FINAL REPORT

Evacuation Time Assessment for Transient and Permanent Population from Various Areas Within the Plume Exposure Pathway Emergency Planning Zone

Diablo Canyon Power Plant
2002 Update

September 2002

FOREWORD

This update of the Evacuation Time Assessment for the Diablo Canyon Power Plant (DCPP) recognizes the population figures need periodic updating. The previous evacuation time assessment was prepared in 1992 and reflected 1990 conditions within the Basic Emergency Planning Zone (BEPZ). This current evacuation time assessment update reflects 2000 census data.

A significant amount of time and effort has been invested by Pacific Gas and Electric and San Luis Obispo County staff and Wilbur Smith Associates in the development of permanent and transient population estimates within the BEPZ. This effort was focused on providing the most accurate estimates possible without double counting and developing overly conservative population levels. It should also be noted that Wilbur Smith Associates has utilized automobile ownership by household statistics in the estimation of evacuation vehicles for the permanent population and has applied auto usage assumptions that are slightly higher than those that have been used in the past. Wilbur Smith Associates believes that these refinements have resulted in a more realistic assessment of both the potential evacuation vehicle demand and evacuation time estimates.

The analysis was performed using a computer simulation model to investigate four different evacuation conditions: a non-summer weekday condition, a non-summer weeknight condition, a summer weekday condition, and a summer weekend day condition. For each condition, nine different combinations of Protective Action Zones (PAZs) were used to simulate evacuation of various portions of the BEPZ. Time required to complete an evacuation of the entire BEPZ is estimated to be 13 hours on a normal weekday, 11 hours on a normal weeknight, 12 1/2 hours on a summer weekday, and 12 hours on a summer weekend day. Partial evacuations would require less time and are the most likely evacuation scenarios to occur.

Substantial effort has also been expended by Pacific Gas and Electric, San Luis Obispo County staff and Wilbur Smith Associates in the preparation and review of draft study products prior to finalizing the study report. These quality control/assurance efforts have resulted in a final study product that can be used effectively in the emergency response planning for Diablo Canyon Power Plant.

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INTRODUCTION

This report presents the results of an updated assessment of evacuation times within the Basic Emergency Planning Zone (BEPZ) surrounding the Diablo Canyon Power Plant in San Luis Obispo County, California. The report was prepared by Wilbur Smith Associates (WSA) in response to a request by the Nuclear Regulatory Commission (NRC) that licensees of nuclear power plants provide information regarding time estimates for evacuation of the resident and transient populations within the Emergency Planning Zone. The evacuation time estimates are for use by those emergency response personnel responsible for recommending and deciding on protective actions in the event of nuclear power plant emergencies.

A previous evacuation time assessment was prepared by WSA in 1992 which reflected 1990 conditions within the BEPZ[1]. Recognizing that population figures need periodic updating, Pacific Gas & Electric Company (PG&E) contracted WSA at the end of 2000 to re-evaluate the evacuation time estimates using 2000 census data.

1.1 Study Scope

This evacuation time estimate study provides the information and uses the presentation formats described in "Appendix 3: Evacuation Time Estimates Within the Plume Exposure Pathway Emergency Planning Zone, Revision 1" of NUREG-0654[2]. The evacuation time study includes:

1. The identification of resident and transient populations within the BEPZ in 2000, based upon available information.

2. Identification of existing institutions which require special evacuation assistance.

3. An evaluation of evacuation routes relative to traffic-carrying capacity during an evacuation.

[1] Evacuation Times Assessment for Transient and Permanent Population from Various Areas Within the Plume Exposure Pathway Emergency Planning Zone Diablo Canyon Power Plant Update, December, 1992, prepared for the PG&E Company by Wilbur Smith Associates.

[2] Criteria for Preparation and Evaluation of Radiological Emergency Response Plans and Preparedness in Support of Nuclear Power Plants, U.S. Nuclear Regulatory Commission, November, 1980 (Revision 1).

4. Estimation of evacuation time requirements for the resident and transient populations and special institutions under normal and adverse weather conditions.

1.2 Regional Location

As shown in **Figure 1**, the Diablo Canyon Power Plant is located on the coastline of San Luis Obispo County between the communities of Morro Bay and Pismo Beach. The Plant site is approximately 12 miles west of the City of San Luis Obispo, California.

1.3 Basic Emergency Planning Zone

The geographic relationship of the Diablo Canyon Power Plant to nearby communities, major roadways, and generalized topographic features in the BEPZ is illustrated in **Figure 2**. The power plant is sited on a coastal shelf surrounded by the steep topography of the Irish Hills. The Irish Hills separate the site from the nearest communities some six to eight miles away. These communities are Avila Beach to the southeast and Baywood Park-Los Osos to the north.

Resident population in the area tends to be concentrated in the City of San Luis Obispo and along the U.S. Route 101/California Route 1 corridor to the south through the "Five Cities" area which includes Shell Beach, Pismo Beach, Grover Beach, Arroyo Grande, Oceano, and Nipomo. Population in the BEPZ is also located westward from San Luis Obispo through the Los Osos Valley area, in the Morro Bay vicinity, and northward along the coast to Cayucos. To the northeast Cuesta Ridge, in the Los Padres National Forest, acts as a barrier to development.

1.4 Protective Action Zones

Emergency planning zones have been established by the NRC, Federal Emergency Management Agency (FEMA), the State of California Office of Emergency Services (OES), and by the County of San Luis Obispo. The NRC/FEMA zones are based upon a 10-mile zone with 16 sectors subtending 22.5 degrees of arc and distance rings of 2, 5, and 10 miles. However, the County of San Luis Obispo and the State of California OES defined a somewhat larger area called the Basic Emergency Planning Zone (BEPZ). The BEPZ is divided into 12 irregularly shaped Protective Action Zones (PAZ) which reflect the coastline, the mountainous areas, and the population centers[3]. Beyond the BEPZ is a Public Education Zone. This zone receives information about the Diablo Canyon Power Plant on a semi-annual basis.

The BEPZ and the PAZs in this evacuation time assessment are depicted in **Figure 3.**

[3] 10CFR 50.33, the DCPP Emergency Plan, the San Luis Obispo County/Cities Emergency Plan and the Radiation Protection Act.

1.4.1 BEPZ Population

BEPZ Resident Population

A summary of current (year 2000) U. S. Census Bureau-based resident population and number of dwelling units by Protective Action Zone (PAZ) for the "base case" scenario is given in **Table 1.** Year 1990 data is also shown along with the resultant total growth for the 10-year period.

The base case scenario is defined as a normal non-summer weekday, with both Cuesta College and California Polytechnic State University in normal session. For the entire 12-zone BEPZ, 2000 population totals estimated 142,427 persons for this scenario, an increase of 8.7 percent over the 1990 total. The number of dwelling units went up from 55,055 to 61,394 over the period, an increase of about 11.5 percent.

A comparison of 2000 and 1990 figures by PAZ reveals that growth was not uniform throughout the BEPZ. Within the two-mile ring, no new dwelling units were recorded since 1990. Between two and six miles, two new dwellings were built. Approximately 2,100 new dwellings were built in PAZ eight and 1,700 in PAZ 10, indicating relatively rapid growth in these areas. About 400 to 800 new homes were recorded in each of zones 6, and 9, while slower growth (less than 400) occurred in zones 3, 4, 5, 7, 11, and 12.

The far right column in **Table 1** includes the margin of error that has been estimated for each PAZ population and the BEPZ population as a whole. The margin of error estimate reflects the potential for error introduced when PAZ or BEPZ boundaries split census tracts. In these cases, the demographic data within the split tract is proportioned to the PAZ's based on the general area of land that falls within each of the affected PAZ's. Generally, the more split census tracts that occur within a PAZ and the greater the population/housing within the split tract(s), the higher the potential for error.

A summary of current resident population by PAZ for four alternative evacuation scenarios is given in **Table 2**. The evacuation scenarios include Normal Non-Summer Weekday ("base case"), Normal Non-Summer Week Night, Normal Summer Weekday, and Normal Summer Weekend Day. For the purposes of this study, "Summer" is represented by the month of August, while "Non-Summer" is represented by April or October. As stated previously, for Scenario 1, the Normal Non-Summer Weekday, resident population figures include the full student populations of both California Polytechnic State University and Cuesta College. Scenario 2 represents a Normal Non-Summer Week Night condition. In this scenario, resident population is the same as for the Normal Non-Summer Weekday, since all residents are assumed to return home during the Normal Non-Summer Weekday scenario prior to evacuating. The Normal Non-Summer Week Night scenario is assumed to occur on a late spring or early fall week night.

The Normal Summer Weekday resident population, scenario 3, includes a reduced number

of college students. Specifically, scenario 3 includes those college students enrolled in summer classes and maintaining a residence within the BEPZ as well as 50 percent of those not enrolled but still maintaining a residence off-campus but within the BEPZ. The assumption is that at any given time during the summer, half of the students that are not enrolled in the summer session and that live off campus within the BEPZ, are temporarily outside of the EPZ.

The Normal Summer Weekend Daytime resident population, scenario 4, is the same as in the Normal Summer Weekday.

BEPZ Transient Population

Transient populations consist of non-resident visitors to the BEPZ area, such as tourists and beachgoers, and workers and students who live outside the BEPZ. The evacuation time estimates assume that residents of the BEPZ will return home prior to an evacuation. Note that a portion of beachgoers, workers, and students are residents of the BEPZ and therefore are not included in the estimates of transients, as this would result in double-counting of the resident population category.

Higher than normal levels of transient population occurs within the BEPZ during the summer on weekends and holidays. During these periods, considerable numbers of persons from outside the BEPZ visit the beach recreation areas. Also included in the transient population component are employees who work within the BEPZ, but reside outside. As shown in **Table 3**, the estimated BEPZ transient population for the Normal Non-Summer Weekday, Scenario 1, is 30,544. For the Non-Summer Nighttime, Scenario 2, the BEPZ transient population is 15,919. On the Normal Summer Weekday, Scenario 3, the estimated BEPZ transient population is 36,495. Finally, for the Normal Summer Weekend day, Scenario 4, the transient population in the BEPZ is 35,437. It should be noted that on certain holidays such as the Fourth of July, these transient population numbers can be considerably higher. For example, visitation statistics indicate that the number of visitors to Oceano Dunes State Vehicle Recreation Area may approach 50,000 on July 4th (vs. 10,000 on a typical summer weekend day).

Although Scenario 1 represents a non-summer condition, data shows that there still are a substantial number of transients (workers and tourists) that would be present at this time (in addition to residents). Recreation facilities such as State Parks and public beaches would still be significantly utilized. This scenario assumes that the evacuation occurs during the midday period when the maximum number of visitors and transient workers would be present within the BEPZ.

Scenario 2, the nighttime scenario, represents a non-summer nighttime condition, with significantly lower numbers for both transient workers and visitors. In the event that an evacuation takes place at night, the maximum resident population and the minimum transient population would be in the BEPZ. This scenario assumes the evacuation warning occurs on a

non-summer evening when most people would be at their permanent or temporary place of residence. Non-resident visitors would be generally limited to those individuals that are lodging overnight at area hotels, RV parks and at State Park campsites.

Summer Weekday, scenario 3, represents a summer condition with significant numbers of both transient workers and tourists. As a result, this scenario has a higher number for transient population than the Non-Summer Weekday, Nighttime, or Summer Weekend scenarios. Recreation facilities such as State Parks and public beaches would be significantly utilized, while employment and resulting transient workers within the BEPZ would be comparable to the non-summer periods. This scenario assumes that the evacuation occurs during the midday period when the maximum number of visitors and transient workers would be present within the BEPZ.

Finally, Scenario 4, Summer Weekend Daytime, has the second-highest number of potential transient evacuees. In this weekend daytime scenario, it was assumed that the evacuation occurred at mid-day when the largest number of visitors would be in the area. Transient workers would be significantly less for this scenario than for either weekday scenario.

Tables 4.1 & 4.2 provide a detailed breakdown of transient population by category and scenario, including transient workers, hotel visitors, state park visitors, RV park and campground visitors, visitors to local beaches, and transient students.

Transient workers, the largest component of the transient population on non-summer weekdays, is derived from data supplied by the San Luis Obispo Council of Governments (SLOCOG), and the 1995 Jobs/Housing Balance Study. Estimates of transient workers by evacuation condition are based on job classification distribution data supplied by SLOCOG.

Hotel visitors represent that segment of the transient population identified through an inventory of hotel rooms within the BEPZ and average hotel occupancy rates and room occupancy rates. This component of the transient population represents visitors (including tourists, business travelers, and others) residing in local hotels during their stay within the BEPZ. Information used to derive these estimates was provided by the San Luis Obispo Visitors & Conference Bureau. This data indicated a hotel occupancy rate of 87.4 percent for the summer and 65.5 percent for the non-summer scenarios, with an average room occupancy rate of 2.3 persons/room.

State Park visitors, including both day-use and overnight campers, are derived from actual State Park visitor attendance statistics and official estimates of off-season and normal summer season utilization of the various State Parks facilities within the San Luis Obispo Coast District. The attendance statistics were discussed with the State Parks department rangers to assist in the interpretation of these statistics and to ultimately estimate transient visitors to State Parks and beaches for the four evacuation scenarios. **Table 5** presents a detailed breakdown of State Park transient population by PAZ and evacuation condition. It should be noted that the transient population estimates that appear in **Table 5** do not include park visitors that reside

within the BEPZ. The transient population estimates only include those park visitors that reside outside the BEPZ. Additionally, transient population estimates represent a "snapshot" in time of transient visitors rather than the total daily visitation.

The portion of park visitors that are transient to the BEPZ varies by park facility. Visitors to the park campgrounds were assumed to be all transients. Visitors to the day-use facilities at Pismo Beach State Park were found to be comprised of about two-thirds transient visitors and one-third BEPZ residents. Day-use facilities within Montana de Oro State Park are known to be used by many local residents (approximately 50 percent of the total visitors). Visitor access statistics at Moro Bay State Park required careful interpretation since the park access road is used by local residents as a convenient travel route between Baywood Park and Cabrillo Highway (SR 1).

It is important to note that while normal summer conditions result in visitation at the State Parks that is higher than average, there are numerous holidays during the summer (e.g. 4th of July) that generate even higher visitation levels. Although the transient visitors would be greater during these holidays, they may also attract a slightly higher proportion of local visitors. Holidays that occur during the non-summer period would also attract higher than normal "non-summer" visitation that would be comparable to the normal summer condition. It is also important to note that the non-summer condition is assumed to represent late spring or early fall conditions when the weather conditions are still relatively mild (summer is represented by the month of August). Winter conditions would result in even lower visitation numbers.

Private Campgrounds represent that component of the transient population made up of RV parks and other campsites not included within the boundaries of any of the various State Parks in San Luis Obispo County. Estimates of persons at private campgrounds were derived from an inventory of available campsites and seasonal occupancy statistics provided by the San Luis Obispo County Visitors & Conference Bureau.

Local Beaches include the transient component of local beach population at both Avila and Pismo Beaches, as well as at Port San Luis. Estimates of transient beach visitors are based on peak utilization of public beaches at these three locations, with an assumption of 50 percent of the total beach visitor population composed of transients from outside the BEPZ. The total peak-period beach population was derived from information supplied by Port San Luis and Pismo beach officials. It should be noted that there is a maximum beachgoer population at most public beaches on peak days dictated by the limited availability of parking.

Transient Students are composed of students commuting to Cuesta College and Cal Poly from outside the BEPZ, primarily from the North County area. Cuesta College students form the larger portion of the two groups of student commuters, as the majority of Cal Poly students already reside within the BEPZ. Estimates of transient students are based on student residence location statistics supplied by the San Luis Obispo Council of Governments and student enrollment statistics supplied by Cal Poly and Cuesta College. These statistics indicate that just 5 percent of Cal Poly students commute into the BEPZ from the North County

area and Santa Barbara County, whereas 23.5 percent of Cuesta College students commute into the BEPZ from these areas.

In all cases, the number of potential evacuees listed for each transient population category reflects persons with residences outside the BEPZ.

Conclusions

Since year 2000 transient population figures are not readily available from the 2000 Census data in a format which was useable in this study, it was necessary for WSA to develop these estimates based on several sources of information including: SLOCOG's 1995 Jobs Housing Balance Study; SLOCOG's 1999 Regional Profile; San Luis Obispo County Visitors and Conference Bureau data; Cal Poly student enrollment and housing occupancy data; 2001 California Department of Parks and Recreation Visitor/Attendance Reports; local Chamber of Commerce published material; and local field investigations.

Based on our investigations, the worker and hotel visitor components of the transient population were found to represent a major portion of the total transients potentially present within the BEPZ on a Normal Non-Summer weekday and Summer Weekday. For the Normal Non-Summer Week Night and Normal Summer Weekend Daytime conditions, workers were much less significant and the visitors to State Parks and private recreation facilities were much more significant in the composition of total transients.

In the year 2000 transient population estimates, workers represent 51 percent and 34 percent of the Normal Weekday and Summer Weekday condition transient population estimates respectively. Hotel visitors represent another 32 percent and 36 percent of the Normal Weekday and Summer Weekday condition transient population estimates respectively.

Hotel visitors represent a very significant 61 percent of the Normal Week Night condition transient population estimate and 37 percent of the Normal Summer Weekend condition transient estimate. For these same two scenarios, visitors of the State, public, and private beach/campground facilities represent a significant 29 percent and 49 percent respectively.

1.5 Major Transportation Facilities

The regional highway network comprises the primary transportation facilities that would be of principal relevance in an emergency evacuation. These are shown in **Figure 2**. Two major routes -- U.S. Route 101 and California Route 1 -- are primary elements of the roadway system. U.S. 101 is constructed to freeway standards through most of the BEPZ, as a four-lane divided roadway with grade separation. Proceeding northward from San Luis Obispo, U.S. 101 climbs a steep 7% grade about five miles long to the Cuesta Pass. This segment, and some further to the north, are constructed to expressway standards with some at-grade intersections. There is currently an improvement project underway which will add truck

climbing lanes to this segment of U.S. 101. While this improvement will increase the capacity of the "Cuesta Grade" segment, the remaining two-lane segments both south and north of the Cuesta Grade will effectively constrain the capacity to two lanes.

California Route 1 north of San Luis Obispo, has been upgraded generally to four-lane expressway design standards in the BEPZ, with freeway segments in the urban stretches through Morro Bay and Cayucos. South of its south junction with U.S. 101 in Pismo Beach, to the Santa Barbara County line, State Route 1 functions as a local street of varying cross-section and reduced capacity.

Other routes that are located in the BEPZ and would be used for evacuation generally have two-lane cross-sections with lower capacity than the major through routes. These include State Route 227; Price Canyon Road; Los Berros Road; Los Osos Valley Road; South Bay Boulevard; State Route 41; and Old Creek Road.

In addition to the critical evacuation routes that are located within BEPZ and/or cross the BEPZ boundary, there are several significant evacuation routes located outside of the BEPZ that will serve to disperse the evacuation traffic once it has exited the BEPZ. These routes include: State Route 166 that runs along the San Luis Obispo/Santa Barbara County line; State Route 58 that heads east into Kern County from U.S. 101 just south of Atascadero; and State Route 46 that connects California Route 1 to U.S. 101 and destinations further east in Kern County. While these routes would serve an important supplemental routing function during an evacuation, they are not a critical constraint that determines the evacuation time for populations within the BEPZ.

1.6 Emergency Response Plan

This study has been completed in consultation and cooperation with the primary local response agencies responsible for evacuation planning and implementation within the area. The evacuation time estimates presented in this study were developed to reflect the plans and procedures set forth in the relevant emergency response plans which have been developed and adopted by the various local agencies. These plans define the agency responsibilities, assigned functions, and procedures to be utilized in the event of a radiological incident at Diablo Canyon Power Plant. The principal plans include:

Off-site Emergency Response Plans

- San Luis Obispo County/Cities Nuclear Power Plant Emergency Response Plan;
- San Luis Obispo County/Cities Nuclear Power Plant Emergency Response Plan, Standard Operating Procedure - California Highway Patrol, San Luis Obispo Area Office;
- San Luis Obispo County/Cities Nuclear Power Plant Emergency Response Plan,

Standard Operating Procedure - State Department of Parks and Recreation;

- San Luis Obispo County/Cities Nuclear Power Plant Emergency Response Plan, Standard Operating Procedure – County Office of Education;

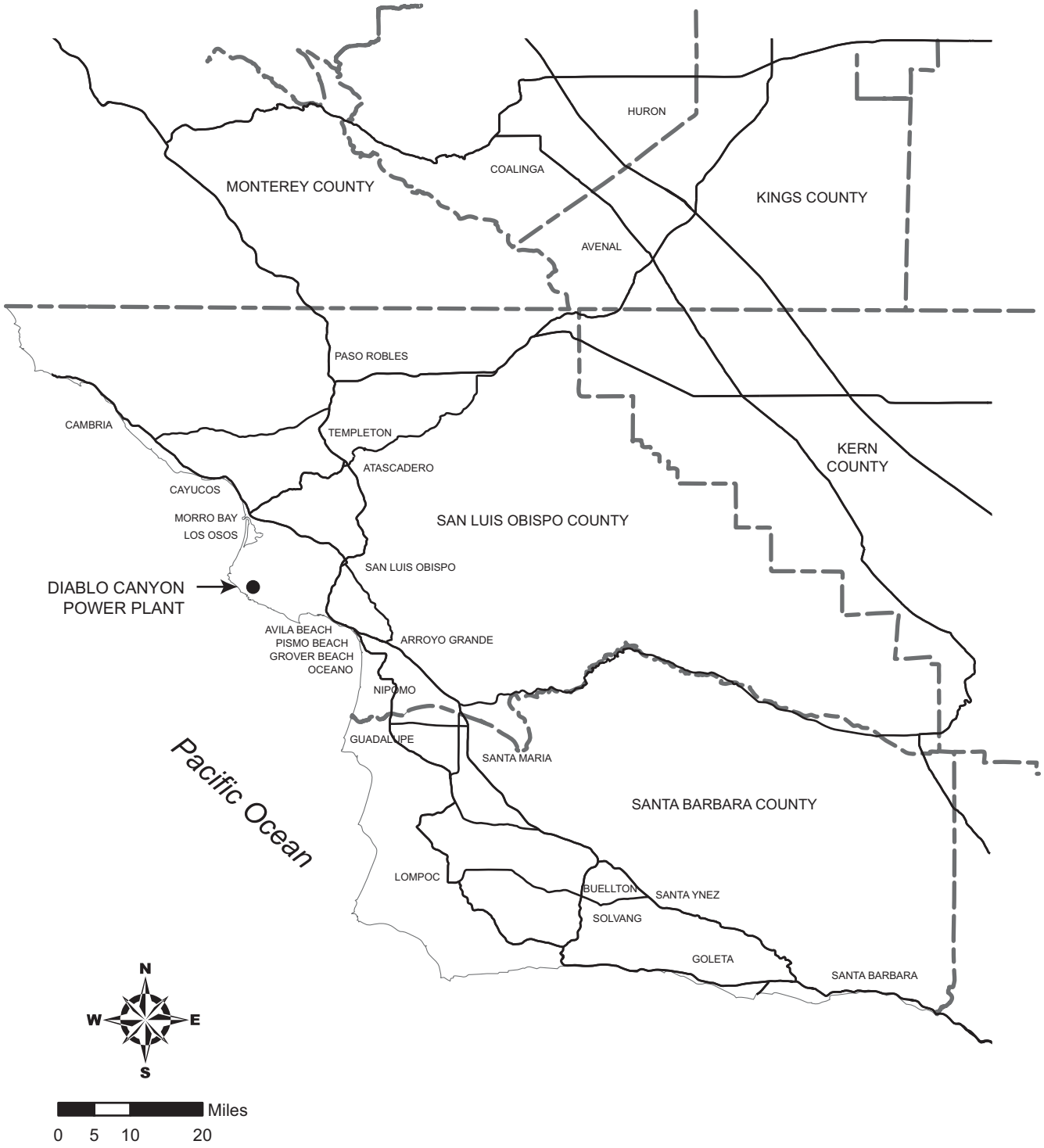
- San Luis Obispo County/Cities Nuclear Power Plant Emergency Response Plan, Standard Operating Procedures - San Luis Coastal Unified School District;

- San Luis Obispo County/Cities Nuclear Power Plant Emergency Response Plan Standard Operating Procedure - Lucia Mar Unified School District; and

- San Luis Obispo County/Cities Nuclear Power Plant Emergency Response Plan, Standard Operating Procedure - Cuesta College, San Luis Obispo County Community College District.

On-site Emergency Response Plan

- Diablo Canyon Power Plant Emergency Plan



REGIONAL LOCATION

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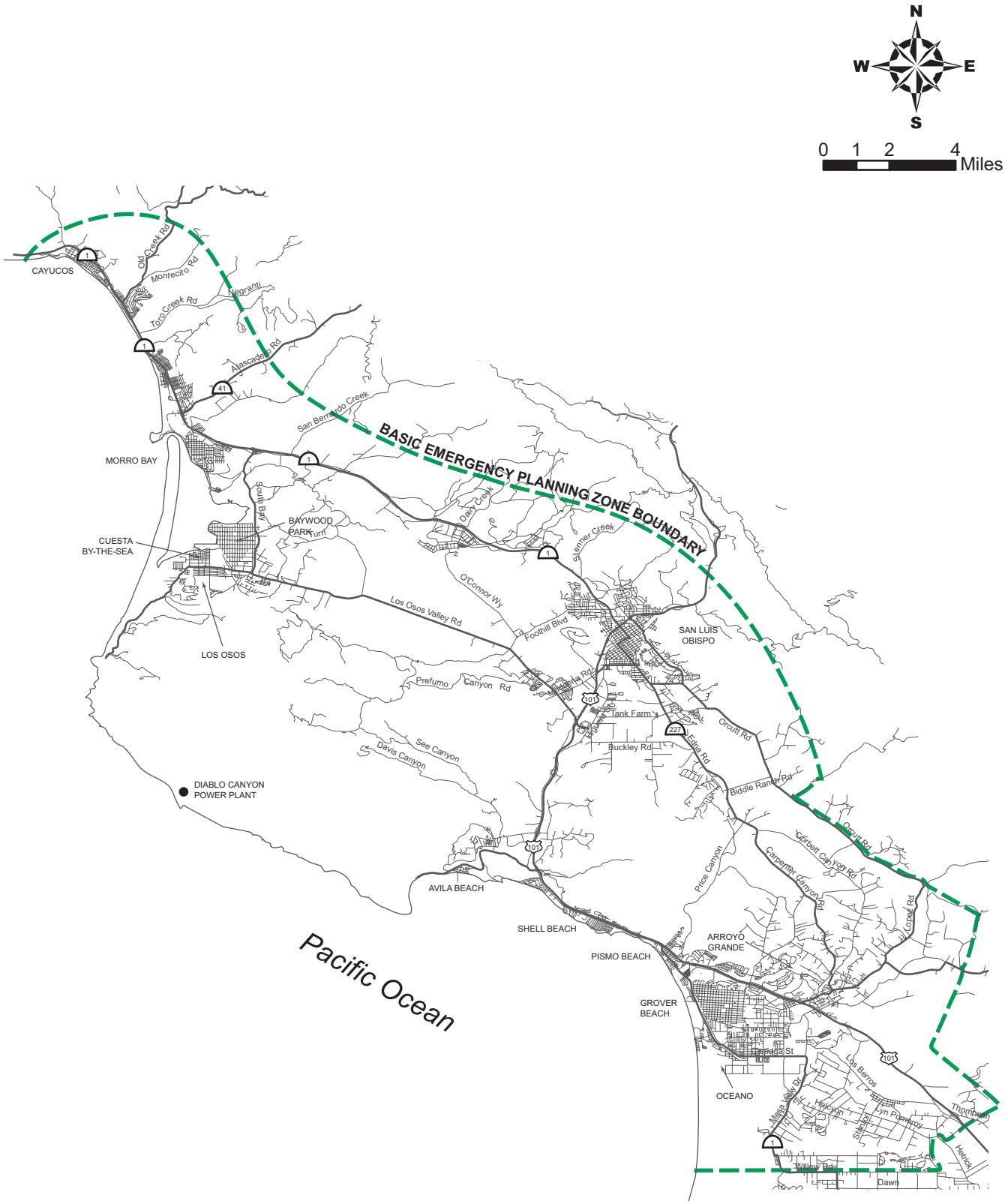
Figure 1



