SECTION 4.0

Environmental Hazards / Natural Hazards

SECTION 4.1

Geologic / Seismic Hazards

4.1 GEOLOGIC AND SEISMIC

The following report and analysis on the geologic and seismic conditions in the City of Redondo Beach is based on a compilation of existing published and unpublished documents, reports, and papers obtained from the U.S. Geologic Survey (USGS), U.S. Soil Conservation Service, U.S. Army Corps of Engineers, State of California Division of Mines and Geology, Geological Society of America, and numerous private geotechnical consulting companies. Results of this study are regional and general in nature, and are written to meet the adopted requirements of the State of California General Plan Guidelines, and the California Environmental Quality Act (CEQA) relative to the preparation of seismic safety components of Safety Elements.

This report is not intended to take the place of site-specific or project-specific geotechnical studies and analyses, which still must be carried out for individual projects, but is meant to provide a general framework for future land-use planning and environmental review, based on existing regional geological and seismic conditions. No original field work or geotechnical interpretations have been made in the preparation of this report. It is expected that future regional and site-specific geotechnical and engineering studies may modify the data presented herein. Modifications should be incorporated through periodic general plan amendments and information updates as required and deemed necessary by state law and local government bodies.

4.1.1 Regulations and Guidelines

California State Law, specifically Assembly Bill 890, Chapter 1255 and California Government Code Section 65302(1), establishes and requires that each city or county prepare and adopt a Safety Element as follows:

> *A safety element for the protection of the community from any unreasonable risks associated with the effects of seismically-induced surface rupture, ground shaking, ground failure, tsunami, seiche, and dam failure; slope instability leading to mudslides and landslides...; subsidence and other geologic hazards known to the legislative body; flooding; and wild land and urban fires. The safety element shall include mapping of known seismic and other geologic hazards. It shall also address evacuation routes, peakload water supply requirements and minimum road widths and clearances around structures, as those items relate to identified fire and geologic hazards.*

The significant geologic and seismic hazards with the potential to significantly impact the City of Redondo Beach include ground shaking and localized liquefaction susceptibility. Less significant potential geologic and seismic hazards include ground subsidence, localized slope instabilities, and tsunami.

These hazards, and their potential impacts, were previously identified and analyzed in the tripartite Seismic Safety Element and Policies completed by Envicom Corporation in 1975 for the Cities of Redondo Beach, El Segundo, and Manhattan Beach. This report will build on and incorporate a portion of the material and data contained in that report. Updates and additions to the material contained in the 1975 study are included, based on new up-to-date geotechnical information and additional changes that have since occurred in planning and environmental guidelines and requirements.

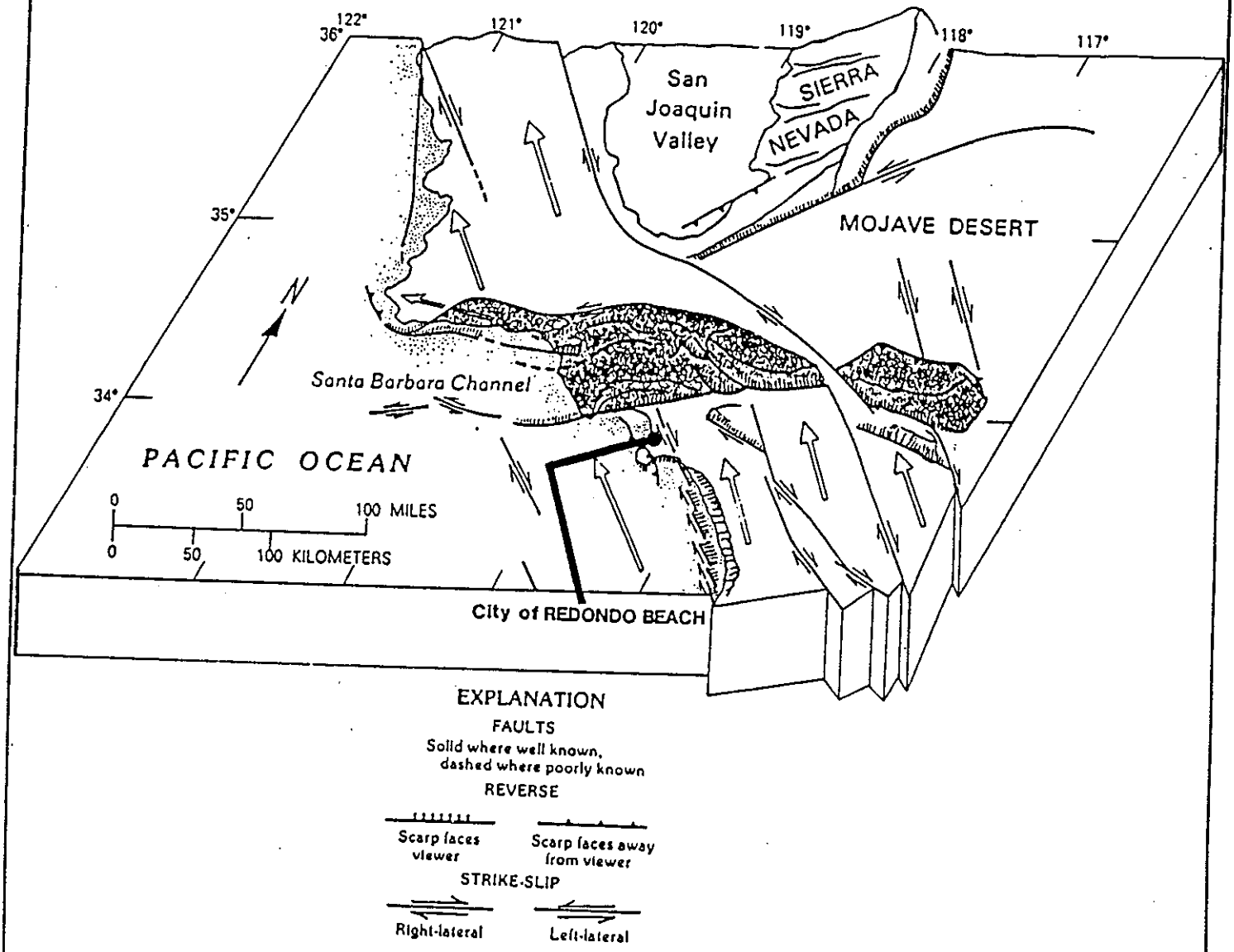
4.1.2 Geologic and Tectonic Setting

The basic geologic setting of Southern California is molded by plate tectonics, a global process involving the slow movement of very large plates of the earth's crust. These plates move relative to one another, at one another, and away from each other; their margins, produce earthquake activity and crust deformation. Where these plates slide past one another, large seismically-active fault systems such as the San Andreas and related faults may form, and in turn be responsible for earthquakes and deformation of the earth's surface.

The deformational processes presently operating in Southern California are dominated by the San Andreas and Transverse Ranges fault systems (Yerkes, 1985) (**Figure 27**). These deformational processes have been influencing the evolution of Southern California geology for close to five million years. From a land use planning perspective, these deformational processes are of primary concern to safe urban development since periodic earthquake activity can be anticipated to continue through the lifetime of buildings constructed today.

The City of Redondo Beach is situated within the western edge of the Los Angeles Basin, near the boundary of the Southern California Continental Borderland Geomorphic Province (**Figure 28**). The Los Angeles Basin is underlain by both marine and non-marine accumulations of gravel, sand, silt, and clay, that were deposited over time as a consequence of sea level fluctuations and erosion of the land masses north, east, and south of the Los Angeles Basin.

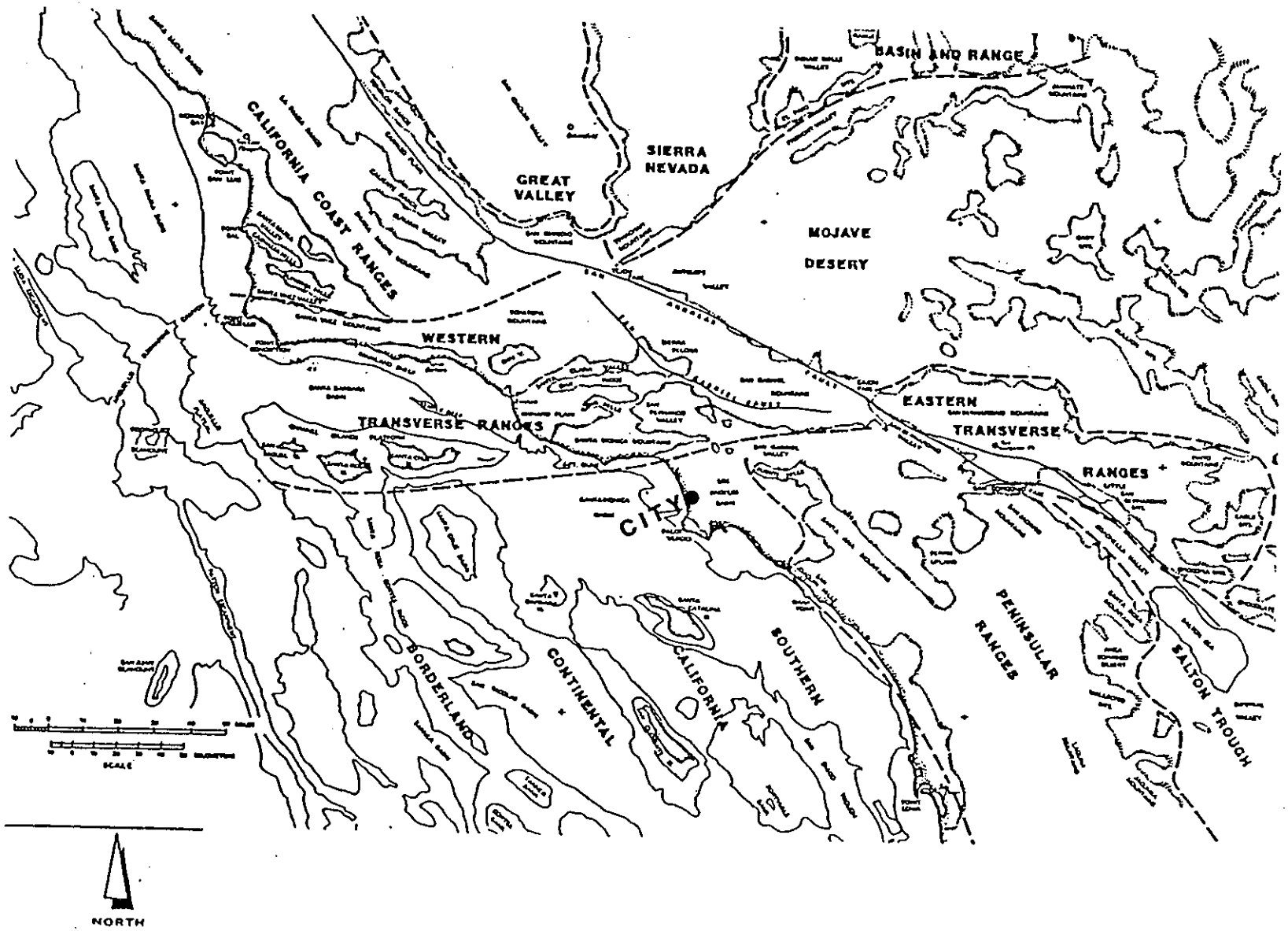
The youngest of these deposits, located on the ground surface within most of the local area, are the El Segundo Sand Hills. These deposits are comprised of Late Pleistocene into Holocene age (200,000 to 10,000 years before the present); they are moderately to poorly indurated, and are composed of sand, silty sand, and silt.



Present relative motions of crustal blocks. Blocks in the foreground move northwest with the Pacific plate and represent the Peninsular Ranges; those representing the Transverse Ranges (shaded) generally are bounded by reverse faults and prominent scarps. Modified from Anderson (1971).

PRESENT RELATIVE MOTIONS OF REGIONAL CRUSTAL BLOCKS

FIGURE 27



PHYSIOGRAPHIC MAP OF THE WESTERN TRANSVERSE RANGES REGION

FIGURE 28

These materials were derived from extensive off-shore sand bars, and were deposited by strong on-shore winds during periods of lower sea level. The Sand Hills parallel the coast for approximately eleven miles from the Ballona Escarpment to the base of the Palos Verdes Hills, and extend from 3 to 6 miles inland (**Figure 29**). Maximum thickness of the Sand Hills is about 150 feet.

Directly underlying the El Segundo Sand Hills layer is the Upper Pleistocene Lakewood formation, consisting of marine and non-marine derived gravel, sand, silt, and clay (**Figures 29** and **30**). This formation is exposed in a very small area in the northeast corner of the City of Redondo Beach. No other geologic formations are known to have surface exposures within the local area.

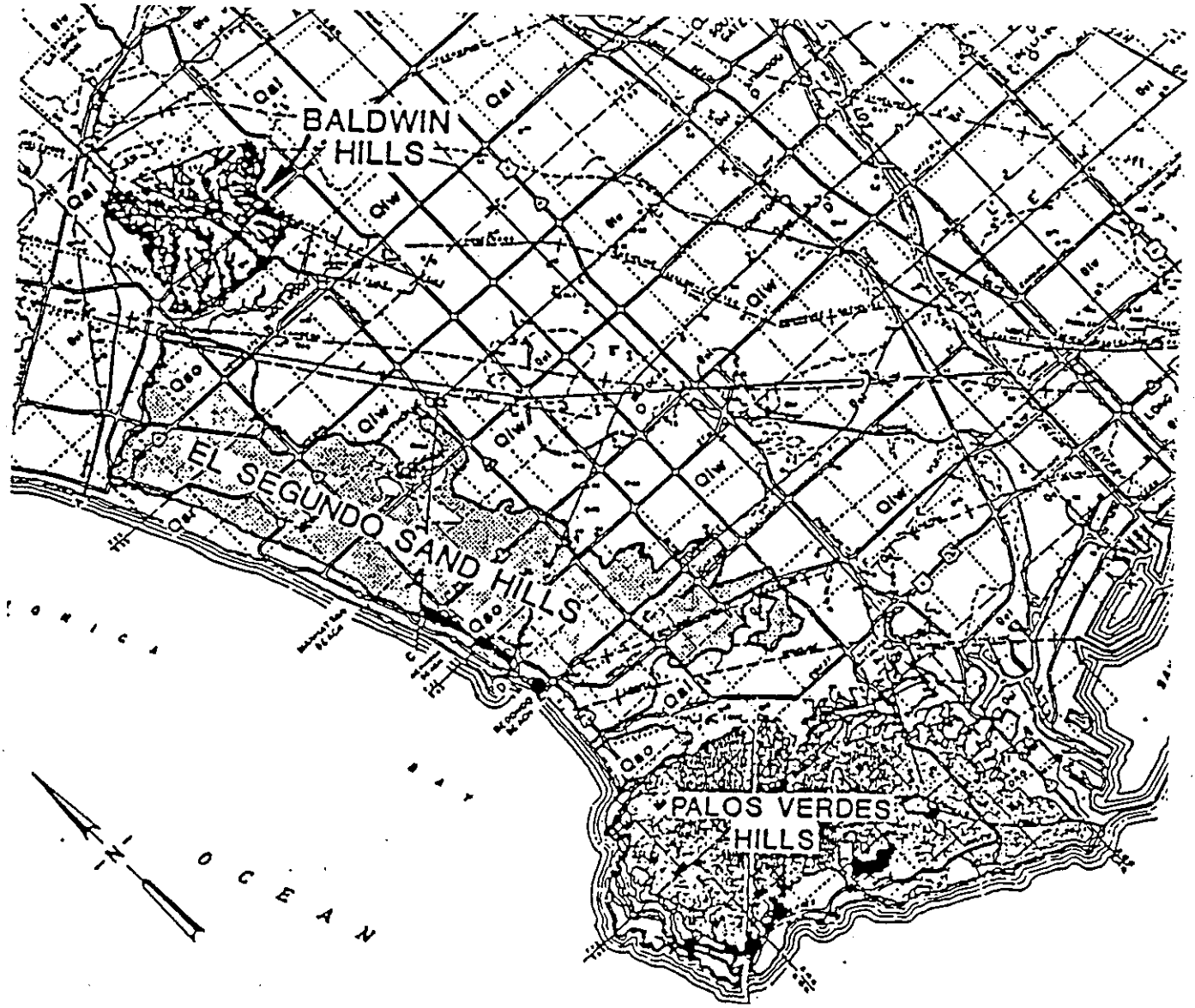
4.1.3 Regional Fault Setting and Evaluation of Relevant Fault Activity

The City of Redondo Beach lies in a seismically active region where numerous faults are probably capable of generating moderate to large earthquakes (Ziony, 1985). The major faults are related to the San Andreas fault system which generate earthquakes as blocks on either side of the fault planes slide laterally past one another. Subsidiary faults, which may have developed from complicated stresses within the San Andreas system, generate earthquakes as blocks on either side of the fault planes slide up or down relative to each other.

One of the most critical and difficult steps in the evaluation of fault activity is the determination of whether or not faults in the planning area of study are "active" in the sense of producing a damaging earthquake. Generally speaking, active faults are those faults that are considered likely to undergo renewed movement within a period of concern to humans.

Faults that are currently slipping, that display earthquake activity, or that have had historical surface rupture clearly are active with respect to land use planning. However, except in the above clear-cut cases, it is difficult to differentiate with certainty faults capable of precise or predictable future movement and those that cannot move under the state of stress existing in a particular region (Ziony and Yerkes, 1985). Known active and potentially active faults have displayed a wide range of behavior, and the processes determining fault activity are only partially understood.

A common assumption used in the designation of a fault as active is that the more recent the faulting, the more likely any future movement. However, because different faults can lie dormant for different lengths of time before they rupture again, there is no universally applicable time span for evaluating regional fault activity. Both historical and geologic evidence suggests that some faults may remain dormant for hundreds, thousands, or tens of thousands of years between major displacements.



0 1 2
Scale Miles

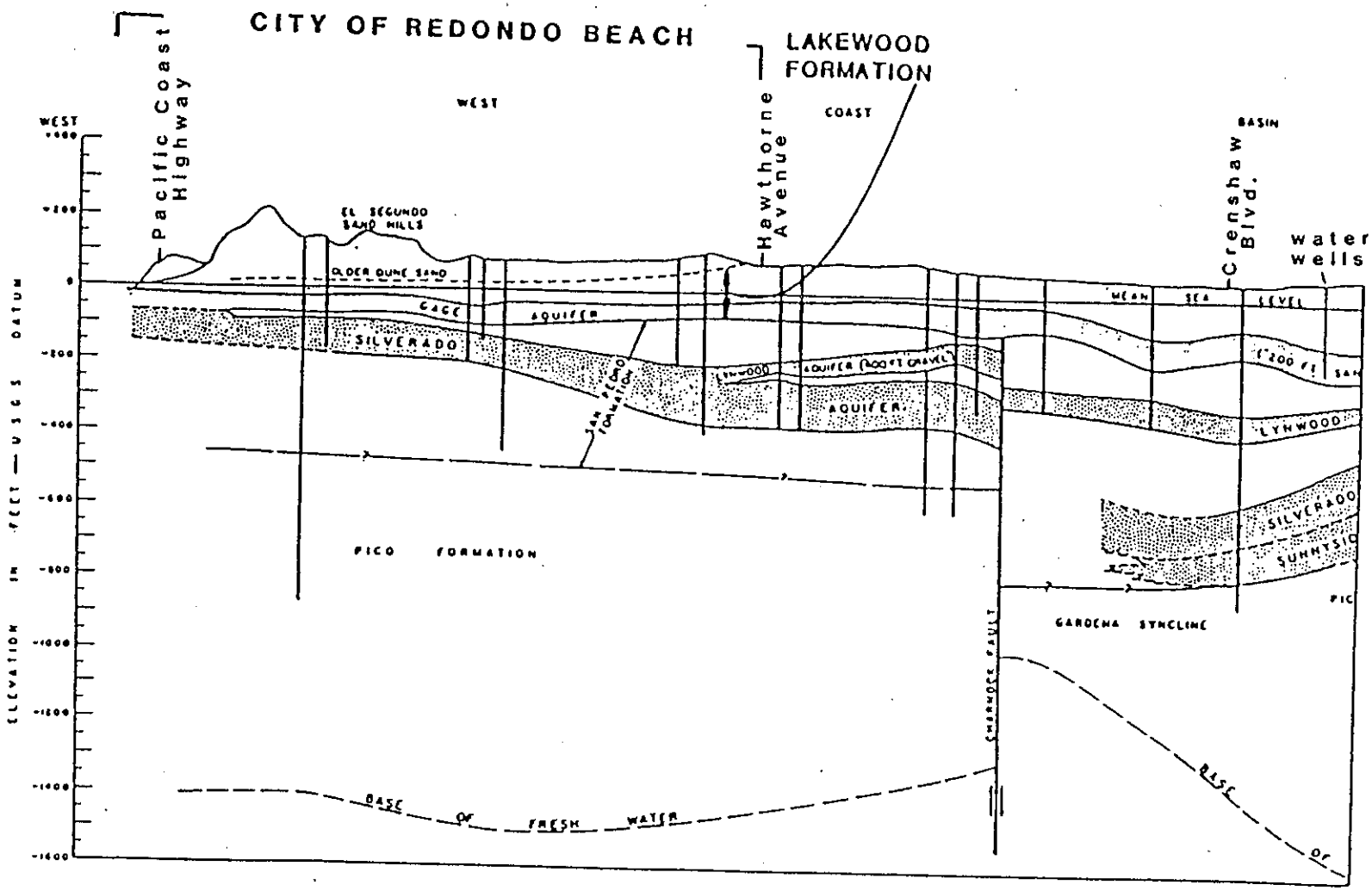
EARTH UNITS LEGEND:

- Qsr — Active Dune Sand (Recent)
- Qso — Active Dune Sand (Upper Pleistocene)
- Qal — Recent Alluvium
- Qlw — Lakewood Formation (Upper Pleistocene)

(*SOURCE:* California Department of Water Resources Bulletin No. 104, Plate 3B)

REGIONAL GEOLOGIC SETTING

FIGURE 29



GENERALIZED GEOLOGIC CROSS-SECTION

(Illustrating Surficial Earth Units, Bedrock Units, and Important Deep Aquifers)

(*SOURCE:* C.D.W.R. Bulletin 104, Plate 6B)

HORIZONTAL SCALE: 1"=4,500'

GENERALIZED COASTAL GEOLOGIC CROSS-SECTION

FIGURE 30

Investigations of earthquake history have demonstrated that earthquakes in Southern California do not occur randomly in time but instead occur regularly at approximately constant faulting recurrence intervals. This conclusion has led to the idea that particular fault segments will generate characteristic earthquakes of specific magnitude with a certain regularity.

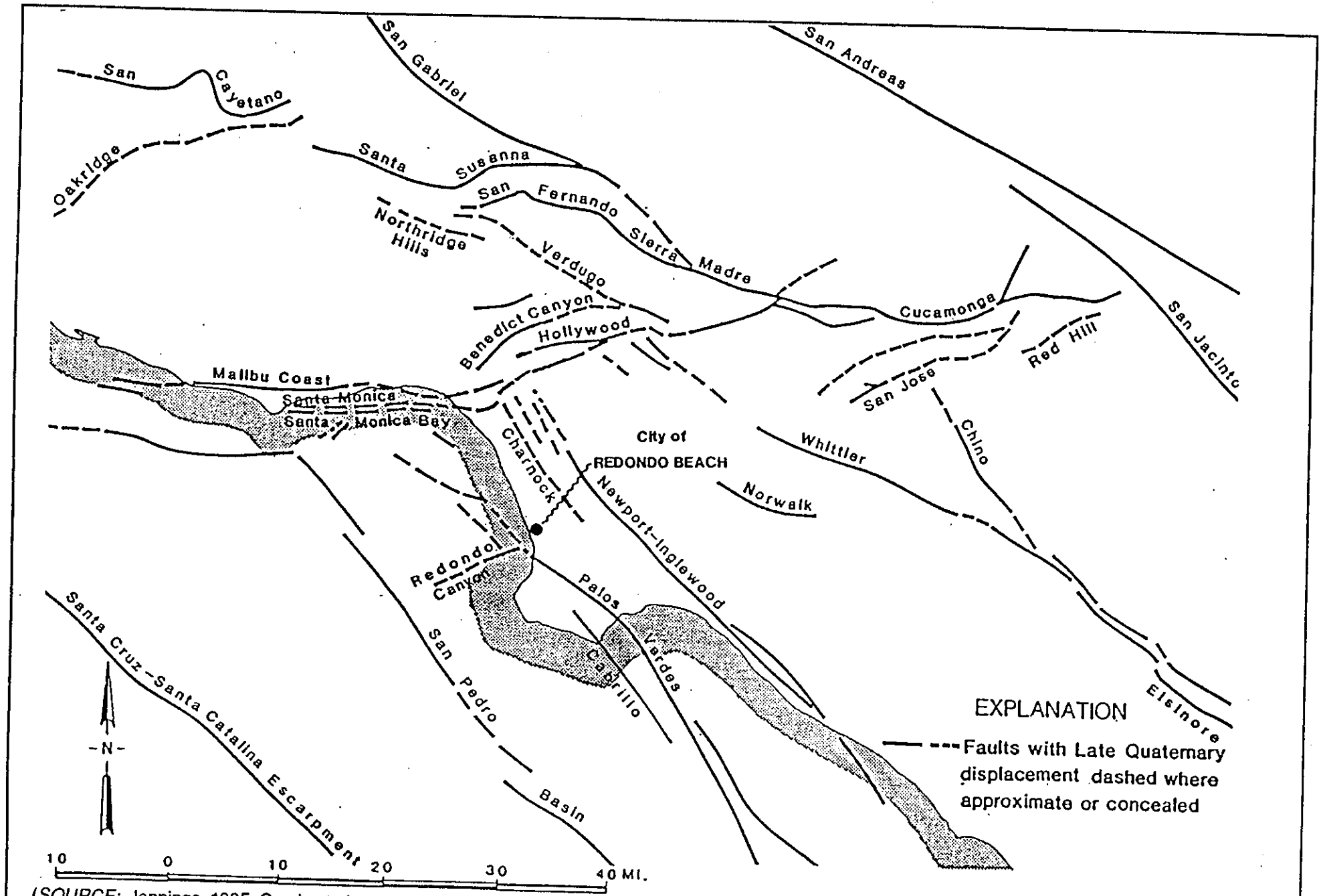
Generally, the probability of earthquake occurrence increases from year to year at a rate which depends upon how long it has been since the last earthquake occurred, amount of and length of displacement, and statistical uncertainties associated with the average length of the cycle.

The regional faults that may generate earthquakes that could affect the City of Redondo Beach are shown in **Figures 31** and **32**. Figure 32 is especially pertinent to the City of Redondo Beach, because of the close proximities of the offshore Redondo Canyon and Palos Verdes faults which have faulted Holocene and/or sea floor deposits. The faults in the above figures have been subdivided into categories of faults with historical surface rupture (past 200 years), faults with Holocene surface rupture (past 200 to 10,000-11,000 years), and faults with Late Quaternary surface rupture (past 11,000 to 750,000 years). Individual characteristics of these various faults are summarized in **Table 49**.

Regionally damaging earthquakes could also occur on other known faults in Southern California, but their distance from the planning area or magnitude limitations suggest that the resulting ground shaking and related damage would be less than is anticipated for the faults in **Table 49**. However, it is also very important to note that earthquake activity from unmapped subsurface faults is a distinct possibility that is currently not predictable. For example, the 1987 Whittier Narrows magnitude 6.1 earthquake occurred due to movement on a fault under the Los Angeles Basin that apparently had no surface exposure (Weber, 1987). In addition, detailed studies of offshore faults have been limited to about the last 15 years and will probably be refined and expanded in the future.

The earthquake magnitudes in **Table 49** represent an estimated range taken from a variety of sources. The uppermost magnitude shown is considered to be the maximum credible or design earthquake that might occur on a specific fault. The maximum credible estimated magnitudes are based on the 1/2 fault length method of fault rupture length correlations by Slemmons (1977 and 1982) and Bonilla et. al. (1984) (**Figure 33**), and by estimates by Ziony and Yerkes (1985). The common approach is to base estimates on the assumption that one-half of the total fault length can rupture in a single earthquake.

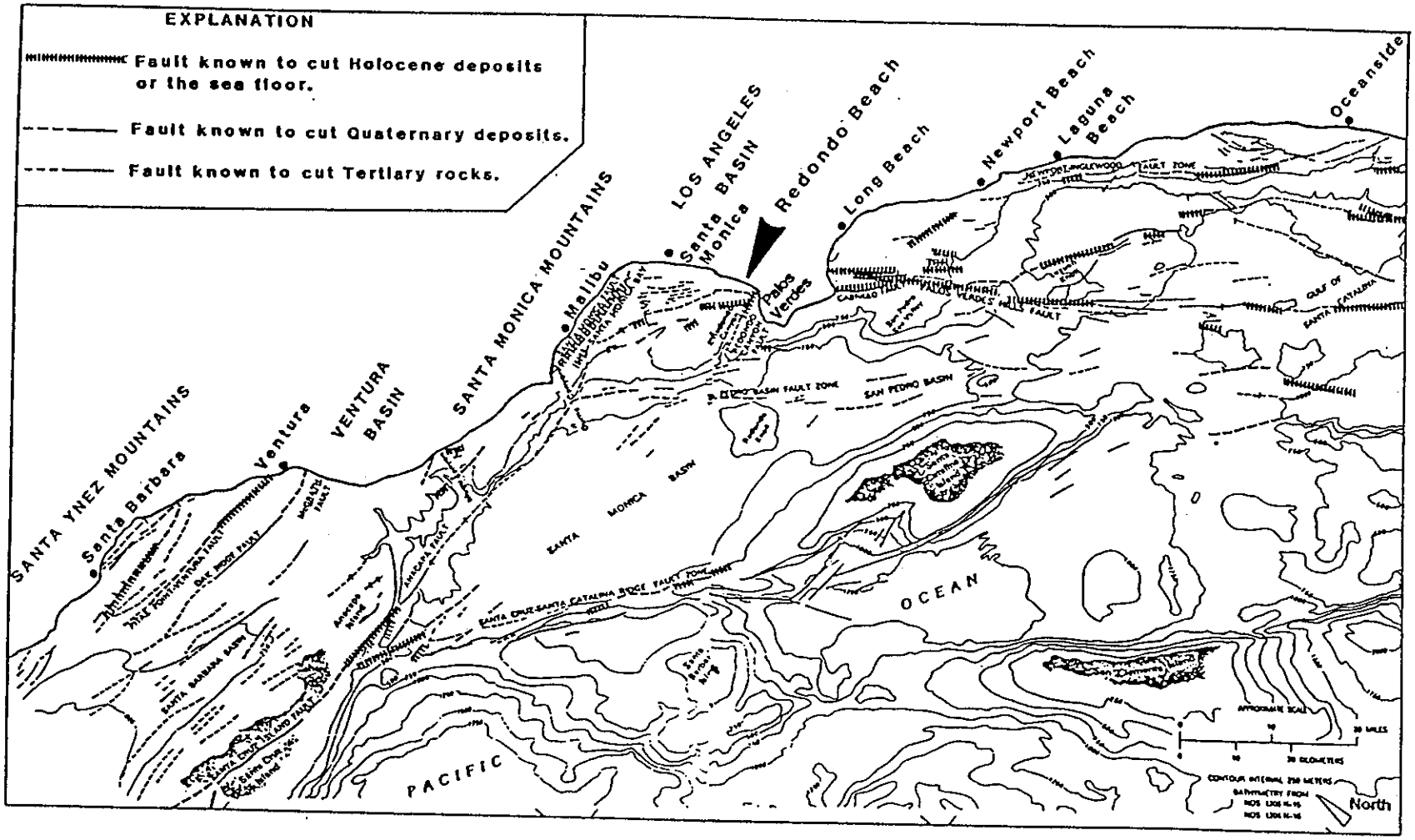
However, there is much uncertainty about what proportion of a fault will rupture in a single event, or the actual length of a fault, so resultant magnitudes must be viewed with caution (Ziony and Yerkes, 1985).



(*SOURCE:* Jennings, 1985, Crook, et.al., 1978, Hill, et.al. 1979, Clarke, et.al., 1985, Ziony and Yerkes, 1985, and Weber, et.al., 1980.)

PRIMARY REGIONAL FAULTS

FIGURE 31



(*SOURCE:* U.S. Geological Survey Professional Paper 1360, 1985.)

PRINCIPAL QUATERNARY FAULTS IN THE OFFSHORE LOS ANGELES REGION

FIGURE 32

TABLE 49

Characteristics and Estimated Earthquakes for Regional Faults

Fault Name	Level of Activity	Distance to City Center (~miles)	Fault Length (~miles)	Slip Rate (~mm/yr)	Maximum Historic Magnitude	Estimated Magnitude Range	Recurrence Interval (~magnitude/years)k M7	Ground Accelerations (~g's of gravity)a,k,l M6.5	M6
Elysian Park	Historic	11	50+	2	5.9?(1987)	7	?	?	0.35
Cabrillo	Holocene	8	12	0.1	---	6.75a	>1500	>800	>400
Palos Verdes	Historic	2.5	50	0.8	3.9(1972)	5j-7a	1200	600	300
Redondo Cyn.	Holocene	2.5	8	---	small?l	6.5a	?	?	?
Charnock	L. Quat.	4	6	---	---	6.4a	?	?	?
Newport-Inglewood	Historic	6.5	45	0.5	6.3(1933)	6j-7a	1500	800	200-400
San Pedro	L. Quat.	15	48	0.8g	---	7a	1200	600	300
Hollywood-Raymond Hill	Holocene	15	25	0.2	?(1855)	5.5j-7a	1500	?	400
Santa Monica-Malibu Coast	Historic	11	60	0.4	5.7(1973)	5.5j-7a,d	1500+	800+	400+
Whittier	Historic	20	28	1-2	4.2(1976) 6.1(1987)?	5.5j-7a	200-900	?	20-40
Elsinore	Historic	50	130	2.3	6.0(1910)	5.5j-7.5a	200-900	?	20-90
Catalina Escarpment	L. Quat.?	35	80	0.8g	---	7a	1200	600	300
San Fernando-Sierra Madre	Historic	30	36	1-4f	6.6(1971)	6.0j-7a	500	200	100
San Andreas	Historic	52	650	36	8+(1857)	8.0j-8.5a,b	40-100M8	3-10M7	3-1M6
San Jacinto	Historic	55	270	8h	7(1899)	6.0j-7.5a,b	400-1000M8	40-100M7	4-10M6

General Sources: Envicom, 1975, 1986, 1988; Woodward Clyde Consultants, 1986, Ziony, 1985.

SUBSCRIPTS:

a) Based on estimated rupture length and Slemmons, 1982.

b) Based on historic seismicity.

c) Crook and others, 1978; and Matti and others, 1982.

d) Based on comparisons with the Sierra Madre fault.

e) Hansen and others, 1988.

f) Clark and others, 1984.

g) Based on comparisons with the Palos Verdes fault.

h) Sharp, 1981.

i) Unknown, assumed to be 0.1 mm/year.

j) Envicom, 1975.

k) Lamar, 1973; Slemmons, 1982; and Ziony, 1985 for recurrence intervals.

l) Ziony, 1985.

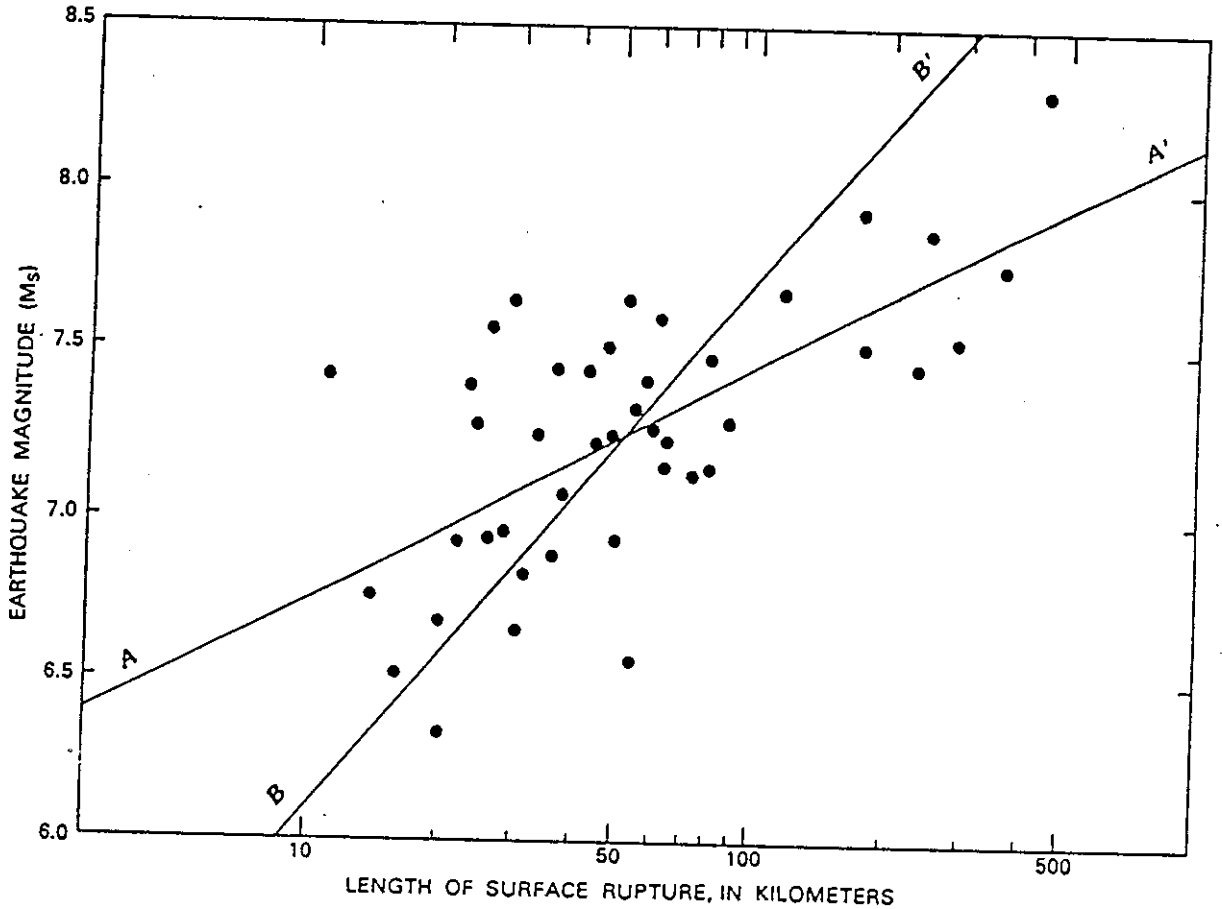
EXPLANATION:

RECENCY OF ACTIVITY

Historic: 0-200 years before present.

Holocene: 200-10,000 to 11,000 years before present.

Late Quaternary: Within last 750,000 years.



Length of surface-fault rupture of historical earthquakes worldwide in relation to magnitude for all types of faults (modified from Bonilla and others, 1984, fig. 1A). Because of the statistics involved in estimating maximum values, line A–A' is used to estimate the most likely earthquake magnitude associated with a given length of surface rupture, whereas line B–B' is used to estimate the most likely rupture length associated with a given earthquake magnitude.

(*SOURCE:* Ziony, 1985)

LENGTH OF SURFACE FAULT RUPTURE OF HISTORICAL EARTHQUAKES IN RELATION TO MAGNITUDE

FIGURE 33

The relative threat of earthquake damage posed by a given fault is related to the magnitude of the generated earthquake, its distance from the City, its long-term slip rate, and the elapsed time since its last major earthquake.

The earthquake magnitude, distance, and subsurface geologic characteristics provide a measure of potential ground shaking (measured as ground acceleration) and damage done (measured as intensity) as discussed in a subsequent section. **Table 49** also shows the estimated average recurrence interval (where known) for earthquakes as correlated to the faults slip rate. In general, faults with lower slip rates or which produce earthquakes of higher magnitude, will have longer recurrence intervals between major earthquakes, whereas a higher slip rate or lower magnitude correlates with more frequent earthquakes (**Figure 34**).

Since long-term probability of an event is an imperfect measure of current earthquake potential, an event of long recurrence interval could still pose a significant earthquake threat if the elapsed time since the last event approaches or exceeds the average recurrence time. For many faults in the region, the elapsed time since the last earthquake is specifically unknown thus making earthquake predictions more subjective.

The following text describes the characteristics of the faults shown in **Figures 31** and **32** and summarized in **Table 49**. The Table 49 summary includes the level of activity which lists when the most recent fault movement probably occurred; the approximate distance to the center of the City of Redondo Beach; the approximate fault length; the approximate slip rate; the maximum historic earthquake; the estimated magnitude earthquake range; the approximated recurrence interval for magnitude 6.0, 6.5, and 7.0 earthquakes; and the peak ground accelerations for the estimated magnitude ranges.

The estimated earthquake magnitudes are shown as a range because the original determinations made in the 1975 Seismic Safety Element were also depicted as a range of magnitudes. The fault systems described below generally consist of two or more faults within the same structural trend and, by convention, are therefore considered as "systems."

Elysian Park Fault: Three years of recently observed seismic activity suggests that this newly discovered thrust fault trends at least 50 miles from Whittier to Malibu across the northern portion of the Los Angeles Basin. The fault does not apparently break the ground surface and is therefore difficult to detect without further study. The 1987 Whittier Narrows earthquake may have been along this fault trace. Earthquakes of magnitude 7 may be expected to be generated by subsurface movement of the fault (Los Angeles Times, June 14, 1989). The fault is located approximately 11 miles north of Redondo Beach.

Average Recurrence Intervals for Earthquakes, As a Function of Slip Rate*

Slip Rate (mm/yr)	Recurrence Interval (Years) by Earthquake Magnitude			
	M 7	M 6.8	M 6.5	M 6
0.5	1,500	1,200	800	400
1	900	650	400	200
2	500	300	200	100

*(After Slemmons, 1982; Actual average recurrence intervals may be longer, due to contributions of smaller earthquakes and other deformation processes.)

AVERAGE EARTHQUAKE RECURRENCE INTERVALS

FIGURE 34

Cabrillo Fault: This fault consists of several strands that are an apparent splay from the Palos Verdes fault, and extend approximately 12 miles across the San Pedro shelf. The fault may deform Holocene sediments and has had numerous small earthquakes occur near its trace. The fault is considered active by Woodward Clyde Consultants (1986). The fault's slip rate suggests a recurrence interval for a magnitude 6.0 earthquake of greater than 400 years, however, no data are available as to when the last earthquake approaching that magnitude occurred. The fault is located approximately eight miles from the City.

Palos Verdes Fault: The Palos Verdes (or Palos Verdes Hills) fault extends from the Santa Monica-Malibu Coast fault in northern Santa Monica Bay southeastward across the Palos Verdes Peninsula and the San Pedro Shelf to the vicinity of Lasuen Knoll, a distance of more than 50 miles. Several strands of the segments of the fault offshore of San Pedro and the City of Redondo Beach are known to cut Holocene deposits on the sea floor (Clarke et. al., 1985). These segments of the fault would be considered active since they displace deposits younger than 10,000 to 11,000 years of age. The offshore segments of the Palos Verdes fault from its juncture with the Redondo Canyon fault to the vicinity of Lasuen Knoll is characterized by continuous to intermittent offsets of Holocene strata.

The presence of the Palos Verdes fault on the Palos Verdes Peninsula is indicated by vertical separation of the pre to Late Quaternary Catalina Schist basement rock and evidence of deformed strata of early to Late Pleistocene Age. A lack of faulted Holocene strata within the Palos Verdes Peninsula suggests that the fault has not been active in that area since Holocene time, however, as discussed above, the fault is considered to be active on either side of the peninsula so this currently potentially active segment is in structural continuity with other active segments to the northwest and southeast. A 3.9 magnitude earthquake was attributed to the fault in 1972 in the area south of San Pedro.

Earthquake magnitude ranges for the fault are from about 5.0 to 7.0 with recurrence interval for a magnitude 6.0 earthquake being about every 300 years. Data were unavailable indicating when the last 6.0 earthquake occurred. Segments of the fault across Santa Monica Bay, across the Palos Verdes Peninsula, and southeast of San Pedro, are all considered to be potentially seismogenic (Ziony, 1985). The fault is closest to the City of Redondo Beach where it cuts across Santa Monica Bay, approximately two and one-half miles southwest of the City.

Redondo Canyon Fault: This fault is approximately eight miles long and joins the main strand of the Palos Verdes fault near the shoreline off the City of Redondo Beach (Clarke et. al., 1985). A presumed single strand of the fault cuts the sea floor and Holocene deposits on the shelf south of the head of Redondo Canyon. Scattered small earthquakes have occurred near the fault. The fault is considered active with an estimated maximum credible magnitude of 6.5. Recurrence intervals were not available because of a lack of data regarding the slip rate.

Charnock Fault: The Charnock fault consists of two strands that cut Late Quaternary strata and leave no surface expression. The fault is about six miles long and is located about four miles north of the City. No recurrence interval data were available.

Newport-Inglewood Fault System: This fault system is over 45 miles in length and is located approximately 6.5 miles east of the City. The fault is considered active and was the source of the 1933 magnitude 6.3 Long Beach earthquake. It is less likely that the fault segment between Signal Hill and Newport Beach, which moved in the 1933 event will be the source of another major earthquake in the near future. However, it is possible that the 25 mile segment between Cheviot Hills and Signal Hill could produce a major earthquake event (Envicom Corporation, 1986).

San Pedro Fault: This fault is located approximately 15 miles offshore and consists of a series of strands that cut Late Quaternary strata. The fault length is about 45 miles, generally paralleling the coastline. Recurrence intervals for a magnitude 6.0 earthquake could be about every 300 years, however, actual dating of the last earthquake close to that magnitude is unknown.

Hollywood-Raymond Hill Fault System: This system extends in an east-west direction along the south side of the Santa Monica Mountains and may be continuous with the Raymond fault in the vicinity of Glendale. Holocene strata was faulted prior to about 1,600 years before the present. However, an 1855 earthquake may have occurred as a result of subsurface faulting. The fault is located about 15 miles north of the City. There is a high probability that this fault system is capable of generating damaging earthquakes (Real, 1987).

