4-6

VOLUME V

AN

INDEPENDENT ASSESSMENT OF EVACUATION TIMES

FOR

LIMERICK

NUCLEAR POWER PLANT

Prepared for

FEDERAL EMERGENCY MANAGEMENT AGENCY

Wilbur Smith and Associates

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The independent assessment of the evacuation times contained in this report was performed under the technical direction of John C. Cosby. Mr. William V. Sheppard, Vice President, was the Principal-in-Charge of the Project. The principal contributors to the individual volumes of the report were:

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Volume II	- Bailly	- James R. Bancroft
Volume III	- Beaver Valley	- Richard A. Day
Volume IV	- Enrico Fermi	- Elbert L. Waters
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INTRODUCTION

An independent assessment of evacuation times around nine nuclear power plant sites was made for the Federal Emergency Management Agency. The results of this three-month study are contained in ten volumes, as follows:

- Volume I - Program Report - Evacuation Time Assessment of Nine Nuclear Power Plant Emergency Planning Zones (EPZ's)
- Volume II - Bailly Nuclear Power Plant Evacuation Time Assessment
- Volume III - Beaver Valley Nuclear Power Plant Evacuation Time Assessment
- Volume IV - Enrico Fermi Nuclear Power Plant Evacuation Time Assessment
- Volume V - Limerick Nuclear Power Plant Evacuation Time Assessment
- Volume VI - Maine Yankee Nuclear Power Plant Evacuation Time Assessment
- Volume VII - Midland Nuclear Power Plant Evacuation Time Assessment
- Volume VIII - Millstone Nuclear Power Plant Evacuation Time Assessment
- Volume IX - Shoreham Nuclear Power Plant Evacuation Time Assessment
- Volume X - Three Mile Island Nuclear Power Plant Evacuation Time Assessment

In addition, an Executive Summary is also available.

This volume contains a technical discussion and evacuation times assessment for Limerick Nuclear Power Plant. The evaluation of four scenarios and the discussion of evacuation of special problem areas are included. The scenarios evaluated are those expected when evacuation takes place at night (the optimum time from the standpoint of evacuation time), during a normal workday, during bad weather (the worst case condition), and, where applicable, the evacuation with summertime resident and transient population.

Evacuation Time Assessment Versus Evacuation Plan

The assessment employs available demographic data and transportation facility information to predict the public response time to an evacuation warning on the assumption that such a warning is made within 15 minutes of an on-site nuclear incident warranting such emergency action.

The assessment must provide for estimates of public response time to these warnings, assembly of family and other groups, preparation for departure, travel time on the network including consideration of capacity limitations on the network possibly forming queues which add to delays, and clearance of the 10-mile radius around the site. It must consider the evacuation of special problem areas and groups. These would include schools, nurseries, nursing and retirement homes, hospitals, penal facilities, beaches and recreational areas, and other activities which may provide periodic or seasonal concentrations of people. Population groups without access to their own transportation or unable to provide the special transportation facilities required for evacuation must be included in the evacuation time assessment.

Evacuation time assessment methodology combines selected techniques of traffic management and planning, land use planning and operational analysis. Because some conditions prevailing during an evacuation are not well documented, modifications to some established principles may be required to meet evacuation requirements. Assumptions may be required in lieu of well formulated relationships because of the highly specialized problems being addressed. These assumptions must be founded on best professional judgement and/or extrapolation from existing knowledge. The assumptions must be specifically identified. The bases upon which the assumptions are founded should be appropriately discussed.

Evacuation time assessments contain basic methodology common to evacuation plan development. However, the assessment is <u>not</u> an evacuation plan. The major distinction between the assessment and a plan is the extent to which the elements have been coordinated with all participant agencies and jurisdictions. For example, the assessment may assume that a specific traffic management element is established to optimize traffic operations at a specific location along an evacuation network. The feasibility of such an element in the assessment would be based upon established technical principles. However, the element would not be coordinated with specific law enforcement agencies to establish what agency would exercise the element control and management nor identify the type and number of personnel to be required. The study time allotted makes such coordination impossible. The assessment must <u>identify</u> what is required for the evacuation time to be realized, and <u>assume</u> that such an element would be implemented.

<u>General Assumptions</u>

In the assessment of evacuation times, certain general assumptions were mandatory. More important of these are summarized as follows:

1. Emergency evacuation of the general public from the EPZ will be performed largely from the home by the family as a united

group. This assumption is prefaced by the following quote:[1] ". . . people will not evacuate an area, regardless of the danger, if their family group is separated, unless they know that members of their family are safe, accounted for, and that arrangements have been made for them to evacuate." It was felt that this psychological pressure is so prevalent and strong that the above assumption appears to be justified. In addition, to assure that segments of the family are safe and accounted for would have required the establishment of shelter locations and the development of a shelter support plan. In view of the next assumption and due to the short time period of the study, this was not done.

2. Public use of shelters in previous mass evacuation experience related to natural disasters appears to be a very small percentage of total evacuees. Examples cited in literature include:[2] "In a California flood, only 9,260 out of 50,000 persons evacuated registered in the 38 Red Cross shelters; during Hurricane Carla, 75 percent of the evacuees went to other than public shelters; and during Hurricane Betsy, only 20 percent requested assistance. Generally, shelter centers are used only if nothing else is available or if one cannot financially care for himself." In this evacuation time assessment study, it was assumed that the predominant traffic, after leaving the 10-mile EPZ, went diverse routes rather than to a shelter destination. Therefore, the evacuation time assessment ended at the EPZ boundary. An analysis of route capacities and service levels of highway facilities beyond that boundary was made to assure that delays or problems were unlikely to occur.

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(1) EVACUATION RISKS - AN EVALUATION, U.S. Environmental Protection Agency, Office of Radiation Programs, EPA-520/6-74-002, June, 1974, p. 49.

(2) Ibid., p. 52.

3. Experience gained in a large range of evacuations indicates that private vehicles[3] ". . . were the predominant mode for evacuation (more than 99 percent). Population density ranged from approximately 15 persons per square mile to 20,000 persons per square mile." It was assumed that this was applicable to this time assessment study. It was further assumed that persons without private vehicle transportation would be provided, at their telephone request, adequate transportation in high occupancy vehicles (HOV's). The additional vehicle volumes on the network would therefore be small, could be affected during the general public evacuation time, and would not affect the computed evacuation times of the general population.

4. It has been observed that not all persons will evacuate the EPZ. "In many cases, even when presented with a grave threat, people refuse to evacuate."[4] This source continues, "Results of this study indicate that approximately six percent of the total population refused to evacuate. Other reports indicate this figure can run as high as 50 percent. There is no reason to believe that because the disaster agent is radiation rather than some other agent . . . will provide sufficient motivation to leave. Rather the opposite viewpoint should be taken--people will hesitate to leave."[5] It is believed that a majority of this hesitance is based on fear of exposing their property to looting and vandalism. Notwithstanding this evidence, this time assessment study assumed that <u>all</u> persons evacuate.

5. It has been assumed that the traffic network within the EPZ has been isolated so that no through traffic is permitted to enter it within 15 minutes after the evacuation warning has been issued.

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(3) *Ibid.*, p. 52.

(4) *Ibid.*, p. 48.

(5) *Loc. cit.*

6. Traffic management by appropriate law enforcement officers will be performed at selected intersection where evacuation traffic flow is given priority.

7. All persons in the EPZ have been provided, in advance, sufficient information regarding the assigned evacuation route from their place of residence (referred to as the "centroid" in the report).

8. It was assumed that the public response to an evacuation order can be defined as a combination of up to four categories of statistically distributed responses: receive warning, leave work, travel home, and evacuate home. It was assumed that these responses are time-distributed following a normal distribution curve. The details and applications of this assumption are more fully discussed later in this report.

Additional assumptions were made which are summarized at the back of the report under this heading.

Description of Site

Location - The site of the Limerick nuclear generating station is in Limerick Township of Montgomery County, Pennsylvania, on the northeast bank of the Schuylkill River approximately four miles downriver from Pottstown, 35 river miles upriver from Philadelphia, and 49 river miles above the confluence of the Schuylkill with the Delaware River.

The site is situated in the rolling countryside of Montgomery County, Pennsylvania. The area included within a 10-mile radius of the station includes parts of three Pennsylvania counties - Montgomery, Chester, and Berks.

In 1985, it is estimated that there will be 171,876 people residing within 10-miles of the site. Montgomery County will have 102,510 people (60 percent), Chester County 49,701 people (29 percent), and Berks County 19,665 peop..e (11 percent).

Licensee - The licensee for Limerick is the Philadelphia Electric Company. The General Electric Company is responsible for the nuclear steam supply system (NSSS) and is designing and supplying the reactors, the reactor fuel, and the associated turbine - generator system with the Chicago Bridge and Iron Company supplying the reactor vessels. All other systems of the station are being designed, procured, and constructed by the Bechtel Corporation which is the architect/engineer/constructor for the project.

Type of Plant - The ''merick Generating Station will produce electrical power using two turbine-generator units, each driven by steam produced by its own boiling water nuclear reactor (BWR). Each unit will have a rated thermal power level from its associated NSSS of 3293 MWT. The net station output from each of the generators will be 1055 MWE. The date of initial criticality for unit one is scheduled for January, 1985 with the date for commercial operation being scheduled for April, 1985. The scheduled dates for initial criticality and commercial operation for unit two are January, 1987 and April 1987, respectively.

Emergency Planning Area

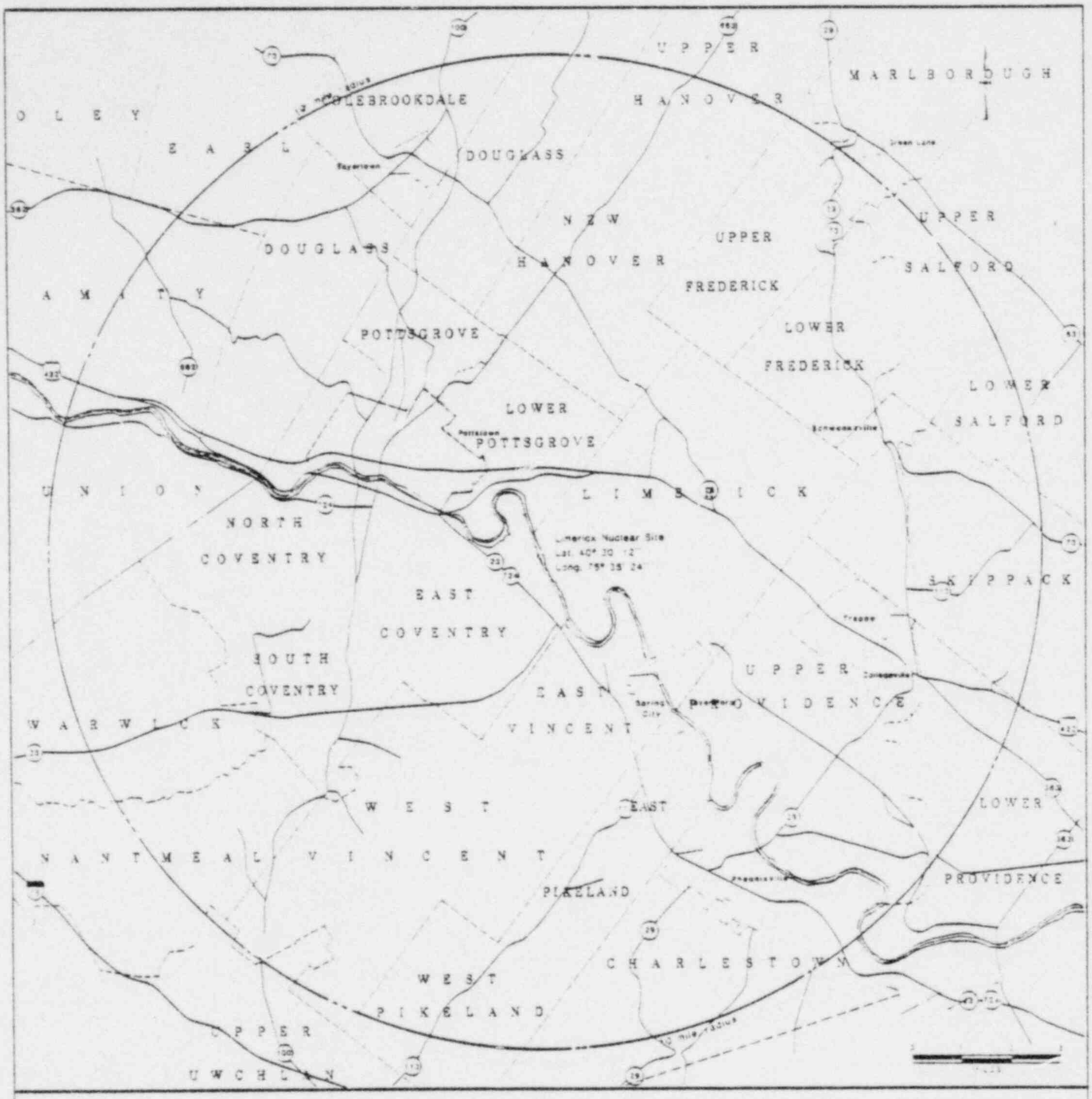
The area within a 10-mile radius surrounding a nuclear plant is recommended for the delineation of the emergency planning zone (EPZ). The area within the 10-mile radius around the Limerick generating plant encompasses all or part of 34 townships and 9 boroughs in three counties.

The EPZ is defined as the area enclosed by a circle of 10-mile radius. For purposes of confirmation of evacuation of the EPZ, boundaries were delineated to just outside the perimeter of the 10-mile circle to coincide with readily identifiable landmarks such as rivers, political jurisdictional boundaries, roadways, and other easily identified topographical features. Although the roadway network developed for evacuation purposes stops at the 10-mile circle, the peripheral boundaries will assist the agencies implementing the evacuation plans and the people affected by evacuation to identify the outer boundaries of the planning area. Figure 1 presents a map of the Emergency Planning Area around Limerick and shows the 10-mile radius circle which depicts the EPZ for the plant.

The following description of the emergency planning area starts at the junction of the Montgomery and Chester county lines in the Schuylkill River and goes counter-clockwise around the perimeter of the EPZ. The Emergency Planning area boundary in Montgomery County generally follows the Schuylkill River, LR 46065, LR 46064, SR 363, US 422, T 386, T 340, T 397, Shippack Creek, T 364, SR 113, T 367, T 131, SR 63, SR 29, LR 46013, T 477, T 380, New Hanover Co., Line, and LR 46012 to the Berks county line.

In addition to the 34 townships that the EPZ affects, there are part of two additional townships in the Montgomery County emergency planning area that is not within the EPZ. These are Towamencin and Worester Townships.