BASIC EMERGENCY PLAN ZONE

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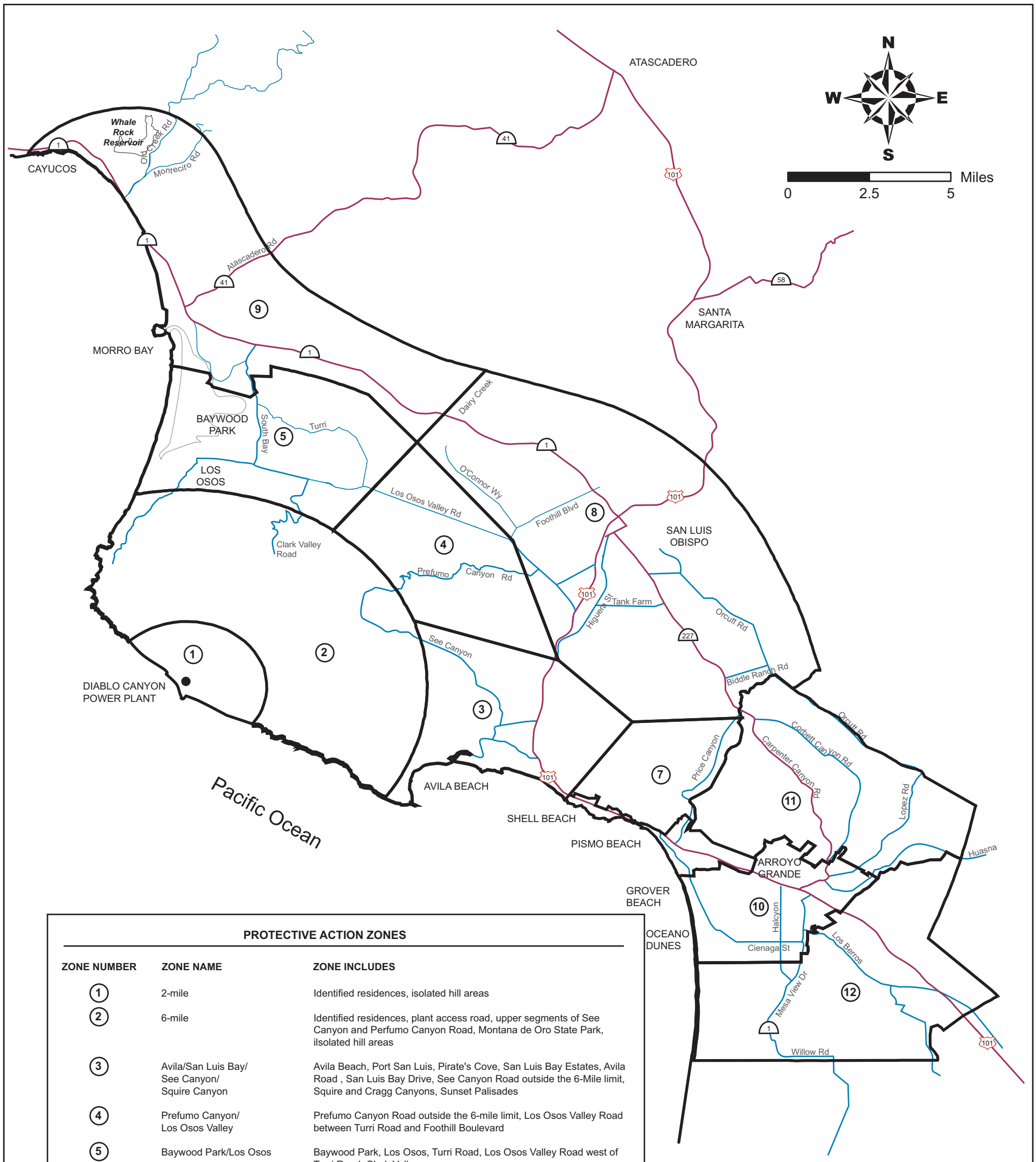
Figure 2



PROTECTIVE ACTION ZONES

ZONE NUMBER	ZONE NAME	ZONE INCLUDES
1	2-mile	Identified residences, isolated hill areas
2	6-mile	Identified residences, plant access road, upper segments of See Canyon and Perfumo Canyon Road, Montana de Oro State Park, ilsolated hill areas
3	Avila/San Luis Bay/ See Canyon/ Squire Canyon	Avila Beach, Port San Luis, Pirate's Cove, San Luis Bay Estates, Avila Road , San Luis Bay Drive, See Canyon Road outside the 6-Mile limit, Squire and Cragg Canyons, Sunset Palisades
4	Prefumo Canyon/ Los Osos Valley	Prefumo Canyon Road outside the 6-mile limit, Los Osos Valley Road between Turri Road and Foothill Boulevard
5	Baywood Park/Los Osos	Baywood Park, Los Osos, Turri Road, Los Osos Valley Road west of Turri Road, Clark Valley
6	City Pismo Beach	City of Pismo Beach , Shell Beach south of Spyglass Drive (including adjacent beaches)
7	Indian Knob/Price Cayon	Price Canyon Road and isolated hill areas north of Pismo Beach
8	San Luis Obispo Area	City Of San Luis Obispo, Cal Poly, California Men's Colony, Camp San Luis Obispo, Cuesta College, O'Connor Way, Orcutt Road north of East Corral de Piedra Creek, Edna, Country Club, Crestmont Drive and Davenport Creek Area
9	Morro Bay/Cayucos	Route 1 west of Cuesta College, Morro Bay, Cayucos, Whale Rock Reservoir area
10	Five Cities (Southern Portion)	City of Arroyo Grande, City of Grover Beach, Oceano, Halcyon and Pismo State Beach
11	Orcutt Road/Lopez Drive/Route 227	Canyon area north of Five Cities (bounded by Price Canyon, Orcutt Road, Huasna Creek and northern limits of Arroyo Grande and Pismo Beach)
12	Nipomo (North of Willow Road)	Nipomo Mesa north of Willow Road, Cienega Valley, Oceano Dunes State Vehicle Recreation Area

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PROTECTIVE ACTION ZONES

Figure 3

Table 1
BEPZ Resident Population and Dwelling Units
2000 vs. 1990
Diablo Canyon Evacuation Time Study

Protective Action Zone	Residential Population			Dwelling Units			Margin of Error*
	1990	2000	Ratio	1990	2000	Ratio	
1. 2-Mile	4	4	1.00	3	3	1.00	2%
2. 6-Mile	100	114	1.14	51	53	1.04	2%
3. Avila/San Luis/See Canyon/Squire Canyon	3,151	3,357	1.07	1,515	1,619	1.07	14%
4. Prefumo Canyon/Los Osos Valley	1,174	1,600	1.36	419	744	1.78	13%
5. Baywood/ Los Osos	15,290	14,943	0.98	6,437	6,495	1.01	2%
6. City of Pismo Beach	7,669	8,545	1.11	4,548	5,344	1.18	2%
7. Indian Knob/Price Canyon	168	202	1.20	59	109	1.85	2%
8. San Luis Obispo Area	51,173	55,330	1.08	17,803	19,948	1.12	2%
9. Morro Bay/Cayucos	12,949	14,307	1.10	7,979	8,973	1.12	2%
10. Five Cities, Southern Portion	31,848	36,153	1.14	13,194	14,907	1.13	2%
11. Orcutt Road/Lopez Drive/Route 227	2,615	2,776	1.06	994	1,124	1.13	10%
12. Nipomo North of Willow Road	4,687	5,152	1.10	2,053	2,086	1.02	6%
BEPZ Total	**130,828**	**142,483**	**1.09**	**55,055**	**61,405**	**1.12**	**2%**

* (estimated maximum)

Sources:

(1) PG&E Land Department, September, 1991.

(2) U.S. Census Data Set, Census 2000 Summary File 1 (SF 1) 100-Percent Data by Census Tract: P1 Total Population; P15 Households

Note: BEPZ denotes Basic Emergency Planning Zone

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Table 2
BEPZ Resident Population
Multiple Evacuation Conditions
Diablo Canyon Evacuation Time Study

Protective Action Zone		2000 Resident Population			
PAZ	Sector	Normal Weekday Non-Summer Daytime	Normal Weekday Non-Summer Nighttime	Normal Weekday Summer Daytime*	Normal Weekend Summer Daytime*
1	2-Mile	4	4	4	4
2	6-Mile	114	114	114	114
3	Avila/San Luis/See Canyon/Squire Canyon	3,357	3,357	3,316	3,316
4	Prefumo Canyon/Los Osos Valley	1,600	1,600	1,600	1,600
5	Baywood/ Los Osos	14,943	14,943	14,423	14,423
6	City of Pismo Beach	8,545	8,545	8,387	8,387
7	Indian Knob/Price Canyon	202	202	202	202
8	San Luis Obispo Area	55,330	55,330	48,550	48,550
9	Morro Bay/Cayucos	14,307	14,307	13,946	13,946
10	Five Cities, Southern Portion	36,153	36,153	35,576	35,576
11	Orcutt Road/Lopez Drive/Route 227	2,776	2,776	2,776	2,776
12	Nipomo North of Willow Road	5,152	5,152	5,152	5,152
BEPZ	**Basic Emergency Planning Zone**	**142,483**	**142,483**	**134,046**	**134,046**

* Summer scenarios assume reductions in California Polytechic State University and Cuesta College student populations

Source:
U.S. Census Data Set, Census 2000 Summary File 1 (SF 1) 100-Percent Data by Census Tract:
P1 Total Population;P15 Households

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Table 3
Estimated 2000 Transient Population By Zone
Diablo Canyon Evacuation Time Study

TRANSIENT POPULATION SUMMARY												
	Normal Weekday Non-Summer Daytime			Normal Weekday Non-Summer Nighttime			Normal Weekday Summer Daytime			Normal Weekend Summer Daytime		
Protective Action Zone	Workers *	Visitors	Total	Workers	Visitors	Total	Workers *	Visitors	Total	Workers	Visitors	Total
1. 2-Mile	180	0	180	15	0	15	180	0	180	15	0	15
2. 6-Mile	2	195	197	0	80	80	2	285	287	1	410	411
3. Avila/San Luis/See Canyon/Squire Canyon	295	773	1,068	37	723	760	295	1,572	1,867	295	2,322	2,617
4. Prefumo Canyon/Los Osos Valley	28	0	28	4	0	4	28	0	28	11	0	11
5. Baywood/ Los Osos	381	99	480	48	94	142	381	130	511	146	130	276
6. City of Pismo Beach	648	6,118	6,766	81	5,948	6,029	648	8,941	9,589	497	9,898	10,395
7. Indian Knob/Price Canyon	4	0	4	0	0	0	4	0	4	1	0	1
8. San Luis Obispo Area	10,253	3,529	13,782	882	3,529	4,411	7,261	4,710	11,971	2,715	4,710	7,425
9. Morro Bay/Cayucos	1,010	2,625	3,635	126	2,510	2,636	1,010	4,173	5,183	775	4,173	4,948
10. Five Cities, Southern Portion	2,459	1,649	4,108	307	1,499	1,806	2,459	4,120	6,579	943	8,280	9,223
11. Orcutt Road/Lopez Drive/Route 227	64	0	64	8	0	8	64	0	64	25	0	25
12. Nipomo North of Willow Road	232	0	232	29	0	29	232	0	232	89	0	89
BEPZ Total	**15,556**	**14,988**	**30,544**	**1,536**	**14,383**	**15,919**	**12,564**	**23,931**	**36,495**	**5,514**	**29,923**	**35,437**

* Includes transient students as well as transient workers

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Source:
Estimates developed by Wilbur Smith Associates based on: SLOCOG 1995 Jobs/Housing Balance Study; California State Parks Visitor Data; SLO Chamber of Commerce Data; SLO County Visitors & Conference Bureau Data; Port San Luis Visitor Estimates; City of Pismo Beach Visitor Estimates; U.S. Census Bureau Data

Table 4.1
Estimated 2000 Transient Population By Zone
Diablo Canyon Evacuation Time Study

Protective Action Zone	TRANSIENT WORKERS				HOTEL VISITORS				STATE PARKS *			
	Normal Weekday Non-Summer Daytime	Normal Weekday Non-Summer Nighttime	Normal Weekday Summer Daytime	Normal Weekend Summer Daytime	Normal Weekday Non-Summer Daytime	Normal Weekday Non-Summer Nighttime	Normal Weekday Summer Daytime	Normal Weekend Summer Daytime	Normal Weekday Non-Summer Daytime	Normal Weekday Non-Summer Nighttime	Normal Weekday Summer Daytime	Normal Weekend Summer Daytime
1. 2-Mile	180	15	180	15	0	0	0	0	0	0	0	0
2. 6-Mile	2	0	2	1	0	0	0	0	195	80	285	410
3. Avila/San Luis/See Canyon/Squire Canyon	295	37	295	295	597	597	796	796	0	0	0	0
4. Prefumo Canyon/Los Osos Valley	28	4	28	11	0	0	0	0	0	0	0	0
5. Baywood/ Los Osos	381	48	381	146	94	94	125	125	5	0	5	5
6. City of Pismo Beach	648	81	648	497	3,333	3,333	4,447	4,447	355	230	760	1,035
7. Indian Knob/Price Canyon	4	0	4	1	0	0	0	0	0	0	0	0
8. San Luis Obispo Area	7,076	882	7,076	2,715	3,421	3,421	4,565	4,565	0	0	0	0
9. Morro Bay/Cayucos	1,010	126	1,010	775	1,672	1,672	2,231	2,231	475	360	1,305	1,305
10. Five Cities, Southern Portion	2,459	307	2,459	943	582	582	776	776	510	360	2,600	6,760
11. Orcutt Road/Lopez Drive/Route 227	64	8	64	25	0	0	0	0	0	0	0	0
12. Nipomo North of Willow Road	232	29	232	89	0	0	0	0	0	0	0	0
BEPZ Total	12,379	1,536	12,379	5,514	9,699	9,699	12,940	12,940	1,540	1,030	4,955	9,515

* Includes transient students as well as transient workers

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Source:
Estimates developed by Wilbur Smith Associates based on: SLOCOG 1995 Jobs/Housing Balance Study; California State Parks Visitor Data; SLO Chamber of Commerce Data; SLO County Visitors & Conference Bureau Data; Port San Luis Visitor Estimates; City of Pismo Beach Visitor Estimates; U.S. Census Bureau Data

Table 4.2
Estimated 2000 Transient Population By Zone
Diablo Canyon Evacuation Time Study

Protective Action Zone	PRIVATE CAMPGROUNDS				LOCAL BEACHES				TRANSIENT STUDENTS			
	Normal Weekday Non-Summer Daytime	Normal Weekday Non-Summer Nighttime	Normal Weekday Summer Daytime	Normal Weekend Summer Daytime	Normal Weekday Non-Summer Daytime	Normal Weekday Non-Summer Nighttime	Normal Weekday Summer Daytime	Normal Weekend Summer Daytime	Normal Weekday Non-Summer Daytime	Normal Weekday Non-Summer Nighttime	Normal Weekday Summer Daytime	Normal Weekend Summer Daytime
1. 2-Mile	0	0	0	0	0	0	0	0	0	0	0	0
2. 6-Mile	0	0	0	0	0	0	0	0	0	0	0	0
3. Avila/San Luis/See Canyon/Squire Canyon	113	113	151	151	63	13	625	1375	0	0	0	0
4. Prefumo Canyon/Los Osos Valley	0	0	0	0	0	0	0	0	0	0	0	0
5. Baywood/ Los Osos	0	0	0	0	0	0	0	0	0	0	0	0
6. City of Pismo Beach	2,373	2,373	3,166	3,166	57	12	568	1250	0	0	0	0
7. Indian Knob/Price Canyon	0	0	0	0	0	0	0	0	0	0	0	0
8. San Luis Obispo Area	108	108	145	145	0	0	0	0	3,177	0	185	0
9. Morro Bay/Cayucos	478	478	637	637	0	0	0	0	0	0	0	0
10. Five Cities, Southern Portion	557	557	744	744	0	0	0	0	0	0	0	0
11. Orcutt Road/Lopez Drive/Route 227	0	0	0	0	0	0	0	0	0	0	0	0
12. Nipomo North of Willow Road	0	0	0	0	0	0	0	0	0	0	0	0
BEPZ Total	**3,629**	**3,629**	**4,843**	**4,843**	**120**	**25**	**1,193**	**2,625**	**3,177**	**0**	**185**	**0**

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* Includes transient students as well as transient workers

Source:
Estimates developed by Wilbur Smith Associates based on: SLOCOG 1995 Jobs/Housing Balance Study; California State Parks Visitor Data; SLO Chamber of Commerce Data; SLO County Visitors & Conference Bureau Data; Port San Luis Visitor Estimates; City of Pismo Beach Visitor Estimates; U.S. Census Bureau Data

Table 5
State Parks Transient Population Summary
Diablo Canyon Evacuation Time Study

PAZ	State Park Facility		Normal Non-Summer		Normal Summer	
			Weekday	Week Night	Weekday	Weekend Day
2	Montana De Oro St Park	Day Use	125	10	125	250
	Montana De Oro St Park	Campground	70	70	160	160
5	Los Osos Oaks	Day Use	5	0	5	5
9	Morro Bay St Park	Day Use	15	0	50	50
	Morro Bay St Park	Museum	10	0	75	75
	Morro Bay St Park	The Rock	25	10	150	150
	Morro Bay St Park	Golf Course	25	0	100	100
	Morro Bay St Park	Campground	250	250	450	450
	Morro Strand St Beach	Day Use	50	0	200	200
	Morro Strand St Beach	Campground	100	100	280	280
6	Pismo Beach St Park	Day Use	175	50	225	500
	Pismo Beach St Park	No Bch CG	180	180	535	535
10	Pismo Beach St Park	Day Use	20	20	50	50
	Pismo Beach St Park	Oceano CG	200	200	410	410
	Oceano Dunes SVRA	Day Use	225	75	1,500	3,100
	Oceano Dunes SVRA	Campground	65	65	640	3,200

NOTES: 1 Data obtained from State Park visitor records and interviews with State Park ranger staff.
2. SLO Co. OES & DCPP EP provided input and discussion.

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Chapter 2

STUDY METHODOLOGY

The evacuation time assessment update made use of a computerized transportation model package developed by Wilbur Smith Associates (WSA) especially for the purpose of estimating time requirements and related information for evacuation of large areas and populations. This model simulates the evacuation traffic conditions, given the public response characteristics to a public evacuation alert, route capacities, and numbers of evacuating vehicles. The methodology for applying this computer model to assess the evacuation time requirements can be divided into five phases: data preparation; development of the evacuation network; computer processing of the simulation model for various scenarios; analysis of output and development of findings; and recommendations for reduced evacuation time as may be appropriate. The work flow for development of the computer network is illustrated in **Figure 4** and summarized in the following section.

2.1 Data Collection

Collection of the data necessary for the evacuation time estimates included the following efforts:

- Review of pertinent sections of Emergency Response Plans;
- Review and updating of the inventory of existing highway facilities, including facility type, number of lanes, operating speeds, and traffic controls; and
- Assembly and review of updated information relating to evacuation demand at recreational facilities, schools, and special institutions within the area.

Contacts were made with state, county and city officials responsible for emergency response planning. Available data on existing traffic characteristics, transportation facilities, and land uses were reviewed and supplemented by field reconnaissance observations in the BEPZ. A list of contacts made during the course of this study are provided in Appendix 1.

2.2 Evacuation Route Network Development

The evacuation routes in the BEPZ emergency response plans were used to define an evacuation roadway network for input to the evacuation time estimate computer model. Major evacuation routes throughout the BEPZ are shown in **Figure 5**. Local evacuation routes through individual communities and major recreation centers are shown in Appendix **Figures 2-1 through 2-11**.

To develop the computer network, United States Geological Survey quadrangle maps were used for analysis and distance measurements and were supplemented with local mapping and field observations for detail of more recent development. A base map was created to illustrate the BEPZ and was used for mapping the computer network of evacuation routes. Established Protective Action Zones (PAZ) were analyzed and converted to centroids which represent the zonal activity center in the network. Centroid connectors are used in the network to represent access to the evacuation route system. Traffic routing from each centroid to the major evacuation routes was determined on the basis of directness and available roadway capacity.

2.2.1 Computer Coding of Roadway Link/Node Descriptions

To employ a computerized network, the roadways to be used as evacuation routes must be defined as a series of "links" and "nodes". Each "link" represents a specific segment of roadway which has common geometric features as well as similar operational characteristics. A pair of "nodes" identifies the limits of each link. Nodes are located wherever evacuation routes intersect, converge, or change operational characteristics.

Each link was described by the two node numbers; the "A" node at the beginning and the "B" node at the end of the link. The traffic characteristics of each link in the evacuation network were determined through map and data review, field reconnaissance, and traffic engineering analysis. A listing of the link characteristics was prepared, identifying the two node numbers, the length of the link, the operating speed, and capacity (the number of lanes times the assigned capacity per lane). Operating speeds and lane capacities reflect average operating conditions that would be expected during an evacuation.

It should be noted that during most of the evacuation period, traffic on the area roadways would generally be traveling in the same direction as the vehicles follow the identified evacuation routes to exit the area. The evacuation route capacities assume that only one direction of travel is used by the evacuating traffic. The reverse direction travel lanes are assumed to be available for emergency vehicles.

2.2.2 Centroid Population and Vehicles

The numbers of evacuating persons and vehicles estimated for the area represented by each centroid, consist of two main components -- resident and transient populations. The estimated number of evacuating resident vehicles was derived from updated estimates of population and dwelling units within each Protective Action Zone in the BEPZ. The estimate of transient vehicles recognized employment and visitation records at State beaches and other sources reflecting in the area tourist activity. Details of these estimates are given in Chapter 5.

2.2.3 Identification of Special Institutions and Recreation Areas

Several population components would require special evacuation consideration. These include resident population not having access to an automobile and those in special institutions or locations, such as schools, nursery schools, hospitals, nursing homes, and transients without vehicles at area beaches. The evacuation requirements for these were considered by individual analyses, separate from the computer simulation.

2.3 Evacuation Time Assessment Simulation

A general description of the evacuation time assessment computer model is presented below. A more detailed description of the computer model and procedures involved is presented in Appendix 3.

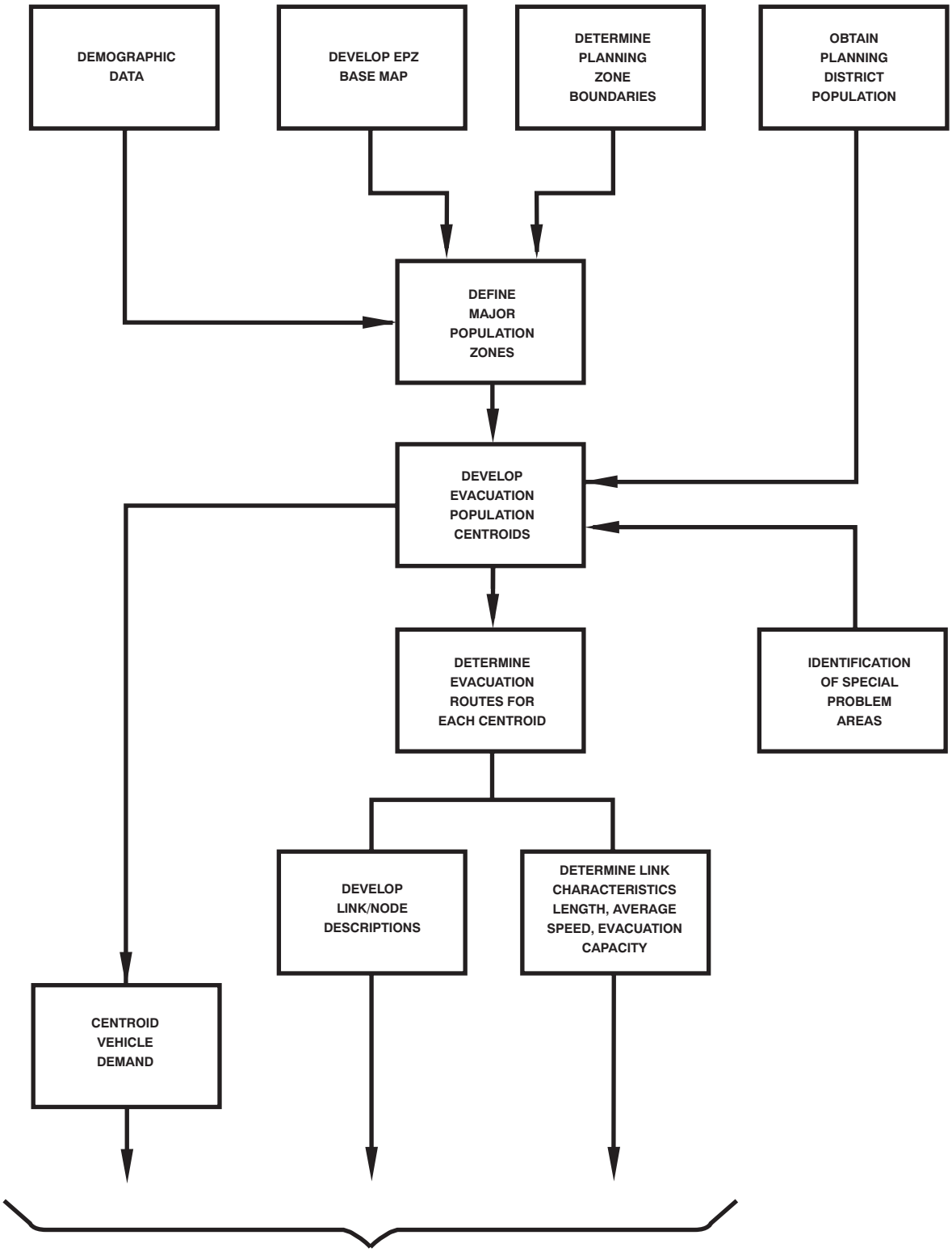
For each evacuation scenario and condition simulated, the number of trips originating from each centroid is specified by the user. These trips are loaded onto the network over several time intervals at a rate corresponding to the estimated composite mobilization time distribution representing public response time following an evacuation order. This mobilization time results from the combination of individual time distributions to receive the warning, to travel home (if necessary), and to make preparations to leave home. Public response characteristics and mobilization time are discussed in more detail later in Section 7.1 Components of Evacuation Time. Also input into the computer program are the routes to be followed by vehicles evacuating from each centroid.

In the evacuation simulation procedure, the total evacuation period was analyzed in a series of 15-minute time increments. During each time increment, trips were loaded onto the computer roadway network from the zone centroid in accordance with the mobilization time distribution. Each vehicle, or group of vehicles, flows through the network, with progress along its evacuation route determined initially by the operating speeds assigned to each roadway link. Where the number of vehicles seeking to use a specific link in a given time increment exceeds the link capacity, the simulation model begins to register traffic queues on links approaching the point of constraint. Where queues build up along a route, they introduce delay time on the constrained link (roadway segment) and on feeder links further upstream. Each vehicle entering the queue will experience a delay while moving through the queuing area. These delays are encountered by all traffic on the congested links, until the vehicle volumes decrease to a level less than link capacity. Once past the point of constraint, the evacuating vehicles resume normal operating speed, until they encounter a new queue, or reach safety, beyond the evacuation area boundary.

The model produces several kinds of information useful for evaluation. These include the total evacuation time and distribution of the percentage of trips reaching the BEPZ boundary by elapsed time from start of evacuation. The above distributions also may be produced for trips leaving from any specified subareas within the total evacuation area. Average travel time and

delay time is calculated for trips exiting the BEPZ for each successive time increment within the total evacuation period.

The simulation model can also provide "snapshots" of transport system conditions at specified moments during the evacuation process. These "snapshots" consist of link volume, queue lengths, average delay by link, and volume-capacity ratios for each link in the system.



EVACUATION NETWORK DEVELOPMENT WORK FLOW

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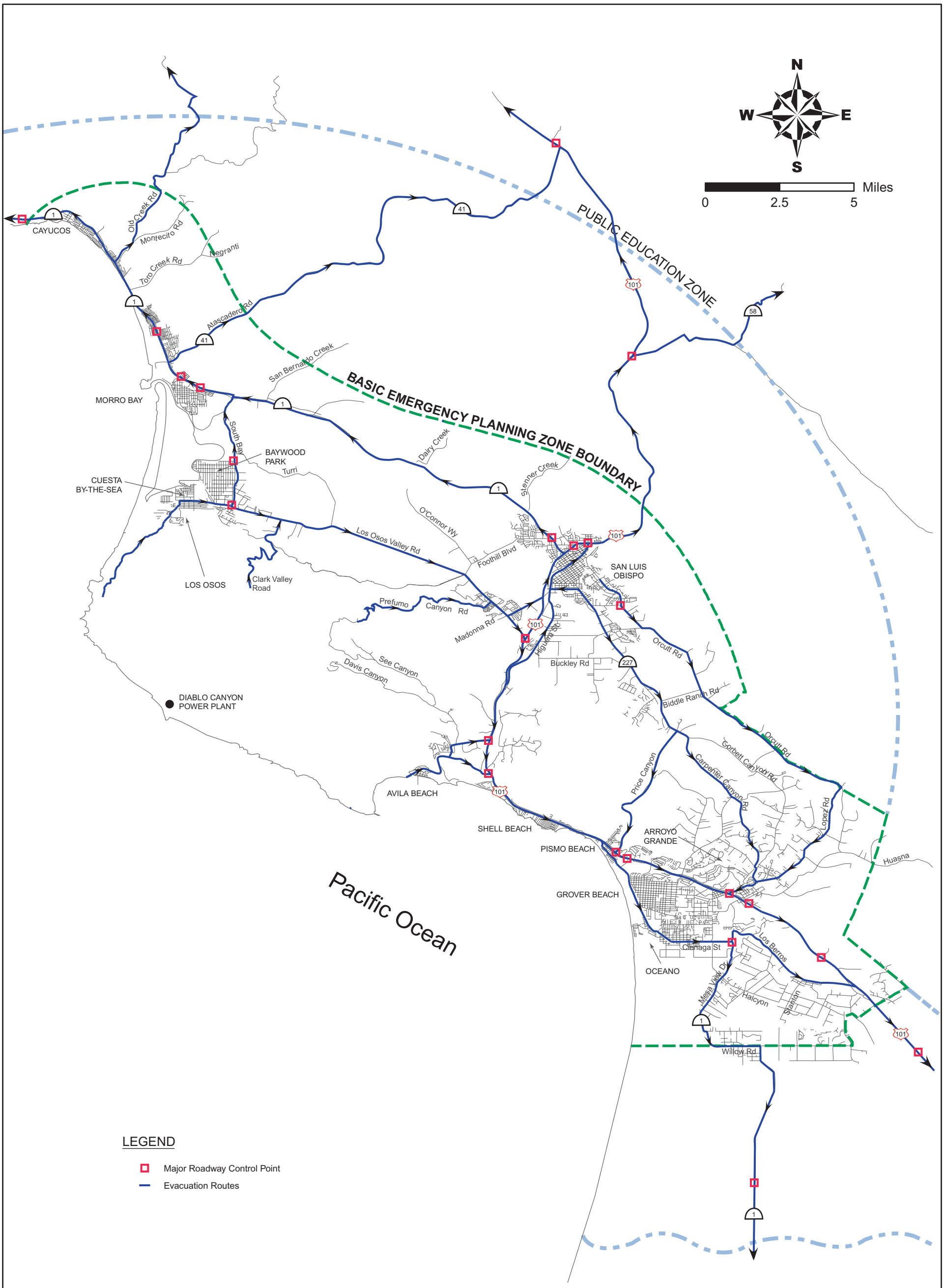
Figure 4



LEGEND

- Major Roadway Control Point
- Evacuation Routes

MAJOR EVACUATION ROUTES

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Figure 5

Chapter 3

GENERAL ASSUMPTIONS

Several general assumptions were made as part of the process of estimating the numbers of persons and vehicles which would evacuate. The most significant of these are presented in the following sections. Supplemental assumptions are identified in subsequent chapters.