Santa Monica-Malibu Coast Fault System: These faults extend approximately 60 miles in an east-west trend from north of Santa Monica parallel to the coast and into the Santa Barbara Channel. The faults are located about 11 miles to the north of the City. The Malibu Coast segment of this system experienced a 5.7 magnitude earthquake in 1973.

Whittier Fault: The Whittier fault is approximately 28 miles long and is located about 20 miles east of the City. This fault may have been the source of the 1987 6.1 magnitude Whittier Narrows earthquake (Weber, 1987). Recurrence intervals on this fault are relatively short with 20 to 40 estimates for magnitude 6.0 earthquakes. The southerly extension of the fault probably merges with the Elsinore fault.

Elsinore Fault: The Elsinore fault is approximately 130 miles long and is located about 50 miles east of the City. The fault was the site of a 1910 magnitude 6.0 earthquake. Recurrence intervals are also relatively short with a 20 to 90 year recurrence for a magnitude 6.0 earthquake.

Catalina Escarpment Fault: This offshore fault is approximately 80 miles long and is located about 35 miles west of the City. Recurrence intervals are about every 300 years for a magnitude 6.0 earthquake. Late Quaternary deposits may have been faulted in the past.

San Fernando-Sierra Madre Fault System: This fault system is approximately 36 miles long and extends along the base of the San Gabriel Mountains from east of Sierra Madre to west of San Fernando. These faults are found about 30 miles north of the City. The San Fernando segment was the source of the 1971 magnitude 6.6 earthquake. Recurrence intervals are estimated at 100 years for a magnitude 6.0 earthquake.

San Andreas Fault System: This fault system forms the dominant geologic structure throughout most of western California and has been responsible for the largest recorded earthquakes in the region. Two of the State's largest historic earthquakes occurred along the fault system in 1857 near Fort Tejon and in 1906 near San Francisco. Both of these earthquakes have been estimated at 8+ magnitudes with surface displacements of 16 to 36 feet and fault rupture lengths of 200+ miles. Separate segments of the fault system appear to have ruptured during these seismic events.

The fault system segment between Parkfield and Cajon Pass, which produced the 1857 earthquake, currently has a very low level of seismic activity. Two different earthquake histories have been documented within the above segment. The portion from near Parkfield to Tejon Pass experiences great earthquakes of magnitude 8+ roughly every 250 years (Sieh and Jahns, 1984); whereas, the segment between Tejon Pass and Cajon Pass experienced major to great earthquakes (magnitude 7 and greater) on an average of every 145 years (Sieh, 1984). The latter segment last broke during the 1857 Fort Tejon earthquake 132 years ago.

The fault system segment between Cajon Pass and the Salton Sea has not experienced a major earthquake for a least 265 years and possibly for as long as 600 years. Various earthquake studies suggest that this segment may be the location for the next great earthquake in California with probabilities of between 2 and 5 percent per year or about 50 percent in the next 20 or 30 years (Wesson and Wallace, 1985).

Future earthquake predictions of magnitude and displacement cannot precisely be determined along the San Andreas fault system. Regional studies do, however, indicate that a magnitude 8.0 or larger earthquake could be expected to occur in the future and should be considered for planning and design purposes (Ziony and Yerkes, 1985). The closest these latter fault system segments come to the City is about 52 miles to the northeast. A major earthquake along this system should be considered a strong possibility and would produce ground accelerations of about 0.14 g within the City.

San Jacinto Fault System: Faults of this system display Late Quaternary to Historic activity with numerous small earthquakes evident near their traces. In terms of numbers of damaging earthquakes, this system has been the most prolific in historical time (Yerkes, 1985). At least 10 earthquake events have taken place from 1858-1980 over a fault length of 120 miles, with about half of these earthquakes causing damage in the San Bernardino-Riverside area. Recurrence intervals suggest a magnitude 6.0 within 4 to 10 years and a magnitude 7.0 within 40 to 100 years. The fault system's closest point to the City is about 55 miles to the east, therefore, even though a moderate earthquake magnitude could occur at any time the actual expected damage within the City would probably be quite small.

4.1.4 Localized Fault Rupture Potential

Currently no active or potentially active faults are known to exist within the City of Redondo Beach. The Redondo Canyon fault has a structural trend that would project on-shore in the vicinity of King Harbor, however, existing data suggests that the fault terminates very close to the shoreline (Clarke et. al., 1985). Earthquake epicenters from 1927 to 1977 also do not suggest seismic activity within the City limits (**Figure 35**).

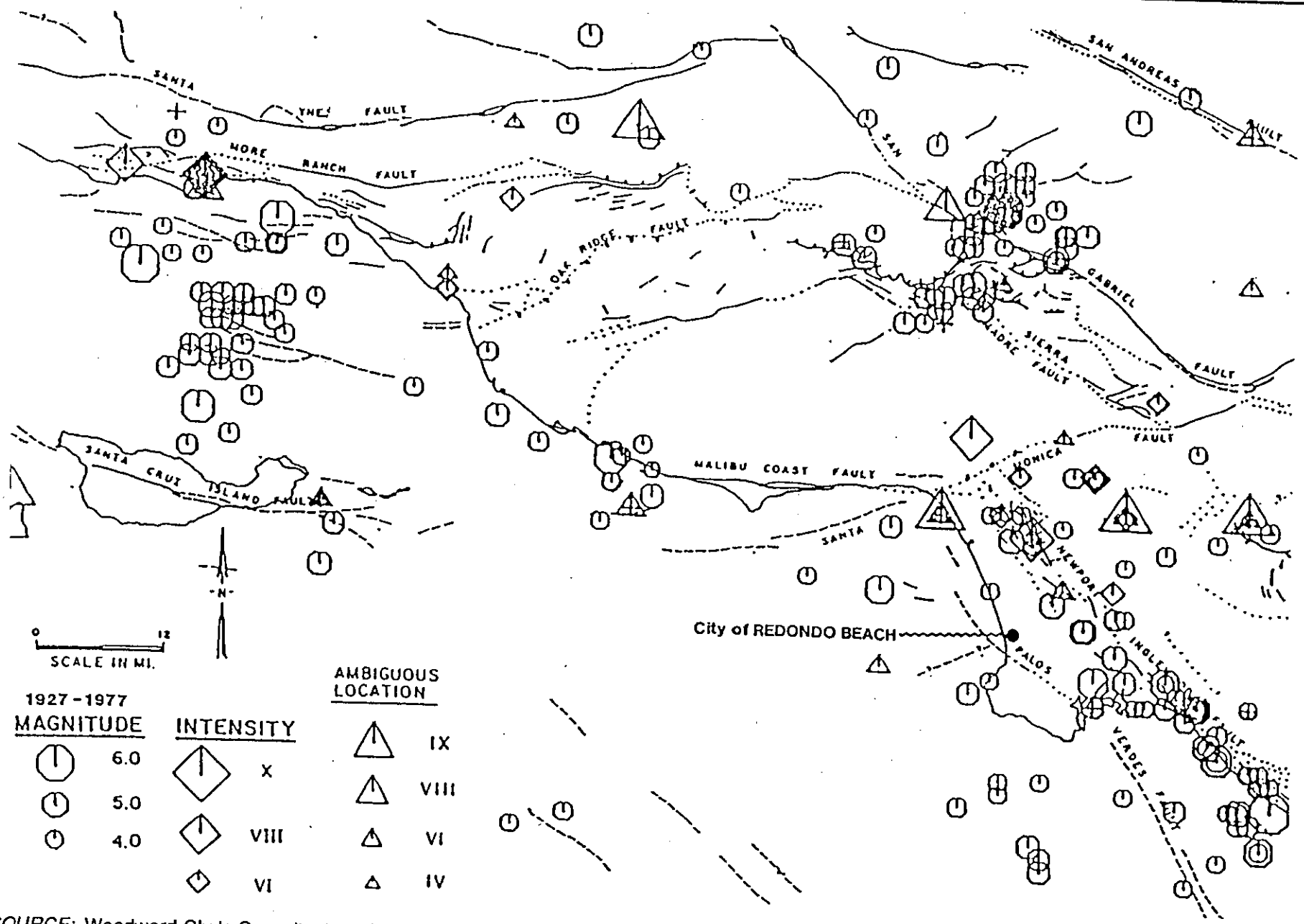
4.1.5 Localized Ground Shaking Potential

The United States Geological Survey has proposed that faults in Southern California which show evidence of offset during Late Quaternary time (from 750,000 years ago to the present time) should be considered candidates for future seismic activity under the present tectonic setting (Ziony and Yerkes, 1985). They identify this as the appropriate time span in Southern California because:

(a) Time spans of a few tens of thousands of years or less appear inadequate to judge fault activity. Large historical earthquakes and surface ruptures have occurred worldwide along some faults that lacked evidence of any historical or Holocene (past 10,000 to 11,000 years) activity.

(b) Geologic evidence in and near the planning area suggests that major changes in the tectonic regime of Southern California took place in early Quaternary time, from 2,000,000 years up to 750,000 years ago. Many faults that were active under earlier stress regimes may not be active under existing stress field that began about 750,000 years ago.

(c) Many of the Late Quaternary age geologic deposits in Southern California contain datable markers for evaluation of fault activity under the current stress field of the last 750,000 years.



(*SOURCE:* Woodward-Clyde Consultants, 1978 LNG Terminal Study.)

HISTORIC REGIONAL SEISMICITY PROFILE (1927-1977)

FIGURE 35

In this study, known faults exhibiting evidence of Late Quaternary (past 750,000 years) displacement or earthquakes are identified and are considered to be sufficiently active to be hazards for land use planning (Ziony, 1985). The location of most recent displacement, distance to the fault, potential earthquake magnitude, subsurface geology, depth to ground water and building construction are all important characteristics that can influence the degree of localized ground shaking and potential damage.

A summary of earthquakes in the region from 1927 to 1977 indicate varying degrees of existing seismic activity on the Palos Verdes, Newport-Inglewood, San Fernando-Sierra Madre, Santa Monica-Malibu Coast, Whittier, Elsinore, San Andreas, and San Jacinto faults (**Figure 35**). These and other faults in the region show evidence of Late Quaternary to Holocene displacement or earthquake activity and could be responsible for future localized ground shaking.

As seismic waves that are generated by fault displacement, pass through the earth's crust, the severity and duration of ground shaking at a particular site area depends on several factors including:

- Total energy released from a particular magnitude earthquake in the form of seismic waves.
- Distance from the source of the earthquake.
- Nature of the surface and subsurface earth materials including age, composition, density, thickness, and water content.
- Type and age of building materials.

The severity of ground shaking is commonly quantified by determination of peak and/or repeatable ground acceleration. Acceleration is a term describing the velocity transferred to earth materials by the passage of seismic waves originating from a particular magnitude earthquake. Numerically, acceleration is expressed as a fraction of gravity (g). The actual damage done in a particular area, resulting from the ground shaking and acceleration, is measured on the Modified Mercalli Intensity Scale (**Figure 36**).

In general, seismic waves traveling from more dense crystalline bedrock, through less dense sedimentary rock, into thick unconsolidated sediments and finally into water saturated alluvial deposits tend to become reduced in velocity and increased in amplitude. Resultant duration of ground shaking can therefore become greater. Ground shaking amplification may pose special problems to multi-story buildings since damage commonly can result when the length of time it takes for a seismic shock wave to pass through a building is coincident with the natural wave motion of the ground.

The Mercalli Intensity Scale

(As modified by Charles F. Richter in 1956 and rearranged)

If most of these effects are observed	*then the intensity is:*
Earthquake shaking not felt. But people may observe marginal effects of large distance earthquakes without identifying these effects as earthquake-caused. Among them: trees, structures, liquids, bodies of water sway slowly, or doors swing slowly.	I
Effect on people: Shaking felt by those at rest, especially if they are indoors, and by those on upper floors.	II
Effect on people: Felt by most people indoors. Some can estimate duration of shaking. But many may not recognize shaking of building as caused by an earthquake; the shaking is like that caused by the passing of light trucks.	III
Other effects: Hanging objects swing. *Structural effects:* Windows or doors rattle. Wooden walls and frames creak.	IV
Effect on people: Felt by everyone indoors. Many estimate duration of shaking. But they still may not recognize it as caused by an earthquake. The shaking is like that caused by the passing of heavy trucks, though sometimes, instead, people may feel the sensation of a jolt, as if a heavy ball had struck the walls. *Other effects:* Hanging objects swing. Standing autos rock. Crockery clashes, dishes rattle or glasses clink. *Structural effects:* Doors close, open or swing. Windows rattle.	V
Effect on people: Felt by everyone indoors and by most people outdoors. Many now estimate not only the duration of shaking but also its direction and have no doubt as to its cause. Sleepers wakened. *Other effects:* Hanging objects swing. Shutters or pictures move. Pendulum clocks stop, start or change rate. Standing autos rock. Crockery clashes, dishes rattle or glasses clink. Liquids disturbed, some spilled. Small unstable objects displaced or upset. *Structural effects:* Weak plaster and Masonry D* crack. Windows break. Doors close, open or swing.	VI
Effect on people: Felt by everyone. Many are frightened and run outdoors. People walk unsteadily. *Other effects:* Small church or school bells ring. Pictures thrown off walls, knicknacks and books off shelves. Dishes or glasses broken. Furniture moved or overturned. Trees, bushes shaken visibly, or heard to rustle. *Structural effects:* Masonry D* damaged; some cracks in Masonry C*. Weak chimneys break at roof line. Plaster, loose bricks, stones, tiles, cornices, unbraced parapets and architectural ornaments fall. Concrete irrigation ditches damaged.	VII
Effect on people: Difficult to stand. Shaking noticed by auto drivers. *Other effects:* Waves on ponds; water turbid with mud. Small slides and caving in along sand or gravel banks. Large bells ring. Furniture broken. Hanging objects quiver. *Structural effects:* Masonry D* heavily damaged; Masonry C* damaged, partially collapses in some cases; some damage to Masonry B*, none to Masonry A*. Stucco and some masonry walls fall. Chimneys, factory stacks, monuments, towers, elevated tanks twist or fall. Frame houses moved on foundations if not bolted down; loose panel walls thrown out. Decayed piling broken off.	VIII
Effect on people: General fright. People thrown to ground. *Other effects:* Changes in flow or temperature of springs and wells. Cracks in wet ground and on steep slopes. Steering of autos affected. Branches broken from trees. *Structural effects:* Masonry D* destroyed; Masonry C* heavily damaged, sometimes with complete collapse; Masonry B* is seriously damaged. General damage to foundations. Frame structures, if not bolted, shifted off foundations. Frames racked. Reservoirs seriously damaged. Underground pipes broken.	IX
Effect on people: General panic. *Other effects:* Conspicuous cracks in ground. In areas of soft ground, sand is ejected through holes and piles up into a small crater, and, in muddy areas, water fountains are formed. *Structural effects:* Most masonry and frame structures destroyed along with their foundations. Some well-built wooden structures and bridges destroyed. Serious damage to dams, dikes and embankments. Railroads bent slightly.	X
Effect on people: General panic. *Other effects:* Large landslides. Water thrown on banks of canals, rivers, lakes, etc. Sand and mud shifted horizontally on beaches and flat land. *Structural effects:* General destruction of buildings. Underground pipelines completely out of service. Railroads bent greatly.	XI
Effect on people. General panic. *Other effects:* Same as for Intensity X. *Structural effects:* Damage nearly total, the ultimate catastrophe. *Other effects:* Large rock masses displaced. Lines of sight and level distorted. Objects thrown into air.	XII

*Masonry A: Good workmanship and mortar, reinforced, designed to resist lateral forces.
Masonry B: Good workmanship and mortar, reinforced.
Masonry C: Good workmanship and mortar, unreinforced.
Masonry D: Poor workmanship and mortar and weak materials, like adobe.

MERCALLI EARTHQUAKE INTENSITY SCALE

FIGURE 36

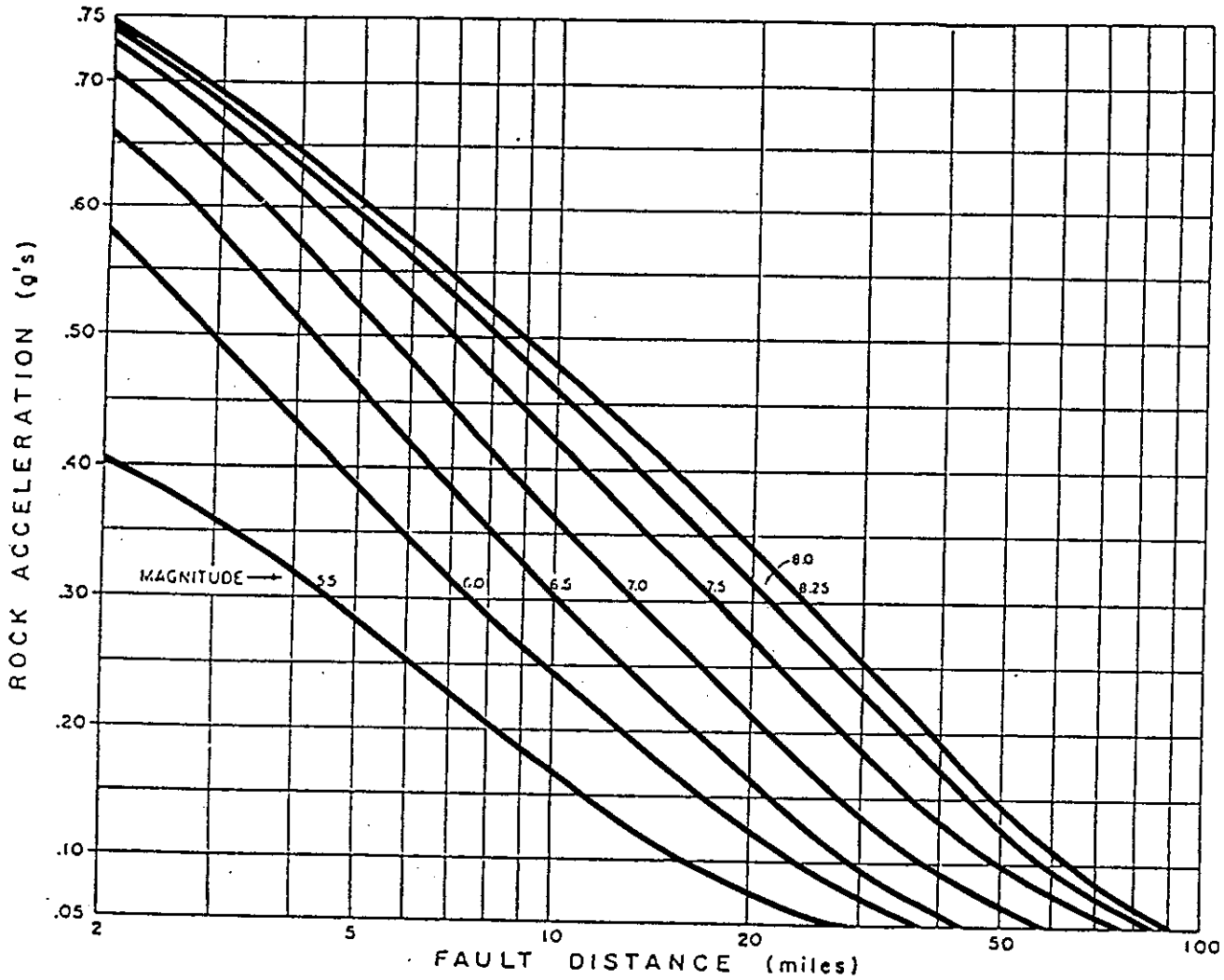
Taller buildings having a longer wave period, which, depending on building height, design, and construction materials, may be similar to the wave period in poorly or unconsolidated earth materials. Thus, shaking of the building may be greater because of the amplification of the shock waves.

Regional ground acceleration values for the City of Redondo Beach were computed for the regional and local faults that have been considered as potential earthquake sources. The ground acceleration values were computed for bedrock materials (**Figure 37**), however, the study area is considered to consist of "firm ground" or stiff soils that would yield similar regional values as rock with relatively minor modification (Envicom, 1975) (**Figure 38**). Regional peak ground acceleration values range from a high of 0.68 g for the Palos Verdes fault, 0.63 g for the Redondo Canyon fault, 0.47 g for the Newport-Inglewood fault, to 0.14 for the San Andreas fault (see **Table 49** for additional values). The regional values are valuable for general land use planning purposes but do not take the place of site specific geotechnical evaluation that take into account, by testing, the competence of underlying earth materials, ground water depth, and actual distance to the causative fault.

The peak ground acceleration values are for the Newport-Inglewood fault and vary from 0.20 g to 0.42 g. within the City. However, these site specific studies did not take into consideration the Palos Verdes or Redondo Canyon faults as earthquake sources. Recent studies also indicate that peak ground accelerations may contribute less to cumulative damage potential than repeatable ground acceleration cycles of less intense shaking. Overall, the higher the peak ground acceleration the higher the repeatable ground accelerations, whereas, the repeatable ground accelerations are usually 60 to 70 percent of the peak ground accelerations and should therefore be considered in site specific building design (Ploessel and Slosson, 1974). Local building codes usually are equated to either peak or repeatable ground accelerations in order to determine building design.

From a planning perspective, the delineation of earthquake Intensities for the City may be more valuable than ground acceleration. It is well known that peak acceleration shows a poor correlation with damage and risk (Evernden and Thomson, 1985). Intensity is only one of the several commonly used measures of ground shaking from earthquakes that correlates directly with damage to ordinary structures and can be accurately predicted for a postulated magnitude earthquake. For the City of Redondo Beach area, regional Modified Mercalli Scale Intensities have been calculated for earthquake magnitudes of 7.0 on the Newport-Inglewood fault (Toppozada et. al., April, 1989), and 6.5 to 6.6 on the Palos Verdes fault (Evernden and Thomson, 1985).

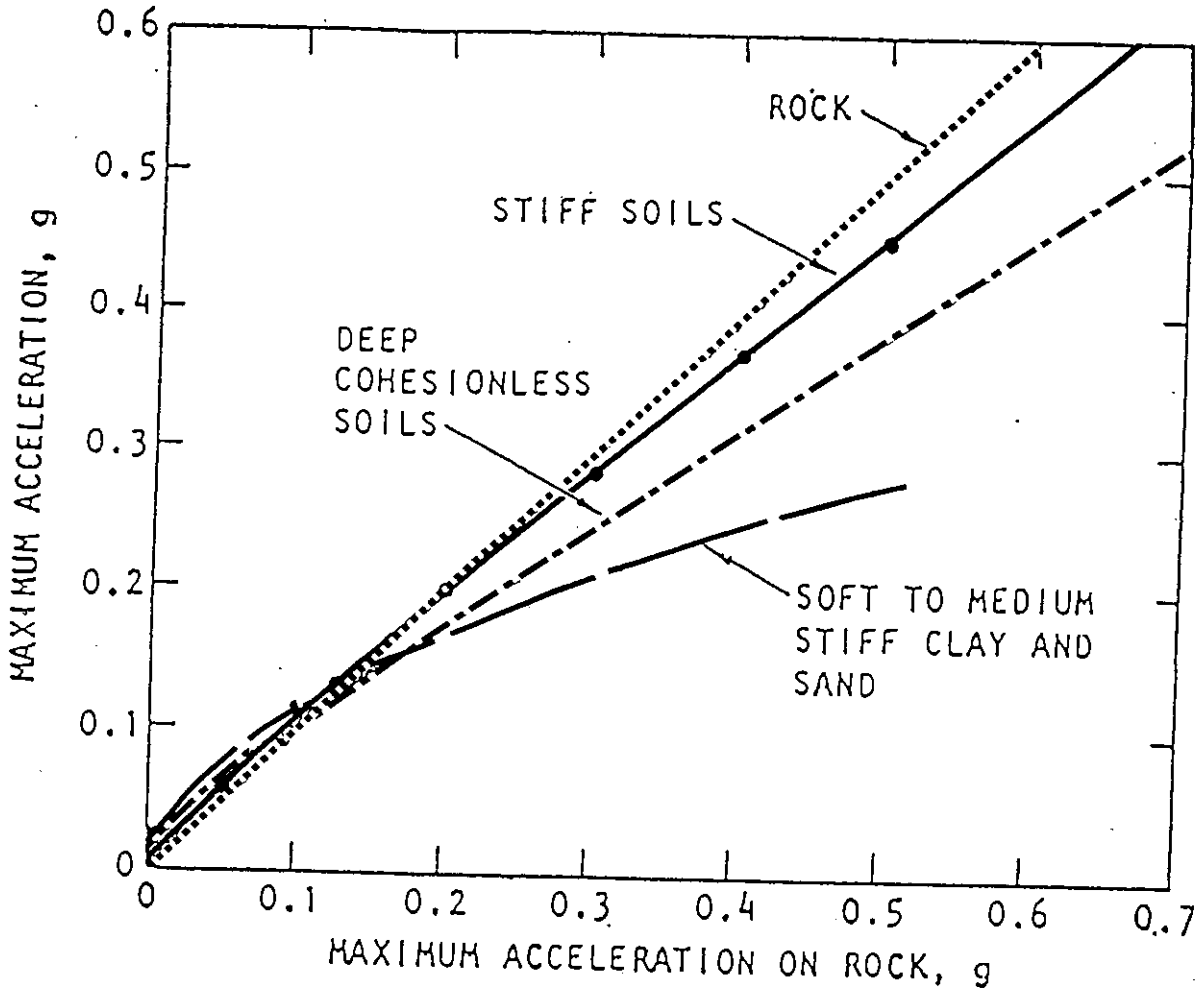
Resultant regional Intensities throughout the City has been postulated to range from VII to VIII. Site specific conditions can modify these Intensities depending on subsurface earth materials, depth to ground water, and building construction. **Figure 36** details the effects of an Intensity VII to VIII earthquake.



(*SOURCE:* Ziony, 1985.)

ROCK ACCELERATION vs. FAULT DISTANCE IN EARTH MAGNITUDE

FIGURE 37



(*SOURCE:* Scnabel & Seed, 1972.)

RELATIONSHIPS BETWEEN MAXIMUM ACCELERATIONS ON ROCK AND OTHER LOCAL SITE CONDITIONS

FIGURE 38

Generally, masonry that is unreinforced or has poor workmanship will sustain the most damage. Unbraced chimneys, parapets, tiles, cornices may fall. Frame houses may be damaged if not bolted onto foundations. Interior items such as bookcases may also fall.

Predicted ground accelerations and Intensities for an earthquake on the San Andreas fault would be less than the figures shown above. For land use planning and risk assessment a worst case situation should be planned for from a future seismic event on the Newport-Inglewood and Palos Verdes faults or possibly the newly discovered Elysian Park fault.

4.1.6 Liquefaction Susceptibility

Liquefaction is a process whereby strong earthquake shaking causes sediment layers that are saturated with ground water to lose strength and behave as a fluid. This subsurface process can lead to near-surface or surface ground failures that can result in property damage and structural failure.

During an Earthquake, seismic waves travel through the earth and vibrate or shake the ground. In cohesionless granular material having low relative density, the vibration can disturb the particle framework leading to increased compaction of the material and concomitant reduction of pore space between the grains. If the sediment is saturated, water occupying the pore spaces resists this compaction and exerts pore pressure which reduces the contact stresses between the sediment grains. With continued shaking, transfer of intergranular stress to pore space water can generate strength and change from a solid state to a liquefied state.

This mechanical transformation can cause various kinds of ground failure at or near the surface. It is important to note that liquefaction of subsurface water saturated materials does not always cause surface ground failures.

If surface ground failure does occur, it is usually expressed as lateral spreading, flow failures, ground oscillation, and/or general loss of bearing strength (Matti and Carson, 1986). Sand boils (injections of fluidized sediment) can commonly accompany these different types of failures.

In order to determine a region's liquefaction susceptibility, three major factors must be analyzed. These include:

(a) the age and textural characteristics of the alluvial sediments;

(b) the intensity and duration of ground shaking; and

(c) the depth to ground water.

Generally, sand and silty sand, that is poorly compacted and of Holocene age is most susceptible to liquefaction. These types of deposits can be found and are dominant within the City of Redondo Beach. Older, finer or coarser grained, indurated materials are less susceptible to potential liquefaction. Potential ground shaking within the city from a moderate to severe earthquake would be adequate to be within a threshold distance to generate liquefaction impacts (**Figure 39**). Ground water depths within 30 feet of the ground surface is the third condition necessary for liquefaction to occur.

For the City of Redondo Beach, a very high zone of liquefaction susceptibility exists within the coastal area where elevations are less then 30 feet above sea level (Envicom, 1975; Tinsley et. al., 1985). Groundwater depths in this area are considered to be within 30 feet of the ground surface. Subsurface migration and percolation of surface runoff may create areas of perched groundwater.

In these areas groundwater would be tapped or perched above more impermeable subsurface deposits. Perched groundwater may occur locally throughout the study area and also produce conditions necessary for liquefaction. These potential areas cannot be determined without site specific or project specific borings drilled down to a depth of 50 feet.

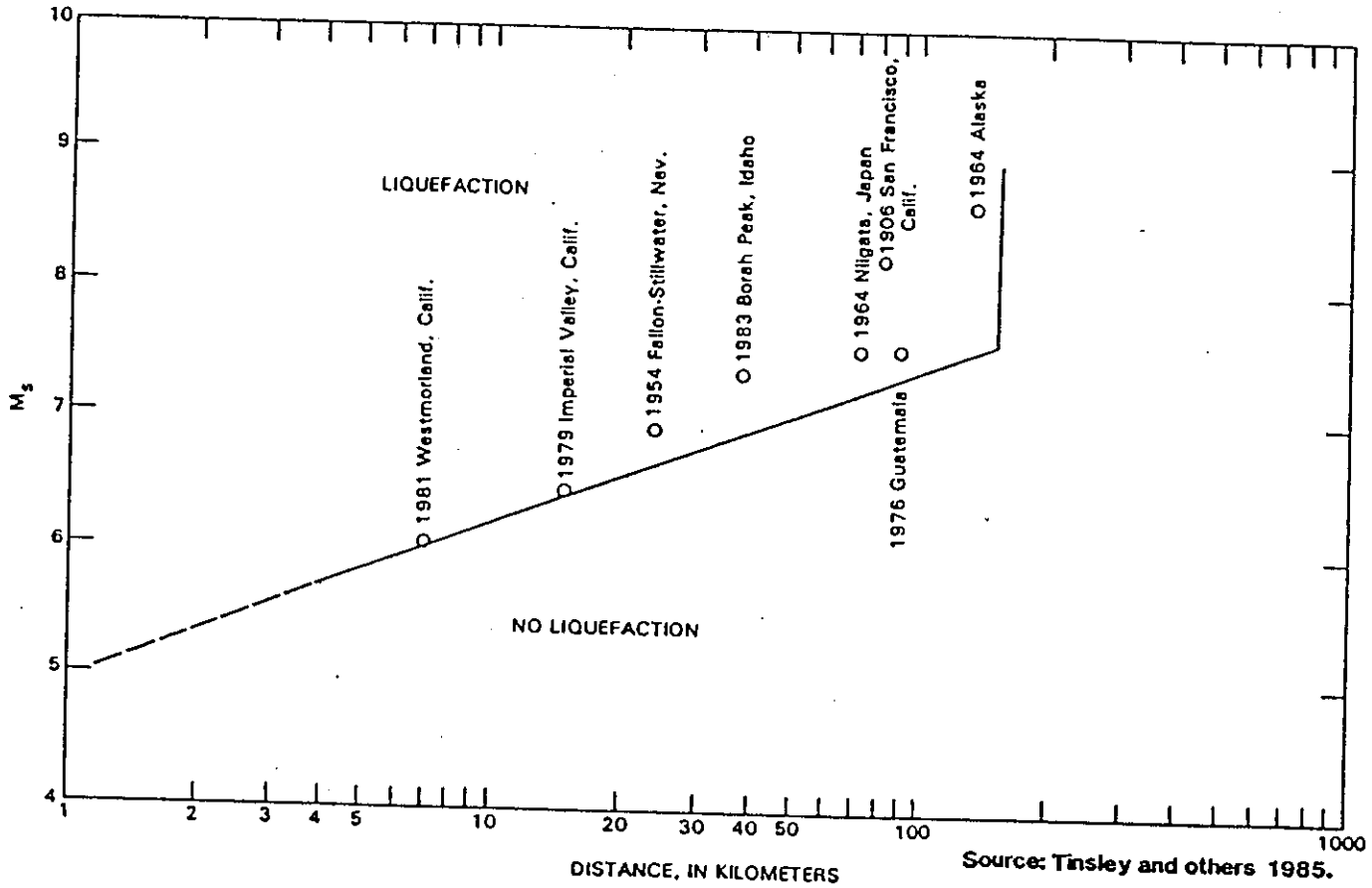
4.1.7 Subsidence

Subsidence (other than that caused by liquefaction) may occur due to earthquake shaking, withdrawal of groundwater and/or withdrawal of hydrocarbons from the underlying soil material.

Subsidence may occur in unconsolidated soils during earthquake shaking as the result of a more efficient rearrangement of existing individual soil particles. Subsidence of sufficient magnitude to cause significant structural damage is normally associated with rapidly deposited alluvial materials, or improperly compacted fill. None of these areas were identified within the City of Redondo Beach (Envicom Corporation, 1975).

Withdrawal of groundwater and/or hydrocarbons from the underlying soil material may cause subsidence on a regional scale that may be disruptive to the leveling of buildings, railroad tracks, sewer lines, etc.

Historically, hydrostatic pressure in the West Coast Groundwater Basin (underlying the City of Redondo Beach) confined aquifers were sufficient to maintain a freshwater outflow to the ocean and prevent seawater intrusion. During the first half of the century, however, an almost total dependence on groundwater to meet water use demands resulted in a serious overdraft of the basin resulting in seawater intrusion.



Source: Tinsley and others 1985.

Relation of earthquake magnitude to the maximum threshold distance at which liquefaction has been observed.

DISTANCE THRESHOLD FOR EARTHQUAKE GENERATED LIQUEFACTION

FIGURE 39

Since 1953, the withdrawal of groundwater from under the City of Redondo Beach has been offset by the West Coast Basin Barrier Project. This project injects water via 106 injections wells which, in turn, prevents salt water intrusion and replenishes the groundwater basin. Continuing operation of the Barrier Project should prevent any future regional subsidence.

Portions of the City of Redondo Beach are underlain by the Torrance Oil Field which had a peak production from approximately eighty-two active on and off-shore wells from a period of 1925 to 1956. Subsidence resulting from hydrocarbon withdrawal was considered to be negligible in the past and is considered to probably be non-existent in the future (Leighton and Associates, 1986).

4.1.8 Slope Stability

Slope failures within the areas of the City underlain by the El Segundo San Hills could occur due to seismic shaking or saturation of the existing sandy earth materials. Generally, if the sand is consolidated and moderately cemented, then the reasonably high frictional strength of the material makes the sand less conducive to slope failure (Leighton and Associates, 1986). Site specific evaluations of future developments would be necessary to determine the specific stability of slopes within the Sand Hills areas.

The surface soils within the San Hills are comprised of the Oceano association and consist of layers of grayish brown to brownish gray sands approximately 60 inches deep. These sands are highly susceptible to wind erosion (USDA, 1969), and have easily erodible surfaces (Leighton and Associates, 1986).

4.1.9 Tsunamis

Tsunamis are seismic sea waves generated by subsea fault displacements, submarine landslides, and/or submarine volcanic activity. Tsunamis begin as long wave trains; when they encounter shallow coastal waters their wavelength shortens and the waves become steeper, breaking and running up onto the adjacent land masses.

Historically, California has suffered little tsunami damage, which makes planning for such an event or occurrence often speculative. However, both distant and locally generated tsunamis can present a long-term hazard to Southern California. The risk is, however, much lower than that from the more common, geologically controlled earthquake hazards (McCulloch, 1985).

Seismically active faults that reach the sea floor may be capable of producing future tsunamis in these areas; similar faults may produce tsunamis offshore from the Los Angeles area. Movement of earthquake-triggered submarine slides of the dimensions of existing slides found in Los Angeles area do not appear to present a serious tsunami hazard.

Predictive modeling for distantly generated tsunamis indicate that wave runups of approximately five feet above sea level every 100 years and nine feet above sea level every 500 years are possible in the Redondo Beach area (U.S. Army, 1974). A preliminary appraisal of wave height for locally generated offshore earthquakes, suggests general wave runup height no greater than six to nine feet in Southern California (McCulloch, 1985) (**Figure 40**).

4.1.10 Hazardous Buildings

The principal threat in an earthquake is not limited to ground shaking, fault rupture, or liquefaction, but the damage that the earthquake may cause to buildings that contain people or essential functions.

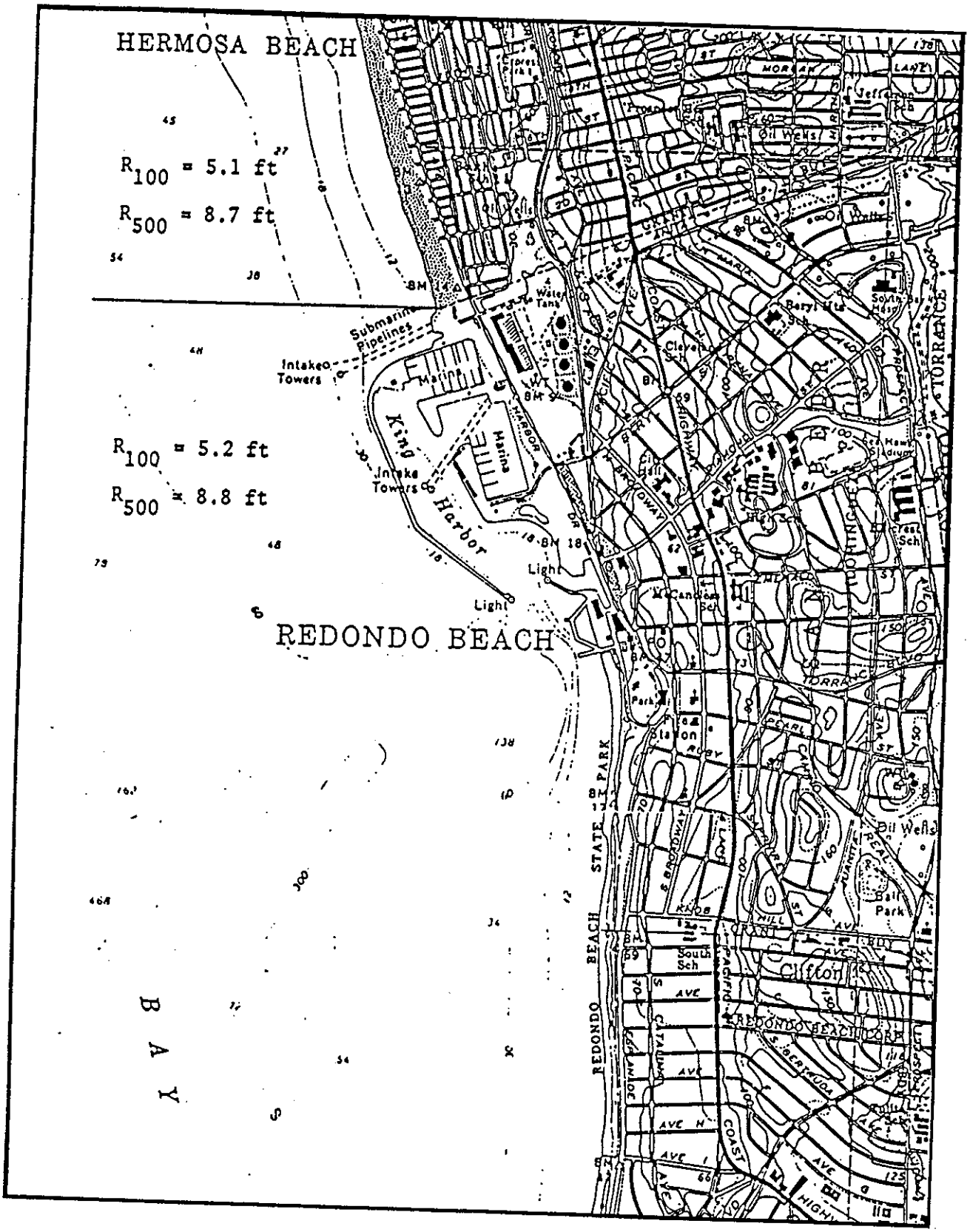
Continuing advances in engineering design and building code standards over the past decades have greatly reduced the potential for and occurrence of collapse in an earthquake in most of the newer buildings. Many existing buildings were, however, built in past decades before some of the more recent, progressive earthquake design standards were incorporated into the building codes. Several specific building types existing in the City of Redondo Beach may be of particular concern in this regard.

Unreinforced Masonry Buildings. In the 1800's and early 1900's unreinforced masonry was the most common type of construction material used for larger downtown commercial structures and for multi-story apartment and hotel buildings. These were recognized as a collapse hazard after their performance in earthquakes in San Francisco, 1906; Santa Barbara, 1925; and Long Beach, 1933.

Following the Long Beach earthquake of 1933, seismic requirements were added to local building codes for the first time; the Field Act of 1934 instituted state-wide standards to the vast stock of existing unreinforced masonry buildings. Today, these buildings were still recognized as the most hazardous buildings in an earthquake. Because of the concentrated development within portions of the City of Redondo Beach by the 1930s, a substantial number of unreinforced masonry buildings may still exist.

Senate Bill 547 requires local jurisdictions to enact structural hazard reduction programs by a) inventorying pre-1934 unreinforced masonry buildings, and b) developing mitigation programs to correct structural hazards. Inventories and mitigation plans have been submitted to the State, as required by law.

Pre-cast Concrete Tilt-up Buildings. This building type was introduced following World War II and gained popularity for use in light industrial buildings during the late 1950s and 1960s. Extensive damage to concrete tilt-up buildings in the 1971 San Fernando earthquake revealed the need for better anchoring of walls to the roof, floor, and foundation elements of the building, and for stronger roof diaphragms.



(*SOURCE:* U.S. Army Engineer Waterways Experiment Station, 1974.)

LOCAL TSUNAMI PREDICTIONS (For 100 and 500 Year Events)

FIGURE 40

In the typical damage to types buildings, the concrete wall panels would fall outward and the adjacent roof would collapse.

New design standards for tilt-up buildings, developed after the 1971 earthquake, were incorporated into the 1976 Uniform Building Code. However, a large majority of existing tilt-up buildings were designed under the former code standards and may be subject to collapse under strong ground shaking. Light industrial or commercial areas of the City that were developed in the last 1950s and 1960s may contain these types of buildings.

The older tilt-up construction was used primarily for single-story industrial and warehouse buildings with solid wall panels and few or no window openings. However, recent application of tilt-up construction techniques has expanded to two- and three-story commercial, retail an mass housing uses, with poor connection details and a high proportion of glass openings in the wall panels (California Seismic Safety Commission, 1985).

Soft-Story Buildings. The failure of the modern Olive View Hospital in the 1971 San Fernando earthquake as well as the Imperial County Service Buildings in the 1979 Imperial Valley earthquake, led to the repeated recognition of the seismic vulnerability of soft-story construction. Soft-story buildings are those in which at least one story (commonly the ground floor) has significantly less rigidity and/or strength than the rest of the structure. This situation can form a weak link in the structure, unless special design features are incorporated to give the building adequate structural integrity.

Typical examples of soft-story construction are buildings with glass curtain walls on the first floor only, or buildings placed on stilts or columns, leaving the first story open for landscaping, street friendly building entry, parking, or other purposes. In the 1950s to early 1970s, soft-story buildings were a popular construction style for low- and mid-rise concrete frame structures.

Non-Ductile Concrete Frame Buildings. The brittle behavior of non-ductile concrete frame buildings can create major damage or collapse under strong ground shaking. This type of construction, generally lacks masonry shear walls, and was common in the very early days of reinforced concrete buildings, continuing to be built until building codes were updated in 1973. Large numbers of these buildings were built for commercial and industrial use in many urban areas. These structures may be up to four to eight stories in height, yet can also include one-story parking garages with heavy concrete roof systems supported on non-ductile concrete columns.

The history of construction in the City of Redondo Beach spans the dates and uses common for all of the potentially hazardous building types mentioned and detailed above. However, without a detailed inventory, the specific existence or locations of any buildings of these categories within the City limits is not known.

4.1.11 Critical, Sensitive, and High Occupancy Facilities

Some facilities and buildings pose a greater degree of importance or risk to the public, and may warrant special standards or protection from seismic-related impacts or damage for a variety of reasons. Three general categories of facilities pertinent to the City of Redondo Beach are distinguished for future policy considerations and include:

- Critical facilities are those facilities whose continued functioning is necessary to maintain public health and safety following a disaster, and facilities where damage or failure could pose hazards to life and property well beyond their immediate vicinity.

- Sensitive facilities include facilities used for manufacturing, storage, or sale of hazardous materials; socially significant facilities such as schools, nursing homes, and housing for the elderly, handicapped, or mentally ill.

- High occupancy facilities are public or private structures for housing or assembly of large populations (i.e., libraries, auditoriums).

The siting and design of hospitals and public schools falls under the approval authority of the Office of the State Architect, which enforces the state's seismic codes for those facilities. The specification and enforcement of seismic standards for other uses is the responsibility of the City.

4.1.12 Emergency Management Plan

The City of Redondo Beach should formulate specific emergency plans to establish and detail the functional responsibilities and interactions of the federal, state and local governmental agencies, as well as private organizations in the event of natural and/or human related disasters. This plan should also describe potential hazards, possible effects on the City, recommended hazard mitigations, post disaster aid, reconstruction, and financial assistance.

4.1.13 Summary of Composite Hazards

The geologic and seismic hazards that could potentially impact the City of Redondo Beach include ground shaking, liquefaction, slope instability, and tsunamis. Subsidence has probably been mitigated by the replenishment of groundwater into the underlying aquifers.

- All portions of the City of Redondo Beach are subject to potentially strong ground shaking with peak ground accelerations approaching 0.68g and Modified Mercalli Intensities of approximately VII to VII1/2. Postulated earthquakes of 6.4 to 6.7 magnitude on the Palos Verdes or Newport-Inglewood faults would be responsible for the above intensities.