In Berks County the boundary generally follows LR 06033, T 841, LR 06026, LR 06098, T 652, Colebrookdale County Line, SR 73, T 626, LR 06034, SR 562, SR 662, LR 06108, T 464, T 443,



STUDY SITE LOCATION
EVACUATION TIME ASSESSMENT

LIMERICK

FIGURE 1

LR 06059, LR 06179, LR 06097 and the western boundary of the U.S. Federal Park into Chester County.

After crossing into Chester County along the Federal Park boundary, the emergency planning area boundary generally follows SR 345, T 533, SR 23, T 410, T 513, T 514, T 512, T 510, T 452, SR 100, T 464, T 461, SR 401, I 76, the Charlestown County Line, and the Schuylkill County Line to the river and Montgomery County.

General Regional Characteristics

The Limerick site is in the Triassic lowland sections of the Piedmont Physiographic Province, which is part of the Appalachian Highlands. Although Montgomery County is the third most populous in the state, there is a fairly high level of agricultural activity, principally dairying. In 1971, Chester and Berks were ranked in the top ten counties of Pennsylvania in the production of corn, oats, hay, potatoes, apples, peaches, poultry and milk.

There are several manufacturing plans located within the 10-mile circle along the Schuylkill River. Boyertown, Trappe, and Collegeville, also have small manufacturing facilities. There are several employers within the EPZ which employ over 1,000 people. West Comapny in Phoenixville employs 3,200 people. Mrs. Smith Pie Company in Pottstown, employs 2,400 and Teleflex Inc., in Royersford has over 1,400 employees.

Population Distribution - Within the 10-mile radius of the Limerick plant there are 34 townships and 9 boroughs. The nearest populations center within the 10-mile circle is Pottstown in Montgomery County with a 1985 projected population of 27,720, six smaller communities within the 10-mile circle with 1985 projected populations of 2,000 to 15,000 include Phoenixville, Trappe, Collegeville, Spring City, Boyertown, and Roversford. The largest populated township is Upper Providence in Montgomery County which will have close to 10,000 people in 1985. Other townships with a 1985 projected population of over 5,000 include Douglass, Limerick, Lower Pottsgrove, Lower Providence and Shippack in Montgomery County, North Coventry Township in Chester County and Amity Township in Berks County.

Map - Planning Zones - As mentioned previously, Figure 1 presents a map of the planning area around the Limerick Nuclear Plant with the station being at the center of the map. The EPZ is shown as a circle with a 10-mile radius and the Emergency Planning Area boundary is depicted around the perimeter of the circle. The map shows the Schuylkill River running in a NW-SE direction through the EPZ with county, township, and borough boundaries identified as such.

Major Transportation Facilities - There are several highways within relatively short distance from the site. US 422 is 1-1/2 miles north and runs in a NW-SE direction. PA 100 is 4 miles west through Pottstown and runs N-S. PA 724 is 1-1/4 mile west accross the Schuylkill river and runs in a NW-SE direction. An extension of the Schuylkill Expressway (NW-SE) is presently under construction and is being routed within 4 miles of the eastern boundary of the site.

Other highways within the 10-mile radius include PA 23 which is 4 miles south across the river and runs W-E. PA 73 is 6-1/2 miles north and runs NW-SE. PA 29 is 7-1/2 miles east and runs N-S while PA 663 is 3 miles west and runs NE from Pottstown.

The are is also served by Conrail Railroad which has track within one mile of the site along the Schuylkill River. The Pottstown airport is a general aviation airport located about 5-1/4 miles north-west of the station, but at present it accommodates no scheduled commercial or commuter flights.

Support Organizations

In cases of an emergency at the facility, close coordination between federal, state, and local agencies is imperative to provide the responsibility necessary to ensure implementation of an evacuation plan. Philadelphia Electric Company will have categories of incidents defined including criteria for determining when protective measures should be considered and for notification of off-site support groups. Agreement, liaison, and communications will be established with appropriate agencies that have responsibilities for coping with emergencies.

Support agencies expected to coordinate activities in the Limerick area are:

1. Pennsylvania Emergency Management Agency (PEMA)
2. Montgomery County Office of Emergency Preparedness
3. Chester County Office of Emergency Preparedness Service
4. Berks County Office of Emergency Preparedness Service
5. Nuclear Regulation Commission (NRC)
6. Bureau of Radiation Protection
7. National Guard
8. Pennsylvania State Police
9. Local Municipalities, such as, police, fire, and others necessary to implement an evacuation plan.

Summary of Emergency Planning to Date

Licensee Evacuation Plan - As a result of a request by NRC that Philadelphia Electric do an evacuation time study, the utility contracted with NUS Corporation to perform the study. The study being done by NUS is presently in draft form and has not yet been submitted to NRC.

Other Evacuation Plans - The Pennsylvania Emergency Management Agency in conjunction with the Pennsylvania Department of Transportation, will develop an evacuation road network and an estimate of evacuation time, for the Limerick area.

These estimates will be done in conjunction with the actual evacuation plans being developed at the county levels. As is the case with other nuclear plants in Pennsylvania, evacuation time scenarios for populations within a 2, 5, 10 and 20 mile radius of the station will be developed. Since the first unit at Limerick does not come on line until 1985, Pennsylvania's priority for developing evacuation times for Limerick is lower than for other Pennsylvania nuclear plants such as TMI.

AREA CHARACTERISTICS

The area characteristics were obtained by field inspection, from information contained in the Limerick Generating Station Environmental Statement supplied by the Licensee, and from information obtained from the various Planning Commissions of Montgomery, Chester, and Berk counties.

Topography *(6)

As mentioned earlier, the Limerick site lies in the upper part of the region known as the Piedmont Providence. In the area around the plant, four distinct habitats are forest, successional areas (urban and rural), cultivated areas and wetlands.

Commerical woodlands in the Montgomery County area of Pennsylvania occupy about 13 percent of the total county area. A large portion of the cultivated areas in southeastern Pennsylvania produces grain, hay, fruit, and vegetables. The wetlands of the area include the Schuylkill River, smaller streams, small artificial ponds, marshes, and swamps. The station is on the northeast side of the river at a mean elevation of 210 feet above sea level (MSL). Throughout the immediate site area the land slopes upward from the river from an elevation of roughly 100 to 280 feet (MSL).

Meteorology *(6)

Temperature - The climate of Montgomery and Chester counties and the southeastern portion of Berks County is characterized by

*(6) Source: U.S. Atomic Energy Commission (now the Nuclear Regulatory Commission), 1973, Environmental Statement for Limerick Generating Station.

warm, humid summers and moderately cold winters. The average temperature of the three-county area is approximately 55°F. Temperatures below 0°F and above 100°F are rare; average daily maximum termperatures range from 87°F in July to 40°F in January, and average daily minimum temperatures range from 23°F in January and February to 65°F in July and August. The average annual precipitation is 45 inches and is rather uniformly distributed throughout the year, with only small differences between the wettest and driest months. Table 1 gives an average of the data from 1931 to 1960 from the West Chester, Coatesville, and Phoenixville weather stations. These weather conditions are due in large measure to the protection given by the Allegheny Mountains to the west.

Precipitation - In the period of December through the early part of March, part of the precipitation falls in the form of snow produced from storms that are more extensive and frequent than those occurring during the warm seasons. Occasionally, moisture-laden storms moving along the Atlantic Seaboard produce heavy snow, creating near-blizzard conditions. The average annual snowfall is 29.5*(7) inches, while the record maximum annual snowfall received at Reading, according to available records, was 58.8*(7) inches, in the winter of 1960-61. The record minimum annual snowfall occurred during the winter of 1972-73, totalling less than 6*(7) inches.

Winds - Winds in the Limerick area are predominantly from the NW. The wind rose in Figure 2 shows the percentage of time that the wind comes from each section at the Limerick weather station. Table 2 gives the percentage frequency of wind speeds at Peach Bottom, a similar site whose data can be used with substantial confidence.

*(7) Source: U.S. Department of Commerce, 1968 Local Climatological Data. Total depth, not water equivalent.

TABLE 1

Chester County climatological summary 1931–1960[a]

Month	Temperature data							Precipitation data		
	Mean temperature (°F)[b]			Mean degree days,[b] based on 65°F	Mean number of days[c]			Mean precipitation (in.)[b]		Mean days of 0.1 in. or more precipitation
					Max temp		Min temp 32°F and below			
	Daily max	Daily min	Monthly		90°F and above	32°F and below		Rain	Snow and sleet	
Jan.	40.9	23.7	32.3	1023		5	26	3.34	5.9	6
Feb.	42.1	23.1	32.9	857		3	23	2.85	7.4	6
Mar.	51.0	30.2	40.6	784		1	20	4.13	5.5	8
Apr.	63.3	39.9	51.9	364			4	3.48	0.4	8
May	74.1	50.2	62.3	147	1			4.15		7
June	82.7	59.0	71.0	23	5			4.00		7
July	87.2	63.8	75.6	1	11			4.49		6
Aug.	84.9	61.3	73.3	4	7			5.07		7
Sept.	78.3	55.0	66.7	73	2			3.61		5
Oct.	67.5	43.9	55.8	309			4	3.18	0.2	5
Nov.	54.8	34.2	44.7	640			15	3.73	1.4	6
Dec.	42.8	25.1	34.1	955		5	23	3.39	4.3	6
Year	64.1	42.5	53.4	5180	26	14	115	45.42	25.1	77

[a]Modification of Chester County Planning Commission's tabulation from United States Weather Bureau's official records (averages from three stations: Coatesville, Phoenixville, and West Chester).

[b]30 years of record.

[c]10 years of record.

Source: U.S. Atomic Energy Commission (now the Nuclear Regulatory Commission), 1973, Environmental Statement for Limerick Generating Station.

FIGURE 2

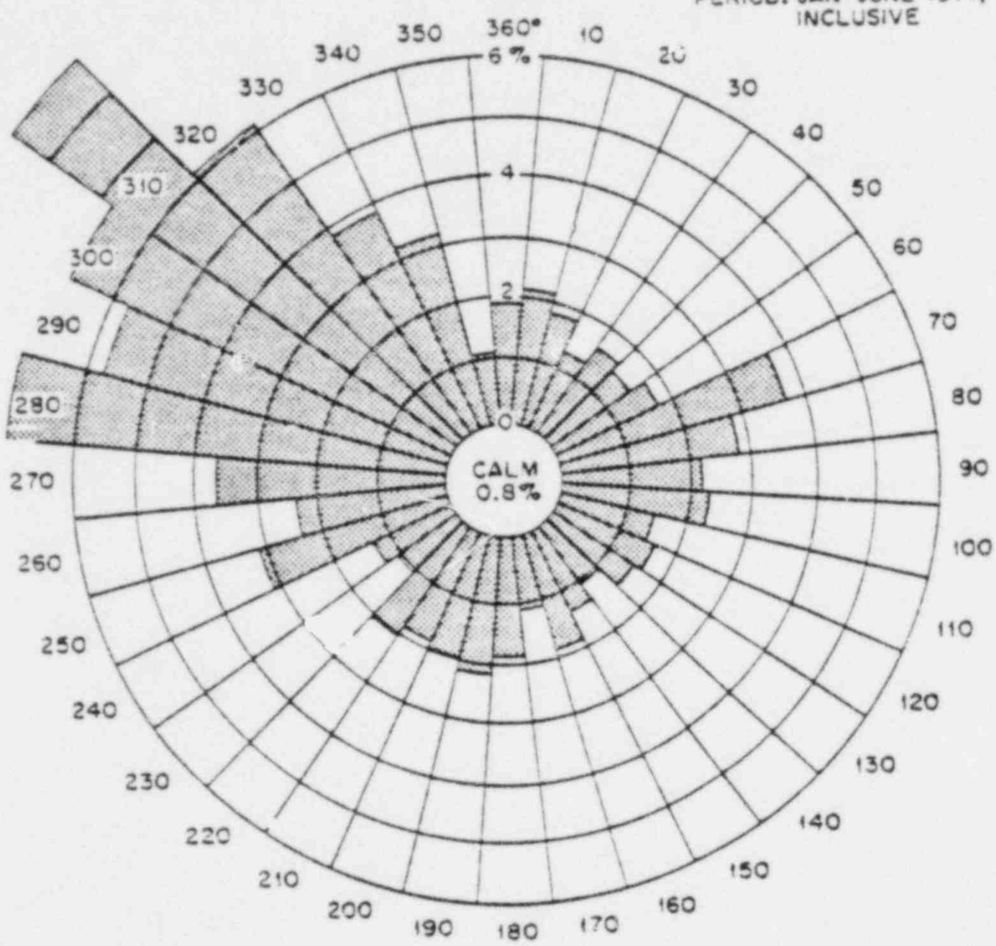


Fig. 2. Six-month wind rose (1971), Limerick weather station No. 1; location W-11 (temporary pole), nominal 30-ft level, el. 280 MSL. Shaded areas show percentage of time that wind comes from each 10° sector, during all hours for which data are available.

Source: U.S. Atomic Energy Commission (now the Nuclear Regulatory Commission), 1973, Environmental Statement for Limerick Generating Station.

TABLE 2

Percentage frequency of wind speeds, Peach Bottom weather station No. 2, location W-6 (nominal 320-ft level, el. 688 ft MSL)

Period: August 1967–July 1971

Turbulence class	Frequency (%) of winds of specified speeds					
	1–3 mph	4–7 mph	8–12 mph	13–18 mph	19+ mph	All speeds
I	0.5	[illegible]	0.1	0.0	0.0	0.7
II	1.1	6.1	13.0	17.2	10.4	47.7
[illegible]	0.6	0.3	0.6	0.1	0.0	1.7
[illegible]	0.0	0.1	2.1	7.8	9.4	19.4
[illegible]	3.2	6.9	10.2	8.5	0.8	29.6
[illegible]						0.9
All classes	5.3	13.7	26.0	33.6	20.5	100.0

Source: U.S. Atomic Energy Commission (now the Nuclear Regulatory Commission), 1973, Environmental Statement for Limerick Generating Station.

Surface Water - In the Schuylkill River, there are high flows in late winter and early spring when the snows are melting, but the highest flows are caused by rains from hurricanes which occasionally make their way inland. In June 1972, heavy rains caused by tropical storm Agnes caused record floods on the Susquehanna and Schuylkill Rivers in Pennsylvania. The peak flow rate produced by the storm has been estimated as approximately 110,000 cfs at Pottstown, about 4 miles above the Limerick site. Preliminary estimates are that the water level in the vicinity of the plant reached elevations between 129.5 and 130 feet above mean sea level, which are well below the station elevation (about 210 feet above msl). The highest flow previously recorded was 53,900 cfs at Pottstown in 1902. The average annual flood flow is 21,000 cfs and the 100-year flood flow is computed to be 99,000 cfs. The probably maximum flood flow is estimated to be 356,000 cfs. Failure of any maximum flood flow is estimated to be 356,000 cfs. Failure of any upstream dams would not add materially to the level of the probably maximum flood which is calculated to be 158 feet above mean sea level.

