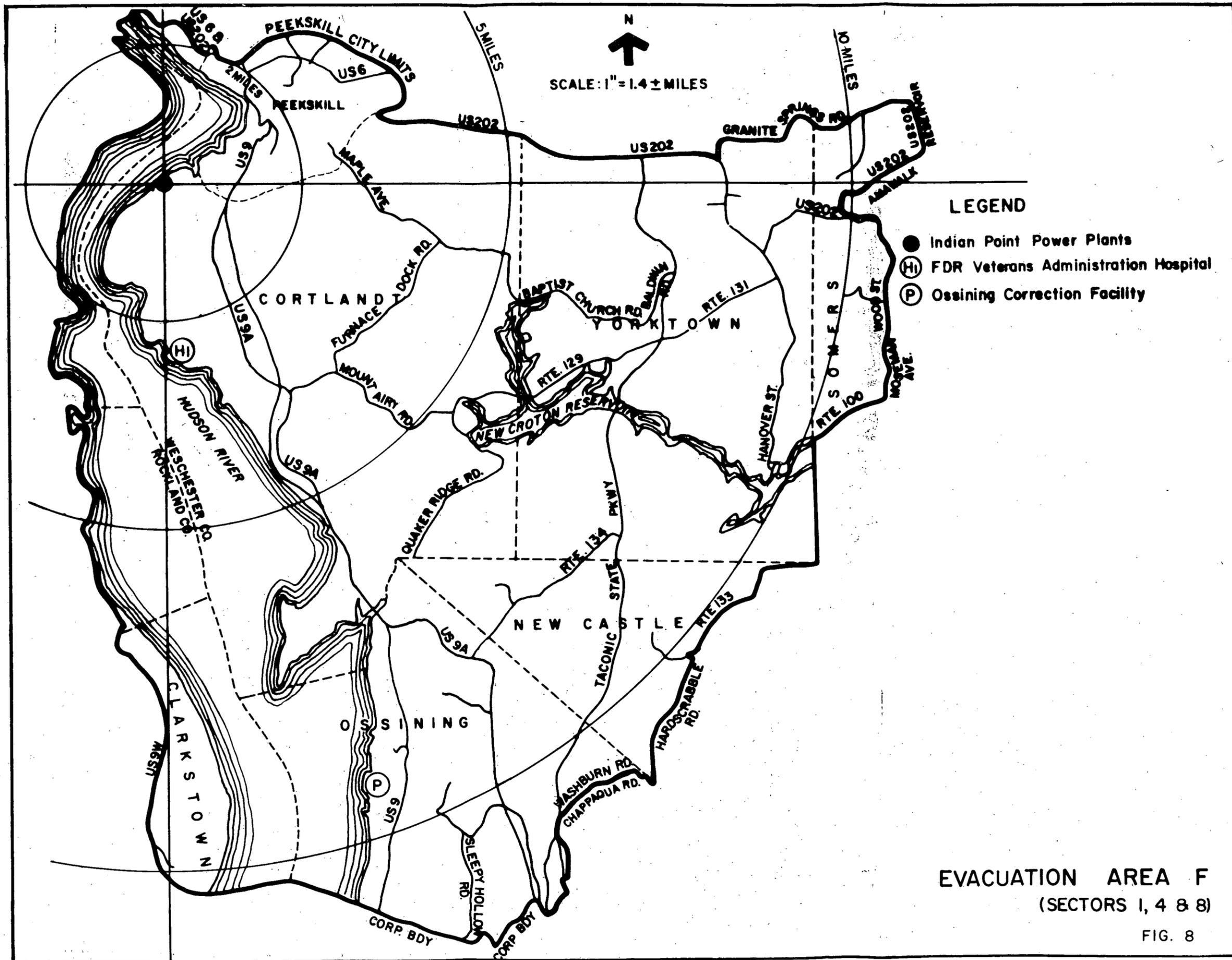
SCALE: 1" = 1.3± MILES

**LEGEND:**

- Indian Point Power Plants
- Ⓜ FDR Veterans Administration Hospital