- The zones of liquefaction susceptibility are concentrated along the coast within 30 feet elevation of mean sea level, and possibly in unspecified inland areas where perched water is encountered within 30 feet of the ground surface.

- Slope instability could occur on side slope within the Sand Hills if poorly indurated or saturated dune faces are excavated. Surface wind and/or water erosion may also be a potential hazard within the Sand Hills on any denuded slope areas.

- Tsunami runup hazards exist within areas located approximately six to nine feet above mean sea level.

4.1.14 Geologic/Seismic Related Issues

The potential hazards affecting the City of Redondo Beach in this area lead to a series of policy issues that need to be considered within the Safety Element of the Updated General Plan. These issues include, but are not necessarily limited to, the following:

(a) Sensitive or high-occupancy land uses, such as South Bay Hospital, local elementary and secondary schools, local fire stations, mid-rise (3 to 5 story) buildings, or larger assembly halls or auditoriums are more critical from a human safety standpoint, and may, therefore, warrant a higher level of precaution and protection relative to seismic hazards.

(b) The edition of the Uniform Building Code used in the City of Redondo Beach should be periodically reviewed and assessed to determine and ensure if it continues to be sufficient for the high levels of ground shaking that may be anticipated in the local area from a high-intensity seismic (earthquake) event.

(c) Current formats and guidelines required for geotechnical reports and environmental impact reports prepared and submitted to the City for proposed development projects, particularly locations within high liquefaction areas, need to be periodically reviewed and evaluated to assure their continued adequacy and comprehensiveness.

(d) Existing grading standards, slope retainage standards, and erosion control mitigation measures required and implemented by the City in local development and construction projects need to be evaluated for their continued adequacy relative to seismic safety.

(e) Information regarding potentially active and "damage capable" faults (Redondo Canyon fault and Palos Verdes fault) located adjacent to the City in the local area should be monitored and reviewed. Based on a change in the activity or status of these faults, the City may wish to consider imposing limitations or precautions on new development in the areas of the City (i.e., water's edge and southwest corner of the City) that are located closest to these faults and fault systems.

(f) Portions of the City of Redondo Beach which lie within high liquefaction zones or potential tsunami runup zones (i.e., areas located at low elevations and areas with shallow groundwater levels) posing potential hazards to property and human beings, should be specifically identified and appropriate mitigation measures applied to future development and construction within these areas.

(g) The City of Redondo Beach contains a number of hazardous, unreinforced masonry buildings, pre-cast concrete buildings, soft-story structures, and non-ductile concrete frame buildings. These types of existing structures must be identified, analyzed, and modified by the individual owners within certain time periods, in order to conform with Ordinance 2576 and Senate Bill 547, requiring the structural upgrading of such structures to improve their safety and reduce potential hazards and injuries relative to seismic safety.

(h) Existing local, state and federal disaster preparedness resources and emergency mobilization/evacuation plans need to be reviewed and coordinated to assure their continued adequacy and effectiveness in the event of a major seismic event.

4.1.15 Goals, Objectives, and Policies

The goals, objectives, and policies proposed within relative to geologic/seismic hazards in the City of Redondo Beach are intended to reduce death, injuries, damage to property, and economic and social dislocation due to earthquakes and related geologic hazards.

The goals, objectives, and policies are also intended to enhance the preparedness of City agencies, departments, and the community in general to survive, respond to, and effectively and safely recover from a major seismic (earthquake) event.

Issue GEOLOGIC AND SEISMIC SAFETY AWARENESS/CONFORMANCE

Goal *It shall be the goal of the City of Redondo Beach to:*

9A Ensure that the City of Redondo Beach and all private developers and builders undertaking projects in the City meet and conform to all applicable state, regional, and local requirements, ordinances, and policies relative to seismic safety.

Objective *It shall be the objective of the City of Redondo Beach to:*

9.1 Substantially reduce the level of death, injury, property damage, economic and social dislocation and disruption of vital services that would result from earthquake damage and related seismic events; and to ensure the widespread availability and effective response of emergency, evacuation, and disaster relief services throughout the community following an earthquake (seismic) event.

Policies *It shall be the policy of the City of Redondo Beach to:*

9.1.1 Continually maintain, monitor, and update all relevant geologic and seismic related ordinances, regulations, and codes, including the seismic safety component of the Safety Element of the General Plan to maximize awareness, efficient planning, and effective response to these continually evolving issues.

Issue ADMINISTRATIVE, REPORTING, AND CODE AWARENESS/ ENFORCEMENT

Goal *It shall be the goal of the City of Redondo Beach to:*

9B Ensure the continued adequacy, comprehensiveness, and availability of the various ordinances, requirements, codes or other administrative documents enacted by or used by the City of Redondo Beach relative to seismic safety.

Objective *It shall be the objective of the City of Redondo Beach to:*

9.2 Maintain, adopt, enforce, and make available all appropriate state/local ordinances, requirements, codes, and administrative documents, in

order to further enhance, advance, and ensure the geologic and seismic safety of the community.

Policies *It shall be the policy of the City of Redondo Beach to:*

9.2.1 Periodically review and assess the edition of the Uniform Building Code used in the City, in order to determine and ensure that its requirements and standards will continue to be sufficient for the high levels of ground shaking that may be anticipated to occur in the local area from a high-intensity seismic (earthquake) event.

9.2.2 Periodically review and evaluate current formats and guidelines required for geotechnical reports and environmental impact reports prepared and submitted to the City for proposed development projects, particularly locations within high liquefaction areas, to assure their continued adequacy and comprehensiveness.

9.2.3 Monitor and evaluate existing grading standards, slope retainage standards, and erosion control mitigation measures required and implemented by the City in local development and construction projects to ensure their continued adequacy and success relative to seismic safety.

Issue <u>FAULT RUPTURE</u>

Goal *It shall be the goal of the City of Redondo Beach to:*

9C Protect life, safety, substantially reduce earthquake-related damage resulting from nearby local and regional fault rupture, and help ensure safe and orderly evacuation of building occupants following an earthquake event.

Objective *It shall be the objective of the City of Redondo Beach to:*

9.3 Take all appropriate measures and actions to maintain and update the City's information and data base relative to the potential for local and regional fault rupture and avail the community to this information on an ongoing basis.

Policies *It shall be the policy of the City of Redondo Beach to:*

9.3.1 Promote the continued collection of relevant data on fault locations and history of fault displacement and activity, as a basis for future refinement of seismic-related policies. Should a previously undetermined or unexposed fault be identified within the City limits,

it should be evaluated immediately, and a determination made of the siting and construction limitations that should be imposed on new development and construction in these areas.

9.3.2 Monitor and relate land use regulations regarding active or potentially active local and regional faults in the planning for new critical or high-occupancy facilities to ensure for their continued operation and/or relative ease of evacuation of occupants if the building(s) are damaged by fault rupture.

9.3.3 Should a previously unidentified or unexposed fault be identified within the City of Redondo Beach municipal boundaries, the city shall formally notify (by United States mail or other appropriate means) all property owners within a 500 linear foot radius of any and all boundaries of such fault of the discovery and existence of the fault.

Issue STRONG GROUND MOTION

Goal *It shall be the goal of the City of Redondo Beach to:*

9D Protect health/life safety and property in the City from the adverse effects of strong ground motion through the implementation of effective standards for seismic design of structures in the City.

Objective *It shall be the objective of the City of Redondo Beach to:*

9.4 Ensure that the design standards implemented to protect local structures against ground shaking be consistent with those considered state-of-the-art at the time of implementation, and seek to reduce the level of potential property damage from strong ground motion, thereby facilitating rapid physical and economic recovery following an earthquake event.

Policies *It shall be the policy of the City of Redondo Beach to:*

9.4.1 Maintain the existing high standards of performance currently enforced in the City for existing buildings and construction techniques of new buildings relative to potential strong ground motion and shaking that may be caused in the local area by an earthquake event.

Issue LIQUEFACTION

Goal *It shall be the goal of the City of Redondo Beach to:*

9E Protect life and essential transportation and evacuation routes, reduce the potential for property damage from liquefaction, and promote the collection of more complete information on liquefaction susceptibility throughout the City.

Objective *It shall be the objective of the City of Redondo Beach to:*

9.5 Take all necessary and appropriate actions to seek out and maintain additional information and protect the residents, employees, visitors, and structures of the community against potential damage related to liquefaction.

Policies *It shall be the policy of the City of Redondo Beach to:*

9.5.1 Require that developers determine the specific liquefaction potential at a project or construction site within areas of the City identified as being prone to liquefaction prior to development, and require that specific measures be taken by the developer or builder, as necessary, to prevent or reduce liquefaction-related damage in an earthquake event.

9.5.2 Promote the collection of relevant data on local groundwater levels and areas susceptible to liquefaction, as a basis for future refinement of liquefaction policies or procedures in the City.

9.5.3 Include potential damage to transportation and evacuation routes in liquefaction prone areas or site-related mitigation programs, both in project-specific and City-wide instances.

Issue CRITICAL, SENSITIVE, AND HIGH-OCCUPANCY FACILITIES

Goal *It shall be the goal of the City of Redondo Beach to:*

9F Ensure the continued functioning of essential facilities following a geologic or seismic-related disaster; prevent loss of life from the failure of critical and sensitive facilities in and following an earthquake event; and be prepared for post-disaster response, such as difficult or hazardous evacuations or rescue, treating large numbers of injured persons, and cleanup or decontamination of hazardous materials.

Objective *It shall be the objective of the City of Redondo Beach to:*

9.6 Take all necessary and appropriate actions in the siting, maintenance, and operation of critical and sensitive facilities in the community, to ensure, as much as possible, that these facilities continue to operate safely and successfully both during and after an earthquake event.

Policies *It shall be the policy of the City of Redondo Beach to:*

9.6.1 Require that earthquake survival and efficient post-disaster functioning be a primary concern in the siting, design and construction standards for essential critical facilities in the City.

9.6.2 Require that proposed Critical, Sensitive, and High-Occupancy facilities be subject to careful and rigorous standards of seismic review prior to any local approvals or permits, including detailed site investigations for faulting, liquefaction and ground motion characteristics, and application of the most current professional standards for seismic design.

9.6.3 Prohibit the location of any Sensitive and High-Occupancy facilities within one hundred (100) feet of an active or potentially active local fault or fault system.

9.6.4 Attempt, wherever possible, to locate Critical and Sensitive structures in areas of the City with continuous road access, and areas where utility services can be easily maintained and/or quickly reinstated in the event of an earthquake.

9.6.5 Require that existing Critical and Sensitive Facilities with significant seismic vulnerabilities be upgraded, relocated or phased out as appropriate or possible.

9.6.6 Incorporate planning for potential geologic or seismic-related incidents affecting Critical, Sensitive and High-Occupancy Facilities into the City's contingency plans for disaster response, evacuation, and recovery.

9.6.7 Require all Critical, Sensitive, and High-Occupancy Facilities located in areas of potential seismic-related hazards (particularly liquefaction or tsunami) to maintain site-specific emergency response plans, with contingencies for all appropriate geologic and seismic-related hazards.

Issue TSUNAMI RUNUP

Goal *It shall be the goal of the City of Redondo Beach to:*

9G Protect life, prevent human injury, and reduce the potential for property damage from tsunami runup, and promote the collection of more complete information on tsunami runup susceptibility throughout the waterfront and low-lying areas of the City.

Objective *It shall be the objective of the City of Redondo Beach to:*

9.7 Obtain, update, and make available all existing information regrading tsunami susceptibility, adopt all necessary policies to prevent the potential for tsunami damage in the community, and require the conduct of all reasonable analysis and installation of all reasonable construction mitigation measures, in order to ensure the greatest possible protection of the community and its residents from damage from such hazards.

Policies *It shall be the policy of the City of Redondo Beach to:*

9.7.1 Determine the specific tsunami runup potential at an existing structure or proposed project/construction site within areas of the City identified as susceptible to such prior to development, and require that specific measures be taken by the developer or builder, as necessary, to prevent or reduce tsunami runup-related damage.

9.7.2 Require that specific structures determined to be susceptible to tsunami runup or the City as a whole explore participation in and receipt of information from the Seismic Sea-Wave Warning System and the Alaska Tsunami Warning Center.

9.7.3 Require that specific structures determined to be particularly susceptible to tsunami runup develop site-specific evacuation and emergency response programs related to such an event.

Issue HAZARDOUS BUILDINGS

Goal *It shall be the goal of the City of Redondo Beach to:*

9H Prevent the loss of life, serious injuries, and major social and economic disruption caused by the collapse of or severe damage to vulnerable or structurally unsafe buildings in an earthquake.

Objective *It shall be the objective of the City of Redondo Beach to:*

9.8 Adopt and enforce all available and appropriate construction, engineering, and safety regulations/requirements relative to seismic safety of local buildings and construction methods and materials to upgrade local structures to non-hazardous levels and ensure that new or rehabilitated structures are constructed in accordance ~~will~~ with all applicable laws, codes, and industry standards.

Policies *It shall be the policy of the City of Redondo Beach to:*

9.8.1 Continue to monitor and enforce the orderly and effective upgrading of seismically hazardous buildings in the City in accordance with Ordinance 2576 and Senate Bill 547.

9.8.2 Develop procedures to periodically review the seismic condition of other potentially hazardous buildings at appropriate points in the buildings' histories.

Issue EMERGENCY PREPAREDNESS

Goal *It shall be the goal of the City of Redondo Beach to:*

9.I Provide means and methods for effective response in a seismic-related disaster or emergency situation, including life-saving and the curtailment of property damage.

Objective *It shall be the objective of the City of Redondo Beach to:*

9.9 Ensure the availability, maintenance, and successful implementation of a modern and comprehensive seismic-related emergency preparedness and disaster response program in the community.

Policies *It shall be the policy of the City of Redondo Beach to:*

9.9.1 Develop and adopt a comprehensive City of Redondo Beach emergency preparedness and response plan.

9.9.2 Ensure that the City's emergency preparedness plan (once adopted) and efforts are properly coordinated with other federal, state, and local response agencies.

9.9.3 Periodically review and upgrade (as necessary) the City's disaster response plan (once adopted).

Issue POST-DISASTER RECOVERY AND RECONSTRUCTION

Goal *It shall be the goal of the City of Redondo Beach to:*

9J Plan for and facilitate the rapid and effective recovery of the City following a seismic-related (earthquake) event.

Objective *It shall be the objective of the City of Redondo Beach to:*

9.10 To provide for and increase the potential for a rapid and effective recovery of the City's residents, employees, visitors, and reconstruction of its structures following a seismic-related (earthquake) event.

Policies *It shall be the policy of the City of Redondo Beach to:*

9.10.1 Develop programs, options, and procedures which will promote the rapid construction and/or rehabilitation of the City following an earthquake event, and facilitate planning efforts to upgrade the community's physical environment and character, as opportunities allow.

4.1.16 Implementation Program

The following presents the respective programs which shall be carried out by the City of Redondo Beach (or the indicated designee) to implement the preceding goals, objectives, and policies of the Geology and Seismic Safety Section. Each implementation program is followed by a number which indicates the pertinent policy or policies which it is intended to implement. Notwithstanding the language in specific implementation measures, action by the City is subject to the availability of funding and staff.

- City of Redondo Beach Department of Public Works Department officials shall, on an ongoing basis, monitor available reports and materials available through regional seismologists, universities, and institutes to receive updates on regional and local seismic conditions, particularly as they relate to discoveries and modifications to fault traces, fault zones, and fault activity (*Policy 9.1.1, 9.3.1, 9.3.2*).

- Technical reviews and updates of the seismic safety portion of the Safety Element of the General Plan, local groundwater/liquefaction susceptibility data, ground shaking/motion potential and fault data shall be carried out, at least every three years. Updates and potential revisions in liquefaction susceptibility areas, fault zone designations, and related land use and construction policies shall be made, as necessary to reflect changing

conditions, technological advances, and policies (*Policy 9.1.1, 9.3.1, 9.3.2, 9.4.1, 9.5.2*).

- City of Redondo Beach Building Department officials shall periodically conduct and complete a technical review of the Uniform Building Code used in the community, to ensure that requirements and standards continue to be sufficient and appropriate (particularly as they relate to ground-shaking that may be anticipated in the local area from a high-intensity seismic event (*Policy 9.2.1, 9.4.1*).

- All geologic and soils reports submitted to the City of Redondo Beach Community Development Department in the enforcement of the Safety Element of the General Plan and review/approval of development and construction proposals shall be reviewed for format (legal), technical adequacy, and completeness by an experienced geologist or soils engineer employed or retained by the City of Redondo Beach. Format requirements and other guidelines for such reports shall be updated and revised as necessary, to assure continued adequacy and comprehensiveness (*Policy 9.2.2*).

- Grading, slope, and erosion control standards within building and safety codes used in the City of Redondo Beach shall be monitored, evaluated, and amended, as necessary, to ensure their continued adequacy and effectiveness (*Policy 9.2.3, 9.4.1*).

- The most advanced and up-to-date professional standards for seismic planning and design shall be used in the siting and design of Critical, Sensitive and High-Occupancy Facilities in the community, to ensure continued safe operation and effective protection & evacuation of occupants (*Policy 9.3.2, 9.4.1*).

- If a previously unidentified or unexposed fault is identified within the community, the City of Redondo Beach Community Development (Building) Department shall provide formal direct mail notification of the discovery, and all available information regarding its location, potential activity, and condition to all property owners within a 500 linear foot radius of the previously unidentified or unexposed fault trace (*Policy 9.3.3*).

- Specific guidelines shall be developed by the City of Redondo Beach Community Development (Building) Department for the collection of data and conduct of studies for determination of liquefaction potential at specific sites in areas identified by the City to be liquefaction-prone. Potential impacts from such sites to adjacent transportation and evacuation routes must be included within these studies. The guidelines should specify: minimum depth of boreholes, minimum lapse time for observation of water level, sample types and frequencies, and the appropriate soils test for evaluation of

suspect soil types. Based on the result of these studies, mitigation measures must be taken prior to construction to reduce the potential for liquefaction-related damage (*Policy 9.5.1, 9.5.2, 9.5.3*).

- The City of Redondo Beach shall require the completion and submittal of detailed and rigorous site-specific technical studies analyzing ground shaking characteristics, liquefaction potential and fault rupture potential prior to and as a part of the siting, development, and construction planning and approval process for local Critical, Sensitive, and High-Occupancy Facilities (*Policy 9.6.1, 9.6.2, 9.6.3, 9.6.4*).

- Local zoning and building regulations shall be amended, as necessary, to prevent the siting of new Critical, Sensitive, and High-Occupancy Facilities within one hundred (100) feet of an active or potentially-active local fault or fault system (*Policy 9.6.1, 9.6.2, 9.6.3*).

- City of Redondo Beach Community Development Department officials shall, within one year of adoption of the updated General Plan, review existing local Critical, Sensitive, and High-Occupancy structures to determine their status and vulnerability relative to seismic safety. The City of Redondo Beach Community Development Department officials shall notify and attempt to work with the owners and/or occupants of any local structures determined to be unsafe or particularly vulnerable to seismic impacts to implement measures to upgrade, relocate, or phase out these facilities, as feasible and appropriate (*Policy 9.6.5*).

- Environmental review conducted in accordance with any proposed development projects located west of Catalina Avenue in South Redondo Beach shall include the specific identification and analysis of the tsunami run-up potential of the site (*Policy 9.7.1*).

- Sites or structures determined to be particularly susceptible to tsunami run-up as a result of these analyses shall be required to implement mitigation measures (including site-specific evacuation and emergency response programs responding to such an event, and should also be made aware of and have access to information provided by the Seismic Sea-Wave Warning System and the Alaska Tsunami Warning Center, to further reduce the potential for damage from such an event (*Policy 9.7.2, 9.7.3*).

- The City of Redondo Beach Community Development (Building) Department shall aggressively monitor and enforce the upgrading of local seismically-hazardous structures, in accordance with City of Redondo Beach Ordinance #2576 and Senate Bill #547 (*Policy 9.8.1*).

- The City of Redondo Beach Community Development (Building) Department shall develop a formal system and method (including timing) for reviewing and reporting on the seismic condition of other potentially hazardous local structures (*Policy 9.8.2*).

- The City of Redondo Beach Community Development (Building) Department (in association with the Planning Division, the Department of Public Works, the Fire Department, and other appropriate local agencies and departments) shall revise, adopt, enforce, update, and maintain a comprehensive emergency preparedness and disaster response program for the City of Redondo Beach. The program shall include policies related to the planning, physical reconstruction, and rehabilitation of the area following a disaster event. The program shall be reviewed and coordinated with other appropriate and responsible federal, state, and regional agencies to assure the greatest possible level of comprehensiveness and effectiveness (*Policy 9.6.6, 9.9.1, 9.9.2, 9.9.3, 9.10.1*).

- The City of Redondo Beach shall ensure that specific procedures for post-event traffic control, emergency evacuations, and security of damaged areas are included within the adopted local emergency preparedness and disaster response program (*Policy 9.10.1*).

- All Critical, Sensitive, and High-Occupancy local facilities deemed by the City of Redondo Beach to be in areas subjected to significant seismic-related hazards must complete, maintain, and submit to the City of Redondo Beach Community Development (Building) Department site-specific emergency response plans, with contingencies for all site-specific geologic and seismic-related hazards (*Policy 9.6.7*).

- The City of Redondo Beach shall maintain effective and up-to-date mutual aid agreements for fire, police, medical response, public works, building inspection, mass care, and heavy rescue, as they relate to post-disaster response and recovery (*Policy 9.10.1*).

SECTION 4.2

Noise (Ambient and Stationary Sources)

4.2 NOISE (OVERALL [AMBIENT] AND STATIONARY [INTRUSIVE] SOURCES)

4.2.1 Statutory Requirements

The generation of noise, its impacts on land uses and the functional quality of life of residents, business people, and visitors to the area, and its buffering and/or mitigation is required to be documented and analyzed as a separate element within a city's or county's General Plan.

The State of California, under California Government Code Section 65302(f), requires that a noise element be included within all city and county General Plans, as follows:

"A noise element which shall identify and appraise noise problems in the community. The noise element shall recognize the guidelines established by the Office of Noise Control in the State Department of Health Services and shall analyze and quantify, to the extent practicable, as determined by the legislative body, current and projected noise levels for all of the following sources:

(1) Highways and freeways.

(2) Primary arterials and major local streets.

(3) Passenger and freight on-line railroad operations and ground rapid transit systems.

(4) Commercial, general aviation, heliport, helistop, and military airport operations, aircraft overflights, jet engine test stands, and all other ground facilities and maintenance functions related to airport operation.

(5) Local industrial plants, including, but not limited to, railroad classification yards.

(6) Other ground stationary noise sources identified by local agencies as contributing to the community noise environment."

Recommendations within the State of California General Plan Guidelines (Chapter III) issued by the State of California Office of Planning and Research (OPR) also suggest that Noise Elements shall:

"Accurately reflect the noise environment, the stationary sources of noise, and the impacts of noise on local residents. Based upon the "shoe fits" doctrine, the noise element will be as detailed as necessary to describe the local situation and mitigate local noise problems."

Issues to be analyzed in the Noise Element should include:

- "Identification and appraisal of major noise sources;
- Existing and projected levels of noise and noise contours for major noise sources;
- Determination of the extent of "noise problems in the community; and
- Selection and imposition of methods of noise attenuation and the protection of residences from excess noise."

These guidelines set forth the basic standards and expected contents of a city's Noise Element. The most recent and presently "in-force" City of Redondo Beach Noise Element was adopted in 1975. Although the document has been judged to be adequate and comprehensive for its time, it must, like a number of the older components of the existing General Plan, be updated to reflect changing physical, environmental, legislative, and legal conditions and requirements.

4.2.2 Background/Context

The overall noise environment is a combination of sound from a number of individual sources which generate differing aural intensities and intervals. The actual effects of the surrounding sound levels on land uses and people depends on the spatial and temporal distribution of these noise sources at the time of occurrence.

Among the negative effects of noise on people are annoyance, inconvenience, activity interference, short-term physical pain, and serious long-term hearing damage or loss. The degree to which there is annoyance/inconvenience or activity interference depends on the magnitude of the intruding noise level, the frequency with which it occurs, and the time of day which the noise occurs.

Noise levels and impacts occurring within the City of Redondo Beach are typical of those expected in an urbanized area, but have the potential of being exacerbated by several specific noise generating sources in or near the community. The overall noise levels experienced within the City of Redondo Beach are generated by the combination of a number of mobile or stationary sources, including:

- Noise generated by traffic or traffic-related sources (including passenger vehicles, construction vehicles, or emergency vehicles [cars, buses, and trucks]);

- Noise generated by airplane traffic flying overhead to and from various smaller regional airports and airfields (i.e., Hawthorne Airport, Torrance Airport);

- Noise generated by daily construction and commercial operations (i.e., deliveries, waste removal, petroleum extraction activities, machinery operation, car washes, entertainment activities, etc.) and day-to-day human activities; and

- Noise generated by stationary utility uses (i.e., Southern California Edison Power Plant, Southern California Edison elevated high-tension electricity transmission lines, Atcheson, Topeka, and Santa Fe Railroad traffic).

The intensity and impacts of these noise generating sources have all been considered and quantified within the following analysis. Of all of the sources contributing to the overall (ambient) noise level, the two most significant noise generating sources in the city, and, therefore, the most intensely analyzed and influential in this document and the resultant General Plan document, are:

(1) vehicular or traffic-related noise (increased along major thoroughfares); and

(2) noise generated by the activity of the Southern California Edison Power Plant located in South Redondo Beach.

4.2.3 Scope and Format of the Noise Section of the Document

The unique nature and profile of the noise issue within the City of Redondo Beach has caused the scope and degree of detail of the noise data compilation and analysis to go well beyond that which is normally required and contained in a General Plan. This response was primarily caused by a recognition of the number, intensity, and complexity of the various stationary noise sources in the community, and their potential impact on the overall (ambient) noise conditions and quality of life in the community.

In response to these conditions, a much greater focus and level of detail has been placed on the stationary noise source issue. In order to guarantee the most accurate, objective, and sophisticated analysis possible, an extremely thorough technical analysis and report on the primary stationary noise sources (including an analysis of the levels and potential impacts of low-frequency noise from the Southern California Edison Company Power Plant) was conducted by the acoustical research and analysis firm of Walker, Celano & Associates.

In order to provide a more complete and effective understanding of the noise topic for the reader, the existing conditions data and analysis portions of the document have been split into two components:

(1) the data and analysis which focuses on the overall components of the noise topic (which also include the general [cumulative] levels and impacts of all of the stationary noise sources in the community), conducted primarily by the prime project consultant (Envicom Corporation); and

(2) the data and analysis which specifically focuses on the stationary component of the noise topic, conducted primarily by the acoustical sub-consultant (Walker, Celano & Associates).

The goals, objectives, policies, and implementation programs for both the overall and stationary components of the noise topic have been formatted similarly to the other sections of the document, and are contained (together) at the end of the entire section.

4.2.4 Noise Measurement Methodology

A number of government agencies charged with establishing noise standards and criteria have determined that the day-night average sound level (depicted as Ldn) is the preferred and most logical unit of noise measurement exposure for use in evaluating the potential impact of an intruding noise source (**Table 50**). The day-night average sound level (Ldn) represents an average of the A-weighted noise levels occurring during a complete twenty-four hour period; however, the measurement includes a weighting or penalty (an increase of 10 decibels) applied to noise occurring during the more sensitive nighttime hours (10:00 p.m. to 7:00 a.m.).

The A-weighted noise level is a measurement of the noise level at any one point in time, while the day-night sound level is a quantitative measure of the noise exposure over a full day. The term "A-weighted" refers to a filtering of the noise signal to emphasize frequencies in the middle of the audible spectrum and to de-emphasize low and high frequencies in a manner corresponding to the way in which the human ear perceives sound. The "A-weighted" noise level has been found to correlate well with people's actual judgments of the "noisiness" of different sounds and has been successfully used for many years as a measure of community noise levels and the basis for analyses.

The gross measurements conducted for the existing conditions analysis of this study are expressed in A-weighted peak hour noise levels. The actual peak hour measurements taken in the field have been mathematically adjusted, according to accepted industry standards (reductions of approximately 5 decibels below the peak

TABLE 50

Standard Noise Level Measurement Definitions

Ldn- Day-Night Sound Level:

Ldn, or Day-Night Sound Level, is a measure (in decibels) of the A-weighted noise exposure averaged for a given period at one particular site or in the community as a whole. The measure results from the interpolated average of measurements over a given time period, with an increased weighting factor applied to the nighttime time period. For the purposes of Ldn calculations, day is defined at 7:00 a.m. to 10:00 p.m. with no weighting factor applied. Nighttime is defined as 10:00 p.m. to 7:00 a.m. with occurrences during this time period weighted with a 10 decibel penalty over those occurring in the daytime.

CNEL- Community Noise Equivalent Level:

CNEL, or Community Noise Equivalent Level, is also a measure (in decibels) of the A-weighted noise exposure averaged for a twenty-four hour period at one particular site or in the community as a whole. This measurement technique is used only by the State of California, in relating community noise exposure and land use compatibility. The only difference between CNEL and Ldn is the intermediate or slight "extra" weighting penalty that CNEL applies to earlier evening noise. CNEL applies a 5 decibel weighting penalty to noise between the hours of 7:00 p.m. and 10:00 p.m. and a 10 decibel weighting penalty to noise between the hours of 10:00 p.m. and 7:00 a.m.. (Ldn applies a 10 decibel penalty to noise between the hours of 10:00 p.m. and 7:00 a.m., but applies no weighting penalty to noise between the hours of 7:00 p.m. and 10:00 p.m.)

Excepting for very extreme aberrations in sound levels during the 7:00 p.m. to 10:00 p.m.(i.e., a very loud outdoor concert or sporting event) CNEL and Ldn measurements should be almost exactly the same (within 1 or 2 decibels of each other).

Leq- Hourly Equivalent Sound Level:

Leq, or Hourly Equivalent Sound Level, is a measure (in decibels) of the A-weighted noise exposure averaged for any defined period of time at one particular site or in the community as a whole with no weighting or penalties applied for time of day. The measure results from the average of cumulative noise measurements taken during any one time period. This measure is presently used primarily be the federal government in their noise analysis and guidelines (i.e., Federal Highway Administration). In this manner very loud and very quiet sound levels taken over the given time period are averaged out to provide a more consistent measure of the noise environment during the given period.

A-Weighting:

A-Weighting is a sound frequency filtering process, used with sound meters that measure noise levels, where the extremely high and extremely low frequency components of the sound are de-emphasized or "filtered" in a manner similar to the natural filtering process of the human ear. This filtering process allows noise levels to be quantified, analyzed, and more effectively correlated to the "realistic" response and sensitivity of actual human hearing.

reading), to account for averaging over a 24 hour period. These mathematically adjusted measurements generate the average day night noise level exposure levels (Ldn) used in the majority of the descriptions/analyses contained in the document.

4.2.5 Government Guidelines/Requirements

Noise guidelines and requirements have been established at the federal (Federal Highway Administration), state (State of California, through the State Building Code and State Department of Health and Safety Office of Noise Control), and local (City of Redondo Beach Municipal Code) levels to specify levels of sound and specific requirements relating to the protection of public health and welfare relative to noise.

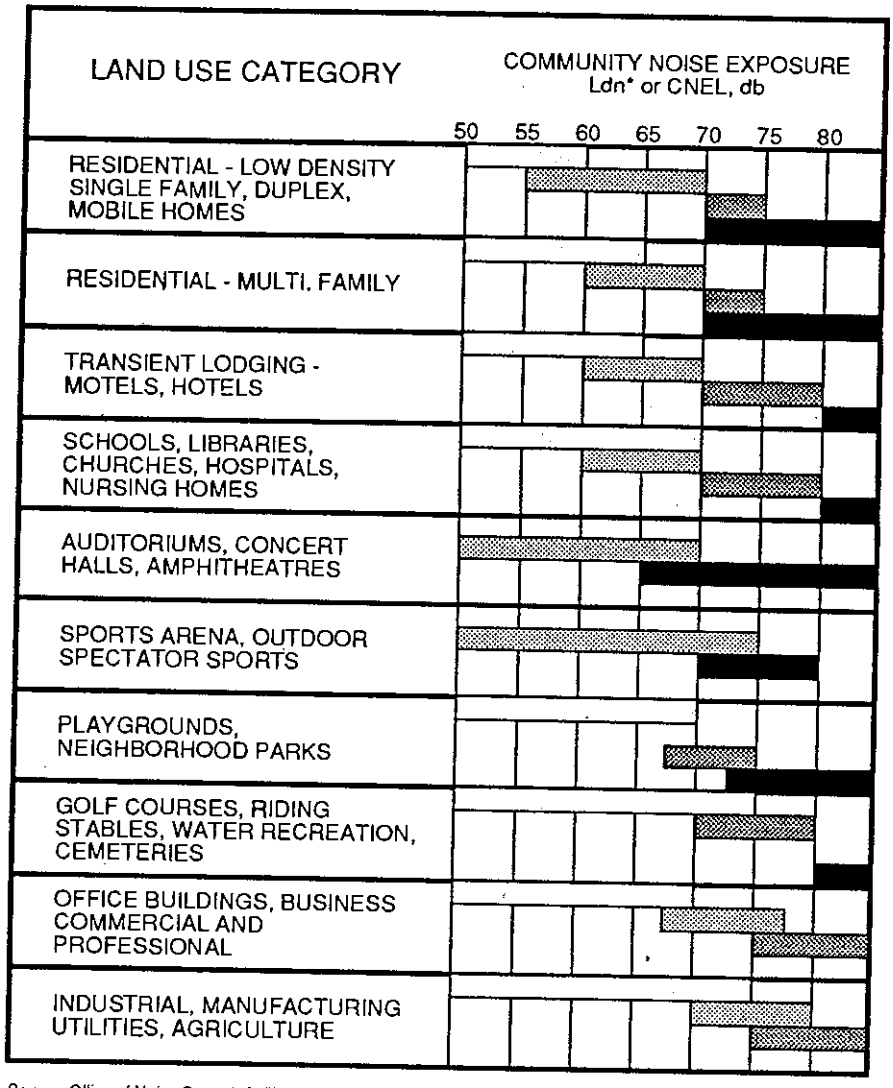
Federal

The Federal Highway Administration (FHWA) had adopted and published noise level and impact abatement criteria for highway construction projects. These criteria establish an exterior noise level goal for residential land uses of 67 Leq (for the peak hour). The interior noise level goal for residential land uses is 52 Leq. The exterior criteria apply to private yards. The interior criteria assume that a typical wood-frame structure reduces exterior noise levels by ten decibels (with windows open) and by twenty decibels (with windows closed).

State of California

The State of California, through the State Building Code, has adopted certain noise standards specifying that building noise insulation shall be designed and installed as such to limit the interior noise levels of apartment houses, and dwellings other than detached single-family dwellings to a level of 45 decibels, Ldn or CNEL, in any habitable room, with windows closed. The State of California Department of Health and Safety (Office of Noise Control) has published a recommended, but not mandatory, set of guidelines, Land Use Compatibility for Community Noise Environments, for the exposure of various land uses and protection of public health in communities from different levels of noise (**Figure 41**).

As shown in the figure, the highest recommended "normally acceptable" exterior noise level exposure for single family residential uses is 60 decibels (CNEL or Ldn); the highest recommended "normally acceptable" exterior noise level exposure for multi-family residential uses is 65 decibels (CNEL or Ldn); the highest recommended "normally acceptable" exterior noise level exposure for commercial uses, institutional uses, and public/governmental uses is 70 decibels (CNEL or Ldn); and the highest recommended "normally acceptable" exterior noise level exposure for industrial uses is 75 decibels (CNEL or Ldn).



Source: Office of Noise Control, California Deparment of Health

INTERPRETATION

NORMALLY ACCEPTABLE

Specified land use is satisfactory, based upon the assumption that any buildings involved are of normal conventional construction without any special noise insulation requirements.

CONDITIONALLY ACCEPTABLE

New construction or development should be undertaken only after a detailed analysis of the noise reduction requirements is made and needed noise insulation features included in the design. Conventional construction, but with closed windows and fresh air supply systems or air conditioning will normally suffice.

NORMALLY UNACCEPTABLE

New construction or development should generally be discouraged. If new construction or development does proceed, a detailed analysis of the noise reduction requirements must be made and needed noise insulation features included in the design.

CLEARLY UNACCEPTABLE

New construction or development should generally not be undertaken.

* Definition - Ldn Day - Night Average Sound Level

The Day - Night Sound Level is a measure of the cumulative noise exposure in the community. It results from the summation of hourly Leq's over a 24 - hour time period with an increased weighting factor applied to the nighttime time period. For Ldn calculations, day is defined at 7am to 10pm with a weighting factor of unity. Night is defined as 10pm to 7am with occurrences during this time period deemed 10 times as significant as those occurring in the daytime.

STATE OF CALIFORNIA LAND USE COMPATIBILITY FOR COMMUNITY NOISE ENVIRONMENTS

FIGURE 41

Achievement of these exterior exposure levels would likely cause interior noise exposure levels in these areas to remain within the ranges recommended by the various federal and state agencies, assuming the normal reduction in exposure levels (approximately 10 to 20 decibels) from outside to inside (depending on the open or closed status of the structures windows).

Where the "normally acceptable" range is used, it is defined as the highest noise level that should be considered for the construction of the buildings which do not incorporate any special acoustical treatment or noise mitigation. The "conditionally acceptable" or "normally unacceptable" ranges include conditions calling for detailed acoustical study or construction mitigation to reduce interior exposure levels prior to the construction or operation of the building under the listed exposure levels.

City of Redondo Beach

The City of Redondo Beach Municipal Code, under Chapter 24 Noise Regulation (effective August 11, 1976), provides the local government ordinance relative to community noise level exposure, guidelines, and regulations. The ordinance provides local noise limits through setting out a series of maximum permissible exterior and interior (for sensitive receptors only) sound levels by land use categories.

These limits differ between daytime hours (7:00 a.m. to 10:00 p.m.) and nighttime hours (10:00 p.m. and 7:00 a.m.), with the nighttime being more restrictive. The limits (expressed in A-weighted decibels) include:

Exterior Noise Levels

Single and Low-Density Residential	(Daytime)	50 decibels
	(Nighttime)	45 decibels
Medium Density Residential	(Daytime)	55 decibels
	(Nighttime)	50 decibels
High Density Residential	(Daytime)	60 decibels
	(Nighttime)	55 decibels
Commercial/Retail	(Daytime)	65 decibels
	(Nighttime)	60 decibels
Industrial (Planned Development)	(Daytime)	65 decibels
	(Nighttime)	60 decibels
Industrial (Planned)	(Daytime)	70 decibels
	(Nighttime)	70 decibels

Interior Noise Levels

Residential	(Daytime)	45 decibels
	(Nighttime)	40 decibels
School	(Daytime)	45 decibels
Hospitals	(Anytime)	40 decibels

The local ordinance also limits the days and times of construction operation (for noise considerations), provides specific supplemental requirements for certain unique and/or stationary noise sources, and provides additional components for the investigation and reporting of conditions and complaints, measuring and interpreting of exposure levels, enforcement of violations, eligibility and processing of variance requests from the requirements, and further explanation and interpretation of the ordinance.

4.2.6 Existing Local Noise Conditions

An existing profile of the noise environment of the City of Redondo Beach has been developed through field measurement/research and interpolation of measured noise exposure levels. As a basic measure for context, the reader should be aware that the overall day-night average (Ldn) overall (ambient) noise level exposure for moderate-sized urbanized areas such as the City of Redondo Beach generally ranges in the area of 55-58 decibels.

Although it is difficult (even through the use of "high-tech" measuring devices) to determine and quantify how much each individual noise source contributes to overall noise levels at any one time, it is clear that the impacts of noise generated by a number of stationary noise sources becomes more noticeable in the evenings, after the majority of noise that can be attributed to higher traffic levels in the afternoon peak period declines.

The reader should keep in mind that the levels of noise generated by vehicular traffic at any one point vary according to the volume of traffic, the percentage of trucks within the traffic stream, the speed of vehicles within the traffic stream, the time distribution of the traffic, and the grade of the road segment.

Noise measurements for the following analysis were conducted by an Envicom Corporation staff field research team using a Bruel and Kjaer type 2225 noise meter, utilizing the A-weighted decibel noise level scale.

Overall peak hour noise level measurements were taken at a total of fifty specific locations or intersections across the community (thirty in North Redondo Beach and twenty in South Redondo Beach). Additional measurements were interpolated mathematically (based on average daily traffic volumes) for supplemental segments of streets in certain areas of the city, to ensure a more complete and comprehensive

coverage of the city. Measurements were recorded during the morning (7:00 a.m. to 9:00 a.m.) and afternoon (4:00 p.m. to 6:00 p.m.) peak hours, in order to ensure a "worst-case" analysis that takes into consideration the maximum overall (ambient) noise and traffic period (for environmental purposes). The geographic locations of these overall (ambient) noise level measurements and interpolations and their recorded noise levels throughout the City are indicated (**Figure 42** and **Figure 43**).

Contours depicting the generalized existing overall noise conditions in the City of Redondo Beach are also shown (**Figure 44**). In reviewing the contour illustrations, the reader should be aware that, because it is physically and mathematically impossible without taking readings at every point along the contour (virtually every lot or parcel in the City) no adjustment has been made to the contours to reflect the buffering or filtering of the noise that actually occurs (from fences, structures, and landscaping) as the sound waves extend out away from the roadways. Hence, these contours represent the "worst-case" depiction of these noise levels; the actual noise levels decline more rapidly (in some areas substantially) based on the specific presence of these various buffering or filtering features.

As the figure indicates, the areas in the City of Redondo Beach which are subject to exposure to the greatest noise levels are generally located directly adjacent to the most intensely traveled roadway segments and intersections in the community. These areas include:

(1) Areas with peak hour noise exposure level readings ranging between 76 and 79 decibels (generating day-night average (Ldn) overall (ambient) noise levels ranging between 71 and 75 decibels) include:

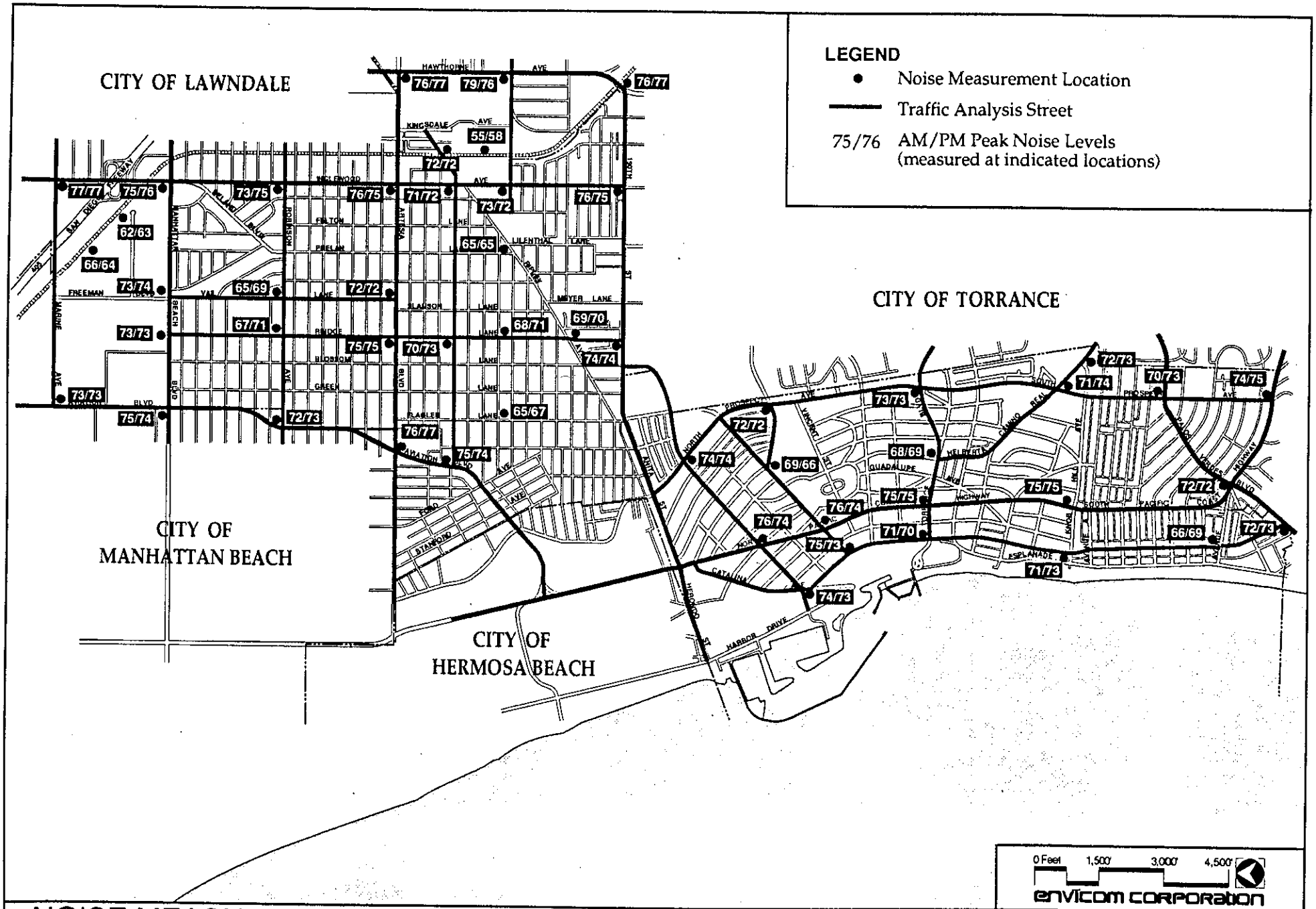
- Inglewood Avenue, between Marine Avenue and Manhattan Beach Boulevard (generally due to noise impacts generated by traffic volumes on the San Diego (405) Freeway;

- Hawthorne Boulevard, between Artesia Boulevard and 182nd Street (adjacent to the Galleria at South Bay);

- Artesia Boulevard, at its respective intersections with Inglewood Avenue and Aviation Boulevard;

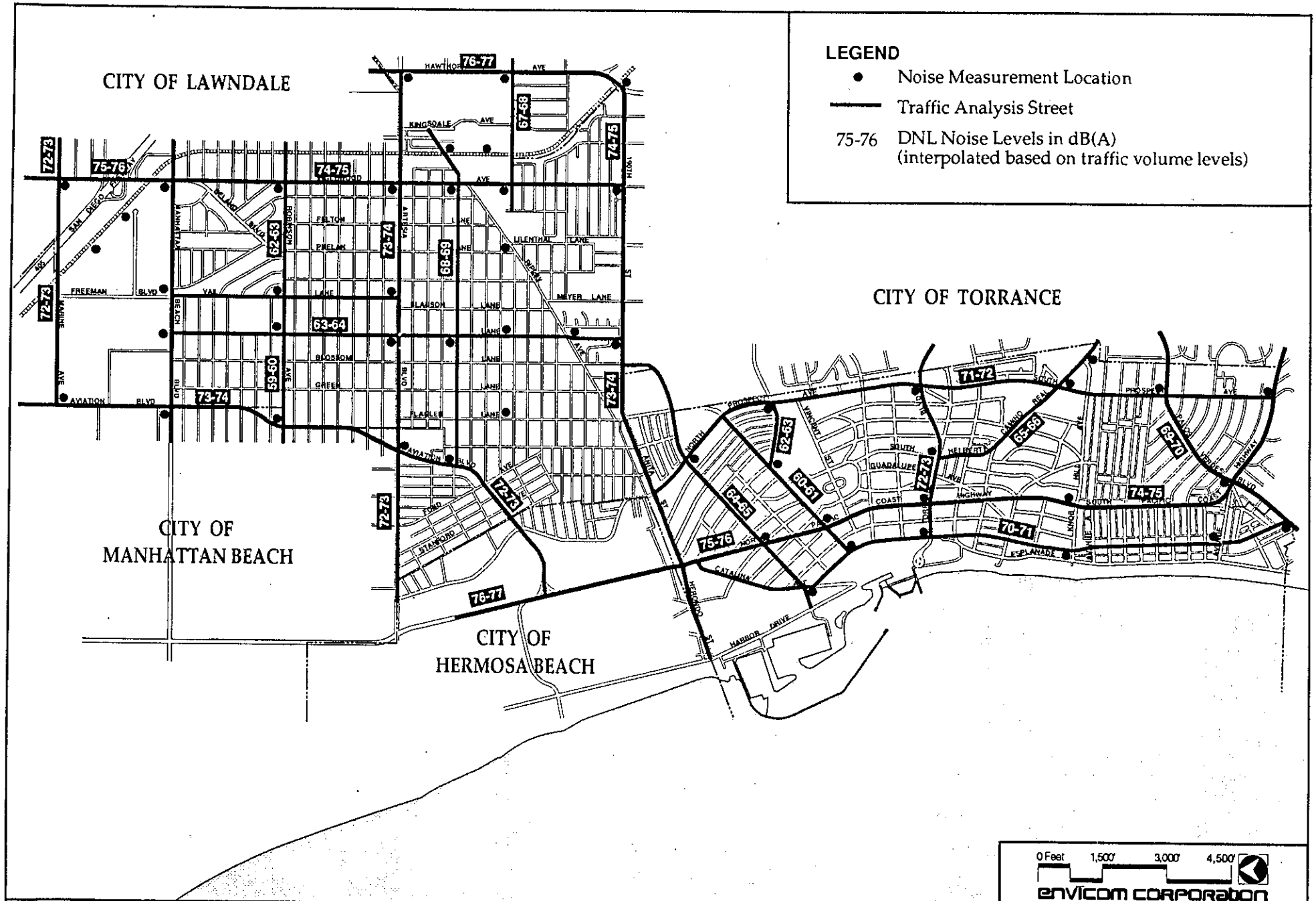
- 190th Street between Hawthorne Boulevard and Inglewood Avenue; and

- Pacific Coast Highway, between Anita Street/Herondo Street and Torrance Boulevard.