Demography

Demographic data was collected within the EPZ by townships and boroughs to identify populations and other pertinent factors which affect evacuation. Townships and boroughs were used as planning zones; however, in many instances, the planning zones were subdivided to avoid overloading of roadway networks. When this occurred, the subzones were divided by some early identifiable basis to permit the assignment of persons residing in these areas to a logical and definite evacuation route.

The EPZ for Limerick includes townships and boroughs in three counties. Each of the 34 townships within the EPZ was given a letter designation for identification purposes. Where a township was subdivided, the letter designation was suffixed with a number. The nine boroughs were assigned alpha-numeric designations using the letter of the nearest township or townships, in cases where a large borough was subidivided.

Table 3 lists all the political subdivisions within the EPZ, namely counties, townships and boroughs and gives the projected 1985 population of each. Population projections for 1985 in Berks County were extrapolated from census numbers for 1970 and 1977. In Montgomery and Chester counties, the 1985 projections were interpolated from the 1977 and 1990 census numbers.

Table 4 lists all the schools in the three county area along with their locations and associated enrollment. Likewise hospitals and nursing homes in the EPZ are listed by county in Table 5 and Table 6, respectively, along with their location and associated populations. Table 7 lists all other potential population gathering points by county and location. This list includes such facilities as prisons, parks, campgrounds, and recreation areas. Fiugers 3, 4, 5, and 6 present quadrant maps that depict the location of schools, hospitals, nursing homes as listed in the above tables. Key numbers in tables refer to the accompanying location on the maps.

TABLE 3

SUMMARY OF 1985 PROJECTED
POPULATION OF THE PLANNING ZONES

POPULATION CENTER	SUB-ZONE	POPULATION
Montgomery County		
Townships		
Douglass	R-1, R-2	5022
Limerick	C-1...C-4,C-7	5769
Lower Frederick	E-1	2454
Lower Pottsgrove	M-1, M-2	7458
Lower Providence	A-1...A-5	7467
Lower Sulford	H-1	3738
Marlborough	F-1	1251
New Hanover	P-1,P-2	4056
Perkiomen	I-1,I-2	2907
Skippack	K-1...K-4	5226
Upper Frederick	D-1,D-2	1437
Upper Hanover	Q-1	60
Upper Pottsgrove	N-1	2739
Upper Providence	B-1...B-3	9999
Upper Salford	G-1	1632
West Pottsgrove	O-1	1446
Boroughs		
Collegeville	B-5	3405
Green Lane	F-2	690
Pottstown	M-3...M-7; N-2...N-4; O-2...O-4	27720
Reyersford	C-5,C-6	4956
Schwenksville	I-3	876
Trappe	B-4	2202
Montgomery County Total:	102,510	
Chester County		
Townships		
Charlestown	CK-1	348
East Coventry	Z-1...Z-3	4470
East Nuntmeal	CE-1	471
East Pikeland	CG-1...CG-3	4470

TABLE 3 (cont'd)

<u>Chester County Continued</u>

East Vincent	CB-1...CB-3	4335
North Coventry	Y-1...Y-3	7326
Schuylkill	CJ-1, CJ-2	4770
South Coventry	CA-1	1089
Warwick	CF-1	1203
West Pikeland	CH-1	1650
West Vincent	CC-1...CC-3	1914
Upper Uwchlan	CD-1	27
<u>Boroughs</u>		
Phoenixville	CJ-3...CJ-7	13869
Spring City	CB-4	3759

Chester County Total: 49,701

<u>Berks County</u>

<u>Townships</u>		
Amity	T-1...T-3	5277
Colebrookdale	V-1,V-2	3750
Douglass	S-1...S-3	3912
Earl	U-1	1338
Union	X-1,X-2	2286
Washington	W-1	498
<u>Boroughs</u>		
Boyertown	V-3...V-5	2604

Berks County Total: 19,665

TABLE 4

SCHOOLS WITHIN A 10-MILE RADIUS
OF THE LIMERICK SITE

MONTGOMERY COUNTY

PERKIOMEN VALLEY SCHOOL DISTRICT

KEY	SCHOOL	LOCATION	ENROLLMENT
S-1	Kulp Elementary	Perikomen Twp.	944
S-2	Collegeville-Trappe Elementary	Collegeville	463
S-3	Skippuzk Elementary	Skippuck Twp.	369
S-4	Perkiomen Valley Sr. High	Perkiomen Twp.	944
S-5	Perkiomen Valley Middle	Collegeville	444

POTTSTOWN SCHOOL DISTRICT

KEY	SCHOOL	LOCATION	ENROLLMENT
S-6	Edgewood Elementary	Pottstown	273
S-7	Franklin Elementary	Pottstown	229
S-8	Jefferson Elementary	Pottstown	388
S-9	Rupert Elementary	Pottstown	209
S-10	West End Elementary	Pottstown	309
S-11	Pottstown Senior High	Pottstown	1050
S-12	Pottstown Jr. High	Pottstown	571

SPRING-FORD AREA SCHOOL DISTRICT

KEY	SCHOOL	LOCATION	ENROLLMENT
S-13	Consolidated Elementary	Collegeville	147
S-14	Limerick Elementary	Royersford	485
S-15	Mont Clare	Upr.Providence Twp.	185
S-16	Spring City	Limerick Twp.	268
S-17	Oaks	Upr.Providence Twp.	409
S-18	Royersford	Royersford	333
S-19	Spring-Ford Area Sr. High	Royersford	950
S-20	Spring-Ford Area Jr. High	Royersford	855

METHALTON SCHOOL DISTRICT

KEY	SCHOOL	LOCATION	ENROLLMENT
S-21	Audubon Elementary	Lwr.Providence Twp.	420

TABLE 4

(Cont'd)

BOYERTOWN SCHOOL DISTRICT

KEY	SCHOOL	LOCATION	ENROLLMENT
S-22	Conge Elementary	Douglass Twp.	92
S-23	Gilbertsville Elementary	Douglass Twp.	314
S-24	New Hanover Upr. Frederick Elem.	New Hanover Twp.	676
S-25	Junior High East	New Hanover Twp.	816

PRIVATE SCHOOLS

KEY	SCHOOL	ENROLLMENT
S-26	Hill School	194
S-27	St. Allysius School	512
S-28	St. Peter's	103
S-29	St. Pius'	684
S-30	Windcroft	95
S-31	St. Gabriel's	222
S-32	Sacred Heart	277
S-33	Kripaul Ashran	N/A
S-34	St. Eleanor's	256
S-35	St. Mary's	183
S-36	St. Phillip Neri	290
S-37	Franconia Day School	N/A
S-38	New Life Boy's Ranch	55
S-39	Jennview Christian	596
S-40	Lower Providence Kindergarten and Nursery School	N/A

UNIVERSITIES AND COLLEGES

KEY	SCHOOL	LOCATION	ENROLLMENT
S-41	Northeast Bible Institute	Upr. Frederick Twp.	N/A
S-42	Ursinus	Collegeville	N/A

CHESTER COUNTY

PHOENIXVILLE

KEY	SCHOOL	LOCATION	ENROLLMENT
S-43	East Pikeland Elementary	East Pikeland Twp.	370
S-44	Schuylhill Elementary	Schuylhill Twp.	575
S-45	Mason Street Elementary	Phoenixville Twp.	125
S-46	Second Avenue Elementary	Phoenixville Twp.	160
S-47	Barkley Elementary	Phoenixville Twp.	400

TABLE 4

(Cont'd)

PHOENIXVILLE

KEY	SCHOOL	LOCATION	ENROLLMENT
S-48	Phoenixville Senior High	Schuylhill Twp.	725
S-49	Phoenixville Junior High	Schuylkill Twp.	950
S-50	Northern Chester County Vocational-Technical	Schuylkill Twp.	500
S-51	Liberty Forge School (Special Education Center)	Schuylkill Twp.	N/A

OWEN J. ROBERTS SCHOOL DISTRICT

KEY	SCHOOL	LOCATION	ENROLLMENT
S-52	Warwick Elementary School	Warwick, Twp.	212
S-53	French Creek Elementary	East Nantmeal Twp.	313
S-54	East Coventry Elementary	East Coventry Twp.	232
S-55	Vincent Elementary	East Vincent Twp.	397
S-56	West Coventry Elementary	North Coventry Twp.	591
S-57	Owen J. Roberts High	South Coventry Twp.	1236
S-58	Owen J. Roberts Middle	South Coventry Twp.	1067

PRIVATE SCHOOLS

KEY	SCHOOL	LOCATION	ENROLLMENT
S-59	St. Anne School		250
S-60	St. Basil School		160
S-61	Sacred Heart School		125
S-62	Holy Trinity School		100
S-63	St. Mary		150
S-64	Valley Forge Church Academy		120

UNIVERSITIES AND COLLEGES

KEY	SCHOOL	LOCATION	ENROLLMENT
S-65	Valley Forge Christian College		N/A

BERKS COUNTY

DANIEL BOONE SCHOOL DISTRICT

KEY	SCHOOL	LOCATION	ENROLLMENT
S-66	Amity Elementary School	Amity Twp.	600
S-67	Monocacy Elementary	Union Twp.	200

TABLE 4
(Cont'd)

BOYERTOWN SCHOOL DISTRICT

KEY	SCHOOL	LOCATION	ENROLLMENT
S-68	Colebrockdale Elementary	Colebrookdale Twp.	367
S-69	Boyertown Elementary	Boyertown	709
S-70	Pine Forge Elementary	Douglas Twp.	277
S-71	Boyertown Senior High	Boyertown	1645
S-72	Intermediate Unit Special Education School	Boyertown	N/A

PRIVATE SCHOOLS

KEY	SCHOOL	LOCATION	ENROLLMENT
S-73	Pine Forge Elementary School		N/A
S-74	Pine Forge Academy		N/A
S-75	Wayside Chapel		N/A
S-76	Montessori Academy of Pennsylvania		N/A

Note: Only the location of county operated schools are depicted on the maps in Figures 3, 4, 5, and 6.

TABLE 5

HOSPITALS WITHIN A

TEN-MILE RADIUS OF THE LIMERICK SITE

MONTGOMERY COUNTY

KEY	HOSPITAL	LOCATION	CAPACITY
H-1	Pottstown Memorial Medical Center	Pottstown Boro	275
H-2	Eagleville Hospital and Rehabilitation Center	Lower Providence Twp.	126

CHESTER COUNTY

KEY	HOSPITAL	LOCATION	CAPACITY
H-3	Pennhurst State Hospital	East Vincent Twp.	1,000
H-4	Phoenixville Hospital	Phoenixville	139

BERKS COUNTY

KEY	HOSPITAL	LOCATION	CAPACITY

There are no hospitals within a 10-mile radius.

TABLE 6

NURSING HOMES WITHIN A

TEN-MILE RADIUS OF THE LIMERICK SITE

MONTGOMERY COUNTY

KEY	NURSING HOME	LOCATION	CAPACITY
N-1	Leader Nursing and Rehabilitation Center	Pottstown Boro.	159
N-2	Manatawny Manor and Residential Care	Pottstown Boro.	99
N-3	Frederick Mennonite Home	Upper Frederick Twp.	143
N-4	Montgomery County Geriatric and Rehabilitation Center	Upper Providence Twp.	600

CHESTER COUNTY

KEY	NURSING HOME	LOCATION	CAPACITY
N-5	Coventry Manor	South Coventry Twp.	41
N-6	Mary Hill Rest Haven	Schuylkill Twp.	17
N-7	Phoenixville Manor	Phoenixville	135
N-8	Manatawny Manor	East Coventry Twp.	100

BERKS COUNTY

KEY	NURSING HOME	LOCATION	CAPACITY
N-9	Douglassville Home	Union Twp.	40
N-10	River Road Home	Union Twp.	25

TABLE 7

POPULATION GATHERING POINTS (NOT OTHERWISE CLASSIFIED) WITHIN A TEN-MILE RADIUS OF THE LIMERICK SITE

MONTGOMERY COUNTY

KEY	NAME	LOCATION
Parks and Camp Grounds		
0-1	Lakeview Amusement Park	Limerick Twp.
0-2	Evansburg State Park	Skippack Twp. and Lower Providence Twp.
0-3	Lower Perkiomen Valley County Park	Upper Providence Twp.
0-4	Sunrise Mill County Park (Under Development)	Limerick Twp.
0-5	Upper Perkiomen Valley County Park	Upper Frederick Twp.
0-6	Upper Schuylkill Valley County Park	Upper Providence Twp.
Governmental Facilities		
0-7	Eastern State Game Farm	Limerick Twp.
0-8	Montgomery County Geriatic and Rehabilitation Center	Upper Providence Twp.
0-9	Montgomery County Prison Farm	Lower Providence Twp.
0-10	Pennsylvania State Correctional Institution	Skippack Twp.

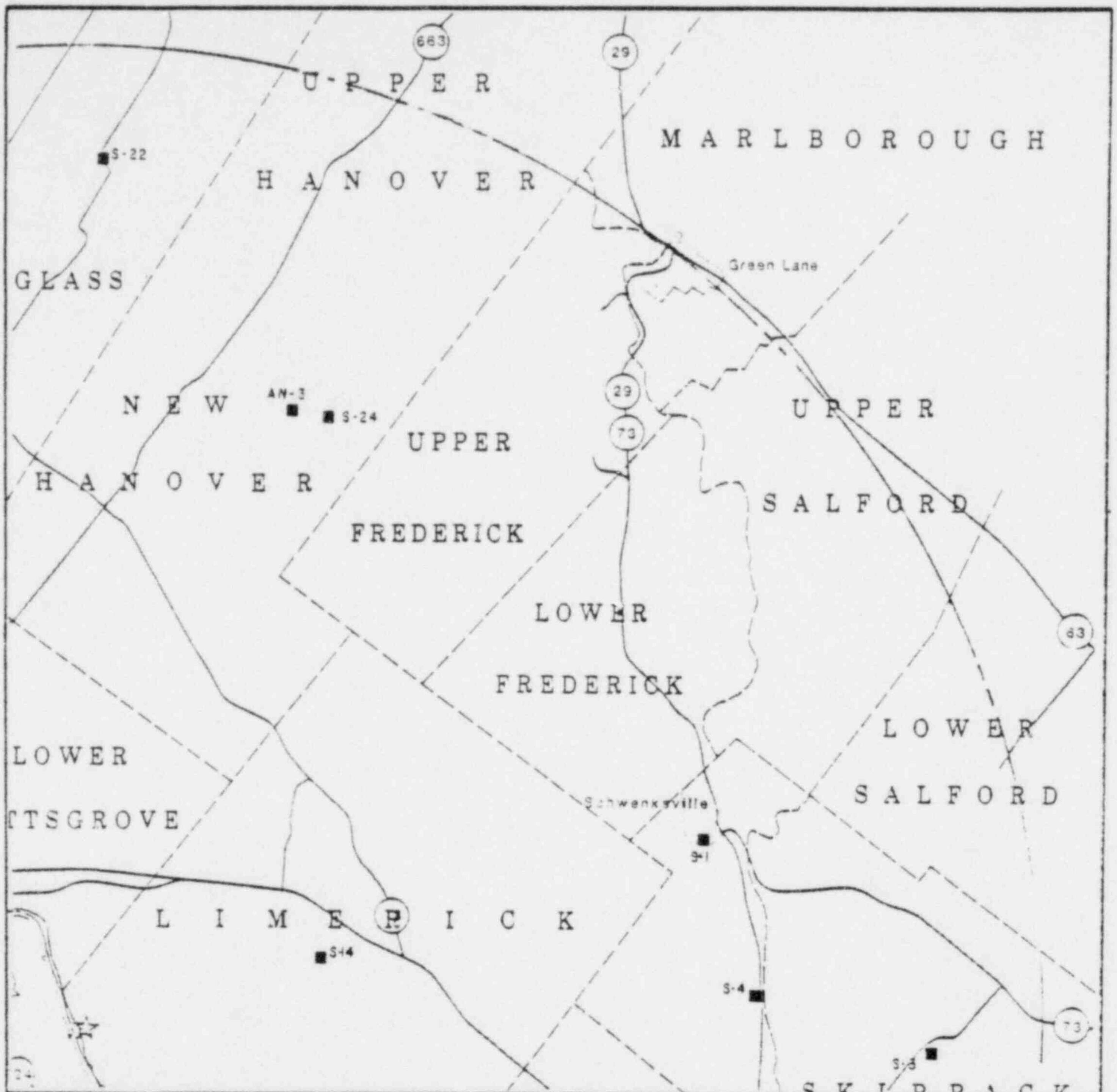
BERKS COUNTY

KEY	NAME	LOCATION
Parks and Camp Grounds		
0-11	Schlegel's Grove	Colebrookdale Twp.
0-12	Pottstown Community Center	Earl Twp.