3.1 Public Information and Notification

For this study it is assumed that the Early Warning System sirens are used to alert the BEPZ population, followed by instructions to evacuate through radio and television broadcasts. In the event an early warning system siren fails to sound, the County will use supplemental route alerting using fire or law enforcement personnel.

3.2 Evacuation Actions

The Diablo Canyon Power Plant Emergency Plan and the San Luis Obispo County/Cities Nuclear Power Plant Emergency Response Plan identify four Emergency Action Level Classifications:

- Notification of Unusual Event;
- Alert;
- Site Area Emergency; and
- General Emergency.

No evacuation action is initiated in response to a Notification of Unusual Event.

An Alert emergency classification level will result in the closing of Montana De Oro State Park and the beach area of the community of Avila Beach/Port San Luis. School buses will be dispatched to standby at appropriate schools which may be instructed to evacuate at this stage under certain conditions.

For a Site Area Emergency, Montana De Oro State Park, Pismo State Beach, Oceano Campground, and the beach area of the community of Avila Beach/Port San Luis will be closed. Also, consideration will be given to implementing school evacuation, limiting hospital admissions, and consideration of evacuation of PAZs 1 & 2.

Upon declaration of a General Emergency, the general public will be notified by activation of the sirens and instructed about protective actions by means of Emergency Alert System (EAS) messages. Initial protective actions will involve the six-mile low population zone (Protective Action Zones 1 and 2).

Since beaches and parks may be closed prior to any need for evacuation by the general public, a certain number of transients may have left the area early on. To the extent that this takes place, estimates of evacuation time may be conservative, because they assume that all persons remain within the area until they are instructed to evacuate.

3.3 Traffic Controls

When the County Command Group determines an evacuation is imminent, external/through traffic traveling on U.S. 101, S.R. 1, S.R. 41, and S.R. 166 will be diverted at various locations beyond the perimeter of the BEPZ. Local residents, property owners and business owners will be allowed to enter the BEPZ to assist with removal of their families and possessions.

When an evacuation becomes imminent, California Highway Patrol (CHP) officers will be dispatched to direct traffic at their assigned posts. Officers will be assembled and dispatched according to Standard Operating Procedures established for the specific evacuation scenario. It is assumed that in the event that sufficient officers are not available to manage all identified traffic control points, the County Command Group will determine the most effective use of available resources.

Immediately following notification to evacuate, it is assumed that normal traffic controls will be in place as area residents return home and make preparations to evacuate. It is anticipated that within one to two hours after notification to evacuate, the prevailing direction of travel would be outbound and evacuation-related traffic control measures could begin to be implemented, if warranted and directed by the County Command Group.

Current CHP traffic control plans indicate that Caltrans personnel and San Luis Obispo County Department of Public Works and Transportation would be requested to assist in the implementation of traffic diversion and traffic control measures including the placement of signs and barricades. Additionally, the CHP would mobilize wreckers to designated points in advance of the major flow of evacuation traffic. Wreckers would be dispatched to remove disabled vehicles from the evacuation roadways and maintain traffic flow.

3.4 Number of Vehicles Evacuating

The number of evacuating vehicles that would be generated by residents of the BEPZ is based on an estimate that: all of the one-vehicle households would generate one vehicle; 75 percent of the two-vehicle households would generate two vehicles, and the remaining 25 percent would generate one vehicle; and the three-vehicle households would have an average utilization of 2.5 vehicles for evacuation purposes. Additional discussion of evacuation vehicle demand estimates in provided in Section 5.1 Persons Evacuating by Own Vehicle. These evacuation vehicle rates were then applied to estimated 2000 PAZ household data to obtain the estimates of residents' evacuating vehicles.

The estimated number of vehicles evacuating reflect the following characteristics regarding occupancy levels:

a. Resident populations evacuate using one or more vehicles per household (depending on vehicle ownership characteristics in each zone). This is estimated to result in between 1.1 and 1.8 persons per vehicle, on average, for the various areas within the BEPZ, if school-age children are included. The resulting average vehicle occupancy for resident vehicles within the entire BEPZ is estimated at 1.5 persons per vehicle;

b. Non-resident beach visitors are estimated to average between 2.7 to 3.5 persons per vehicle based on visitation statistics collected by local State Parks staff; and

c. Non-resident workers, persons staying at area hotels/motels, and visitors to areas other than the beaches, are estimated to average between 1.0 to 3.0 persons per vehicle.

3.5 Evacuation Route Conditions

A set of evacuation time estimates were developed for the area, based on all evacuation routes available for use. The evacuation network and the assumed operating conditions and capacities are discussed in Chapter 6.

Additional time estimates were made assuming that adverse weather conditions were present. Adverse weather conditions in this area would most likely be heavy rain or fog. Such weather conditions are assumed to reduce roadway capacities by 15 percent.

Chapter 4

ALTERNATIVE EVACUATION SCENARIOS

An evacuation of part or all of the BEPZ could be initiated at any time. The evacuation might occur under any of a broad range of seasonal factors involving varying weather conditions and levels of recreational area activity. As discussed in Chapter 1, and shown in **Table 3**, it is estimated that the transient population of up to 36,495 persons may be located within the area during the daytime on a normal summer weekday.

The season and time of day at which an evacuation is initiated would determine the number of persons to be evacuated and the time interval required to respond to the evacuation warning. These factors, then, would influence the total time interval required to evacuate the area. Therefore, four different time period scenarios were selected for development of evacuation time estimates. These are:

- Normal weekday, non-summer
- Normal week night, non-summer
- Normal weekday, summer; and
- Normal weekend daytime, summer

Warm-weather conditions were chosen for the scenarios, to maximize the estimated transient population to be evacuated for the time assessment (see **Table 3**). A fifth scenario was also investigated, which reflects an evacuation during adverse weather conditions (rain or fog).

4.1 Normal Weekday Non-Summer Evacuation

The first scenario investigates an evacuation assumed to occur on a late spring, or early fall weekday. It is estimated that a substantial number of transients (workers and tourists) would be present at this time. Recreation facilities such as State Parks and public beaches would be heavily utilized. This scenario assumes that the evacuation occurs during the midday period when the maximum number of visitors would be present within the BEPZ.

The evacuation times for schools in the BEPZ have also been included in the weekday time estimate for special institutions. The time estimates reflect normal school year attendance.

4.2 Normal Week Night Non-Summer Evacuation

In the event that an evacuation takes place at night, the maximum resident population and the minimum transient population would be in the BEPZ. This scenario assumes the evacuation warning occurred on a spring or fall evening when most people would be at their permanent or temporary place of residence.

4.3 Normal Weekday Summer Evacuation

In the event that the evacuation takes place on a summer weekday, a portion of the evacuees would be non-residents (tourists, workers, and/or beachgoers). On a weekday, resident population in the area might be slightly lower than on a weekend due to some residents being out of the area in connection with their work. In this weekday scenario, it was assumed that the evacuation occurred at mid-day when the largest number of transients would be in the area. Estimates of beach visitors are based on peak utilization of State Park and public beaches. The number of visitors at most beach areas on peak days is limited by the availability of parking.

4.4 Normal Weekend Daytime Summer Evacuation

In the event that the evacuation takes place on a summer weekend day, a portion of the evacuees would be non-residents (tourists, workers, and/or beachgoers). On a weekend day, resident population in the area might be slightly higher than on a weekday when some residents would be out of the area in connection with their work. In this weekend day scenario, it was assumed that the evacuation occurred at mid-day when the largest number of transients would be in the area. Estimates of beach visitors are based on peak utilization of State Park and public beaches. The number of visitors at most beach areas on peak days is limited by the availability of parking.

4.5 Adverse Weather

Adverse weather conditions may occur in the BEPZ which could potentially coincide with and impede an evacuation. The most probable would be the effects of heavy rainfall or dense fog. Heavy rainfall is used for this analysis.

Chapter 5

EVACUATION DEMAND ESTIMATES

The number of persons within the Basic Emergency Planning Zone (BEPZ) at the time an evacuation occurs, their mobility characteristics, and their locations relative to the major evacuation routes are key factors governing the time necessary to evacuate part or all of the area. These factors affect the number of vehicles which would travel each section of the evacuation routes, the locations where congestion would occur, and the requirements for special assistance.

The populace within the BEPZ has been classified into six groups, based on their particular transportation characteristics and/or needs. The groups are:

A. Persons Evacuating By Own Vehicle

   1. Residents who own vehicles;
   2. Transients (visitors and non-resident workers) who have vehicles available;

B. Persons Requiring Evacuation Assistance

   1. Residents without vehicle;
   2. Transients without vehicle;
   3. School children; and
   4. Special populations having restricted mobility.

The following sections discuss the population groups, and the evacuation transportation requirements associated with each.

5.1 Persons Evacuating By Own Vehicle

The estimated number of resident-owned evacuating vehicles was derived from the updated estimate of dwelling units per zone, after deducting the number of households without vehicles. Households without vehicles and multi-vehicle owning households for each zone in 2000 were based on the same proportion of SLO County total households as in the 1990 census, adjusted using 2000 census data for the State and other similar California counties.

The number of evacuating vehicles generated by BEPZ residents is based on an estimate that: all of the one-vehicle households would generate one vehicle; 75 percent of the two-vehicle households would generate two vehicles, and the remaining 25 percent would generate one vehicle; and the three-vehicle households would have an average utilization of 2.50 vehicles for evacuation purposes. These evacuation vehicle rates were then applied to

estimated 2000 PAZ household data to obtain the updated estimates of residents' evacuating vehicles. Although detailed 2000 Census data which reports household vehicle ownership was not available at the time of this study, 1990 data for San Luis Obispo County and 2000 statewide data were available and were utilized to estimate 2000 vehicle ownership characteristics for the County.

The assumed evacuation vehicle generation rates used for vehicle-owning households were originally developed by Alan M. Voorhees & Associates (AMVA) for use in the 1980 Evacuation Time Assessment Plan for the Diablo Canyon Power Plant. The AMVA assumption results in an average evacuation rate of approximately 1.2 vehicles per vehicle-owning household. As a comparison, many of the evacuation studies prepared for emergency response purposes throughout the United States assume an average evacuation rate of one vehicle per vehicle-owning household.

Based on Wilbur Smith Associates (WSA) experience in the area of evacuation planning, the estimation method that uses household automobile ownership data as the basis for estimation produces a more realistic estimate of evacuation vehicles for area residents. The assumption that all single vehicle owning households produce one evacuation vehicle results in a slight over-estimation of vehicles since some of these vehicles may already be outside of the BEPZ at the time that an evacuation is declared. The estimate of evacuation vehicles for households that own two or more vehicles reflects the viewpoint that in most cases these households would elect to split up the family in order to evacuate their personal autos. Early evacuation planning studies assumed that households/families would evacuate as a single unit with the head of household as the driver. In this update study, WSA's estimate of evacuation vehicles acknowledges that while some households may still desire to evacuate as a single unit, many families today are made up of members that are more independent that those in the past. The assumptions used in this update study clearly produce evacuation vehicle estimates that are higher (e.g. more conservative) than past studies.

The number of transient vehicles evacuating were estimated independently for the four evacuation conditions. Earlier transient estimates reported in the March 1990/Revision 3 Emergency Response Plan and those developed for the 1990 Evacuation Time Assessment were reviewed and updated for 2000 conditions. Transient population components (e.g. non-resident beachgoers, tourists/visitors, and workers) were identified and estimated for each PAZ and for each evacuation condition.

Beachgoers, which represent the largest proportion of the daytime transients within the BEPZ, were estimated based on California Department of Parks and Recreation 2000 Visitor Attendance Reports and official State Parks Department estimates (for utilization of the State Park beaches). Beachgoers at public beaches where no visitation records are kept were estimated based on physical characteristics of the beach areas and estimates made by local officials. Non-resident tourist/visitor and worker populations were estimated based on several factors which included the SLOCOG 1995 Jobs/Housing balance study and general tourism,

business, and employment information available through the local Chambers of Commerce and the Visitors & Conference Bureau.

It should be noted that the scope of this study did not include a detailed survey of transient population. The 2000 transient population estimates represent a compilation of data from many sources which have served as checks on each other. The current estimates have resulted in various adjustments and/or shifts in transient population between PAZs from the earlier 1990 study. In some cases, individual PAZ transient populations have increased and in others the figures have decreased with respect to estimates used in the 1990 Evacuation Time Assessment. Transient population within the 0 to 10-mile radius (PAZs one through five) in the 2000 estimates shows little change. Between the 10-mile radius and BEPZ boundary, transient populations have been reduced. The most significant adjustments have been made within PAZ 6 (City of Pismo Beach). In this PAZ the 1990 peak summer weekend and nighttime transient population accumulations of 6,900 and 2,250 non-residents respectively were increased to 10,770 and 6,500 persons. Normal weekday transient populations were also judged to be somewhat underestimated. The re-assessed 2000 transient estimates for PAZ 6 are significantly higher for these three scenarios, as are the totals for the entire BEPZ as a whole.

It is important to note that evacuation assumptions applied to the transient population in the evacuation time assessment add a factor of conservatism to the analysis. These assumptions include the following:

1. Fifty percent of beachgoers are assumed to be non-residents of the BEPZ based on a recent limited survey performed by San Luis Obispo County at Avila Beach; and

2. Beachgoers and other transients are assumed to remain in the area until they and the resident population are instructed to evacuate.

Estimated 2000 evacuating resident and transient vehicles by zone for each evacuation condition are given in **Table 6**. For the entire BEPZ, resident-related evacuating vehicles are estimated to total 95,532. Transient vehicles are estimated to total 20,503 on a normal non-summer weekday, as many as 16,871 on a normal summer weekend day, 21,274 on a normal summer weekday, and approximately 7,409 for nighttime conditions. Resident and transient vehicles combined produce the evacuation vehicle totals summarized in **Table 7** by evacuation condition.

5.2 Population Requiring Evacuation Assistance

A small number of persons in the BEPZ may not have a vehicle available to use in an evacuation. Groups which may require transportation assistance would include households without vehicles, households where the family vehicles are unavailable at the time of

evacuation, transients without vehicles, and persons in institutions (schools, hospitals, or nursing/convalescent homes).

The San Luis Obispo County/Cities Nuclear Power Plant Emergency Response Plan[4] provides for the evacuation of persons in households where vehicles are not available by instructions that those not evacuated by friends or relatives should assemble at designated collection points to be evacuated by bus. Those unable to go to the collection point are instructed to telephone a designated number for transportation assistance.

Public transit in the BEPZ is furnished by several providers operating a variety of buses of different sizes. In order to estimate the number of bus trips needed for supplementary transportation assistance during an evacuation, representatives from Central Coast Area Transit were contacted to estimate the average seating capacity of buses that would likely be used. It was determined that the typical seating capacity of buses used in the Central Coast Area ranged from 36 to 40 persons. Recognizing that some standees could be accommodated for the trip to the reception centers, but, on the other hand, that many riders would be carrying at least one parcel or bag, a conservative average estimate load of 40 persons per bus was used to estimate bus demand. For each of the three evacuation scenarios, the required numbers of bus trips are shown in **Table 8.**

Note that public school children are not included in the above weekday scenario, since, as noted below, the School Districts plan to evacuate them by school bus. Also, the totals given assume that the entire BEPZ is evacuated and therefore represent a very conservative estimate of the demand for transportation assistance. The most likely scenario would involve partial evacuation of the BEPZ (e.g., PAZs downwind of the DCPP). For a partial evacuation, there would be a smaller requirement for supplemental transportation.

5.2.1 Schools

A summary of student enrollment in public and private schools within the BEPZ is given in **Tables 9.1 and 9.2.** Current enrollments within the study area are reported by school authorities to be 18,033 students in public schools and 4,020 in private schools.

5.2.2 Public Schools

Public school enrollments are divided between three school districts: San Luis Obispo Coastal (8,155 students), Lucia Mar (9,606 students), and Cayucos (272 students) Unified School Districts. Each District has its own fleet of buses to transport students. The Office of County Superintendent of Schools also has a number of buses for use in transporting students to and from facilities under its jurisdiction.

[4] Part I, Section 6, Concept of Operations, Pages 6-8.

In the event that an evacuation warning is given on a weekday while school is in session, San Luis Obispo County School Districts will relocate students from schools within the BEPZ to pre-designated locations outside the affected area. Pupils in selected pre-designated school units will be transported by the County Office of Education (COE). The primary means of transport would be by school bus.

There are presently approximately 74 school buses of various capacities in the Basic Emergency Planning Zone. The legal capacity of each bus is based on three students per seat, but California law allows the practice of putting four students in the seat in case of emergency. This increases the capacity substantially. The combined total legal school bus capacity of the Lucia Mar and San Luis Coastal Unified School Districts is 4,203 students, while the combined total emergency capacity is 6,021 students, an increase of 30 percent.

Based on past exercises, the districts have determined that, when using the emergency seating arrangement, and multiple trips, they can evacuate all their students and staff without the need for outside buses. Their first concern is to evacuate the elementary schools, since it is assumed that many high school students drive to school and can evacuate themselves and friends. For the second run, the buses go to the high schools to evacuate any remaining students or staff and to the elementary schools outside the BEPZ. Standard operating procedures have been prepared for each school district in the area: San Luis Coastal; Lucia Mar; and Cayucos.

The evaluation of transportation requirements for school children assumes that the majority of students attending public schools would be transported outside the affected area by school district buses which would be assigned to each school. The County emergency plans encourage the parents of these children to reunite with their children at assigned reception centers outside the BEPZ.

5.2.3 Private Schools

Few private schools provide bus transportation for their pupils. The COE will notify private schools of an emergency condition. The private school operators are responsible to arrange transportation for the approximately 4,020 private school students. Assistance/coordination may be available from the COE.

5.2.4 Special Populations Having Restricted Mobility

There are three population sub-categories within the BEPZ which would require assistance in an emergency evacuation. These are:

1. Hospital patients;
2. Convalescent Home residents; and

3. Homebound persons.

As indicated in the San Luis Obispo County/Cities Nuclear Power Plant Emergency Response Plan,[5] persons in these special categories would be relocated to reception centers or appropriate facilities outside the affected area. Transportation requirements for the relocation of these special institutions are identified in the following sections.

5.2.5 Persons in Institutions

Four acute care hospitals and several convalescent and residential facilities are located within the BEPZ. Patients from these facilities would be evacuated by bus, wheelchair van or ambulance, as appropriate. Estimated transportation requirements shown below are based on an assumed average mix of patient requirements based on the judgment of staff of the four hospitals. For acute care hospitals, 41 percent of patients were assumed to be ambulatory; about 39 percent to require wheelchair vans; and 20 percent ambulances. For nursing homes/convalescent hospitals, 10 percent were assumed ambulatory, 60 percent to require wheelchair vans, and 30 percent ambulances.

For residential care facilities, 42 percent of residents were assumed to be ambulatory, 39 percent to require wheelchair vans, and 19 percent ambulances. **Table 10** gives the number of patients at each facility by type of facility, and includes the PAZ of each institution. A breakdown as to how many trips by buses, ambulance, and wheelchair vans are estimated to be required is given in **Table 11.** As shown there, a total of 15 buses, 194 ambulances and 130 wheelchair vans are estimated to be required to meet institutional special transportation needs.

5.2.6 Homebound Persons

The number of homebound persons requiring special transportation was estimated from a list maintained by the County Office of Emergency Services. Estimated vehicle requirements were derived after consultation with County health service staff on the assumption that roughly 43 percent would require wheelchairs and 22 percent ambulances. **Table 12** lists the number of homebound persons requiring transportation assistance by PAZ.

5.3 Summary of Special Transportation Assistance Needs

A summary of the population within the BEPZ requiring evacuation assistance is given in **Table 13** for each of the three evacuation scenarios. These figures have been estimated with the assumption that these persons do not seek transportation assistance from friends of relatives who live in the area. As indicated in the table, demand for supplemental

[5] Part I, Section 6, Concept of Operations, Pages 6-9.

transportation assistance is expected to be at a maximum on a school day when persons requiring bus transportation could total about 31,771 including students at schools for the Normal Weekday Non-Summer scenario. As mentioned previously in the discussion of schools, School District Emergency Response plans call for public school evacuation needs to be met by the school bus fleet when school is in session. Persons estimated to require transportation by public transit bus are estimated to range from approximately 8,647 on a Normal Weekend Summer Day to about 8,576 on a Normal Weekday Summer, with the estimated Non-Summer Nighttime value 8,385. Considerably lower total demand is expected at night or on weekends, when students and workers are at home. Demand for ambulances or wheelchair vans shows less variation from one scenario to another. A summary of estimated vehicle trip needs for transportation assistance is given in **Table 14**. A listing of schools and hospitals by PAZ can be found in Appendix 2.

5.4 Diablo Canyon Plant Workers and Visitors

The number of on-site workers and visitors present at the Diablo Canyon Plant depends upon the day of the week, and whether or not a generation unit is shutdown for maintenance or refueling activities. During routine shutdowns or "outages" of a unit, there is an increase in the number of contractor personnel on site to perform the necessary maintenance and fueling activities.

Diablo Canyon Power Plant would order an evacuation of non-essential personnel at the plant at the declaration of a Site Area Emergency in coordination with off-site officials. In this event, an estimated 900 vehicles would be instructed to evacuate the site, with some personnel remaining on-site for emergency action.

Table 6
Estimated Evacuation Vehicles 2000
Diablo Canyon Evacuation Time Study

Protective Action Zone	Residents (1)		Transients (2)			
	Normal Weekday Non-Summer Day & Night	Normal Weekday & Weekend Summer	Normal Weekday Non-Summer Daytime	Normal Weekday Non-Summer Nighttime	Normal Weekday Summer Daytime	Normal Weekend Summer Daytime
1. 2-Mile	3	3	165	14	165	14
2. 6-Mile	87	87	80	32	116	165
3. Avila/San Luis/See Canyon/Squire Canyon	2,622	2,590	602	344	931	1,235
4. Prefumo Canyon/Los Osos Valley	1,024	1,024	26	3	26	10
5. Baywood/ Los Osos	11,030	10,630	392	84	406	190
6. City of Pismo Beach	7,864	7,742	3,115	2,529	4,256	4,486
7. Indian Knob/Price Canyon	179	179	3	0	3	1
8. San Luis Obispo Area	31,345	27,684	10,937	2,341	8,705	4,534
9. Morro Bay/Cayucos	12,973	12,695	2,059	1,199	2,723	2,507
10. Five Cities, Southern Portion	23,207	22,763	2,853	830	3,672	3,624
11. Orcutt Road/Lopez Drive/Route 227	1,821	1821	59	7	59	23
12. Nipomo North of Willow Road	3,377	3377	212	26	212	82
BEPZ Total	95,532	90,595	20,503	7,409	21,274	16,871

Note: Assumed Transient Persons Per Vehicle: Workers: 1.09; Visitors: 2.30

Sources:
(1) US Census Bureau
(2) California State Parks Department
San Luis Obispo Council of Governments
Cal Poly San Luis Obispo
San Luis Obispo County Visitors & Conference Bureau
Port San Luis Public Safety & Information Office

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Table 7
Total Evacuating Vehicles

Vehicle-Owning Population Component	Evacuation Condition			
	Normal Weekday Non-Summer Daytime	Normal Weekday Non-Summer Nighttime	Normal Weekday Summer Daytime	Normal Weekend Summer Daytime
Resident	95,532	95,532	90,595	90,595
Transient	20,503	7,409	21,274	16,871
Total Vehicles	**116,035**	**102,941**	**111,869**	**107,466**

Table 8
Required Number of Bus Trips for All Evacuation Scenarios

Scenario	Persons	Bus Trips
Normal Weekday, Non-Summer, Daytime	13,087	327
Normal Weekday, Non-Summer, Nighttime	8,376	209
Normal Weekday, Summer, Daytime	8,937	223
Normal Weekend, Summer, Daytime	8,879	222

Includes: Households w/o vehicles; Transient workers & visitors w/o vehicles;
Persons in Institutions; Homebound persons; Private & Pre-Schools
(normal weekday non-summer daytime scenario only)

Table 9.1
Public School Enrollment
Diablo Canyon Evacuation Time Study

Public Schools	Community	PAZ	Student Enrollment[1]
San Luis Coastal Unified School District			
Bellevue Sante Fe Elementary	Avila Valley	3	162
Baywood Elementary	Baywood	5	323
Los Osos Middle School	Los Osos	5	524
Monarch Elementary	Los Osos	5	258
Pismo Beach High School	Pismo Beach	6	72
Bishop's Peak Elementary	San Luis Obispo	8	333
C.E. Teach	San Luis Obispo	8	170
C.L. Smith Elementary	San Luis Obispo	8	370
Hawthorne Elementary	San Luis Obispo	8	272
Laguna Middle School	San Luis Obispo	8	825
Los Ranchos Elementary	San Luis Obispo	8	472
Monarch Grove Elementary	San Luis Obispo	8	462
Pacheco Elementary	San Luis Obispo	8	452
Sinsheimer Elementary	San Luis Obispo	8	489
Vicente	San Luis Obispo	8	10
San Luis Obispo High School	San Luis Obispo	8	1,510
Del Mar Elementary	Morro Bay	9	235
Morro Bay High School	Morro Bay	9	944
Morro Elementary	Morro Bay	9	272
SubTotal			**8,155**
Lucia Mar Unified School District			
Judkins Middle School	Pismo Beach	6	584
Shell Beach Elementary	Pismo Beach	6	439
Arroyo Grande High School	Arroyo Grande	10	3,149
Branch Elementary	Arroyo Grande	10	302
Harloe Elementary	Arroyo Grande	10	672
Mesa Middle School	Arroyo Grande	10	792
Ocean View Elementary	Arroyo Grande	10	634
Paulding Middle School	Arroyo Grande	10	658
Independent/Home Study	Five Cities	10	135
Grover Beach Elementary	Grover Beach	10	499
Grover Heights Elementary	Grover Beach	10	523
North Oceano Elementary	Grover Beach	10	544
Oceano Elementary	Oceano	10	502
Lopez High School	Arroyo Grande	12	173
Subtotal			**9,606**
Cayucos Elementary School District			
Cayucos Elementary	Cayucos	9	272
Subtotal			**272**
Total Enrollment, Public Schools			**18,033**

[1] Enrollment numbers were current as of January 2002

Source: San Luis Coastal Unified School District, Lucia Mar Unified School District, Cayucos Elementary School

Table 9.2
Private School Enrollment
Diablo Canyon Evacuation Time Study

Private Schools	Community	PAZ	Student Enrollment
Laureate Private School	San Luis Obispo	8	209
Mission College Prep	San Luis Obispo	8	259
Montessori Children's School	San Luis Obispo	8	80
Old Mission Catholic School	San Luis Obispo	8	290
San Luis Obispo Christian School	San Luis Obispo	8	65
Coastal Christian School	Arroyo Grande	10	213
Lighthouse Christian School	Arroyo Grande	10	60
Royal Oaks Christian School	Arroyo Grande	10	250
St. Patricks's Catholic School	Arroyo Grande	10	337
Valley View Academy	Arroyo Grande	10	78
Total Enrollment, Private Schools			**1,841**
Pre-Schools	**Location**	**PAZ**	**Student Enrollment**
Total Pre-School Enrollment, PAZ 1	2-Mile Protective Action Zone	1	0
Total Pre-School Enrollment, PAZ 2	6-Mile Protective Action Zone	2	0
Total Pre-School Enrollment, PAZ 3	Avila/San Luis/See Canyon/Squire Canyon	3	0
Total Pre-School Enrollment, PAZ 4	Prefumo Canyon/Los Osos Valley	4	0
Total Pre-School Enrollment, PAZ 5	Baywood/ Los Osos	5	252
Total Pre-School Enrollment, PAZ 6	Pismo Beach	6	105
Total Pre-School Enrollment, PAZ 7	Indian Knob/Price Canyon	7	0
Total Pre-School Enrollment, PAZ 8	San Luis Obispo Area	8	1280
Total Pre-School Enrollment, PAZ 9	Morro Bay/Cayucos	9	148
Total Pre-School Enrollment, PAZ 10	Five Cities, Southern Portion	10	394
Total Pre-School Enrollment, PAZ 11	Orcutt Road/Lopez Drive/Route 227	11	0
Total Pre-School Enrollment, PAZ 12	Nipomo North of Willow Road	12	0
Total Enrollment, Pre-Schools			**2,179**
Total Enrollment, Private and Pre Schools			**4,020**

Source: WSA correspondence with private school and pre-school owners and administrative staff, January 2002

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Table 10
Persons in Institutions Needing Special Transportation Assistance
Diablo Canyon Evacuation Time Study

Facility	Address/Community	PAZ	Persons Needing Evacuation Assistance
Hospitals			
French Hospital	1911 Johnson Ave., San Luis Obispo	8	35
San Luis Obispo General Hospital[1]	2180 Johnson Ave., San Luis Obispo	8	10
Sierra Vista Hospital	1010 Murray Ave., San Luis Obispo	8	100
Arroyo Grande Community Hospital	345 S. Halcyon Rd., Arroyo Grande	10	75
Subtotal			**220**
Convalescent Care Centers			
Cabrillo Care Center	3033 Augusta, San Luis Obispo	8	155
Woodside Nursing Center	1425 Woodside Dr., San Luis Obispo	8	160
Bayside/Casa de Flores	State Route 1 & South Bay Blvd., Morro Bay	9	144
Arroyo Grande Community Hospital[2]	1212 Farroll Ave., Arroyo Grande	10	0
Subtotal			**459**
Residential Care Facilities			
Threlkeld Family Home	Baywood	5	6
Angel House	Los Osos	5	6
Bay-Osos #1	Los Osos	5	6
Bay-Osos #2	Los Osos	5	6
Bay-Osos #3	Los Osos	5	6
Baywood Manor	Los Osos	5	6
Defehr Home	Los Osos	5	4
Garbett Home	Los Osos	5	3
M&L South Bay	Los Osos	5	6
Manzanita Manor	Los Osos	5	6
Sea Gardens	Los Osos	5	6
Sierra #1	Los Osos	5	6
Sierra #2	Los Osos	5	6
Threlkeld #2	Los Osos	5	6
Double Heart	Shell Beach	6	6
Case De Vida	San Luis Obispo	8	91
Adult Care Association	San Luis Obispo	8	35
Adult Transitions	San Luis Obispo	8	12
Anna's Gardens	San Luis Obispo	8	8
Garden Creek	San Luis Obispo	8	72
Greenhills	San Luis Obispo	8	6
Julie's	San Luis Obispo	8	2
Laguna Lake	San Luis Obispo	8	6
Las Brisas	San Luis Obispo	8	95
Manse on Marsh	San Luis Obispo	8	49
Village at Sydney Creek	San Luis Obispo	8	65
Pacific Vista	Cayucos	9	6
Casa De Flores	Morro Bay	9	120
Garden House	Morro Bay	9	12
Home Sweet Home	Morro Bay	9	4
Options	Morro Bay	9	30
Roseville	Morro Bay	9	6
The Huntington	Morro Bay	9	52
Oak Park Manor	Arroyo Grande	10	35
Alder Guest Home	Arroyo Grande	10	32
Brighton Community	Arroyo Grande	10	6
Gaynfair House	Arroyo Grande	10	6
Hillside Villa #2	Arroyo Grande	10	6
Sacred Heart	Arroyo Grande	10	6
Spruce	Arroyo Grande	10	45
Wyndham	Arroyo Grande	10	72
Carmel Homes	Grover Beach	10	6
Carmel Homes 2	Grover Beach	10	6
Full Circle	Grover Beach	10	4
Grover Heights	Grover Beach	10	6
Total Tender	Grover Beach	10	6
Adult-Care	Halcyon	10	15
Subtotal			**1007**
Total Persons	**BEPZ**		**1686**

Source: WSA correspondence with hospitals, convalescent care centers, and residential care facilities staff, January 2002

[1] As of May 2002, San Luis Obispo General Hospital has stated plans to close the hospital in 2003.
[2] Has indicated that no evacuation assistance is needed.