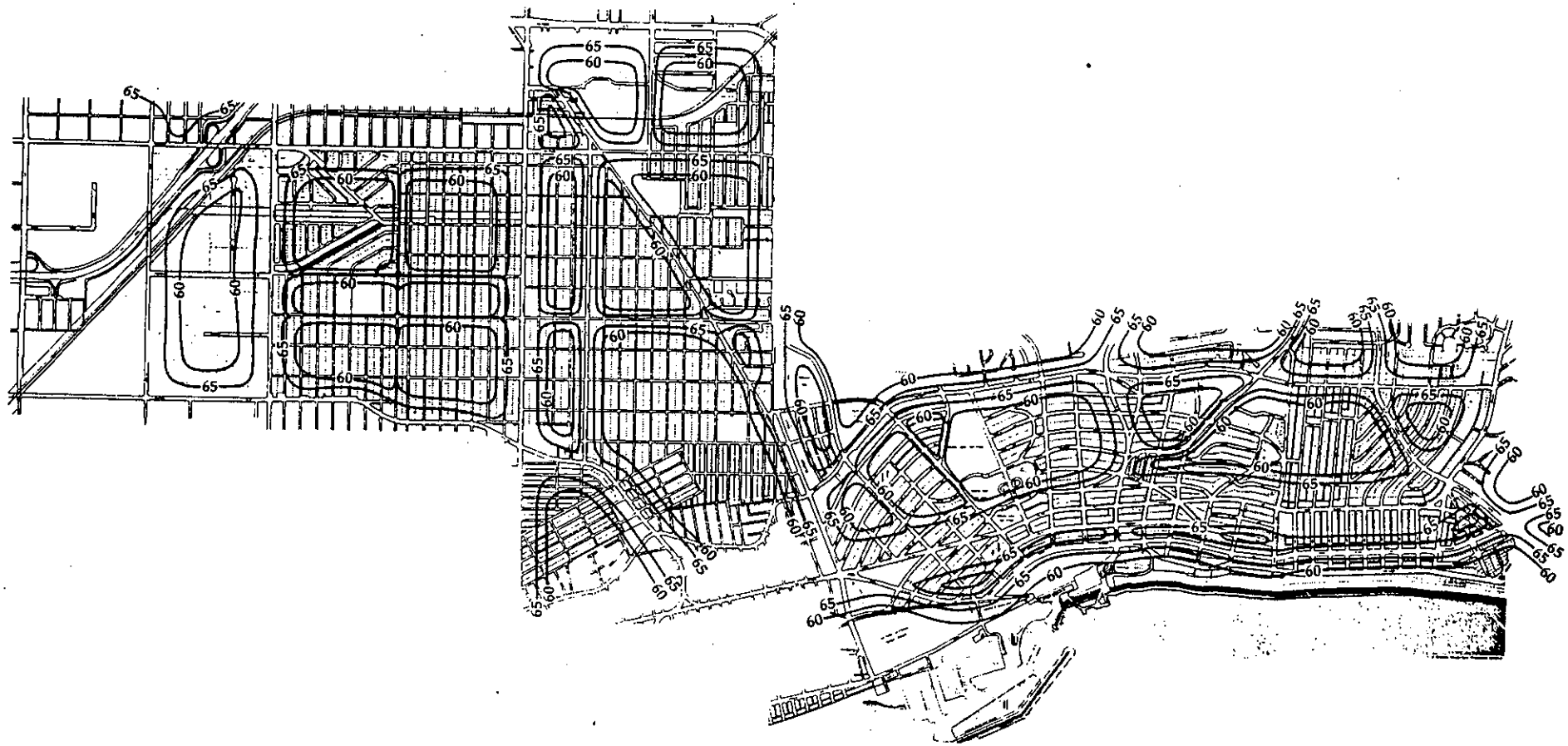
NOISE MEASUREMENT LOCATIONS AND EXISTING MEASURED PEAK HOUR NOISE LEVELS (1989)

FIGURE 42



EXISTING INTERPOLATED ROADWAY SEGMENT PEAK HOUR NOISE LEVELS (1989)

FIGURE 43



0 Feet 1,500' 3,000' 4,500'

envicom corporation

NOISE CONTOURS--1989 (Ldn dBA)

FIGURE 44

(2) Areas with peak hour noise exposure level readings between 71 and 75 decibels (generating day-night average (Ldn) overall (ambient) noise levels ranging between 66 and 70 decibels) include:

- Marine Avenue, between Inglewood Avenue and Aviation Boulevard;
- Manhattan Beach Boulevard, between Inglewood Avenue and Aviation Boulevard;
- Artesia Boulevard, between Hawthorne Boulevard and Aviation Boulevard;
- Aviation Boulevard, between Marine Avenue and the City of Hermosa Beach municipal boundary (west of Harper Avenue);
- Inglewood Avenue, between Manhattan Beach Boulevard and 190th Street;
- Grant Avenue, between Kingsdale Avenue and Inglewood Avenue;
- Pacific Coast Highway, between Torrance Boulevard and the City of Torrance municipal boundary (east of South Prospect Avenue);
- Torrance Boulevard, between Catalina Avenue and the City of Torrance municipal boundary (east of South Prospect Avenue);
- Catalina Avenue, between Pacific Coast Highway and Knob Hill Avenue, and between Avenue "I" and the City of Torrance boundary (south of Palos Verdes Boulevard);
- Camino Real, between South Prospect Avenue and the City of Torrance municipal boundary (east of its intersection with Knob Hill Avenue); and
- Prospect Avenue, between Anita Street and Pacific Coast Highway

4.2.7 Conformance with State Guidelines

The vast majority of areas within the City of Redondo Beach are currently exposed to environments of overall (ambient) noise levels within the maximum recommended "normally acceptable" exterior noise levels contained within the aforementioned state guidelines.

It is, however, important to remember that there is some chance that these acceptable conditions may be impacted and, in some cases, exceeded during specific short-term periods by noise generated by one or more of the stationary noise sources that may not have been operating or emitting noise at the actual times of the overall

(ambient) noise measurements. As was previously described, the actual contribution and potential impacts of noise generated by these sources are described and analyzed within the "stationary source" portion of this section of the document.

Single family residential areas within the city that are currently exposed to overall (ambient) noise levels potentially greater than the 60 decibel maximum State-recommended "normally acceptable" exterior noise level are shown (**Figure 45**).

Multi-family residential areas within the community that are currently exposed to overall (ambient) noise levels potentially greater than the 65 decibel maximum State-recommended "normally acceptable" exterior noise level are shown (**Figure 46**).

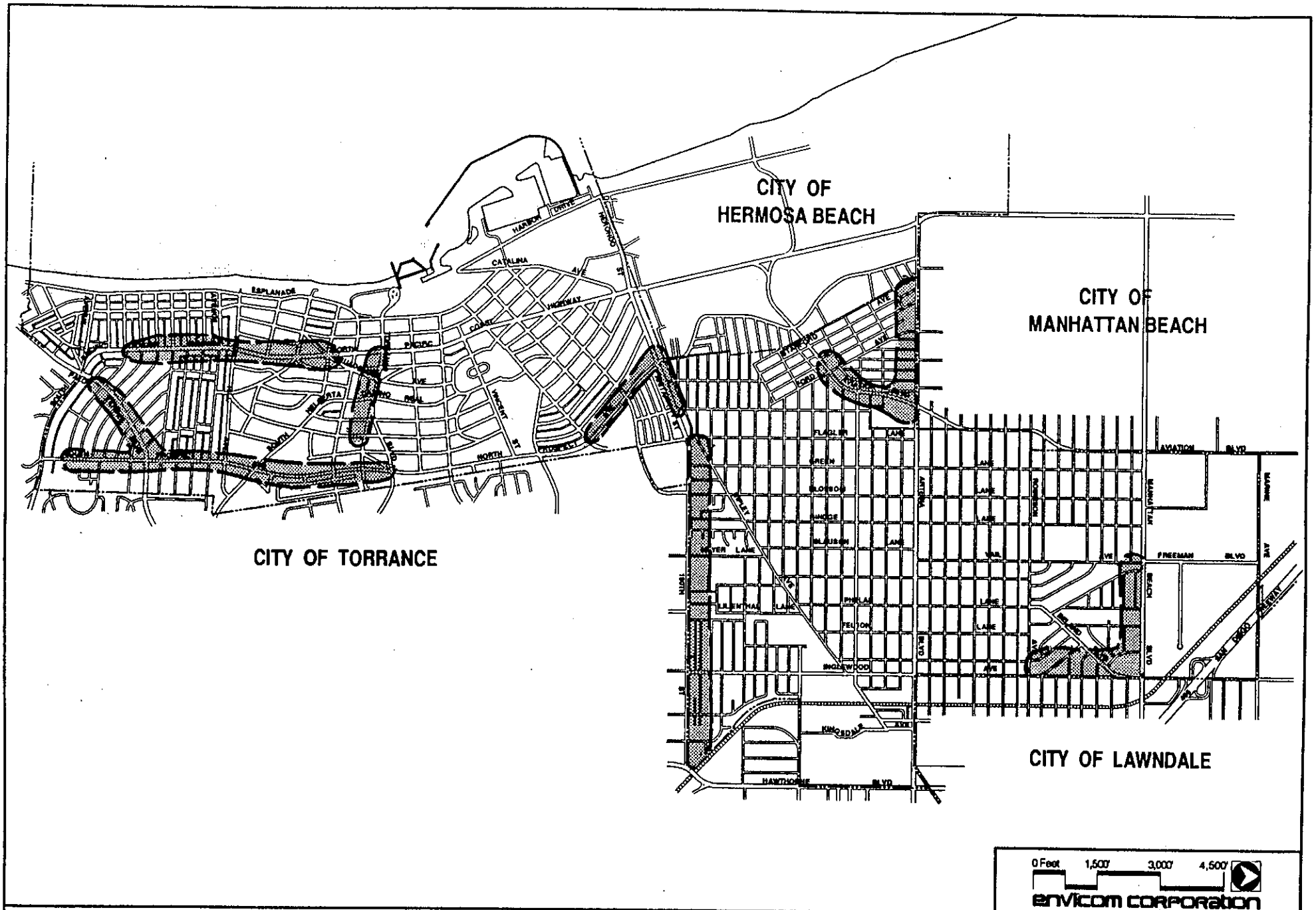
Commercial areas within the community that are currently exposed to noise levels potentially greater than the 70 decibel maximum state recommended "normally acceptable" exterior noise level are shown (**Figure 47**).

No institutional or public/governmental use structures within the community are currently exposed to noise levels greater than the 70 decibel maximum State-recommended "normally acceptable" exterior noise level (several of the parking lot frontages or front yard setbacks of these structures may be exposed to overall noise at or near this level, but the noise decreases to the "normally acceptable" level as it extends out from the roadway through the distances of the frontages or setbacks to the actual structures).

No existing industrial areas within the city are currently exposed to noise levels greater than the 75 decibel maximum State-recommended "normally acceptable" exterior noise level.

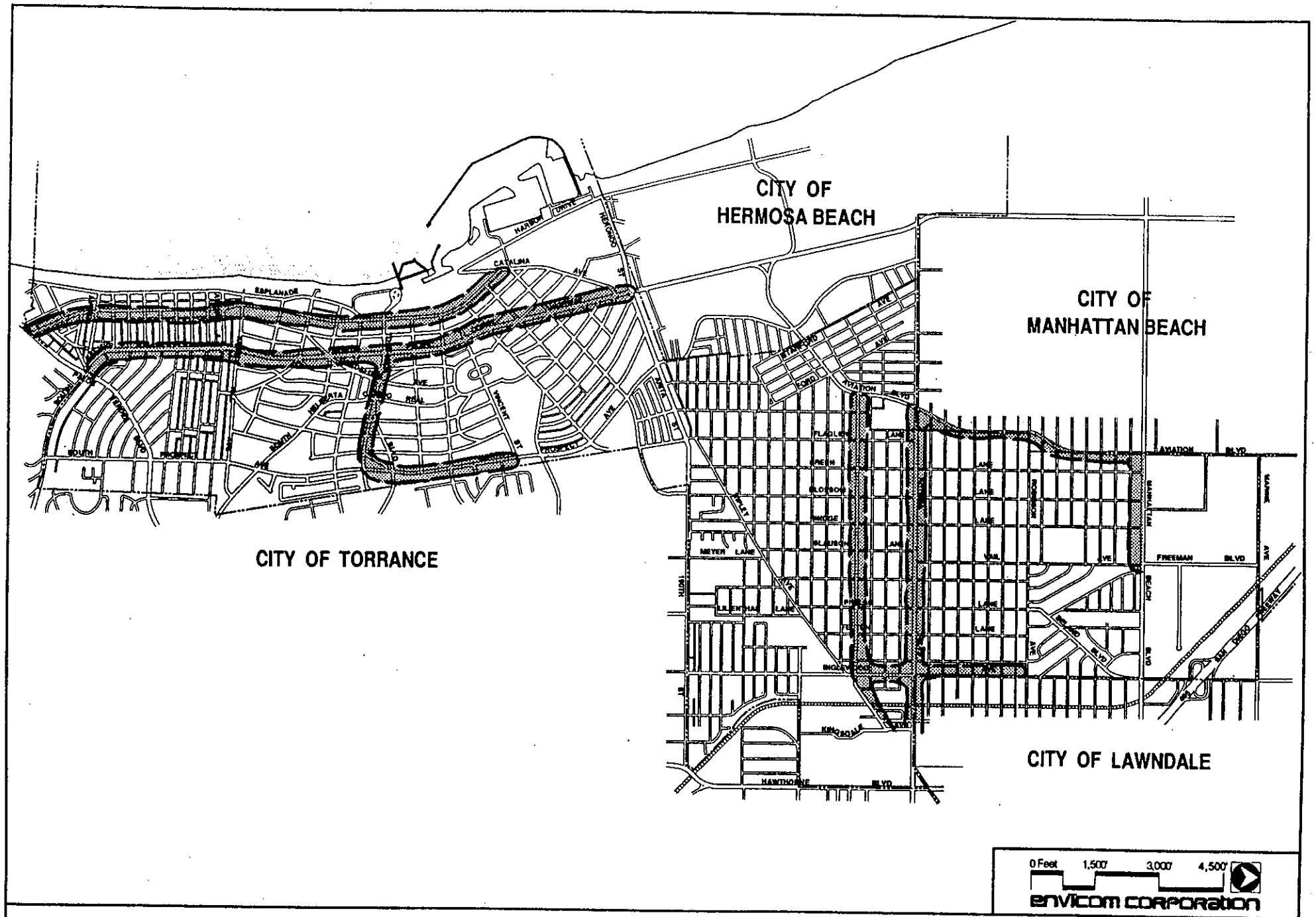
The vast majority of all "sensitive noise receptors" within the city are also located within areas currently exposed to environments of overall (ambient) noise within the maximum recommended "normally acceptable" exterior noise level of 70 decibels contained within the state guidelines.

These receptors include: 1) South Bay Hospital, whose surface parking area and structure is subject to exposure to average daily noise levels in the range of 68 to 70 decibels, but is not subject to exposure to levels higher than the maximum permitted State-recommended noise level exposure of 70 decibels; and 2) the vast majority of local public school and public open space facilities, whose parking areas and open space areas directly fronting major streets are exposed to average daily noise exposure levels in the range of 62 to 69 decibels, but are not subject to exposure to levels higher than the maximum permitted State-recommended average daily noise exposure level of 70 decibels.



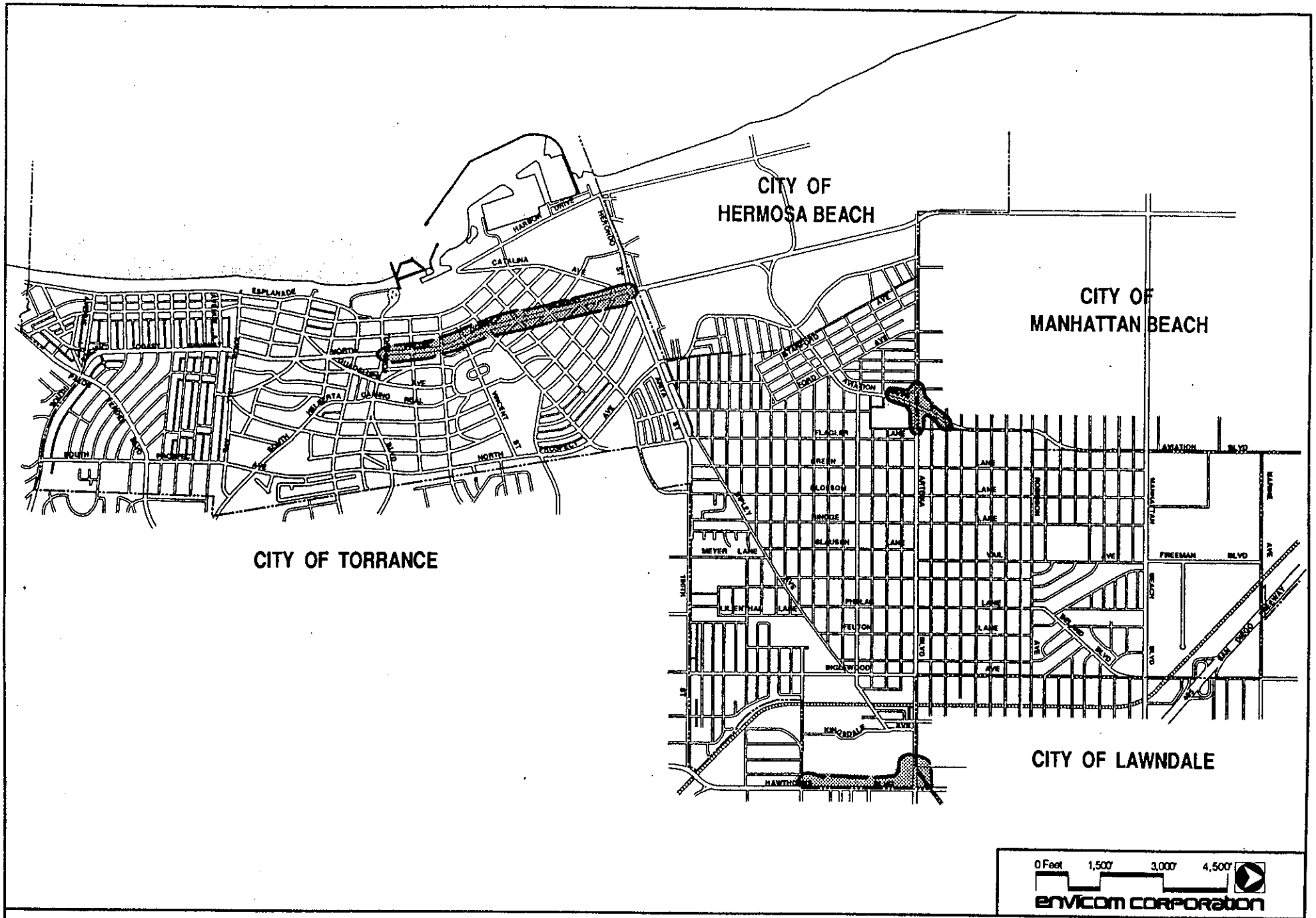
SINGLE FAMILY AREAS PRESENTLY EXCEEDING STATE EXTERIOR NOISE GUIDELINES

FIGURE 45



MULTI-FAMILY AREAS PRESENTLY EXCEEDING STATE EXTERIOR NOISE GUIDELINES

FIGURE 46



COMMERCIAL AREAS PRESENTLY EXCEEDING STATE EXTERIOR NOISE GUIDELINES

FIGURE 47

The only specific exception to this status is the portion of the Redondo Union High School property (primarily the auditorium structure) immediately fronting onto Pacific Coast Highway, which is exposed to average daily noise exposure levels of 69 to 71 decibels, at or slightly above the maximum permitted State-recommended average daily noise exposure level of 70 decibels.

4.2.8 Conformance With City Guidelines

Due to the relatively high average daily overall (ambient) noise exposure levels city-wide (55 to 58 decibels) (normal for urbanized areas) and the more restrictive nature and requirements of the specific standards and maximum permitted noise exposure levels contained within the City of Redondo Beach Noise Ordinance, the vast majority of areas within the City of Redondo Beach (particularly those adjacent to public roadways and rights of way) are currently exposed to environments of overall (ambient) noise at or slightly above the permitted maximum allowed exterior noise exposure levels.

Differences and reductions in the overall (ambient) noise exposure levels across the community do occur, however, due to normal reduction caused by attenuation and rates of distance from specific noise generating sources, changes in the time of day, reductions or changes in traffic volumes, changes in weather and atmospheric conditions, and changes in other acoustic-related factors.

These changes cause certain areas in the community which often times are exposed to noise exposure levels above the maximum permitted city guidelines, to fall within or below these maximum permitted city guidelines for certain short, and/or extended periods of time.

Because these changes are extremely subtle and difficult to quantify and occur at and across a great range of times and conditions, the specific actual conformance of all areas in the city relative to maximum permitted local noise level exposure guidelines cannot be conclusively and comprehensively determined within the scope of this analysis.

Installation and maintenance of common building insulation materials and treatments and standard industry-wide acoustical-related construction practices, which greatly reduce exterior noise level exposure levels, will, however, bring the vast majority of structures in the community exposed to greater than permitted maximum exterior noise levels into conformance with the maximum permitted ranges of interior noise level exposure established under state and local noise guidelines.

4.2.8 Future City-Wide Noise Conditions

One important function of the Noise Element of the General Plan is to forecast the future, or "post-project" overall (ambient) noise increases and conditions that could be expected to exist in the community at the end of the "horizon" or projected life span of the updated General Plan (in this case the year 2010).

As previously described in the existing conditions component of this section, the overall (ambient) noise conditions and impacts experienced within the City of Redondo Beach are primarily a function of noise generated by local and regional traffic volumes and geographic trip distribution. For this reason, the future noise conditions of the community can be reliably estimated through conducting a mathematical and graphic interpolation/adjustment of the existing noise conditions to reflect local and regional traffic volume increases or decreases and geographic trip distribution patterns that are expected to occur when the land uses and building densities permitted in the community under the updated Land Use Plan of the General Plan are built out to their maximum level.

As one might logically conclude, the geographic locations and areas where the major projected increases or decreases in noise conditions and impacts in the community are expected to occur essentially coincide with the areas where major increases or decreases in traffic volumes/trip distribution are expected to occur.

The reader should be aware, however, that the changes in future noise levels are based on logarithmic and exponential mathematical functions, not proportionate mathematical functions (i.e., specific increases or decreases in traffic volumes do not necessarily generate directly proportionate increases or decreases in noise levels).

The basic functional result of this dynamic in generating future noise level projections is that areas with higher existing noise levels need to experience much higher percentage increases or decreases in noise levels to reflect any actual mathematical or audible change in the noise level than areas with lower existing noise levels.

In practice, this dynamic may be illustrated as follows: a ten percent increase in traffic volumes on a more highly-traveled thoroughfare [Artesia Boulevard, Inglewood Avenue, Pacific Coast Highway, etc.] may not generate any mathematical or audible change in noise levels in those areas of the community; whereas a similar ten percent increase in traffic volumes on a less-traveled thoroughfare [Beryl Street, Diamond Street, Camino Real, Palos Verdes Boulevard, etc.] may generate a mathematical or audible change in noise level in those areas of the community.

The areas directly adjacent to the following listed thoroughfares are expected to experience the following changes (increases or decreases) in overall noise levels following a full buildout of the land uses and building densities permitted under the updated Land Use Plan and impacts from regional growth-related traffic increases occurring during this period (**Table 51**). When reviewing the list of thoroughfares and respective levels of change, the reader should be aware that an increase of three (3) decibels is the industry-accepted threshold whereupon human beings with average hearing can be expected to perceive an actual change in audible noise.

Based on the aforementioned mathematical/graphic interpolation and adjustment of existing noise conditions to reflect local and regional traffic volume increases or decreases and vehicle trip distribution changes, projected noise contours have also been developed and depicted for the community, indicating the overall (ambient) noise levels that may be expected to occur when the land uses and building densities permitted in the community under the Land Use Plan of the updated General Plan are built out to their maximum level, as well as impacts from regional growth-related traffic increases occurring during this period (**Figure 48**).

Although the overall noise level increases in the City of Redondo Beach projected from the maximum buildout of the Land Use Plan are not overly significant (from a perceived audible change to the average human), the changes do force the contours to "expand out" to a moderate degree. In practice, this causes a number of additional areas in the community which are currently not exposed to overall (ambient) noise levels which are greater than the maximum state recommended "normally-acceptable" exterior noise levels to be exposed to levels which are greater than the maximum State-recommended "normally-acceptable" exterior noise levels.

Single family residential areas within the city that are presently exposed to overall (ambient) noise levels within the 60 decibel maximum state recommended "normally-accepted" exterior noise levels that will potentially be exposed to overall (ambient) noise levels greater than the 60 decibel maximum State-recommended "normally-acceptable" exterior noise level following a maximum buildout of the land uses and building densities permitted under the Land Use Plan of the updated General Plan are shown (**Figure 49**).

Multi-family residential areas within the City that are presently exposed to overall (ambient) noise levels within the 65 decibel maximum State-recommended "normally-accepted" exterior noise levels that may be exposed to overall noise levels greater than the 65 decibel maximum state recommended "normally-acceptable" exterior noise level following a maximum buildout of the Land Use Plan are shown (**Figure 50**).

TABLE 51

Primary Projected Ambient Noise Level Changes
(Following Maximum Buildout of Land Use Plan to year 2010)

North Redondo Beach

Marine Avenue (between Inglewood Avenue and Aviation Boulevard) a 1.4 decibel increase, from 67.5 decibels to 68.9 decibels.

Manhattan Beach Boulevard (between Inglewood Avenue and Aviation Boulevard) a 1.7 decibel increase from 67.5 decibels to 69.2 decibels.

Robinson Street (between Inglewood Avenue and Aviation Boulevard) a 0.8 decibel increase, from 57.5 decibels to 58.3 decibels.

Artesia Boulevard (between Hawthorne Boulevard and Harper Avenue) a 0.8 decibel increase, from 68.5 decibels to 69.3 decibels.

Grant Avenue (from Ripley Avenue to Aviation Boulevard) a 0.6 decibel increase, from 63.5 decibels to 64.1 decibels.

182nd Street (from Hawthorne Boulevard to Inglewood Avenue) a 0.1 decibel increase, from 62.5 decibels to 62.6 decibels.

190th Street (from Inglewood Avenue to Flagler Lane) a 0.6 decibel increase, from 69.5 decibels to 70.1 decibels.

Hawthorne Boulevard (between Artesia Boulevard and 182nd Street) a 0.7 decibel increase, from 71.5 decibels to 72.2 decibels.

Inglewood Avenue (between Marine Avenue and Grant Avenue) a 0.6 decibel increase, from 69.5 decibels to 70.1 decibels, (between Grant Avenue and 190th Street) a 1.6 decibel increase, from 65.5 decibels to 67,1 decibels.

Vail Avenue (from Robinson Street to Artesia Boulevard) a 0.8 decibel increase, from 56.5 decibels to 57.3 decibels.

Rindge Lane (from Artesia Boulevard to 190th Street) a 0.8 decibel increase, from 65.5 decibels to 66.3 decibels.

Aviation Boulevard (from Marine Avenue to Artesia Boulevard) a 1.0 decibel increase, from 68.5 decibels to 69.5 decibels, (between Artesia Boulevard and Harper Avenue) a 2.0 decibel increase, from 69.5 decibels to 71.5 decibels.

TABLE 51 (Cont.)

South Redondo Beach

North Prospect Avenue (from Anita Street to Diamond Street) a 0.5 decibel increase, from 68.0 decibels to 68.5 decibels, (from Diamond Street to Pacific Coast Highway) a 1.3 decibel increase, from 68.5 decibels to 69.8 decibels.

Pacific Coast Highway (from Anita Street to Torrance Boulevard) a 0.3 decibel increase, from 70.5 decibels to 70.8 decibels, (from Torrance Boulevard to South Prospect) a 0.2 decibel increase, from 70.0 decibels to 70.2 decibels.

Catalina Avenue (from Anita Street to Torrance Boulevard) a 0.5 decibel increase, from 68.5 decibels to 69.0 decibels, (from Torrance Boulevard to Palos Verdes Boulevard) a 0.7 decibel increase, from 68.0 decibels to 68.7 decibels.

Anita Street/Herondo Street (from Flagler Lane to Harbor Drive) a 0.5 decibel increase, from 68.5 decibels to 69.0 decibels.

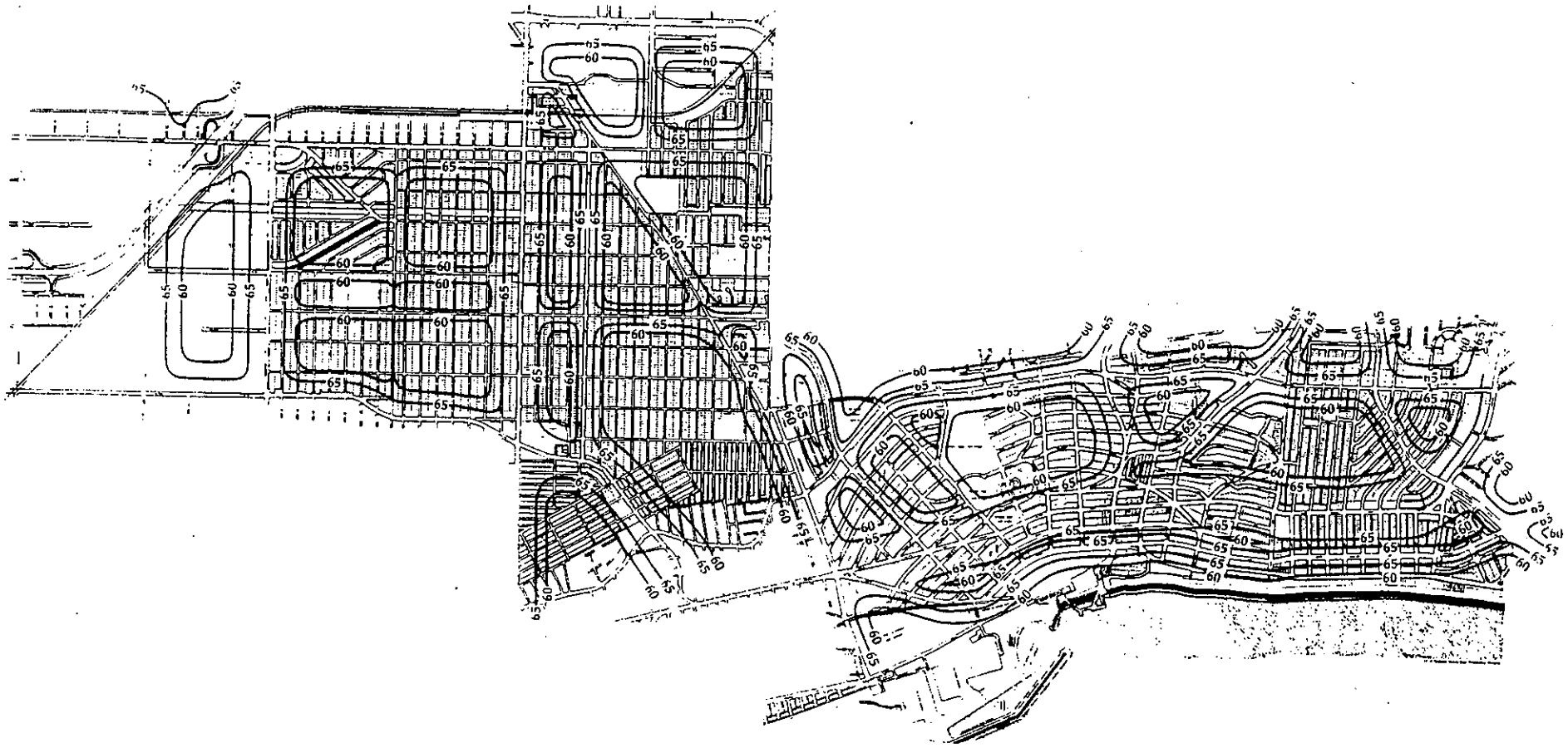
Beryl Street (from 190th Street to North Catalina Avenue) a 4.6 decibel increase, from 59.5 decibels to 64.1 decibels.

Diamond Street (from Prospect Avenue to Pacific Coast Highway) a 3.6 decibel increase, from 55.5 decibels to 59.1 decibels.

Torrance Boulevard (from the City of Torrance municipal boundary to Catalina Avenue) a 1.6 decibel increase, from 67.5 decibels to 69.1 decibels.

Camino Real (from Torrance Boulevard to the City of Torrance municipal boundary) a 3.7 decibel increase, from 60.5 decibels to 64.2 decibels.

Palos Verdes Boulevard (from the City of Torrance municipal boundary to Pacific Coast Highway) a 1.2 decibel increase, from 64.5 decibels to 65.7 decibels.

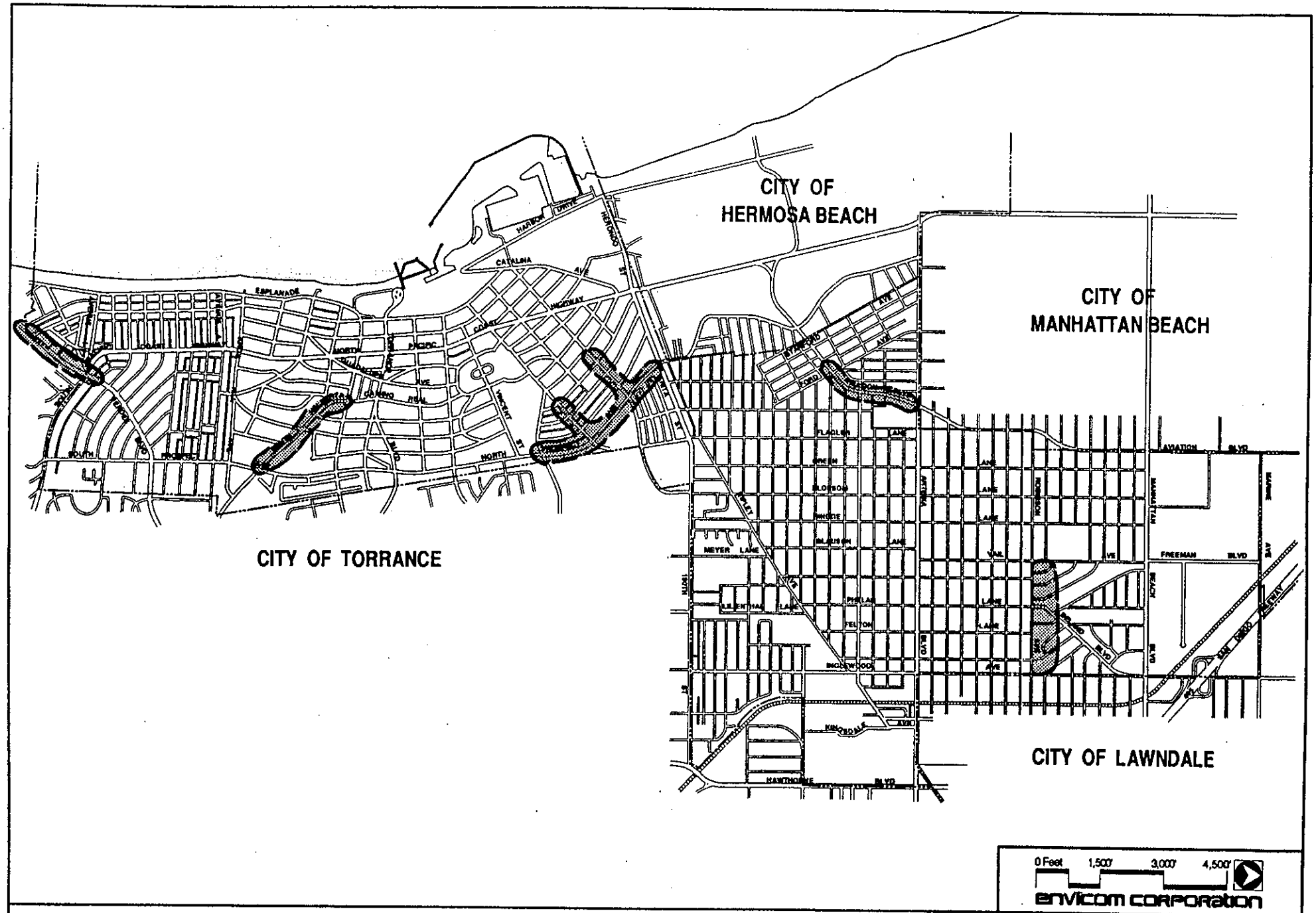


0 Feet 1,500' 3,000' 4,500'

envicom corporation

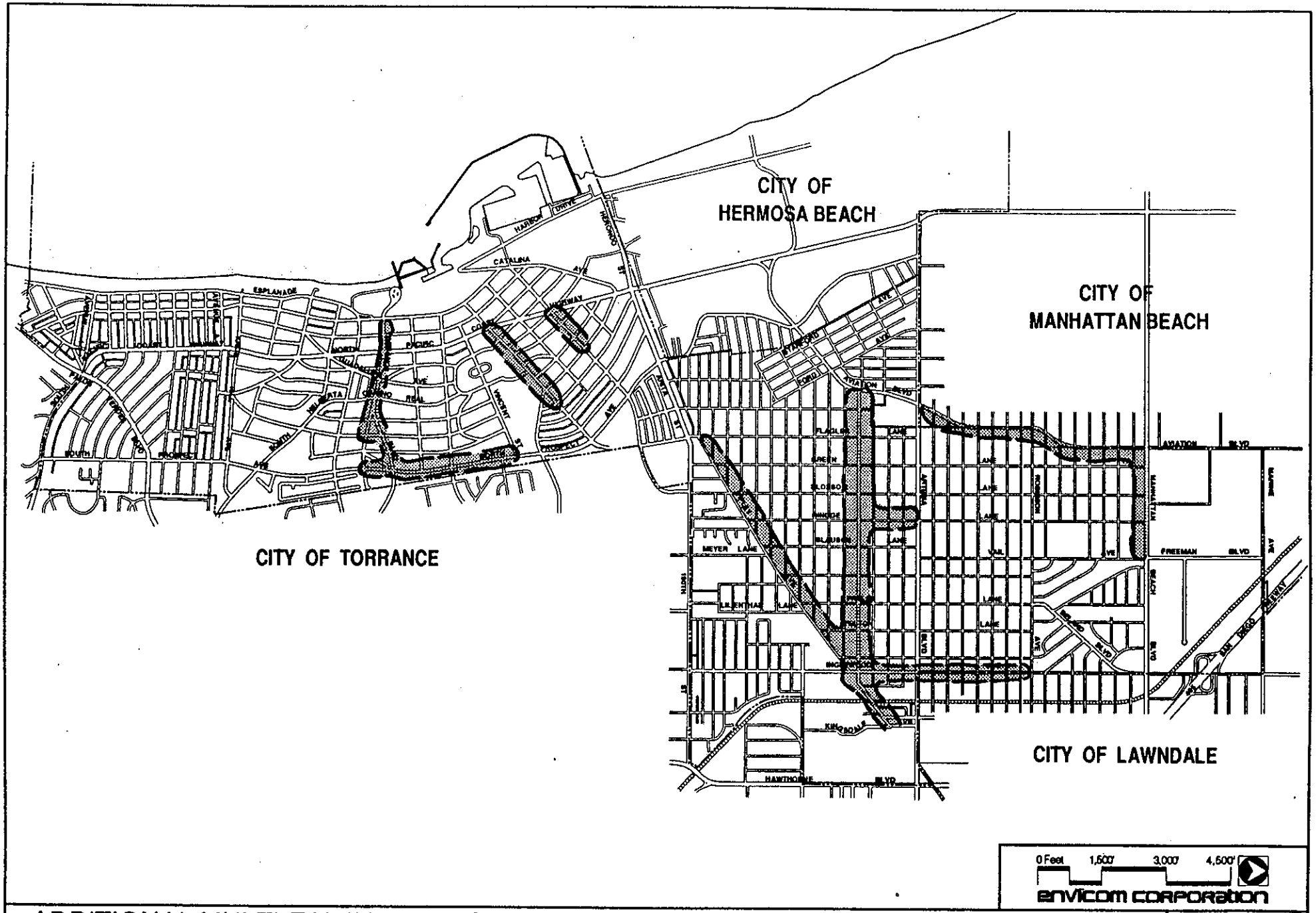
FUTURE NOISE CONTOURS--2010 (Ldn dBA)

FIGURE 48



ADDITIONAL SINGLE FAMILY AREAS EXPECTED TO EXCEED STATE EXTERIOR NOISE GUIDELINES (2010)

FIGURE 49



ADDITIONAL MULTI-FAMILY AREAS EXPECTED TO EXCEED STATE EXTERIOR NOISE GUIDELINES (2010)

FIGURE 50

Commercial areas within the City that are presently exposed to overall (ambient) noise levels within the 70 decibel maximum State-recommended "normally-accepted" exterior noise levels that may be exposed to overall (ambient) noise levels greater than the 70 decibel maximum state recommended "normally-acceptable" exterior noise level following a maximum buildout of the Land Use Plan are shown (**Figure 51**).