TABLE 7
(Cont'd)

KEY	NAME	LOCATION
0-13	French Creek State Park	Union Twp.
0-14	Church of God Camp Ground	Colebrookdale Twp.
0-15	Ironstone Campsite	Douglass Twp.
0-16	YMCA Camp	Douglass Twp.
0-17	Camp Shilo (Special Children)	Douglass Twp.

NOTE: Facilities listed in the table are not depicted on Figures 3, 4, 5, and 6.



LEGEND:

S - SCHOOLS
NS - NURSERY SCHOOLS
H - HOSPITALS
AN - ADULT NURSING HOMES
J - JAILS

QUADRANT INDEX

0 1 2 3
MILES

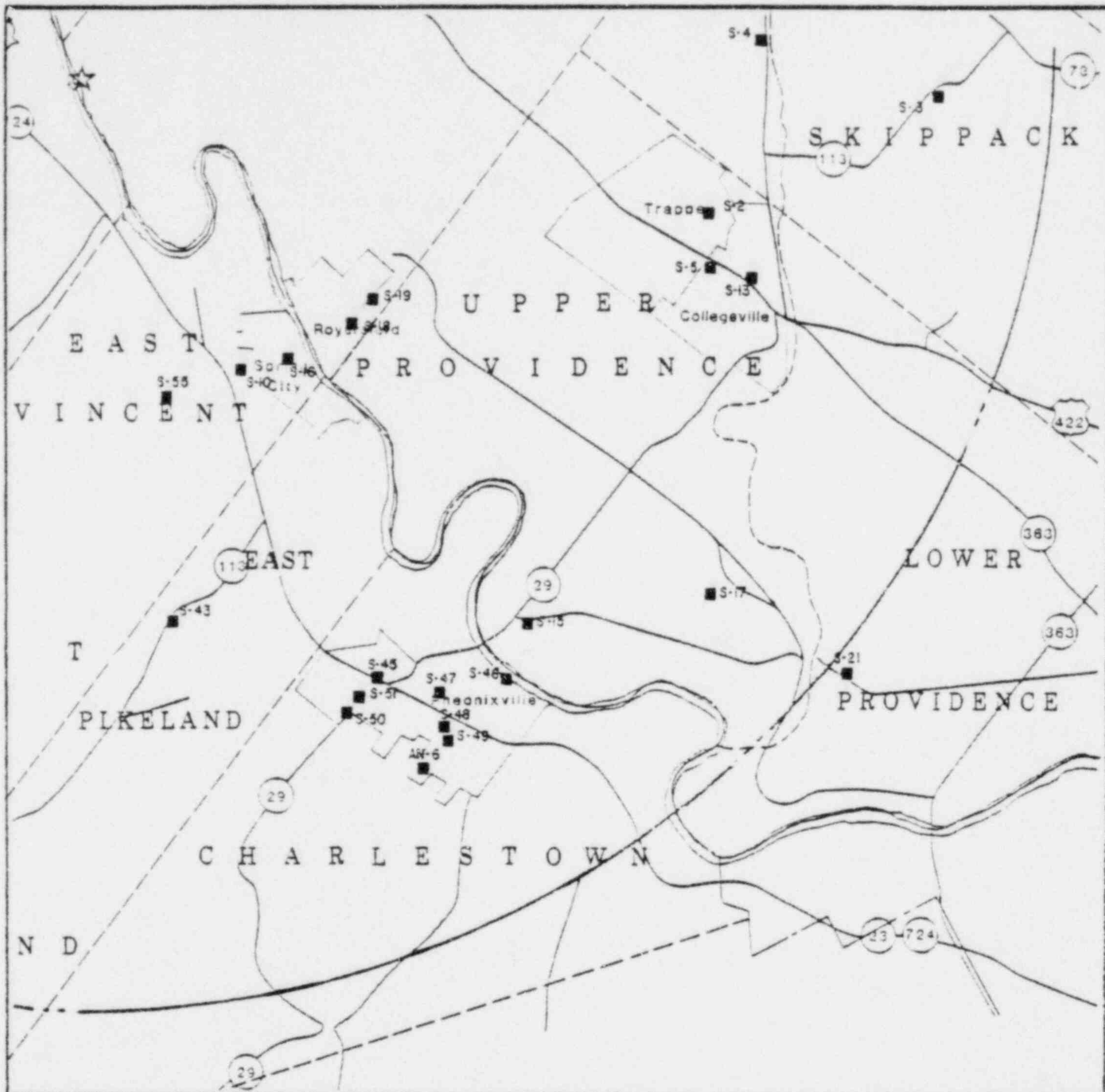
SPECIAL PROBLEM AREAS

LIMERICK

Evacuation Time Assessment Study

Wilbur Smith and Associates

FIGURE 3



LEGEND:

S - SCHOOLS
NS - NURSERY SCHOOLS
H - HOSPITALS
AN - ADULT NURSING HOMES
J - JAILS

QUADRANT INDEX

0 1 2 3
MILES

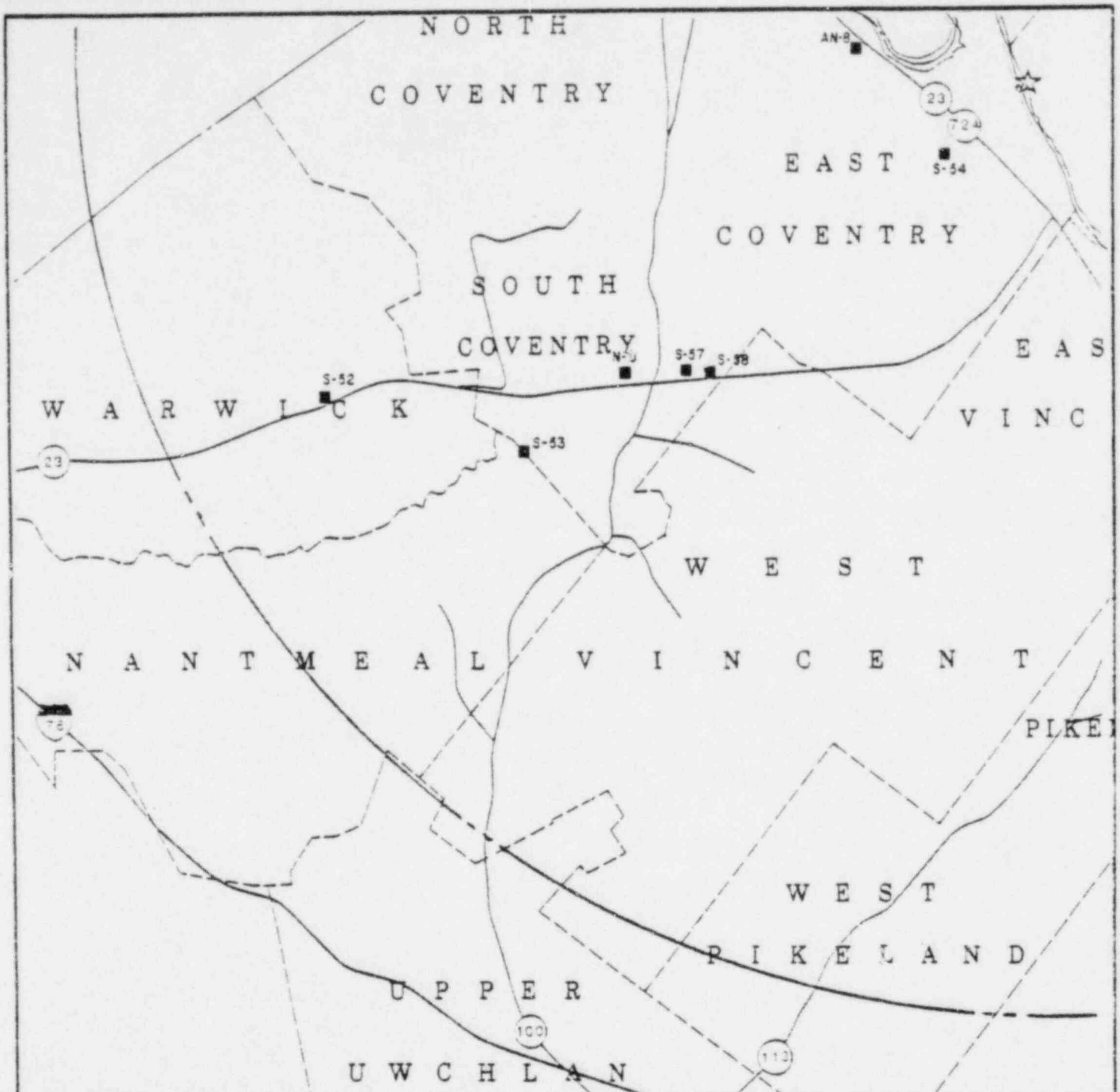
SPECIAL PROBLEM AREAS

LIMERICK

Evacuation Time Assessment Study

Wilbur Smith and Associates

FIGURE 4



LEGEND:

- S - SCHOOLS
- NS - NURSERY SCHOOLS
- H - HOSPITALS
- AN - ADULT NURSING HOMES
- J - JAILS

QUADRANT INDEX

0 1 2 3
MILES

SPECIAL PROBLEM AREAS

LIMERICK

Evacuation Time Assessment Study

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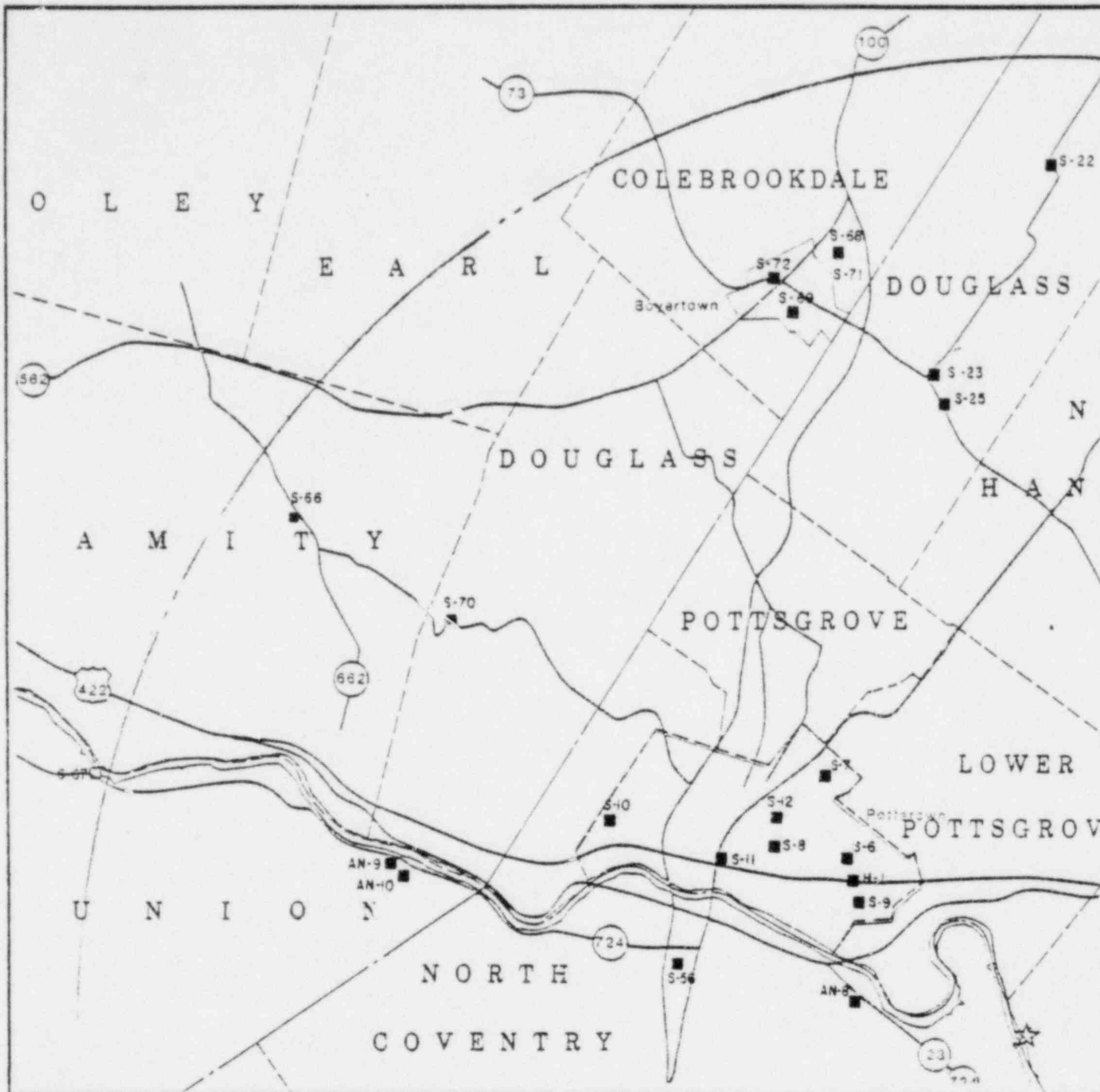
FIGURE 5



