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August 3, 1981



Director of Nuclear Reactor Regulation  
Attention: Ms. E. Adensam, Chief  
Licensing Branch No. 4  
U.S. Nuclear Regulatory Commission  
Washington, DC 20555

Pilgrim Station Unit #2  
License Application Filed  
December 12, 1973 (Docket No. 50-471)

Reference:

- (a) NRC letter: R. L. Tedesco to  
R. M. Butler: "Evacuation  
time and population estimates for  
the first year of operation at  
Pilgrim Station Unit 2."  
Dated: July 24, 1981

Enclosures:

- (1) "An Update of the Population  
Distribution Around the Pilgrim  
Site." Dated: July 31, 1981  
(2) "Major Roadway Improvements in  
the vicinity of the Pilgrim Nuclear  
Generating Station." Dated:  
July 31, 1981

Dear Ms. Adensam:

Enclosed, as Enclosure (1), please find the updated population data  
requested by Reference (a).

Also enclosed, as Enclosure (2), is a description of the road network  
improvements projected to exist during the first year of plant  
operation.

As stated in Reference (a), the evacuation time estimates for the  
first year if plant operation will be forwarded by August 24, 1981.

Question on the enclosed documents should be addressed to Mr. W. F.  
Hickey. (617)424-2774.

Very truly yours,

*Robert M. Butler*

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AN UPDATE OF POPULATION  
DISTRIBUTION AROUND THE  
PILGRIM SITE

July 31, 1981

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## 1. INTRODUCTION

In response to NRC's request to provide evacuation time estimates for the plume exposure emergency planning zone (EPZ) defined for Pilgrim 2 at the approximate time of plant startup, it is necessary to develop population projections for the area. Population data are included in PSAR Section 2.1.3. However, the PSAR information does not reflect the 1980 Census data since these data have only been available within the past several months. Furthermore, only the Census data for permanent resident population is available at this time.

Thus, as a starting point for the population input to the evacuation analysis, a review of the 1980 Census data has been made. In addition to the town by town population counts which are published by the Bureau of the Census, data for smaller subdivisions within the plume exposure EPZ were obtained. Data for these smaller subdivisions (enumeration districts and blocks) enable the distribution of the permanent population within the plume exposure EPZ to be made more accurately than using only town level population breakdowns. Projections of the permanent population to 1990 have also been developed.

The peak transient component of population in the plume exposure EPZ has been estimated based on data previously submitted. This data is all included in Appendix 13A to the Preliminary Safety Analysis Report. No new Census information related to this component of the population is available at this time.

## 2. PERMANENT RESIDENT POPULATION

### 2.1 Introduction

The purpose of this section is to provide an estimate of the permanent population within 50 miles of Unit 2 and a projection of the 1990 population. Data from several sources were used to develop distributions and projections of the permanent resident population within 50 miles of the Pilgrim site. This area includes portions of both Massachusetts and Rhode Island. Each data source is identified in the following subsections. The most recent Census data from the 1980 U.S. Census and available population projections have been used in preparing these estimates.

### 2.2 Permanent Population within 10 Miles

The area within 10 miles of the site is entirely within the State of Massachusetts. Table 2-1 lists the towns located partly within 10 miles of the site. Also shown on Table 2-1 are the 1980 resident population and projected permanent resident population for 1990. The greatest portion of the land area within 10 miles is within the boundaries of Plymouth. Nearly all of this town is within the 10-mile radius. Likewise, about half or more of the land area of Carver, Duxbury and Kingston is within 10-miles of the site. Small portions of Bourne, Plympton, Marshfield and Wareham are also included in this radius. Communities within the plume exposure EPZ include Duxbury, Kingston, Plymouth and portions of Carver and Marshfield.

Table 2-2 shows the estimated 1980 resident population distribution within 10 miles of the site. Table 2-3 presents similar information for 1990. The resident population for 1980 is estimated 49,416 and 58,365 for 1990. Subdivisions

TABLE 2-1  
TOWNS WITHIN 10 MILES OF PILGRIM UNIT 2

<u>Town</u>	<u>1980 Population</u>	<u>Projected 1990 Population</u>
Bourne	13,874	15,900**
Carver*	6,988	7,250***
Duxbury*	11,807	12,900 <sup>+</sup>
Kingston*	7,362	11,500***
Marshfield*	20,916	22,100 <sup>+</sup>
Plymouth*	35,913	43,400 <sup>++</sup>
Plympton	1,974	3,850***
Wareham	18,475	22,350***

\* Communities included within the plume exposure EPZ, Duxbury, Kingston, Plymouth and portions of Carver and Marshfield.

\*\* Commonwealth of Massachusetts, Population Projections Prepared Under the 208 Water Quality Management Planning Program, Department of Environmental Quality Engineering, November 1979. The report indicated a 1980 value of 12,000 which was less than the 1980 Census. The 1990 value was adjusted upward by 1,900 to obtain the above estimate.

\*\*\* Table 3, SRPEDD Projected Populations (Final Draft) includes "low", "most favorable", and "high" projections. The above value is the high value. The "high" estimates for the other towns were also included above.

<sup>+</sup> Interim Population Forecasts 1980-2010 MAPC Municipalities. Metropolitan Area Planning Council, 1981.

<sup>++</sup> Table B, 208 Water Quality Program, Old Colony Planning Council, March 1977.

TABLE 2-2  
ESTIMATED DISTRIBUTION OF 1980 PERMANENT POPULATION  
WITHIN 10 MILES BY SECTOR

<u>Direc-</u> <u>tion</u>	<u>Distance from Pilgrim Unit 2 (Miles)</u>						<u>Total</u>
	<u>0-1</u>	<u>1-2</u>	<u>2-3</u>	<u>3-4</u>	<u>4-5</u>	<u>5-10</u>	
N	0	0	0	0	0	0	0
NNE	0	0	0	0	0	0	0
NE	0	0	0	0	0	0	0
ENE	0	0	0	0	0	0	0
E	0	0	0	0	0	0	0
ESE	0	0	15	0	0	0	15
SE	570	1,176	479	0	0	0	2,225
SSE	19	210	530	2,029	819	1,389	4,996
S	0	39	208	53	22	2,389	2,711
SSW	19	0	23	0	0	998	1,040
SW	0	39	123	65	349	497	1,073
WSW	0	77	236	3	217	2,518	3,051
W	58	95	475	1,254	4,522	9,562	15,966
WNW	117	0	0	0	711	10,278	11,106
NW	19	0	0	0	8	5,646	5,673
NNW	0	0	0	0	13	1,547	1,560
Total	802	1,636	2,089	3,404	6,661	34,824	49,416

TABLE 2-3  
ESTIMATED DISTRIBUTION OF 1990 PERMANENT POPULATION  
WITHIN 10 MILES BY SECTOR

Direc- tion	Distance from Pilgrim Unit 2 (Miles)						Total
	<u>0-1</u>	<u>1-2</u>	<u>2-3</u>	<u>3-4</u>	<u>4-5</u>	<u>5-10</u>	
N	0	0	0	0	0	0	0
NNE	0	0	0	0	0	0	0
NE	0	0	0	0	0	0	0
ENE	0	0	0	0	0	0	0
E	0	0	0	0	0	0	0
ESE	0	0	17	0	0	0	17
SE	657	1,336	541	0	0	0	2,534
SSE	22	242	611	2,358	852	1,635	5,820
S	0	45	242	63	26	3,434	3,810
SSW	22	0	31	0	0	1,849	1,902
SW	0	45	157	89	475	799	1,565
WSW	0	90	264	11	295	3,433	4,093
W	67	111	494	1,288	4,542	12,808	19,310
WNW	136	0	0	0	714	10,924	11,774
NW	22	0	0	0	8	5,791	5,821
NNW	0	0	0	0	13	1,706	1,719
Total	926	1,869	2,357	3,809	7,025	42,379	58,365

of the tables which show a zero resident population indicate an uninhabited area such as water.

The distribution of the permanent resident population for 1980 within 10 miles of the site was determined using 1980 Census data, the most recent U.S. Geological Survey Maps, and results of a limited field survey performed in July 1981. The procedures which were used are described below.

Within 10 miles of the site and within the EPZ, the current resident population was determined by reviewing the detailed 1980 U.S. Census of population including breakdowns by applicable enumeration districts and census blocks. Populations of the census areas were assigned to sectors based on review of census district and USGS maps. The number of structures recorded on USGS maps was generally used as the basis for distributing populations within census areas covering several sectors.

The projected populations for towns in Massachusetts for year 1990 were obtained from sources indicated on Table 2-1. The difference between the 1980 and 1990 town population totals was allocated to large areas based on a comparison of the 1970 and 1980 Census data. First, the future growth was assigned in a manner that reflected growth during the past decade. The growth assigned to broad areas was next allocated to the various sectors based on the 1980 Census data and on the USGS maps for the study area.

The EPZ has a 1980 estimated population based on the recent Census data of 60,576. This population would be broken down by towns as indicated in the following estimates:

<u>Town</u>	<u>Population within EPZ</u>
Carver (partial)	4,016
Duxbury	11,807
Kingston	7,362
Marshfield (partial)	1,478
Plymouth	<u>39,913</u>
Total	60,576

For 1990, the EPZ is projected to have a permanent resident population of about 73,530.

### 2.3 Permanent Population Between 10 and 50 Miles

The 50-mile radius around the site includes portions of Massachusetts and Rhode Island. Concentric circles were drawn with radii of 10, 20, 30, 40, and 50 miles centered on the site. The circles were divided into the  $22\frac{1}{2}^{\circ}$  sectors with each sector centered on one of the 16 cardinal compass points. The population distribution was developed for each area formed by the series of concentric circles and radial lines.

Table 2-4 shows the estimated 1980 population within 50 miles of the site. This estimate was developed from the 1980 U.S. Census of population data. The distribution of population in the area between 10 and 50 miles from the site was made by area allocation. The fraction of a town's area within each sector defined by the grid of concentric circles and radial lines was determined. The same fraction of each town's population was assigned to that segment.

Table 2-5 shows the projected 1990 population within 50 miles of the site. The projections for the towns located between 10 and 50 miles of the site were based on the population change between 1970 and 1980. The same rates of change which occurred during that period were applied to the 1980 population counts to project the population to 1990. The only exception occurs where there was a decrease in population between 1970 and 1980. In those instances, it was assumed that the 1980 population remained constant through 1990.