Several institutional or public/governmental use structures within the community not presently exposed to noise levels greater than the 70 decibel maximum State-recommended "normally acceptable" exterior noise level may be exposed to noise levels greater than the 70 decibel maximum State-recommended "normally acceptable" exterior noise level. These areas are shown (**Figure 52**), and include:

- The North Redondo Beach branch of the United States Post Office, located on the north side of Artesia Boulevard, between Rindge Lane and Blossom Lane;

- The former Aviation High School structure, presently being renovated into a public, multi-use, community assembly and recreational facility, located on the east side of Aviation Boulevard north of Manhattan Beach Boulevard;

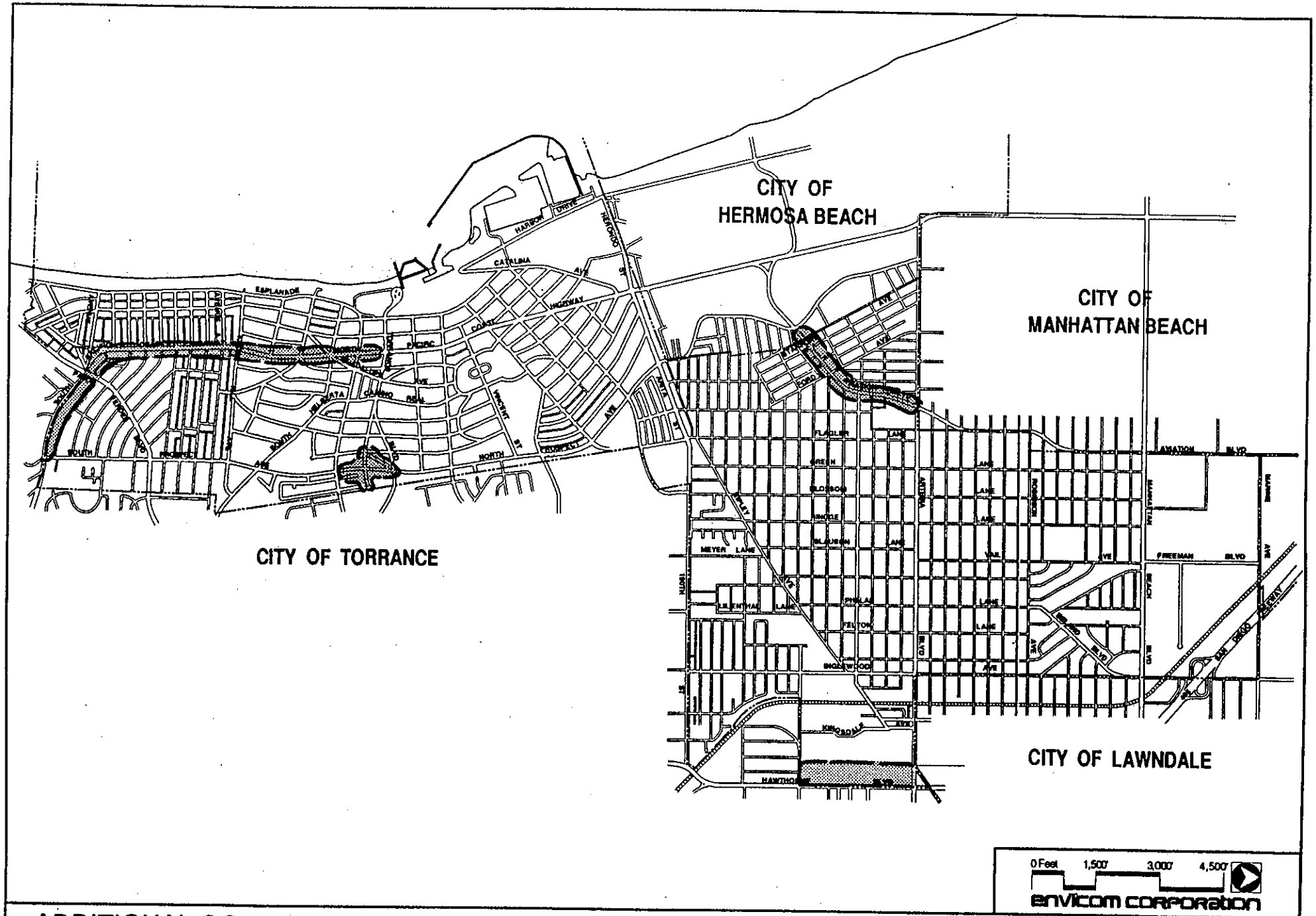
- The City of Redondo Beach City Hall Annex (presently housing the City of Redondo Beach Community Services Department and Police Investigative Unit), located at the northeastern corner of the intersection of Pacific Coast Highway and Emerald Street;

- The City of Redondo Beach Community Resources Center (the former Patterson School) located at the southwest corner of the intersection of Pacific Coast Highway and Knob Hill Avenue; and

- The eastern half of the parcel occupied by the existing Redondo Beach Civic Center facility, located on the western side of Pacific Coast Highway (between Carnelian Street and Diamond Street).

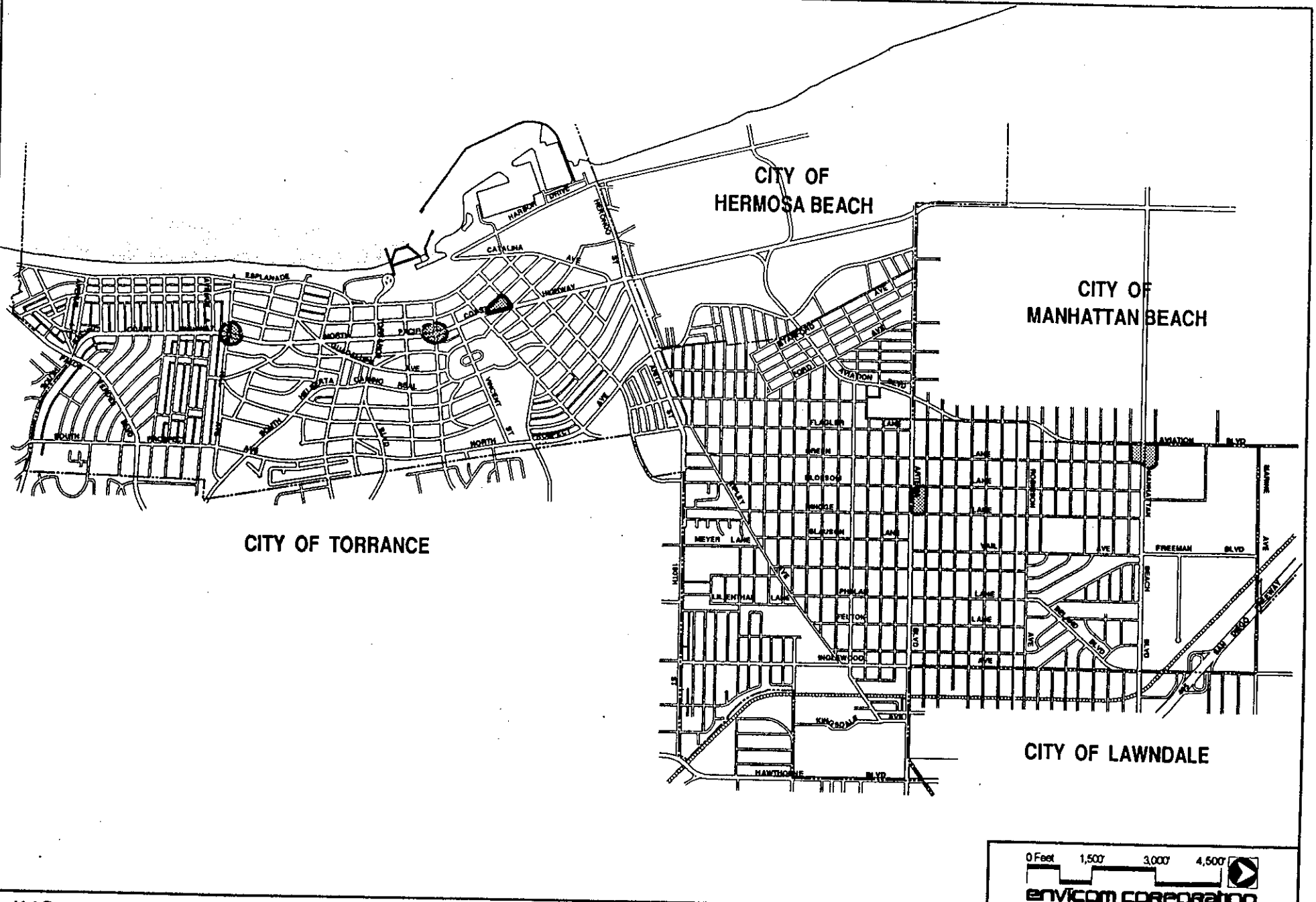
Even following a maximum buildout of the land uses and building densities permitted under the Land Use Plan of the updated General Plan, no industrial areas within the city will be exposed to noise levels greater than the 75 decibel maximum State-recommended "normally acceptable" exterior noise level.

The vast majority of all "sensitive noise receptors" within the city are also located within areas currently exposed to environments of overall (ambient) noise within the maximum recommended "normally acceptable" exterior noise levels contained within the State guidelines.



ADDITIONAL COMMERCIAL AREAS EXPECTED TO EXCEED STATE EXTERIOR NOISE GUIDELINES (2010)

FIGURE 51



INSTITUTIONAL OR PUBLIC / GOVERNMENTAL AREAS EXPECTED TO EXCEED STATE EXTERIOR NOISE GUILDELINES (2010)

FIGURE 52

Several "sensitive noise receptors" within the community presently located within areas currently exposed to environments of overall (ambient) noise within the maximum recommended "normally acceptable" exterior noise levels contained within the State guidelines may be exposed to noise levels greater than the maximum recommended "normally acceptable" exterior noise levels following a maximum buildout of the land uses and building densities that will be permitted under the Land Use Plan of the updated General Plan. The facilities are shown (**Figure 52**), and include:

- The northern and western one-third of the parcel occupied by the South Bay Hospital, located east of North Prospect Avenue (between Beryl Street and Diamond Street);

- The western frontage of the Tulita School, along South Prospect Avenue, between South Irena Avenue and Avenue H; and

- Additional portions of the Redondo Union High School facility, on the east side of Pacific Coast Highway, between Diamond Street and Vincent Street.

4.2.9 Stationary (Fixed-Source) Noise Component

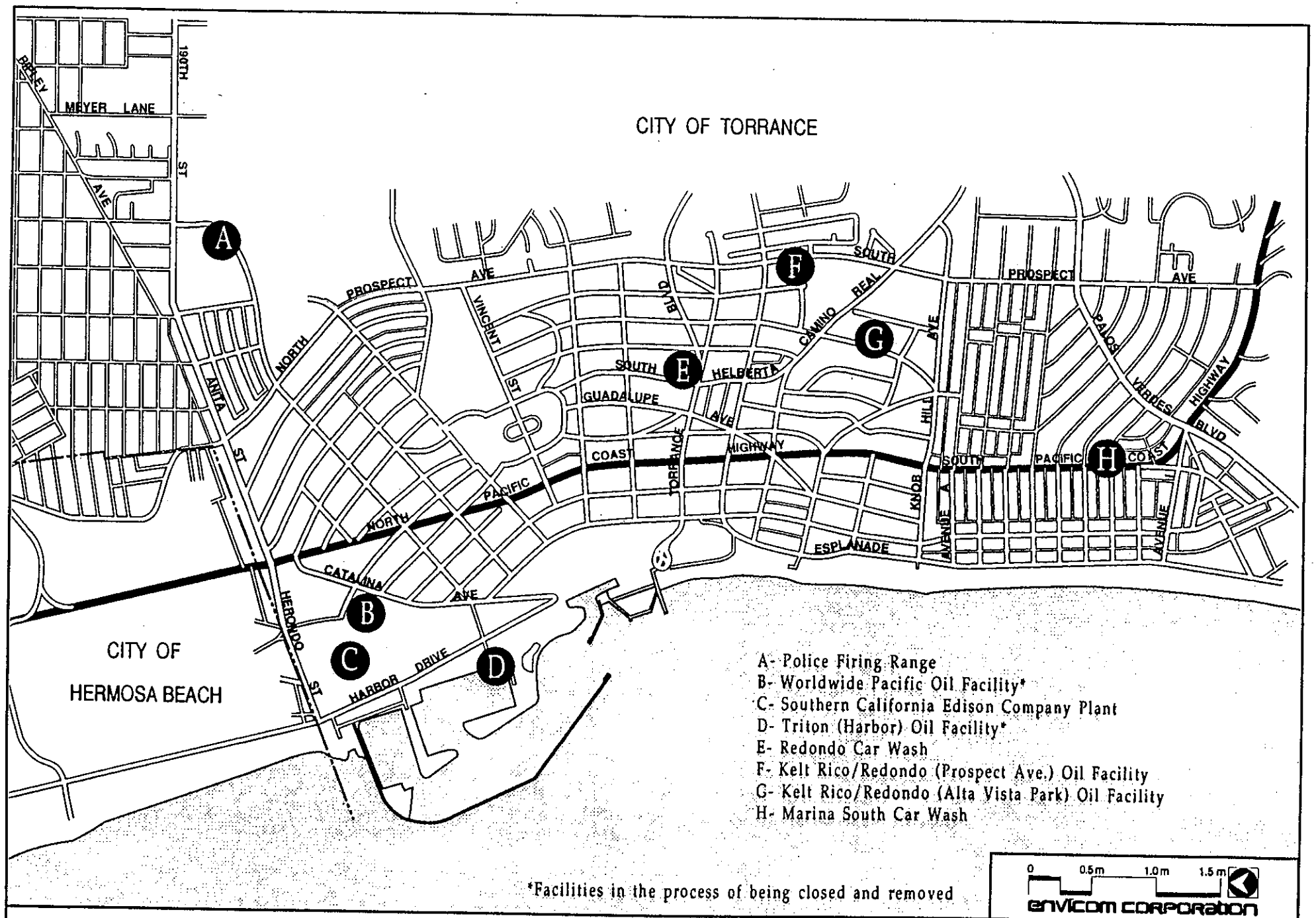
The following portion of the section represents the documentation and analysis of the fixed (or stationary) source component of the City of Redondo Beach Noise Element. For the purposes of the analysis, acoustic (normal frequency) and ground vibration (low frequency) measurements have been taken in and around eight (8) of these sources (identified by the City of Redondo Beach Community Development (Planning) Department as the primary stationary noise generators in the community). Based on these measurements, noise contour maps have been created which reflect the influence of the noise levels generated by each source on the surrounding area.

In addition to this level of analysis, concern has been expressed over the effects of low frequency and infrasonic noise produced by a number of these sources. In order to more fully address these concerns, this report also includes a summary of findings regarding the effects of these low frequency noise impacts on human health and welfare and structural damage.

4.2.10 Stationary (Fixed-Source) Noise Sources Investigated

Measurements were taken to quantify the noise and vibration levels produced by the eight specific following stationary (fixed-source) noise sources (**Figure 53**):

- Marina South Car Wash (located at the southeasterly intersection of Pacific Coast Highway and Avenue G).



LOCATIONS OF PRIMARY LOCAL STATIONARY NOISE SOURCES

FIGURE 53

- Redondo Car Wash (located at the northwesterly intersection of Torrance Boulevard and South Irena Avenue).

- Southern California Edison Company Generating Plant (bounded by Herondo Street to the north, Harbor Drive to the west, and Francisca Avenue and Catalina Avenue to the east).

- Triton (Harbor) Oil Pumping Facility (located at the northwesterly intersection of Harbor Drive and Portofino Way) [this facility is in the process of ceasing operations; all wells on the site are being removed].

- Kelt Rico/Redondo Oil Pumping Facility (located near the southwesterly intersection of Prospect Avenue and Pearl Street).

- Kelt Rico/Redondo Oil Pumping Facility (located near the southeasterly intersection of Camino Real and South Juanita Avenue in Alta Vista Park).

- Worldwide Pacific Oil Facility (located on northeast side of Francisca Avenue, due southeast of the intersection of Francisca Avenue and North Gertruda Avenue) [this facility is also in the process of ceasing operations; all machinery on the site will be removed].

- Police Firing Range (located in the southeast corner of Dominguez Park, due south of the intersection of 190th Street and Beryl Street).

4.2.11 Existing Stationary (Fixed-Source) Noise Level Criteria and Regulations

Local Criteria: The City of Redondo Beach, under Chapter 24 Noise Regulation of the Municipal Code, has established noise and vibration exposure guidelines for medium density residential areas of the community as follows:

1) The presumed overall (ambient) noise level and noise standard is 50 dB from 10 p.m. to 7 a.m. and 55 dB from 7 a.m. to 10 p.m. Continuous sources of noise are not allowed to exceed these limits. Noises occurring for reduced periods are allowed to exceed the standards on the following schedule (Noise Ordinance 4-24.301):

30 minutes per hour or less	+ 5 dB
15 minutes per hour or less	+ 10 dB
5 minutes per hour or less	+ 15 dB
1 minute per hour or less	+ 20 dB

If the source of noise is located in a different land use category, the lower applicable noise limit, plus 5 dB applies.

If the intruding noise contains pronounced pure tone components, the noise limits are reduced by 5 dB.

2) The indoor noise level standard is 40 dB from 10 p.m. to 7 a.m. and 45 dB from 7 a.m. to 10 p.m. Noises occurring for reduced periods are allowed to exceed the standard on the following schedule:

   5 minutes per hour or less + 5 dB
   1 minute per hour or less + 10 dB

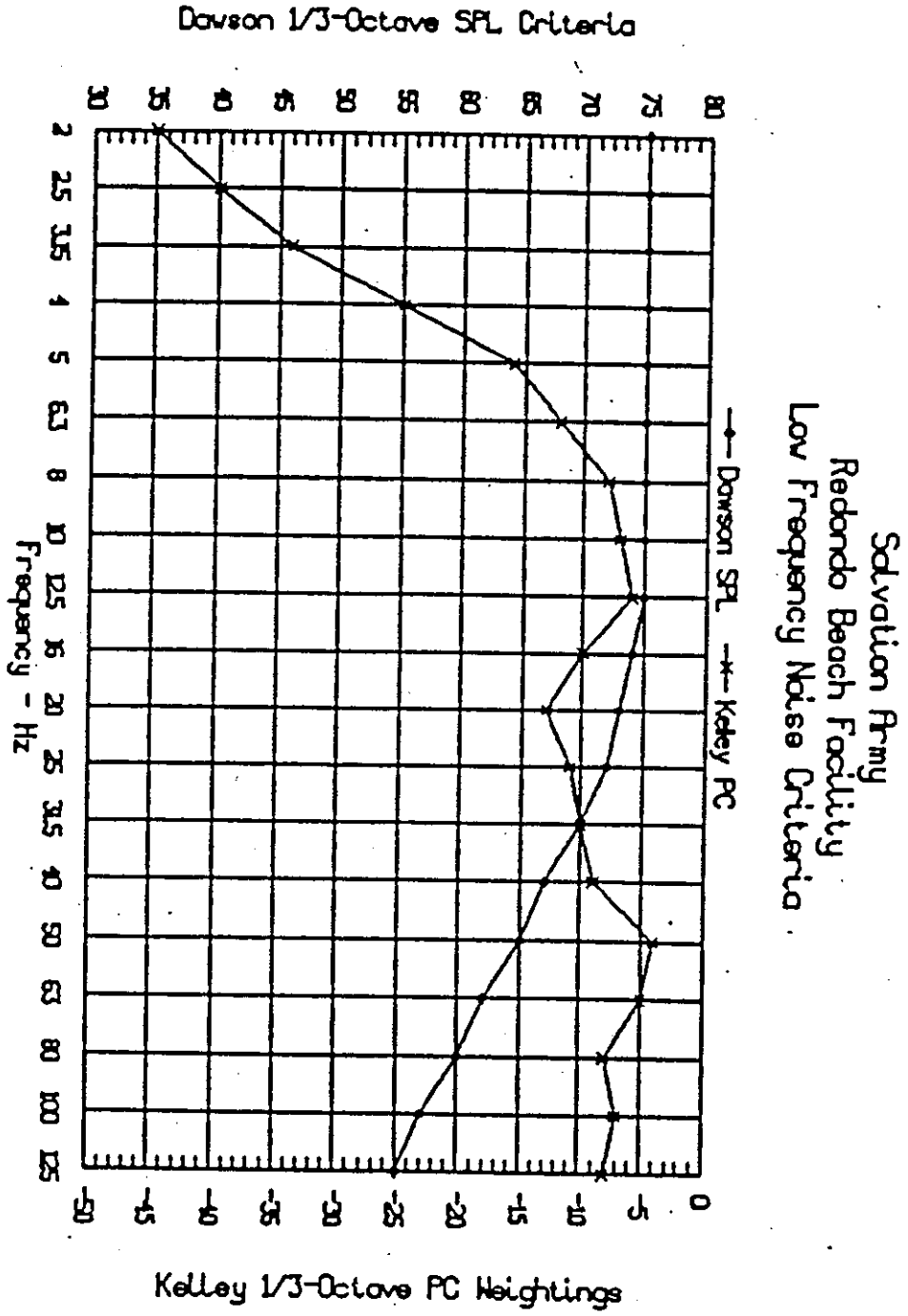
3) Ground vibration (acceleration) is limited to .001 G units (-60 dB re 1 G) for frequencies up to 30 Hz and to .003 G units (-50 dB re 1 G) from 30 Hz to 100 Hz (Noise Ordinance 4-24.504).

Supplemental Criteria: The American National Standards Institute (ANSI) Section 3.29 "Criteria for Assessment of Vibration in Buildings" provides a somewhat more detailed set of criteria for building vibration. It includes effects of vibration amplitude and frequency, body orientation (standing/sitting vs. reclining), building use, time of day, frequency of occurrence. A criterion curve, applicable to residences at nighttime for a combination of body orientation has been developed from Section 3.29 and reproduced on the graphs of measured vibration data.

Low frequency noise has been established as a potential result of activities at the Southern California Edison Company Generating Plant. The best known criterion for low frequency noise exposure relative to indoor residential impacts is set forth in the paper "A Proposed Metric for Assessing the Potential of Community Annoyance from Wind Turbine Low-Frequency Noise Emissions" by Dr. Neil Kelley of Solar Energy Research Institute, designed for assessment of noise impacts of wind turbines on nearby residences. The metric is based on 1/3-octave band noise levels in the frequency range 5-100 Hz, adjusted for "typical" residential structural response and average human sensitivity (**Figure 54**). Dr. Kelley refers to the metric as PC, and has established the following criteria:

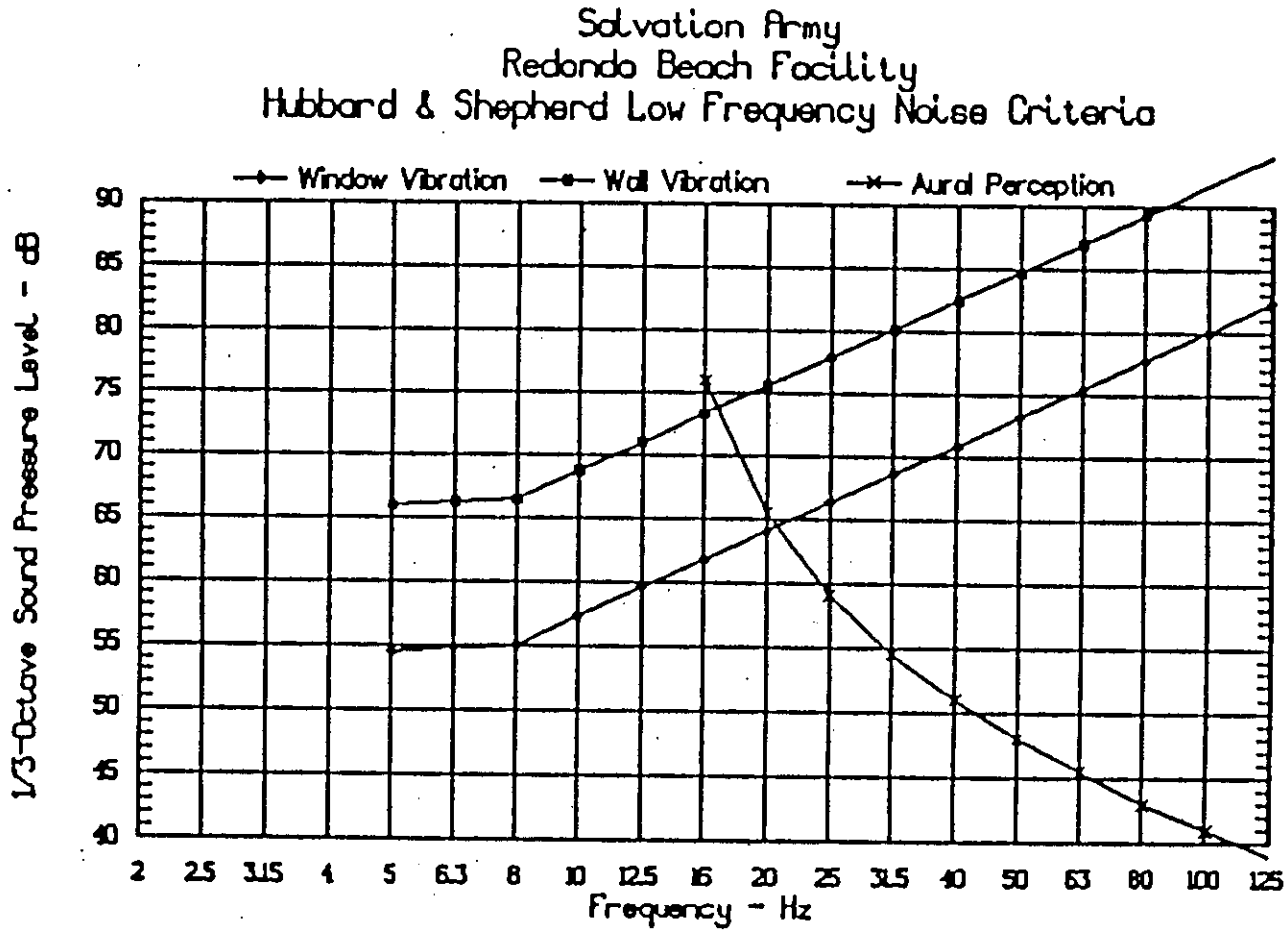
Perception Threshold	68 dB
Annoyance Threshold	75 dB
Unacceptable Threshold	77 dB

A second reference to low frequency noise criteria is presented in H. Dawson "Practical Aspects of the low frequency noise problem," (*Journal of Low Frequency Noise and Vibration*, January, 1982) which recommends a 1/3-octave band limit in outdoor areas (**Figure 54**). Finally, Hubbard and Shepherd have prepared a set of curves relating outdoor low frequency noise to window and wall vibration potential in typical residences and to the threshold of human hearing (ref. "Physical characteristics and perception of low frequency noise from wind turbines," *Noise Control Engineering Journal*, February, 1991) (**Figure 55**).



KELLEY'S/DAWSON'S LOW FREQUENCY NOISE CURVES

FIGURE 54



HUBBARD & SHEPHERD'S LOW FREQUENCY NOISE CURVES

FIGURE 55

4.2.12 Description of Stationary (Fixed-Source) Sources

At each of the eight stationary noise sources analyzed in the study, one or more noise measurement(s) was taken, at varying distances from the actual source (where feasible). A brief locational and qualitative description of each stationary (fixed-source) source and measurement site follows:

Marina South Car Wash: Gasoline fill up and prep areas are located on the east side of the facility. The main wash line is on the west side, adjacent to Pacific Coast Highway. Drying blowers, located near the north end of the wash line, were judged to be the dominant noise source. Measurements were taken in front of the nearest residences on the north side of Avenue G, one to the north of the facility on the east side of Pacific Coast Highway and one diagonally across the Pacific Coast Highway/Avenue G intersection. Most of the time, noise in the area is dominated by traffic on Pacific Coast Highway. For this reason, noise levels specifically attributable to the car wash were determined by measurements in traffic lulls.

Redondo Car Wash: The main wash line runs east to west (parallel) along Torrance Boulevard exiting near South Irena Avenue, with the vacuum blowers located north of Torrance Boulevard at the rear of the parcel. Noise from the vacuum blowers (located adjacent to residences) and the dryer blowers (located at the eastern end of the wash line, in proximity to residences) were judged to be the dominant noise sources. Except for certain specific periods during peak traffic periods, noise generated by the facility does exceed the overall (ambient) noise level.

Southern California Edison Company Generating Plant: The vast majority of noise on-site is produced by steam turbine generator boilers and associated equipment. The two largest boilers, #7 and #8, are located near the south end of the complex. Measurements were taken at numerous locations throughout the area to the east and southeast of the facility, as well as at one location in the harbor area to the west of the facility.

Triton (Harbor) Oil Facility: Well pumps are distributed across the entire site. The only available measurement site was in the Port Royal Marina parking lot, approximately 25 feet from the west fence of the facility, opposite running pumps. The dominant noise source was a squeaky bearing on one or more of the pumps. This facility is in the process of ceasing operations; all well on the site are being removed.

Kelt Rico/Redondo (Prospect) Oil Facility: Well pumps are aligned in a row along the east side of the facility, with storage tanks to the west. Measurements were taken at three locations. The first was on the east side of Prospect Avenue, at the back side of residences. The second was on the east side of Faye Lane, with one row of homes between the measurement and the pumps. The third was on the east side of Lucia

Avenue, with the microphone positioned to minimize shielding by the storage tanks.

Kelt Rico/Redondo (Alta Vista Park) Oil Facility: Well pumps are aligned in a row along the east side of a fenced area, located between the baseball diamond to the east and tennis courts to the west. One or more of the pumps produces a periodic "clunk" due to a loose connection or bearing. An on-site compressor cycles on and off at 5- to 10-minute intervals and produces a distinct low frequency "buzz." Measurements were taken at two locations. The first was 50 feet from the east fence of the facility, approximately 70 feet from the center of the row of pumps. The second was on the east side of Serpentine Street, a residential street to the west and above the facility, at a distance of approximately 350 feet.

Worldwide Pacific Oil Facility: Pumps, pipe lines and storage tanks are distributed over the facility. Source localization is difficult from outside because of masking created by noise generated by the adjacent Southern California Edison Company Generating Plant. The dominant noise source at the Worldwide Pacific Oil facility appeared to be a noisy pump located approximately one foot from the property line at the southwest corner of North Francisca Avenue. Measurements were taken just outside the facility fence, immediately opposite the audible pump. This facility is also in the process of ceasing operations; all machinery on the site will be removed.

Police Firing Range: Measurements were taken on the west and north sides of the firing area, which is enclosed on the sides by a concrete block wall, but open on the top. Because of coordination problems, measurements were taken for a single police officer firing a pistol in a standard course. The measured levels were extrapolated to represent actual use conditions. The western position was in Dominguez Park, approximately 150 feet from the center of and above the range. The northern position was on the Southern California Edison Company power line easement, approximately 350 feet from the range, 65 feet from the west curb of the street.

4.2.13 Stationary (Fixed-Source) Noise Source Measurement Methodology

The measurement microphone used in the analysis (Bruel & Kjaer 4165) was fitted with a foam windscreen and mounted on a stand, extendible in height to 15 feet, plus 7 feet when placed on top of the measurement van. The microphone was connected to a Larson-Davis Laboratories Type 3100 1/3-octave integrating real time analyzer. This analyzer separates the signal into frequency bands of width approximately 23% of the center frequency. The center frequencies are minimally 1/3-octave apart, so that each successive band center frequency is 1.26 times higher than the previous.

The lowest frequency band on the analyzer is 1 Hz and the highest is 20,000 Hz bandwidth, or frequency resolution at 1 Hz center frequency is therefore 0.23 Hz, at 100 Hz center frequency the resolution is 23 Hz, at 1000 Hz center frequency the

resolution is 230 Hz, etc. The 1/3-octave series of center frequencies and bandwidths provide a convenient analysis tool for the wide range of frequencies to which human hearing is sensitive.

Further, they very approximately track the so-called "critical masking bands" of human hearing. These are the bandwidths of random noise which will just mask a pure tone of the same level.

The Larson-Davis analyzer was connected to a PC-compatible portable computer. The computer instructed the analyzer to gather 15-minute long measurement samples of data. For each 15-minute period, the analyzer measured directly the Leq 15-minute A-weighted, overall, C-weighted, user-weighted (see subsequent discussion) and the 1/3-octave frequency spectrum from 1 Hz to 20,000 Hz. At the rate of 2.5 times per second, the analyzer transferred to the computer the instantaneous value of the A-weighted sound level and the levels of the analysis bands selected by the engineer at the onset of the measurement.

For some of the measurements, these bands were 8 Hz, 20 Hz and 160 Hz 1/3-octaves. For others, the 8 Hz band was replaced by the user-weighting, which was pre-programmed to provide the PC-weighting proposed by N. Kelley for assessment of low frequency noise in communities. The computer stored the individual data samples on magnetic disk and computed statistical levels for each of the four bands.

The signal output from the Larson-Davis analyzer was connected to a Rion type SA-77 spectrum analyzer. This analyzer performs a sophisticated mathematical transformation of the actual acoustic signal, resulting in a frequency spectrum with a resolution equal to the inverse of the length of the captured signal sample. In this case, it was desired to use the spectra to attempt to identify sources of low frequency noise. The upper limit of the spectrum was therefore set to 200 Hz. The frequency resolution was set to 1/4 Hz. For each measurement, 200 individual spectra were calculated and averaged and the result was stored on magnetic disk for subsequent plotting. In some cases, up to three average spectra were computed and stored during one 15-minute 1/3-octave measurement.

During most of the measurements, the Rion analyzer was also used to measure low frequency ground vibration or vibration in structures. This was done by disconnecting the Rion analyzer from the Larson-Davis analyzer and connecting it to a Bruel & Kjaer type 4370 delta-shear piezoelectric accelerometer. Vibration spectra were measured in the same manner as the narrow-band acoustic spectra, except that at some locations, the frequency range was reduced to 0-100 Hz, with 1/8 Hz resolution.

Prior to and following each series of measurements, the calibration of the entire measurement system was checked using a Bruel & Kjaer type 4230 acoustic

calibrator. During each measurement, a written log was kept, noting particular audible source characteristics, times and identifications of intruding noises, etc.

4.2.14 Stationary (Fixed-Source) Data Analysis Format

Each noise measurement taken with the Larson-Davis 1/3-octave analyzer was analyzed as follows:

- The A-weighted and three other band levels were plotted as a function of time for the entire measurement.
- The A-weighted level was plotted as a cumulative statistical distribution.
- The A-weighted and three other band levels were statistically analyzed and tabulated as L_{90}, L_{50}, L_{25}, L_8, and L_2 for review relative to the City noise ordinance.
- The 13/-octave Leq 15 minute spectrum was plotted and tabulated for frequencies 6.3 Hz and above.
- For sources which were judged to operate essentially continuously, the A-weighted L_{90} values were increased by 6.4 dB to determine Day-Night Average noise levels (Ldn). The L_{90} values were used to minimize the contamination by spurious motor vehicle, aircraft and other noises. Sources that operated during daytime hours only (car washes) were corrected by -3.8 dB to determine Ldn.
- At sources which operate quasi-continuously, with periodic fluctuations in level, contamination-free noise segments were analyzed to determine Leq, which was then converted to Ldn by adding 6.4 dB.

Measurements of narrow band sound and vibration spectra were analyzed as follows:

- The measurement data was plotted as band sound pressure (re 20 micropascals rms) or acceleration level (re 1 G (9.8 m/s^2) rms) vs. frequency. At locations where more than one measurement was taken within a 15-minute interval, all measurements were plotted on a common graph.
- Spectral features such as single tones or narrow ranges of frequency with pronounced concentrations of acoustical or vibrational energy were noted and tabulated.
- Where applicable, the narrow band and 1/3 octave levels were compared for consistency and for potential aural masking of tones.

The measurement data was used, together with aural and visual observations, to create approximate contours of constant noise level (Ldn) around each of the stationary sources. For all but the Southern California Edison Company Generating Plant, this was done by fitting physically feasible models of noise generation, propagation and shielding to the measured noise levels. This resulted in relatively simple contour shapes.

In areas where complex shielding by structures or terrain results in significant uncertainties in the contours, dashed lines have been plotted. In most cases, these contours will be "swamped" by noise from transportation sources or the Southern California Edison Company Generating Plant.

In the area surrounding the Southern California Edison Company Generating Plant, the contours were initially produced by fitting the measured data with a two-dimensional gridding program (Golden Software SURFER IV). Because the gridding program fails for areas outside the measurement area, the contour curves were modified in these areas to reflect physically reasonable propagation characteristics. Both A-weighted Ldn and Kelley PC-weighted low frequency noise contours were computed and plotted.

Noise from the pistol range was analyzed by determining the Sound Exposure Level of individual shots on the range. This was done by "windowing" segments of the recorded sound levels and computing SEL for groups of shots. The individual shot SEL is determined by subtracting 10 log (number of shots) from the group SEL. The time-average sound levels (Ldn, Leq_{1hr}, etc.) are then determined as the average individual shot SEL plus 10 log (number of shots in time period) minus 10 log (number of seconds in time period).

Noise contours were determined based on the computed Ldn for the two measurement locations, together with observations of the shielding characteristics of the building associated with the range.

4.2.15 Study and Analysis Results

A summary of all the noise measurements taken with the 1/3-octave analyzer is presented (**Table 52**). As was indicated above, in most cases for sources which operate day and night, Ldn was determined by adding 6.4 dB to either the L_{90} value of the measurement or the value of Leq that was clearly attributable to the noise source being investigated.

At sources which operate on an 8 a.m. to 6 p.m. nominal schedule, the Ldn was determined by subtracting 3.8 dB from the noise level which was representative of maximum generation by the source. For example, if car wash equipment cycles down during lulls in business, these "quiet" intervals are not taken into account in the assessment of Ldn, so the results are conservative on the side of overprediction.

TABLE 52

Summary of Stationary Noise Source Measurements (A-weighted Ldn and Pc-weighted)

Location	Date	Time	L_{90}	L_{eq}	L_{dn}	Kelley PC
Roof of Salvation Army Chapel	2/26/91	23:47-00:02	53.9	56.9	60.3	64.3
	2/27/91	03:22-03:37	53.5	54.0	59.9	63.5
NE Cnr Salvation Army Property	2/27/91	03:25-03:40	53.6	54.0	60.0	
Francisca N of Gertruda	3/7/91	00:09-00:24	55.7	58.4	62.1	63.6
	4/24/91	00:54-01:09	55.5	57.3	61.9	66.8
	4/26/91	01:54-02:09	57.0	58.8	63.4	67.8
	4/28/91	10:08-10:23	56.1	62.7	62.5	66.2
Front of 518 N Elena	3/7/91	00:43-00:58	54.9	56.6	61.3	66.8
	3/8/91	03:33-03:48	53.3	54.0	59.7	65.8
Front of Charley Brown	3/7/91	01:12-01:27	53.7	56.3	60.1	65.1
S Cnr Beryl & Broadway	3/7/91	01:37-01:52	53.6	60.2	60.0	64.9
Front of 508 Francisca	3/8/91	00:48-01:03	53.5	55.1	59.9	61.2
Front of 534 Francisca	3/8/91	01:13-01:28	53.5	56.2	59.9	65.5
Front of 522 Gertruda	3/8/91	01:34-01:49	50.4	52.6	56.8	61.6
N Cnr Broadway & Carnelian	3/8/91	01:56-02:11	48.9	51.5	55.3	59.5
Front of 524 Guadalupe	3/8/91	02:20-02:35	41.8	44.9	48.2	53.6
	4/24/91	01:19-01:34	42.2	46.4	48.6	52.7
	4/28/91	09:37-09:52	42.7	53.6	49.1	55.9
E Cnr Beryl & Juanita	3/8/91	02:46-03:01	37.0	48.6	43.4	52.8
E Cnr Agate & Irena	3/8/91	03:11-03:26	37.5	45.6	43.9	56.5
E Cnr Catalina & Broadway	4/24/91	01:48-02:03	56.7	59.7	63.1	68.3
	4/26/91	02:17-02:32	58.8	61.0	65.2	71.1
Bank Parking Lot on Catalina	5/2/91	23:00-23:15	55.3	56.9	61.7	68.0
Front of 307 Ave G (PCH Car Wash)	4/23/91	16:52-17:07	57.9	62.7	56.7	
Front of 233 Ave G (PCH Car Wash)	4/23/91	17:19-17:34	64.2	68.8	59.7	
Port Royal Parking Lot 25' from Triton Oil	4/23/91	19:22-19:37	59.5	61.2	67.6	62.5
E side Francisca 10' from Oil	4/23/91	20:10-20:25	76.2	76.5	82.6	70.6
Front of 514 Faye opp Prospect Oil	4/23/91	20:46-21:01	46.5	50.4	52.9	
E Side Lucia behind Prospect Oil Facility	4/23/91	21:28-21:43	52.7	54.8	59.1	
E Side Prospect opp Oil Facility	4/24/91	00:24-00:39	54.2	59.1	61.4	
Alta Vista Park 50' from Oil Facility	4/23/91	22:08-22:23	55.3	57.7	63.7	
N Side Serpentine abv Park Oil Facility	4/23/91	22:32-22:47	43.6	55.0	50.0	
NW Cnr Car Wash (Torrance &Irena)	4/28/91	08:31-08:46	68.3	69.0	65.2	
Res PL at rear of Park lot W of Car Wash	4/28/91	09:00-09:15	56.4	58.3	53.2	
W Side Irena @ Opal opp Wash	5/6/91	11:18-11:33	66.2	68.3	63.1	
Dominguez Park W of Pistol Range	5/6/91	09:14-09:29	53.0	72.3	70.0	
SCE Easement NE of Pisto Range	5/6/91	10:00-10:15	52.6	63.2	59.0	

As most of the readings were taken at locations representative of actual or potential "worst case" noise impacts on residential or recreational uses, the measurements can be used as initial investigations for assessment of noise ordinance compliance.

4.2.16 Discussion of Study and Analysis Conclusions

The following presents a description of the results of the measurement and analysis, with appropriate conclusions and specific measures recommended to reduce the potential impacts of the various stationary noise sources that were the subject of the study.

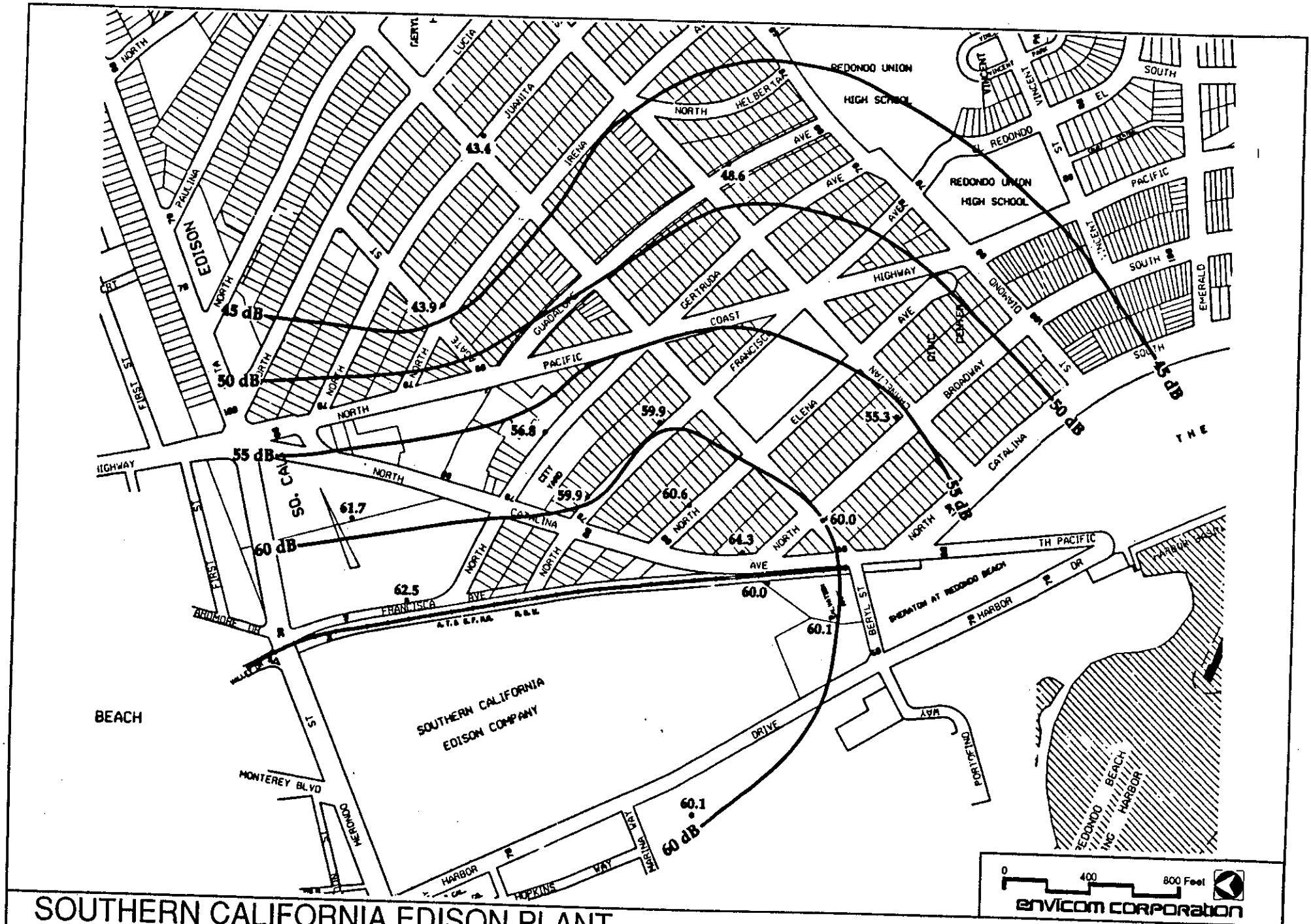
Southern California Edison Company Generating Plant Noise: From the data presented in **Table 52**, and from the Ldn (normal frequency) contours plotted from the data (**Figure 56**), it can be seen that Southern California Edison Company Generating Plant produces a 55 dB noise zone that approximately encompasses the area north of Carnelian Street, west of Pacific Coast Highway and west of North Gertruda Avenue. Similarly, the Southern California Edison Company Generating Plant 60 dB zone is approximately contained within the area north of Beryl Street and west of Francisca Avenue. Based on the measurements, the 65 dB zone is fully within the boundaries of the Southern California Edison Company Generating Plant.

At locations within approximately 1,000 feet of the Southern California Edison Company Generating Plant, the overall, PC-weighted (low frequency) noise levels are 4-6 dB higher than the A-weighted levels (**Figure 57**). At locations on the east side of Pacific Coast Highway, the differential increases up to approximately 13 dB, owing to the lower atmospheric attenuation and reduced effect of shielding for the longer wavelength, low frequency sounds.

In the area immediately to the east of the Southern California Edison Company Generating Plant, PC-weighted (low frequency) noise levels were measured in the range 65-71 dB, which straddles Kelley's perception threshold, but are below the annoyance and unacceptable thresholds.