LEGEND:

S - SCHOOLS
NS - NURSERY SCHOOLS
H - HOSPITALS
AN - ADULT NURSING HOMES
J - JAILS

QUADRANT INDEX

0 1 2 3
MILES

SPECIAL PROBLEM AREAS

LIMERICK

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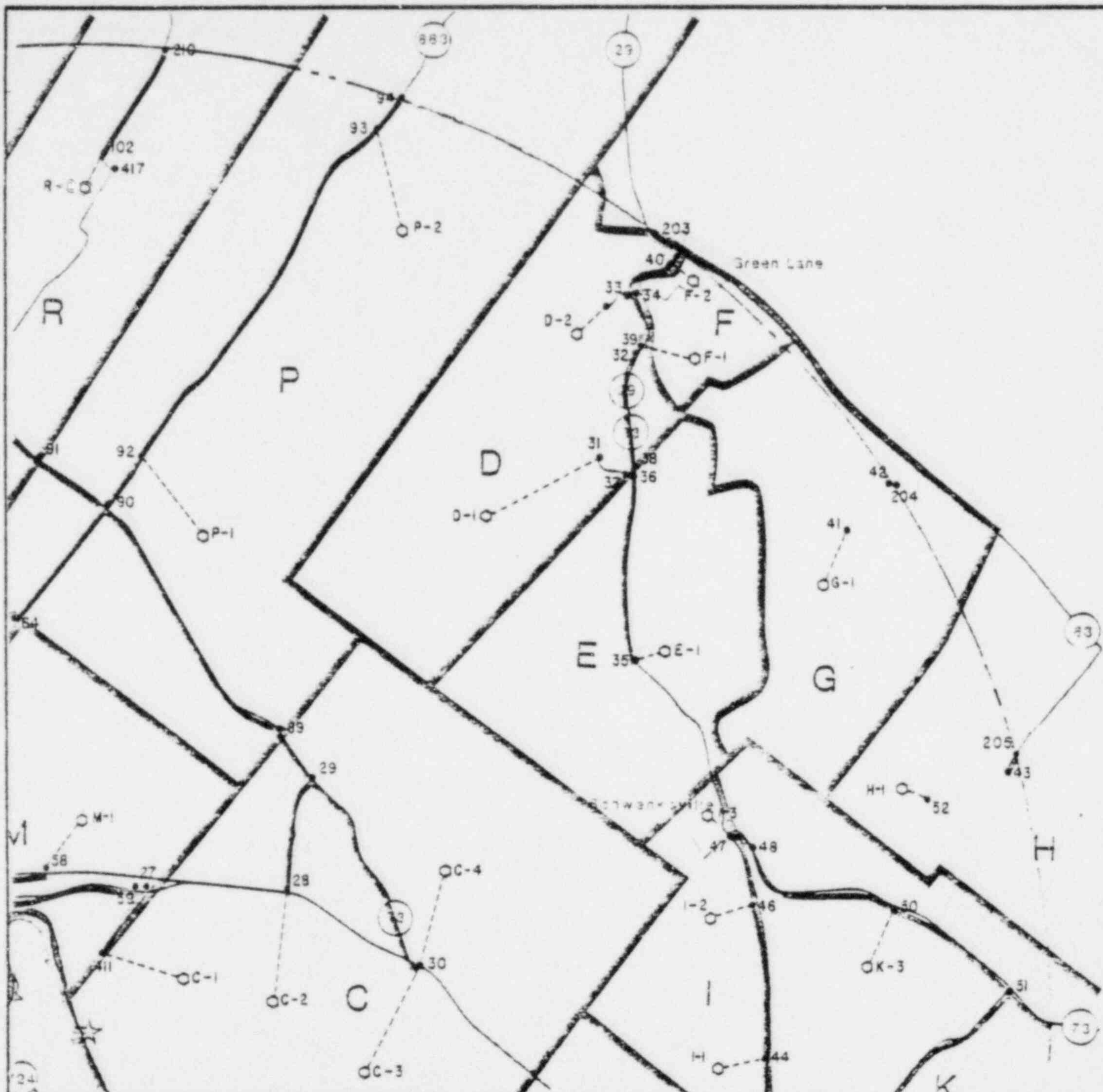
FIGURE 6



LEGEND:

○ A-1 CENTROID AND NUMBER

• 142 NODE AND NUMBER

▬ EVACUATION ROUTE

QUADRANT INDEX

0 1 2 3 MILES

EVAC'JATION NETWORK

LIMERICK

Evacuation Time Assessment Study

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FIGURE 7

CONCEPT OF EVACUATION

The concept of evacuation in this assessment of the Limerick evacuation times assumes that everyone in the 10-mile radius will be evacuated outside of that 10-mile radius. There is no assessment of the time to evacuate within the two- or the five-mile radius. It is assumed that all people that live within the 10-mile radius will be evacuated along a specified route known to them. The evacuation time will include the time from notification until the last vehicle crosses the 10-mile radius.

Notification of Evacuation

There are two distinct events which are necessary to initiate the evacuation. One event is the direct notification of public agencies, schools, major employees and other locations of large population concentrations. The second event is the dissemination of the evacuation warning to the general population. Btoh of these events must include instructions regarding the sectors to be evacuated. The first event is assumed to be accomplished by telephone from the Emergency Operating Center to the affected group. Ideally the second event would be implemented by a public warning system, which would combine an acoustical warning system by sirens or horns, supplemented by instructions over selected radio and T.V. Broadcast stations. In the particular site, no advanced system of this type is in place. Therefore, the predominant mode of this notification is by use of vehicles and helicopters with mounted loudspeakers. A specified message from these vehicles would indicate that an evacuation has been recommended and to turn on their radios for additional information. Radio stations must be provided with complete, accurate and current information. They should have prior zone descriptions and repeat recommended routing information. They should have phone numbers people can call should these people require special evacuation assistance or additional information.

Public Response Time

There can be up to four activities preceding the evacuation from the home which can be statistically distributed in time: (1) Receive warning; (2) Leave work; (3) Travel home; and, (4) Evacuate home. Each of the response times may have different distributions, depending upon the particular scenario being assessed.

Receipt of Notification - Receipt of notification is assumed to approach a normal distribution in time; therefore, the accumulated probability approaches an "S" curve. This distribution can be approximated by three straight lines. One line, passing through the 50 percent, 16 percent and 84 percent distributions, represents two time increments. One straight line from zero to 16 percent represents one time increment. The third straight line from 84 to 100 percent represents one time increment. It is assumed that the time increments are five minutes, so the total time for receipt of notification is 20 minutes.

This distribution means that 16 percent will have been notified within the first five minutes, 50 percent will have been notified in ten minutes, 84 percent will have been notified in 15 minutes, and 100 percent will have been notified in 20 minutes. (See Volume I for more detail.)

Departure From Place of Work - Departure from the place of work is assumed to approach a normal distribution curve in the same manner as receipt of notification. Distribution is approximated by three straight lines and four five-minute time increments. The distribution assumes that 16 percent will depart from their place of work in five minutes, 50 percent will depart in ten minutes, 84 percent will depart in 15 minutes, and 100 percent will depart in 20 minutes (see Volume I for more detail.)

Travel From Work to Home - The time of travel to the home approaches normal distribution of time in the same manner as the two previous responses. Under normal conditions this distribution assumes that 16 percent will travel to home in five minutes, 50 percent in 10 minutes, 84 percent in 15 minutes, and 100 percent will travel to home in 20 minutes. This distribution is expanded in certain scenarios, specifically that of the adverse weather scenario (see Volume I for more detail).

Departure From Home - Departure from home also approaches a normal distribution in time and the accumulated probability approaches and "S" curve. The distribution is approximated by three straight lines in the same manner as the above three responses. The activity is distributed over eight five-minute periods for a total of 40 minutes. The distribution indicates that eight percent will depart from home in the first five minutes, 16 percent in ten minutes, 33 percent in 15 minutes, 50 percent in 20 minutes, 67 percent in 25 minutes, 84 percent in 30 minutes, 92 percent in 35 minutes, and 100 percent will have departed home within 40 minutes (see Volume I for further details.)

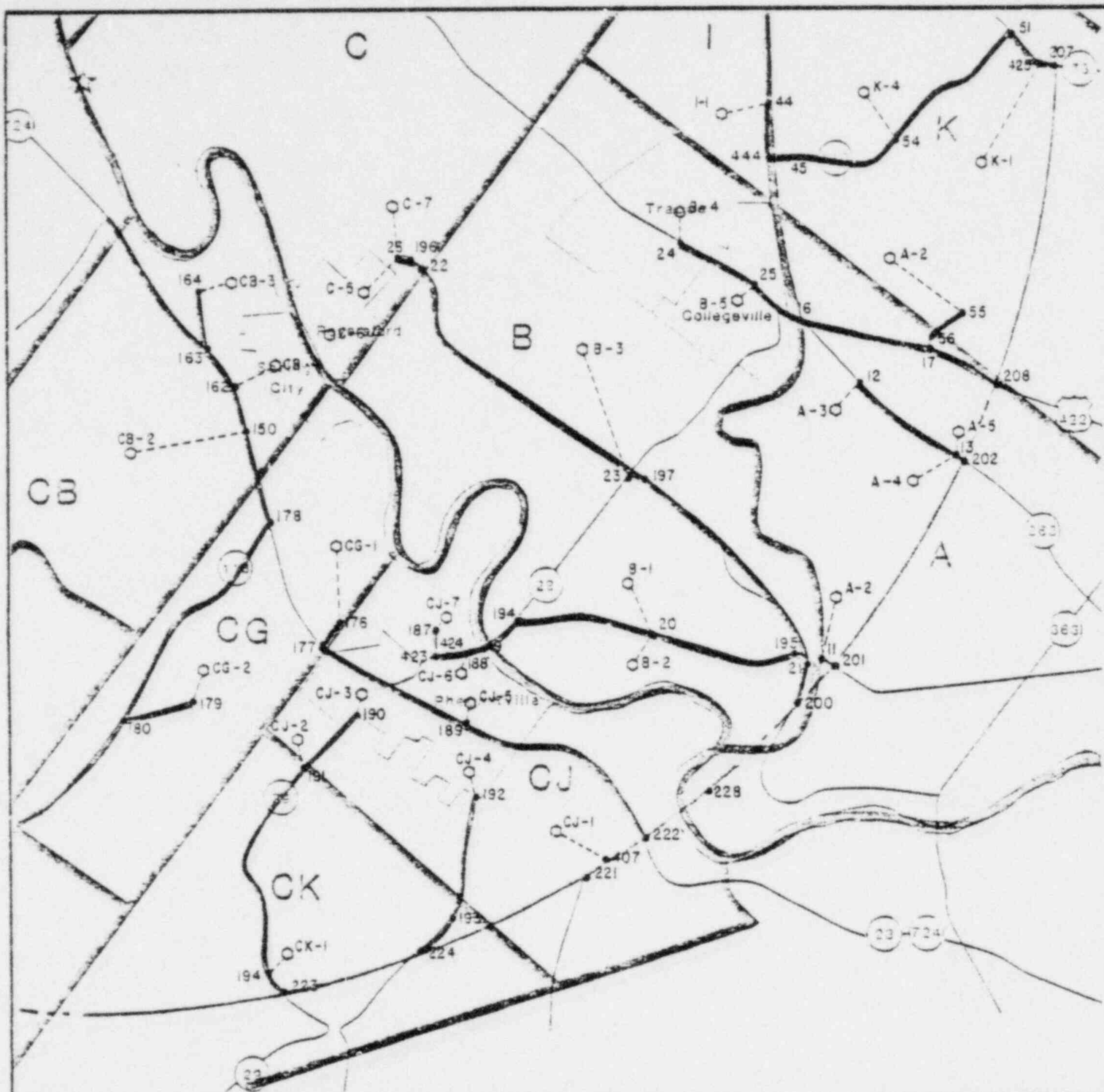
Evacuation Link/Node Network

The evacuation routes for each centroid has been manually established and coded for computer evaluation. Figures 7, 8, 9, and 10 indicate the coded network and the evacuation route for each centroid.

Table 8 contains the network descriptions. The table contains two node numbers for each end of a given link, the distance between nodes in miles, the assumed speed for that link, its total capacity in vehicles per hour in the direction of evacuation, and the identiry of the roadway. For example, the first link in Table 8 is from Node 11 to Node 201. The distance is 0.10 miles, the assigned speed is 35 miles per hour, the capacity is 1,500 vph, and the roadway segment is on Egypt Road. The values assigned to each link represent the best judgement of these factors considering roadway geometry, width, terrain and other factors.

Many of the evacuation zones are rather large and may have several centroids. These centroids associated with population centers and are located to provide for a logical evacuation of the zone.

The capacities established for each link are not the capacities that could be expected under normal circumstances. The evacuation of a ten-mile area has all the vehicles headed in the same direction, with the possible exception of emergency vehicles coming into the area. Because of the directional flow and controlled routings, lane capacities are generally larger than could be expected under normal circumstances. Another important factor that contributes to smoother flow and greater capacities is that all drivers of vehicles on any roadway segment are of one accord and are headed for the same location. Generally, they are probably the most seasoned, experienced of the drivers in a household. All drivers know that they must evacuate the area and cross the ten-mile zone.