TABLE 2-4  
ESTIMATED DISTRIBUTION OF 1980 PERMANENT POPULATION BY SECTOR

<u>Direction</u>	<u>Distance from Pilgrim Unit 2 (Miles)</u>					<u>Total</u>
	<u>0-10</u>	<u>10-20</u>	<u>20-30</u>	<u>30-40</u>	<u>40-50</u>	
N	0	0	0	0	30,916	30,916
NNE	0	0	0	0	0	0
NE	0	0	0	0	0	0
ENE	0	530	3,482	0	0	4,012
E	0	0	3,294	341	0	3,635
ESE	15	0	5,875	13,095	0	18,985
SE	2,225	1,236	40,250	5,906	0	49,617
SSE	4,996	13,238	19,547	0	712	38,493
S	2,711	16,583	25,230	7,795	712	53,031
SSW	1,040	15,831	7,798	316	359	25,344
SW	1,073	12,757	141,620	46,457	46,539	248,446
WSW	3,051	11,780	50,443	136,660	184,644	386,578
W	15,966	17,578	60,499	141,897	377,620	613,560
WNW	11,106	28,320	164,700	113,261	107,983	425,370
NW	5,673	39,600	206,743	821,487	635,549	1,709,052
NNW	1,560	26,623	28,296	104,220	414,120	574,819
Total	49,416	184,076	757,777	1,391,435	1,799,154	4,181,858



TABLE 2-5  
ESTIMATED DISTRIBUTION OF 1990 PERMANENT POPULATION BY SECTOR

<u>Direction</u>	<u>Distance from Pilgrim Unit 2 (Miles)</u>					<u>Total</u>
	<u>0-10</u>	<u>10-20</u>	<u>20-30</u>	<u>30-40</u>	<u>40-50</u>	
N	0	0	0	0	31,663	31,663
NNE	0	0	0	0	0	0
NE	0	0	0	0	0	0
ENE	0	644	4,225	0	0	4,869
E	0	0	4,199	522	0	4,721
ESE	17	0	8,324	22,241	0	30,582
SE	2,534	1,891	67,381	8,419	0	80,225
SSE	5,820	21,702	32,330	0	960	60,812
S	3,810	26,491	39,849	11,661	1,110	82,921
SSW	1,902	24,192	8,666	389	609	35,758
SW	1,565	23,074	148,030	56,415	54,498	283,582
WSW	4,093	18,414	55,669	163,452	194,500	436,128
W	19,310	23,557	68,808	147,572	360,835	620,082
WNW	11,774	35,065	182,775	121,304	116,045	466,963
NW	5,821	48,360	213,557	822,489	636,817	1,727,044
NNW	1,719	66,183	29,041	104,351	415,196	616,490
Total	58,365	289,573	862,854	1,458,815	1,812,233	4,481,840

### 3. PEAK TRANSIENT POPULATION

The transient population consists of two components, seasonal residents and daily transients. Each of these elements is discussed below.

#### 3.1 Seasonal Residents

Appendix 13A to the Preliminary Safety Analysis Report presents the 1980 seasonal population distribution. This distribution of seasonal residents was developed from two sources. For the area out to five miles from the site, data were taken from a study prepared for Boston Edison Company in 1975 (Reference 1). Reference 1 provided estimates of seasonal resident population for 1980 and 1990. Unlike the situation for the permanent resident population, projections for the seasonal resident population are not typically made. Consequently, a growth rate in seasonal housing units was derived and applied to estimate the magnitude of the future seasonal resident population. Although Reference 1 has previously been submitted to NRC, the portion of this document dealing with seasonal resident estimates is included in Appendix A to this document.

For the area between 5 and 10 miles, information provided in the Pilgrim Unit 2 Environmental Report (Reference 2) was used. Table 3-1 is a copy of the relevant data from Reference 2.

The seasonal resident population for 1980 from the site to 10 miles is shown on Figure 3-1. This is the same data as included in PSAR Appendix 13A. For 1990, Table 3-2 presents the information.

#### 3.2 Daily Transients

The numbers of daily transients for 1980 and 1990 were estimated through an inventory approach. All potential "generators" of a seasonal transient population were identified through the aid of local resources such as the Plymouth Chamber

TABLE 3-1  
SEASONAL POPULATION DISTRIBUTION WITHIN  
10 MILES OF PILGRIM STATION SITE

SEGMENTS	YEAR	0-1 MI	1-2 MI	2-3 MI	3-4 MI	4-5 MI	5-10 MI
W	1972	0	0	0	0	13	0
	1980	0	0	0	0	18	0
	1990	0	0	0	0	19	0
	2000	0	0	0	0	20	0
	2010	0	0	0	0	21	0
	2020	0	0	0	0	23	0
NW-E	1972	0	0	0	0	0	0
	1980	0	0	0	0	0	0
	1990	0	0	0	0	0	0
	2000	0	0	0	0	0	0
	2010	0	0	0	0	0	0
	2020	0	0	0	0	0	0
NW	1972	0	0	0	0	0	0
	1980	0	0	0	0	0	0
	1990	0	0	0	0	0	0
	2000	0	0	0	0	0	0
	2010	0	0	0	0	0	0
	2020	0	0	0	0	0	0
ENE	1972	0	0	0	0	0	0
	1980	0	0	0	0	0	0
	1990	0	0	0	0	0	0
	2000	0	0	0	0	0	0
	2010	0	0	0	0	0	0
	2020	0	0	0	0	0	0
E	1972	0	0	0	0	0	0
	1980	0	0	0	0	0	0
	1990	0	0	0	0	0	0
	2000	0	0	0	0	0	0
	2010	0	0	0	0	0	0
	2020	0	0	0	0	0	0
SE-E	1972	36	0	115	0	0	0
	1980	38	0	121	0	0	0
	1990	41	0	130	0	0	0
	2000	43	0	138	0	0	0
	2010	46	0	146	0	0	0
	2020	48	0	154	0	0	0
SE	1972	303	1,498	680	520	0	0
	1980	279	1,582	718	550	0	0
	1990	372	1,687	786	587	0	0
	2000	263	1,792	813	624	0	0
	2010	414	1,867	861	661	0	0
	2020	436	2,003	909	698	0	0
S-E	1972	92	93	348	957	893	1,007
	1980	98	94	366	1,011	771	1,064
	1990	106	95	393	1,147	966	1,136
	2000	111	95	417	1,147	966	1,207
	2010	118	95	442	1,215	1,064	1,278
	2020	124	97	466	1,282	1,061	1,360
SEGMENTS	YEAR	0-1 MI	1-2 MI	2-3 MI	3-4 MI	4-5 MI	5-10 MI
W	1972	0	0	15	175	12	2,231
	1980	0	0	16	185	13	2,357
	1990	0	0	18	197	14	2,515
	2000	0	0	19	209	15	2,674
	2010	0	0	20	221	16	2,832
	2020	0	0	22	223	17	2,990
NW-E	1972	21	0	0	0	0	1,284
	1980	22	0	0	0	0	1,357
	1990	24	0	0	0	0	1,448
	2000	26	0	0	0	0	1,539
	2010	27	0	0	0	0	1,630
	2020	29	0	0	0	0	1,721
NW	1972	0	4	46	27	36	213
	1980	0	5	48	29	38	226
	1990	0	5	51	31	41	241
	2000	0	5	54	33	43	257
	2010	0	6	57	35	46	272
	2020	0	6	61	37	48	288
ENE	1972	0	4	56	28	65	1,625
	1980	0	5	62	30	69	1,719
	1990	0	5	67	32	74	1,837
	2000	0	5	71	34	78	1,955
	2010	0	6	75	36	83	2,073
	2020	0	6	79	38	87	2,191
E	1972	0	8	140	120	146	1,736
	1980	0	9	148	127	155	1,809
	1990	0	10	156	136	165	1,887
	2000	0	10	166	144	175	1,985
	2010	0	11	178	153	186	2,074
	2020	0	11	188	161	196	2,162
SE-E	1972	0	0	8	85	120	1,365
	1980	0	0	9	90	147	1,443
	1990	0	0	10	97	152	1,540
	2000	0	0	10	103	167	1,637
	2010	0	0	11	109	173	1,736
	2020	0	0	11	115	181	1,831
SE	1972	0	0	0	0	126	2,131
	1980	0	0	0	0	135	2,252
	1990	0	0	0	0	144	2,403
	2000	0	0	0	0	153	2,594
	2010	0	0	0	0	162	2,796
	2020	0	0	0	0	171	2,956
S-E	1972	0	0	0	0	448	1,148
	1980	0	0	0	0	473	1,213
	1990	0	0	0	0	505	1,295
	2000	0	0	0	0	537	1,378
	2010	0	0	0	0	568	1,457
	2020	0	0	0	0	600	1,536