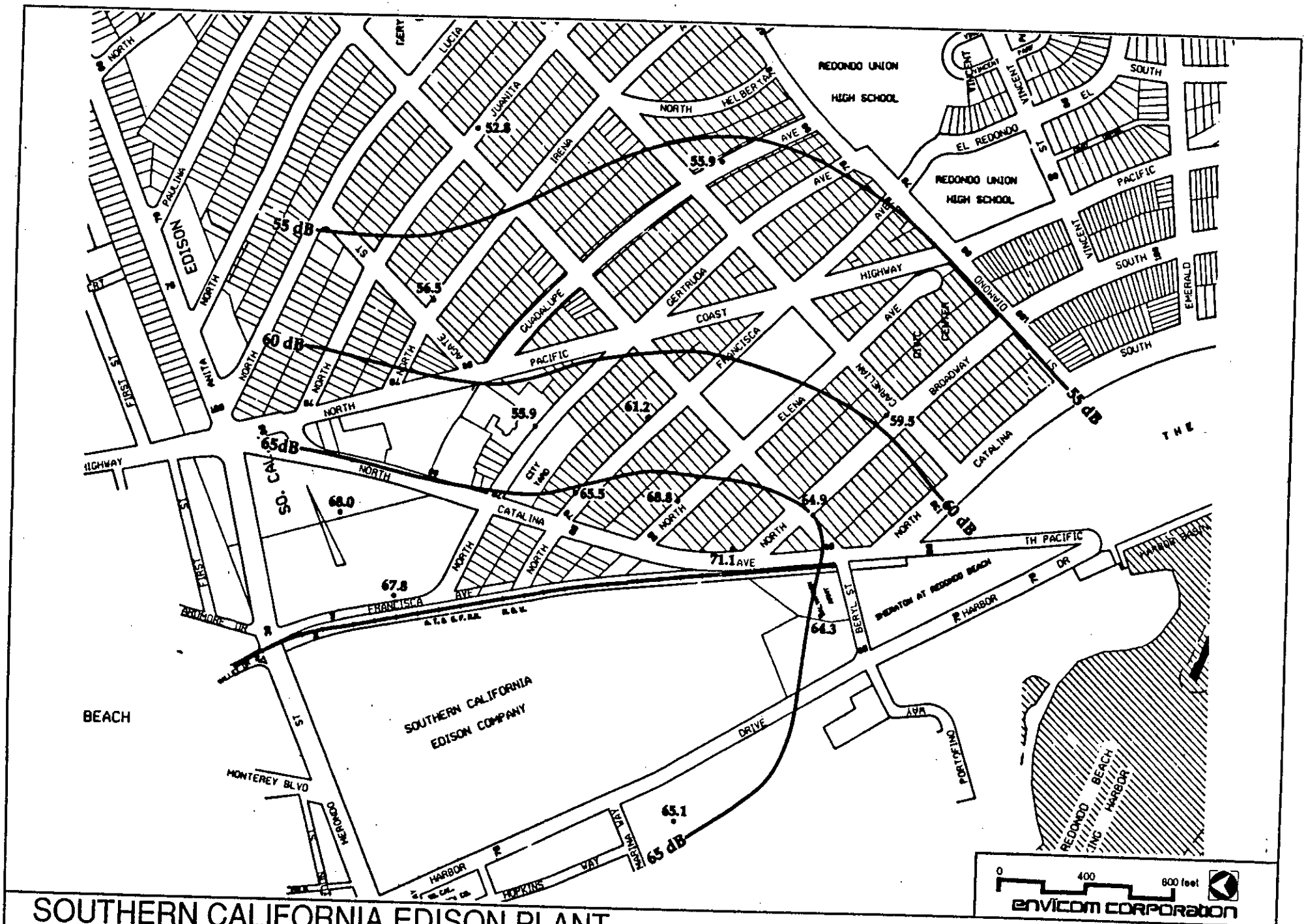
To better understand the nature of the low frequency noise exposures in the community and noise generation by the Southern California Edison Company Generating Plant, the narrow band acoustic data samples were reviewed in detail and a special measurement was made of the 13-octave sound level vs. time at the most exposed position, the corner of Catalina Avenue and Broadway. This location is approximately 750 feet distant from and in sight line of SCE boilers #7 and #8.

The analysis showed numerous discrete frequency and narrow band spectral peaks, some of which were repeated throughout the measurements and some of which varied among positions and measurement times.



SOUTHERN CALIFORNIA EDISON PLANT
(NORMAL FREQUENCY NOISE CONTOURS)

FIGURE
56



SOUTHERN CALIFORNIA EDISON PLANT
(LOW FREQUENCY NOISE CONTOURS)

FIGURE
57

The hypothesis at this time is that the steady discrete frequency signals are from mechanical sources, such as the generator rotation (30 Hz), power line frequency (60 Hz), magnetostrictive noise (120 Hz), the main fan rotation (15 Hz) and the main fan blade passage (149.25 Hz). Narrow band noises in the range 6-60 Hz, which tend to fluctuate in frequency and level, are probably products of the combustion process. Spectral details would therefore be sensitive to load, air temperature and possibly other considerations.

The time average spectrum may be compared to the narrow band spectrum measured at approximately the same time. This was done by converting the narrow band spectrum to a 1/3-octave spectrum by simply summing the energy from all spectral lines within each 1/3-octave. Note that the discrete frequency peaks in the narrow band spectrum are much less pronounced in the 1/3-octave spectrum but that overall levels are easier to assess on the 1/3-octave spectrum. Note also that the levels computed from the narrow band spectrum agree well with the measured 1/3-octave band levels, generally falling between the maximum and minimum.

Time lines for the overall, A-weighted and PC-weighted noise levels show that between vehicles (the 5-10 dB "bumps" on the A-weighted plots) the noise level is very steady. It is interesting to note that while the levels in the individual 1/3-octave bands were observed to fluctuate over a 9-18 dB spread, the overall and PC-weighted levels were steady within 41.5 dB. If the vehicles and brief peak at 57 seconds are eliminated, the spread is less than 3 dB. This is a remarkably constant level for sound with quasi-random spectral components extending down as low as 6 Hz.

Comparison of the measured and calculated 1/3-octave spectra to the aural and structural response criteria are shown on the appended color chart. At the distance of 750 feet, noise levels exceed the window vibration criterion at frequencies up to 31.5 Hz and exceed the wall vibration criterion for frequencies between 5 and 10 Hz. Low frequency noise is expected to be audible for frequencies 25 Hz and higher. The average noise level just barely exceeds the wall vibration criterion, but the maximum 1/3-octave levels exceed the criterion by up to 8 dB (brief peak at 57 seconds with strong component at 6.3 Hz).

It may be noted from the 1/3-octave spectrum plots that for the SCE noise, the PC-weighted low frequency noise level is a very nearly equal to the 1/3-octave band levels in the 5-8 Hz range which determine exceedance of the vibration excitation criteria.

The community noise survey results may therefore be analyzed with reasonable accuracy by comparing the measured PC-weighted level against the 6.3 Hz criteria, 55 dB for windows, 66 dB for walls.

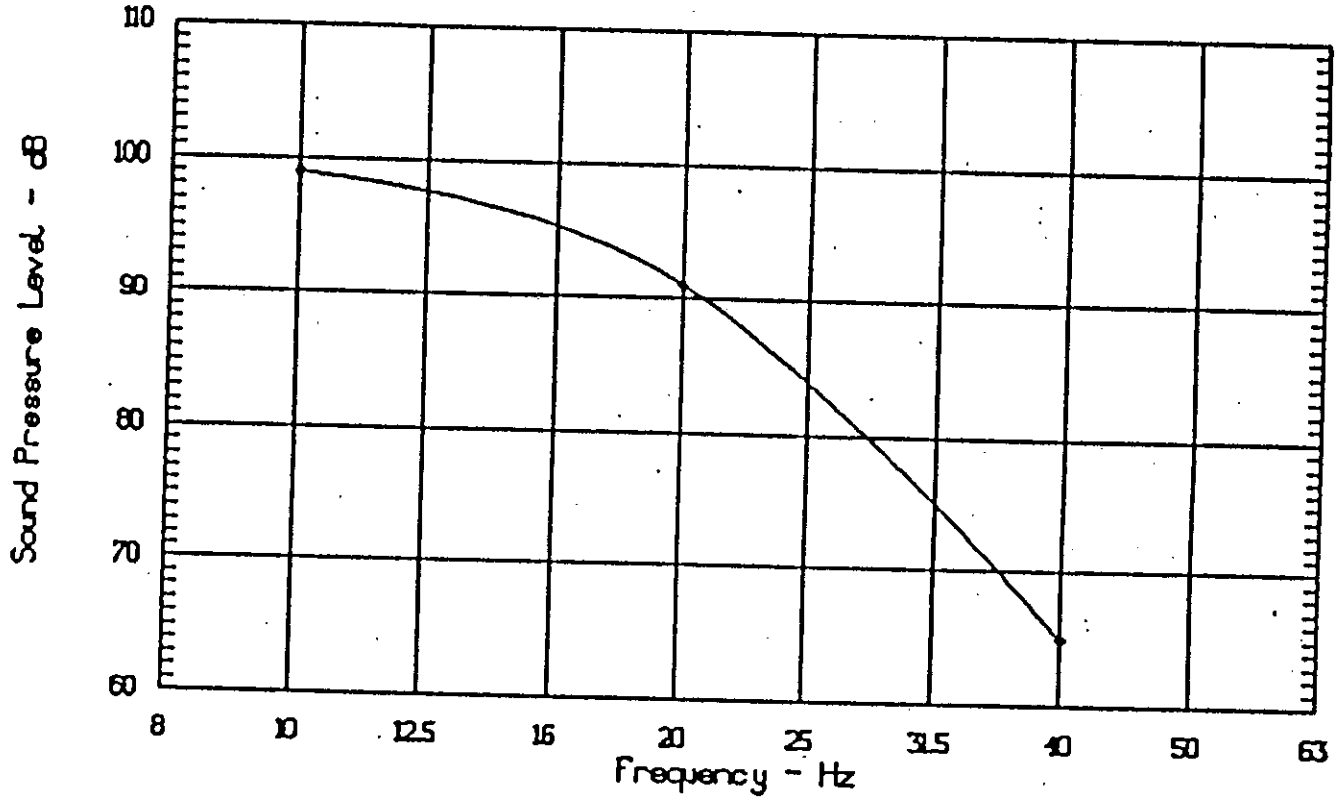
On the basis of an expected 6 dB or greater loss vs. distance doubling (inverse distance squared wave-spreading), one would expect locations at distance greater than approximately 980 feet to be free of perceptible wall vibrations and locations at distance greater than 3,500 feet to be free of window vibration. Actual measurements, taken at locations 2400-2800 feet from the Southern California Edison Company Generating Plant indicated that, depending upon direction (because of varying shielding conditions), this latter distance is the more appropriate, reflected by the PC 55 dB noise contour.

The predicted overall effect of the low frequency noise may be assessed by comparing the measured levels to Kelley's and Dawson's criteria. Recalling that Kelley established PC 68 dB as a perception threshold and PC 75 dB as an annoyance threshold, the indication from the measurements is that within approximately 750 feet of the boilers, low frequency noise would be perceptible inside residences, but that at none of the measured sites would the noise be assessed as objectionable.

When Dawson's 1/3-octave criterion curve is interpolated to 149 Hz (a dominant component of Southern California Edison Company Generating Plant noise - actually 149.25 Hz), the criterion is approximately 53 dB. Review of the 1/3-octave data plots indicates that levels are below Dawson's criterion curve except at 63 Hz at locations directly adjacent to the Southern California Edison Company Plant and at 160 Hz (the band encompassing 149 Hz) within approximately 1,000 feet of the boilers. However, the 149.25 Hz noise is a distinct tone which is audible to the west of the facility (in the harbor area) during otherwise-quiet early morning hours.

An extensive investigation into the effects of low frequency noise on sleep interference revealed only one research paper: "Effects of infra and low frequency sound on sleep stages" by Kzuhide Yamazaki and Yasuo Tokita in *Proceedings of Inter-Noise 84*. Sleeping test subjects (young male students) were exposed to sounds of frequency 10, 20 and 40 Hz and levels ranging from 55 to 104 dB. Sleep stages (I, II, III, REM and Wake) were determined before and after exposure using EEG, EMG and EOG monitoring. The results matrix for their study is duplicated below. Based on the results, they estimated the threshold for awakening from Stage I sleep as a function of frequency as shown (**Figure 58**).

Review of the measured 1/3-octave data demonstrates that few or none of the measurements indicated levels above these thresholds outdoors. It is therefore unlikely that low frequency noise from the Southern California Edison Company Generating Plant is directly responsible for sleep interference problems. The noise could be indirectly responsible if rattling noises are produced by low-frequency induced window or wall vibrations.



YAMAZAKI & TOKITA LOW FREQUENCY NOISE SLEEP INTERFERENCE CURVE

FIGURE 58

Structural damage for sound levels in the ranges measured in this study are quite unlikely. The following is quoted from H. Hubbard "Noise Induced House Vibrations and Human Perception" in Noise Control Engineering Journal, Volume 19/Number 2, 1982:

> *"Damage Experience. Very little if any damage to elements of the structure is expected except at extreme values of the input noise level. Experience for blasting, explosions and for sonic booms suggest that damage to houses may occur at peak acceleration values between about 0.3 and 3.0 g in the frequency range 10 to 100 Hz, respectively...."*

Vibration levels measured on walls, doors and windows at 515 Elena Street and on the window of the Los Angeles County Beaches Department warehouse (located at North Catalina Avenue & Broadway) were all below 0.1 g, well below the values indicated by Hubbard as having potential for structural damage.

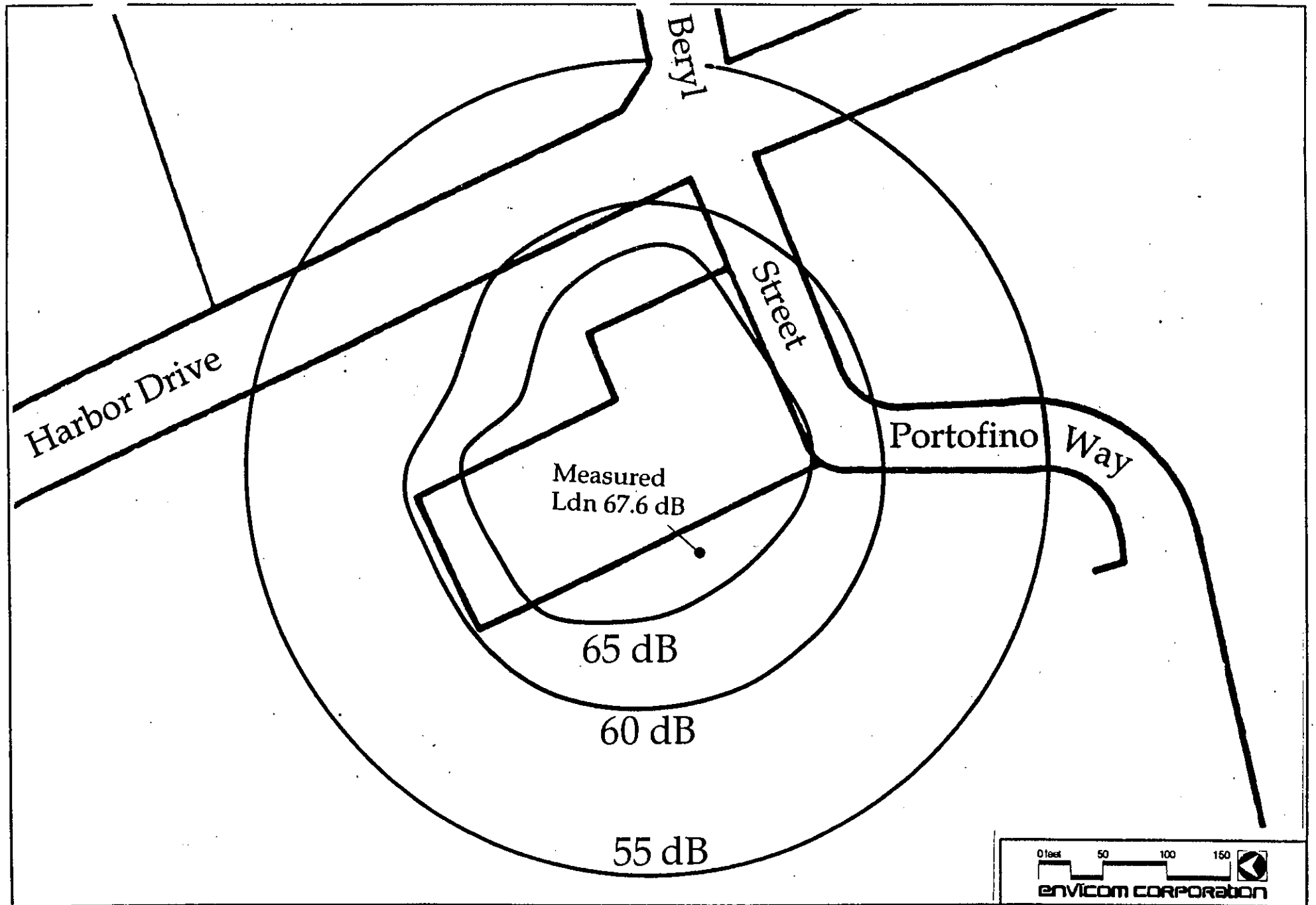
Petroleum Facilities: Although the noise levels from these four facilities are typically below 55 dB at the nearest noise sensitive uses, their impact on the environment could be reduced by the elimination of a number of distinctive characteristics (**Figure 59**), (**Figure 60**), (**Figure 61**), (**Figure 62**). As has been indicated previously, these include:

Screeching bearings
Clunks from loose couplings or linkages on oil pumps
Low frequency buzz from exposed compressors
Hum from pumps and motors

Improved equipment maintenance and/or addition of housings or barriers would be the most applicable and effective noise reduction strategies for these facilities.

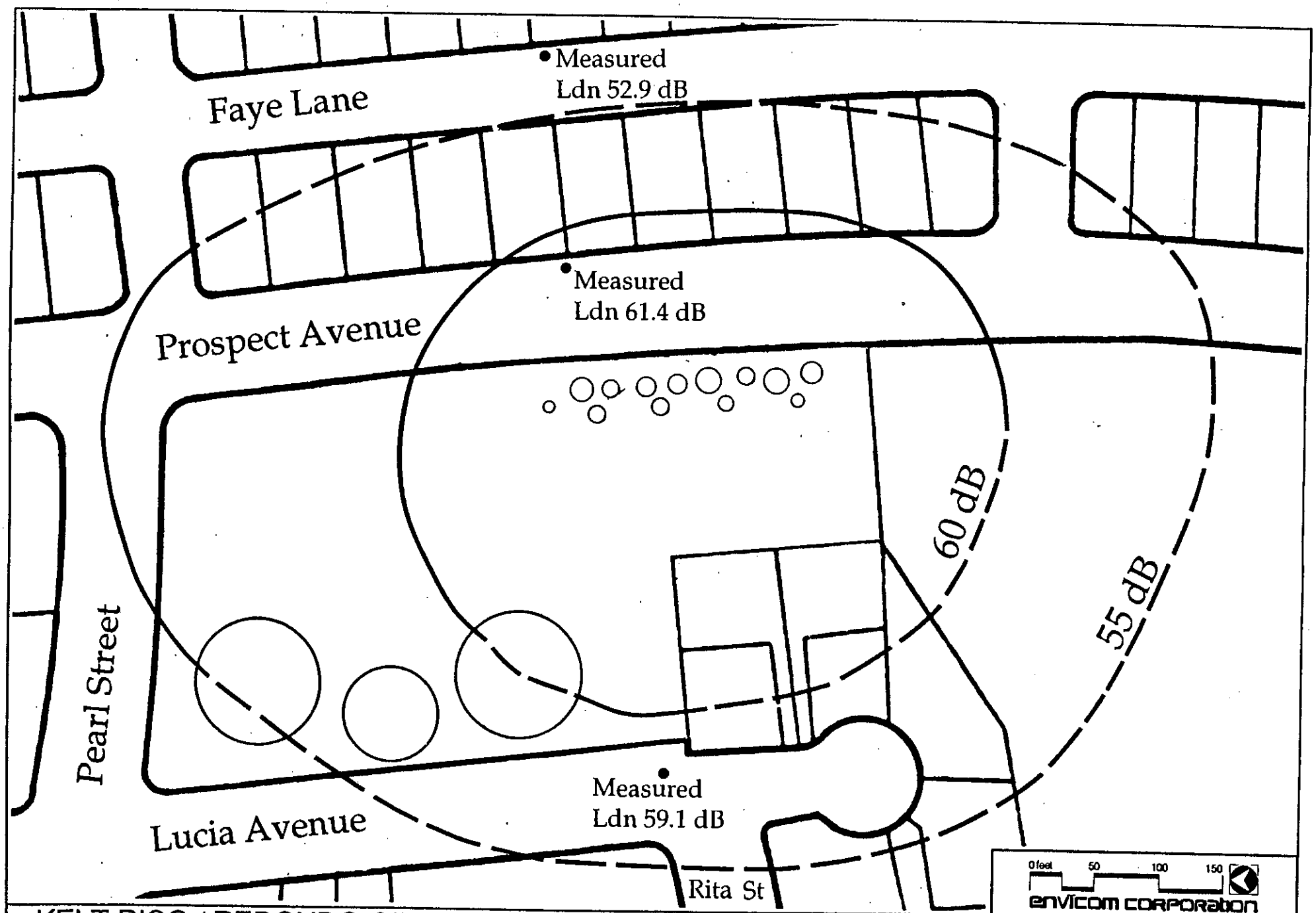
Car Washes: The two car washes investigated (the Marina South Car Wash, located adjacent to Pacific Coast Highway and the Redondo Car Wash, located adjacent to Torrance Boulevard) are located adjacent to major roadways and operate during daytime hours only.

At the Marina South Car Wash (**Figure 63**), residences are located across Avenue G in a location partially shielded from the major noise sources by the car wash structure. Other residences are located on the opposite side of Pacific Coast Highway. At both these residential locations, the major noise sources are audible during lull periods in traffic, but the noise impact on the overall acoustical environment is small.



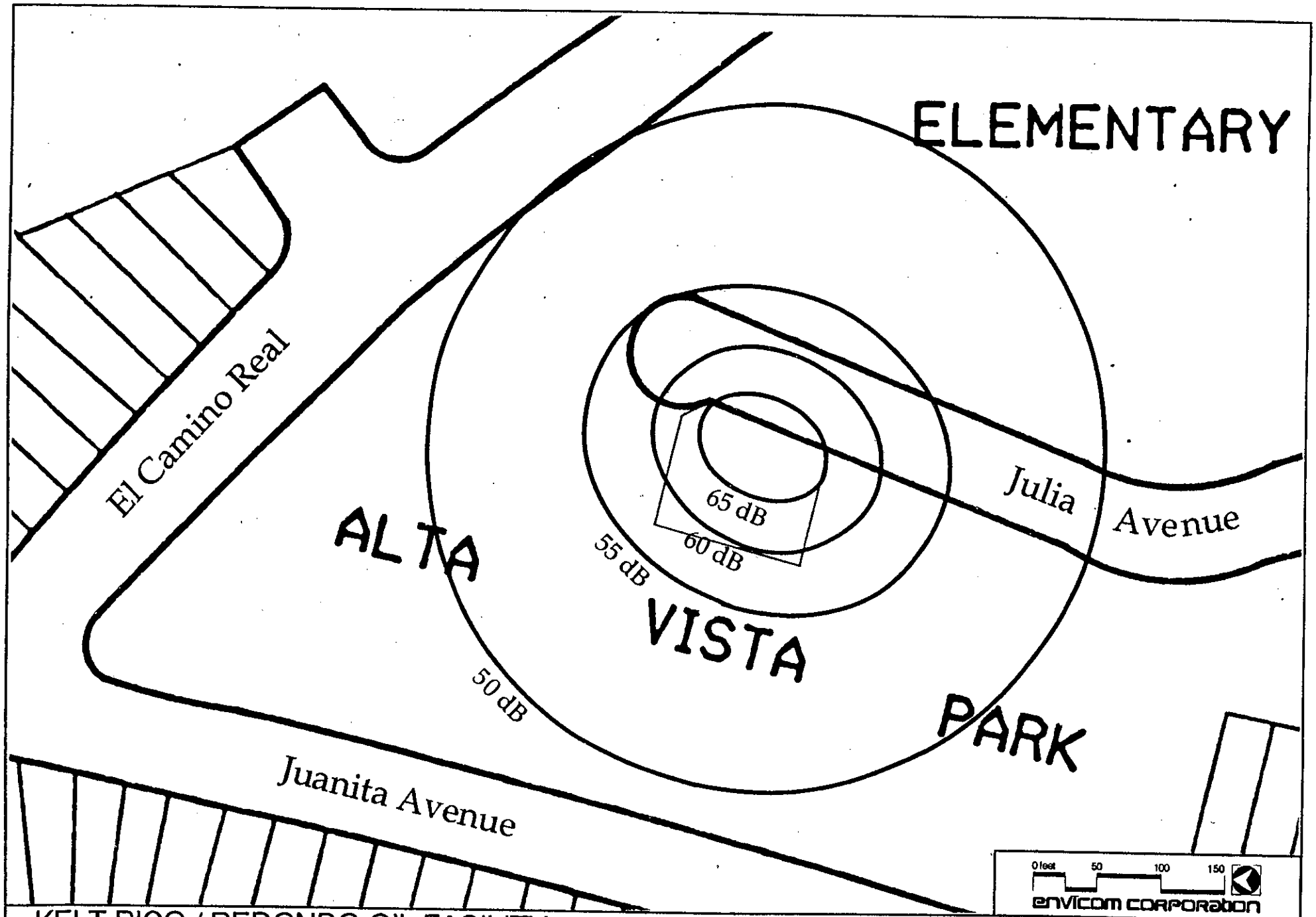
TRITON (HARBOR) OIL FACILITY (NORMAL FREQUENCY NOISE CONTOURS)

FIGURE 59



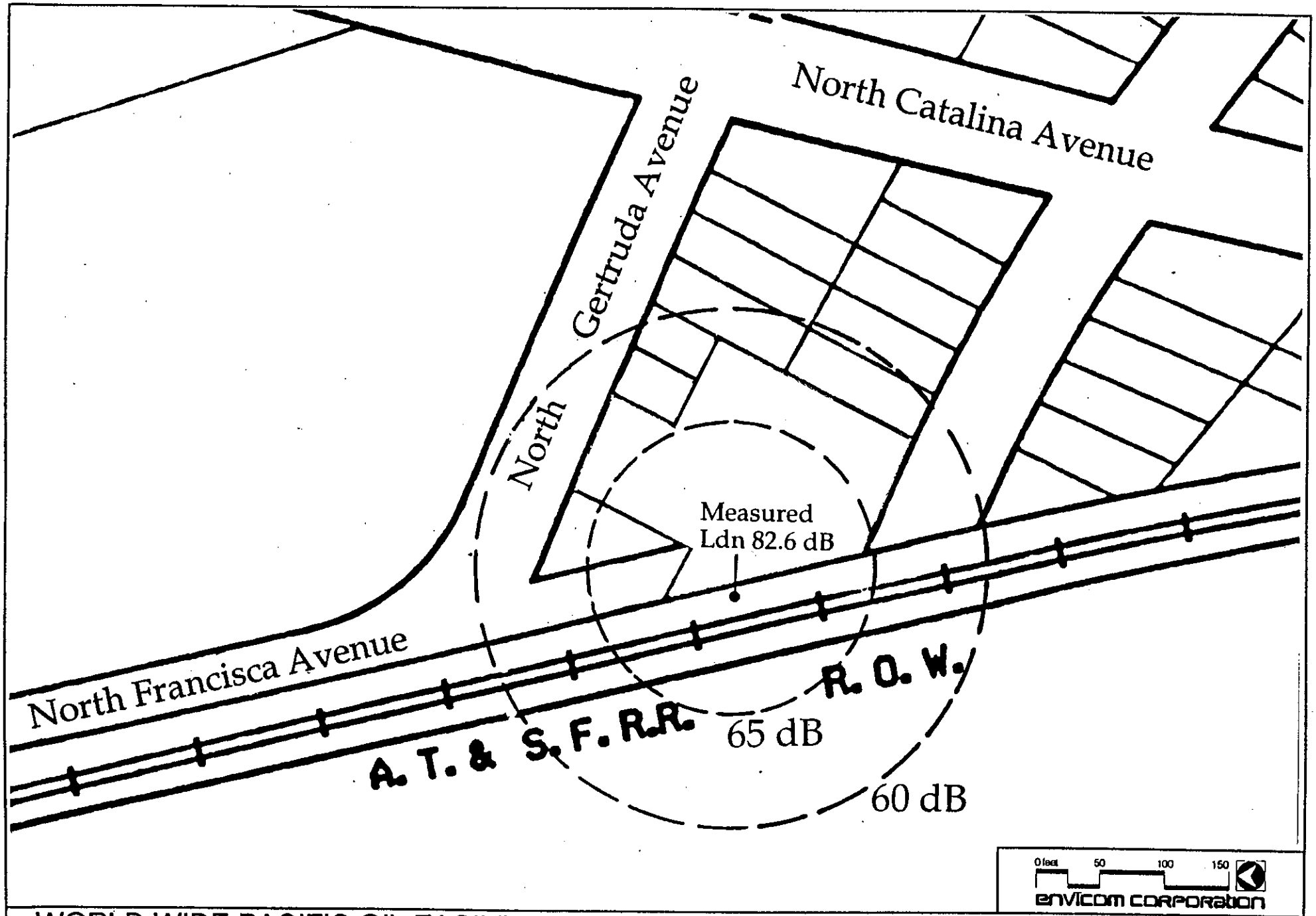
KELT RICO / REDONDO OIL FACILITY (PROSPECT AVE.)
(NORMAL FREQUENCY NOISE CONTOURS)

FIGURE
60



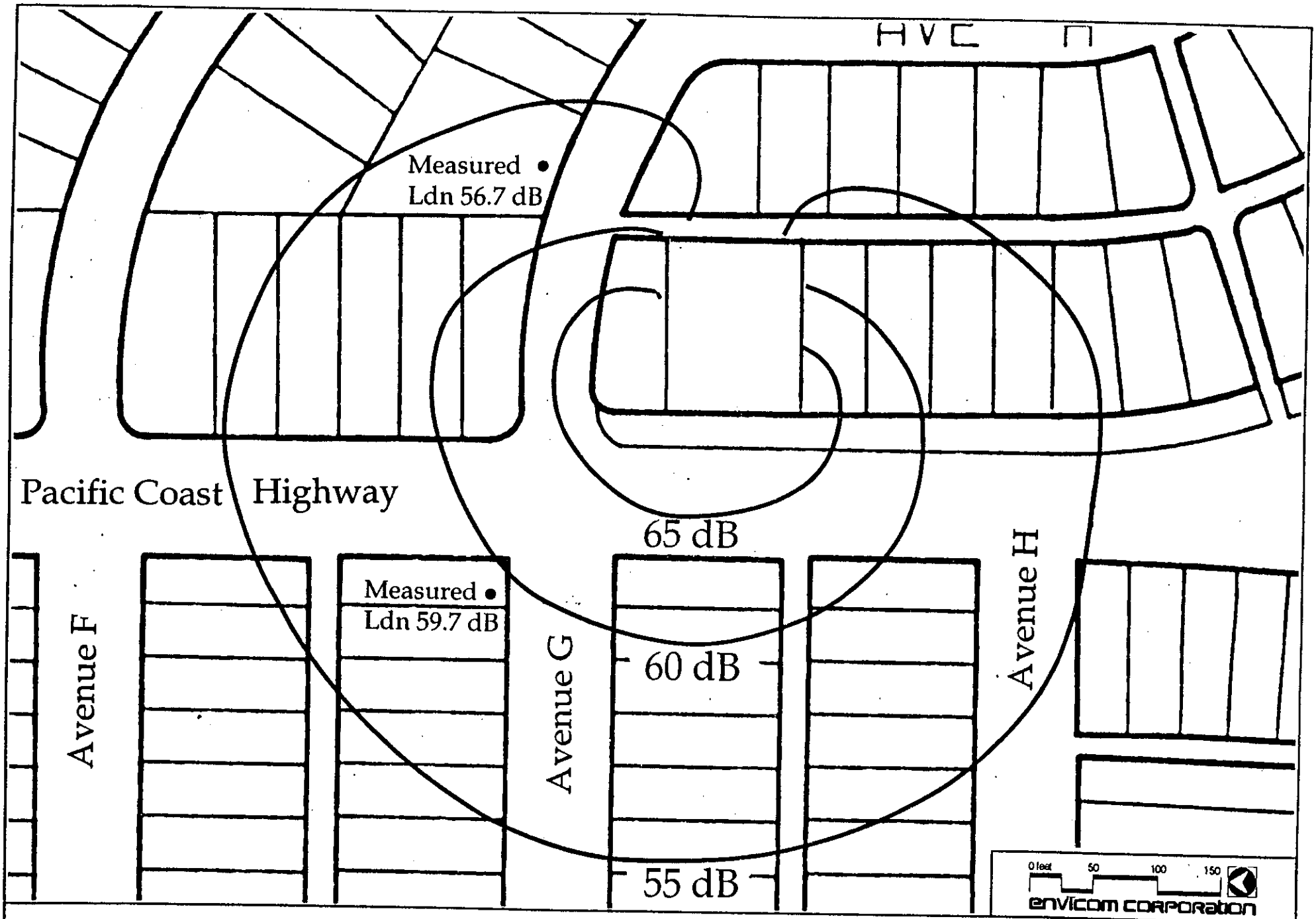
KELT RICO / REDONDO OIL FACILITY (ALTA VISTA PARK)
(NORMAL FREQUENCY NOISE CONTOURS)

FIGURE
61



WORLD WIDE PACIFIC OIL FACILITY
(NORMAL FREQUENCY NOISE CONTOURS)

FIGURE
62



MARINA SOUTH CAR WASH (NORMAL FREQUENCY NOISE CONTOURS)

FIGURE 63

At the Redondo Car Wash (**Figure 64**), existing older residences are located immediately behind the facility, across a block wall from the vacuum blowers. Noise levels resulting from these blowers are approximately 65 dB, well in excess of the shielded traffic noise.

At the location of residences on the south side of Torrance Boulevard, to the southeast of the car wash, noise levels from the main wash line will be 65-66 dB, based on measurements of 68 dB at an intermediate distance. This is 3-5 dB above the overall (ambient) noise level, and is a clearly audible element in the environment.

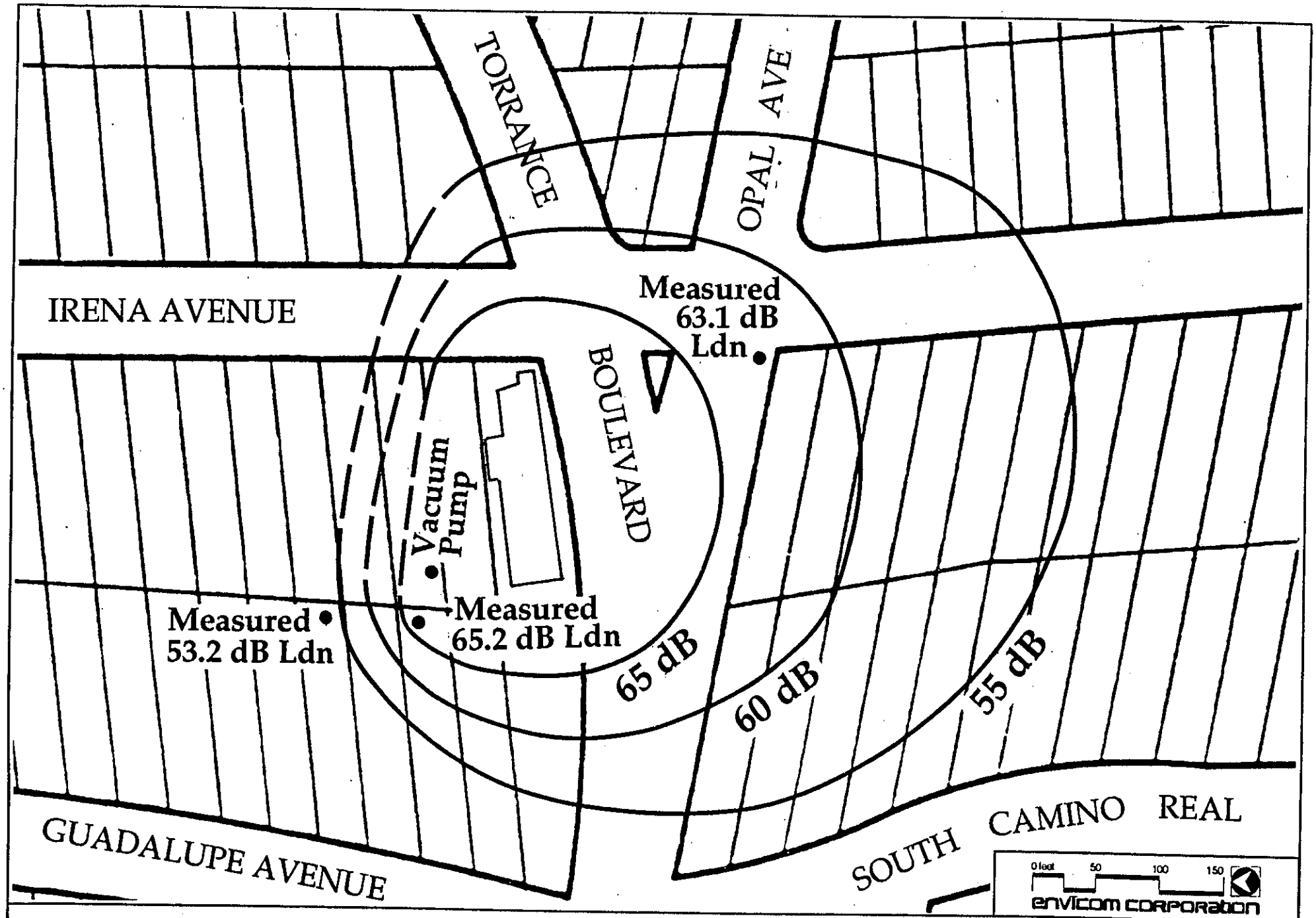
The sources of noise which could be treated to reduce noise are the vacuum blowers and the dryer blowers. Both of these could be reduced with inlet and discharge silencers. In addition, a sound absorptive barrier could be constructed on the front side of the wash line and around the vacuum blowers.

Police Firing Range: At a distance of 150 feet and above the range, maximum individual pistol shots (Fast SLM detector) were in the range 88-94 dB depending upon shooter location. The absolute peak sound pressure level was measured as 117 dB. At 350 feet, the levels were lower by 10-12 dB, consistent with the increased distance and greater shielding. With intense range usage, one expects approximately 1,800 shots in a worst case hour, resulting in L_{eq1hr} 83 dB at the westerly measurement position and 72 dB to the northeast. For more average conditions, this number of shots would be spread over a four hour period, with resultant 6 dB reduction in hourly average levels. The Ldn would be 62 dB at the westerly position, 51 dB to the northeast (**Figure 65**).

It must be realized that, because of the high crest factor (peak to average ratio) for the pistol shot noise, individual shots will be clearly audible at distances greater than suggested by the contours. Significant noise reduction could be achieved at the range through the installation of sound absorbing baffles between the wood slats of the top of the range, or through the construction of a roof over the facility. The construction of a new police facility is presently under consideration by the City of Redondo Beach; during future planning for this facility, it would be appropriate to consider the potential for relocating the existing fire range to the new facility (possibly below ground, to reduce any potential noise impacts).

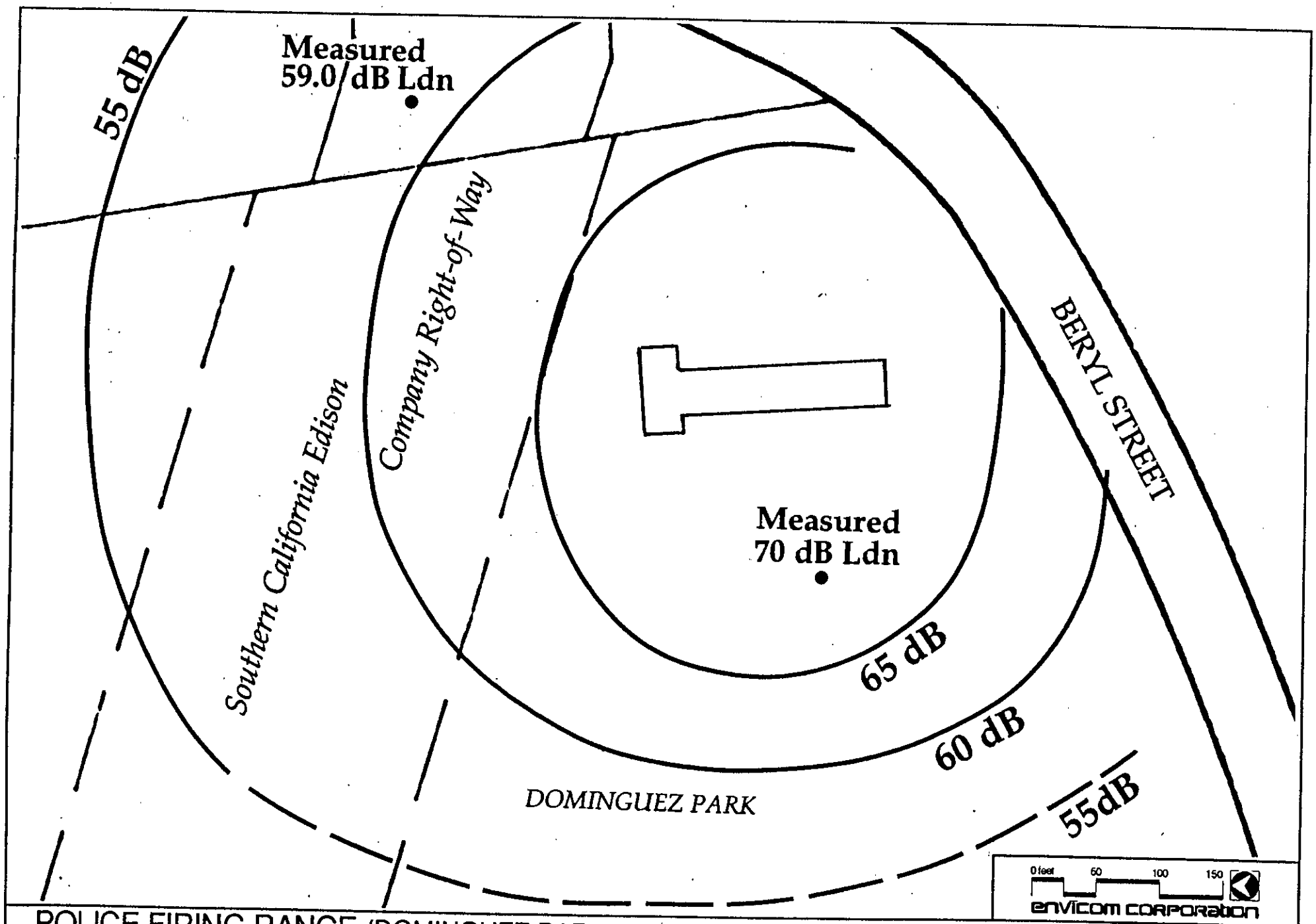
4.2.17 Goals, Objectives, and Policies

The following presents the various goals, objectives, and policies relative to both overall (ambient) and stationary (fixed-source) source noise conditions and impacts in the City of Redondo Beach.



REDONDO CAR WASH (NORMAL FREQUENCY NOISE CONTOURS)

FIGURE 64



POLICE FIRING RANGE (DOMINGUEZ PARK)
(NORMAL FREQUENCY NOISE CONTOURS)

FIGURE
65

Goal *It shall be the goal of the City of Redondo Beach to:*

10A Ensure that residents, employees, and visitors in the City of Redondo Beach are protected from the adverse human health and environmental impacts of excessive noise levels created by stationary and overall (ambient) noise sources and conditions, and take all necessary and appropriate action to avoid or mitigate the detrimental affects of such excessive noise level exposure impacts on the community.

Issue NOISE ORDINANCES, REGULATIONS, AND GUIDELINES

Objective *It shall be the objective of the City of Redondo Beach to:*

10.1 Adopt and enforce appropriate local noise ordinances, regulations, and guidelines, in order to effectively control both overall (ambient) and stationary noise conditions and impacts that may occur in the community.

Policies *It shall be the policy of the City of Redondo Beach to:*

10.1.1 Adopt and enforce a revised version of the City of Redondo Beach Noise Regulation (Chapter 24, Title 4 of the City of Redondo Beach Municipal Code) that effectively responds to and regulates (to the extent feasible) the range of overall (ambient) and stationary noise conditions that are expected to occur in the City.

10.1.2 Ensure that any and all local noise ordinances, regulations, and guidelines are appropriate for their intended purpose, are consistent with existing technical standards, are legally adequate, and are enforced according to their terms.

Issue NOISE LEVEL AND NOISE IMPACT INFORMATION MONITORING AND UPDATING

Objective *It shall be the objective of the City of Redondo Beach to:*

10.2 Maintain base line information regarding the overall (ambient) and stationary source related noise environment of the community on an ongoing basis.

Policies *It shall be the policy of the City of Redondo Beach to:*

10.2.1 Monitor and update available data as required (but not less than every five years) regarding the community's existing and projected overall (ambient) and stationary noise levels.

10.2.2 Employ or encourage the use of technological or mechanical advances in overall and stationary source noise impact mitigation, as feasible.

Goal *It shall be the goal of the City of Redondo Beach to:*

10B Ensure that residents, employees, and visitors in the City of Redondo Beach are protected from the adverse human health and environmental impacts of excessive overall (ambient) noise levels, and take all necessary and appropriate action to avoid or mitigate the detrimental affects of such excessive noise level exposure impacts on the community.

Issue <u>OVERALL (AMBIENT) NOISE IMPACTS ON THE COMMUNITY</u>

Objective *It shall be the objective of the City of Redondo Beach to:*

10.3 Prevent and mitigate the adverse impacts of excessive noise exposure on the residents, employees, and visitors of the community.