LEGEND:

○ A-1 CENTROID AND NUMBER

• 142 NODE AND NUMBER

EVACUATION ROUTE

QUADRANT INDEX

0 1 2 3
MILES

EVACUATION NETWORK

LIMERICK

Evacuation Time Assessment Study

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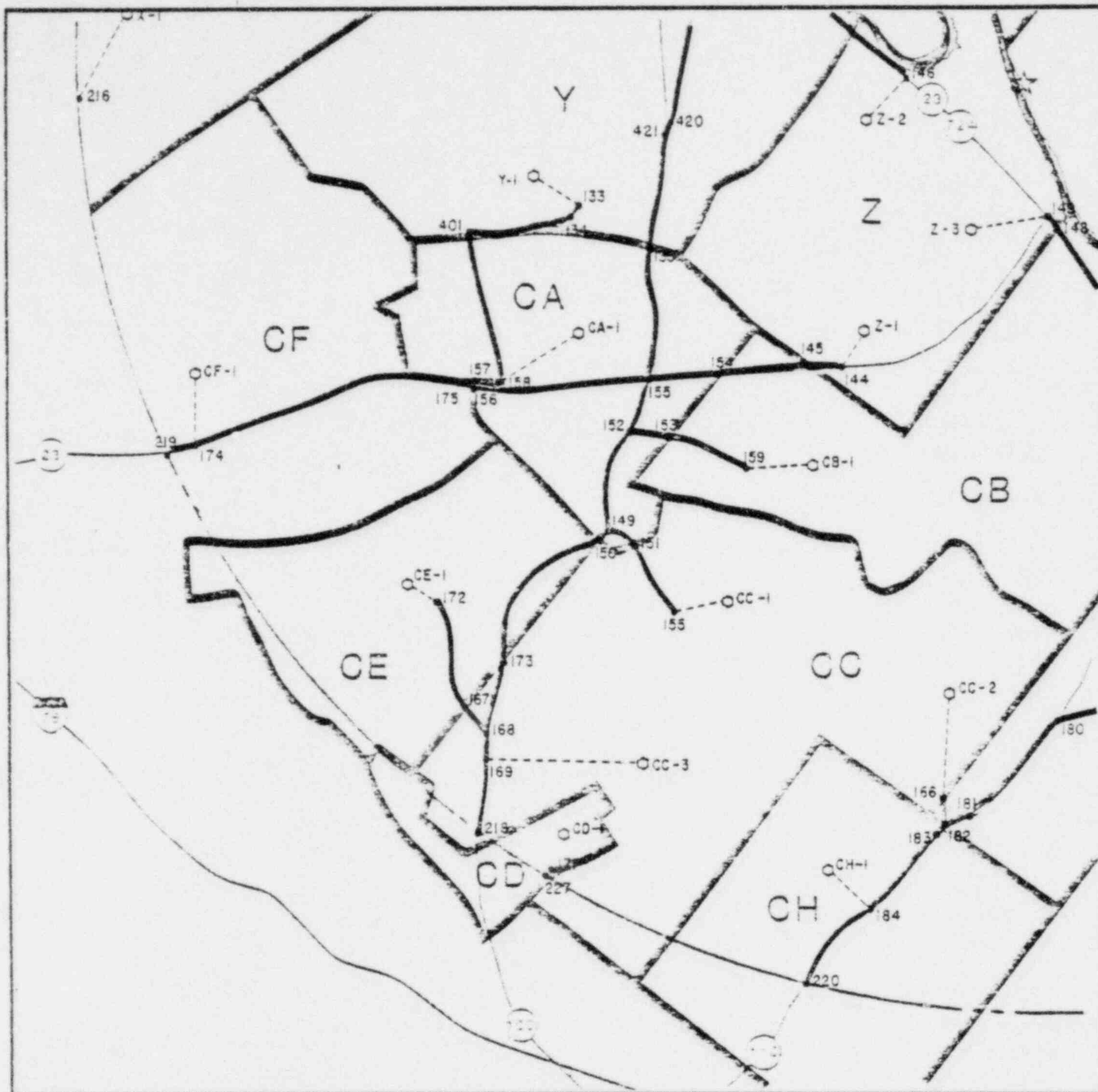
FIGURE 8



LEGEND:

○ A-1 CENTROID AND NUMBER

• 142 NODE AND NUMBER

EVACUATION ROUTE

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0 1 2 3
MILES

EVACUATION NETWORK

LIMERICK

Evacuation Time Assessment Study

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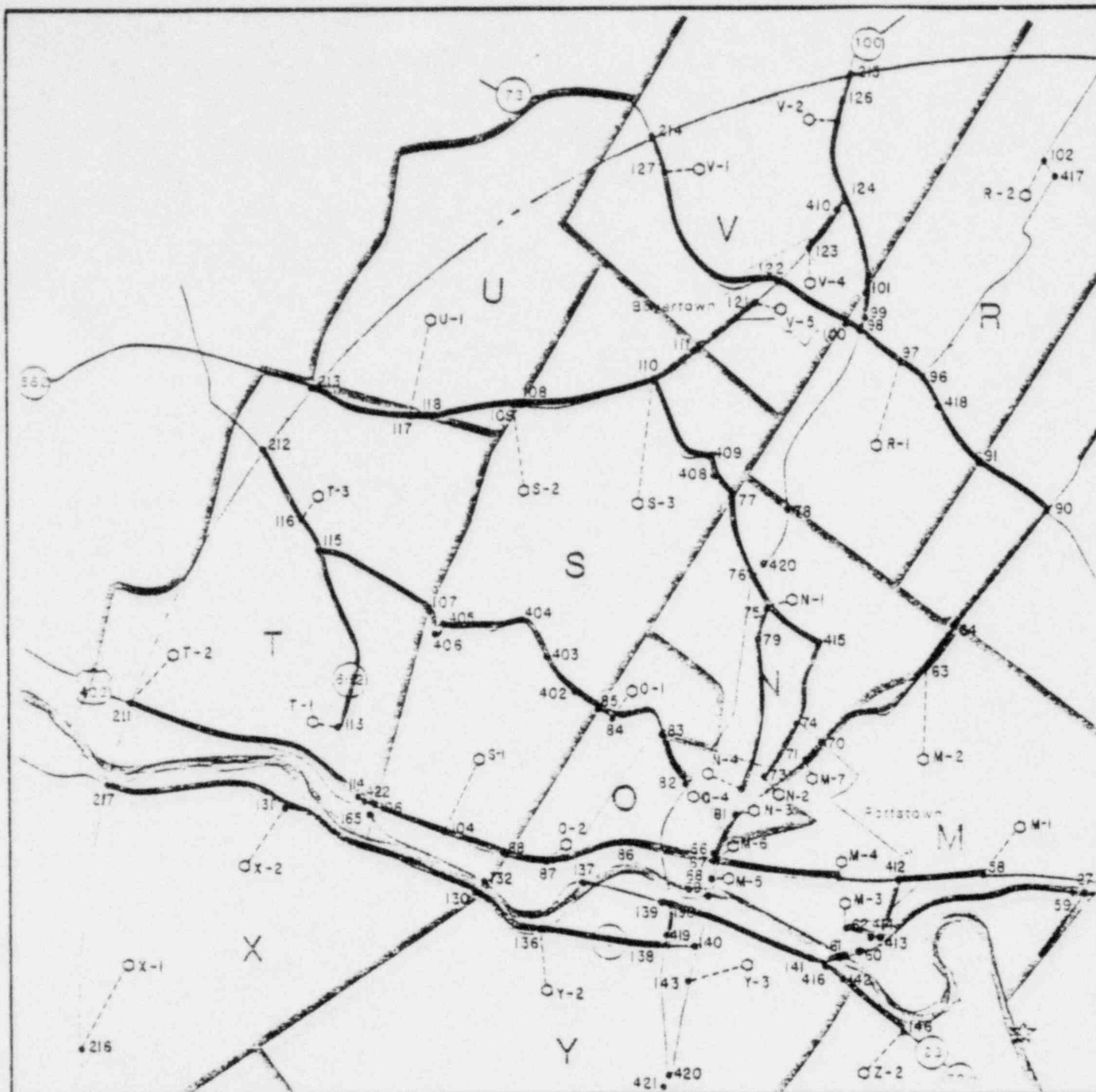
FIGURE 9



LEGEND:

○ A-1 CENTROID AND NUMBER

• 142 NODE AND NUMBER

━━ EVACUATION ROUTE

QUADRANT INDEX

0 1 2 3

MILES

EVACUATION NETWORK

LIMERICK

Evacuation Time Assessment Study

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FIGURE 10

TABLE 8

NETWORK DESCRIPTION

ANODE	NODE	DIST	SPEED	CAP	NODE	DIST	SPEED	CAP	ROADWAY IDENTITY
11	201	0.10	35.0	1500					Egypt Road
12	202	1.40	[illegible]	3000					Ridge Pike Road
13	[illegible]	0.10	35.0	3000					Ridge Pike Road
14	[illegible]	0.50	35.0	1500					Twp. R. [illegible]68
15	[illegible]	0.10	35.0	1500					SR 345
16	[illegible]	1.40	35.0	1500					US 422
[illegible]	208	0.30	35.0	1500					US 422
19	194	0.4[illegible]	35.0	1500					SR 29
20	195	1.60	35.0	1500					Egypt Road
21	200	0.40	50.0	4000					Schuylkill Expressway
22	197	2.30	50.0	4000					Schuylkill Expressway
23	197	0.20	20.0	1500					Ramp to Schuylkill Exp.
24	25	0.90	35.0	1500					US 422
25	26	0.40	35.0	1500					US 422
26	198	0.20	20.0	1500					Ramp to Schuylkill Exp.
27	[illegible]	0.10	20.0	1500					Ramp to US 422 Bypass
28	29	1.20	30.0	1000					Fruitville Rd.
29	34	0.70	35.0	1500					Swamp Pike
30	[illegible]	2.30	35.0	1500					Swamp Pike
31	[illegible]	0.20	25.0	1000					Salford Rd.
32	39	0.10	35.0	1500					Gravel Pike
33	[illegible]	0.10	[illegible]	1000					Snyder Rd.
34	[illegible]	0.50	35.0	1500					Gravel Pike
35	[illegible]	1.90	35.0	1500					Gravel Pike
36	38	0.10	35.0	1500					Gravel Pike
37	[illegible]	[illegible]	[illegible]	1000					Salford Rd.
38	[illegible]	1.10	35.0	1500					Gravel Pike
39	[illegible]	0.70	35.0	1500					Gravel Pike
40	20[illegible]	0.80	35.0	1500					Gravel Pike
41	4[illegible]	0.70	35.0	1500					Patato Rd.
42	204	0.10	35.0	1500					Perkiomendile Rd.
43	[illegible]	0.30	35.0	1500					SR 113
44	400	0.60	35.0	1500					SR 29
45	54	1.20	35.0	1500					SR 113
46	44	1.60	35.0	1500					SR 29
47	46	0.30	35.0	1500					SR 73 (Skippack Pike)
48	50	1.80	35.0	1500					SR 73 (Skippack Pike)
50	51	1.50	35.0	1500					SR 73 (Skippack Pike)
51	207	0.60	35.0	1500					SR 73 (Skippack Pike)
52	43	0.90	35.0	1500					Bergeys Mill Rd.
54	51	1.80	35.0	1500					SR 113
55	56	0.50	30.0	1000					Skippack Creek Rd. (Twp. R. 399)
56	17	0.20	30.0	1000					Skippack Creek Rd. (Twp. R. 399)
58	412	0.90	35.0	3000					Ridge Pike Road
59	60	2.40	50.0	4000					US 422 Bypass
60	61	0.20	50.0	4000					US 422 Bypass
61	141	0.40	50.0	4000					US 422 Bypass
62	414	0.30	25.0	1500					Yost Rd.
63	64	0.60	35.0	1500					SR 663
64	90	1.50	35.0	1500					SR 663

TABLE 8 (Continued)

NODE	NODE	DIST	SPEED	CAP	NODE	DIST	SPEED	CAP	ROADWAY IDENTITY
65	67	1.30	35.0	3000					US 422 (High St.) LR 146
66	67	0.10	25.0	1500					Hanover St. (LR 284)
67	68	0.10	25.0	1500	86	1.00	35.0	3000	Hanover St. (SR 663)/US 422 (High St).
68	69	0.10	25.0	1500					Hanover St. (SR 663)
69	140	0.60	35.0	1500					SR 663
70	43	1.50	35.0	1500					SR 663
71	70	0.30	35.0	1500					SR 663
73	74	0.70	25.0	1500					N. Hanover St.
74	415	0.90	35.0	1500					N. Hanover St.
75	76	0.30	35.0	1500					Manger's Mill Rd.
76	77	0.90	35.0	1500	420	0.20	20.0	1500	Manger's Mill Rd./Ramp to SR 100
77	418	0.50	35.0	1500					LR 284
78	49	1.70	35.0	1500					SR 100
79	75	0.30	35.0	1500					Farmington Ave.
80	79	1.60	35.0	1500					Farmington Ave.
81	66	0.50	25.0	1500					Hanover St. (LR 284)
82	63	0.50	35.0	1500					LR 46001
83	84	0.70	35.0	1500					LR 46001
84	85	0.30	35.0	1500					LR 46001
85	402	0.30	35.0	1500					LR 06103
86	87	1.80	35.0	3000					US 422 (High St.)
87	88	0.50	35.0	3000					US 422 (High St.)
88	104	0.60	50.0	4000					US 422 Benjamin Franklin Hwy.
89	90	3.10	35.0	1500					Swamp Pike
90	91	0.90	35.0	1500	92	0.60	35.0	1500	Swamp Pike/SR 663
91	413	0.70	35.0	1500					Swamp Pike
92	43	4.20	35.0	1500					SR 663
93	44	0.40	35.0	1500					SR 663
94	109	0.10	35.0	1500					SR 663
95	105	0.10	35.0	1500					Ward Rd.
96	97	0.30	35.0	1500	417	2.70	35.0	1500	SR 73 /(Congo Rd.
97	98	0.50	35.0	1500					SR 73
98	99	0.20	20.0	1500	100	0.30	35.0	1500	Ramp to SR 100/SR 73
99	101	0.40	35.0	1500					SR 100
100	102	0.90	35.0	1500					SR 73
101	124	1.00	35.0	1500					SR 100
102	216	1.40	35.0	1500					Congo Niantic Rd.
104	106	0.30	50.0	4000					US 422/Benjamin Franklin
105	114	0.10	50.0	4000					US 422 Bypass
106	422	0.10	50.0	4000					US 422/Benjamin Franklin
107	115	1.30	35.0	1500					LR 06102
108	109	0.10	35.0	1500					SR 562
109	118	1.00	35.0	1500					SR 562
110	108	1.50	35.0	1500					SR 562
111	110	0.60	35.0	1500					SR 652
112	111	0.90	50.0	4000					US 422
113	115	2.00	35.0	1500					SR 662
114	112	2.70	50.0	4000					US 422
115	116	0.40	35.0	1500					SR 662
116	112	0.30	35.0	1500					SR 662

TABLE 8 (Continued)