POPULATION DISTRIBUTION-SEASONAL

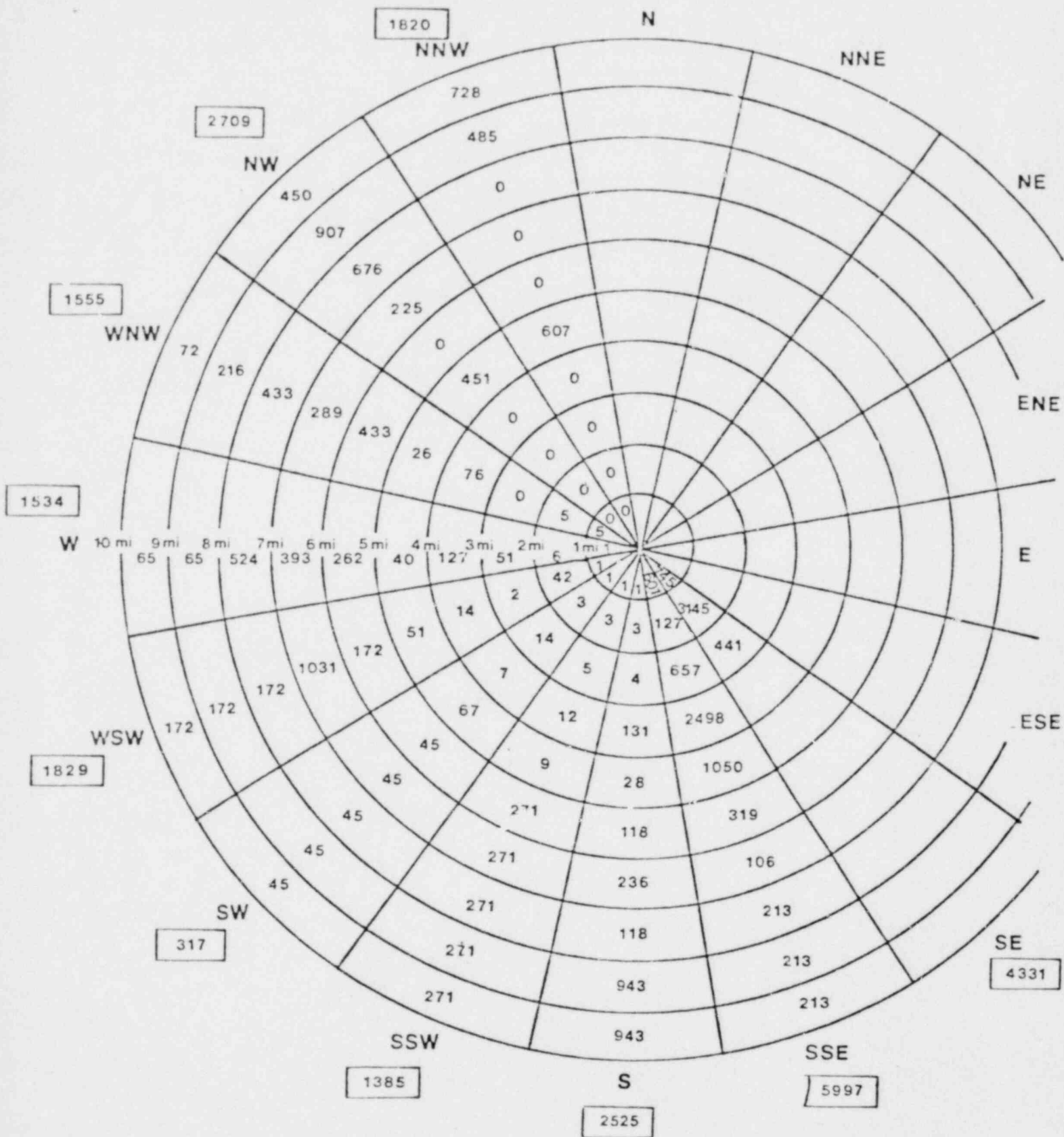


FIGURE 3-1 - SEASONAL RESIDENT POPULATION FOR 1980

TABLE 3-2  
1990 SEASONAL RESIDENT POPULATION

Direc- tion	Distance from Pilgrim Unit 2 (Miles)						Total
	<u>0-1</u>	<u>1-2</u>	<u>2-3</u>	<u>3-4</u>	<u>4-5</u>	<u>5-10</u>	
N	0	0	0	0	0	0	0
NNE	0	0	0	0	0	0	0
NE	0	0	0	0	0	0	0
ENE	0	0	0	0	0	0	0
E	0	0	0	0	0	0	0
ESE	0	0	0	0	0	0	0
SE	746	3,148	443	0	0	0	4,337
SSE	602	131	662	2,505	1,060	1,136	6,096
S	2	8	10	142	45	2,515	2,722
SSW	2	275	16	28	28	1,448	1,797
SW	2	274	23	22	82	241	644
WSW	2	45	8	23	66	1,837	1,981
W	2	8	55	133	50	1,397	1,645
WNW	7	5	0	77	27	1,540	1,656
NW	0	0	0	0	452	2,403	2,855
NNW	0	0	0	0	612	1,295	1,907
Total	1,365	3,894	1,217	2,930	2,422	13,812	25,640

of Commerce, the Plymouth telephone directory, town officials and the New England Camping Association. After the inventory was completed, the persons in charge of the facilities were contacted. Each official was requested to provide an estimate of the peak capacity and peak use, in addition to information regarding future expansion plans.

This inventory effort was undertaken in the process of preparing Reference 1 for the distance out to 5 miles from the site. During the summer of 1979, the information for 5 miles was updated and the study area increased to 10 miles.

During the performance of evacuation time-estimate studies, some refinements to estimates for beach populations in Duxbury were made. The details of the 1980 estimate were included as Tables B-3 through B-1C in Appendix 13A of the Preliminary Safety Analysis Report. These tables, together with estimates for 1990 are included as Appendix B to this document.

The resulting distributions of daily transients for 1980 and 1990 are presented in Tables 3-3 and 3-4, respectively.

TABLE 3-3  
ESTIMATED 1980 PEAK SEASONAL TRANSIENT POPULATION BY SECTOR

Direc- tion	Distance from Pilgrim Unit 2 (Miles)						Total
	0-1	1-2	2-3	3-4	4-5	5-10	
N	0	0	0	0	0	0	.
NNE	0	0	0	0	0	0	0
NE	0	0	0	0	0	0	0
ENE	0	0	0	0	0	0	0
E	0	0	0	0	0	0	0
ESE	0	0	0	0	0	0	0
SE	0	2,286	133	0	0	0	2,419
SSE	0	50	2,068	0	50	1,370	3,538
S	0	0	0	0	0	1,348	1,348
SSW	150	0	0	0	0	3,710	3,860
SW	0	0	0	0	0	1,290	1,290
WSW	0	205	0	0	159	1,644	2,008
W	0	0	791	4,338	4,771	4,067	13,967
WNW	0	0	0	0	1,996	2,992	4,988
NW	268	0	0	0	0	995	1,263
NNW	0	0	0	0	0	9,645	9,645
Total	418	2,541	2,992	4,338	6,976	27,061	44,326

TABLE 3-4  
ESTIMATED 1990 PEAK SEASONAL TRANSIENT POPULATION BY SECTOR

Direc- tion	Distance from Pilgrim Unit 2 (Miles)						Total
	0-1	1-2	2-3	3-4	4-5	5-10	
N	0	0	0	0	0	0	0
NNE	0	0	0	0	0	0	0
NE	0	0	0	0	0	0	0
ENE	0	0	0	0	0	0	0
E	0	0	0	0	0	0	0
ESE	0	0	0	0	0	0	0
SE	0	3,152	133	0	0	0	3,285
SSE	0	50	2,219	0	50	1,544	3,863
S	219	0	0	0	0	1,786	2,005
SSW	0	0	0	0	0	5,827	5,827
SW	0	0	0	0	0	1,884	1,884
WSW	0	280	0	0	261	1,838	2,379
W	0	0	841	6,158	4,898	5,496	17,393
WNW	0	0	0	0	2,796	3,122	5,918
NW	268	0	0	0	0	1,143	1,411
NNW	0	0	0	0	0	9,645	9,645
Total	487	3,482	3,193	6,158	8,005	32,285	53,610



## REFERENCES

1. "An Evacuation Analysis for the Pilgrim Site",  
Environmental Research & Technology, Inc., August 1975.
2. Pilgrim Station Unit 2, Applicant's Environmental Report  
Construction Permit Stage, Boston Edison Company.

#### 4. SUMMARY

The objectives of this population update are to provide a current data base for estimating evacuation times for the area around the Pilgrim site for 1990 and to provide population estimates based on the 1980 Census. Prior sections of this report have presented the bases for 1980 and 1990 estimates of permanent and seasonal residents and daily transients. The distributions within 10 miles of the Pilgrim site of the peak 1980 and 1990 populations incorporating these population groups are shown on Tables 4-1 and 4-2.

The plume exposure EPZ has been defined in the Preliminary Safety Analysis Report. In order not to exclude areas which should logically be included within the plume exposure EPZ, the boundary extends beyond 10 miles in some sectors. As a result, the 1990 population which will be used in the evacuation time estimate will account for about 15,000 people in addition to those located within 10 miles of the site.

TABLE 4-1  
ESTIMATED 1980 PEAK POPULATION

Direc- tion	Distance from Pilgrim Unit 2 (Miles)						Total
	0-1	1-2	2-3	3-4	4-5	5-10	
N	0	0	0	0	0	0	0
NNE	0	0	0	0	0	0	0
NE	0	0	0	0	0	0	0
ENE	0	0	0	0	0	0	0
E	0	0	0	0	0	0	0
ESE	0	0	15	0	0	0	15
SE	1,315	6,607	1,053	0	0	0	8,975
SSE	620	387	3,255	4,527	1,919	3,823	14,531
S	1	42	212	184	50	6,095	6,584
SSW	170	3	28	12	9	6,063	6,285
SW	1	42	137	72	416	2,012	2,680
WSW	1	324	238	17	427	5,881	6,888
W	59	101	1,317	5,719	9,333	14,938	31,467
WNW	122	5	0	76	2,733	14,713	17,649
NW	287	0	0	0	459	8,899	9,645
NNW	0	0	0	0	620	12,405	13,025
Total	2,576	7,511	6,255	10,607	15,966	74,829	117,744

TABLE 4-2  
PROJECTED 1990 PEAK POPULATION

Direc- tion	Distance from Pilgrim Unit 2 (Miles)						Total
	<u>0-1</u>	<u>1-2</u>	<u>2-3</u>	<u>3-4</u>	<u>4-5</u>	<u>5-10</u>	
N	0	0	0	0	0	0	0
NNE	0	0	0	0	0	0	0
NE	0	0	0	0	0	0	0
ENE	0	0	0	0	0	0	0
E	0	0	0	0	0	0	0
ESE	0	0	17	0	0	0	17
SE	1,403	7,636	1,117	0	0	0	10,156
SSE	624	423	3,492	4,863	2,062	4,315	15,779
S	221	53	252	205	71	7,735	8,537
SSW	24	275	47	28	28	9,124	9,526
SW	2	319	180	111	557	2,924	4,093
WSW	2	415	272	34	622	7,108	8,453
W	69	119	1,390	7,579	9,490	19,701	38,348
WNW	143	5	0	77	3,537	15,586	19,348
NW	290	0	0	0	460	9,337	10,087
NNW	0	0	0	0	625	12,646	13,271
Total	2,778	9,245	6,767	12,897	17,452	88,476	137,615

APPENDIX A

SEASONAL RESIDENT BACKGROUND DATA

### 3.3 Seasonal Resident Population

This section describes the technique and procedures used to estimate the current seasonal resident population and to project and allocate the future seasonal resident population for the years 1980 through 2020. The discussion is sub-divided into four major topics: (1) Current population estimates, 1975; (2) Allocation of the current population to the study area; (3) Projected Future Population, 1980-2020 and; (4) Allocation of the future population to the study area.