Policies *It shall be the policy of the City of Redondo Beach to:*

10.3.1 Require new noise-sensitive land uses (including health care facilities and libraries) in areas exposed to existing or projected noise levels exceeding an Ldn of 60 dB(A) exterior, to incorporate effective mitigation measures to reduce interior noise to no more than 45 dB(A).

10.3.2 Implement requirements under Title 24 of the State Building Code to ensure that interior noise levels attributable to exterior sources shall not exceed an Ldn of 45 dB(A) in any habitable room within new hotels, motels, dormitories, long-term care facilities, apartment houses, and dwellings other than detached single-family units.

10.3.3 Develop standards to provide adequate sound insulation for the construction of single-family homes in areas potentially exposed to overall (ambient) noise levels exceeding an Ldn of 60 dB(A). Such insulation standards would be applied unless an acoustical analysis is conducted that shows that overall (ambient) noise levels do not exceed an Ldn of 60 dB(A).

10.3.4 Prohibit the development of new industrial, commercial, or related land uses or the expansion of existing land uses when it can be demonstrated that such new or expanded land uses would be directly responsible for causing overall (ambient) noise levels to exceed an Ldn of 65 dB(A) exterior upon areas containing housing, schools, health care facilities, or other "noise-sensitive" land uses (as determined by the City of Redondo Beach).

10.3.5 Encourage "noise sensitive" land uses, including schools, libraries, health care facilities, and residential uses, to incorporate fences, walls, landscaping, and/or other noise buffers and barriers, where appropriate and feasible to do so.

Issue <u>TRAFFIC-RELATED NOISE IMPACTS</u>

Objective *It shall be the objective of the City of Redondo Beach to:*

10.4 Minimize the adverse impacts of traffic-generated noise on residential and other "noise sensitive" uses.

Policies *It shall be the policy of the City of Redondo Beach to:*

10.4.1 Require that all new non-residential development design and configure on-site ingress and egress points to divert traffic (and its resultant noise) away from "noise sensitive" land uses to the greatest degree practicable, and consistent with applicable safety and planning considerations.

10.4.2 Require that any municipal vehicles or noise-generating mechanical equipment purchased or used by the City of Redondo Beach comply with noise performance standards to the extent feasible.

10.4.3 Encourage local and regional public transit providers to ensure that the equipment they use and operate does not generate excessive noise impacts on the community.

10.4.4 Provide for and encourage the development of alternate transportation modes such as bicycle paths and pedestrian walkways to minimize the number of noise generating automobile trips.

10.4.5 Attempt to reduce traffic generated noise levels in the community through the reduction of vehicular traffic by encouraging both the public and the private sector to implement or participate with others, in implementing transportation demand management (TDM) programs as discussed in Policies 5.4.1 and 5.4.2 of the Transportation

and Circulation element, including but not limited to, consideration of incentives for car pooling, van pools, and the use of public transit.

Issue **NOISE IMPACT ENCROACHMENT OF COMMERCIAL AND INDUSTRIAL LAND USES**

Objective *It shall be the objective of the City of Redondo Beach to:*

10.5 Minimize noise spillover or encroachment from commercial and industrial land uses into adjoining residential neighborhoods or "noise-sensitive" uses.

Policies *It shall be the policy of the City of Redondo Beach to:*

10.5.1 Require that loading and shipping facilities for commercial and industrial land uses abutting residential parcels be located and designed in a manner to minimize the potential noise impacts upon these parcels to the greatest degree practicable.

10.5.2 Require that all parking areas for commercial and industrial land uses abutting residential areas be buffered and shielded by walls, fences, or adequate landscaping.

10.5.3 Require that parking structures serving commercial or industrial land uses be designed to minimize the potential noise impacts of vehicles using these facilities both on site and on adjacent land uses or properties. The design measures used may include: 1) the use of materials which mitigate sound transmission; or 2) the configuration of interior spaces to minimize sound amplification and transmission.

10.5.4 Adopt an ordinance to control the use of leaf blowers, parking lot sweepers, or other high-noise generating commercial/industrial equipment to reduce the potentially adverse noise impacts of such equipment upon adjacent residential areas.

10.5.5 Require that the hours of truck deliveries to commercial or industrial land uses abutting residential uses be limited (within a reasonable period) unless there is no feasible alternative or there are overriding transportation benefits by scheduling deliveries at other hours, to the extent consistent with the adopted County of Los Angeles Congestion Management Plan (CMP), or other applicable County, State, or Federal requirements relative to this subject.

Issue **NOISE IMPACTS OF MIXED-USE STRUCTURES**

Objective *It shall be the objective of the City of Redondo Beach to:*

10.6 Minimize the potentially adverse noise impacts associated with the development of mixed-use structures where residential units are located above ground floor commercial uses (where permitted).

Policies *It shall be the policy of the City of Redondo Beach to:*

10.6.1 Ensure that mixed use buildings are constructed to prevent adverse noise transmission between differing uses or tenants located in the same structures.

10.6.2 Require that mixed-use structures designed for concurrent commercial and residential land uses minimize to the greatest degree practicable (through design and construction techniques or other such technological means as may become available) the transfer or transmission of noise and vibration from the commercial land use to the residential land use.

Issue **CONSTRUCTION NOISE IMPACTS**

Objective *It shall be the objective of the City of Redondo Beach to:*

10.7 Minimize the impacts of construction noise on adjacent uses.

Policies *It shall be the policy of the City of Redondo Beach to:*

10.7.1 Ensure that the prohibitions relative to legal hours of operation for construction activities contained within the existing City of Redondo Noise Ordinance and/or any future/revised Noise Ordinance be adhered to and enforced.

10.7.2 Require that construction activities adjacent to residential land uses and dwelling units be regulated, as necessary, to prevent the generation of adverse and/or excessive noise impacts.

10.7.3 Require that construction activities employ feasible and practical techniques and practices which minimize the generation of adverse and/or excessive noise impacts on adjacent land uses.

Issue **NOISE IMPACTS/ENCROACHMENT WITHIN MULTI-OCCUPANT STRUCTURES**

Objective *It shall be the objective of the City of Redondo Beach to :*

10.8 Ensure that buildings are constructed soundly to prevent adverse noise transmission between differing uses or tenants located in the same commercial structure and individual dwelling units in multi-family residential structures.

Policies *It shall be the policy of the City of Redondo Beach to:*

10.8.1 Enforce the applicable provisions of the Uniform Building Code (UBC) and City of Redondo Beach Municipal Code which prevent the transmission of excessive and unacceptable noise levels between individual tenants and businesses in commercial structures and between individual dwelling units in multi-family residential structures.

Issue **NOISE IMPACTS OF ENTERTAINMENT AND RESTAURANT/BAR LAND USES**

Objective *It shall be the objective of the City of Redondo Beach to:*

10.9 Minimize the generation of excessive noise level impacts and/or spillover from entertainment and restaurant/bar establishments into adjacent residential or "noise sensitive" land uses.

Policies *It shall be the policy of the City of Redondo Beach to:*

10.9.1 Develop local ordinance requirements and/or mandate construction mitigation measures which prohibit noise levels emanating from any entertainment or restaurant/bar use from being audible at a distance of fifty (50) linear feet from the property line of the structure in which it is being conducted or at the property line of any dwelling unit (whichever is more restrictive).

10.9.2 Require that entertainment and restaurant/bar uses take appropriate steps to control the activities of their patrons on-site, as well as within a reasonable and legally justified distance or proximity, to minimize potential noise-related impacts on adjacent residential neighborhoods.

10.9.3 Discourage the development of new nightclubs, discotheques, and other high noise-generating entertainment uses adjacent to any residential neighborhoods, residential dwelling units, schools, health

care facilities, or other "noise sensitive" land uses, unless it can be demonstrated that adequate measures can be installed and employed to adequately mitigate the potential impacts of on-site operations and/or off-site customer access and activities of these establishments upon these areas.

10.9.4 Require that all new nightclubs, discotheques, and other high noise-generating entertainment uses be subject to a conditional use permit, in order to mitigate potential adverse noise impacts.

Issue **NOISE IMPACTS OF RAILROAD USES**

Objective *It shall be the objective of the City of Redondo Beach to:*

10.10 Minimize the noise effect of railroad transit (freight and passenger) on residential uses and other sensitive land uses.

Policies *It shall be the policy of the City of Redondo Beach to:*

10.10.1 Work with railroad operators using facilities that cross through the City of Redondo Beach to properly maintain lines and establish operational restrictions during the early morning and late evening hours to reduce adverse noise impacts in residential areas and other noise sensitive areas.

10.10.2 Work with railroad operators using facilities that cross through the City of Redondo Beach to install noise mitigation features where operations impact existing adjacent residential or other noise-sensitive uses.

Goal *It shall be the goal of the City of Redondo Beach to:*

10C Ensure that residents, employees, and visitors in the City of Redondo Beach are protected from the adverse human health and environmental impacts of excessive noise levels created by stationary noise sources and conditions, and take all necessary and appropriate action to avoid or mitigate the detrimental affects of such excessive noise level exposure impacts on the community.

Issue **ANALYSIS AND MITIGATION OF CITY-WIDE STATIONARY (FIXED-SOURCE) NOISE IMPACTS**

Objective *It shall be the objective of the City of Redondo Beach to:*

10.11 Ensure the conduct of a proper, modern, and site-specific acoustical analysis of any local structure determined (by the City of Redondo Beach) to be a potential generator of significant stationary noise impacts, and ensure that the results or mitigation measures recommended within such analyses are implemented, as feasible.

Policies *It shall be the policy of the City of Redondo Beach to:*

10.11.1 Require an acoustical analyses for any new or expanded land uses determined (by the City of Redondo Beach) to be potential major stationary noise sources. Such studies will be completed and reviewed, with recommended mitigation measures successfully implemented and tested, prior to the issuance of a Certificate of Occupancy for said land use.

(Such studies would be expected to be funded by the respective developer or builder and conducted by the City of Redondo Beach) similar to existing environmental review) to ensure independence and objectivity.)

10.11.2 Encourage major stationary noise generating sources throughout the City of Redondo Beach to voluntarily install additional noise buffering or reduction mechanisms within their facilities to reduce noise generation levels to the lowest extent practicable (as specifically recommended within the May, 1991 City of Redondo Beach Stationary Source Noise and Vibration Measurement and Analysis Report, conducted by Walker, Celano & Associates or any future technical acoustical analyses commissioned by or conducted by the City of Redondo Beach).

10.11.3 Require that major stationary noise generating sources throughout the City of Redondo Beach install additional noise buffering or reduction mechanisms within their facilities to reduce noise generation levels to the lowest extent practicable (as specifically recommended within the May, 1991 City of Redondo Beach Stationary Source Noise and Vibration Measurement and Analysis Report, conducted by Walker, Celano & Associates or any future technical acoustical analyses commissioned by or conducted by the City of Redondo Beach) prior to the renewal of Conditional Use Permits or prior to the approval and/or issuance of new Conditional Use Permits for said facilities.

Issue **STATIONARY NOISE IMPACTS OF SOUTHERN CALIFORNIA EDISON COMPANY PLANT**

Objective *It shall be the objective of the City of Redondo Beach to:*

10.12 Continue to monitor, assess, and mitigate, whenever and however possible, the existing and potential future stationary noise impacts generated by the regional electricity generation plant, owned and operated by the Southern California Edison Company, and located adjacent to North Catalina Avenue in South Redondo Beach.

Policies *It shall be the policy of the City of Redondo Beach to:*

10.12.1 Continue to work proactively (on a formal basis) with the Southern California Edison Company to lessen, mitigate, and eliminate the impacts of normal frequency noise and low frequency noise generated by its electricity generation plant on the community.

(These efforts would be expected to include the installation of additional noise buffering or reduction elements in and around the plant and the intensification of maintenance efforts within the plant to lessen said impacts.)

10.12.2 Adopt appropriate provisions within the City's Noise Ordinance (Chapter 24, Title 4 of the Redondo Beach Municipal Code) to address the impacts of low frequency noise from stationary noise sources.

Issue **STATIONARY NOISE IMPACTS OF POLICE FIRING RANGE**

Objective *It shall be the objective of the City of Redondo Beach to:*

10.13 Continue to monitor, assess, and lessen, whenever and however possible, the existing and potential future stationary noise impacts generated by the Police Firing Range, located adjacent to Dominguez Park.

Policies *It shall be the policy of the City of Redondo Beach to:*

10.13.1 Work closely with the City of Redondo Beach Police Department to conduct an impact study weighing the advantages and disadvantages of any modifications to the Police Firing Range prior to the implementation of any noise reduction measures such as baffles or roofing.

10.13.2 If determined to be feasible and advantageous, pursue funding mechanisms and proposals to construct appropriate sound absorbing baffles and/or roofing above the existing Police Firing Range, to reduce the noise generated by a maximum use of the facility to surrounding overall (ambient) noise levels.

4.2.18 Noise Implementation Programs

The following presents the respective programs which shall be carried out by the City of Redondo Beach (or the indicated designee) to implement the preceding goals, objectives, and policies contained within the Noise Section of the General Plan. Each implementation program is followed by a number or numbers indicating the pertinent policy or policies which it is intended to help implement. Notwithstanding the language in specific implementation measures, action by the City is subject to the availability of funding and staff.

- The City of Redondo Beach shall adopt and enforce an appropriate and legally-adequate revised local Noise Ordinance, to be incorporated within the City of Redondo Beach Municipal Code. Said ordinance shall contain policies and regulations addressing both overall (ambient) and stationary source noise impacts, and shall attempt to address the range and intensity of noise issues addressed within the Noise Section of the General Plan. The revised Ordinance shall be completed and adopted within eighteen (18) months of the adoption of the updated General Plan *(Policy 10.1.1, 10.1.2, 10.3.1, 10.3.2, 10.3.3, 10.3.4, 10.6.1, 10.6.2, 10.7.3, 10.8.1, 10.9.2, 10.9.3, 10.11.3, 10.12.2, 10.13.1, and 10.13.2).*

- Representatives of the City of Redondo Beach Community Development (Planning) Department and the Department of Public Works shall, on an ongoing basis, review available technical and acoustical data and studies conducted in the community, and, as necessary, shall commission the gathering of additional acoustical data and the conduct of additional acoustical analyses, in order to effectively monitor and update existing and future noise levels and impacts in the City of Redondo Beach *(Policy 10.2.1).*

- This noise monitoring and data collection effort shall include assuring the availability to the public of an existing local noise contour map, indicating estimated City-wide Ldn noise levels, which shall be used to determine the geographic areas in the community exposed to existing noise levels which would cause a proposed development or project at a particular site to be subject to the conduct of a specific acoustical analysis detailing the noise conditions and impacts expected to be experienced at such a particular site, as a part of the environmental review and approval process of the development or project *(Policy 10.2.1, 10.3.1, 10.3.2, 10.3.3, 10.3.4).*

- The existing local noise contour map, including the low frequency noise contour map related to the Southern California Edison Plant, shall be updated, as necessary, but not less than evey five years, to ensure the highest possible level of accuracy in the use of this information *(Policy 10.2.1).*

- Based on the results of the above-listed review and monitoring of noise data and materials, the City of Redondo Beach shall require the use of known technological and mechanical noise impact mitigation measures during the existing environmental and development review and approval process. Such measures shall also be listed and included within local building permit applications/information materials distributed to the public *(Policy 10.2.2).*

- Include specific provisions within the revised local Noise Ordinance which requires new noise-sensitive land uses (including health care facilities and libraries) exposed to noise levels exceeding and Ldn of 60dB(A) exterior, to implement mitigation measures within their sites and structures which will reduce interior noise levels to levels no greater than an Ldn of 45dB(A) *(Policy 10.3.1).*

- Include specific provisions within the revised local Noise Ordinance which require that, prior to the issuance of certificates of occupancies and/or certificates of completion, habitable areas within all new hotel, motel, dormitory, long-term care facility, and multi-family dwellings proposed in areas exhibiting existing noise levels of an Ldn of 60 db(A) or greater demonstrate that interior noise levels do not exceed the level of an Ldn of 45dB(A). Facilities which fail to meet this requirement shall be required to install mitigation measures which reduce the interior noise level in these habitable areas to within the 45dB(A) Ldn level, prior to the issuance of certificates of occupancies and/or certificates of completion from the City of Redondo Beach Community Development (Building) Department *(Policy 10.3.2).*

- The City of Redondo Beach Community Development (Building) Department, or designated consultant, shall research and compile an available list of possible structural insulation and/or construction methods which can be used by the proponents of new single family homes proposed to be located in areas exposed to ambient noise levels exceeding an Ldn of 60 db(A) to reduce such noise levels. This list shall be made available and distributed to all individuals proposing or applying for approvals to construct a single family home or homes located within an area of the community which, according to the existing noise contour map, are exposed to ambient noise levels exceeding an Ldn of 60 db(A). Proposed structures would not be subject to the installation of such insulation methods if an appropriate acoustical analysis is submitted to the City of Redondo Beach Community

Development (Building) Department indicating that the site is not exposed to ambient noise levels exceeding an Ldn of 60 db(A) *(Policy 10.3.3).*

- Representatives of the City of Redondo Beach Community Development (Planning) Department shall specifically review proposals for new industrial, commercial, or related land uses, in concert with the existing local planning and environmental review process, to determine the potential impacts of such development on adjacent areas containing housing, schools, health care facilities, or other "noise-sensitive" land uses. Any proposals determined to be directly responsible for causing ambient noise levels in and around these adjacent "noise-sensitive" land uses to exceed an Ldn of 65 db(A) shall be modified, redesigned, or mitigated to reduce these impacts to a level of non-significance; otherwise, such proposed projects shall be prohibited *(Policy 10.3.4).*

- During the existing local planning, design, and environmental review process, all "noise-sensitive" land uses requiring discretionary approvals through the City of Redondo Beach shall be required to minimize the potential noise-related impacts on surrounding structures and occupants *(Policy 10.3.5).*

- During the existing local planning, design, and environmental review process, require that all new non-residential development proposals locate on-site ingress and egress points so as to minimize resultant noise-related impacts on neaby land uses *(Policy 10.4.1).*

- As budgetary and related operational conditions permit, the City of Redondo Beach shall purchase or renovate/maintain vehicles and other noise-generating mechanical equipment which comply with and conform to the latest available noise standards and requirements *(Policy 10.4.2).*

- City of Redondo Beach Department of Public Works staff shall meet, on at least an annual basis, with representatives of the Southern California Rapid Transit District, Torrance Transit, and other local and regional public transit providers to discuss and suggest the impacts of the operation of their vehicles on local noise conditions; feasible mitigation measures shall be suggested, requested, and implemented, as feasible, to reduce such impacts *(Policy 10.4.3).*

- All feasible policies and programs contained within the Transportation and Circulation Section of the General Plan relative to the further development and use of bicycle and pedestrian facilities as alternative modes of transportation shall be fully implemented, in order to reduce and minimize future noise-generating automobile trips *(Policy 10.4.4).*

- All feasible policies and programs contained within the Transportation and Circulation Section of the General Plan relative to transportation demand management (TDM) programs shall be implemented, in order to reduce traffic and associated noise levels in the community *(Policy 10.4.5).*

- During the existing local planning, design, and environmental review process, require that all new commercial and industrial loading and shipping facilities abutting residential areas be located and designed as such to minimize potential noise impacts on residential uses. For commercial and industrial projects relating to renovation of existing buildings, incorporate mitigation measures, as feasible, to minimize noise impacts on residential uses from loading and shipping facilities *(Policy 10.5.1.*

- During the existing local planning, design, and environmental review process, require that all new commercial and industrial parking areas abutting residential areas and all new parking structures be buffered and shielded by fences, walls, landscaping, or other design measures, and be designed internally in a fashion which would minimize potential noise impacts on residential uses *(Policy 10.5.2, and 10.5.3).*

- Ensure that the revised City of Redondo Beach Noise Ordinance contain provisions which specifically address and sufficiently regulate or limit: 1) the use of leaf blowers, parking lot sweepers, and other high noise-generating equipment; and 2) the hours of truck deliveries to commercial or industrial land uses abutting residential areas, to reduce their potential impacts upon local residential land uses *(Policy 10.5.4 and 10.5.5).*

- During the existing local planning, design, and environmental review process, ensure that commercial land uses proposed to be located below residential uses within mixed-use structures not be overly noise-intensive, and require that (through the implementation of design and construction measures and/or other means of mitigation) the transfer of noise and vibration from the commercial uses to the residential uses be minimized to the furthest extent practicable *(Policy 10.6.1 and 10.6.2).*

- Ensure that the revised City of Redondo Beach Noise Ordinance contain provisions which specifically address: 1) regulating and/or limiting the legally permitted hours of construction activities (particularly those occurring within or in close proximity to residential uses; and 2) require that operational techniques and practices be employed during construction activities to minimize the generation of adverse and/or excessive noise on adjacent land uses *(Policy 10.7.1, 10.7.2, and 10.7.3).*

- During the existing local planning, design, and environmental review process and the existing local building inspection process, ensure that all

applicable provisions of the Uniform Building Code and Redondo Beach Municipal Code which prevent and mitigate the transmission of excessive and unacceptable noise levels between tenants and businesses in commercial structures and between individual dwelling units within multi-family residential structures be adequately enforced *(Policy 10.8.1).*

- Ensure that the revised City of Redondo Beach Noise Ordinance contain provisions which specifically require that all local entertainment and restaurant/bar land uses, through the discretionary development approval process, include measures to limit the audibility of noise levels emanating from their establishments from the ambient noise level at distances of fifty (50) feet from the property line of the establishment *(Policy 10.9.1).*

- Require, through the imposition of discretionary development approval conditions and police enforcement, that all local entertainment and restaurant/bar land uses take appropriate measures to control and limit the activities and noise of patrons in and around their facilities, in order to reduce potential noise-related impacts on surrounding local residential areas *(Policy 10.9.2).*

- Ensure that the revised Redondo Beach Municipal Code require all proposed entertainment and restaurant/bar land uses to be subject to the local conditional use permit review and approval process, in addition to any and all other applicable development, design, and environmental reviews and approvals, to ensure that noise-related issues are specifically and adequately addressed. Through this process, locating such facilities adjacent to "noise-sensitive" land uses shall be discouraged or prohibited, unless it can be demonstrated that the potential noise-related impacts of the project can be mitigated to a level of non-significance *(Policy 10.9.3 and 10.9.4).*

- City of Redondo Beach Department of Public Works staff shall, on an ongoing basis, review local railroad operations and procedures to monitor potential noise-related impacts of these operations on the community. As necessary, staff shall meet with railroad operator officials to discuss operations and suggest or require (if possible) noise mitigation measures which would reduce the noise-related impacts of railroad operations on the community *(Policy 10.10.1 and 10.10.2).*

- Based on the results of the local Initial Study and Environmental Checklist process completed by the City of Redondo Beach Community Development (Planning) Department, all proposed new or expanded land uses determined to be potential major stationary noise sources, must fund and complete a specific acoustical analysis to identify, determine, and analyze potential noise impacts and propose appropriate mitigation measures which will reduce these potential noise-related impacts to a level of non-significance. Said

mitigation measures must be installed and tested prior to the issuance of a Certificate of Occupancy for the structure by the City of Redondo Beach Building Department. (Such analyses will be conducted in a manner similar to the environmental impact review process overseen by the City of Redondo Beach to assure independence and objectivity of the findings.) *(Policy 10.11.2).*

- During the existing local planning, design, and environmental review process and the existing local building inspection process, encourage major stationary noise generating sources to install additional noise buffering or reduction techniques to reduce noise generation levels in and around their facilities. The installation of such measures shall be required prior to the renewal of an existing Conditional Use Permit or prior to the issuance of a new Conditional Use Permit *(Policy 10.11.2 and 10.11.3).*

- City of Redondo Beach Community Development (Planning) Department staff and Department of Public Works staff representatives shall continue to actively monitor the performance and impacts of the existing Southern California Edison Company Power Plant related to noise generation, and shall meet and work with Southern California Edison Company officials on a regular basis, to suggest (and/or require where possible) the installation of additional mitigation measures and or operational regulations which will further lessen or eliminate the impacts of audible frequency noise and low frequency noise on the community *(Policy 10.12.1).*

- City of Redondo Beach Community Development (Planning) Department staff representatives shall meet and work with City of Redondo Beach Police Department officials to carry out an impact study weighing the potential advantages and disadvantages of making any physical or structural modifications to the existing Police Firing Range. If determined to be financial and structurally feasible and in the best interest of the City of Redondo Beach Police Department and the public, appropriate sound absorbing baffles and/or roofing shall be installed in the existing Police Firing Range, to reduce the noise-related impacts of operation of the facility. Said impact study shall be completed within eighteen (18) months of adoption of the updated General Plan *(Policy 10.13.1 and 10.13.2).*

SECTION 4.3

Flooding Hazards

4.3 FLOODING HAZARDS

Significant and far-reaching portions of the Los Angeles Basin (including the City of Redondo Beach) have experienced flooding events during historic times. Some of the more notable flood events occurred in the early 1800's, when the Los Angeles River would periodically shift its course/direction and eventual discharge point into the Pacific Ocean, alternating between the Santa Monica Bay area and the San Pedro/Long Beach Harbor areas. Specific major regional-scale flooding events have occurred in the Los Angeles basin on at least five occasions, including during the winters of 1938, 1943, 1952, 1956, 1959, 1969, 1977, and 1983.

Concrete channelization of the major rivers and drainages in the region and the installation of additional modern flood control and prevention improvements (primarily through the Los Angeles Department of Public Works Flood Control Division and Army Corps of Engineers) have reduced the potential for and occurrences of regional-scale flooding substantially over time. The same trend has occurred in the local area due to improvements constructed by the City of Redondo Beach Department of Public Works, Los Angeles County Department of Public Works Food Control Division, and the Army Corps of Engineers.

Flooding hazards in a given individual community are directly related to a number of individual factors, including: 1) the intensity and duration of precipitation; 2) existing regional and local hydrological, geographic, and topographic features; 3) the type and extent of local impermeable ground surfaces and vegetation cover; and 4) existing local drainage and flood control and prevention improvements.

4.3.1 Local Precipitation Characteristics

Despite continuing natural deviations due to alternating drought and wet periods, the overall intensity and duration of rainfall in the region (and community) have not changed substantially from historic times to the present. The average annual rainfall recorded for the South Bay area of the Los Angeles Basin for the thirty year period from 1959 to 1989 was 11.85 inches.

In the seven year period since July of 1984, the City of Redondo Beach Department of Public Works has recorded an average annual total of approximately 9.32 inches of rainfall in the local area (approximately 20 percent below the 30 year "normal" average), ranging from a high of 16.2 inches (from July, 1985 to July, 1986) to a low of 5.25 inches (from July, 1989 to July, 1990). This local total has averaged only 6.86 inches per year from July, 1988 to July, 1991 (more than 25 percent lower than even the below normal seven year average). The trend reflected in this data is indicative of the severe drought conditions experienced in the southern California region during the last five year period.

4.3.2 Regional Drainage/Flood Control Features

Although the southern half of the City of Redondo Beach, is, in general, located in a relatively low-lying coastal area, it is not a major regional drainage or outfall area. Major drainages of the region (all three of which have been channelized by the Army Corps of Engineers and the Los Angeles County Department of Public Works Flood Control Division):

(1) The Los Angeles River, whose headwaters are located in the foothills of the San Fernando Valley (due northwest of the Sepulveda Dam), approximately 32 miles northwest of the City of Redondo Beach. The river flows in a south/southeasterly direction through the center of the Los Angeles Basin, passes by the City of Redondo Beach approximately eight miles due east of the Civic Center, between the Cities of Carson and Long Beach, and terminates and discharges into San Pedro Bay and the Pacific Ocean in the City of Long Beach, approximately 12 miles southeast of the City of Redondo Beach Civic Center;

(2) The Rio Hondo River, whose headwaters are located in the City of Rosemead (due north of the Whittier Narrows Dam), approximately 20 miles northeast of the City of Redondo Beach Civic Center. The river flows in a south/southwesterly direction, terminating and discharging into the Los Angeles River near the City of Lynwood, approximately 15 miles northeast of the City of Redondo Beach Civic Center.

(3) The San Gabriel River, whose headwaters are located in the foothills of the San Gabriel Mountains north of City of Glendale (north of the Santa Fe Dam), approximately 30 miles northeast of the City of Redondo Beach. The river flows in a south/southwesterly direction, (a portion of which is diverted to and discharges into the Rio Hondo River at the Whittier Narrows Dam), and continues flowing south, terminating and discharging into the Pacific Ocean on the eastern side of the City of Long Beach, approximately 18 miles southeast of the City of Redondo Beach Civic Center.

In addition to these "primary" regional drainages of the Los Angeles Basin, the southern Los Angeles area and South Bay region storm drainage/flood control network includes a series of three large "secondary" drainages (these have also all been channelized (at least partially) by the Army Corps of Engineers and the Los Angeles County Department of Public Works Flood Control Division.

(1) The Dominguez Channel, which originates in the City of Hawthorne (due north of the Hawthorne Municipal Airport and east of the San Diego [405] Freeway) approximately five miles northeast of the City of Redondo Beach Civic Center.

The channel flows in a south/southeasterly direction past the Dominguez Hills (essentially following the path of the San Diego [405] Freeway) through the Cities of Lawndale, Torrance, and Carson (approximately six miles due east of the City of Redondo Beach Civic Center), and turns due south approximately one mile west of the Long Beach (710) Freeway, running through the Wilmington District of the City of Los Angeles, terminating and discharging into Los Angeles Harbor/San Pedro Bay and the Pacific Ocean, approximately two miles east of the outfall of the Los Angeles River.

As detailed in Section 3.2 of this document, the majority of the existing storm drainage system of North Redondo Beach flows and drains into the Dominguez Channel as its primary means of storm drainage to the ocean.

(2) The Ballona Creek, which originates near the Mid-Wilshire District of the City of Los Angeles (due northeast of the intersection of La Cienega Boulevard and the Santa Monica (10) Freeway) approximately 18 miles northeast of the City of Redondo Beach Civic Center.

The channel flows in a south/southwesterly direction through the City of Culver City (essentially following the path of Jefferson Boulevard), turns due west through the Westchester District of the City of Los Angeles (due north of Jefferson Boulevard and the Hughes Airport), terminating and discharging into the Pacific Ocean at Dockweiler State Beach (due north of Playa del Ray and due south of Marina del Ray), approximately eight miles northwest of the City of Redondo Beach Civic Center.

(3) The Compton Creek, which originates due west of the Watts area of the City of Los Angeles (due northeast of the intersection of Imperial Highway and the Harbor (110) Freeway) approximately eight miles northeast of the City of Redondo Beach Civic Center.

The channel flows in a south/southeasterly direction through the City of Compton, crosses due southwest of the intersection of Alameda Street and the Artesia (91) Freeway, continues southeasterly throughout the northern tips of the Cities of Carson and Long Beach, terminating and discharging into the Los Angeles River north of intersection of the Long Beach (710) Freeway and San Diego (405) Freeway, approximately ten miles due east of the City of Redondo Beach Civic Center.

4.3.3 Local Flood Hazard Potential

In general, due to the reasons described below, the geographic and topographic features of the City of Redondo Beach related to drainage and flooding differ sharply between North Redondo Beach and South Redondo Beach.

The entirety of North Redondo Beach is located further inland of and in general at a higher elevation than South Redondo Beach and the lower-lying coastal areas of the community. The area also is virtually entirely developed and covered with impermeable surfaces (i.e., buildings, asphalt, concrete) or vegetation cover, causing a relatively high and efficient rate of natural drainage and runoff into the storm drainage system. Primarily for these reasons, this portion of the community (excluding the few unique and specific exceptions detailed below), is not impacted by regional, coastal-related, or major local flooding.

The eastern portion of South Redondo Beach and the western central portions of South Redondo Beach essentially sit up on a "bluff" elevated well above the lower-lying coastal area located on the west side of Pacific Coast Highway. These areas are also virtually entirely developed and covered with impermeable surfaces or vegetation, causing a relatively high and efficient rate of natural drainage and runoff into the storm drainage system. For these reasons, these areas of the community (excluding the few unique and specific exceptions detailed below) are also less susceptible to regional, coastal-related, or major local flooding.

The northwestern and southwestern portions of South Redondo Beach (particularly the harbor and basin areas and beach areas) are lower-lying areas located in direct proximity to the coast and Pacific Ocean. For these reasons, as one can logically conclude, these areas are more exposed, and are substantially more susceptible to potential impacts related to regional, coastal-related, and major local flooding.

4.3.4 Local Flood Control/Prevention Features

For the most part, all areas in the City of Redondo Beach (particularly those most susceptible to flooding) are well served by the existing local storm drainage network. The network is a cooperative, multi-jurisdictional system, partially maintained by the City of Redondo Beach Public Works Department and partially maintained by the Los Angeles County Department of Public Works Flood Control District.

In general, the system is comprised of a series of catch basins and sumps (which either through gravity or forced pumping) direct excess runoff and storm water into the network of storm drain pipes located below the local streets. These pipes carry and discharge the water into the Dominguez Channel or into the Pacific Ocean through one of the thirteen local outfalls located along the southwestern shoreline of the City.

The specific details of the features and function of the local storm drainage system, and descriptions of future proposed improvements to the system, are described in Section 3.2 of this document.

In addition to the inland storm drainage system, the harbor and harbor basin area of the City (located in the northwestern area of South Redondo Beach and including the various marinas located in the City) are protected from coastal flooding and damage related to storm-generated flooding by a large rock/stone material rip-rap breakwater wall.

The breakwater extends out like a large arm extending out to the west due south of the terminus of Herondo Street, and curving to the south approximately 3,000 linear feet (over one half of a mile), serving as a protective wall between the open and exposed portions of Santa Monica Bay and the Pacific Ocean and the structures, areas, and boats located in the northern coastal area of the City.

In the 1930's a small breakwater facility was installed to protect the harbor area from flooding and storm-related damage. In the mid 1950's the existing large breakwater facility (at a height of 14 feet above the mean low water level) was constructed; in 1963 portions of the facility were elevated to a height of 20 feet above the mean low water level. There is also a project currently underway between the City of Redondo Beach and the Army Corps of Engineers to elevate the height level of the remainder of the existing breakwater to 20 feet above the mean low water level, to extend the southern portion of the breakwater approximately 150 linear feet, and to raise the southern portion of the breakwater to a height of 16 feet above the mean low water level. These improvements will further enhance the ability of the breakwater to protect the harbor area from flooding and storm-related damage.

Prior to any of this protection, significant damage had occurred to a number of major structures and areas of the harbor. Even recently (within the last five years), particularly violent weather systems have caused storm-related damage to the Portofino Inn and the Municipal Pier structures.

The roadways and structures along Harbor Drive and the Esplanade, located due east of the public beach area extending almost the entire length of South Redondo Beach, are also protected from coastal-related damage and flooding. These areas are elevated approximately eight feet above the level of the beach area, and are further protected by a concrete block retaining wall running along the length of the Esplanade.

4.3.5 Local Flood Hazard Ratings

The Federal Emergency Management Agency (FEMA), under the Federal Insurance Administration, has qualitatively rated and mapped the potential for flooding within the City of Redondo Beach as part of the National Flood Insurance Program (Community Panel Reference Numbers 060150-6002-B and 060150-0001-B, effective date September 15, 1983). Under the program all areas of the community are placed within one of ten different categories signifying their potential for flooding during a given increment of time (years).

These maps, used to determine official flood insurance requirements and rates, do not indicate all areas ever subject to possible flooding, but are the best (i.e., most accurate) and most official (and accepted) source for discussion and analysis of this subject. The ten ratings and their accompanying map symbols are summarized as follows, from best to worst, including:

(1) areas of minimal flooding [symbol C];

(2) areas of undetermined, but possible flood hazards [symbol D];

(3) areas between the expected limits of minimal flooding (from only a 500 year storm event) and the areas within the expected limits of flooding resulting from a 100 year storm event (i.e., based on historic trends and data, has the probability of occurring once approximately every 100 years) [symbol B];

(4) areas within the expected limits of flooding resulting from a 100 year storm event to be protected by a flood protection system under construction [symbol A99];

(5) areas within the expected limits of coastal flooding with velocity (i.e., wave action) resulting from a 100 year storm event, with flood elevations and hazards not determined [symbol V];

(6) areas within the expected limits of coastal flooding with velocity (i.e., wave action) resulting from a 100 year storm event, with flood elevations and hazards determined [symbol V1-V30];

(7) areas within the expected limits of flooding resulting from a 100 year storm event, with flood elevations and hazards determined [symbol A1-A30];

(8) areas within the expected limits of shallow flooding (i.e., depths between 1 to 3 feet) resulting from a 100 year storm event, with flood elevations determined but no flood hazards determined [symbol AH];

(9) areas within the expected limits of shallow flooding (i.e., depths between 1 to 3 feet) resulting from a 100 year storm event, with average depths of flood inundation determined but no flood hazards determined [symbol AO]; and

(10) areas within the expected limits of flooding resulting from a 100 year storm event, with flood elevations and hazards not determined [symbol A].

The various flood hazard ratings applicable in the City of Redondo Beach are detailed below. The vast majority of the City of Redondo Beach (in both North Redondo Beach and South Redondo Beach) have been rated in the (C) category, and are subject to minimal or no flooding.

North Redondo Beach

A total of seven small and isolated areas in North Redondo Beach have been rated as subject to greater than minimal flooding, and have been designated with one of the nine substantive flood hazard ratings.

Five of these seven areas have been rated in the (B) category (i.e., areas between the expected limits of minimal flooding (from only a 500 year storm event) and the areas within the expected limits of flooding resulting from a 100 year storm event (i.e., based on historic trends and available data, has the probability of occurring once approximately every 100 years).

These areas include: 1) a small, low-lying, rectangular-shaped area within the North Redondo industrial area, located due north of the intersection of Marina Avenue and Aviation Boulevard; 2) a small, low-lying, oval-shaped area located due northwest of the intersection of Inglewood Avenue and Manhattan Beach Boulevard; 3) a small, low-lying, linear/oval-shaped area within the turfed Southern California Edison transmission corridor right-of-way, located east of Dow Avenue, between Manhattan Beach Boulevard and Beland Boulevard; 4) a small, low-lying, circular-shaped area located along the public right-of-way and residential area along Carnegie Lane, between Blossom Lane (to the east) and Green Lane (to the west); and 5) a small, low-lying, oval-shaped area located within the California Water Service Company Reservoir #10 property (to the rear of the former Andrews School property), located due west of Aviation Way and due north of Rockefeller Lane.

Two of these seven areas have been rated in the (A1 to A30) category (i.e., areas within the expected limits of flooding resulting from a 100 year storm event, with flood elevations and hazards determined.

These areas include: 1) a small, low-lying, triangular-shaped area in a single family residential area, located due northwest of the intersection of Ripley Avenue and Rindge Lane; and 2) a small, low-lying, trapezoidal-shaped area (one of the five existing and aforementioned drainage sumps), located due south of the intersection of Aviation Boulevard and Artesia Boulevard, between Ford Avenue and Goodman Avenue.

South Redondo Beach

A total of five small and more isolated areas and three larger and more prominent areas in South Redondo Beach have been rated as subject to greater than minimal flooding, and have been designated with one of the nine substantive flood hazard ratings. The five smaller and more isolated areas include:

(1) A small, low-lying, and rectangular-shaped area (within the Southern California Edison transmission corridor right-of-way now being used as a commercial plant nursery), located due south of Anita Street, between Harkness Lane, to the east, and Goodman Avenue, to the west. This area is rated in the (B) category (i.e., areas between the expected limits of minimal flooding (from only a 500 year storm event) and the areas within the expected limits of flooding resulting from a 100 year storm event (i.e., based on historic trends and data, has the probability of occurring once approximately every 100 years).

(2) A small, low-lying, circular-shaped area (one of the five aforementioned drainage sumps), in the center of the Redondo Beach Union High School athletic fields), located due east of Helberta Avenue, between Del Amo Street, to the north, and Vincent Street, to the south. The center of the area is rated in the (A1-A30) category (i.e., areas within the expected limits of flooding resulting from a 100 year storm event, with flood elevations and hazards determined).

The outer ring of the area is rated in the (B) category, (i.e., areas between the expected limits of minimal flooding (from only a 500 year storm event) and the areas within the expected limits of flooding resulting from a 100 year storm event (i.e., based on historic trends and data, has the probability of occurring once approximately every 100 years).

This area is the focus of major storm drainage improvements that are currently planned by the County of Los Angeles Department of Public Works Flood Control Division under the Vincent Street Drain Project (for details of these planned improvements, please see Section 3.2 of this document).

(3) A small, low-lying, oval-shaped area (along the South Irena Avenue right of way and adjoining residential area), located between Vincent Street, to the north, and Spencer Street, to the south. The area within the right of way is rated in the (A1-A30) category (i.e., areas within the expected limits of flooding resulting from a 100 year storm event, with flood elevations and hazards determined). The area within the residential portion is rated in the (B) category, (i.e., areas between the expected limits of minimal flooding (from only a 500 year storm event) and the areas within the expected limits of flooding resulting from a 100 year storm event (i.e., based on historic trends and data, has the probability of occurring once approximately every 100 years).

This area will also be served by the major storm drainage improvements that are currently planned by the County of Los Angeles Department of Public Works Flood Control Division under the Vincent Street Drain Project (for details of these planned improvements, please see Section 3.2 of this document).

(4) A small, low-lying, rectangular-shaped area (within the southern half of Alta Vista Park), located due southeast of the intersection of Camino Real and Juanita Avenue. The northern three-quarters of the area is rated in the (A1-A30) category (i.e., areas within the expected limits of flooding resulting from a 100 year storm event, with flood elevations and hazards determined).

The southern one-quarter of the area is rated in the (B) category, (i.e., areas between the expected limits of minimal flooding (from only a 500 year storm event) and the areas within the expected limits of flooding resulting from a 100 year storm event (i.e., based on historic trends and data, has the probability of occurring once approximately every 100 years).

(5) A small, low-lying, oval-shaped area (one of the five aforementioned drainage sumps [the Avenue "H" Sump]), located due southeast of the intersection of Avenue H and Massena Avenue. This area is rated in the (A1-A30) category (i.e., areas within the expected limits of flooding resulting from a 100 year storm event, with flood elevations and hazards determined).

This area is the focus of major storm drainage improvements that are currently planned by the County of Los Angeles Department of Public Works Flood Control Division under the Doris Coast Pump Station Project (for details of these planned improvements, please see Section 3.2 of this document).

The three larger and more prominent areas of potential flood hazard in South Redondo Beach include:

(1) A large, extremely low-lying, rectangular-shaped area at the far southwestern corner of the City (including the beach and waterfront area), located due west of the Esplanade, between Avenue "I", to the north, and the City of Torrance municipal boundary, to the south. This area is subject to coastal storm and wave action impacts related to the geographic function of the Palos Verdes Peninsula, and is rated in the (V) category, (i.e., areas within the expected limits of coastal flooding with velocity (i.e., wave action) resulting from a 100 year storm event, with flood elevations and hazards not determined;

(2) A large, low-lying, linear/rectangular-shaped area at the far southern end of the City (including the Avenue "I" right-of-way and commercial parcels directly on the north and south sides of the right-of-way, between South Elena Avenue, to the east, and the Esplanade, to the west. This area is rated in the (B) category, (i.e., areas between the expected limits of minimal flooding (from only a 500 year storm event) and the areas within the expected limits of flooding resulting from a 100 year storm event (i.e., based on historic trends and data, has the probability of occurring once approximately every 100 years).

Drainage capacity in this area will be improved by major storm drainage improvements that are currently planned by the County of Los Angeles Department of Public Works Flood Control Division under the Knob Hill Coast Drain Project (for details of these planned improvements, please see Section 3.2 of this document.

(3) A large and generally oval-shaped area including: a) the entirety of the harbor and harbor basin bulkhead areas within the existing breakwater closest to the water's edge; b) the harbor basin areas themselves; c) the area of the location of the Municipal Pier; d) the breakwater itself; and e) the water areas directly outside the breakwater. All of these areas are also subject to greater than minimal flooding hazard, and are rated as follows:

- The bulkhead areas or walls directly at the water's edge along the entire outline of the harbor land mass between the City of Hermosa Beach boundary, to the north, to the southern end of Harbor Basin #3, to the south, and the entire inside edge of the breakwater itself are rated in the (B) category, (i.e., areas between the expected limits of minimal flooding (from only a 500 year storm event) and the areas within the expected limits of flooding resulting from a 100 year storm event (i.e., based on historic trends and data, has the probability of occurring once approximately every 100 years):

- The entirety of each of the Harbor Basins and water area within the boundary of the breakwater itself, the outer edge of the breakwater itself, and the land area directly at the water's edge below the remaining structure of the Municipal Pier (not the portion supported on piles) are rated in the (A1-A30) category, (i.e., areas within the expected limits of flooding resulting from a 100 year storm event, with flood elevations and hazards determined; and

- The area below the remaining structure of the Municipal Pier supported by piles and the water area directly outside the breakwater along the entirety of its length are rated in the (V1-V30) category, (i.e., areas within the expected limits of coastal flooding with velocity (i.e., wave action) resulting from a 100 year storm event, with flood elevations and hazards determined.

As previously mentioned, flood protection capabilities in the harbor area as a whole, will be incrementally improved by the project currently underway between the City of Redondo Beach and the United States Army Corps of Engineers to raise the height level of the existing breakwater facility.

4.3.6 Summary

The combination of the relatively favorable topographical, meteorological, and high ground coverage/low permeability characteristics of the local area, the lack of a major regional-scale drainage terminating and discharging in the local area, and the substantial amount of local storm drainage improvements (both existing and proposed) in the community make the City of Redondo Beach a comparably low hazard area relative to flooding hazard, despite the City's overall coastal location and low-lying nature.

The drainage capacity of the primary inland areas of higher flood hazard potential in the community (the majority of which are existing low-lying and underimproved drainage sumps) will soon be enhanced through proposed capital improvements projects. The flood hazard and storm-damage related potential of the harbor area will also be substantially reduced through a capital improvement project to be undertaken later this year by the City of Redondo Beach and Army Corps of Engineers.

4.3.7 Goals, Objectives, Policies, and Implementation Programs

Because of the different types of potential flooding hazard and the related nature and degree of overlap between these types of flooding hazards and other specific topic areas of the General Plan, the goals, objectives, policies, and implementation programs related to flooding hazards have been included within the appropriate specific topic areas of the document, as follows:

- Precipitation and drainage-related flooding hazard goals, objectives, policies, and implementation programs have been included within the storm drainage portion of the Utilities Section (Section 3.2 of this document).