Table 11
Summary of Vehicle Requirements for Special Transportation Needs by Institution
Diablo Canyon Evacuation Time Study

Institution	Patients				Vehicles Required		
	PAZ	Ambulatory	Non-Ambulatory	Total	Bus	Ambulance	WC Van
Acute Care Hospitals							
French Hospital	8	30	5	35	0.8	1.0	0.5
San Luis Obispo General Hospital[1]	8	4	6	10	0.1	1.0	0.7
Sierra Vista Hospital	8	50	50	100	1.3	12.5	4.2
Arroyo Grande Community Hospital	10	45	30	75	1.1	6.0	3.0
Subtotal		**129**	**91**	**220**	**3**	**21**	**8**
Convalescent Care Centers							
Cabrillo Care Center	8	30	125	155	0.8	20.8	13.9
Woodside Nursing Center	8	0	160	160	0.0	26.7	17.8
Bayside/Casa de Flores	9	14	130	144	0.4	21.7	14.4
Arroyo Grande Care Center[2]	10	0	0	0	0.0	0.0	0.0
Subtotal		**44**	**415**	**459**	**1**	**69**	**46**
Residential Care Facility							
Threlkeld Family Home	5	2	4	6	0.1	0.7	0.4
Angel House	5	4	2	6	0.1	0.3	0.2
Bay-Osos #1	5	0	6	6	0.0	1.0	0.7
Bay-Osos #2	5	0	6	6	0.0	1.0	0.7
Bay-Osos #3	5	3	3	6	0.1	0.5	0.3
Baywood Manor	5	0	6	6	0.0	1.0	0.7
Defehr Home	5	4	0	4	0.1	0.0	0.0
Garbett Home	5	3	0	3	0.1	0.0	0.0
M&L South Bay	5	6	0	6	0.2	0.0	0.0
Manzanita Manor	5	0	6	6	0.0	1.0	0.7
Sea Gardens	5	0	6	6	0.0	1.0	0.7
Sierra #1	5	6	0	6	0.2	0.0	0.0
Sierra #2	5	6	0	6	0.2	0.0	0.0
Threlkeld #2	5	0	6	6	0.0	1.0	0.7
Double Heart	6	6	0	6	0.2	0.0	0.0
Case De Vida	8	59	32	91	1.5	5.3	3.6
Adult Care Association	8	0	35	35	0.0	5.8	3.9
Adult Transitions	8	12	0	12	0.3	0.0	0.0
Anna's Gardens	8	2	6	8	0.1	1.0	0.7
Garden Creek	8	25	47	72	0.6	7.8	5.2
Greenhills	8	0	6	6	0.0	1.0	0.7
Julie's	8	2	0	2	0.1	0.0	0.0
Laguna Lake	8	0	6	6	0.0	1.0	0.7
Las Brisas	8	93	2	95	2.3	0.3	0.2
Manse on Marsh	8	0	49	49	0.0	8.2	5.4
Village at Sydney Creek	8	65	0	65	1.6	0.0	0.0
Pacific Vista	9	0	6	6	0.0	1.0	0.7
Casa De Flores	9	0	120	120	0.0	20.0	13.3
Garden House	9	12	0	12	0.3	0.0	0.0
Home Sweet Home	9	0	4	4	0.0	0.7	0.4
Options	9	30	0	30	0.8	0.0	0.0
Roseville	9	0	6	6	0.0	1.0	0.7
The Huntington	9	52	0	52	1.3	0.0	0.0
Oak Park Manor	10	14	21	35	0.4	3.5	2.3
Alder Guest Home	10	0	32	32	0.0	5.3	3.6
Brighton Community	10	6	0	6	0.2	0.0	0.0
Gaynfair House	10	0	6	6	0.0	1.0	0.7
Hillside Villa #2	10	0	6	6	0.0	1.0	0.7
Sacred Heart	10	0	6	6	0.0	1.0	0.7
Spruce	10	0	45	45	0.0	7.5	5.0
Wyndham	10	0	72	72	0.0	12.0	8.0
Carmel Homes	10	0	6	6	0.0	1.0	0.7
Carmel Homes 2	10	0	6	6	0.0	1.0	0.7
Full Circle	10	0	4	4	0.0	0.7	0.4
Grover Heights	10	6	0	6	0.2	0.0	0.0
Total Tender	10	0	6	6	0.0	1.0	0.7
Adult-Care	10	0	15	15	0.0	2.5	1.7
Subtotal		**418**	**589**	**1007**	**11**	**98**	**66**
Totals		**591**	**1095**	**1686**	**15**	**188**	**120**

Source: WSA correspondence with hospitals, convalescent care centers, and residential care facilities staff, January 2002

Notes:

[1] As of May 2002, San Luis Obispo General Hospital has stated plans to close the hospital in 2003.

[2] Has indicated that no evacuation assistance is needed.

Vehicle demand assumes carrying capacity of 40 persons per bus, 2 persons per ambulance, and 6 persons per WC van.

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Table 12
Homebound Persons Requiring
Special Transportation

Location	PAZ	Persons Needing Evacuation Assistance
Avila/Shell Beach	3	5
Los Osos	5	47
Pismo Beach	6	17
San Luis Obispo	8	110
Cayucos	9	0
Morro Bay	9	42
Arroyo Grande/Grover Beach	10	76
Oceano	12	15
Total		**312**

Table 13
Summary of Persons Needing Special Transportation Assistance
Diablo Canyon Evacuation Time Study

Population Category	Normal Weekday Non-Summer Daytime	Normal Weekday Non-Summer Nighttime	Normal Weekday Summer Daytime	Normal Weekend Summer Daytime
Bus Transportation				
Persons-at-Home				
a) Households without vehicles	6,739	6,739	6,340	6,340
b) Homebound persons requiring special transportation	109	109	109	109
Subtotal	6,848	6,848	6,449	6,449
Acute Care Hospitals	129	129	129	129
Convalescent Care Centers	459	459	459	459
Residential Care Facilities	1,007	1,007	1,007	1,007
Transients without Autos	1,404	71	661	732
Subtotal, Persons by Transit Bus	**9,847**	**8,514**	**8,705**	**8,776**
Ambulances				
Homebound persons	69	69	69	69
Acute Care Hospitals	42	42	42	42
Convalescent Care Centers	138	138	138	138
Residential Care Facilities	196	196	196	196
Subtotal, Persons by Ambulance	**445**	**445**	**445**	**445**
Wheelchair Vans				
Homebound persons	134	134	134	134
Acute Care Hospitals	48	48	48	48
Convalescent Care Centers	276	276	276	276
Residential Care Facilities	396	396	396	396
Subtotal, Persons by Wheelchair Van	**854**	**854**	**854**	**854**
Total Persons Needing Special Transportation Assistance	**11,146**	**9,813**	**10,004**	**10,075**

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Table 14
Estimate of Vehicle Trip Requirements for Special Transportation Needs
Diablo Canyon Evacuation Time Study

Population Category	Normal Weekday Non-Summer Daytime	Normal Weekday Non-Summer Nighttime	Normal Weekday Summer Daytime	Normal Weekend Summer Daytime
Bus Transportation				
Persons-at-Home				
a) Households without vehicles	168	168	158	158
b) Requiring special transportation	3	3	3	3
Subtotal	171	171	161	161
Acute Care Hospitals	3	3	3	3
Convalescent Care Centers	11	11	11	11
Residential Care Facilities	25	25	25	25
Transients without Autos	35	2	17	18
Subtotal, Persons by Transit Bus	**245**	**212**	**217**	**218**
Ambulances				
Persons-at-Home	34	34	34	34
Acute Care Hospitals	21	21	21	21
Convalescent Care Centers	69	69	69	69
Residential Care Facilities	98	98	98	98
Subtotal, Persons by Ambulance	**222**	**222**	**222**	**222**
Wheelchair Vans				
Persons-at-Home	22	22	22	22
Acute Care Hospitals	8	8	8	8
Convalescent Care Centers	46	46	46	46
Residential Care Facilities	66	66	66	66
Subtotal, Persons by Wheelchair Van	**142**	**142**	**142**	**142**
Total Vehicles Needed For Special Transportation Assistance	**609**	**576**	**581**	**582**

Note:
Vehicle demand assumes carrying capacity of 40 persons per bus, 2 persons per ambulance, and 6 persons per WC van.

Chapter 6

EVACUATION ROADWAY NETWORK

Evacuation route plans are set forth as part of the emergency response plans for the local organizations responsible for planning and implementing an evacuation of the Basic Emergency Planning Zone (BEPZ). These plans identify the local roadways to be used as evacuation routes by each community. The major evacuation routes designated for the BEPZ are shown in **Figure 5** and more localized figures included in Appendix 2.

6.1 Recent and Planned Improvements to Major Road Network

Contact was made with State and local officials responsible for elements of the area road system to update information on system improvements. These contacts revealed that there are no significant projects planned for area roadways in the near future, although an improvement project on the Cuesta Grade (U.S. 101) is currently underway. Some periodic routine maintenance projects are programmed along state routes in the area; however, Caltrans advises that traffic operations could quickly be "normalized" in the event of an emergency evacuation.

6.2 Evacuation Route Computer Network

The designated evacuation routes were translated into a link/node network for input into the computerized Evacuation Time Assessment Program. First, the area roadway network was redefined as a system of roadway links (segments) and nodes (roadway intersections). Network nodes were then numbered and coded for input into the computer program. Protective Action Zones (PAZ) were represented in the network by centroids, representing the center of activity within the zone. Centroid connectors were used to represent zonal access to major evacuation routes.

The link/node network representing the evacuation routes, and the location of the population centroids representing the Protective Action Zone, are depicted in **Figure 6.** The figure also illustrates the centroid connector links.

6.3 Traffic Operation

Operation of traffic on the major evacuation routes will be governed by the County's Traffic Management Plan. This plan is developed in conjunction with the California Highway Patrol and is part of their Standard Operating Procedures.

6.4 Travel Speeds

Average speeds were assigned to each link according to the character of the roadway. Freeway speeds were assigned at 30-45 miles per hour with ramp speeds at 15 miles per hour. Four-lane roadways were generally assigned speeds ranging from 25 to 35 miles per hour, depending on posted speed limits, roadway quality and access control. Speeds for two-lane roadways ranged from 10 miles per hour to 25 miles per hour. Centroid connectors were considered as local or neighborhood streets and assigned a speed of 10 miles per hour.

It should be noted that the above mentioned speed assignments represent average speeds and apply only when the roadway facilities are operating below the assigned roadway capacity. Once traffic flow reaches or exceeds roadway capacity, the computer model begins to simulate the formation of traffic queues on the "over-capacity" links and any feeder links affected by the over-capacity link. The computer model adjusts the travel times to reflect the congested conditions. It is important to recognize that the speed assumptions have little affect on the overall evacuation time estimates since the evacuation traffic begins to exceed the roadway capacity within the first hour of the evacuation.

6.5 Roadway Conditions

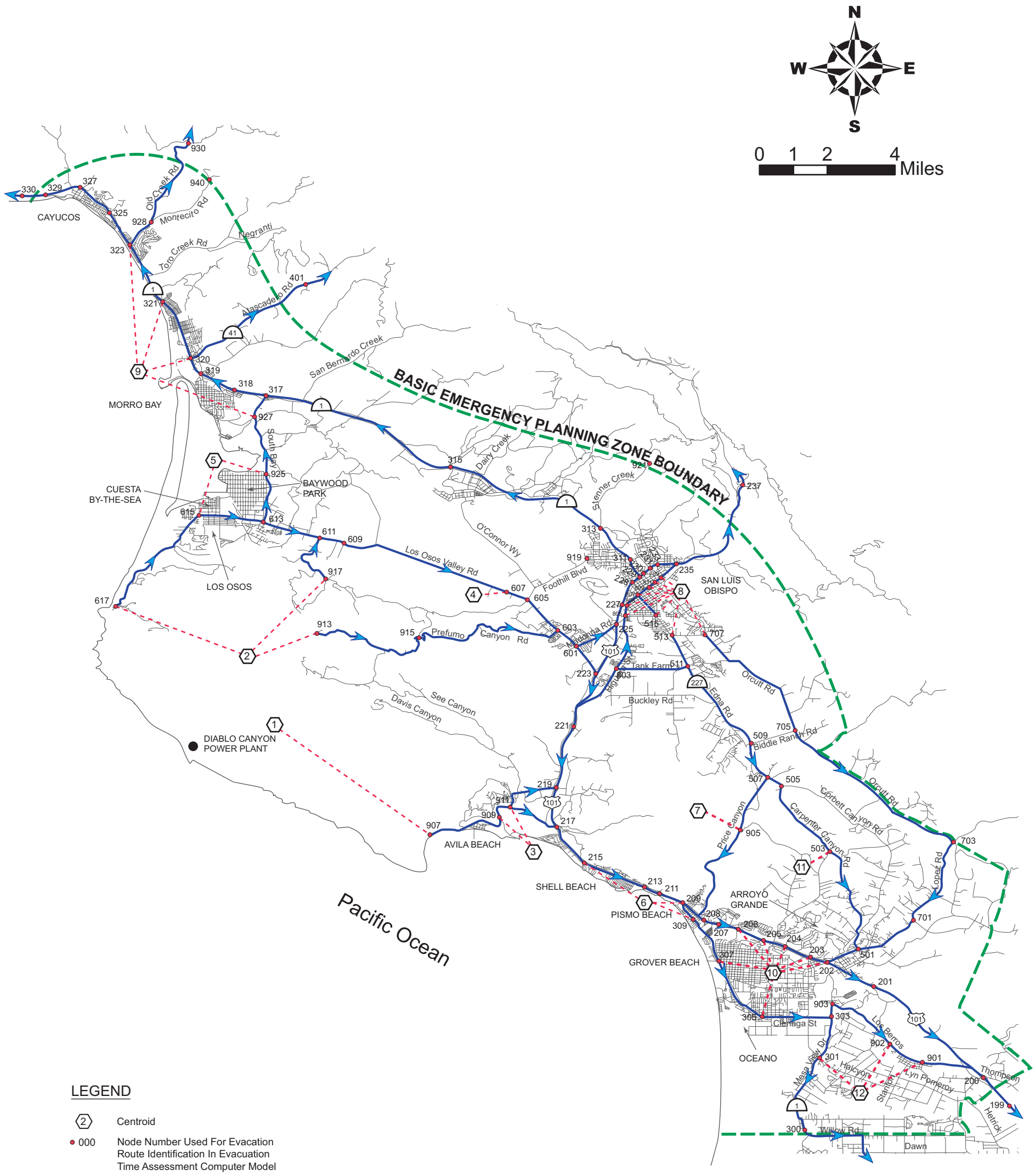
Capacities assigned to each roadway link in the computer model take into consideration general roadway geometrics as well as side road interferences. The roadway capacities used for this analysis are given in **Table 15**. These are not the same values used in the 1980 and 1990 Evacuation Time Assessments. The values were reviewed and adjusted in some cases to reflect more conservative average lane capacities. The updated capacities have been re-evaluated using standard Highway Capacity Manual[6] methodology and are judged to be reasonable estimates for emergency evacuation conditions.

One important consideration in the evacuation capacity assumptions relates to the assumed operation of U.S. 101 northbound in the Cuesta Grade area. The current evacuation capacity assumptions assume that the capacity of U.S. 101 north of the Monterey Street on-ramp is only two northbound lanes instead of three that would be suggested by the soon to be completed Project Cuesta Grade. This highway construction project will essentially add a northbound truck climbing lane that extends for approximately three miles in the vicinity where U.S. 101 climbs up over Cuesta Grade. Although the evacuation capacity of this three-mile segment of U.S. 101 would technically be that of a thee-lane highway, the “effective capacity” of U.S. 101 between the Monterey Street on-ramp and S.R. 58 is limited by the two-lane segments both south and north of Project Cuesta Grade.

Once an evacuation is well underway, most vehicles would be headed in the same direction. Because of the directional flow and controlled routings, lane capacities could be higher than

[6] Highway Capacity Manual, Special Report 209 - Transportation Research Board, National Research Council, Washington, D.C., 1994.

those observed under normal circumstances. Another factor which could contribute to smoother flow and higher capacities is that the drivers involved in the evacuation would probably be the most seasoned, experienced driver(s) of each household. The standard operating procedures for traffic control provide for clearance of disabled vehicles from key evacuation routes.



COMPUTER NETWORK
EMERGENCY EVACUATION ROUTES

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Figure 6

Table 15
Capacity of Major Evacuation Routes
Diablo Canyon Evacuation Time Study

Route	Segment	Type [1]	Total Lanes	One-Way Evacuation Lanes	Capacity [2]
U.S. 101	San Luis Obispo-Atascadero	F	4	2	2400[3]
	San Luis Obispo-Santa Maria	F	4	2	2,400
	Typical Interchange On-Ramp	F	1	1	1,200
State Route 1	San Luis Obispo-Cayucos	F	4	2	2,400
	Cayucos-Cambria	R	2	1	1,500
	Pismo Beach	A	2	1	1,000
	Pismo Beach-Grover Beach	A	2	1	1,200
	Grover Beach-North Nipomo	A	2	1	1,200
	North Nipomo-Guadalupe	R	2	1	1,500
State Route 41	Morro Bay-Atascadero	R	2	1	800
State Route 227	Arroyo Grande	R	2	1	1,000
Los Berros Rd.	Arroyo Grande-Nipomo	R	2	1	1,000
Avila Rd.	Avila Beach-U.S. 101	R	2	1	800
Old Creek Rd.	Cayucos-Route 46	R	2	1	600
Los Osos Valley Rd.	Los Osos-San Luis Obispo	R	2	1	1,500
Orcutt Rd.	Arroyo Grande-San Luis Obispo	R	2	1	1,000
South Bay Blvd.	Los Osos-Morro Bay	R	2	1	1,000

(1) F = Freeway/Expressway, R = Rural Highway, A = Urban Arterial.
(2) Vehicles per hour (vph), in assumed usage during evacuation (one-way capacity).
(3) Capacity of this segment is controlled by the two-lane sections both south and north of Cuesta Grade.

Source:
Wilbur Smith Associates estimates based on field investigations, interpretation of the Highway Capacity Manual (HCM 2000), Transportation Research Board, and understanding of the evacuation time estimate model analysis methodology.

Chapter 7

EVACUATION TIME ESTIMATES

There are two distinct events which are necessary to initiate the evacuation. One event is the direct notification of public agencies, schools, and institutions requiring special evacuation considerations. The second event is the dissemination of the evacuation warning to the general population. Both of these events must include instructions regarding the zones to be evacuated. The first event is assumed to be accomplished by telephone from the various emergency response organizations to each affected group. The second event would be initiated by a public warning system, which would combine an acoustical warning system by sirens, and then be supplemented by instructions over selected broadcast stations.

7.1 Components of Evacuation Time

For the general population, the time required to evacuate is comprised of several individual time components. During an evacuation, each individual would react differently in terms of actions and speed. Therefore, each of these time components must be considered as a distribution of individual time rather than a single, fixed-time increment. The sequence of actions during an evacuation has been formulated to reflect those actions which may be expected from the majority of the population. The evacuation time components used in these analyses are as follows:

1. Receipt of Notification - The time required for the general population within the affected area to receive notification of evacuation once the public alerting is initiated by the local authorities.

2. Return to Home - The time required for persons to return to their homes, if not already at home, prior to their evacuation of the area. This also reflects the time required to close up business and places of work.

3. Departure from Home - Once home, the time required to assemble family members, to pack essential items for the evacuation, and to secure the home prior to their leaving.

4. Evacuation Travel Time - Once underway, the time required for the population to travel out of the affected area.

Each evacuation time component can be expressed graphically as a normal distribution curve where the height of any given point along the curve represents the percentage of the population completing that particular public response component at a given point in time. The response time curves representing the first three components, when combined, form the mobilization time distribution. Mobilization time is that period between the initial evacuation notification and the time the person(s) leaves home. It is the mobilization time distribution which controls the rate at which vehicles enter onto the evacuation roadway network.

7.2 Notification and Preparation Times for General Public

In this study, three different mobilization distributions were developed, two to represent daytime public response on a normal weekday and on a peak weekend day, respectively, and a third to reflect a nighttime response. Public responses during the daytime scenarios would differ somewhat for transients (tourists/beach visitors, workers) and residents. For example, residents and some tourists registered in local hotels/motels would return home prior to evacuating; whereas many transient beach visitors and non-local workers would begin evacuating immediately. The individual and combined public response curves are illustrated in **Figures 7 and 8** for the daytime and nighttime conditions respectively.

The public response time information was combined with the actual travel time needed to travel from their origin point within the BEPZ to the BEPZ boundary. These total evacuation times are discussed below.

7.3 Site Area Emergency

A site area emergency is characterized by events involving actual or likely major failures of plant functions needed for protection of the public. Although emergency actions involving members of the public may not be necessary, emergency response organizations will be mobilized. The Low Population Zone (LPZ) in the Power Plant vicinity may be evacuated. For Diablo Canyon Power Plant, this is the area inside the six-mile distance ring, consisting of Protective Action Zones (PAZ) 1 and 2. Montana De Oro State Park, the beach area of the community of Avila Beach/Port San Luis, Pismo State Beach and Oceano County Campground may be evacuated as a precaution and schools downwind from the plant would be closed or evacuated.

7.4 General Emergency

All events within this classification are situations where release of radioactive materials to the environment is imminent or actually underway. Protective actions will involve evacuation of at least Pay's 1 and 2. Upon notification of a general emergency, emergency response personnel will be mobilized. Early Warning System sirens will be sounded and protective action instructions will be broadcast over the Emergency Alert System (EAS).

7.5 Alternative Evacuation Conditions

Depending on the specific nature of the emergency and the overall assessment of the situation, and recognizing such factors as anticipated time interval to release, meteorological conditions and the other pertinent factors, evacuation measures may be initiated either for various sectors of the area or for the entire BEPZ. For this analysis, evacuation time estimates were made for a total of nine different groupings of PAZs representing various sectors of the BEPZ. Principal and secondary evacuation routes considered in the evacuation time

assessment for each of the evacuation scenarios are illustrated in **Figures 9.1 through 9.10.** Each scenario was investigated to determine the estimated evacuation time for each of the four time conditions (normal weekday, normal week night, summer weekday, and summer weekend) under fair weather conditions. The normal weekday condition was also evaluated for an assumed adverse weather condition. In this case, roadway capacities were reduced by 15 percent to simulate the altered travel conditions.

7.6 Estimated Evacuation Times

Results of the analyses of evacuation time requirements for each evacuation scenario and time condition are given in **Table 16**. It is assumed that traffic control authorities will accord priority access to buses and other high-occupancy vehicles (wheelchair vans, ambulances, etc.) required to make multiple evacuation trips. It is estimated that this procedure will enable the evacuation of persons requiring supplementary transportation to be completed within the time required for a general evacuation.

7.7 NRC Summaries

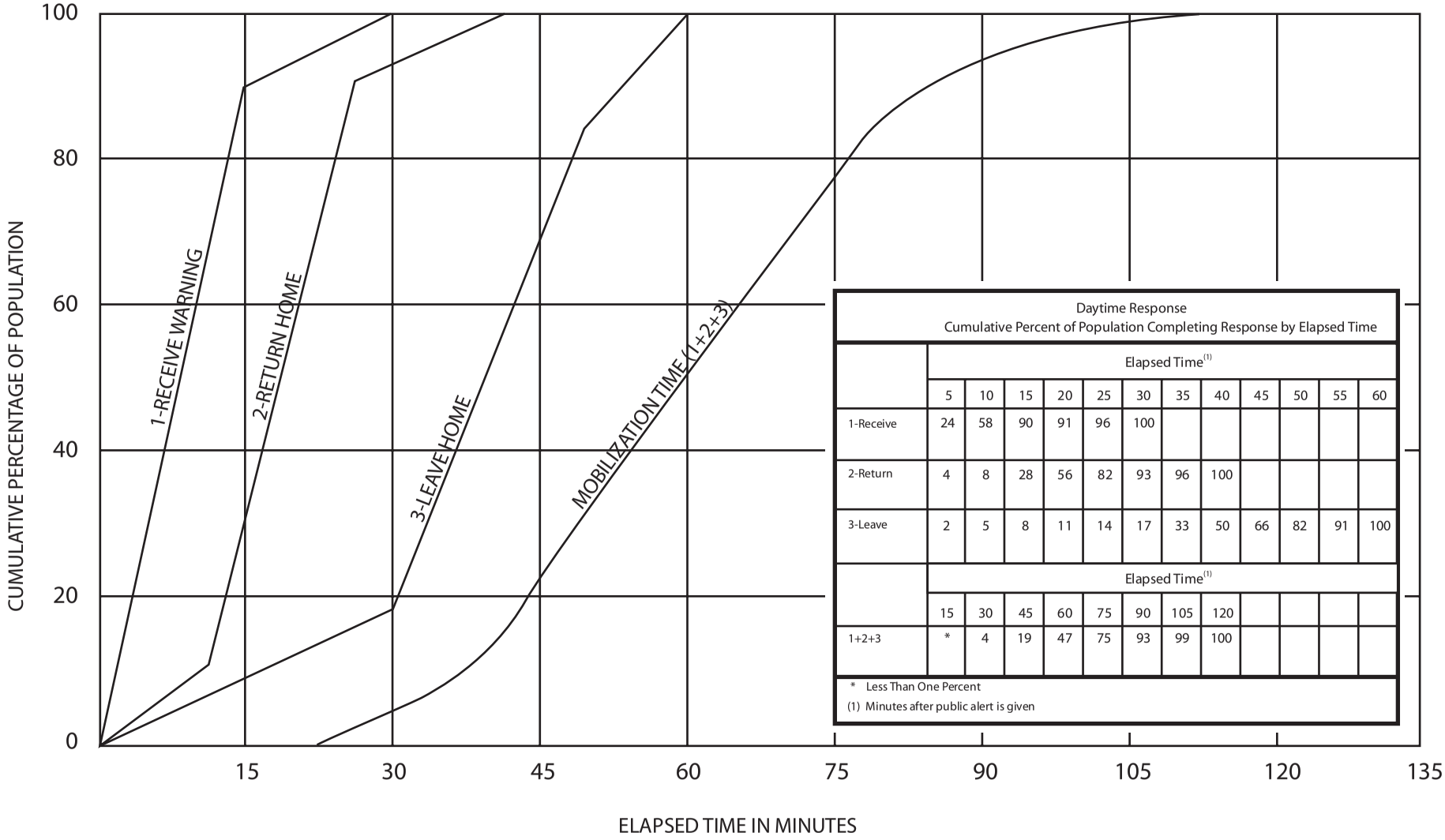
Table 17 gives the estimated population and number of evacuation vehicles for two-, six-, and ten-mile distance rings from the Diablo Canyon Power Plant, according to the summary format prescribed by the Nuclear Regulatory Commission. It also shows the evacuation times both for normal conditions and adverse weather.