#### Current Population Estimate, 1975

The U. S. Census of Population does not provide statistics on the number of seasonal residents living in an area. However, estimates of this population segment can be derived indirectly through the use of the census' count of seasonal dwelling units. According to the 1970 U. S. Census of Housing there are 1,814 seasonal housing units in the town of Plymouth. These dwellings are predominantly located within those enumeration districts which abut Plymouth's coastal shoreline. Based upon a peak weekend occupancy rate of 5 persons per unit, this translates into an estimated peak seasonal residential population of approximately 9,000. The average occupancy factor is derived from an ERT telephone survey of local realtors.<sup>(20)</sup>

During an earlier examination of the aerial photographs of the Plymouth area it was noted that in certain enumeration districts along the coast, there appeared to be an excessively high number of dwelling units relative to the total count of units expressed in the 1970 U. S. Census of Housing. A subsequent conversation with Mr. William Downs, a housing specialist with the U. S. Bureau of the Census,<sup>(21)</sup> revealed that the 1970 census substantially underestimated the number of seasonal dwelling units in the Cape Cod area. Mr. Downs indicated that a similar undercount was likely in the Plymouth area. Therefore, at the suggestion of Mr. Downs, Plymouth's 1970 seasonal resident population was revised upward by considering the undercount as equal to the difference between census counts and air photo counts for certain coastal enumeration districts (ED's 1199, 1200 & 1202). The air photo count of dwelling units in the three enumeration districts resulted in the presence of

slightly more than 900 units over that which was indicated in the census data. Since these three enumeration districts contain the majority of the Town's seasonal dwelling units, it is assumed that the 1970 undercount of seasonal dwellings in Plymouth was approximately 1000 units. When this latter number is added to the original census count of 1,814 seasonal units, the total supply of seasonal dwelling units in 1970 is approximately 2,814. This corresponds to a 1970 estimated peak seasonal residential population of 14,070. ( $2,814 \times 5$  persons per unit).

An updating of the seasonal resident population was accomplished through a review of building permit data between 1970 and March of 1975. Unlike many towns, Plymouth makes the distinction between year-round dwelling units and seasonal units in its building permit tabulations. Their records indicate that during the past five years permits were issued for the construction of 124 seasonal dwellings. Thus, the 1975 seasonal resident population is estimated to be 14,690.

#### Allocation of the Current Population to the Study Area

The distribution of the estimated seasonal resident population to each of the sectors contained within the five mile study area was accomplished through the use of census information, building permit data, air photo counts, and assistance from Officer Peter Paulding of the Plymouth Police Department.

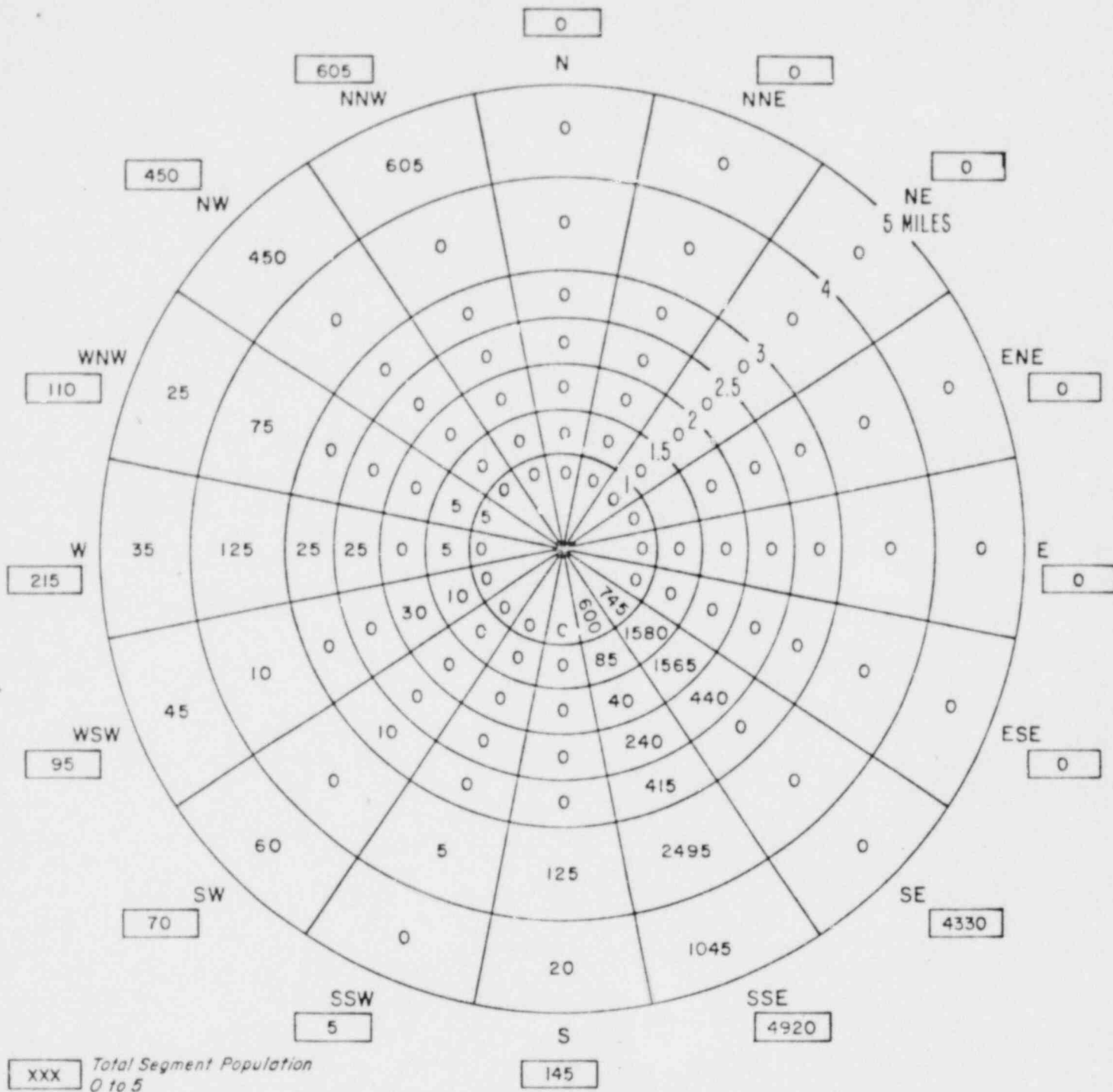
The initial distribution of the seasonal resident population was established through the seasonal dwelling counts available in the 1970 U. S. Census of Housing. As was noted earlier, census data for Plymouth is arranged according to enumeration districts, of which there are 14 within the town. Since the study area does not correspond to the boundaries of the applicable enumeration districts and since it was necessary to determine the distribution of seasonal dwellings on a sector basis, census data provided only a general indication of the number of seasonal dwellings which may be found within any one area of the town. In order to improve upon information provided in the census, a visit was made to the Plymouth Police Department. Since town police in a resort area are generally knowledgeable of the areas where seasonal homes tend to be clustered, Officer Peter Paulding was asked to supplement the census

information in distributing seasonal homes within the study area.<sup>(22)</sup> The process began by presenting Officer Paulding with a map of the town upon which was overlaid the population rose and the boundaries of the appropriately corresponding census enumeration districts. For each of the ten enumeration districts which are either wholly or partially contained within the study area, Officer Paulding was asked to estimate how a given number of seasonal units ought to be distributed with respect to the various sectors of the population rose. The distributional counts provided by Officer Paulding formed the basis from which an update to the current year could be made. When it was later found that there was a significant undercount of seasonal dwellings in the 1970 Census of Housing, upward adjustments were required. Changes, however, were limited to those sectors located within enumeration districts 1199, 1201, and 1202, the coastal areas where census undercounting was estimated to be most likely, given the large number of dwelling units present in these same areas (as counted from air photos) relative to the total count of units expressed in the census. The method used to compensate for the undercount was to adjust the seasonal count upward for each of the affected sectors by an amount equal to the difference between the air photo count for a given sector and the sum of the previously established estimate of year-round and seasonal dwelling units for that sector. This procedure resulted in an addition of more than 900 seasonal units to the original census-based estimate for the study area.

Once the 1970 distribution of seasonal dwelling units was established, the updating process was accomplished through the use of town building permit data. With the aid of plat maps and street indexes, the location and numbers of newly constructed seasonal dwelling units by sector was established for the period 1970 through March of 1975. Current peak seasonal resident population estimates for each sector were then made by multiplying the total number of seasonal dwelling units found in each sector by a peak weekend occupancy of 5 persons per unit.

Figure 3.3-1 illustrates the current distribution of the seasonal resident population with respect to the five mile study area. The population rose shows that the majority of nearly 11,000 seasonal residents found in the study area are located to the SE and SSE. Cumulative





POPULATION TOTALS			
RING, MILES	RING POPULATION	TOTAL MILES	CUMULATIVE POPULATION
0-1	1350	0-1	1350
1-1.5	1685	0-1.5	3035
1.5-2	1635	0-2	4670
2-2.5	705	0-2.5	5375
2.5-3	450	0-3	5825
3-4	2835	0-4	8660
4-5	2285	0-5	10,945

Figure 3.3-1 Seasonal Resident Population Rose - 1975

seasonal population totals indicate that 12% of the seasonal resident population live within 1 mile of the proposed site; 43% within 2 miles; 49% within 2 1/2 miles; 53% within 3 miles and; 79% within 4 miles of the Pilgrim site.

#### Projected Future Seasonal Population

There are no published or unpublished seasonal resident population projections for the Town of Plymouth. The technique used to project the future growth of this population segment was based upon the application of a predetermined ratio to the OBERS Series E permanent population estimates.

A ratio of 0.045 was used to project the future seasonal resident population and was derived from building permit data for the years 1970 to 1974. (Table 3.3-1). This value is the ratio of the number of seasonal dwellings constructed from 1970 to 1974 to the number of year-round units constructed during the same time. This ratio was then applied to the incremental change in the year-round population as established by the OBERS Series E population projections after first converting future population estimates into dwelling units. This latter calculation was accomplished by dividing the change in population by 2.8, the average number of persons per household in Plymouth. according to the 1970 U. S. Census of Housing. The future growth in seasonal housing units was then translated into seasonal population growth by utilizing the previously established factor of 5 persons per unit. Thus, the formula for determining the future seasonal resident population for each succeeding decade becomes:

$$\left( \frac{P_2 - P_1}{2.8} \times 0.045 \right) 5$$

where  $P_2$  = year round population at time 2

where  $P_1$  = year round population at time 1

TABLE 3.3-1  
BUILDING PERMIT DATA

	<u>Year Round Units</u>	<u>Seasonal Units</u>
1970	241	34
1971	751	35
1972	895	27
1973	650	26
1974	216	0
Total	2,753	124

Ratio of seasonal to year round =  $\frac{124}{2,753} = 0.045$

Source: Plymouth Building Department, Building Inspection Division. Annual Report, 1970, 1971, 1972, 1973 and 1974.

Table 3.3-2 indicates the estimated peak seasonal resident populations for the years 1980 through 2020. The projections show the seasonal resident population increasing from 14,690 in 1975 to 16,192 in 2000 and 17,394 by 2020. This estimate of growth in the seasonal population is consistent with current thinking in the town, for recently enacted zoning and building regulations (1972) prohibit the construction of the traditional non-winterized summer cottage. Today, all new construction must comply with year-round construction standards. As a result, new seasonal home construction involves a substantial investment similar to that associated with a permanent home and makes future development of large numbers of seasonal units unlikely in the town of Plymouth. (23)

#### Allocation of the Future Population to the Study Area

Although accessibility to the coastal waters probably weighs more heavily in the location decisions of the seasonal population than in the decisions of the year-round counterparts, little undeveloped land exists along Plymouth's coastline. Therefore, it appears reasonable to assume that future residential location patterns for both the seasonal and year-round populations will be similar and that both population segments will likely be attracted to those areas in Plymouth which are currently least developed.