**EVACUATION AREA E  
(SECTORS 1 & 4)**

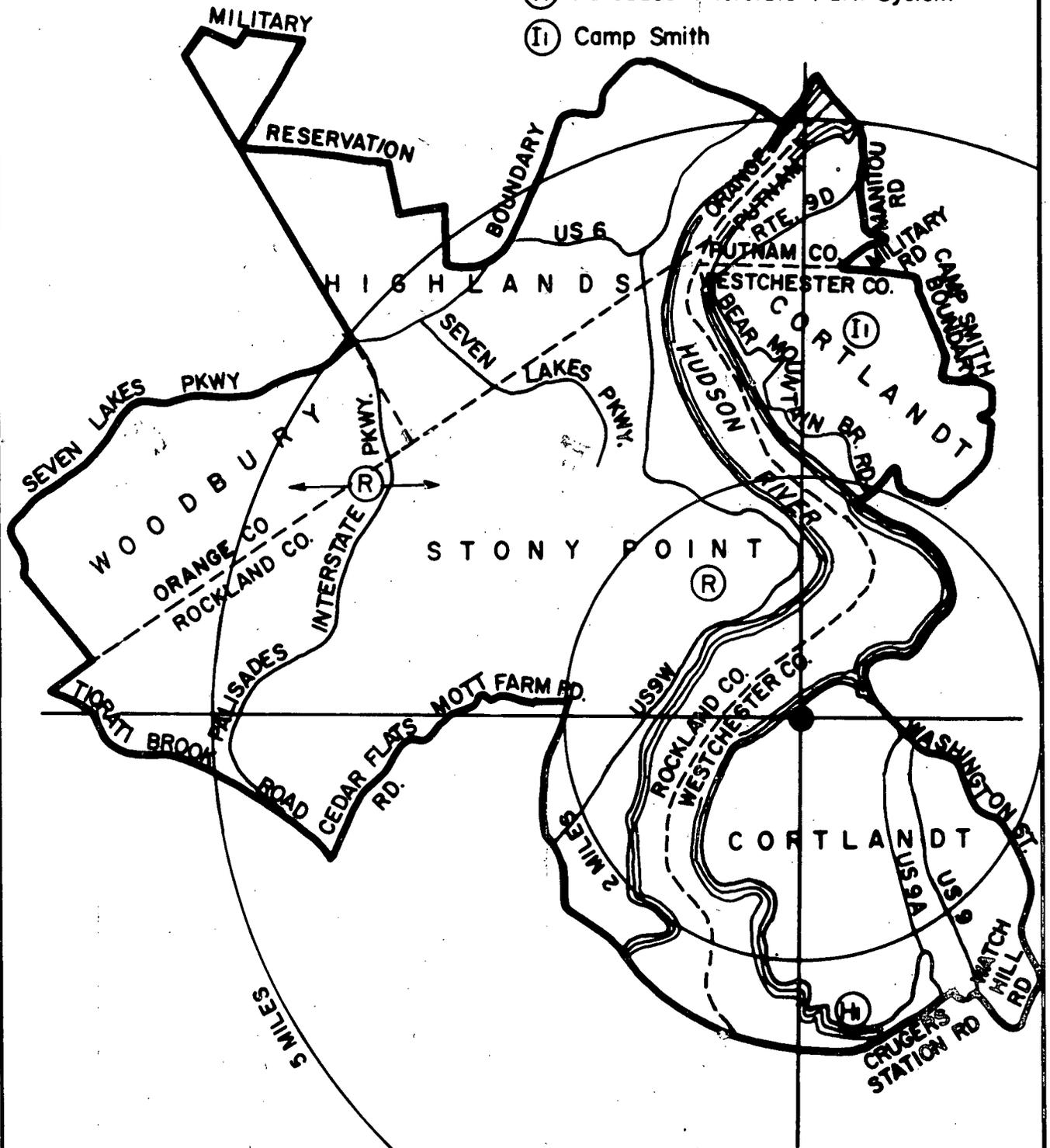




SCALE: 1" = 1.3± MILES

**LEGEND :**

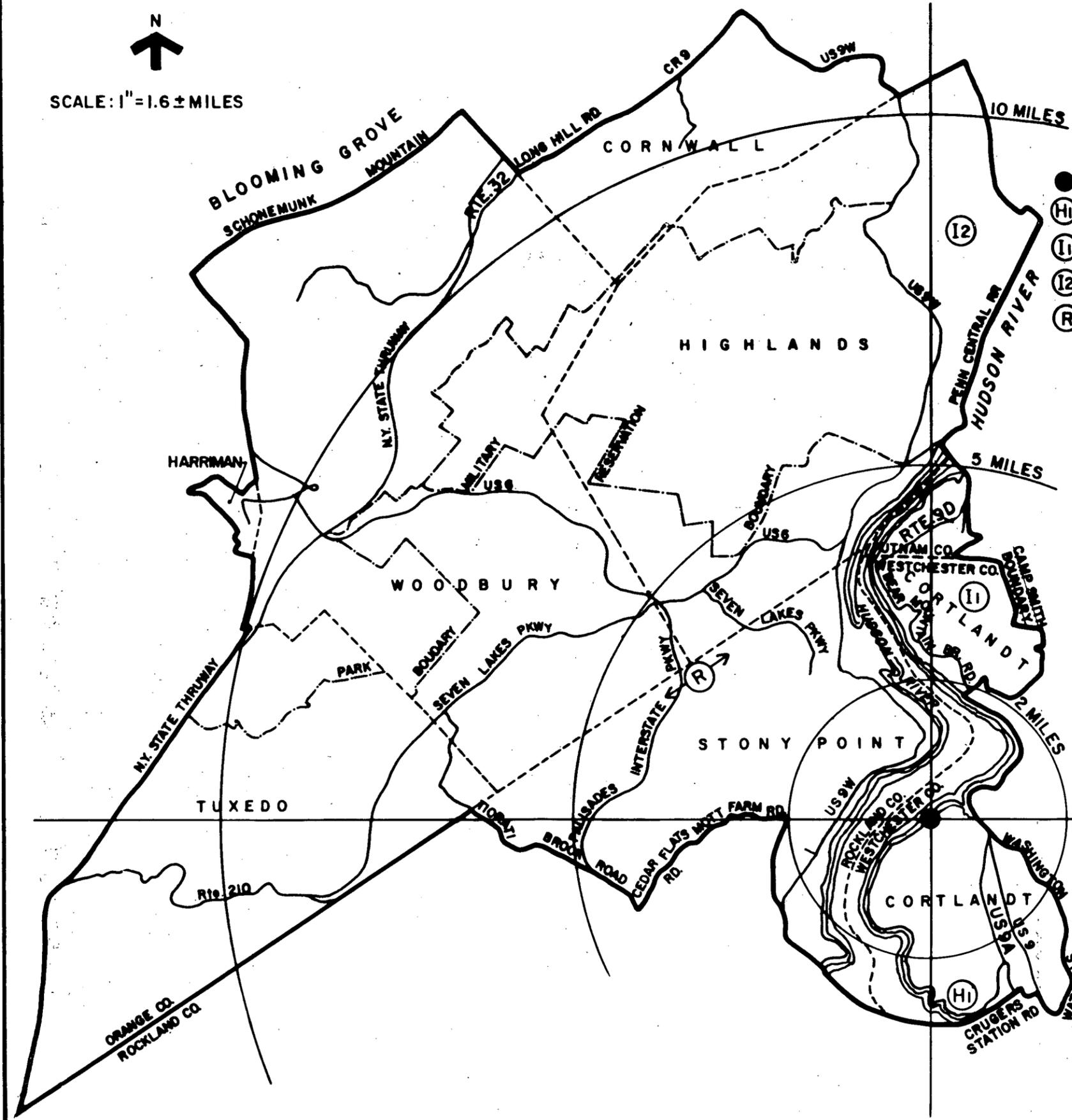
- Indian Point Power Plants
- (Hi) FDR Veterans Administration Hospital
- (R) Palisades Interstate Park System
- (II) Camp Smith