7.8 Bottleneck Locations

The computer simulation of the evacuation process resulted in the identification of several bottleneck locations in the BEPZ, where traffic demand can be expected to significantly exceed available capacity during a general evacuation, resulting in lengthy vehicle queues and delays. These are shown in **Figures 10 and 11** for the Normal Weekday and Weekend Day conditions, respectively. They are generally well known to local transportation officials as trouble-spot locations.

Delays can be expected at access points to U.S. 101 in San Luis Obispo, and along U.S. 101 on the Cuesta grade. South Bay Boulevard is another bottleneck, due to limited roadway capacity. California Route 1 in the Morro Bay area is also expected to be a delay location.

In the southern portion of the BEPZ, delays are also indicated through the Five Cities area on both U.S. 101 and California Route 1.



Daytime Response
Cumulative Percent of Population Completing Response by Elapsed Time

	Elapsed Time[1]											
	5	10	15	20	25	30	35	40	45	50	55	60
1-Receive	24	58	90	91	96	100						
2-Return	4	8	28	56	82	93	96	100				
3-Leave	2	5	8	11	14	17	33	50	66	82	91	100

	Elapsed Time[1]											
	15	30	45	60	75	90	105	120				
1+2+3	*	4	19	47	75	93	99	100				

* Less Than One Percent
(1) Minutes after public alert is given

ESTIMATED DAYTIME RESPONSE

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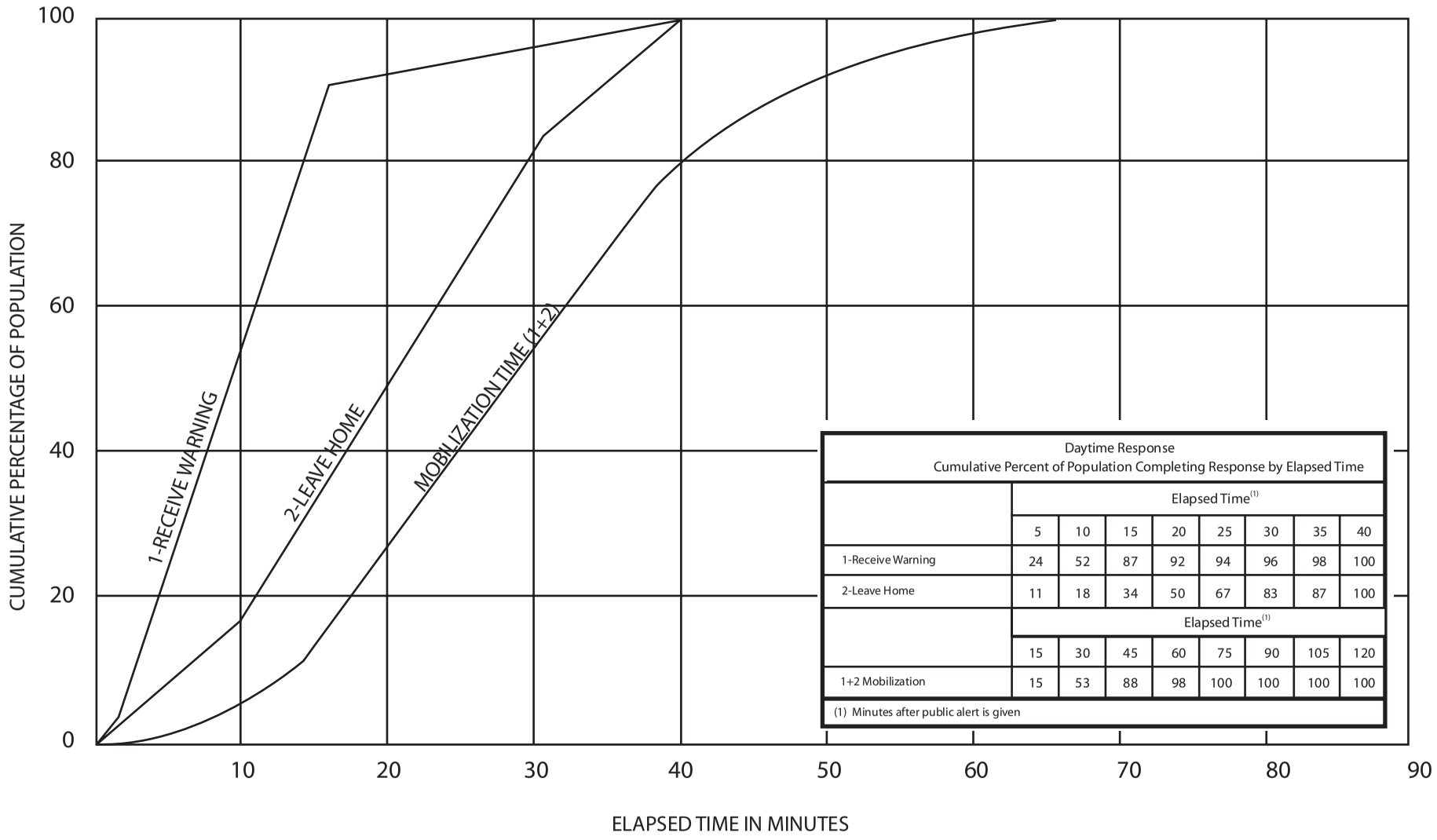
Figure 7



Daytime Response
Cumulative Percent of Population Completing Response by Elapsed Time

	Elapsed Time[1]							
	5	10	15	20	25	30	35	40
1-Receive Warning	24	52	87	92	94	96	98	100
2-Leave Home	11	18	34	50	67	83	87	100
	Elapsed Time[1]							
	15	30	45	60	75	90	105	120
1+2 Mobilization	15	53	88	98	100	100	100	100

(1) Minutes after public alert is given

ESTIMATED NIGHTTIME RESPONSE

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ECONOMISTS
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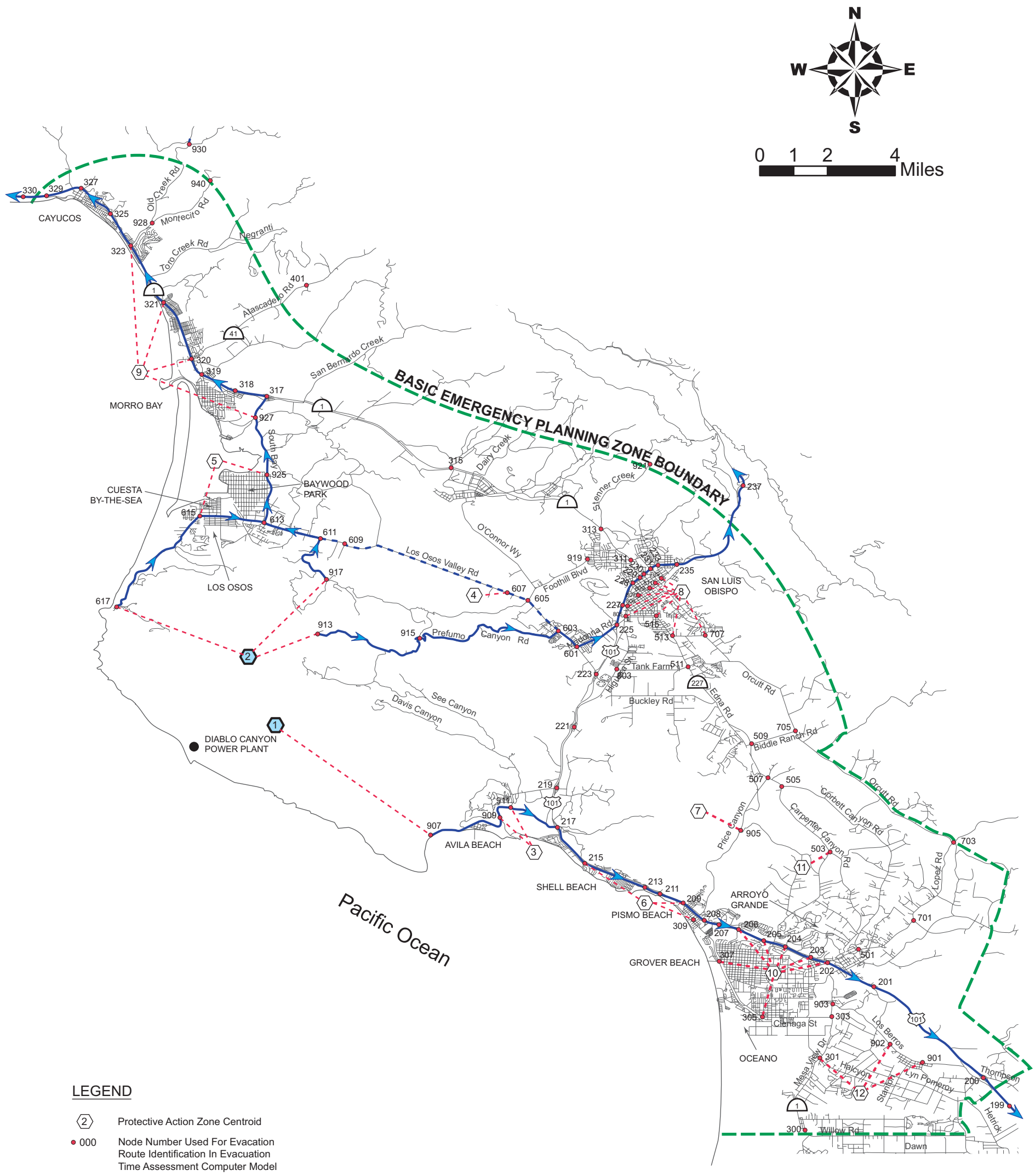
Figure 8



LEGEND

- 2 — Protective Action Zone Centroid
- 000 — Node Number Used For Evacation Route Identification In Evacuation Time Assessment Computer Model
- Evacuating Network Roadway Link
- 2 — Evacuating Protective Action Zone
- Principle Evacuation Route
- Secondary Evacuation Route

EVACUATION SCENARIO NO. 1
BASE EVACUATION
EMERGENCY EVACUATION ROUTES

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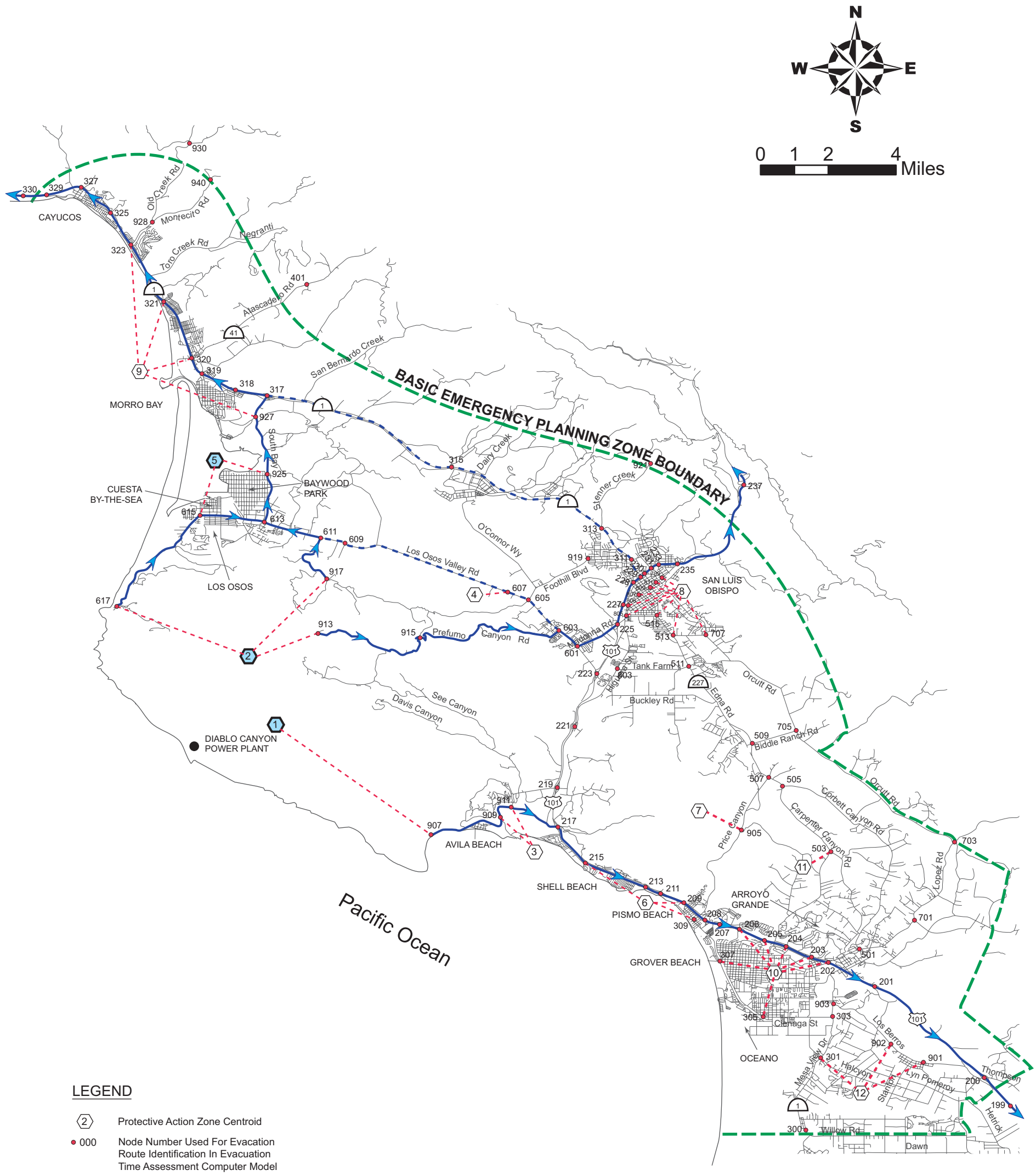
Figure 9.1



EVACUATION SCENARIO NO. 2
NORTH-A (LIMITED) EVACUATION
EMERGENCY EVACUATION ROUTES

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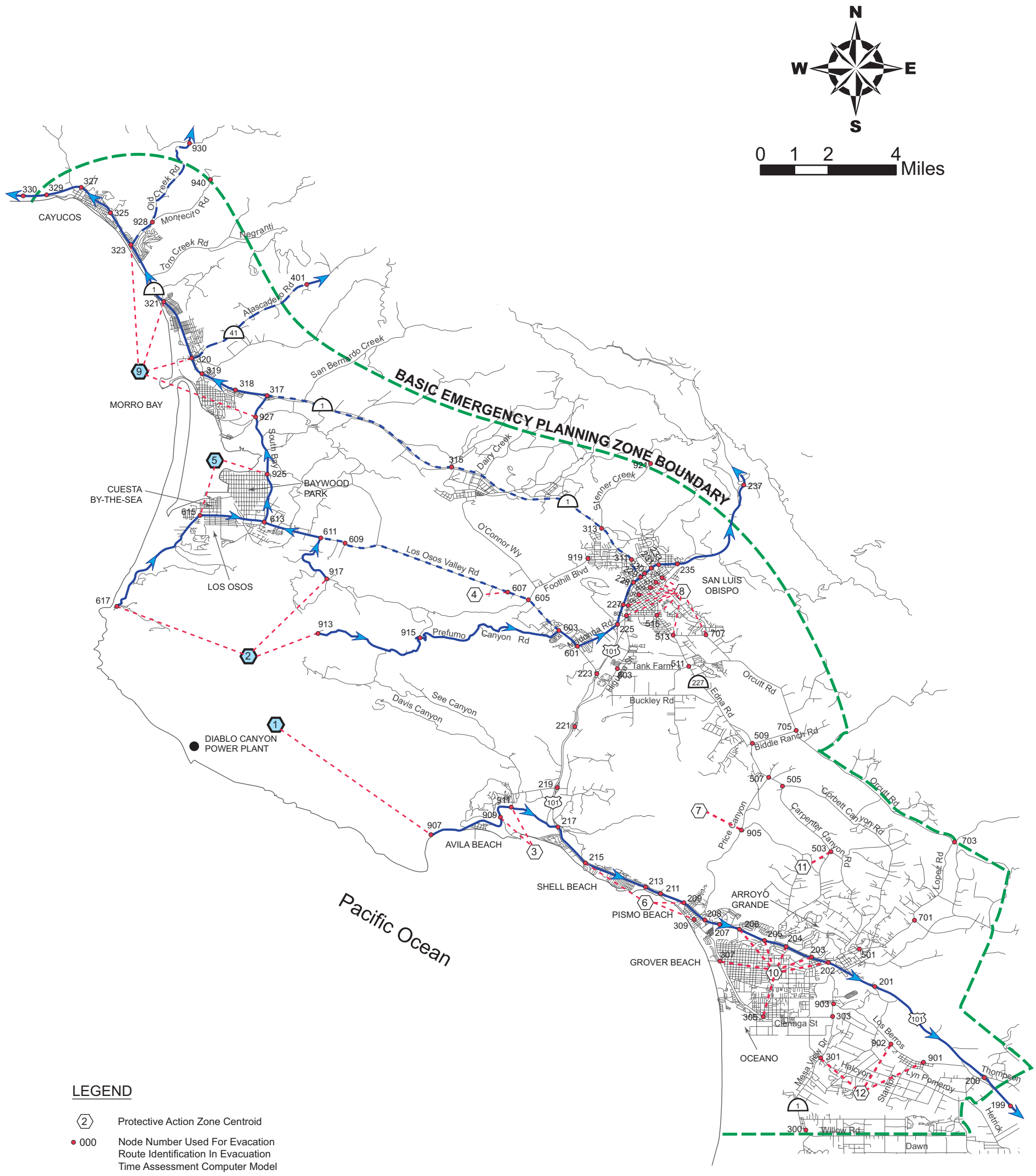
Figure 9.2



LEGEND

- 2 — Protective Action Zone Centroid
- 000 — Node Number Used For Evacation Route Identification In Evacuation Time Assessment Computer Model
- Evacuating Network Roadway Link
- 2 — Evacuating Protective Action Zone
- Principle Evacuation Route
- Secondary Evacuation Route

EVACUATION SCENARIO NO. 3
NORTH-B (ALL) EVACUATION
EMERGENCY EVACUATION ROUTES

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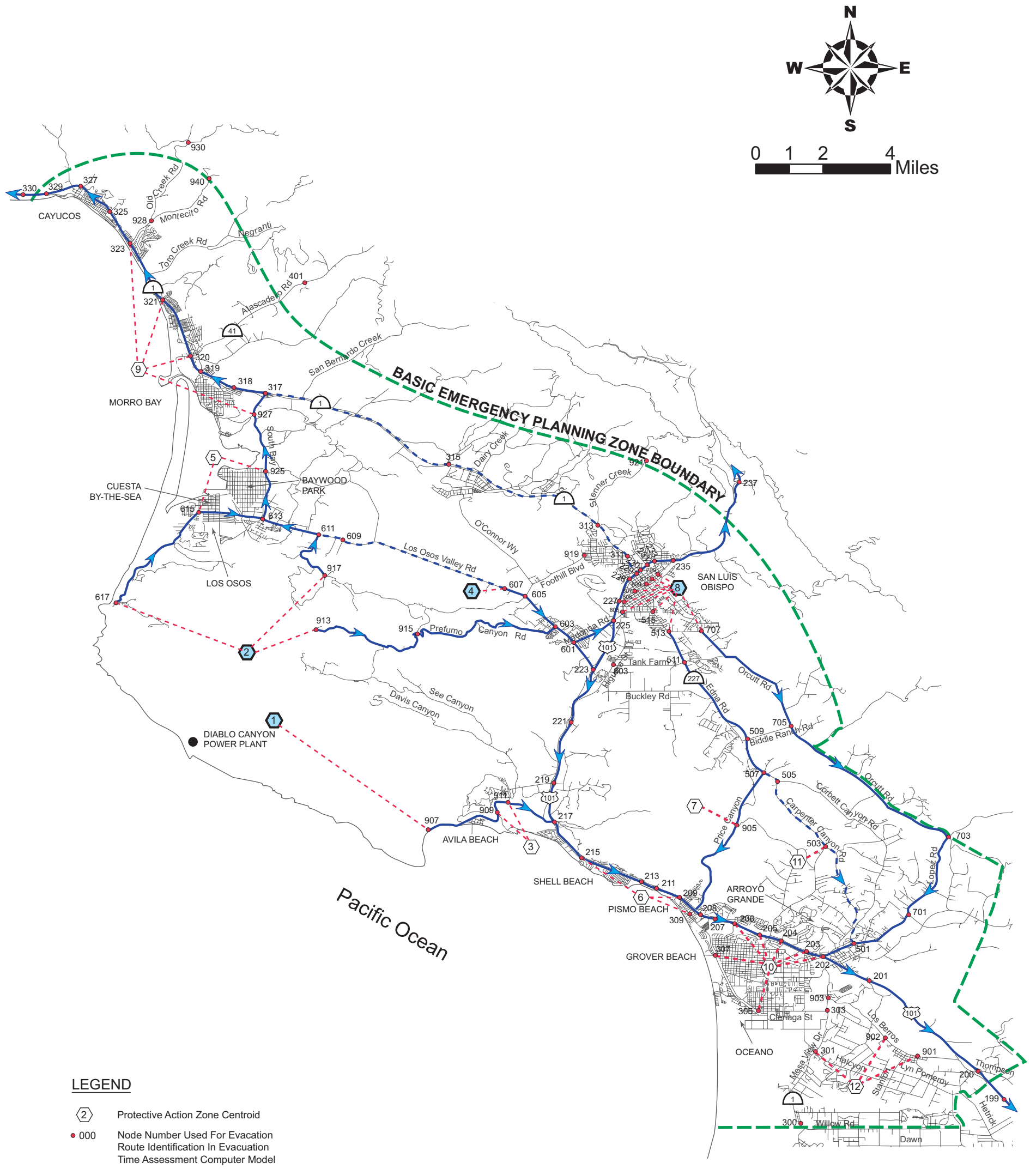
Figure 9.3



LEGEND

- 2 — Protective Action Zone Centroid
- 000 — Node Number Used For Evacation Route Identification In Evacuation Time Assessment Computer Model
- Evacuating Network Roadway Link
- 2 — Evacuating Protective Action Zone
- Principle Evacuation Route
- Secondary Evacuation Route

EVACUATION SCENARIO NO. 4
EAST (ALL) EVACUATION
EMERGENCY EVACUATION ROUTES

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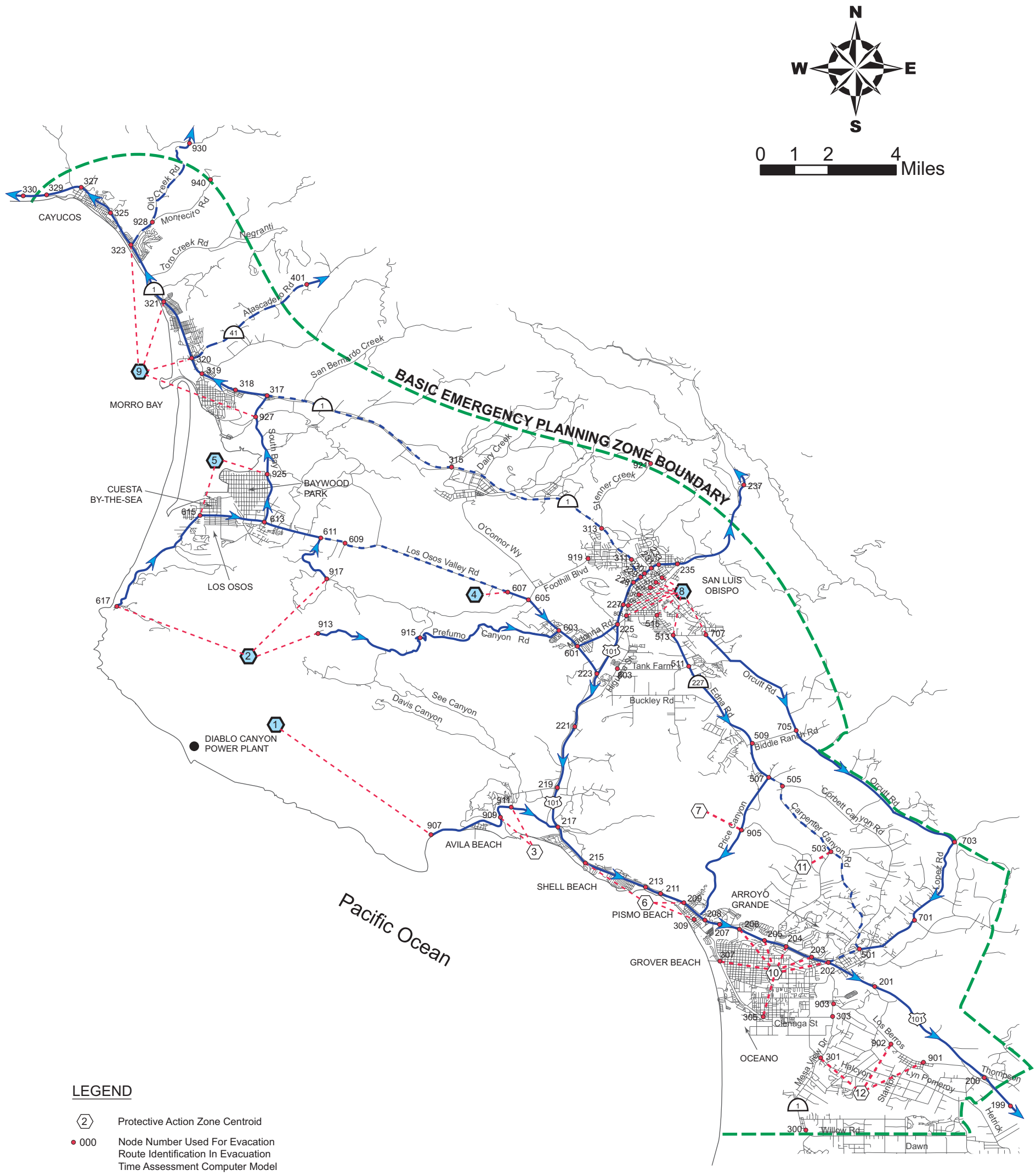
Figure 9.4



EVACUATION SCENARIO NO. 5
NORTH & EAST (ALL) EVACUATION
EMERGENCY EVACUATION ROUTES

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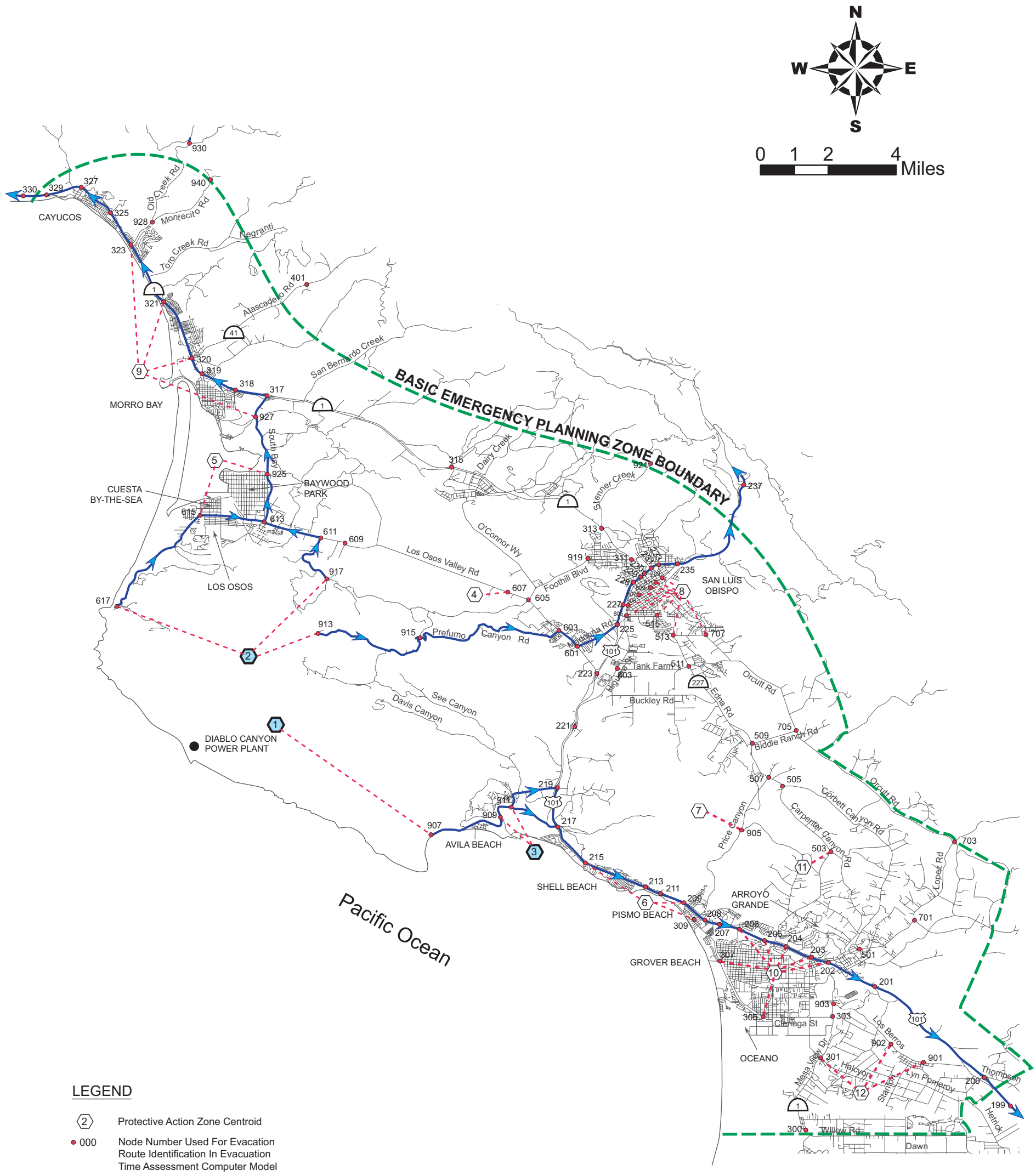
Figure 9.5