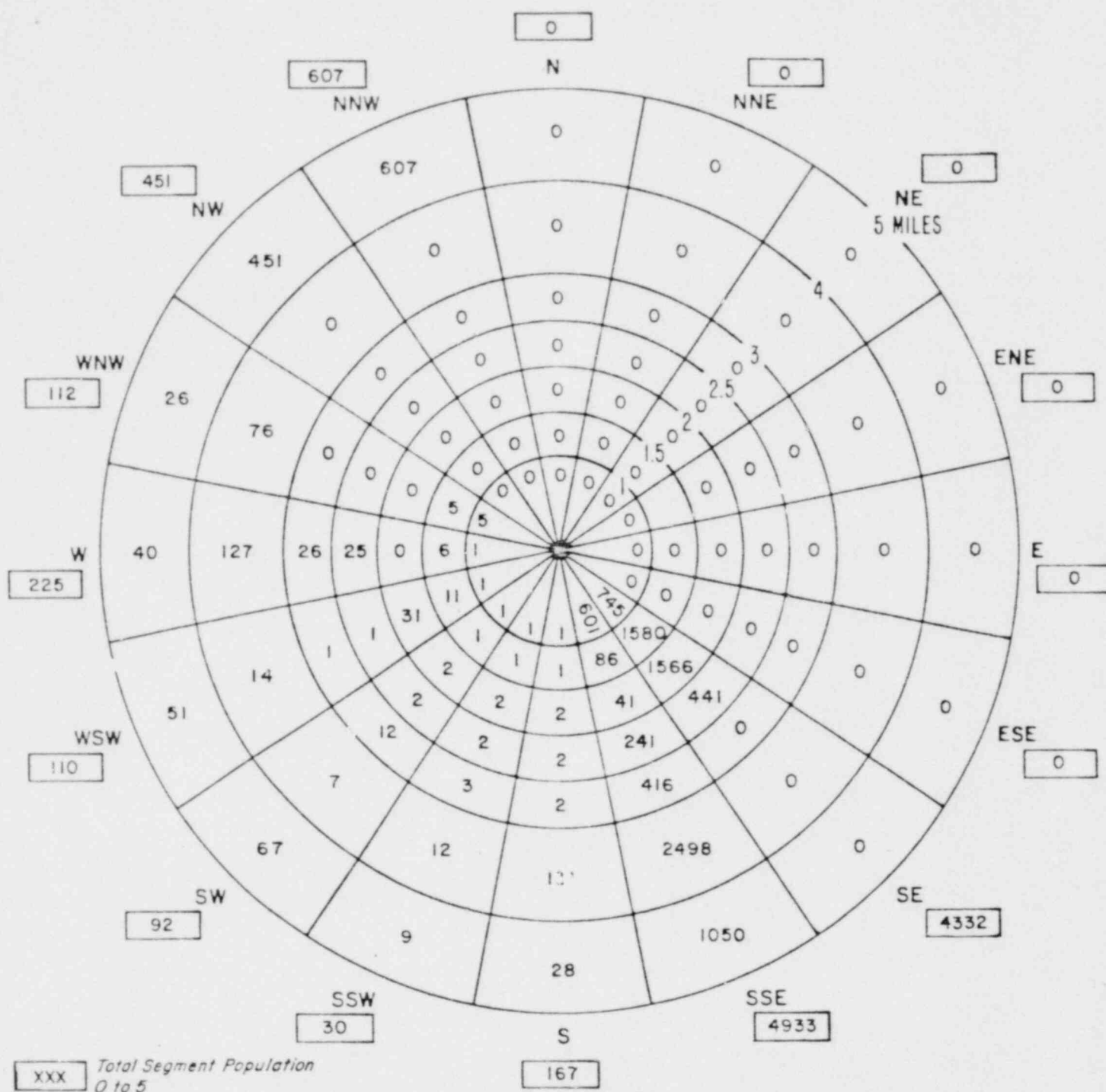
Consequently, the method used to distribute the projected future increases in the seasonal resident population with respect to the 112 sectors contained within the study area is identical to that which was used to allocate the future year-round population. In short, the technique involves the utilization of a "Development Potentials" map in order to construct a weighting system for population allocations by sector. A complete discussion of this methodology is found in Section 3.2.

Figures 3.3-2 through 3.3-6 provide estimates of the future distribution of the seasonal resident population with respect to the sectors contained within the study area. It should be noted that the 1990 population rose takes into consideration the 106 second homes associated with the Seahill development previously identified in Table 3.2-8.

TABLE 3.3-2

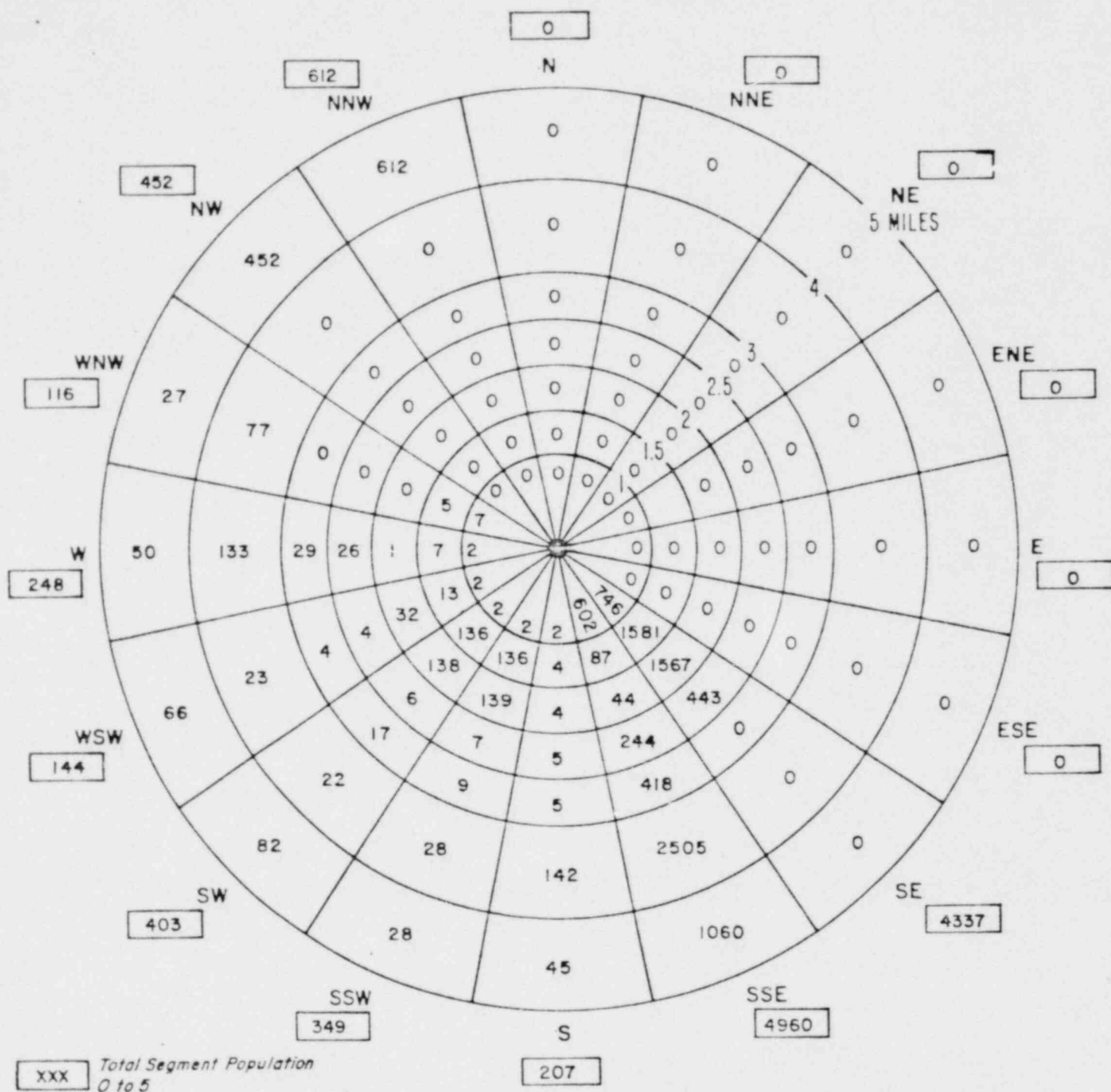
ESTIMATE OF PEAK SEASONAL RESIDENT POPULATIONS, 1980 - 2020: PLYMOUTH, MASS.

Projected Year	(A) Year-Round Population	(B) $\Delta$ in Year-Round Population	(C) $\Delta$ in seasonal pop. = $\frac{(B)}{2.8} \times 0.045 \times 5$	Estimate of Peak Seasonal Resident Population
1975	27,776	---	---	14,690
1980	31,515	3,739	300	14,990
1990	38,993	7,478	601	15,591
2000	46,471	7,478	601	16,192
2010	53,949	7,478	601	16,793
2020	61,429	7,480	601	17,394



POPULATION TOTALS			
RING, MILES	RING POPULATION	TOTAL MILES	CUMULATIVE POPULATION
0-1	1356	0-1	1356
1-1.5	1691	0-1.5	3047
1.5-2	1644	0-2	4691
2-2.5	714	0-2.5	5405
2.5-3	460	0-3	5865
3-4	2865	0-4	8730
4-5	2329	0-5	11,059

Figure 3.3-2 Seasonal Resident Population Rose - 1980



POPULATION TOTALS			
RING, MILES	RING POPULATION	TOTAL MILES	CUMULATIVE POPULATION
0-1	1365	0-1	1365
1-1.5	1969	0-1.5	3334
1.5-2	1925	0-2	5259
2-2.5	735	0-2.5	5994
2.5-3	482	0-3	6476
3-4	2930	0-4	9406
4-5	2422	0-5	11,828