ANODE	NODE	DIST	SPEED	CAP	NODE (2)	DIST (2)	SPEED (2)	CAP (2)	ROADWAY IDENTITY
112	213	1.10	35.0	1500					SR 562
113	117	0.10	35.0	1500					SR 562
121	111	0.80	35.0	1500					SR 652
122	127	1.90	35.0	1500					SR 73
123	410	0.50	35.0	1500					LR 284
124	125	0.80	35.0	1500					SR 100
125	126	0.20	35.0	1500					SR 100
126	215	1.30	35.0	1500					SR 100
127	214	0.40	35.0	1500					SR 73
129	223	0.10	15.0	1500					Pawling Rd.
130	131	1.20	35.0	1500					SR 724
131	217	2.00	35.0	1500					SR 724
132	105	1.40	50.0	4000					US 422 Bypass
133	134	0.20	35.0	1500					LR 15131
134	401	1.20	35.0	1500					LR 15131
135	153	1.40	35.0	1500					SR 100
136	130	0.80	35.0	1500					SR 724
137	132	1.40	50.0	4000					US 422 Bypass
138	136	1.20	35.0	1500					SR 724
139	137	0.80	50.0	4000	198	0.20	20.0	1500	US 422 Bypass/Ramp to SR 100
140	138	0.30	35.0	1500	143	0.40	35.0	1500	SR 724/SR 663
141	139	1.60	50.0	4000					US 422 Bypass
142	416	0.20	35.0	1500					SR 724
143	420	1.00	35.0	1500					SR 663
144	145	0.40	35.0	1500					SR 23
145	154	0.90	35.0	1500					SR 23
146	142	0.80	35.0	1500					SR 724
147	148	0.20	35.0	1500					SR 724
148	163	1.50	35.0	1500					SR 724
149	150	0.20	35.0	1500					SR 100
150	173	1.30	35.0	1500					SR 100
151	149	1.40	35.0	1500					Twp. R. 512
152	149	1.20	35.0	1500					SR 100
153	152	0.40	35.0	1500					Pughtown Rd.
154	155	0.70	35.0	1500					SR 23
155	152	0.60	35.0	1500	156	1.80	35.0	1500	SR 100/SR 23
156	175	0.20	35.0	1500					SR 100/SR 23
157	175	0.20	35.0	1500					Countryville Rd. off Hwy. 23
158	157	0.30	35.0	1500					Countryville Rd. off Hwy. 23
159	153	0.90	35.0	1500					Pughtown Rd.
160	161	0.50	35.0	1500					SR 724
161	178	0.30	35.0	1500					SR 724
162	160	0.50	35.0	1500					SR 724
163	162	0.50	35.0	1500					SR 724
164	163	1.60	35.0	1500					Pennhurst Rd.
165	151	1.60	35.0	1500					Twp. R. 513
166	182	0.30	35.0	1500					Twp. R. 561
167	168	0.30	30.0	1000					Twp. R. 514
168	169	0.30	35.0	1500					SR 100
169	218	0.70	35.0	1500					SR 100

Table 8 (Continued)

ANODE	NODE	DIST	SPEED	CAP	NODE	DIST	SPEED	CAP	ROADWAY IDENTITY
171	227	0.10	35.0	1500					Twp. R. 464
172	167	1.20	30.0	1000					Twp. R. 514
173	168	0.80	35.0	1500					SR 100
174	219	0.30	35.0	1500					SR 23
175	174	2.80	35.0	1500					SR 23
176	177	0.30	35.0	1500					Township Ling Rd.
177	189	1.70	35.0	1500					SR 23
178	177	1.50	35.0	1500	180	2.60	35.0	1500	SR 724/Hareshill Rd.
179	180	0.70	35.0	1500					SR 113
180	181	1.40	35.0	1500					SR 113
181	182	0.30	35.0	1500					SR 113
182	183	0.20	35.0	1500					SR 113
183	184	1.10	35.0	1500					SR 113
184	120	1.00	35.0	1500					SR 113
187	423	0.30	25.0	1500					SR 113
188	19	0.20	35.0	1500					ϚR 19
189	222	1.80	35.0	1500					SR 23
190	191	0.30	35.0	1500					SR 29
191	194	2.50	35.0	1500					SR 29
192	193	1.30	35.0	1500					Whitehorse Rd.
193	224	0.50	35.0	1500					Whitehorse Rd.
194	20	1.40	35.0	1500	223	0.20	35.0	1500	Egypt Rd./SR 29
195	21	0.20	20.0	1500					Ramp to Schuylkill Exp.
196	22	0.20	50.0	4000					Schuylkill Exp.
197	21	2.60	50.0	4000					Schuylkill Exp.
198	419	0.30	35.0	3000					SR 100
400	45	0.20	35.0	1500					SR 113
401	158	1.70	35.0	1500					Twp. R. 470
402	403	0.50	35.0	1500					LR 06154
403	404	0.50	35.0	1500					LR 06101
404	405	0.90	35.0	1500					LR 06102
405	406	0.20	35.0	1500					SR 06155
406	107	0.30	35.0	1500					LR 06102
407	221	0.20	35.0	1500					Countryclub Rd.
408	409	0.20	35.0	1500					LR 06103
409	110	1.10	35.0	1500					LR 06104
410	124	0.30	35.0	1500					LR 06026
411	27	0.90	35.0	1500					LR 46191
412	413	0.70	25.0	1500					Firestone Rd.
413	414	0.10	25.0	1500					Yost Rd.
414	60	0.20	20.0	1500					Ramp to US 422 Bypass
415	33	0.30	30.0	1000	75	0.70	35.0	1500	Snyder Rd./Mangerly Mill Rd. Ramp
416	141	0.20	20.0	1500					Ramp
417	132	0.20	35.0	1500					Hoffmansville Rd.
418	96	0.30	35.0	1500					SR 73
419	138	0.20	20.0	1500					Ramp to SR 724
420	78	0.80	35.0	1500	421	0.10	20.0	1500	SR 100/Ramp to SR 100
421	135	1.20	35.0	1500					SR 100
422	114	0.10	30.0	2000					Ramp
423	424	0.10	25.0	1500					Bridge St.

TABLE 8 (Continued)

ANODE	NODE	DIST	SPEED	CAP	NODE	DIST	SPEED	CAP	ROADWAY IDENTITY
424	193	0.20	25.0	1500					SR 29
425	207	0.00	35.0	1500					SR 73 (Skippack Pike)
501	129	0.20	15.0	1500					Centroid Connector
502	11	0.70	15.0	1500					Centroid Connector
503	12	0.40	15.0	1500					Centroid Connector
504	13	0.60	15.0	1500					Centroid Connector
505	13	[illegible]	15.0	1500					Centroid Connector
507	[illegible]	.60	15.0	1500					Centroid Connector
508	20	0.40	15.0	1500					Centroid Connector
509	23	1.40	15.0	1500					Centroid Connector
510	24	0.40	15.0	1500					Centroid Connector
511	25	0.30	15.0	1500					Centroid Connector
512	411	0.70	15.0	1500					Centroid Connector
513	28	1.20	15.0	1000					Centroid Connector
514	30	1.30	15.0	1500					Centroid Connector
515	30	1.00	15.0	1500					Centroid Connector
516	26	0.20	15.0	1500					Centroid Connector
517	26	1.20	15.0	1500					Centroid Connector
518	26	0.50	15.0	1500					Centroid Connector
519	31	1.30	15.0	1000					Centroid Connector
520	415	0.40	15.0	1000					Centroid Connector
521	35	0.30	15.0	1500					Centroid Connector
522	39	0.50	15.0	1500					Centroid Connector
523	40	0.20	15.0	1500					Centroid Connector
524	41	0.60	15.0	1500					Centroid Connector
525	52	0.30	15.0	1500					Centroid Connector
526	44	0.50	15.0	1500					Centroid Connector
527	46	0.50	15.0	1500					Centroid Connector
528	47	0.30	15.0	1500					Centroid Connector
530	52	1.20	15.0	1500					Centroid Connector
531	55	0.90	15.0	1000					Centroid Connector
532	50	0.60	15.0	1500					Centroid Connector
533	54	0.50	15.0	1500					Centroid Connector
535	58	0.70	15.0	1500					Centroid Connector
536	63	0.90	15.0	1500					Centroid Connector
537	62	0.30	15.0	1500					Centroid Connector
538	65	0.10	15.0	1500					Centroid Connector
539	68	0.20	15.0	1500					Centroid Connector
540	66	0.20	15.0	1500					Centroid Connector
541	71	0.20	15.0	1500					Centroid Connector
542	75	0.30	15.0	1500					Centroid Connector
543	73	0.10	15.0	1500					Centroid Connector
544	81	0.20	15.0	1500					Centroid Connector
545	80	0.40	15.0	1500					Centroid Connector
546	84	0.30	15.0	1500					Centroid Connector
547	87	0.30	15.0	1500					Centroid Connector
548	86	0.20	15.0	1500					Centroid Connector
549	82	0.20	15.0	1500					Centroid Connector
550	92	1.00	15.0	1500					Centroid Connector
551	93	1.00	15.0	1500					Centroid Connector
552	95	0.30	15.0	1500					Centroid Connector

TABLE 8 (Continued)

ANODE	NODE	DIST	SPEED	CAP	NODE	DIST	SPEED	CAP	ROADWAY IDENTITY
553	97	[illegible]	15.0	1500					Centroid Connector
554	102	[illegible]	15.0	1500					Centroid Connector
555	104	0.30	15.0	1500					Centroid Connector
556	108	[illegible]	15.0	1500					Centroid Connector
557	110	1.30	15.0	1500					Centroid Connector
558	113	[illegible]	15.0	1500					Centroid Connector
559	[illegible]	[illegible]	15.0	1500					Centroid Connector
560	[illegible]	[illegible]	15.0	1500					Centroid Connector
561	118	[illegible]	15.0	1500					Centroid Connector
[illegible]	[illegible]	[illegible]	15.0	1500					Centroid Connector
[illegible]	125	0.30	15.0	1500					Centroid Connector
[illegible]	122	[illegible]	15.0	1500					Centroid Connector
[illegible]	123	[illegible]	15.0	1500					Centroid Connector
[illegible]	121	[illegible]	15.0	1500					Centroid Connector
568	14	[illegible]	15.0	1500					Centroid Connector
[illegible]	15	[illegible]	15.0	1500					Centroid Connector
[illegible]	131	0.80	15.0	1500					Centroid Connector
[illegible]	133	[illegible]	15.0	1500					Centroid Connector
[illegible]	136	[illegible]	15.0	1500					Centroid Connector
[illegible]	143	[illegible]	15.0	1500					Centroid Connector
[illegible]	144	[illegible]	15.0	1500					Centroid Connector
[illegible]	146	[illegible]	15.0	1500					Centroid Connector
[illegible]	147	[illegible]	15.0	1500					Centroid Connector
[illegible]	158	[illegible]	15.0	1500					Centroid Connector
[illegible]	159	0.70	15.0	1500					Centroid Connector
[illegible]	160	1.20	15.0	1500					Centroid Connector
[illegible]	164	0.40	15.0	1500					Centroid Connector
581	162	[illegible]	15.0	1500					Centroid Connector
[illegible]	165	[illegible]	15.0	1500					Centroid Connector
	166	1.30	15.0	1500					Centroid Connector
584	169	1.70	15.0	1500					Centroid Connector
585	171	0.50	15.0	1500					Centroid Connector
586	172	0.30	15.0	1000					Centroid Connector
587	174	0.70	15.0	1500					Centroid Connector
588	176	0.80	15.0	1500					Centroid Connector
589	179	0.30	15.0	1500					Centroid Connector
590	181	0.50	15.0	1500					Centroid Connector
591	184	0.50	15.0	1500					Centroid Connector
593	407	0.50	15.0	1500					Centroid Connector
594	191	0.30	15.0	1500					Centroid Connector
595	190	0.20	15.0	1500					Centroid Connector
596	192	0.30	15.0	1500					Centroid Connector
597	189	[illegible]	15.0	1500					Centroid Connector
598	188	[illegible]	15.0	1500					Centroid Connector
599	187	0.20	15.0	1500					Centroid Connector
600	194	0.30	15.0	1500					Centroid Connector

Table 9 indicates the vehicles on each link. The number of vehicles is determined by the population to be evacuated and is based upon the assumption that each vehicle will evacuate 3.0 people. It has been observed in other actual evacuations that about 99 percent of the evacuees leave by private automobile. Therefore, this is a conservative assumption that all people are to be evacuated by automobile. The number of vehicles on each link is a summation of all the vehicles from the different centroids that use any specific link of roadway.

Table 10 describes the evacuation route with a link-node description by centroid. This table gives the numbers of each node through which each evacuation route passes. Table 8 describes each link in this evacuation route and Table 9 indicates the number of vehicles on each link.

Directional Flow - All network routings will operate as two-way facilities. In the case of two-lane roadway, the outbound lane is for evacuation with the inbound lane used for emergency vehicles. A three-lane facility assumes two evacuation lanes and one inbound lane. A four-lane facility assumes two evacuation lanes and two emergency lanes.

Travel Speeds - Speeds were assigned to each link depending on the character of the roadway. Freeway speeds were assigned at 50 m.p.h. with ramp speeds at 20 m.p.h. For two lane roadways, State Highways were assigned at 35 m.p.h. and 30 m.p.h. for roadways of lesser quality. Some downtown streets in Pottstown were assigned speeds of 25 m.p.h. Centroid connectors were considered as local streets and assigned a speed of 15 m.p.h.

Capacities - Capacities were assigned to the evacuation network to reflect emergency conditions with traffic flowing in one direction, occasional emergency vehicles opposing the traffic flow and problem areas controlled by special traffic features. Under these conditions the following capacities were assigned.

POOR ORIGINAL

TABLE 9
VEHICLES ON EACH LINK
Normal Weekday

A Node	B Node	Veh.
15	30	45
11	201	700
12	202	1369
13	202	320
14	226	166
15	216	382
16	17	1869
17	208	2126
19	194	1300
20	195	2782
21	200	6426
22	197	1793
23	197	1851
24	25	734
25	16	1869
26	196	1793
27	59	400
28	29	400
29	89	1382
30	29	982
31	37	350
32	39	1168
33	34	129
34	40	1714
35	36	818
36	38	1168
37	36	350
38	32	1168
39	34	1585
40	203	1944
41	42	544
42	204	544
43	205	1246
44	400	969
45	54	969
46	44	569
47	48	292
48	50	292
50	51	577
51	207	1746
52	43	1246
52	207	1000
54	51	1169
55	56	257
56	17	257
58	412	1236
59	60	400
60	61	2635
61	141	2635
62	414	999
63	64	2472
64	90	2472
65	67	1473
66	67	1642
67	68	1473
67	86	1642
68	69	1837
69	140	1837
70	63	1222
71	70	1222
73	74	740
74	415	740
75	76	2383
76	77	913
76	420	1470
77	408	913
78	79	1470
79	75	730
80	79	730
81	66	700
82	83	500
83	84	500
84	85	982
85	402	982
86	87	2353
87	88	3212
88	104	3212
89	90	1382
90	91	2472
90	92	1382
91	418	2472
92	93	2134
93	94	2734
94	209	2734

TABLE 9

(Cont'd)

A Node	B Node	Veh.
95	225	20
96	97	1222
96	417	1250
97	98	2572
98	99	1222
98	100	1350
99	101	2692
100	122	1350
101	124	2692
102	210	1574
104	106	3412
105	114	1936
106	422	3412
107	115	982
108	109	2317
109	118	2317
110	108	1765
111	110	300
112	211	5848
113	115	600
114	112	5348
115	116	1582
116	212	2241
117	213	2517
118	117	2517
121	111	300
122	127	1818
123	410	100
124	125	2792
125	126	3192
126	215	3192
127	214	2668
129	229	100
130	131	1953
131	217	2353
132	105	1936
133	134	300
134	401	300
135	155	2525
136	130	1953
137	132	1936
138	136	1363
139	137	1936
139	198	499
140	138	364
140	143	1473
141	139	2935
142	416	300
143	420	2525
144	145	400
145	154	400
146	142	300
147	148	790
148	163	790
149	150	2511
150	173	2511
151	149	238
152	149	2273
153	152	400
154	155	400
155	152	1873
155	156	1052
156	175	1052
157	175	1163
158	157	1163
159	153	400
160	161	3088
161	178	3088
162	160	2553
163	162	1300
164	163	510
165	151	238
166	182	150
167	168	157
168	169	2668
169	218	2918
171	227	9
172	167	157
173	168	2511
174	219	2616
175	174	2215
176	177	202
177	189	2755
178	177	2553