LEGEND

- (2) Protective Action Zone Centroid
- 000 Node Number Used For Evacation Route Identification In Evacuation Time Assessment Computer Model
- Evacuating Network Roadway Link
- (2) Evacuating Protective Action Zone
- Principle Evacuation Route
- Secondary Evacuation Route

EVACUATION SCENARIO NO. 6
SOUTHEAST-A (LIMITED) EVACUATION
EMERGENCY EVACUATION ROUTES

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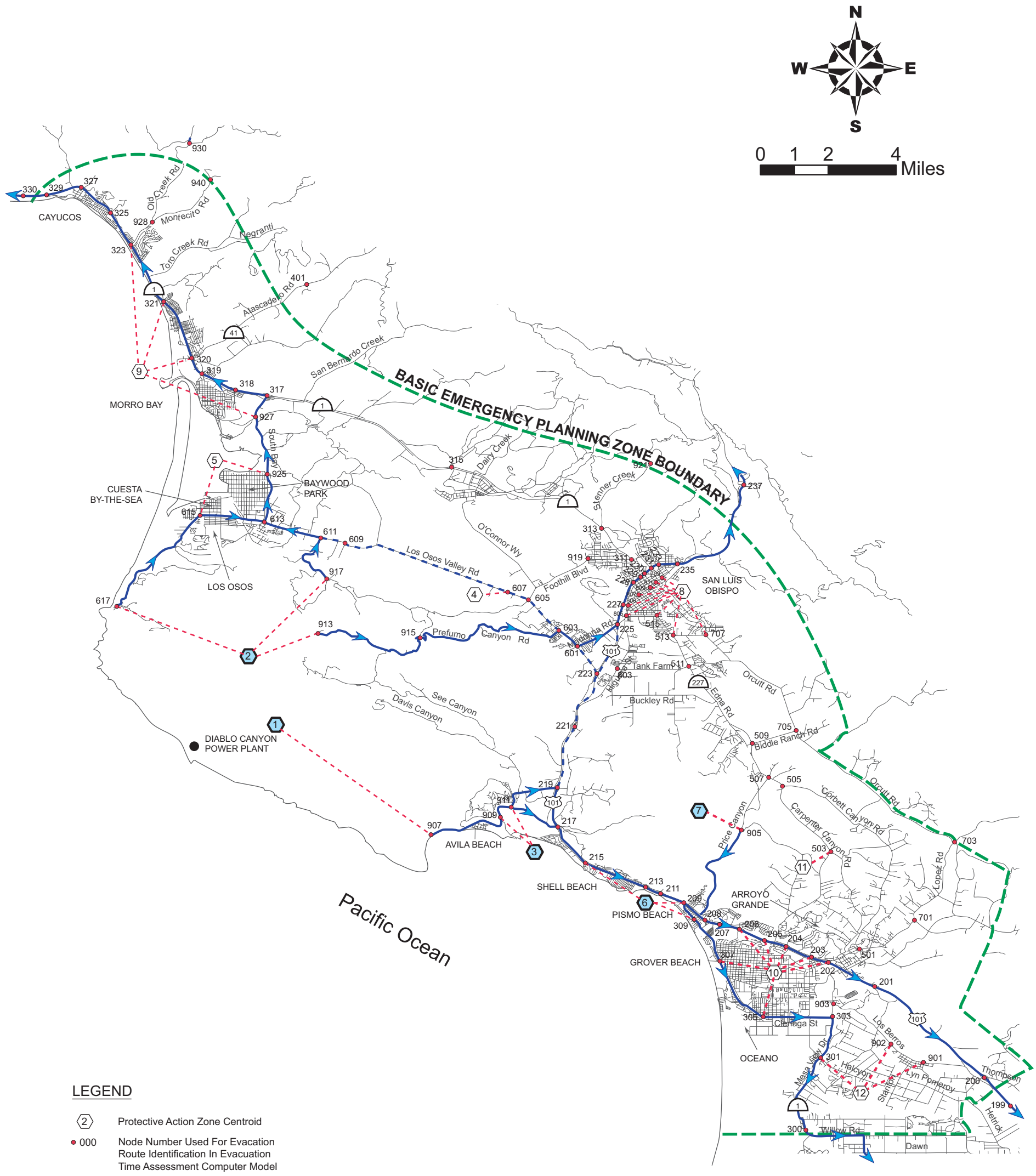
Figure 9.6



LEGEND

- 2 — Protective Action Zone Centroid
- 000 — Node Number Used For Evacation Route Identification In Evacuation Time Assessment Computer Model
- Evacuating Network Roadway Link
- 2 — Evacuating Protective Action Zone
- Principle Evacuation Route
- Secondary Evacuation Route

EVACUATION SCENARIO NO. 7
SOUTHEAST-B (LIMITED) EVACUATION
EMERGENCY EVACUATION ROUTES

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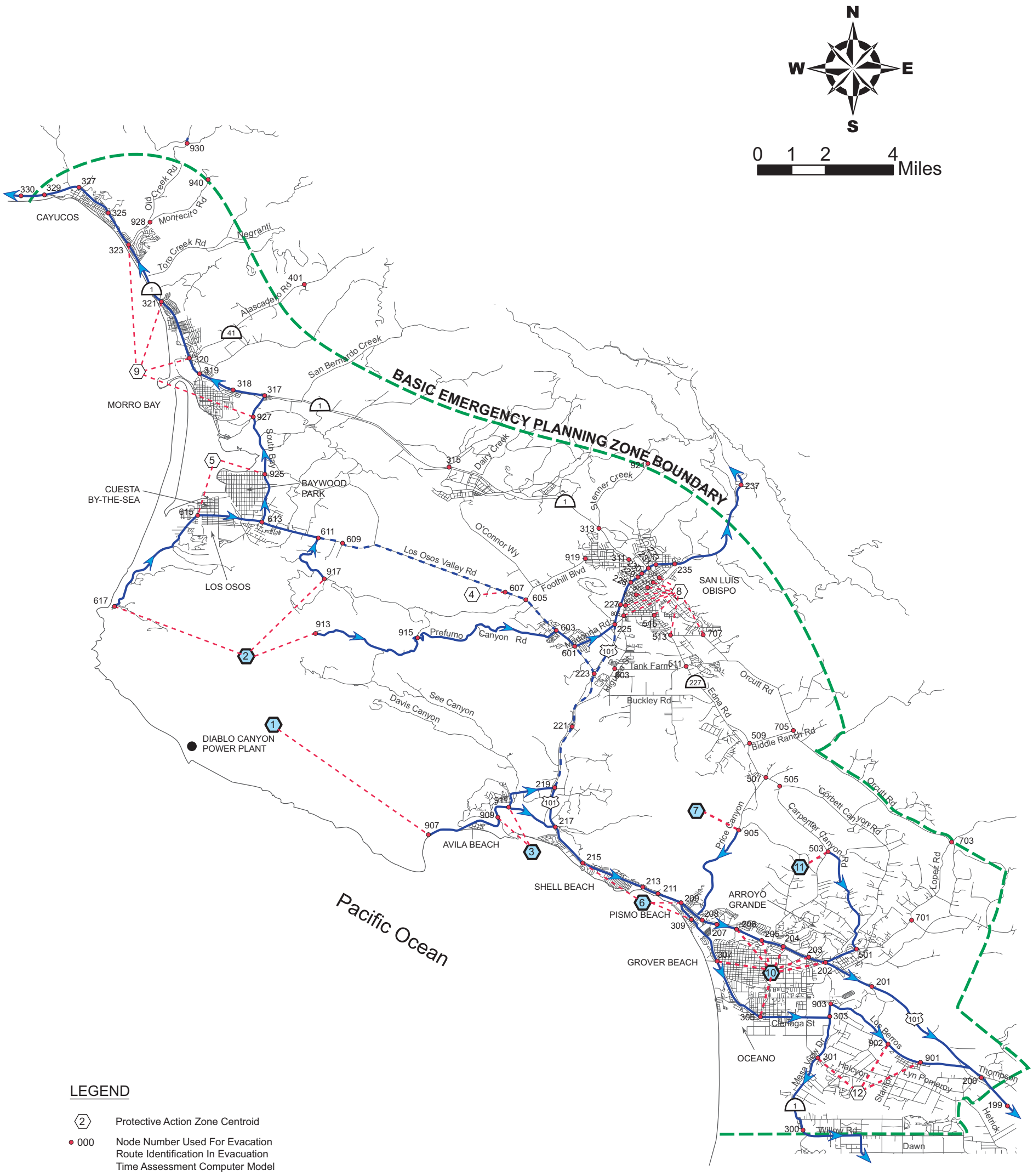
Figure 9.7



LEGEND

- 2 — Protective Action Zone Centroid
- 000 — Node Number Used For Evacation Route Identification In Evacuation Time Assessment Computer Model
- Evacuating Network Roadway Link
- 2 — Evacuating Protective Action Zone
- Principle Evacuation Route
- Secondary Evacuation Route

EVACUATION SCENARIO NO. 8
SOUTHEAST-C (LIMITED) EVACUATION
EMERGENCY EVACUATION ROUTES

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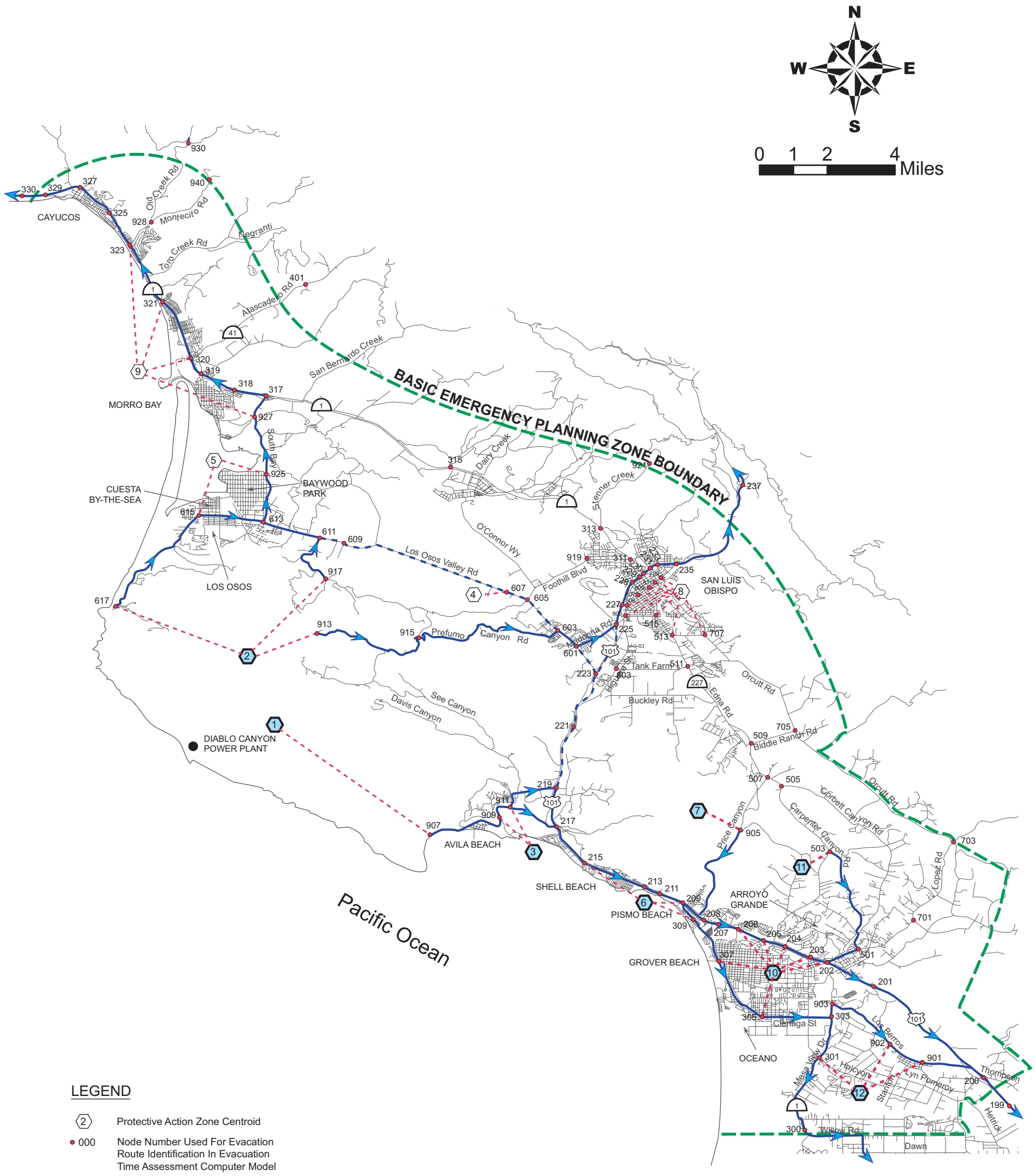
Figure 9.8



LEGEND

- 2 — Protective Action Zone Centroid
- 000 — Node Number Used For Evacation Route Identification In Evacuation Time Assessment Computer Model
- Evacuating Network Roadway Link
- 2 — Evacuating Protective Action Zone
- Principle Evacuation Route
- Secondary Evacuation Route

EVACUATION SCENARIO NO. 9
SOUTHEAST-D (ALL) EVACUATION
EMERGENCY EVACUATION ROUTES

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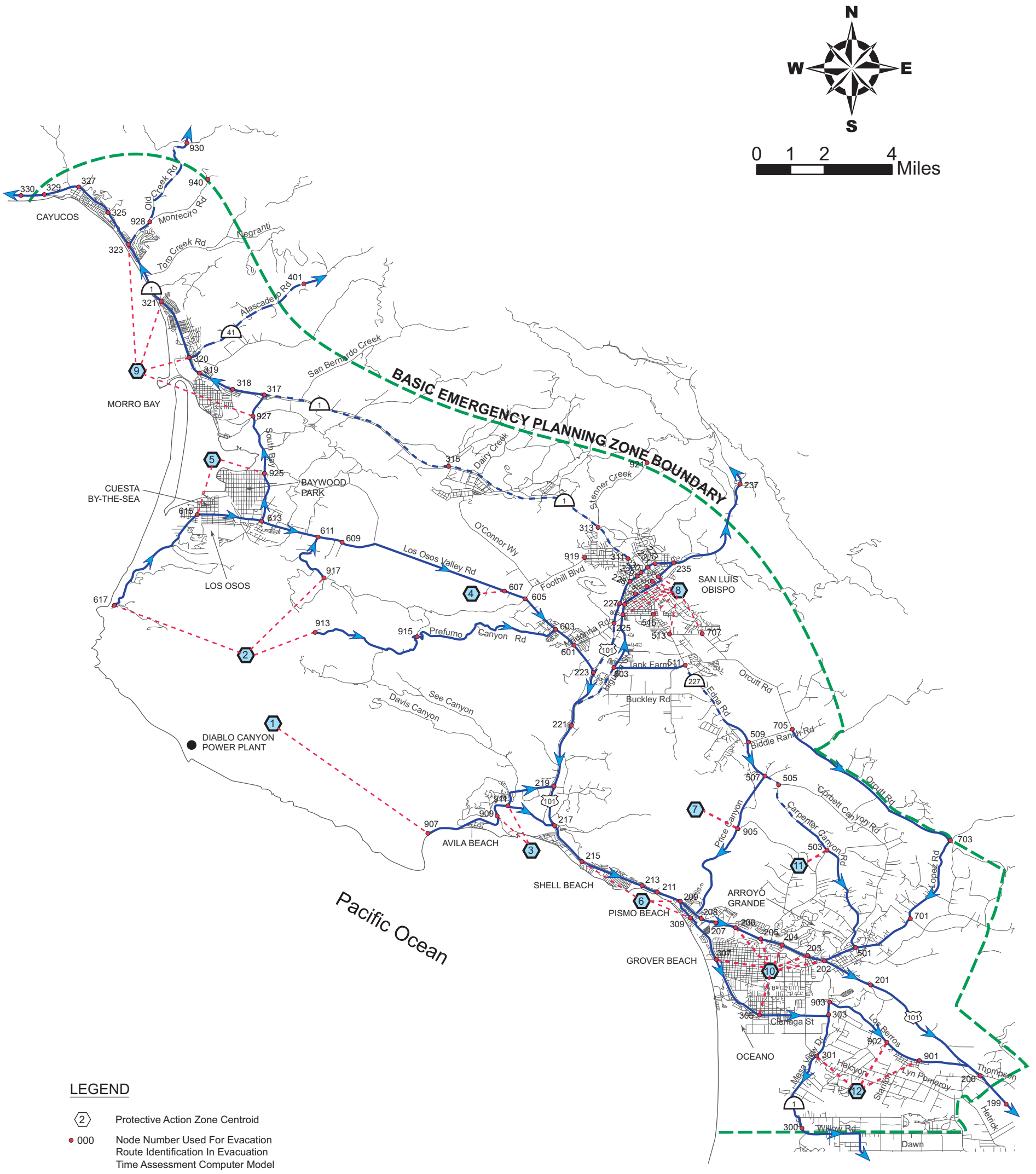
Figure 9.9



EVACUATION SCENARIO NO. 10
ENTIRE BEPZ EVACUATION
EMERGENCY EVACUATION ROUTES

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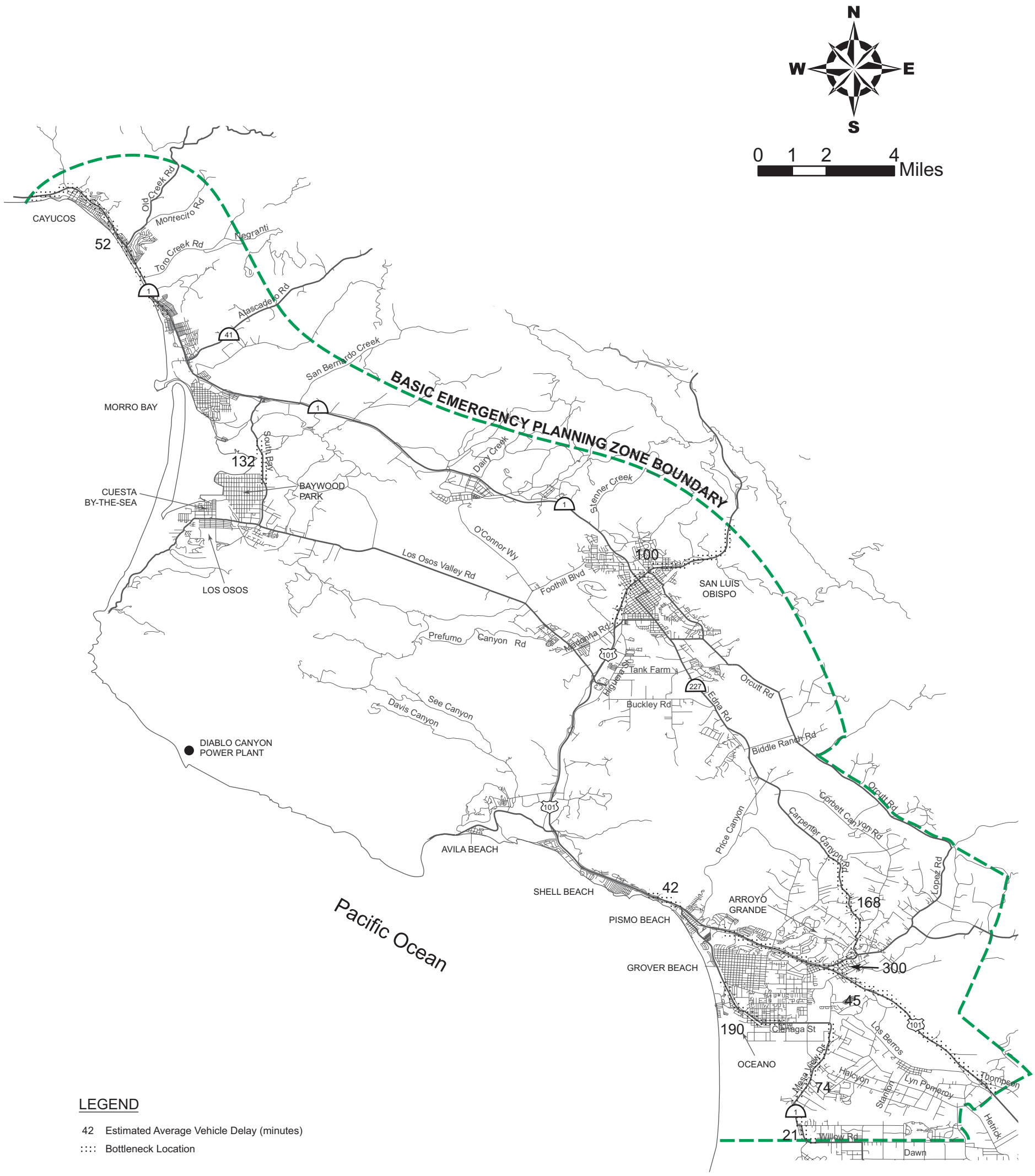
Figure 9.10



LEGEND

42 Estimated Average Vehicle Delay (minutes)

:::: Bottleneck Location

BOTTLENECK LOCATIONS
NORMAL WEEKDAY NON-SUMMER DAYTIME EVACUATION

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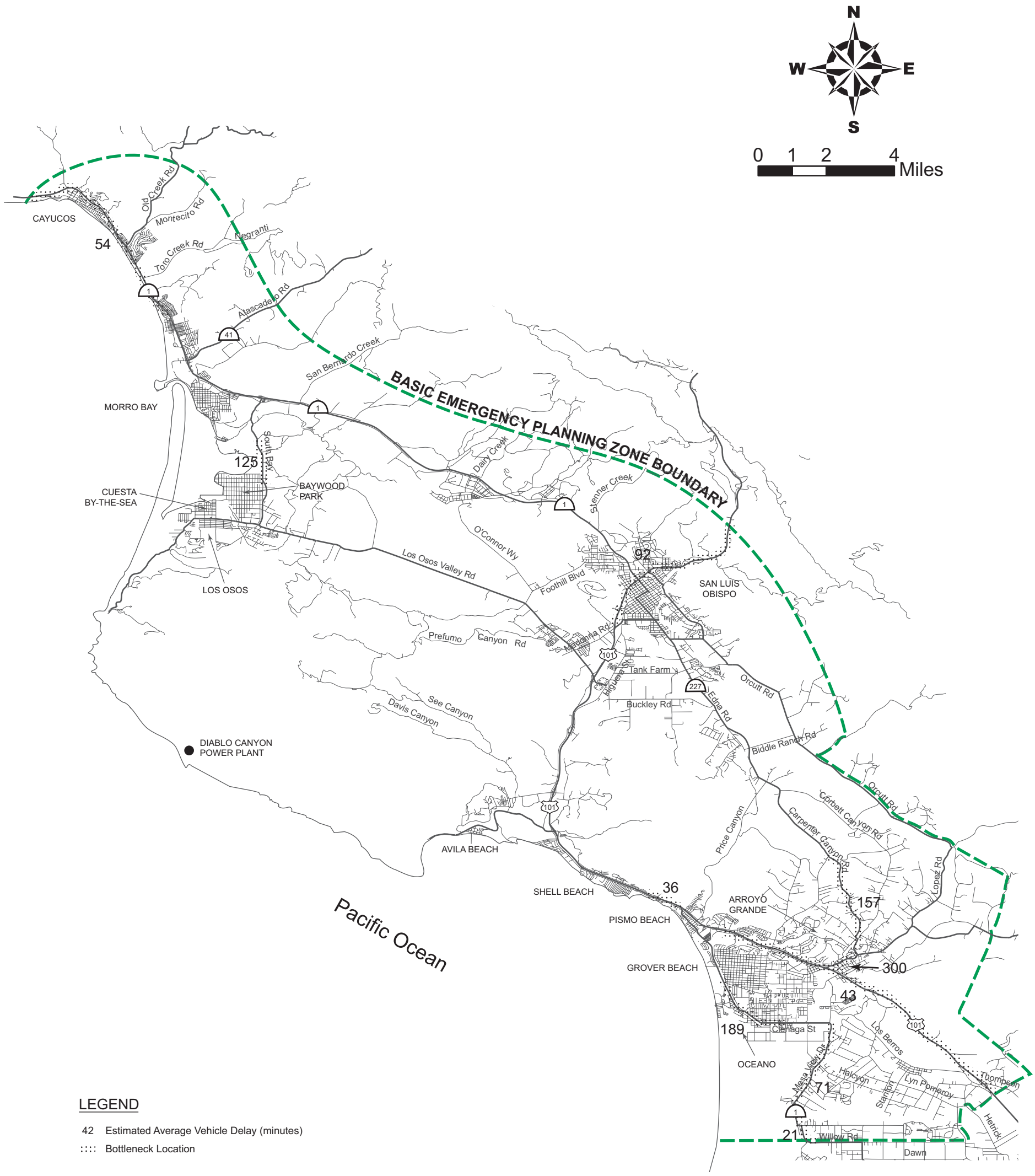
Figure 10



LEGEND

42 Estimated Average Vehicle Delay (minutes)

:::: Bottleneck Location

BOTTLENECK LOCATIONS
NORMAL WEEKEND SUMMER DAYTIME EVACUATION

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Figure 11

Table 16
Evacuation Time Estimates
By Scenerio and Conditions

Diablo Canyon Evacuation Time Study

Evacuation Scenerio			Evacuation Condition				
Number	Sector	PAZs	Normal Weekday	Normal Nighttime	Normal Summer Weekday	Normal Summer Weekend Day	Adverse Weather
1	Base	(1,2)	2.50	2.00	2.50	2.50	2.75
2	North-A (limited)	Base + (5)	11.50	11.50	11.25	11.00	13.75
3	North-B (all)	Base + (5, 9)	12.00	11.50	11.75	11.50	14.25
4	East (all)	Base + (4, 8)	11.50	11.00	11.25	10.75	13.75
5	North & East (all)	Base + (4, 5, 8, 9)	13.00	11.50	12.50	11.75	15.50
6	Southeast-A (limited)	Base + (3)	4.50	4.25	3.25	3.50	5.25
7	Southeast-B (limited)	Base + (3, 6, 7)	4.50	4.50	4.75	5.00	5.25
8	Southeast-C (limited)	Base + (3, 6, 7, 10, 11)	10.25	9.50	9.25	9.25	12.25
9	Southeast-D (all)	Base + (3, 6, 7, 10, 11, 12)	10.25	9.50	9.75	9.75	12.25
10	Entire BEPZ	Base + (3, 4, 5, 6, 7, 8, 9, 10, 11, 12)	13.00	11.00	12.50	12.00	15.50

(Evacuation Time In Hours)

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Table 17
Estimated Populations, Vehicle Demand and Evacuation Times by Evacuation Area
Non-Summer Weekday, 2000
Diablo Canyon Evacuation Time Study

Evacuation Area/PAZ	Resident Population	Transient Population	Total Population	Resident Vehicles	Transient Vehicles	Total Evacuating Vehicles	Estimated Cumulative Evacuation Time (Hours), Normal Weather	Estimated Cumulative Evacuation Time, Adverse Weather *
Within BEPZ Boundary								
2 Mile/1	4	180	184	3	165	168	2.50	2.75
0-2 Mile Total	4	180	184	3	165	168	2.50	2.75
								2.75
0-2 Mile Total	4	180	184	3	165	168	2.50	2.75
6 Mile/2	114	197	311	87	80	167	2.50	2.75
0-6 Mile Total	118	377	495	90	245	335	2.50	2.75
								2.75
0-6 Mile Total	118	377	495	90	245	335	2.50	2.75
Avila, San Luis Bay, See Canyon, Squire Canyon/3	3,357	1,068	4,425	2,622	602	3,224	2.75	3.25
Prefumo Canyon, Los Osos Valley/4	1,600	28	1,628	1,024	26	1,050	2.75	3.25
Baywood, Los Osos/5	14,943	480	15,423	11,030	392	11,422	11.50	13.75
0-10 Mile Total	20,018	1,954	21,972	14,766	1,265	16,031	11.50	13.75
0-10 Mile Total	20,018	1,954	21,972	14,766	1,265	16,031	11.50	13.75
City of Pismo Beach/6	8,545	6,766	15,311	7,864	3,115	10,979	11.50	13.75
Indian Knob, Price Canyon/7	202	4	206	179	3	182	11.50	13.75
San Luis Obispo/8	55,330	13,782	69,112	31,345	10,937	42,282	11.50	13.75
Morro Bay, Cayucos/9	14,307	3,635	17,942	12,973	2,059	15,032	13.00	15.50
Five Cities/10	36,153	4,108	40,261	23,207	2,853	26,060	13.00	15.50
Orcutt Rd., Lopez Dr., Route 227/11	2,776	64	2,840	1,821	59	1,880	13.00	15.50
Nipomo, N of Willow Rd/12	5,152	232	5,384	3,377	212	3,589	13.00	15.50
0-BEPZ Boundary	142,483	30,544	173,027	95,532	20,503	116,035	13.00	15.50

* Adverse Weather assumes Normal Weekday conditions.