Figure 3.3-3 Seasonal Resident Population Rose - 1990



APPENDIX B

DAILY TRANSIENT BACKGROUND DATA



TABLE 1

HOTELS, MOTELS & GUEST HOUSES  
LOCATED WITHIN TEN MILES OF PILGRIM UNIT 2

FACILITY NAME	TOWN LOCATION	DISTANCE AND DIRECTION FROM PILGRIM UNIT 2	ESTIMATED PEAK USE 1980
Bri-Di-Mar Lodge	Plymouth	SE 1-1/4 mi.	12
Sandpiper Inn	Plymouth	SE 1-1/4 mi.	22
White Horse Beach Motel	Plymouth	SE 1-1/2 mi.	40
Colonial House Inn	Plymouth	SE 1-3/4 mi.	12
Mayflower Beach Lodge	Plymouth	SE 1-3/4 mi.	200
White's Cottages	Plymouth	SE 2 mi.	120
Shadow Fox Lodge	Plymouth	SE 2-1/4 mi.	13
Red Oaks Motel	Plymouth	SSE 1-1/2 mi.	50
Blue Spruce Motel	Plymouth	SSE 2-3/4 mi.	38
Cranberry Motel	Plymouth	SSE 4-1/2 mi.	50
Yankee Traveler Motel	Plymouth	WSW 1-1/2 mi.	130
Lofty Elm	Carver	WSW 9-3/4 mi.	24
Pilgrim Sands Motel	Plymouth	W 2-1/4 mi.	252
Loremar	Plymouth	W 2-1/2 mi.	14
The Inn	Plymouth	W 2-3/4 mi.	25
Meadowview Guest House	Plymouth	W 3-3/4 mi.	11
Blue Anchor Motel	Plymouth	W 4-1/4 mi.	15
Gov. Carver Motor Inn	Plymouth	W 4-1/2 mi.	328
Alden House	Plymouth	W 4-3/4 mi.	10
Cadillac Motel	Plymouth	W 5-1/2 mi.	66
Plymouth Motel	Plymouth	W 5-3/4 mi.	85
Clear Pond Cottages	Plymouth	W 7-3/4 mi.	6

TABLE 1  
(Continued)

HOTELS, MOTELS & GUEST HOUSES  
LOCATED WITHIN TEN MILES OF PILGRIM UNIT 2

FACILITY NAME	TOWN LOCATION	DISTANCE AND DIRECTION FROM PILGRIM UNIT 2	ESTIMATED PEAK USE 1980
Proctor's Cabins	Plymouth	W 8 mi.	120
Gov. Bradford Motor Inn	Plymouth	WNW 4-1/2 mi.	376
LeFebre's Guest House	Plymouth	WNW 4-3/4 mi.	2
Sleepy Pilgrim Motel	Plymouth	WNW 5-1/4 mi.	35
Cold Spring Motel	Plymouth	WNW 5-1/4 mi.	64
Breezy Hill Motel	Plymouth	WNW 6-1/4 mi.	25
Bayview	Kingston	WNW 6-3/4 mi.	35
Hilltop	Kingston	WNW 6-3/4 mi.	32
Capeway Travel Motel	Kingston	WNW 7 mi.	34
Howard Johnsons Motor Inn	Kingston	WNW 8 mi.	140
Gurnet Inn	Duxbury	WNW 9-1/4 mi.	32
TOTAL PEAK USE:			2,448

TABLE 2

CAMPS AND CAMPGROUNDS  
LOCATED WITHIN TEN MILES OF PILGRIM UNIT 2

FACILITY NAME	TOWN LOCATION	DISTANCE AND DIRECTION FROM PILGRIM UNIT 2	1980 ESTIMATED PEAK USE
Camp Child	Plymouth	SSE 5-1/2 mi.	200
Indian Head Campgrounds	Plymouth	SSE 7 mi.	900
Camp Dorothy Carleton	Plymouth	S 6-1/2 mi.	150
Baird Center	Plymouth	S 6-1/2 mi.	18
Timberland-Cedarwood	Plymouth	S 7 mi.	60
Camp Clark	Plymouth	S 7-3/4 mi.	120
Camp Dennen	Plymouth	S 8 mi.	200
Camp Massasoit	Plymouth	S 9-1/2 mi.	100
Camp Bourndale	Plymouth	S 9-1/2 mi.	150
Wind in the Pines	Plymouth	SSW 5-3/4 mi.	300
Pine Wood Camp	Plymouth	SSW 6-1/4 mi.	160
Camp Squanto	Plymouth	SSW 8-1/2 mi.	330
Camp Cachalot	Plymouth	SSW 9-3/4 mi.	200
Plymouth Recreation Center	Plymouth	WSW 1-1/2 mi.	75
Blueberry Hill Camp-ground	Plymouth	WSW 4-3/4 mi.	59
Ellis Haven	Plymouth	WSW 7-1/4 mi.	1200
Pinewood Lodge	Plymouth	W 8-1/4 mi.	400
Camp Norse	Plymouth	W 8-1/2 mi.	140
Camp Mishannoeh	Kingston	W 8-3/4 mi.	150
St. Margaret's Camp	Duxbury	NW 7-1/2 mi.	30
Camp Daniel Webster	Duxbury	NW 10 mi.	260
TOTAL PEAK USE:			5,202

TABLE 3

NURSING HOMES AND HOSPITALS  
LOCATED WITHIN TEN MILES OF PILGRIM UNIT 2

FACILITY NAME	TOWN LOCATION	DISTANCE AND DIRECTION FROM PILGRIM UNIT 2	ESTIMATED PEAK USE 1980
Plymouth Nursing Home	Plymouth	W 3-1/2 mi.	37
Jordan Hospital	Plymouth	W 3-1/2 mi.	135
Mayflower House	Plymouth	W 4-1/4 mi.	124
Pilgrim Manor Nursing Home	Plymouth	W 4-1/2 mi.	84
Newfield House	Plymouth	W 4-3/4 mi.	100
Happiness House Rest Home	Plymouth	WNW 4-3/4 mi.	36
Shady Breeze Rest Home	Kingston	WNW 8-3/4 mi.	15
TOTAL PEAK USE:			531

TABLE 4

JAILS AND DETENTION CENTERS  
LOCATED WITHIN TEN MILES OF PILGRIM UNIT 2

FACILITY NAME	TOWN LOCATION	DISTANCE AND DIRECTION FROM PILGRIM UNIT 2	ESTIMATED PEAK USE 1980
Plymouth County Jail (County Farm)	Plymouth	W 3-3/4 mi.	155
Town of Plymouth Jail	Plymouth	WNW 4-3/4 mi.	22
Mass. Correctional Institute	Plymouth	SSW 7-3/4 mi.	65
TOTAL PEAK USE:			242

TABLE 5

MAJOR TOURIST/HISTORIC SITES  
LOCATED WITHIN TEN MILES OF PILGRIM UNIT 2

FACILITY NAME	TOWN LOCATION	DISTANCE AND DIRECTION FROM PILGRIM UNIT 2	1980 ESTIMATED PEAK USE
Plimoth Plantation	Plymouth	W 2-3/4 mi.	500
William Harlow House	Plymouth	W 4-1/4 mi.	60
Sparrow House	Plymouth	W 4-1/4 mi.	30
Plymouth Rock	Plymouth	WNW 4-1/2 mi.	100
Mayflower II	Plymouth	WNW 4-3/4 mi.	125
Howland House	Plymouth	WNW 4-3/4 mi.	60
Spooner House	Plymouth	WNW 4-3/4 mi.	75
Mayflower Society House	Plymouth	WNW 4-3/4 mi.	60
Plymouth National Wax Museum	Plymouth	WNW 4-3/4 mi.	300
Pilgrim Hall Museum	Plymouth	WNW 5 mi.	100
Mayflower Experience	Plymouth	WNW 5 mi.	200
Antiquarian House	Plymouth	WNW 5 mi.	250
Cranberry World Visitors Center	Plymouth	WNW 5-1/2 mi.	400
John Bradford House	Kingston	WNW 8-1/4 mi.	80
Miles Standish Monument	Duxbury	NW 7-1/4 mi.	175
John Alden House	Duxbury	NW 9 mi.	30
TOTAL PEAK USE:			2,745

TABLE 6

PUBLIC RECREATION AREAS  
LOCATED WITHIN TEN MILES OF PILGRIM UNIT 2

FACILITY NAME	TOWN LOCATION	DISTANCE AND DIRECTION FROM PILGRIM UNIT 2	1980 ESTIMATED PEAK USE
White Horse Beach*	Plymouth	SE 1-1/2 mi.	2,000
Emerson Field	Plymouth	SSE 2-1/4 mi.	200
Brook Road Playground	Plymouth	SSE 2-1/2 mi.	100
Briggs Playground	Plymouth	SSE 2-3/4 mi.	200
Fresh Pond	Plymouth	SSE 2-3/4 mi.	1,500
Cederville Landing - Beach	Plymouth	SSE 9-1/4 mi.	100
Sagmore Highlands Beach	Bourne	SSE 9-1/2 mi.	50
Sagamore Beach	Bourne	SSE 10 mi.	120
Rocky Pond	Plymouth	S 5 mi.	100
Morey Hole Pond	Plymouth	S 1/2 mi.	100
Great Herring Pond	Plymouth	S 3 mi.	200
Big Sandy Pond	Plymouth	S 9 mi.	150
Cleft Rock Park	Plymouth	SSW 3/4 mi.	150
Long Pond	Plymouth	SSW 5-3/4 mi.	400
Miles Standish State Park**	Plymouth	SSW 6-10 mi.	2,255
Gunners Exchange Pond	Plymouth	SW 5-1/4 mi.	100
Miles Standish State Park**	Plymouth/Carver	SW 5-10 mi.	1,190
Cooks Pond	Plymouth/Carver	WSW 4-3/4 mi.	100
Miles Standish State Park**	Plymouth/Carver	WSW 6-10 mi.	420
Plymouth Beach*	Plymouth/Carver	W 3-4 mi.	4,000

TABLE 6  
(Continued)

PUBLIC RECREATION AREAS  
LOCATED WITHIN TEN MILES OF PILGRIM UNIT 2

FACILITY NAME	TOWN LOCATION	DISTANCE AND DIRECTION FROM PILGRIM UNIT 2	1980 ESTIMATED PEAK USE
Stephens Field	Plymouth/Carver	W 4 mi.	500
Haskell Field	Plymouth/Carver	W 4 mi.	200
Burton Park	Plymouth/Carver	W 4-1/4 mi.	0
Arthur Sirrico Play- ground	Plymouth	W 4-1/4 mi.	100
Training Green (Park)	Plymouth	W 4-1/4 mi.	0
Brewster Garden (Park)	Plymouth	W 4-1/2 mi.	1,500
Jenny Poor Farm (Park)	Plymouth	W 4-1/2 mi.	1,500
Phillip Jackson (Park)	Plymouth	W 4 mi.	0
Summer Street (Park)	Plymouth	W 4 mi.	150
Lout Pond	Plymouth	W 4-3/4 mi.	100
Allerton Street (Play- ground)	Plymouth	W 4-3/4 mi.	50
Morton Park	Plymouth	W 5-1/4 - 6-1/4 mi.	3,000
Little Pond	Plymouth	W 5-1/2 mi.	100
Nelson Street Play- ground	Plymouth	WNW 5-1/4 mi.	250
Siever Field	Plymouth	WNW 5-3/4 mi.	200
Veterans Field	Plymouth	WNW 6 mi.	150
Greys Beach	Kingston	WNW 7 mi.	1,200
Reed Community Center	Kingston	WNW 8-1/2 mi.	300
Boston Edison Shore- front	Plymouth	NW 1/4 mi.	268
Shipyard Lane Beach	Duxbury	NW 7-1/2 mi.	200



TABLE 6  
(Continued)

PUBLIC RECREATION AREAS  
LOCATED WITHIN TEN MILES OF PILGRIM UNIT 2

FACILITY NAME	TOWN LOCATION	DISTANCE AND DIRECTION FROM PILGRIM UNIT 2	1980 ESTIMATED PEAK USE
Percy Walker Pool	Duxbury	NW 9 mi.	300
Duxbury Beach*	Duxbury	NNW 7-3/4 - 8-1/4 mi.	1,200
Blakeman's Beach	Duxbury	NNW 8-1/4 - 8-1/2 mi.	7,500
Green Harbor Beach	Marshfield	NNW 10 mi.	4,000
TOTAL PEAK USE:			36,213

\* The beach itself extends beyond the indicated distance. However, beach useage predominantly takes place within the indicated area.