**EVACUATION AREA G**  
(SECTORS 2 & 5)



SCALE: 1" = 1.6 ± MILES



**LEGEND**

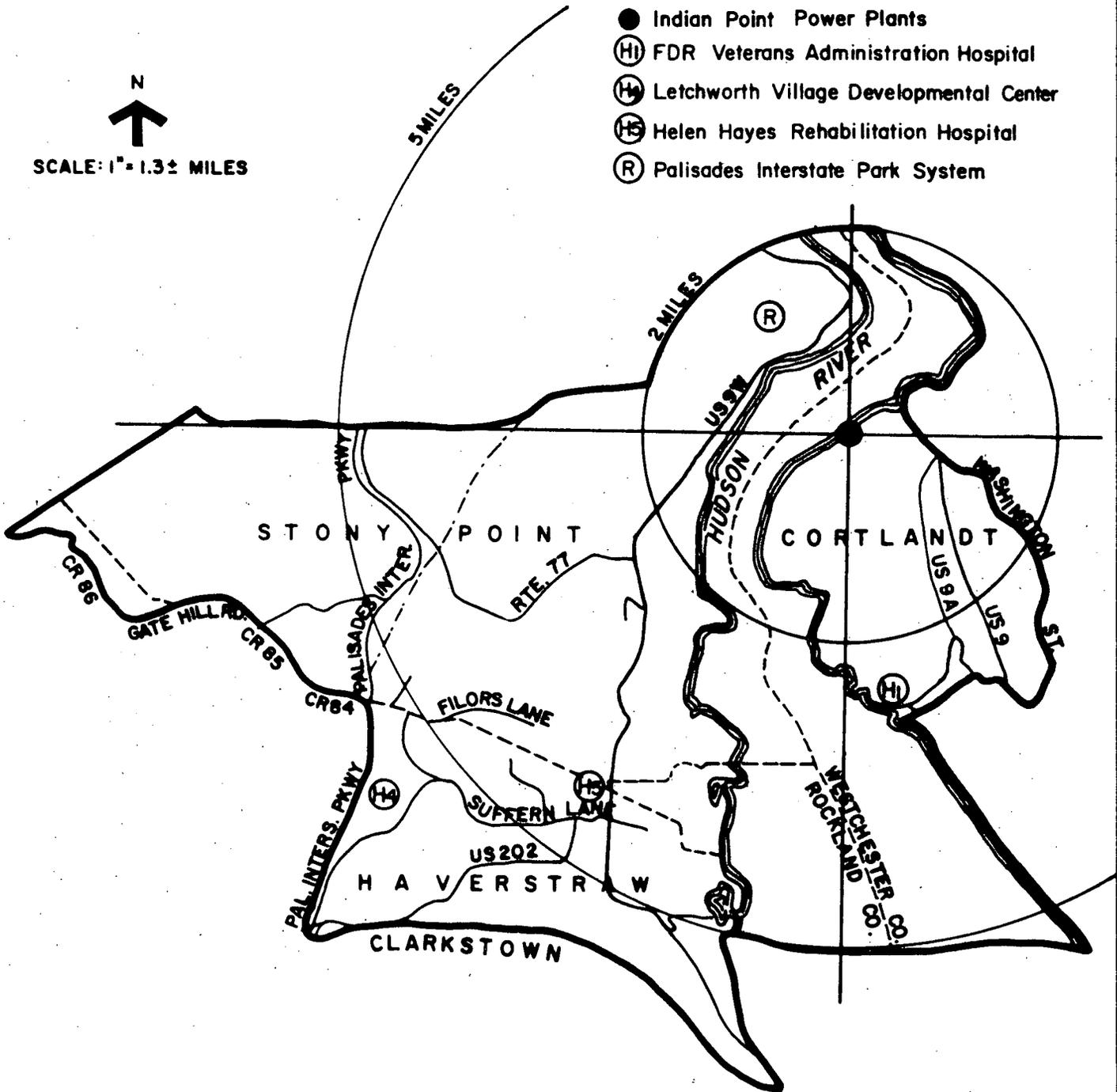
- Indian Point Power Plants
- (H) FDR Veterans Administration Hospital
- (I) Camp Smith
- (12) West Point
- (R) Palisades Interstate Park System

**EVACUATION AREA H**  
(SECTORS 2, 5 & 9)

N  
 ↑  
 SCALE: 1" = 1.3 ± MILES

**LEGEND :**

- Indian Point Power Plants
- (H) FDR Veterans Administration Hospital
- (H) Letchworth Village Developmental Center
- (H) Helen Hayes Rehabilitation Hospital
- (R) Palisades Interstate Park System