Source:

(1) U.S. Census Data Set, Census 2000 Summary File 1 (SF 1) 100-Percent Data by Census Tract: P1 Total Population; P15 Households

(2) Estimates developed by Wilbur Smith Associates based on: SLOCOG 1995 Jobs/Housing Balance Study; California State Parks Visitor Data; SLO Chamber of Commerce Data; SLO County Visitors & Conference Bureau Data; Port San Luis Visitor Estimates; City of Pismo Beach Visitor Estimates; U.S. Census Bureau Data

APPENDIX 1

AGENCIES CONTACTED

TABLE 1-1
Contacts and Acknowledgements

	Agency/Data Source	Date(s) Contacted
1)	U.S. Census Bureau	09/01 through 06/02
2)	Pacific Gas & Electric DCPP EP	10/01 through 06/02
3)	San Luis Obispo County Office of Emergency Services	12/01 through 06/02
4)	California Highway Patrol	12/01
5)	Caltrans District 5	12/01, 06/02
6)	San Luis Obispo County Department of Public Works and Transportation	12/01, 06/02
7)	California Department of Parks and Recreation	12/01 through 06/02
8)	San Luis Obispo County Office of Education	12/01, 01/02
9)	Private Schools (identified in Table 9.2)	12/01, 01/02
10)	Acute Care Hospitals (identified in Table 10)	12/01, 01/02
11)	Convalescent Hospitals/Centers (identified in Table 10)	12/01, 01/02
12)	Residential Care Facilities (identified in Table 10)	12/01
13)	Private Campground Operators	12/01, 01/02
14)	Chamber of Commerce offices in San Luis Obispo, Arroyo Grande, Grover Beach, Pismo Beach, & Morro Bay	12/01 through 06/02
15)	San Luis Obispo County Visitors & Conference Bureau	12/01 through 06/02
16)	San Luis Obispo Council of Governments	12/01 through 03/02
17)	California Polytechnic State University, San Luis Obispo	12/01
18)	Cuesta College	12/01
19)	Port San Luis Public Safety Office	05/02

APPENDIX 2

DESCRIPTIONS OF MAJOR EVACUATION ROUTES
TRAFFIC MANAGEMENT PLAN
MAPS OF LOCAL EVACUATION ROUTES

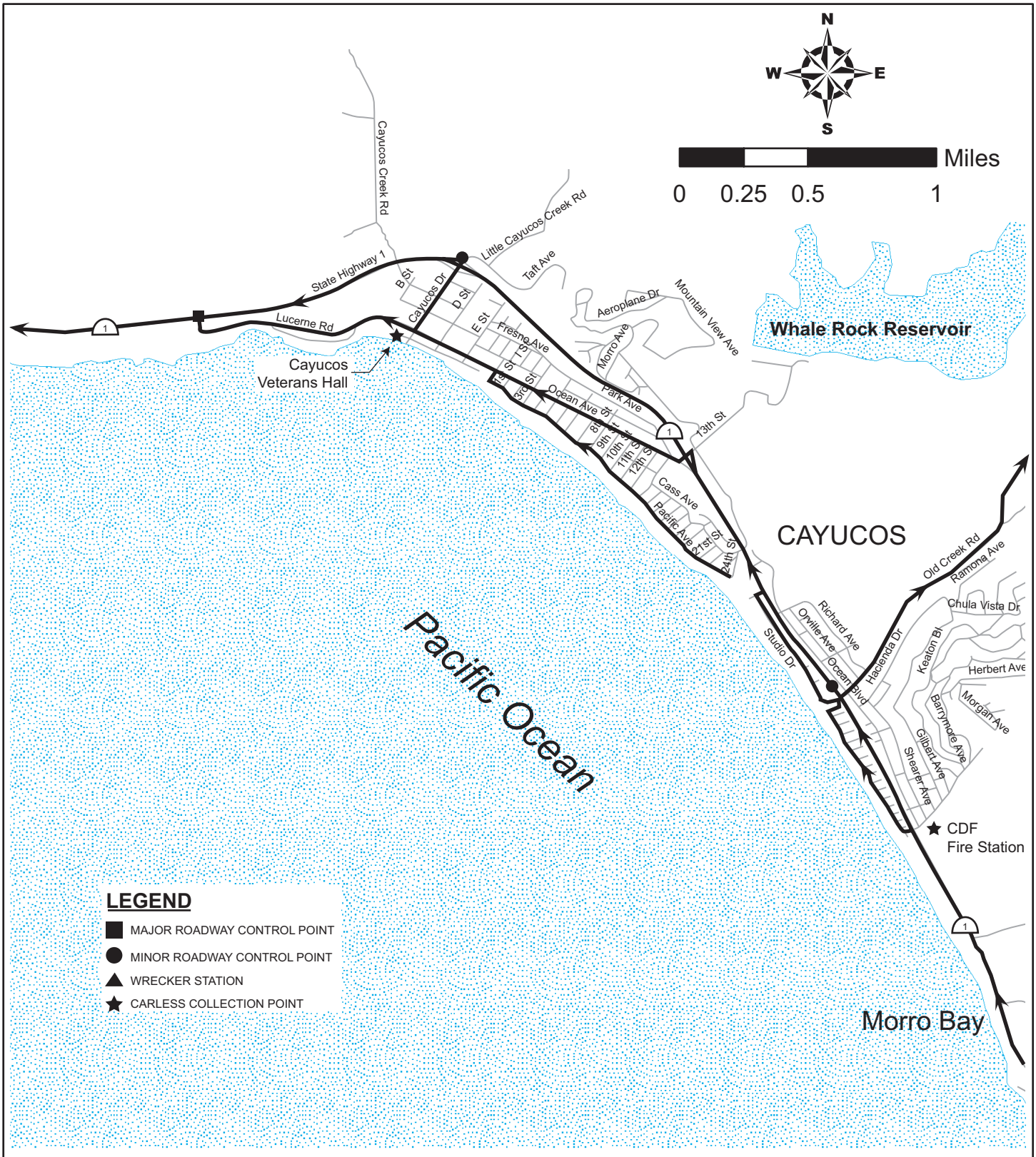
Due to the sparseness of the road system in the County, essentially all State Highways and U.S. 101 serve as major evacuation routes. Key local evacuation routes connect to the through routes. Traffic control points are designated according to their importance for directing traffic during an evacuation. **Figures 2-1 through 2-11** illustrate the evacuation routes, control points, and other features.

State Route 1 between San Luis Obispo and Morro Bay will operate with traffic inbound to San Luis Obispo from Baywood/Los Osos. In many instances it would not be desirable to have traffic from San Luis Obispo directed north on Route 1 (either due to a wind condition or to an evacuation being conducted in coastal areas north of the plant), although this route could be available.

San Luis Obispo traffic will be directed to four key northbound on-ramps to U.S. 101 (Monterey Street, California Boulevard, Osos Street, and Madonna Road).

Evacuees from Avila Beach will travel north on U.S. 101. Pismo Beach could have available U.S. 101 going north for the Shell Beach area, and Price Canyon Road for the portion northeast of U.S. 101, as well as the prime southerly routes U.S. 101 and State Route 1. Similarly, some traffic from the portion of Arroyo Grande northeast of U.S. 101 would be able to evacuate to the north on State Route 227. However, the majority of vehicles from Arroyo Grande would use U.S. 101 to the south.

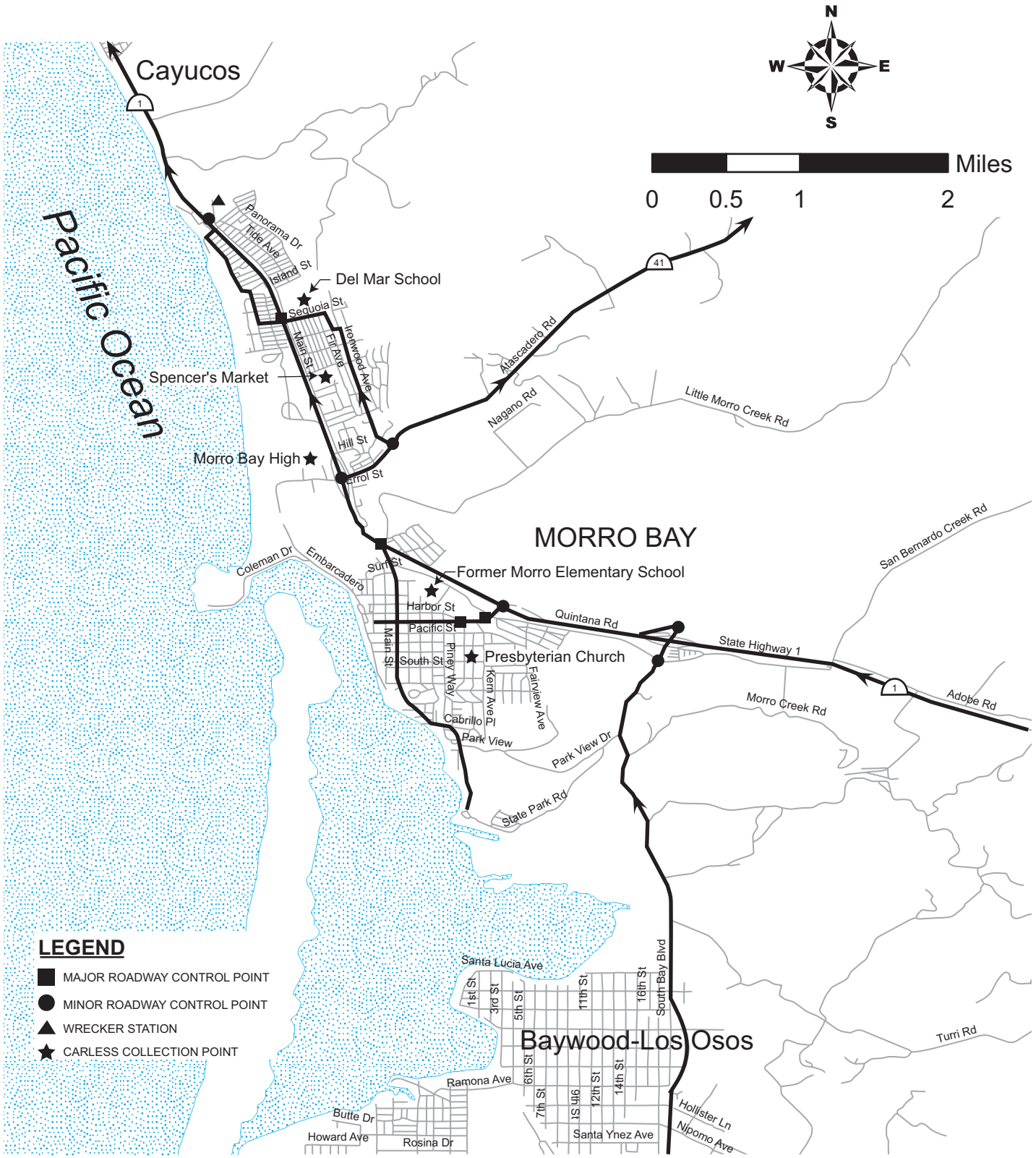
The California Highway Patrol will coordinate control of evacuation traffic throughout the Basic Emergency Planning Zone to provide optimum usage of available capacity.



CAYUCOS
LOCAL EVACUATION ROUTES

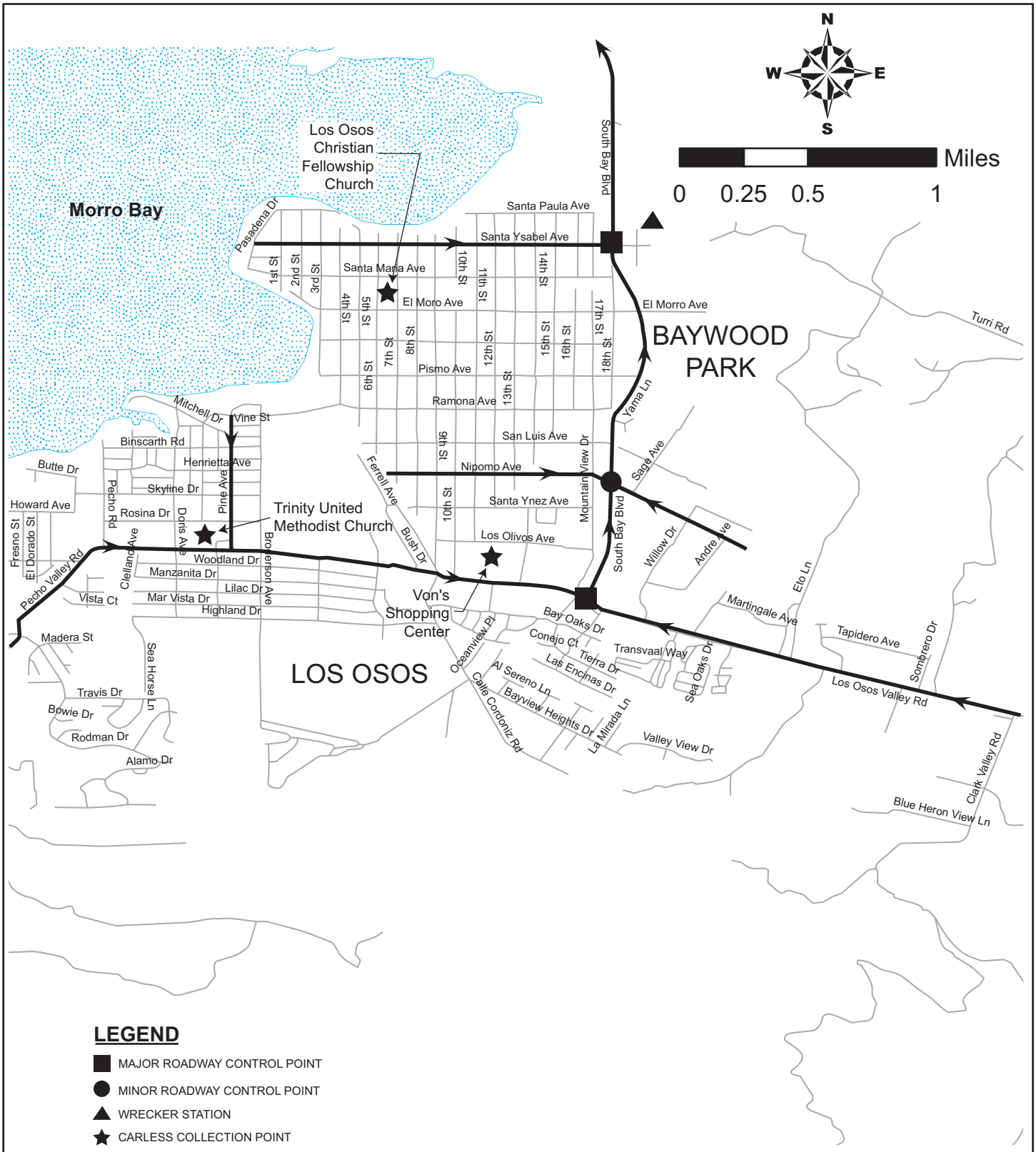
ENGINEERS
PLANNERS
ECONOMISTS
Wilbur Smith Associates

Figure 2-1



MORRO BAY
LOCAL EVACUATION ROUTES

Figure 2-2



BAYWOOD PARK / LOS OSOS
LOCAL EVACUATION ROUTES

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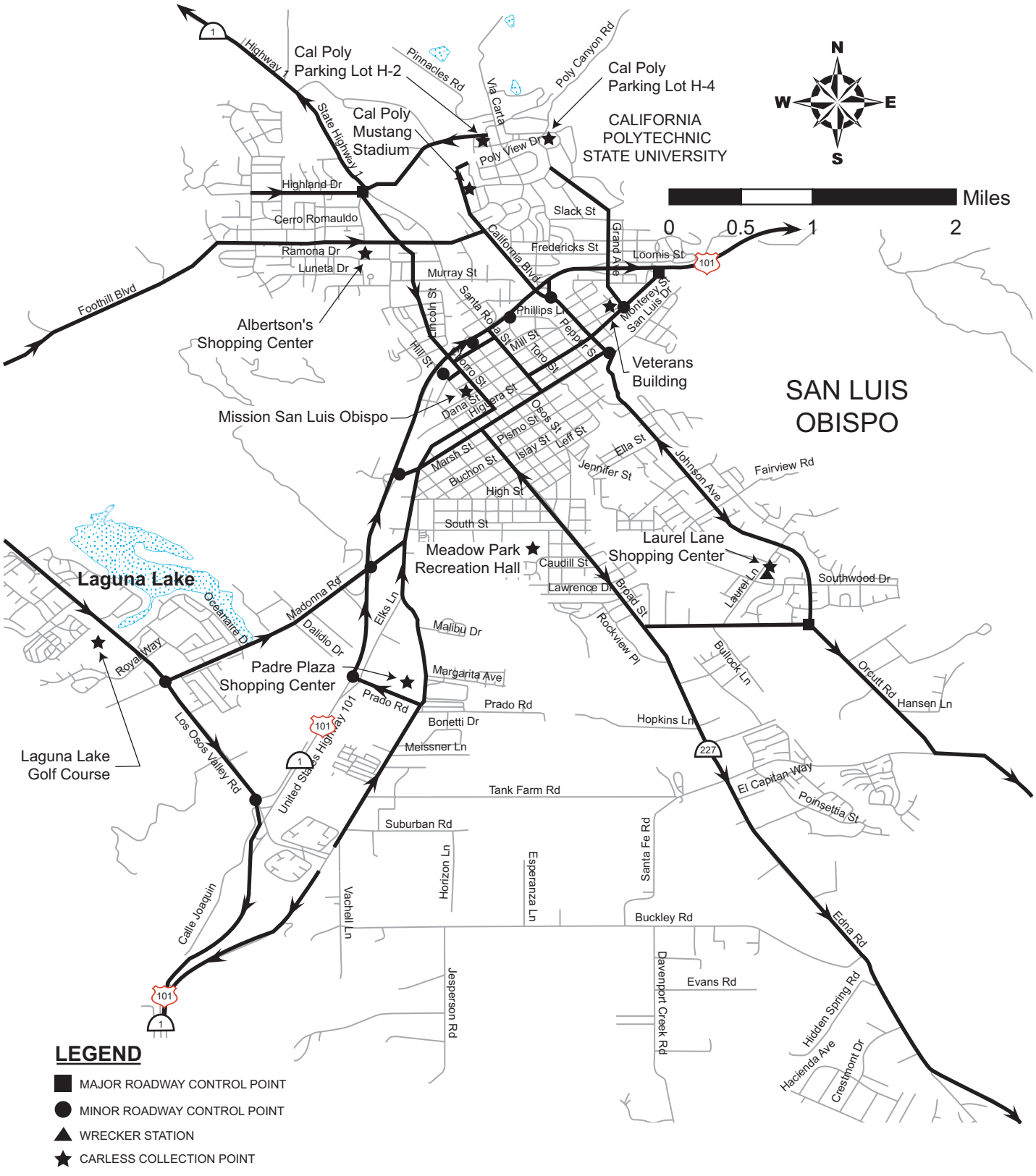
Figure 2-3



SAN LUIS OBISPO
LOCAL EVACUATION ROUTES

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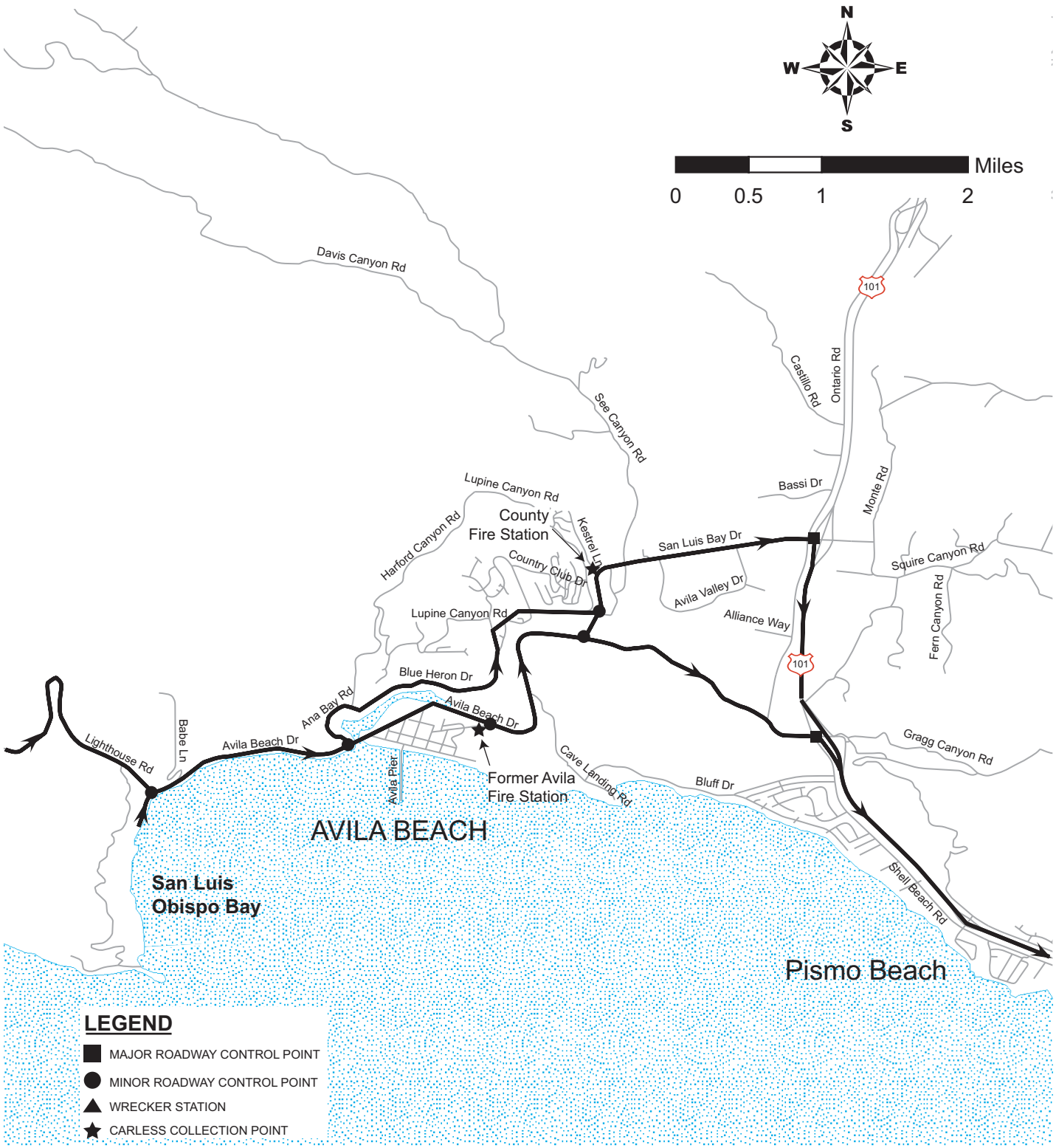
ECONOMISTS

Figure 2-4



AVILA BEACH
LOCAL EVACUATION ROUTES

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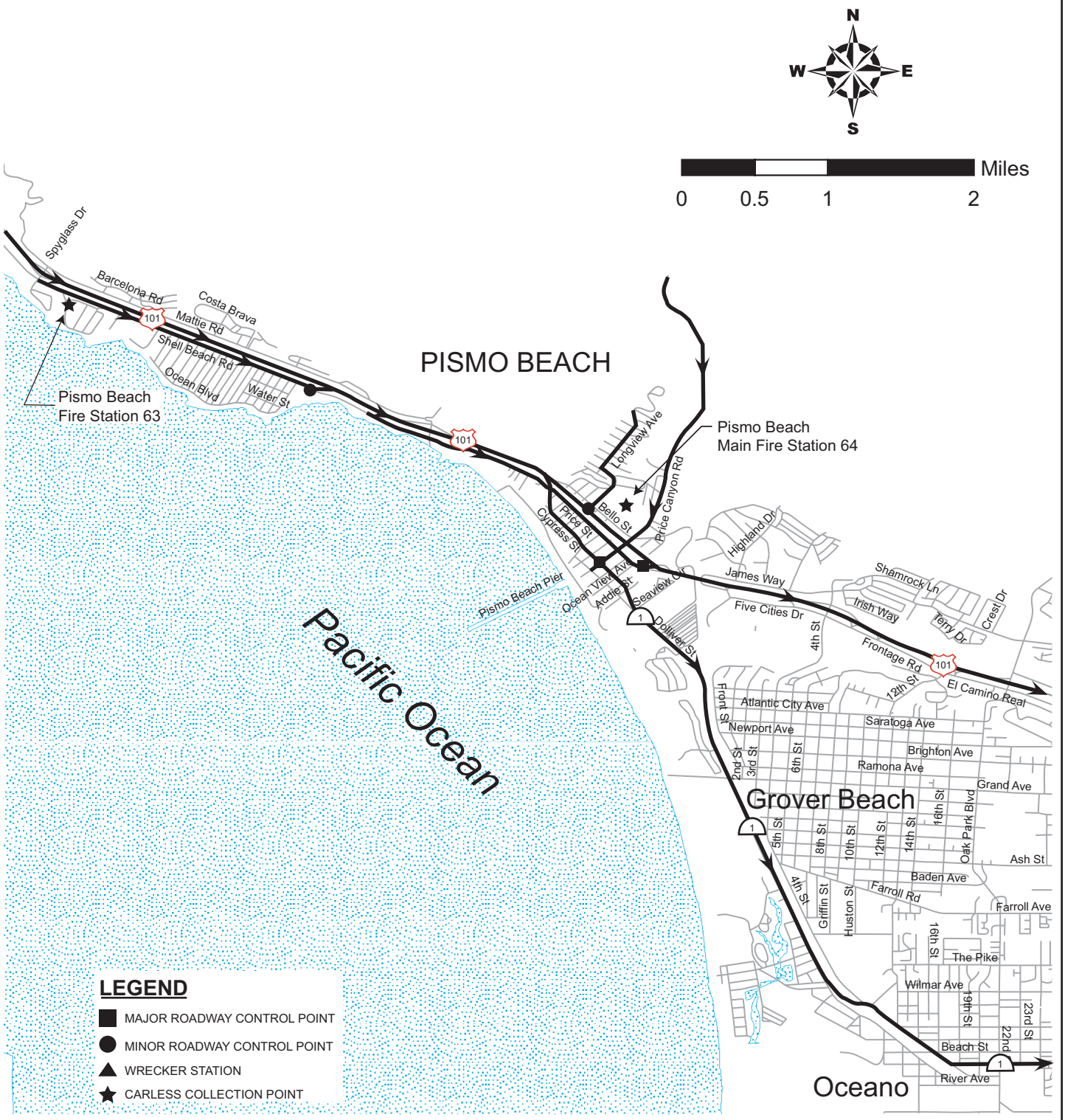
Figure 2-5