\*\* Miles Standish State Park is located in three sectors of the study area. The peak use estimates correspond to the useage in each separate sector.

TABLE 7

ESTIMATED CURRENT PEAK SEASONAL TRANSIENT POPULATION BY SECTOR (1980)

	DISTANCE FROM PILGRIM UNIT 2 (MILES)						TOTAL
	0-1	1-2	2-3	3-4	4-5	5-10	
N	0	0	0	0	0	0	0
NNE	0	0	0	0	0	0	0
NE	0	0	0	0	0	0	0
ENE	0	0	0	0	0	0	0
E	0	0	0	0	0	0	0
ESE	0	0	0	0	0	0	0
SE	0	2,286	133	0	0	0	2,419
SSE	0	50	2,068	0	50	1,370	3,538
S	0	0	0	0	0	1,348	1,348
SSW	150	0	0	0	0	3,710	3,860
SW	0	0	0	0	0	1,290	1,290
WSW	0	205	0	0	159	1,644	2,008
W	0	0	791	4,338	4,771	4,067	13,967
WNW	0	0	0	0	1,996	2,992	4,988
NW	268	0	0	0	0	995	1,263
NNW	0	0	0	0	0	12,700	12,700
TOTAL	418	2,541	2,992	4,338	6,976	30,116	47,381

TABLE 8

HOTELS, MOTELS & GUEST HOUSES  
LOCATED WITHIN TEN MILES OF PILGRIM UNIT 2

FACILITY NAME	TOWN LOCATION	DISTANCE AND DIRECTION FROM PILGRIM UNIT 2	ESTIMATED PEAK USE 1990
Bri-Di-Mar Lodge	Plymouth	SE 1-1/4 mi.	12
Sandpiper Inn	Plymouth	SE 1-1/4 mi.	22
White Horse Beach Motel	Plymouth	SE 1-1/2 mi.	40
Colonial House Inn	Plymouth	SE 1-3/4 mi.	12
Mayflower Beach Lodge	Plymouth	SE 1-3/4 mi.	200
White's Cottages	Plymouth	SE 2 mi.	120
Shadow Fox Lodge	Plymouth	SE 2-1/4 mi.	13
Red Oaks Motel	Plymouth	SSE 1-1/2 mi.	50
Blue Spruce Motel	Plymouth	SSE 2-3/4 mi.	98
Cranberry Motel	Plymouth	SSE 4-1/2 mi.	50
Yankee Traveler Motel	Plymouth	WSW 1-1/2 mi.	130
Lofty Elm	Carver	WSW 9-3/4 mi.	24
Pilgrim Sands Motel	Plymouth	W 2-1/4 mi.	252
Loremar	Plymouth	W 2-1/2 mi.	14
The Inn	Plymouth	W 2-3/4 mi.	75
Meadowview Guest House	Plymouth	W 3-3/4 mi.	11
Blue Anchor Motel	Plymouth	W 4-1/4 mi.	15
Gov. Carver Motor Inn	Plymouth	W 4-1/2 mi.	328
Alden House	Plymouth	W 4-3/4 mi.	10
Cadillac Motel	Plymouth	W 5-1/2 mi.	66
Plymouth Motel	Plymouth	W 5-3/4 mi.	85
Clear Pond Cottages	Plymouth	W 7-3/4 mi.	6

TABLE 8  
(Continued)

HOTELS, MOTELS & GUEST HOUSES  
LOCATED WITHIN TEN MILES OF PILGRIM UNIT 2

FACILITY NAME	TOWN LOCATION	DISTANCE AND DIRECTION FROM PILGRIM UNIT 2	ESTIMATED PEAK USE 1990
Proctor's Cabins	Plymouth	W 8 mi.	120
Gov. Bradford Motor Inn	Plymouth	WNW 4-1/2 mi.	376
LeFebre's Guest House	Plymouth	WNW 4-3/4 mi.	2
Sleepy Pilgrim Motel	Plymouth	WNW 5-1/4 mi.	35
Cold Spring Motel	Plymouth	WNW 5-1/4 mi.	64
Breezy Hill Motel	Plymouth	WNW 6-1/4 mi.	25
Bayview	Kingston	WNW 6-3/4 mi.	35
Hilltop	Kingston	WNW 6-3/4 mi.	32
Capeway Travel Motel	Kingston	WNW 7 mi.	34
Howard Johnsons Motor Inn	Kingston	WNW 8 mi.	140
Gurnet Inn	Duxbury	WNW 9-1/4 mi.	32
TOTAL PEAK USE:			2,528

CAMPS AND CAMPGROUNDS  
LOCATED WITHIN TEN MILES OF PILGRIM UNIT 2

FACILITY NAME	TOWN LOCATION	DISTANCE AND DIRECTION FROM PILGRIM UNIT 2	ESTIMATED PEAK USE 1990
Camp Child	Plymouth	SSE 5-1/2 mi.	200
Indian Head Campgrounds	Plymouth	SSE 7 mi.	1,000
Camp Dorothy Carleton	Plymouth	S 6-1/2 mi.	150
Baird Center	Plymouth	S 6-1/2 mi.	18
Timberland-Cedarwood	Plymouth	S 7 mi.	60
Camp Clark	Plymouth	S 7-3/4 mi.	120
Camp Dennen	Plymouth	S 8 mi.	400*
Camp Massasoit	Plymouth	S 9-1/2 mi.	100
Camp Bourndale	Plymouth	S 9-1/2 mi.	150
Wind in the Pines	Plymouth	SSW 5-3/4 mi.	600
Pine Wood Camp	Plymouth	SSW 6-1/4 mi.	160
Camp Squanto	Plymouth	SSW 8-1/2 mi.	730
Camp Cachalot	Plymouth	SSW 9-3/4 mi.	400*
Plymouth Recreation Center	Plymouth	WSW 1-1/2 mi.	150*
Blueberry Hill Camp- ground	Plymouth	WSW 4-3/4 mi.	118*
Ellis Haven	Plymouth	WSW 7-1/4 mi.	1200
Pinewood Lodge	Plymouth	W 8-1/4 mi.	400
Camp Norse	Plymouth	W 8-1/2 mi.	140
Camp Mishannoeh	Kingston	W 8-3/4 mi.	150
St. Margaret's Camp	Duxbury	NW 7-1/2 mi.	30
Camp Daniel Webster	Duxbury	NW 10 mi.	260

TOTAL PEAK USE: 6,536

\* Expansion plans expressed by owners though no specific number was able to be obtained. In these cases, peak use was assumed to double by 1990.

TABLE 10

NURSING HOMES AND HOSPITALS  
LOCATED WITHIN TEN MILES OF PILGRIM UNIT 2

FACILITY NAME	TOWN LOCATION	DISTANCE AND DIRECTION FROM PILGRIM UNIT 2	ESTIMATED PEAK USE 1990
Plymouth Nursing Home	Plymouth	W 3-1/2 mi.	37
Jordan Hospital	Plymouth	W 3-1/2 mi.	233
Mayflower House	Plymouth	W 4-1/4 mi.	124
Pilgrim Manor Nursing Home	Plymouth	W 4-1/2 mi.	168
Newfield House	Plymouth	W 4-3/4 mi.	100
Happiness House Rest Home	Plymouth	WNW 4-3/4 mi.	36
Shady Breeze Rest Home	Kingston	WNW 8-3/4 mi.	15
TOTAL PEAK USE:			703

TABLE 11

JAILS AND DETENTION CENTERS  
LOCATED WITHIN TEN MILES OF PILGRIM UNIT 2

FACILITY NAME	TOWN LOCATION	DISTANCE AND DIRECTION FROM PILGRIM UNIT 2	ESTIMATED PEAK USE 1990
Plymouth County Jail (County Farm)	Plymouth	W 3-3/4 mi.	155
Town of Plymouth Jail	Plymouth	WNW 4-3/4 mi.	22
Mass. Correctional Institute	Plymouth	SSW 7-3/4 mi.	65
TOTAL PEAK USE:			242

TABLE 12

MAJOR TOURIST/HISTORIC SITES  
LOCATED WITHIN TEN MILES OF PILGRIM UNIT 2

FACILITY NAME	TOWN LOCATION	DISTANCE AND DIRECTION FROM PILGRIM UNIT 2	ESTIMATED PEAK USE 1990
Plimoth Plantation	Plymouth	W 2-3/4 mi.	500
William Harlow House	Plymouth	W 4-1/4 mi.	60
Sparrow House	Plymouth	W 4-1/4 mi.	30
Plymouth Rock	Plymouth	WNW 4-1/2 mi.	100
Mayflower II	Plymouth	WNW 4-3/4 mi.	125
Howland House	Plymouth	WNW 4-3/4 mi.	60
Spooner House	Plymouth	WNW 4-3/4 mi.	75
Mayflower Society House	Plymouth	WNW 4-3/4 mi.	60
Plymouth National Wax Museum	Plymouth	WNW 4-3/4 mi.	600*
Pilgrim Hall Museum	Plymouth	WNW 5 mi.	600
Mayflower Experience	Plymouth	WNW 5 mi.	400*
Antiquarian House	Plymouth	WNW 5 mi.	250
Cranberry World Visitors Center	Plymouth	WNW 5-1/2 mi.	400
John Bradford House	Kingston	WNW 8-1/4 mi.	80
Miles Standish Monument	Duxbury	NW 7-1/4 mi.	175
John Alden House	Duxbury	NW 9 mi.	30
TOTAL PEAK USE:			3,545

\* No expansion plans would be revealed by owner. Peak use assumed to double by 1990.