**EVACUATION AREA I  
 (SECTORS 2 & 6)**

FIG. II

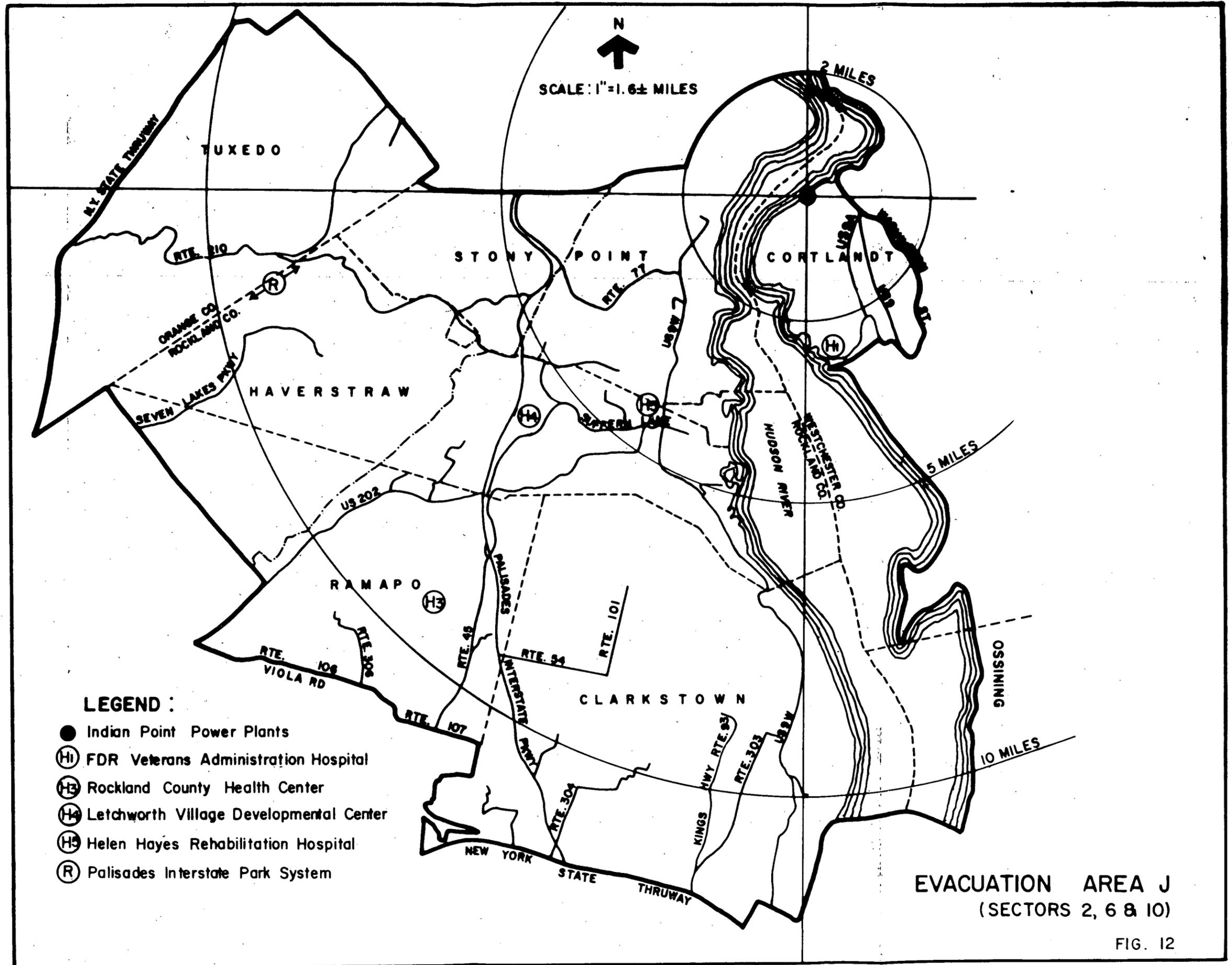
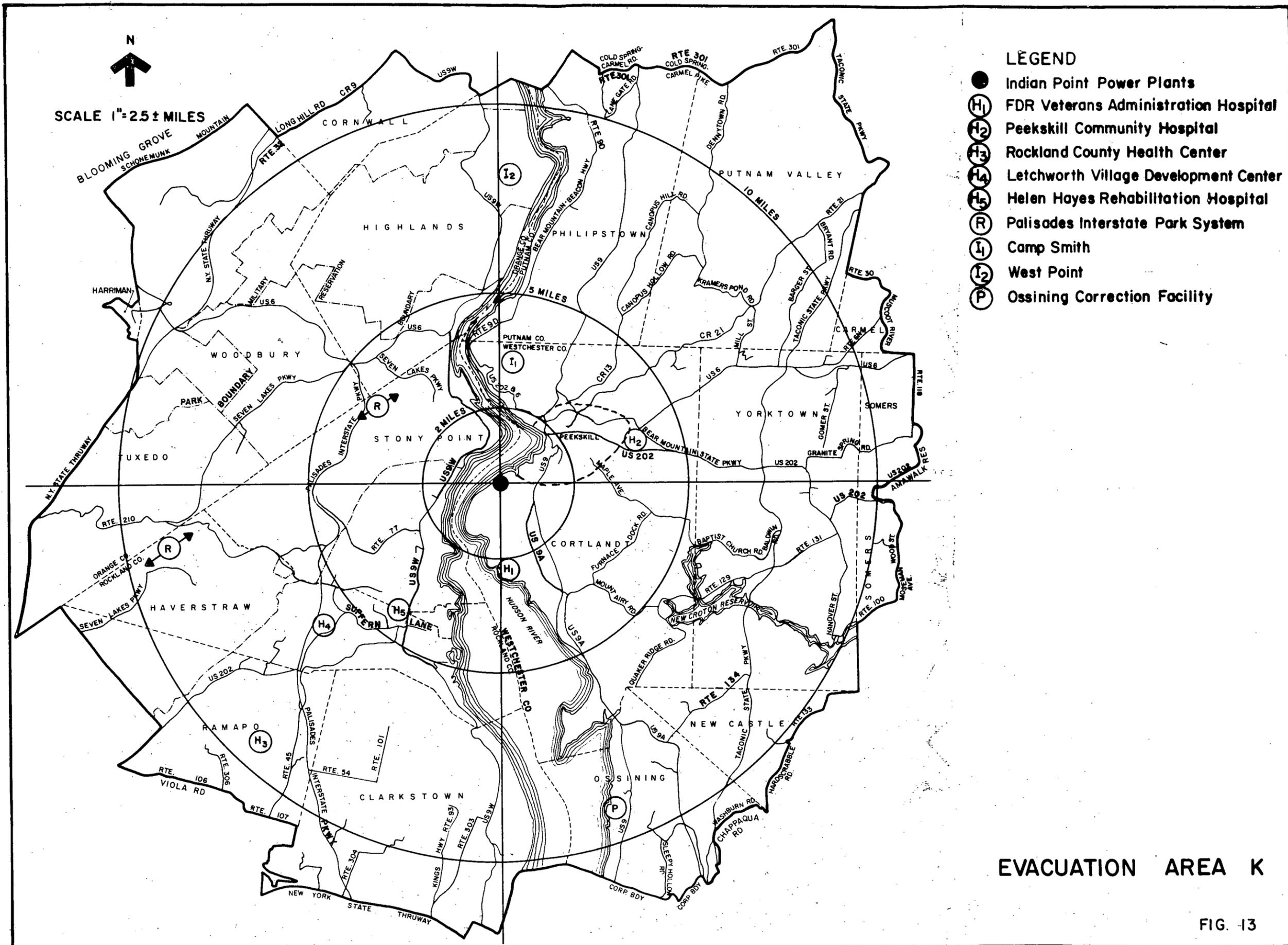


FIG. 12



- LEGEND**
- Indian Point Power Plants
  - (H<sub>1</sub>) FDR Veterans Administration Hospital
  - (H<sub>2</sub>) Peekskill Community Hospital
  - (H<sub>3</sub>) Rockland County Health Center
  - (H<sub>4</sub>) Letchworth Village Development Center
  - (H<sub>5</sub>) Helen Hayes Rehabilitation Hospital
  - (R) Palisades Interstate Park System
  - (I<sub>1</sub>) Camp Smith
  - (I<sub>2</sub>) West Point
  - (P) Ossining Correction Facility

**EVACUATION AREA K**