TABLE 9

(Cont'd)

A Node	B Node	Veh.
178	180	535
179	180	1088
180	181	1623
181	182	1823
182	183	1973
183	184	1973
184	220	2223
187	423	950
188	19	1300
189	[illegible]	3849
190	191	1374
191	194	1451
192	193	855
193	224	855
194	20	1300
194	223	1567
195	21	2782
196	22	1793
197	21	3644
198	419	999
400	45	969
401	158	800
402	403	982
403	404	982
404	405	982
405	406	982
406	107	982
407	221	1513
408	409	913
409	110	913
410	124	100
411	27	400
412	413	1236
413	414	1236
414	60	2235
415	33	129
415	75	740
416	141	300
417	102	1250
418	96	2472
419	138	999
420	78	1470
420	421	2525
421	135	2525
422	114	3412
423	424	950
424	188	950
425	207	2746
501	129	100
502	11	700
503	12	1369
504	13	300
505	13	20
507	20	782
508	20	500
509	23	1851
510	24	734
511	25	1135
512	411	400
513	28	400
514	30	400
515	30	582
516	26	1473
517	26	179
518	26	141
519	31	350
520	415	129
521	35	818
522	39	417
523	40	230
524	41	544
525	52	1246
526	44	400
527	46	569
528	47	292
530	52	1000
531	55	257
532	50	285
533	54	200
535	58	1236
536	63	1250
537	62	999
538	65	1473
539	68	364

TABLE 9

(Cont'd)

A Node	B Node	Veh.
540	66	942
541	71	1222
542	75	913
543	73	740
544	81	700
545	80	730
546	84	482
547	87	859
548	86	711
549	92	500
550	92	752
551	93	600
552	95	20
553	97	1350
554	102	324
555	104	200
556	108	552
557	110	552
558	113	600
559	112	500
560	116	659
561	118	200
563	127	850
564	125	400
565	122	468
566	123	100
567	121	300
568	14	166
569	15	362
570	131	400
571	133	800
572	136	590
573	143	1052
574	144	400
575	146	300
576	147	790
577	158	363
578	159	400
579	160	535
580	164	510
581	162	1253
582	165	238
583	166	150
584	169	250
585	171	9
586	172	157
587	174	401
588	176	202
589	179	1088
590	181	200
591	184	250
593	407	1513
594	191	77
595	190	1374
596	192	855
597	189	1094
598	188	350
599	187	950
600	194	116

TABLE 10

EVACUATION ROUTE
LINK NODE DESCRIPTION
By Centroid
Limerick

LINE	NODE 1	NODE 2	NODE 3	NODE 4	NODE 5	NODE 6	NODE 7	NODE 8	NODE 9	NODE 10	NODE 11	NODE 12	NODE 13	NODE 14
A1	501	127	228											
A2	502	11	201											
A3	503	12	202											
A4	504	12	202											
A5	505	13	202											
B1	507	20	195	21	200									
B2	508	20	195	21	200									
B3	509	23	197	21	200									
B4	510	24	25	16	17	208								
B5	[illegible]	25	16	17	208									
C1	512	411	27	59	60	61	141	139	137	132	105	114	112	211
C2	513	28	29	89	90	92	93	94	209					
C3	514	30	29	89	90	92	93	94	209					
C4	515	30	29	89	90	92	93	94	209					
C5	516	26	196	22	197	21	200							
C6	517	26	196	22	197	21	200							
C7	518	26	196	22	197	21	200							
D1	519	31	37	36	38	32	39	34	40	203				
D2	520	415	33	34	40	203								
E1	521	35	36	38	32	39	34	40	203					
F1	522	39	34	40	203									

TABLE 10
(Cont'd)

LINE	NODE 1	NODE 2	NODE 3	NODE 4	NODE 5	NODE 6	NODE 7	NODE 8	NODE 9	NODE 10	NODE 11	NODE 12	NODE 13	NODE 14
F1	523	40	203											
G1	524	41	42	204										
H1	525	52	43	205										
I1	526	44	409	45	54	51	207							
I2	527	46	44	400	45	54	51	207						
I3	528	47	48	50	51	207								
K1	530	425	207											
K2	531	55	56	17	208									
K3	532	50	51	207										
K4	533	54	51	207										
M1	535	58	412	413	414	60	61	141	139	137	132	105	114	112
	211													
M2	536	63	64	90	91	418	96	417	102	210				
M3	537	62	414	60	61	141	139	198	419	138	136	130	131	217
M4	538	65	67	68	69	140	143	420	421	135	155	152	149	150
	173	168	169	218										
M5	539	68	69	140	138	136	130	131	217					
M6	540	66	67	86	87	88	104	106	422	114	112	211		
M7	541	71	70	63	64	90	91	418	96	97	98	99	101	124
	125	126	215											
N1	542	75	76	77	408	409	110	108	109	116	117	213		
N2	543	73	74	415	75	76	420	78	99	101	124	125	126	215
N3	544	81	66	67	66	87	88	104	106	422	114	112	211	
N4	545	80	79	75	76	420	78	99	101	124.	125	126	215	

TABLE 10
(Cont'd)

NAME	NODE 1	NODE 2	NODE 3	NODE 4	NODE 5	NODE 6	NODE 7	NODE 8	NODE 9	NODE 10	NODE 11	NODE 12	NODE 13	NODE 14
01	546	84	85	402	403	404	405	406	107	115	116	212		
02	547	87	88	104	106	422	114	112	211					
03	548	86	87	88	104	106	422	114	112	211				
04	549	82	83	84	85	402	403	404	405	406	107	115	116	212
P1	550	92	93	94	209									
P2	551	93	94	209										
Q1	552	95	[illegible]											
R1	553	97	98	100	111	127	214							
R2	554	102	210											
S1	555	104	106	422	114	112	211							
S2	556	108	109	118	117	213								
S3	557	110	108	109	118	117	213							
T1	558	113	115	116	212									
T2	559	112	211											
T3	560	116	212											
U1	561	118	117	213										
V1	563	127	214											
V2	564	125	126	215										
V3	565	122	127	214										
V4	566	123	410	124	125	126	215							
V5	567	121	111	110	108	109	118	117	213					

TABLE 10
(Cont'd)

[illegible]	568	14	226									
[illegible]	569	15	216									
[illegible]	570	131	217									
Y1	571	133	134	401	158	157	175	174	219			
Y2	572	136	130	131	217							
Y3	573	143	420	421	135	155	156	175	174	219		
Z1	574	144	145	154	155	152	149	150	173	168	169	218
Z2	575	146	142	416	141	139	137	132	105	114	112	211
Z3	576	147	148	163	162	160	161	178	177	189	222	
CA1	577	158	157	175	174	219						
CB1	578	159	153	152	149	150	173	168	169	218		
CB2	579	160	161	179	180	181	182	183	184	220		
CB3	580	164	163	162	160	161	178	177	189	222		
CB4	581	162	160	161	178	177	189	222				
CC1	582	165	151	149	150	173	168	169	218			
CC2	583	166	182	183	184	220						
CC3	584	169	218									
CD1	585	171	227									
CE1	586	172	167	168	169	218						
CF1	587	174	219									
CG1	588	176	177	189	222							
CG2	589	179	180	181	182	183	184	220				

1. Freeway - 2,000 vehicles per lane per hour; therefore, two evacuation lanes would be 4,000 per hour.

2. Two-lane Facilities - A capacity of 1,500 vehicles per lane per hour was assigned to State Highways and other high type roadways and 1,000 vehicles per lane per hour for a roadway of lesser quality.

3. Interchanges and Ramps - 1,500 vehicles per hour.

Special Traffic Control Strategies - In order to attain maximum capacity on the network, control critical intersection movements and provide direction for complex evacuation routings, special traffic control strategies are imperative.

In some instances major population centers were split to avoid overloads to the network and produce abnormally long delays. These locations will require special handling to ensure that motorists utilize their assigned routing for evacuation. A case in point is node 67 at the junction of High Street and Hanover Street in downtown Pottstown. All west bound traffic on High Street will be required to turn left onto Hanover Street and cross the bridge. All south bound traffic on Hanover Street will have to turn right onto High Street and proceed out of town on U.S. 422.

Interchanges and ramps which affect the capacity that can be loaded to the main line will need special control strategies.

Special Transportation Requirements - Transportation requirements for special problem groups, such as non-car owning families, hospitals, schools, jails, etc., were not included in the evacuation time assessment. The assumtpion was that all families would evacuate as a unit from home. This would preclude the requirement for evacuating school students from school to outside the risk area.

EVACUATION TIME ASSESSMENT

Evacuation times have been considered for four different scenarios. The scenarios are:

1. Normal weekday - workers at work, children in school
2. Ideal conditions - nighttime, most everyone at home
3. Adverse weather conditions - storms, fog, or flood
4. Summertime recreational peak

The assessment was performed by computer to a process described in some detail in Volume I.

Normal Weekday

Table 11 lists the evacuation times by centroid for the four scenarios listed above. The maximum evacuation time is three hours and nine minutes for centroid Z-3 during the normal weekday. This centroid is in East Coventry Township. These evacuation times include receipt of warning, leaving work, travel home, departure from home, network travel and delay time.

Summertime

There are no major recreation areas within the EPZ and the summertime population is the same as other seasons. Therefore, the evacuation times are the same as normal weekday.

Adverse Weather

If the weather were adverse to the extent traffic could not move on the roadway system, then the plant would probably have to be shut down. The probability of that happening is very remote. A more likely occurrence is icy, slick roads during a winter storm.

The second column of Table 11 assumes an ice storm, or ice and snow combination, where roadways are not impassable but are much slower to travel. Under these conditions, travel from work to home would be distributed over 40 minutes instead of 20 minutes. Network travel during evacuation would probably be reduced to one-half of normal speed.

With these conditions, the maximum evacuation time would be three hours and 10 minutes for centroid Z-3. Generally, the adverse weather times are longer than the evacuation times for summer.

Nighttime

This scenario provides the shortest evacuation times of all. People are home from work and children are home from school. With the family all at home, the mobilization time is less. There is a time distribution for receiving the warning and a time distribution for preparing to leave. The time distributions for preparing to leave work and travel from work to home does not apply.

Under these conditions, the maximum evacuation time would be two hours and 54 minutes for centroid Z-3. The third column of Table 11 gives the evacuation time at night.

Sector Evacuation

Evacuation Plans are usually set up on a sector or quandrant basis. This assessment has not been concerned with segmenting the 10-mile radius. The assessment looked at total evacuation from the EPZ. However, this does not preclude evacuation by quadrants. Quadrants can be examined from the data in this report. Sector evacuation can be approximated by the selection of appropriate planning zones.

TABLE 1[illegible]

EVACUATION TIMES BY CENTROID

CENTROID	NORMAL WEEKDAY TIME	ADVERSE WEATHER TIME	NIGHTTIME TIME
A1	76	103	61
A2	78	106	63
A3	80	108	66
A4	77	105	62
A5	76	102	61
B1	132	143	117
B2	132	141	117
B3	102	123	89
B4	108	121	93
B5	105	117	90
C1	95	138	80
C2	146	174	131
C3	148	177	133
C4	147	175	132
C5	76	119	81
C6	95	124	78
C7	92	118	75
D1	104	122	89
D2	95	108	80
E1	102	119	87
F1	98	110	83
F2	86	104	71
G1	78	107	63
H1	78	106	63
I1	94	119	79
I2	97	124	82
I3	94	116	79
K1	90	110	65
K2	91	118	76
K3	91	112	76
K4	91	112	76
M1	123	143	108
M2	133	154	118
M3	127	148	112
M4	151	177	136
M5	102	132	85
M6	130	146	115
M7	164	182	149
N1	130	145	115
N2	151	169	136
N3	131	148	116
N4	152	169	137
O1	117	131	102

TABLE 11 (Cont'd)

EVACUATION TIMES BY CENTROID

NORMAL WEEKDAY CENTROID	TIME	ADVERSE WEATHER CENTROID	TIME	NIGHTTIME CENTROID	TIME
O2	119	O2	137	O2	104
O3	122	O3	143	O3	107
O4	119	O4	135	O4	108
P1	136	P1	152	P1	121
P2	104	P2	133	P2	89
Q1	76	Q1	102	Q1	61
R1	134	R1	148	R1	119
R2	79	R2	108	R2	64
S1	119	S1	138	S1	108
S2	89	S2	120	S2	74
S3	93	S3	128	S3	78
T1	111	T1	123	T1	96
T2	78	T2	107	T2	63
T3	104	T3	115	T3	69
U1	87	U1	117	U1	72
V1	111	V1	126	V1	96
V2	93	V2	120	V2	78
V3	122	V3	132	V3	105
V4	100	V4	130	V4	95
V5	91	V5	125	V5	76
W1	78	W1	105	W1	63
X1	79	X1	108	X1	64
X2	[illegible]	X2	118	X2	71
Y1	104	Y1	133	Y1	91
Y2	[illegible]	Y2	128	Y2	75
Y3	137	Y3	161	Y3	132
Z1	106	Z1	145	Z1	91
Z2	90	Z2	130	Z2	75
Z3	189	Z3	190	Z3	174
CA1	103	CA1	125	CA1	88
CB1	105	CB1	143	CB1	90
CB2	122	CB2	137	CB2	109
CB3	185	CB3	182	CB3	170
CB4	183	CB4	179	CB4	163
CC1	101	CC1	138	CC1	86
CC2	[illegible]	CC2	119	CC2	77
CC3	93	CC3	126	CC3	78
CD1	77	CD1	104	CD1	62
CE1	97	CE1	127	CE1	92
CF1	95	CF1	111	CF1	80
CG1	115	CG1	149	CG1	100
CG2	91	CG2	118	CG2	76
CG3	89	CG3	113	CG3	74

TABLE 11 (Cont'd)

EVACUATION TIMES BY CENTROID

NORMAL WEEKDAY		ADVERSE WEATHER		NIGHTTIME	
CENTROID	TIME	CENTROID	TIME	CENTROID	TIME
CH1	86	CH1	107	CH1	71
CJ1	82	CJ1	105	CJ1	67
CJ2	92	CJ2	112	CJ2	69
CJ3	84	CJ3	115	CJ3	69
CJ4	79	CJ4	108	CJ4	64
CJ5	109	CJ5	138	CJ5	94
CJ6	134	CJ6	147	CJ6	119
CJ7	95	CJ7	149	CJ7	120
CK1	[illegible]	CK1	103	CK1	61