TABLE 13

PUBLIC RECREATION AREAS  
LOCATED WITHIN TEN MILES OF PILGRIM UNIT 2

FACILITY NAME	TOWN LOCATION	DISTANCE AND DIRECTION FROM PILGRIM UNIT 2	ESTIMATED PEAK USE 1990
White Horse Beach*	Plymouth	SE 1-1/2 mi.	2,866
Emerson Field	Plymouth	SSE 2-1/4 mi.	275
Brook Road Playground	Plymouth	SSE 2-1/2 mi.	146
Briggs Playground	Plymouth	SSE 2-3/4 mi.	200
Fresh Pond	Plymouth	SSE 2-3/4 mi.	1,500
Cederville Landing - Beach	Plymouth	SSE 9-1/4 mi.	100
Sagmore Highlands Beach	Bourne	SSE 9-1/2 mi.	72
Sagamore Beach	Bourne	SSE 10 mi.	172
Rocky Pond	Plymouth	S 5 mi.	143
Morey Hole Pond	Plymouth	S 5-1/2 mi.	143
Great Herring Pond	Plymouth	S 9 mi.	287
Big Sandy Pond	Plymouth	S 9 mi.	215
Cleft Rock Park	Plymouth	SSW 3/4 mi.	219
Long Pond	Plymouth	SSW 5-3/4 mi.	573
Miles Standish State Park**	Plymouth	SSW 6-10 mi.	3,299
Gunners Exchange Pond	Plymouth	SW 5-1/4 mi.	143
Miles Standish State Park**	Plymouth/Carver	SW 5-10 mi.	1,741
Cooks Pond	Plymouth/Carver	WSW 4-3/4 mi.	143
Miles Standish State Park**	Plymouth/Carver	WSW 6-10 mi.	614
Plymouth Beach*	Plymouth/Carver	W 3-4 mi.	5,732

TABLE 13  
(Continued)

PUBLIC RECREATION AREAS  
LOCATED WITHIN TEN MILES OF PILGRIM UNIT 2

FACILITY NAME	TOWN LOCATION	DISTANCE AND DIRECTION FROM PILGRIM UNIT 2	ESTIMATED PEAK USE 1979
Stephens Field	Plymouth/Carver	W 4 mi.	500
Haskell Field	Plymouth/Carver	W 4 mi.	200
Burton Park	Plymouth/Carver	W 4-1/4 mi.	0
Arthur Sirrico Play- ground	Plymouth	W 4-1/4 mi.	100
Training Green (Park)	Plymouth	W 4-1/4 mi.	0
Brewster Garden (Park)	Plymouth	W 4-1/2 mi.	1,500
Jenny Poor Farm (Park)	Plymouth	W 4-1/2 mi.	1,500
Phillip Jackson (Park)	Plymouth	W 4-1/2 mi.	0
Summer Street (Park)	Plymouth	W 4-3/4 mi.	150
Lout Pond	Plymouth	W 4-3/4 mi.	143
Allerton Street (Play- ground)	Plymouth	W 4-3/4 mi.	60
Morton Park	Plymouth	W 5-1/4 - 6-1/4 mi.	4,386
Little Pond	Plymouth	W 5-1/2 mi.	143
Nelson Street Play- ground	Plymouth	WNW 5-1/4 mi.	250
Siever Field	Plymouth	WNW 5-3/4 mi.	200
Veterans Field	Plymouth	WNW 6 mi.	150
Greys Beach	Kingston	WNW 7 mi.	1,200
Reed Community Center	Kingston	WNW 8-1/2 mi.	430
Boston Edison Shore- front	Plymouth	NW 1/2 mi.	268
Shipyard Lane Beach	Duxbury	NW 7-1/2 mi.	218

TABLE 13  
(Continued)

PUBLIC RECREATION AREAS  
LOCATED WITHIN TEN MILES OF PILGRIM UNIT 2

FACILITY NAME	TOWN LOCATION	DISTANCE AND DIRECTION FROM PILGRIM UNIT 2	
Percy Walker Pool	Duxbury	NW 9 mi	430
Duxbury Beach*	Duxbury	NNW 7-3/4 - 8-1/4 mi.	1,720
Blakeman's Beach	Duxbury	NNW 8-1/4 - 8-1/2 mi.	7,500
Green Harbor Beach	Marshfield	NNW 10 mi.	5,732
TOTAL PEAK USE:			45,363

\* The beach itself extends beyond the indicated distance. However, beach useage predominantly takes place within the indicated area.

\*\* Miles Standish State Park is located in three sectors of the study area. The peak use estimates correspond to the useage in each separate sector.

TABLE 14

ESTIMATED 1990 PEAK SEASONAL TRANSIENT POPULATION BY SECTOR  
TOTALS

	DISTANCE FROM PILGRIM UNIT 2 (MILES)						TOTAL
	0-1	1-2	2-3	3-4	4-5	5-10	
N	0	0	0	0	0	0	0
NNE	0	0	0	0	0	0	0
NE	0	0	0	0	0	0	0
ENE	0	0	0	0	0	0	0
E	0	0	0	0	0	0	0
ESE	0	0	0	0	0	0	0
SE	0	3,152	133	0	0	0	3,285
SSE	0	50	2,219	0	50	1,544	3,863
S	219	0	0	0	0	1,786	2,005
SSW	0	0	0	0	0	5,827	5,827
SW	0	0	0	0	0	1,884	1,884
WSW	0	280	0	0	261	1,838	2,379
W	0	0	841	6,158	4,898	5,496	17,393
WNW	0	0	0	0	2,796	3,122	5,918
NW	268	0	0	0	0	1,143	1,411
NNW	0	0	0	0	0	14,952	14,952
TOTAL	487	3,482	3,193	6,158	8,005	37,592	58,917

TABLE 15  
REVISED PEAK BEACH POPULATION ESTIMATES

<u>Facility Name</u>	<u>Town</u>	<u>Sector</u> <u>Location</u>	<u>1980 Est.</u> <u>Peak # of</u> <u>Vehicles</u>	<u>Estimated<sup>(c)</sup></u> <u>Population</u>
Duxbury Beach Parking Lot*	Duxbury	NNW 7-3/4 - 8-1/4 mi.	265(a)	795
Beach Buggy Usage*	Duxbury	NNW 7-8 mi.	400(b)	1,200
Parking Lot on West end of Powder Point Bridge*	Duxbury	NNW 7-3/4 - 8-1/4 mi.	50(c)	150
Blakeman's Parking Lot*	Duxbury	NNW 8-1/4 - 8-1/2 mi.	1,500(c)	4,500
Bradford Parking Lot*	Duxbury	NNW 8-1/2 - 9 mi.	100(c)	300
Green Harbor Beach Parking**	Marshfield	NNW 10 mi.	1,000(c)	3,000

\*Source: Ed Leary - Beach Conservation Officer.

\*\*Source: Marshfield Police - Sergeant Welsh.

- (a) Residents only - parking sticker required.
- (b) Estimated 200 residents and 200 transients.
- (c) Estimated to be composed of primarily transients from outside of the 10-mile area.
- (d) Assuming 3 persons per automobile.

MAJOR ROADWAY IMPROVEMENTS  
IN THE  
VICINITY OF THE  
PILGRIM NUCLEAR POWER  
GENERATING STATION

July 31, 1981

MAJOR ROADWAY IMPROVEMENTS WITHIN THE VICINITY OF THE  
PILGRIM NUCLEAR POWER GENERATING STATION

Introduction

NRC has requested that Boston Edison Company examine proposed State and local roadway improvements, for the towns within the plume exposure EPZ, which might affect traffic flow during an evacuation. Highway engineers at State and local DPW offices\* have been contacted in order to identify projects either underway or approved for start prior to 1990 which would involve roadway widenings, realignments or other significant alterations which could influence traffic flows and capacity.

This information will be factored into the transportation modeling along with projected population estimates for the year 1990 in order to develop evacuation time estimates for the Pilgrim Unit 2 at the time of plant startup.

Findings

Based on interviews with State and local highway engineers, roadway projects in the area, both planned and anticipated, were identified. The following table summarizes those projects and differentiates between State and local roadway improvements. Projects designated in the table as being Planned are most likely to be built within the next 5 years, although funding uncertainties could affect the time frames and construction dates of this work. Projects that are labelled as Proposed in the table are of a longer time frame and subject to greater uncertainty.

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\* Telephone interviews with the following DPW engineers: Mr. Jack Hurley, Head of Environmental Section, State DPW; Mr. Ken Wilman, Engineer, Planning Division, State DPW; and Mr. Lionel LaBelle, Project Engineer, State DPW, District 7 regional office.

## FUTURE HIGHWAY PROJECTS

<u>Town</u>	<u>State Projects</u>	<u>Local Projects</u>
Plymouth	<p><u>Planned:</u> 3.5 mile reconstruction of Rt. 3A from Kingston town line to Jabey's Corner; involves lane widening with addition of shoulders.</p> <p><u>Proposed:</u> Rt. 3 upgrade along entire length to improve operations, maintaining same width. This would include resurfacing, signing, etc. to improve traffic flows.</p>	<p><u>Planned:</u> straightening of curve on Long Pond Rd. just south of Clark Rd.</p>
Carver	<p><u>Planned:</u> 8-mile reconstruction of Rt. 58 from Wareham line to Plympton work (beginning 1982-83); involves widening of lanes with addition of shoulders. New extension of Rt. 44 between Rt. 58 and Rt. 3, with new connector interchanges (beginning 1985-86).</p> <p><u>Proposed:</u> Completion of remainder of Rt. 44 to Middleboro as 4-lane road (10-20 year time frame anticipated). Completion of remainder of Rt. 58 reconstruction (10-20 year time frame).</p>	<p><u>Planned:</u> 2.5-mile lane widening of South Meadow Rd. from Plymouth line to Rt. 58.</p>
Bridgewater	<p><u>Planned:</u> I-495 interchange at Rt. 25 to be completed in next 2 years.</p>	
Marshfield	<p><u>Proposed:</u> Bridge replacement and improvement with no increased traffic capacity.</p>	
Bourne	<p><u>Proposed:</u> Rt. 25 extension to Cape Cod Canal and Bourne Bridge with similar capacity to existing Rt. 25 (6 lanes).</p>	
Wareham	<p><u>Proposed:</u> Bridge replacement and improvements with no increased traffic capacity.</p>	