FIVE CITIES
NORTHERN AREA
LOCAL EVACUATION ROUTES

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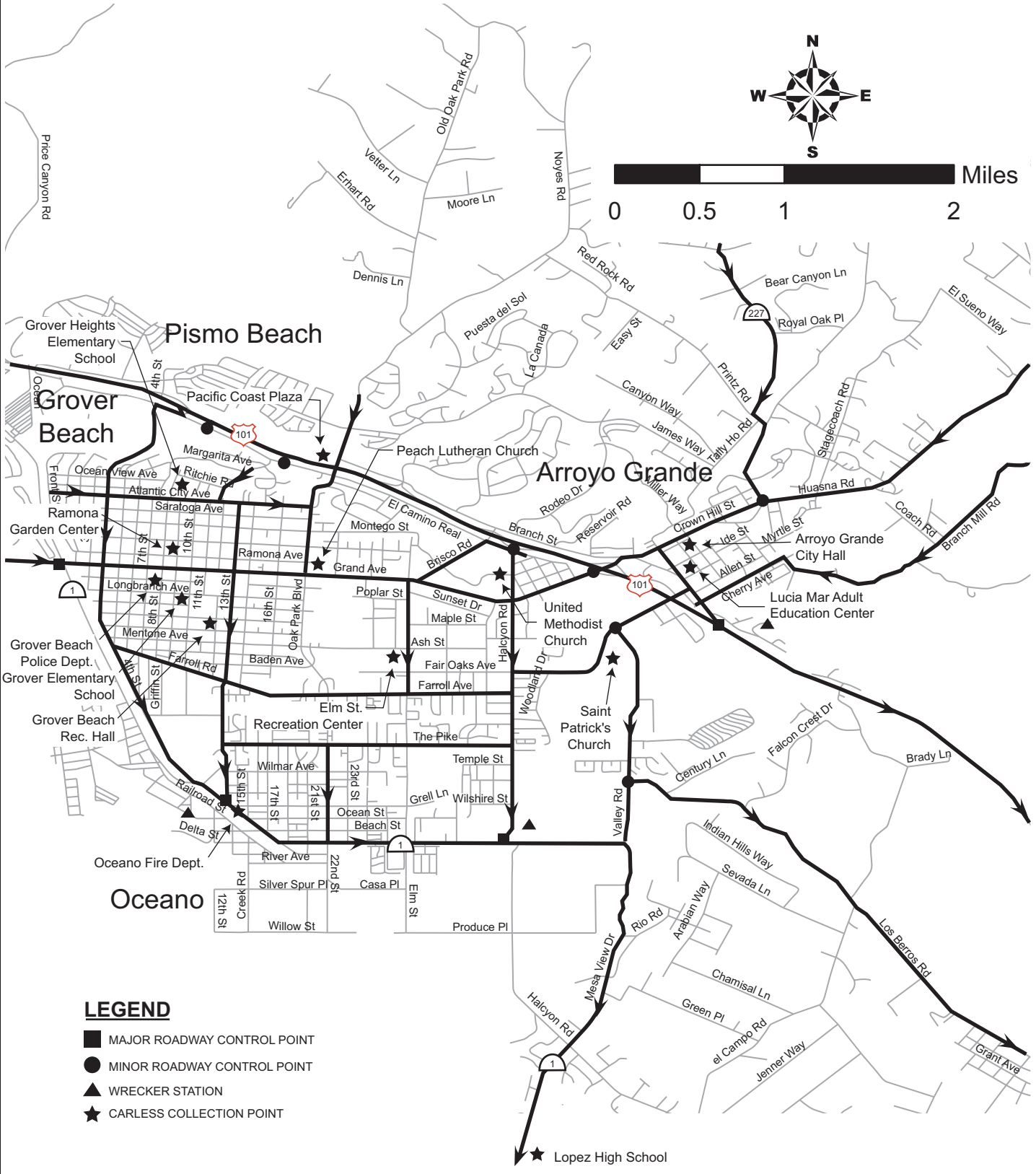
Figure 2-6



LEGEND

- MAJOR ROADWAY CONTROL POINT
- MINOR ROADWAY CONTROL POINT
- WRECKER STATION
- CARLESS COLLECTION POINT

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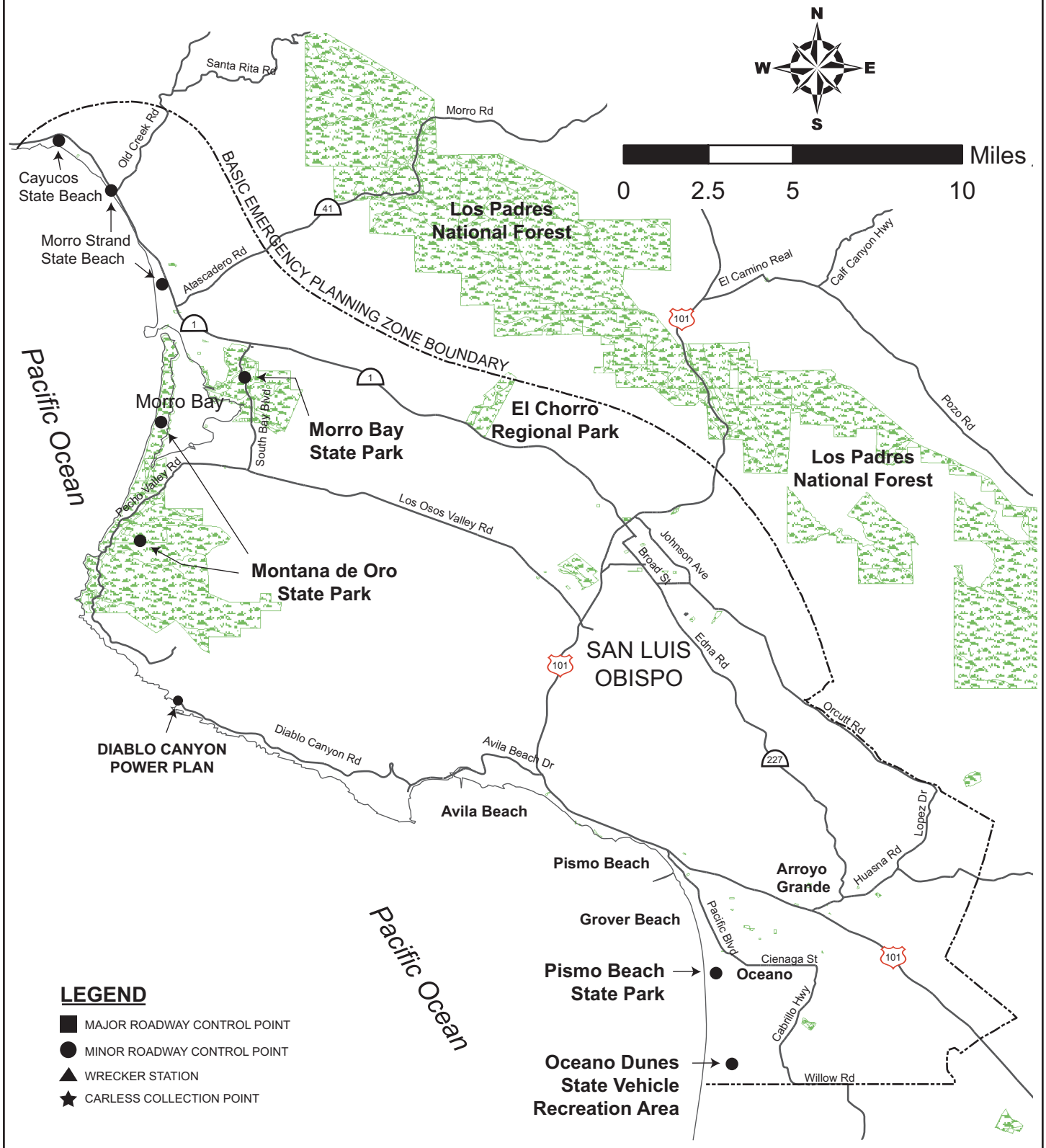
FIVE CITIES SOUTHERN AREA LOCAL EVACUATION ROUTES

Figure 2-7



LOCATION MAP
SAN LUIS OBISPO COUNTY STATE PARKS

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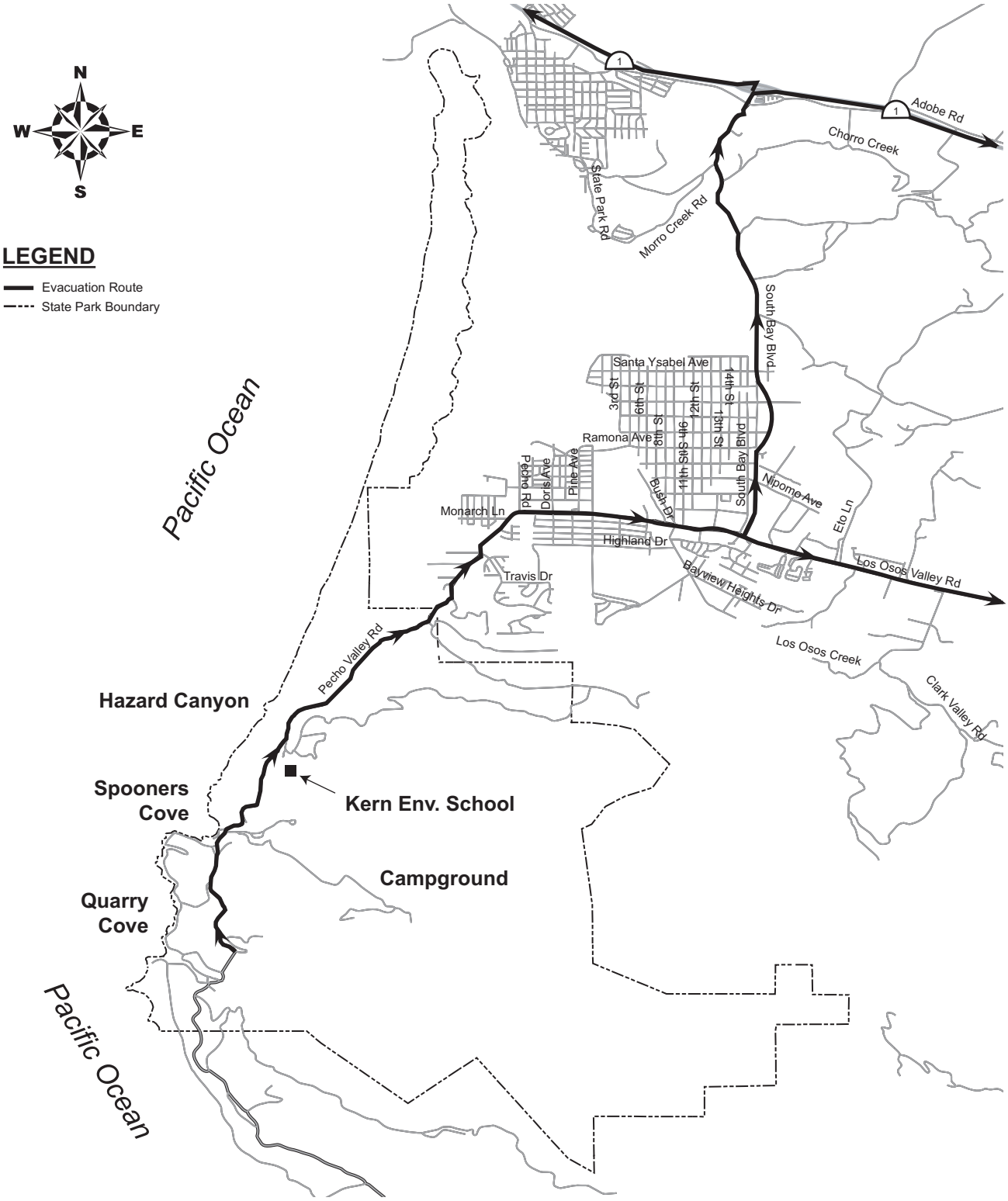
Figure 2-8



MONTANA de ORO STATE PARK
LOCAL EVACUATION ROUTES

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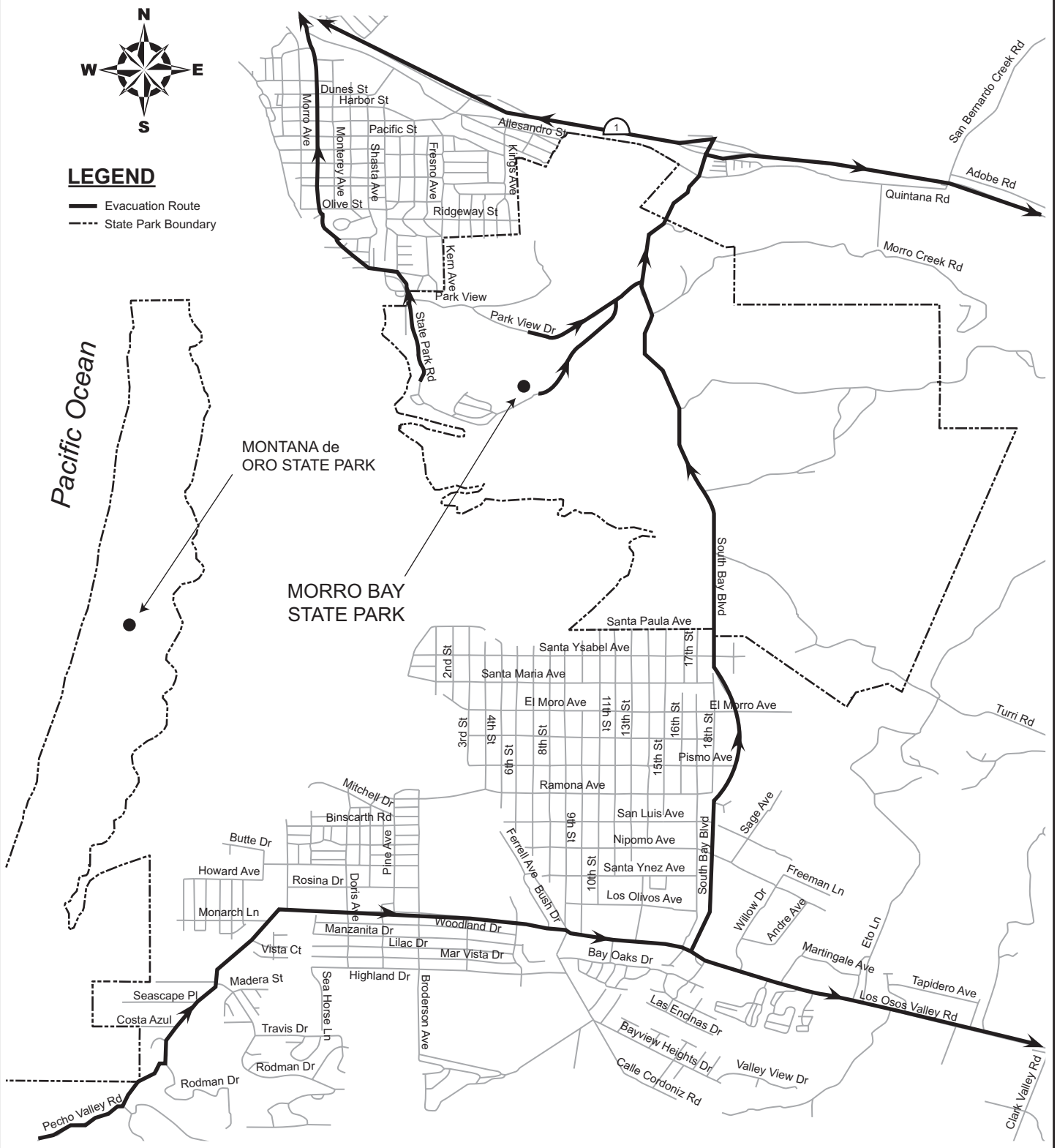
ECONOMISTS

Figure 2-9



MORRO BAY STATE PARK AND NORTH MONTANA de ORO STATE PARK LOCAL EVACUATION ROUTES

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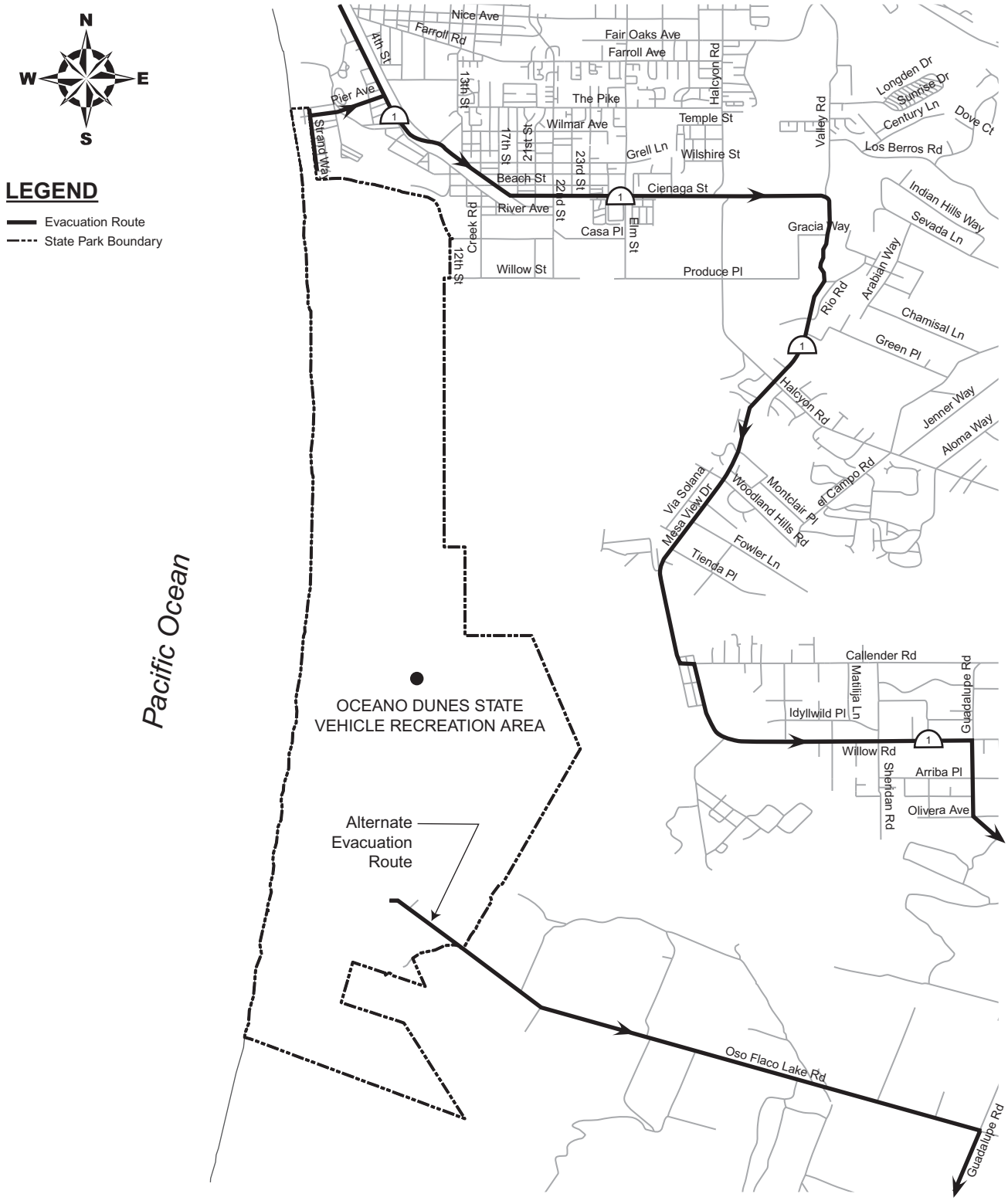
Figure 2-10



PISMO BEACH STATE PARK AND OCEANO DUNES STATE VEHICLE RECREATION AREA LOCAL EVACUATION ROUTES

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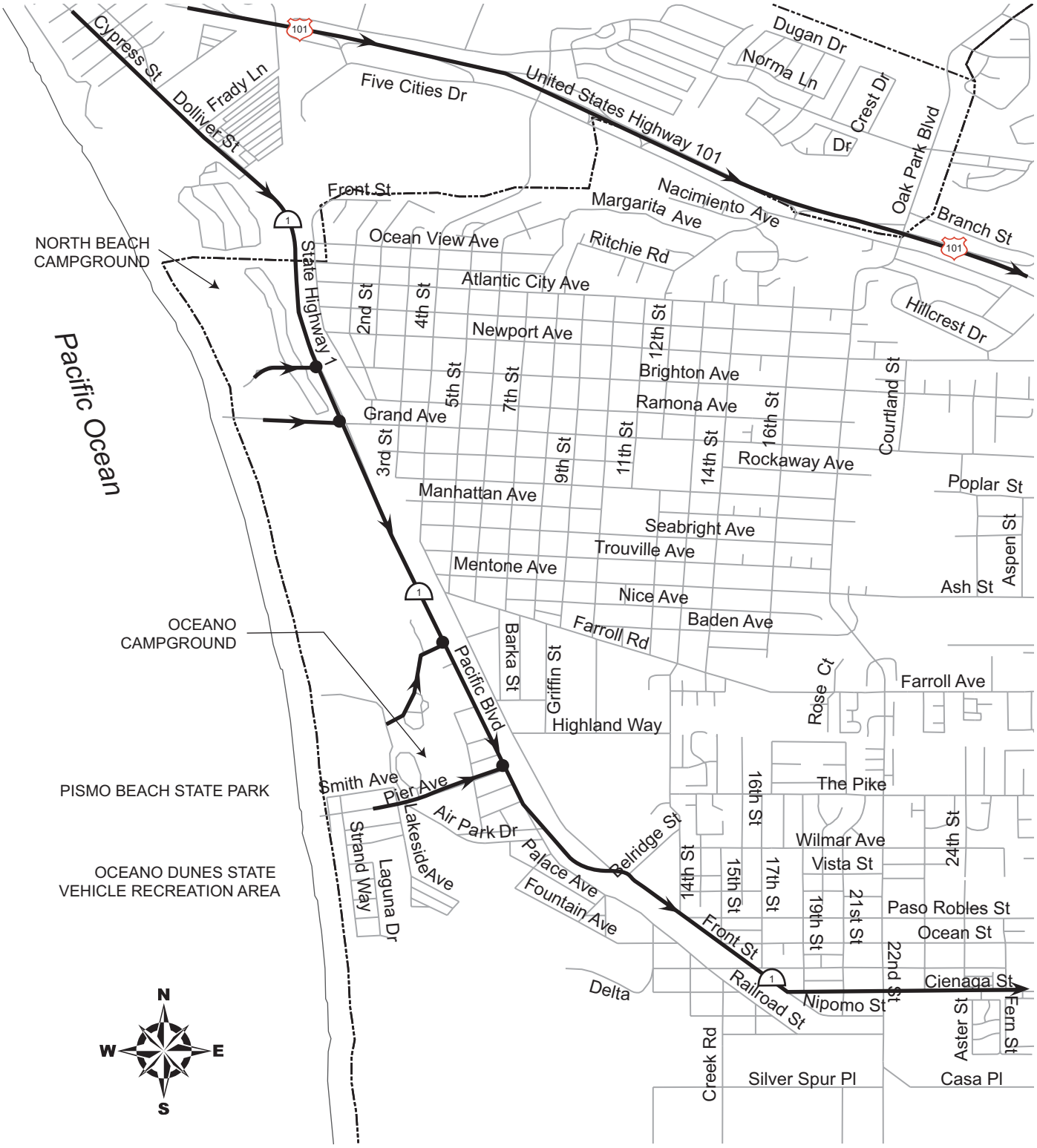
Figure 2-11.1



PISMO BEACH STATE PARK AND OCEANO DUNES STATE VEHICLE RECREATION AREA LOCAL EVACUATION ROUTES

Figure 2-11.2

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APPENDIX 3

EVACUATION TIME ASSESSMENT
PROGRAM METHODOLOGY

The evacuation time assessment was performed in two separate packages of computer programs. The general flow of these packages is illustrated in **Figure 3-1**.

Build Evacuation Network - This portion of the program is accomplished utilizing the link/node descriptions from Evacuation Route development task. The computer program, utilizing well-established principles, was extracted from an in-house program, TRANSIT, which was basically created for transit route development. It organizes the input data and it assembles link data such as distance, speed, hourly capacity, and queuing capacity.

Assignment of Vehicles to Each Centroid - Using centroid population and car occupancy inputs, the user computes vehicle volumes to be evacuated and assigns these volumes to each centroid. Remaining steps are also computed in the evacuation time assessment routine.

Public Response Time Distributions - Since the predicted volume of vehicles entering the network from each centroid is a function of various public response times to the evacuation warning, it is necessary to establish quantification of these responses by certain assumed conditions. Three public response time distributions were combined to assess evacuation times under the four scenarios - summer weekday, nighttime, peak summer weekend, and adverse weather conditions.

Determination of Mobilization Time - Mobilization time is defined as that period between the issuance of the evacuation warning and the time taken for the last vehicle to leave any centroid under the specified scenario conditions.

Time Distribution of Traffic Volumes on the Evacuation Network - The traffic volumes previously assigned to each centroid are then distributed onto the network incrementally as determined by the combined public response distributions.

Capacity Delay Analysis - The capacity delay analysis is performed in the assessment program by the four time increments determined in the above step. It is based upon the rudimentary principle of queuing -- which is, if the input to a network element during a specified time period exceeds the service capacity of that element, a queue of input vehicles is formed and a delay is generated to those vehicles in the queue. These vehicles must be added to the input of the next interval and compared to the service capacity to determine if another queue is formed at the end of that interval. The process is continued until all vehicles to be serviced have passed through the element.

For example, consider the processing of a sequence of intervals where the input of the second and third intervals exceeds capacity. After a first interval when input is less than capacity, all vehicles are served with no delay and no queue is formed (Q1=0). However, when input during the second interval exceeds the capacity, a queue of vehicles, Q2, results. This volume is therefore added to the input of the third interval, which then again exceeds capacity. At the end of this period a queue of Q3 vehicles remains. These vehicles are added to the input of

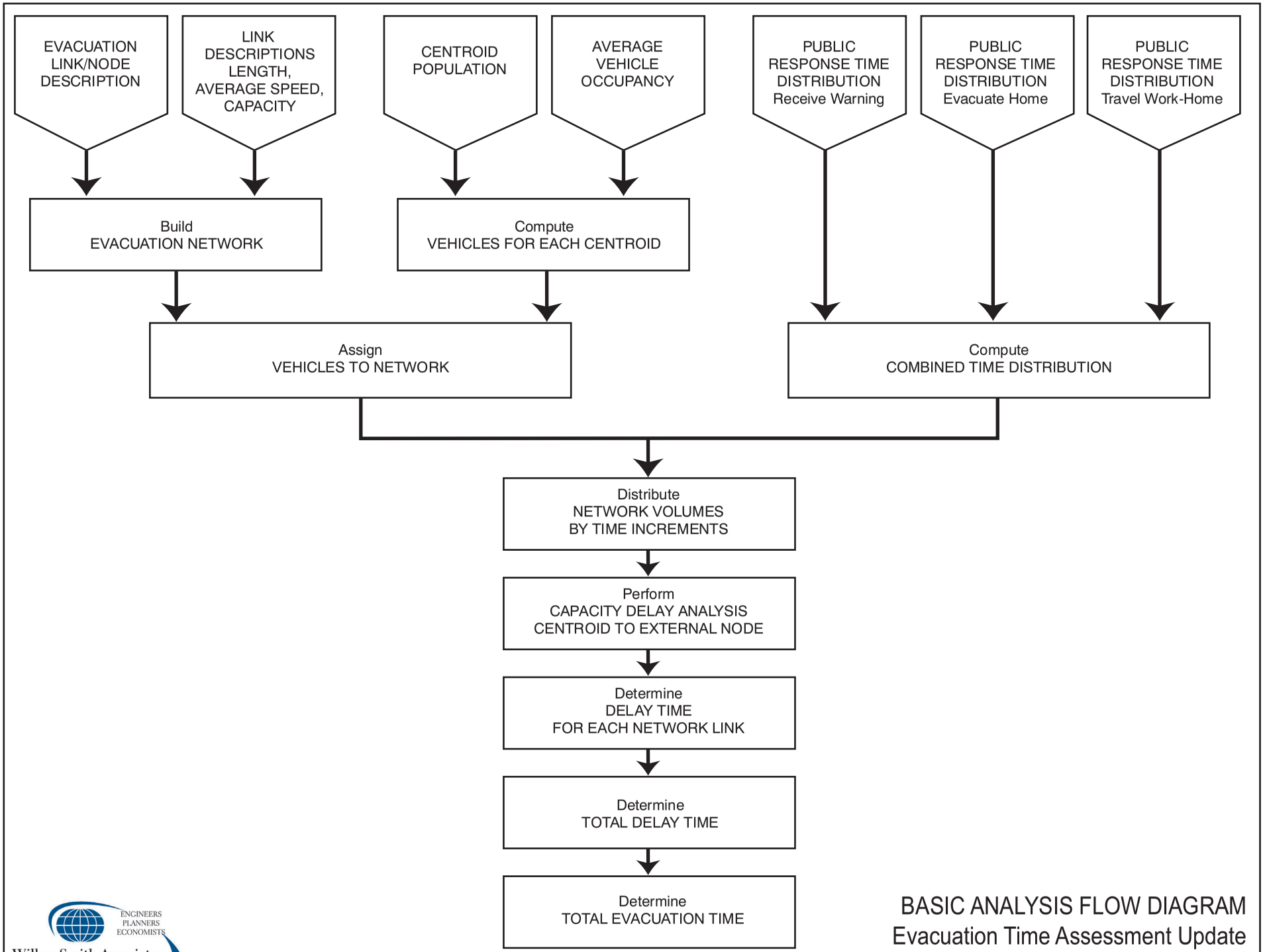
vehicles during the fourth interval. Because that volume exceeds capacity, a number of vehicles, Q4, remains at end of that period. This queue must then be dissipated at a rate equivalent to the link's capacity. A delay of TD is required for this discharge and must be added to the four time increments to obtain the total time for the entire volume to pass through the link.

It is important to note that this process has "metered" the input to equal the link capacity. As the traffic proceeds to the next link of the evacuation route, its input is at the rate commensurate to the previous link's capacity. If no additional volume has been assigned to the subsequent link and that link has the same capacity as the upstream link, no additional delay is experienced.

If either the capacity or volume of the downstream link is different, the analysis procedure must be repeated, using the respective input volumes and capacity of that link.

Determination of Delay Times for Each Link - The evacuation routes for each centroid are analyzed using the delay analysis technique described above. The delays, if any, are assigned to each of the links. Previous delays for any link resulting from the analysis of another centroid for the same link are compared in the program. Appropriate adjustments to each link delay are made by the program and the proper delay assigned.

Determination of Link Travel Times - Travel times for each link are computed by the assessment program using the link distance and the anticipated link operating speed inputs. These travel times assume no capacity delays. Therefore, when the travel time for a link is added to the proper delay time, the actual speed for the link is represented.



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BASIC ANALYSIS FLOW DIAGRAM
Evacuation Time Assessment Update
Figure 3-1