- Tsunami and seismic-related flooding hazard goals, objectives, policies, and implementation programs have been included within the tsunami portion of the Geologic/Seismic Hazards Section (Section 4.1 of this document).

- Evacuation or emergency response goals, objectives, policies, and implementation programs related to flooding hazards have been included within the emergency operations portion of the Fire Hazards Section (Section 4.5 of this document).

SECTION 4.4

Toxic Wastes and Materials

4.4 TOXIC WASTES & MATERIALS

4.4.1 Statutory Requirements

The preparation of hazardous waste management plans, and the siting of hazardous waste facilities in the State of California are governed by and subject to the terms and provisions of the Tanner Act (Assembly Bill 2948, approved in September of 1986). The Tanner Act authorizes and mandates each county to adopt a Hazardous Waste Management Plan pursuant to specified guidelines by September of 1988.

Previous law required hazardous materials planning to be addressed within the Solid Waste Management Plan, the hazardous waste portion of which was subject to review by the California Department of Health Services (DOHS). The Tanner Act also prohibits the establishment or expansion of any facility which treats or disposes of hazardous materials, unless the City or County with jurisdiction determines consistency with the County Hazardous Waste Management Plan (Office of Planning and Research, 1987).

4.4.2 Analysis

Hazardous waste falls into four general categories of materials that have some distinct characteristics in the different types of danger they present. These include materials that are either:) toxic; 2) explosive; 3) reactive; or 4) corrosive. To be in accordance with the terms and provisions of the Tanner Act, respective local or regional hazardous waste management plans need to include provisions for the following:

1) Planning process for waste management
2) Permit process for new and expanded facilities
3) Appeal process to the state for certain local decisions

The Tanner Act also requires that local or regional waste management plans address the following specific issues:

1) Analysis of current hazardous waste streams, treatment and disposal facilities availability and estimates of expected rates of generation until 1994;

2) Analysis of the potential for hazardous waste reduction;

3) Consideration of need to manage small volumes of hazardous waste from businesses and households;

4) Determination of need for additional hazardous waste disposal facilities;

5) Identification of specific sites for additional hazardous waste facilities or identification of siting criteria for locating additional hazardous waste facilities; and

6) Formation of goals, objectives and policies for hazardous waste facilities and hazardous waste management through the year 2000. Additionally, a county may include other elements in the plan such as a description of local programs for public education, enforcement, surveillance, transportation and administration.

The present Los Angeles County Hazardous Waste Management Plan was approved by the City of Redondo Beach City Council on February 21, 1989. To meet state law, the City adopted an ordinance requiring that any approval of an off-site hazardous waste facility meet the minimum siting criteria established under the County Plan. The Los Angeles County Hazardous Waste Management Plan is still under review by the State Department of Health Services.

Hazardous Waste Operations

Under the federal Resource Conservation and Recovery Act (RCRA), permits are required for the generation, storage, treatment or disposal of hazardous wastes. Activities which require permits range from the use of solvents and flammable material in the ordinary repair of automobiles to the treatment or handling of hazardous wastes in large quantities over prolonged periods of time.

Permits issued to generators of hazardous wastes can be of three types or grades depending upon the amount of wastes produced each month. A special permit is required for the transport of hazardous wastes.

Operations which involve the treatment of hazardous wastes or storage over long periods of time (more than 90 days) require the issuance of a Treatment, Storage and Disposal permit (TSD permit) under the Resource Conservation and Recovery Act (RCRA). An Interim Status Document (ISD) is a permit which allows facilities to operate until formal hazardous waste permits are issued.

A number of hazardous or potentially hazardous waste sites are located in the City of Redondo Beach (the sites and locations are available through the City Department of Public Works or the State Department of Health Services). Inclusion in this category only indicates the presence or potential of hazards on these sites, and does not suggest any willful neglect or illegal activity on the part of the parties identified. The type of the potential hazards (e.g., fire, explosion, groundwater, ocean or human contamination) are also detailed in this information. A number of these sites have leaking underground gasoline tanks, a few have toxic settling ponds with leaching of acids and metals. Other potential local contaminants are undetermined at this

time. Remedial action is presently planned through the Environmental Protection Agency Superfund at Microtonics Inc.

In addition, facilities which have permits to generate, transport, store, treat or dispose of hazardous substances are shown in the appended list (**Table 53**). The list does not, however, make any judgments or conclusions relative to compliance or non-compliance of the respective facilities with applicable laws and regulations. These lists have been compiled from the CERCLIS (Comprehensive Environmental Response Compensation and Liability Information System), the Resource Conservation and Recovery Act (RCRA) listing of the Environmental Protection Agency, as well as listings of the Department of Health Services and the Regional Water Quality Control Board.

Emergency Response

Each generator of hazardous waste is required by state and federal laws to form an emergency plan called a "Business Plan," and to send a copy to the local Fire Department. This plan must contain a site plan showing the location of the such substances, a detailed list of hazardous substances, a description of the evacuation emergency routes, and a training plan for employees. The County and the City have developed an area-wide response plan.

Short-term response to accidents caused by hazardous substances (e.g., fire, explosions, spills) is provided by the local Fire Department. The Fire Department maintains protective equipment required by the Occupational Safety and Health Administration (OSHA) for most dangerous situations. If special expertise is needed, assistance is provided by the Hazardous Material Teams of the County Health Department and the Los Angeles County Fire Department.

The Hazardous Material Team of the Los Angeles County Health Department responds on demand when they are called by other agencies. They help in the identification and location of hazardous materials, oversee the clean up activities and make sure that they are done according to the regulations. This team has only up to "level B" protection equipment and some monitoring equipment. The Los Angeles County Fire Department Hazardous Materials Team provides up to "level A" protection for mitigating the most severe chemical hazards. The City Police Department might be involved on the scene for traffic regulations. Both the Fire Department and Hazardous Material Control Program of the County Health Department also play a role in identifying suspect hazardous waste sites or illegal dumping of hazardous substances.

TABLE 53

Permitted Local Users of Hazardous Materials

	Facility	Permit(*)
Southern Redondo Beach (90277)		
1.	Beach Cleaners 306 S. Catalina	Generator 1
2.	Century Cleaners 223 Palos Verdes Blvd.	Generator 1
3.	Gordon Body Shop 638 Torrance Blvd.	Generator 2
4.	Oakley Cleaners 1408 S. Pacific Coast Highway	Generator 1
5.	Pacific Cleaners and Laundry 1306 S. Pacific Coast Highway	Generator 2
6.	Parisian Cleaners 400 Diamond Street	Generator 1
7.	Richway Cleaners 443 N. Francisca	Generator 1
8.	Sea Breeze Cleaners 443 N. Francisca	Generator 2
9.	So California Edison 1100 Harbor Drive	Generator 1
10.	Thrifty Clean 1000 Torrance Blvd.	Generator 2

* Generator 1: >1,000 kg/month of non-acutely hazardous wastes or > kg/month of acutely hazardous wastes.
Generator 2: 100–1,000 kg of non-acutely hazardous wastes.
Generator 3: <100 kg of non-acutely hazardous wastes.

TSD categories: refer to permit status, where the facility is in the permit process.

TABLE 53 (Cont.)

	Facility	Permit(**)
11.	Vermonicas Cleaners 633 N. Pacific Coast Highway	Generator 3
12.	Wardrobe Cleaners 126 N. Catalina	Generator 1
13.	West Oaks Cleaners 541A N. Pacific Coast Highway	Generator 2
14.	Woodstock Furniture Inc. 800 Torrance Blvd., #110	Generator 3
Northern Redondo Beach (90278)		
15.	B &B Drapery Service 575 Mary Ann Drive	Generator 1
16.	Bay Distributors 2420 Santa Fe Avenue	Generator 2
17.	Expert Cleaner 2606 Artesia Blvd.	Generator 2
18.	Klean Rite Cleaners 2299 W. 190 Street	Generator 3
19.	TRW Inc. 4030 Freeman Blvd.	Generator 1 Transportation
20.	Redondo Auto Body Shop 620 Mary Ann Drive	Generator 1

** Generator 1: >1,000 kg/month of non-acutely hazardous wastes or > kg/month of acutely hazardous wastes.
Generator 2: 100–1,000 kg of non-acutely hazardous wastes.
Generator 3: <100 kg of non-acutely hazardous wastes.

TSD categories: refer to permit status, where the facility is in the permit process.

TABLE 53 (Cont.)

	Facility	Permit(***)
21.	So Ca Gas Co 182nd St. Base 2929 W. 182nd Street	Generator 2
22.	TRW E&Ds RB 1 Space Park RB	Generator 1
23.	TRW Inc. 1 Space Park Transportation TSD2	Generator 1
24.	TRW Inc. 2512 Artesia Blvd.	Generator 2
25.	TRW Inc. 2500 Compton Blvd.	Generator 2
26.	TRW Inc. 2501 Santa Fe Avenue	Generator 2
27.	TRW Inc. 2425 Manhattan Beach Blvd.	Generator 2
28.	TRW Inc. Bldg R8 Complex 2005 Manhattan Beach Blvd.	Generator 1
29.	Tune-up Masters 2622 Artesia Blvd.	Generator 3
30.	VSI Corporation 4001 Inglewood Avenue	Generator 1
31.	Web Service Co., Inc. 3690 Freeman Blvd.	Generator 2

*** Generator 1: >1,000 kg/month of non-acutely hazardous wastes or > kg/month of acutely hazardous wastes.
Generator 2: 100–1,000 kg of non-acutely hazardous wastes.
Generator 3: <100 kg of non-acutely hazardous wastes.

TSD categories: refer to permit status, where the facility is in the permit process.

Water Contamination

The presence of a number of hazardous waste generators and sites within the City of Redondo Beach indicates that contamination of groundwater supplies could be possible. The proximity of some of the existing hazardous waste sites to the ocean and beaches could be of particular concern (especially the large Southern California Edison plant with settling ponds containing acids and metals).

Issues

The following issues regarding hazardous wastes and toxic materials in the City of Redondo Beach have been identified:

(1) A certain amount of hazardous waste material and toxics will be stored, treated and transported in the City. The Los Angeles County Hazardous Waste Management Plan prescribes minimum environmental criteria to be used in considering land use decisions for the storage and transfer of hazardous and toxic materials, the City can provide more restrictive guidelines if it so desires.

(2) In addition to hazardous waste regulations, specific land use regulations in the City of Redondo Beach Zoning Code can be developed to protect sensitive facilities such as schools and hospitals.

(3) The handling of hazardous waste material can be excluded from certain areas in the City. This action can provide for the protection of environmentally sensitive resources such as air quality, groundwater, ocean and beaches, wetlands, habitats of rare and endangered species, agricultural lands, natural resources of recreational, cultural, and aesthetic value, critical public facilities, and valuable mineral resources.

(4) The City of Redondo Beach can participate in the process of selecting transportation routes which are acceptable for the safe transportation of hazardous waste material within the City's corporate limits. Streets with high concentrations of people, or streets adjacent to sensitive facilities, such as schools and parks, can be considered for exclusion.

(5) Hazardous waste facilities should be structurally stable to ensure the effective containment of the hazardous material. Areas acceptable for hazardous waste facilities can be selected to avoid natural hazards such as earthquakes, floods and storm-generated waves.

(6) Plans for new development are reviewed by the various departments in the City. These departments are in good position to identify potential hazardous waste generators and advise them of required permits before they are established.

(7) The City Fire Department and the City Police Department can continue to play a key role in the on-site identification of hazardous wastes, tracking of illegal dumping (especially near the beaches), and emergency response to hazardous waste accidents through cooperation with the County Health Departments.

4.4.3 Goals, Objectives, and Policies

The following presents the goals, objectives, and policies for toxic wastes and hazardous materials section of the General Plan.

Goal *It shall be the goal of the City of Redondo Beach to:*

11A Protect the public health, safety, and welfare, and the overall environment of the City of Redondo Beach through proper planning for the management, handling, and transportation of toxic and hazardous waste and materials; ensure a coordinated and effective emergency response system; reduce the risk to the public from known contamination sites; decrease the risks to the public from the transport, handling, storage, and disposal of hazardous uses/materials; and minimize the threat of surface and subsurface water contamination and promote restoration of healthful groundwater resources.

Objective *It shall be the objective of the City of Redondo Beach to:*

11.1 Promote and assist in the oversight of the proper operation and upkeep of local hazardous waste facilities, as well as the safe management, handling, and transportation of toxic and hazardous materials through the enforcement of applicable state and local regulations.

Policies *It shall be the policy of the City of Redondo Beach to:*

11.1.1 Develop and adopt long-range planning programs to protect local resources and the public from toxic and hazardous waste and materials.

11.1.2 Determine the need for and assist in the planning and environmental review of additional toxic and hazardous waste facilities in the local area and the region.

11.1.3 Cooperate with the State Department of Environmental Health Services and the Los Angeles County Department of Health Services to enforce applicable regulations for safe operation of toxic and hazardous waste facilities and adopt new regulations relative to this subject as they become necessary.

11.1.4 Promote waste minimization and use of best feasible technology in City businesses that must use, store, and/or transport toxic or hazardous waste or materials.

11.1.5 Encourage the use of competent operators for toxic and hazardous waste and materials transportation and disposal services.

11.1.6 Facilitate coordinated and effective responses to toxic and hazardous waste and materials emergencies in the City to minimize health, property, and environmental risks, damage, and consequences.

11.1.7 Encourage general public awareness and knowledge of emergency response planning and procedures.

11.1.8 Promote integrated inter-agency and interdepartmental review and participation in water resource evaluation and mitigation programs to protect against toxic and hazardous waste contamination of the local water supply.

11.1.9 Protect surface water and groundwater quality from new or additional contamination from toxic or hazardous wastes.

11.1.10 Eliminate and/or clean existing sources of water supplies that have been previously contaminated by toxic or hazardous materials and uses.

11.1.11 Develop programs and incentives for prevention and clean-up of toxic or hazardous wastes by private owners, business people, and the public-at-large.

11.1.12 Develop programs to collect and dispose of household hazardous waste from local residences (mandated as a component of the local Solid Waste Management Plan, see Solid Waste and Recycling section).

4.4.4 Implementation Programs

The following presents the respective programs which shall be carried out by the City of Redondo Beach (or the indicated designee) to implement the preceding goals, objectives, and policies of the Toxic Wastes and Materials Section of the General Plan. Each implementation program is followed by a number which indicates the pertinent policy or policies which it is intended to implement. Notwithstanding the language in specific implementation measures, action by the City is subject to the availability of funding and staff.

- Ensure, through ongoing monitoring and inspection activities, that the City of Redondo Beach, its businesses, and residents comply fully with the terms and provisions of the adopted County of Los Angeles Hazardous Waste Management Plan *(Policy 11.1.1, 11.1.3).*

- The City of Redondo Beach shall pursue and adopt locally-based planning efforts and additional local ordinances/policies which supplement those contained in the County of Los Angeles Hazardous Waste Management Plan, and respond to specific local circumstances and changes in future conditions *(Policy 11.1.1, 11.1.3).*

- Representatives of the City of Redondo Beach Community Development (Planning) Department, Public Works Department and Fire Department shall actively monitor and participate, where appropriate, in the planning and environmental review of additional toxic and hazardous waste facilities proposed to be located in both the local area and the region. This effort may include consultation with relevant State and County officials, and/or the retention of expert consultants, as necessary, to ensure that legal siting criteria are met and that the public interest and public health and welfare is adequately protected *(Policy 11.1.1, 11.1.2, 11.1.3).*

- The City of Redondo Beach Fire Department, Public Works Department and City of Redondo Beach Environmental and Utilities Commission shall periodically review State and County standards for evolving technology and methods to minimize the generation of toxic or hazardous wastes and materials and improve safety in the use, storage, and transport of such wastes and materials. As appropriate and necessary, local ordinances mandating the use and installation of these methods shall be updated *(Policies 11.1.1, 11.1.3, 11.1.4).*

- Representatives of the City of Redondo Beach Fire Department and/or City of Redondo Beach Environmental and Utilities Commission shall continue to work, as necessary, with the appropriate representatives of the State Department of Health Services and the Los Angeles County Department of Health Services, to ensure coordination of local and regional efforts and enforcement of all appropriate regulations relative to toxic wastes and materials generation, use, storage, transport, and disposal in the City of Redondo Beach *(Policy 11.1.1, 11.1.3).*

- The City of Redondo Beach Fire Department shall, as required by State law, based on accepted industry standards, develop, maintain, and periodically update a "list" of competent local and regional toxic and hazardous wastes and materials transportation and disposal operators and services. *(Policy 11.1.5).*

- Ensure, through critical review and regular rehearsal of ongoing City of Redondo Beach Fire Department efforts, that local toxic and hazardous waste and materials emergency programs and response efforts remain adequate and at a state of readiness *(Policy 11.1.6).*

- In addition to ongoing local efforts lead by the City of Redondo Beach Fire Department, ensure that the City of Redondo Beach continues to participate in the regional Mutual Aid Network, to facilitate and ensure the highest possible availability of resources and greatest degree of coordination and effectiveness in responding to toxic and hazardous waste and materials emergencies in the City of Redondo Beach and the surrounding region *(Policy 11.1.6).*

- City of Redondo Beach Fire Department staff, as resources permit, shall provide written materials for public distribution and/or visual materials explaining the issues and importance of local emergency response planning and procedures, and alerting the local resident and business population to the appropriate roles and actions of the citizenry in these situations. This effort may include the videotaping of a session to be played on a periodic basis on the local government access cable television system, as overall program scheduling allows *(Policy 11.1.7).*

- City of Redondo Beach Department of Public Works staff shall, on a regular basis, and in cooperation with California Water Service Company, West Basin Municipal Water District, and Metropolitan Water District officials, continue to monitor local water quality conditions. When potential contamination sources or areas are identified and arise, appropriate and effective mitigation shall be implemented to protect the public, in accordance with State law. In such cases, City staff shall work with California Water Service Company representatives to notify residents and property owners *(Policy 11.1.8, 11.1.9).*

- City of Redondo Beach Department of Public Works staff, within one year of adoption of the General Plan, and in cooperation with California Water Service Company, West Basin Municipal Water District, and Metropolitan Water District officials, shall formally review the locations and quality of all local water supply, storage, and transmission sources. Locations of these facilities and their corresponding risk potential in relation to known local toxic and hazardous wastes and materials sources shall be established and evaluated. The City shall cooperate with other agencies and the private sector, as feasible, in the process of protecting the public health and welfare where existing sources of water supply and storage are impacted by toxic or hazardous materials *(Policy 11.1.9, 11.1.10).*

- As allowed by law, develop and adopt formal local ordinances or policies and encourage prevention programs and permit financial (i.e., local tax credits) or other specific incentives to enhance voluntary clean ups and effective management of local toxic and hazardous wastes and materials by private property owners, business people, and the public-at-large *(Policy 11.1.11)*.

- The City of Redondo Beach Fire Department shall formally participate in and ensure that appropriate programs and policies regulating and guiding the collection and disposal of household hazardous wastes from local residences are contained within the local Solid Waste Management Plan (as mandated by State law) [see the Solid Waste Management and Recycling Section of the General Plan for more detail on this subject] *(Policy 11.1.12)*.

SECTION 4.5

Fire Hazards

4.5 FIRE HAZARDS

California State Law, specifically Assembly Bill 890, Chapter 1255 and California Government Code Section 65302(1), establishes and requires that each city or county prepare and adopt a Safety Element as follows:

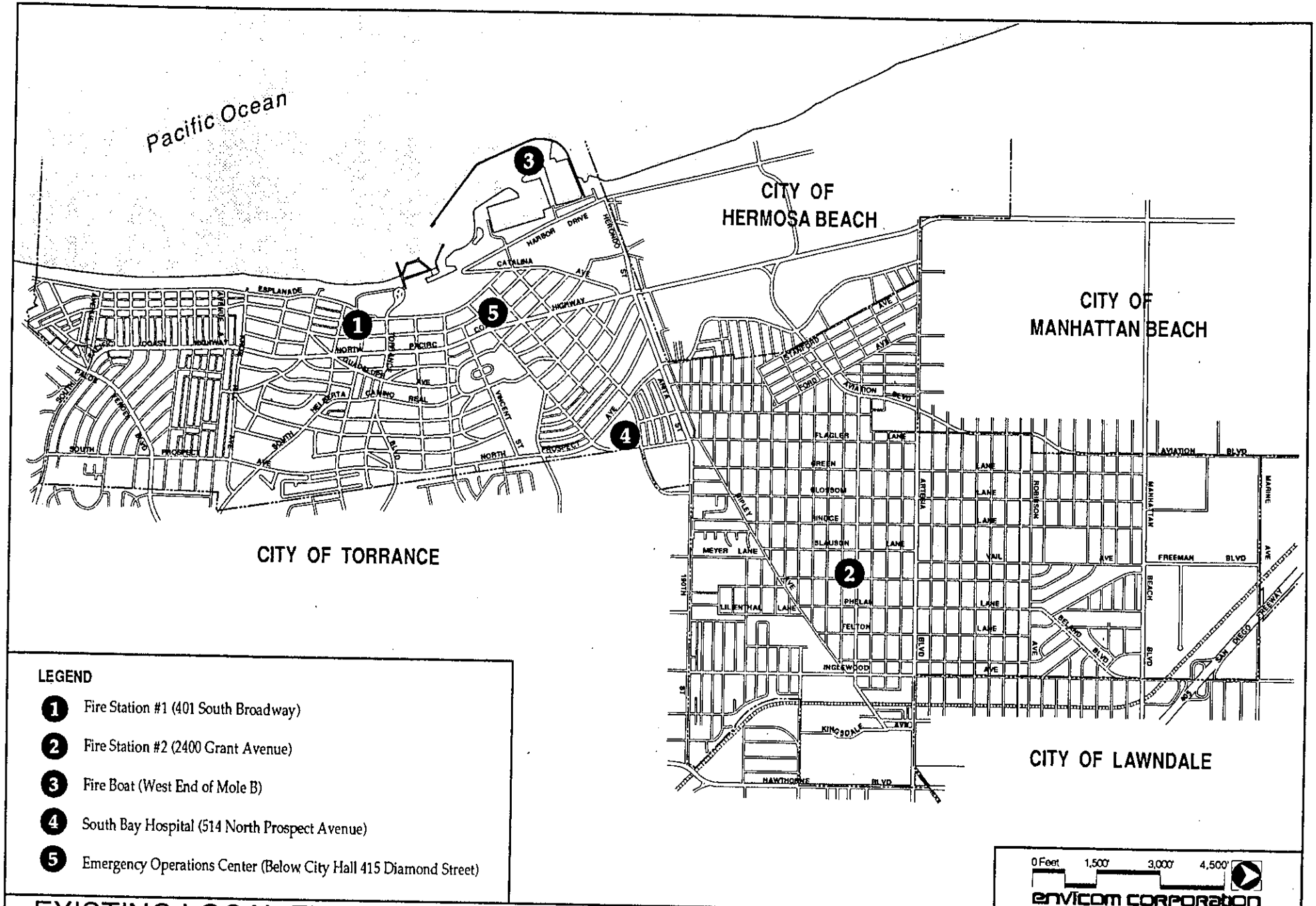
> *A safety element for the protection of the community from any unreasonable risks associated with the effects of seismically-induced surface rupture, ground shaking, ground failure, tsunami, seiche, and dam failure; slope instability leading to mudslides and landslides...; subsidence and other geologic hazards known to the legislative body; flooding; and wild land and urban fires. The safety element shall include mapping of known seismic and other geologic hazards. It shall also address evacuation routes, peakload water supply requirements and minimum road widths and clearances around structures, as those items relate to identified fire and geologic hazards.*

The various geologic and seismic hazards, and their potential impacts, have been inventoried, described, and analyzed (including specific goals, objectives, policies, and implementation programs) within the Geologic/Seismic Hazards Section of this document, representing the "first half" of the Safety Element (Section 4.1).

This portion of the document inventories, describes, and analyses local fire hazards and their potential impacts (including specific goals, objectives, policies, and implementation programs), and represents the "second half" of the Safety Element. The information contained within this section replaces and updates the existing Safety Element of the 1964 Comprehensive General Plan, most recently updated in September of 1975. A number of valid and appropriate components of the original Safety Element have been retained (updated for the passage of time) in this document.

4.5.1 Existing Local Fire Protection/Prevention Services

Local fire protection and prevention services (and paramedic services) within the community are provided by the City of Redondo Beach Fire Department. The Fire Department maintains three facilities in the City, including two fire stations and a fire boat (**Figure 66**). Fire Station #1 is located at 401 South Broadway (at the southwestern intersection of Pearl Street and Broadway) in South Redondo Beach; Fire Station #2 is located at 2400 Grant Avenue (at the southeastern intersection of Grant Avenue and Mackay Lane) in North Redondo Beach; and the fire boat is berthed adjacent to the Harbor Master's office (at the western terminus of Mole B) in South Redondo Beach.



EXISTING LOCAL FIRE, EMERGENCY MEDICAL, AND EMERGENCY OPERATIONS FACILITIES

FIGURE 66

Fire Department Organization

The Fire Department is organized into six different functional divisions, including 1) administration; 2) fire prevention; 3) fire protection [or suppression]; 4) training; 5) public education; and 6) hazardous materials. Call dispatching responsibilities are handled through the integrated local police/fire dispatch center, overseen by the City of Redondo Beach Police Department. The Fire Department has also recently been assigned with the responsibility of overseeing local disaster preparedness and emergency operations activities.

Fire Department Staffing

The City of Redondo Beach Fire Department utilizes a constant manning/qualified relief staff system, using three 24-hour shifts that work a 56-hour work week. A total of 19 different personnel are on duty at all times under normal operating conditions, eleven at Fire Station #1 (including three paramedics), and nine at Fire Station #2 (including two paramedics). Under normal operating conditions, staffing includes a total of 1 Battalion Chief; 3 Captains; 5 Fire Engineers; 5 Fire Paramedics; and 5 Firefighters.

Fire Department Equipment/Infrastructure

In terms of fire equipment, the Fire Department operates four pumpers (one of which includes a 1,000 gallons per minute stream, elevated 50 foot telesquirt); one 100 foot high aerial ladder truck; two paramedic vehicles; and the previously-mentioned fire boat. Specialized equipment owned and operated by the department includes a light/air unit and a foam truck.

The local fire system includes a total of 929 operating fire hydrants distributed along the community's public rights-of-way and within the sites of larger projects and private land areas. Services are called and dispatched through the local telephone emergency system (dialing 911); because of the increasingly high incidence of false alarms in the past, all fire alarm boxes in the City have been removed.

Estimated Local Fire Department Response Times

The City of Redondo Beach Fire Department provides estimated emergency response times (in minutes), based on an analysis of actual calls and responses, for the time that it takes for fire equipment and crews to reach any site in the City, once the call is received at the fire stations. Through analysis of fire department records, it is estimated that current local response times total five minutes or less for approximately 82 percent of fire calls and approximately 90 percent of emergency medical calls. Average response times are currently estimated at approximately 4.25 minutes for fire calls and approximately 4.00 minutes for emergency medical calls.

It should be noted that response times are somewhat greater for the far northern portions of the City. A study of response times north and south of Robinson Street generated the following results:

South of Robinson Street

Structural Response	(3 to 4 minutes)
Rescue Response	(3 minutes)
Ladder Company Response	(5 minutes)

North of Robinson Street

Structural Response	(6 minutes)
Rescue Response	(5 minutes)
Ladder Company Response	(7 to 8 minutes)

Supplemental Fire Department Responsibilities

The Fire Department has been providing paramedic services in the City of Redondo Beach since 1971. The paramedic base station is located at South Bay Hospital, located at the northeastern intersection of North Prospect Avenue and Diamond Street in South Redondo Beach (**Figure 66**). Paramedic crews are located in the local fire stations; local ambulance transportation is provided by the McCormick Ambulance Company.

The Fire Department is also responsible for local hazardous materials responses and inspections. The department employs an environmental scientist as a hazardous materials specialist to coordinate the City's household hazardous waste program, manages the local hazardous disclosure system; and conducts local business and industrial safety inspections.

The City of Redondo Beach Fire Department is also part of a long-standing regional fire protection agreement/pact [known as the Mutual Aid Network] (nearby cities participating in this network include the City of El Segundo, City of Gardena, City of Hawthorne, City of Hermosa Beach, City of Inglewood, City of Manhattan Beach, and City of Torrance. This agreement/pact provides for programmed regional responses for supplemental fire protection services, equipment, and personnel in special situations.

4.5.2 Existing/Historical Local Fire Demands

During calendar year 1990, the City of Redondo Beach Fire Department responded to 4,439 calls (generating a ratio of 0.0738 calls per capita per year). These 4,439 total calls included 3,640 active call (82.0 percent of all calls) and 799 false alarms (18.0 percent of all calls). Of the 3,640 active calls, 3,009 were rescues (67.8 percent of all

active calls); 588 were miscellaneous calls and fires (13.3 percent of all active calls); and 43 were structure fires (1.2 percent of all active calls). Of the 799 total false alarms, 536 were fires (67.1 percent of all false alarms, and 263 were rescues (32.9 percent of all false alarms).

An examination of historic fire response data provides the following information: the 4,439 total fire responses in 1990 were approximately 1.4 percent less than the 4,503 calls that were received in calendar year 1989. A slightly higher percentage of all calls in 1989 were active calls (83.7 percent in 1989 to 82.0 percent in 1990) and a slightly lower percentage of all calls in 1989 were false alarms (16.3 percent in 1989 to 18.0 percent in 1990). A total of 62.5 percent of all active calls in 1989 were rescues, down slightly compared to 67.8 percent in 1990; a total of 19.7 percent of all active calls in 1989 were miscellaneous calls and fires, up slightly compared to 13.3 percent in 1990; and a total of 1.4 percent of all active calls in 1989 were structure fires, up slightly compared to 1.2 percent in 1990. A breakdown of all local fire department responses from 1981 to 1990 is provided (**Table 54**)

4.5.3 Local Fire Hazard Analysis

Fire components of Safety Elements historically focus on the risk and prevention of urban wildfire hazards. These are large, extremely dangerous and difficult to control fires in areas of dense brush or vegetation.

Because of the highly urbanized and built-out nature of the City of Redondo Beach, the risk of such wildfires is extremely negligible (the only large, undeveloped areas in the City with any measurable risk of fire hazard are the Wylie/Steinhart Sump, located at the southwestern intersection of Ford Avenue and Artesia Boulevard in North Redondo Beach, and Hopkins Wilderness Park, located at the northeastern intersection of Knob Hill Avenue and North Prospect Avenue in South Redondo Beach).

For this reason, this document focuses on the risk and prevention of more traditional urban fires and fire-related hazards, which, for analysis purposes, have been broken into six specific categories or types, including:

1) <u>Fire Hazardous Buildings</u>

   These buildings are those having open stairwells, substandard electrical wiring, or faulty heating systems. Upon ignition, fire spreads rapidly through these buildings. A common example of a fire hazardous building is the older, multi-storied hotel converted to permanent residential use, usually for the poor or elderly. These older buildings are also used by some commercial or industrial enterprises. There are not high numbers or major clusters of this type of building in the community, but several individual buildings do exist that fit this description.

TABLE 54

City of Redondo Beach Historic Local Fire Responses (1981-1990)

			Breakdown of Total Responses		Breakdown of Active Calls			Breakdown of False Alarms	
Year	Total Responses	Change from Previous Year	Active Calls	False Alarms	Rescues	Misc. Calls	Structure Fires	Fire False Alarms	Rescue False Alarms
1990	4,439	-64	3,640 (82.0%)	799 (18.0%)	3,009 (82.7%)	588 (16.2%)	43 (1.2%)	536 (67.1%)	263 (32.9%)
1989	4,503	-264	3,768 (83.7%)	735 (16.3%)	2,818 (74.8%)	887 (23.5%)	63 (1.7%)	619 (84.2%)	116 (15.8%)
1988	4,767	+268	3,916 (82.1%)	851 (17.9%)	3,123 (79.7%)	710 (18.1%)	83 (2.1%)	711 (83.6%)	140 (16.4%)
1987	4,499	-368	3,706 (82.4%)	793 (17.6%)	2,941 (79.4%)	713 (19.2%)	52 (1.4%)	593 (74.8%)	200 (25.2%)
1986	4,885	+390	4,263 (87.3%)	622 (12.7%)	3,312 (77.7%)	886 (20.8%)	65 (1.5%)	514 (82.6%)	108 (17.4%)
1985	4,495	-32	3,962 (88.1%)	543 (12.1%)	3,056 (77.1%)	834 (21.0%)	72 (1.8%)	436 (80.3%)	107 (19.7%)
1984	4,527	+54	3,978 (87.9%)	549 (12.1%)	2,976 (74.8%)	930 (23.4%)	72 (1.8%)	455 (82.9%)	94 (17.1%)
1983	4,473	-267	3,859 (86.3%)	614 (13.7%)	2,896 (75.0%)	884 (22.9%)	79 (2.0%)	528 (86.0%)	86 (14.0%)
1982	4,740	-240	4,146 (87.5%)	594 (12.5%)	3,048 (73.5%)	999 (24.1%)	99 (2.4%)	532 (89.6%)	62 (10.4%)
1981	4,980	n/a	4,352 (87.4%)	629 (12.6%)	3,334 (76.6%)	911 (20.9%)	107 (2.5%)	524 (83.3%)	105 (16.7%)

Source: City of Redondo Beach Fire Department (Fire Marshal).

2) Residential Buildings

Residential land uses form a major portion of the structures in the community. Fires occur more frequently in private homes from a variety of causes, human carelessness being chief among them. More lives are lost in residential fires than in any other type of fire. One particularly dangerous hazard in residential fires is the use of untreated wood shingles in roof construction. Windy conditions can spread the fire to a large number of other houses where this type of roof is common.

3) Multistory Buildings

Larger, multi-story buildings (i.e., over four or five stories) pose particularly unique and difficult fire control problems. The large number of occupants in these structures and their dependence on internal support systems such as water pressure systems, ventilation systems, and elevator systems, increase the potential for disaster. Adequate response to high-rise fires requires special equipment such as helicopters, aerial ladders, smoke ejectors, and a fail safe firefighting communications system other than portable radios.

4) Hospitals and Medical Facilities

Medical facilities (hospitals, nursing/convalescent homes, etc.) present critical fire control problems. Damage to sophisticated medical equipment by fire threatens the lives of existing and future patients. Individuals who are mentally or physically debilitated cannot react during crisis in a way that would ensure minimum safety hazards. In times of emergency, ailments are aggravated by stress; medical staffs alone are usually inadequate to provide enough aid and guidance.

5) Indoor Public Assembly Facilities

Public assembly facilities are defined as those in which large numbers of people congregate in generally unfamiliar surroundings. They include schools, theaters, churches, temples, and a variety of recreational facilities. There are a number of these buildings in the community, including local elementary schools. Gatherings of large numbers of people in these buildings create conditions conducive to mass panic in a crisis which only worsens and increases the casualties. Administering medical aid is made more difficult in these situations as well.

6) Industrial Fire Hazards

Several industries of varying intensities are located within the community; the largest and most obvious is the TRW Space Park facility located in far North Redondo Beach.

Many of these facilities engage in the processing or utilization of various flammable petroleum products, caustic chemical compounds, and other exotic substances, all of which are potential threats to human safety. Prevention and control of fire hazards in these facilities are particularly difficult and important.

Many specific facilities within the six general categories have been identified as special fire target areas due to the nature of the activities conducted within them. These facilities receive particular attention from the City's fire prevention and response departments, due to at one or more of the following factors:

- Providing for high public occupancy loads
- Having particular importance in fire or other emergencies
- Containing or handling highly volatile materials

In addition to these "special" facilities, the numerous oil and gas pipelines which traverse the community represent a potential fire hazard, in the event a line should fail. Information regarding the location and operation of these facilities is of vital importance to the Fire Department if it is to be adequately prepared to combat the hazards associated with such facilities.

4.5.4 Local Fire Hazard Rating

The overall risk of fire hazard in local communities is rated, primarily to establish homeowner insurance rates, by the Commercial Risk Services Division of the Insurance Service Office (ISO), an independent, non-profit company which provides information and related services to the insurance industry.

This body rates two aspects of a community's fire system: a) the local fire department's conditions and operation; and b) the local water system's conditions and operation. These two aspects are then combined, to establish an overall community rating. The existing rating system utilizes an ascending numerical scale, ranging from Class 1 (the best) to Class 10 (the worst).

The latest available rating for the City of Redondo Beach is for 1988. At that time, the water department condition and operation aspect of the City of Redondo Beach (the California Water Service Company) was rated as a Class 1; the fire department condition and operation aspect of the City of Redondo Beach (the City of Redondo

Beach Fired Department) was rated as a Class 3; the overall community rating is a Class 2, generally considered excellent for communities of comparable size and character.

4.5.5 Fire Hazard Reduction

A. Preventative Fire Control

Fire hazards can be minimized through two primary methods. The first method involves the reduction of actual fire starts. Preventative fire control, as it is termed, emphasizes maximum safety in the design, maintenance, and use of structures. Implementation of these proper safety measures can effectively remove the possibility of fire by preventing it from starting in the first place.

1) The following state and local codes are applicable to fire prevention:

   a) Uniform Fire Code (UFC)

      This code is intended to set forth the minimum provisions necessary to safeguard life, health, property and public welfare by regulating the storage, use and handling of dangerous and hazardous materials, substances, devices and processes, to maintain buildings and certain equipment, and to maintain adequate egress. The applicable provisions of this code are used and enforced by the City of Redondo Beach Building and Safety Department and City of Redondo Beach Fire Department.

   b) Uniform Building Code (UBC)

      This code is dedicated to the development of higher quality building construction methods and standards and the assurance of greater safety to the public by uniformity in building laws. The code is founded on broad based performance principles that make possible the use of new materials and new construction systems. The applicable provisions of this code are also used and enforced by the City of Redondo Beach Building and Safety Department and City of Redondo Beach Fire Department.

   c) California Administrative Code; Title 19 (State Fire Code):

      This code provides a wide array of standards, guidelines, and regulations for fire prevention and fire safety relative to the contents and assembly of various products and operation of certain facilities and activities, including: General fire and panic safety standards, Canvas tents and structures of similar flammable material, Fire extinguishers, Fire alarm systems and devices, Flammability standards for children's clothing, Fireworks, Wearing apparel (minimum fire safety standards), Flame

retardant chemicals, fabrics and application concerns, Standardization of threaded fittings on fire equipment, Explosives, Transportation of flammable liquids in cargo tanks on highways, Portable internal combustion engine-driven pumps.

d) Redondo Beach Codes and Ordinances:

The local municipal code contains a number of sections, ordinances, or policies related to fire prevention, fire protection, and fire safety. The primary ordinances and policies include:

-Fire Alarm Systems (Sec. 3-4.106, Article 1, Chapter 3, Title 10), requiring that all buildings (including residential, commercial, or industrial) include appropriate and adequate smoke and heat detection (alarm) mechanisms or systems. This requirement is enforced and regulated through the local Fire Department's participation in the design review and plan check process of new construction and renovations and through the inspection of existing facilities.

-Fire Extinguishing Systems (Sec. 9-1.05, Chapter 1, Title 9), requiring that all new structures (including residential, commercial, and industrial) [except for commercial structures totaling less than 500 square feet] include an adequate modern automatic sprinkler system for fire protection.

In addition to being required in all new structures, any commercial or industrial structural renovation exceeding 50 percent of the existing floor area and any residential addition exceeding either 50 percent of the existing floor area or 1,000 square feet, must be accompanied by the installation of an adequate modern sprinkler system throughout the entire structure. This requirement is enforced and regulated through the local Fire Department's participation in the design review and plan check process of new construction and renovations and through the inspection of existing facilities.

-Oil well and oil storage regulations (Chapter 11, Title 4), setting forth specific standards and regulations and for the construction, operation, and maintenance of oil well and oil storage facilities throughout the community. This requirement is also monitored and enforced through the local Fire Department's participation in the design review process and through their inspection of existing facilities.

2) Supplemental Measures for Safeguarding Life and Property

a) Adequate Exit Facilities

Although there is gradual acceptance of the importance of adequate exit facilities, fire casualty statistics show that there are still many buildings, particularly residential occupancies, where exit facilities are inadequate. If there has been proper planning for the prompt use of the avenues of escape in the event of emergency, and if these avenues of escape are maintained readily available, then the danger of loss of live is largely eliminated. An exception should be noted in the case of especially hazardous occupancies where flash fires or explosions may cause casualties, no matter how adequate the egress facilities.

b) Automatic Sprinkler Protection

Automatic sprinkler protection is a particularly important factor in safeguarding life from fire. Records of the National Fire Protection Association show that the loss of life by fire in buildings equipped with automatic sprinklers has been almost negligible. The few deaths that have occurred have been under unusual circumstances where the sprinkler system was shut off for some reason, where the fire was confined to clothing and did not generate enough heat to fuse sprinklers, or where the fatal burns were due to flash fires or explosions.

3) Fire-Resistant Construction

Fire-resistant or so called fireproof construction is an important life-safety measure. It should be noted, however, that severe fires may occur within the contents of fire-resistive buildings, and that highly combustible decorations and interior finish materials may more than off-set the value of noncombustible structural materials.

4) Enclosure Of Vertical Openings

Measures for restricting the spread of fire in buildings are major elements in life safety. Most important is the enclosure of stairways, elevator shafts, and other vertical openings through floors. Thousands of lives have been lost due to the rapid upward spread of fire and smoke through unprotected vertical openings.

5) Education/Awareness About Fire Situations

Inadequate planning for a fire emergency is frequently responsible for fire deaths. A substantial percentage of the lives lost annually in dwelling fires

occurs because families have not taken the time to be sure that each member knows how to escape in case of fire. Escape plans include locating alternative escape routes, arranging for removal of infants and incapacitated persons, training in how to call the fire department, instructing baby sitters, and holding family fire drills.

B. Response Fire Control

The second method of fire hazard reduction emphasizes the effective response aspect of fire control. Effective response can be assisted by providing necessary access and water in adequate amounts and pressures. The following matters are relevant to effective response fire control:

1) Water Supply

The most reliable type of water system is one in which water is collected in impounding reservoirs and fed to the area by gravity flow. It is reliable because the need for and chance of malfunction of pumps is eliminated. Such a system, however, is possible in only a few geographic areas because of the terrain. Most areas take their water from lower lying areas (rivers, lakes, or wells) and pump it to higher elevated areas (through pressurized water mains).

This type of system is also considered to be highly reliable if sufficient storage in reservoirs is provided to be available in case of failure of any essential part of the water system, and if pumps and piping are provided in duplicate (see the Utilities Section of this document for additional information and detail regarding the local water system).

This is the type of water supply system existing in the City of Redondo Beach, which includes cross-connecting mains organized in a grid system, supplied by a combination of storage tanks, wells, and a pressurized pumping system.

The amount of water required by an area includes three major types: 1) Domestic use; 2) Industrial use; and 3) Fire service use (usually less than 1% of the total use). When items a and b are added together, the average national daily consumption is approximately 140 gallons per capita. The maximum daily consumption (in summer) is approximately 210 gallons per person. In order to be considered effective, the local water system should be able to provide all the water required for maximum daily consumption in addition to the required fire flow. This factor necessitates that the storage reservoirs be large enough to store this amount of water and the water mains be large enough to deliver it effectively.

The local water main system (operated and maintained by the California Water Service Company) is divided into several geographic zones. Each zone is separated from flowing into its neighboring zones by closed gate valves. Ideally, each zone should be supplied by its own reservoir tank, although in some cases, one reservoir tank may supply more than one zone.

Since the elevation of one storage reservoir may be different than the other reservoirs, the pressure in the mains which it supplies may be different than the pressure in the mains supplied by the other reservoirs.

In case of a large fire in a zone where the pressure is too low, the water company can improve the water supply in that zone by opening certain gate valves, introducing water from a neighboring pressure zone.

2) Paramedic Program

The Redondo Beach Fire Department was one of the first cities to maintain and operate a paramedic program. This program provides immediate emergency medical aid to the citizens of the City of Redondo Beach. The program is also assumes a major role in cases of major disaster situations in reducing the loss of life and treating injuries.

3) Response Times

As has been previously detailed, the Redondo Beach Fire Department has excellent response times throughout the entire community. This factor is a significant advantage in the ability of the Department to adequately and successfully response to fires and fire-related emergencies.

4.5.6 General Local Emergency Preparedness

A. Emergency Operations Plan

Most of the information previously outlined and presented relative to fire hazards deals with preventative measures, or those measures which should be taken into account prior to a fire or other disaster occurring. There are certain guidelines which should be set up and adhered to at the time of a fire or fire-related emergency. This would also include post emergency situations.

The City of Redondo Beach has completed and maintains a local Emergency Operations Plan to assist in saving lives and protecting public health and welfare in emergency situations. The plan provides for the readiness, mobilization, coordination and employment of important public and private resources to meet essential needs. The objectives are to save lives and property damage, to protect and assist the public in the emergency, and to facilitate recovery after the emergency.

This Emergency Operations Plan applies to many varied emergency situations, ranging from major accidents and natural disasters to a hostile nuclear attack. It provides for the alignment, coordination and direction of existing municipal agencies, supplemented by community and other resources when necessary. The plan is necessarily broad, providing the framework and flexibility for varied actions in a wide range of emergency situations. It does not apply to day-to-day operations, support or assistance in relatively minor emergencies, or conditions resulting from a labor controversy.

The Emergency Operations Plan establishes and puts into practice special relationships between the local government, community, and military. The plan prescribes the general organization, readiness and operational functions and task assignments of these various entities; it also includes guidance for officials and citizens of the community in these situations. When governmental and local resources clearly are inadequate, military assistance may be available to supplement and support these efforts. In grave situations, if civil government were unable to function, the governor or president could impose partial or full martial law; civil authority and the public then are subject to military rule and controls temporarily, until civil government can resume its normal functions.

B. Emergency Operations Center (EOC)

In order to carry out functions during an emergency situation, a Civil Defense and Disaster Organization has been set up. It includes all officers and employees of the City of Redondo Beach, together with registered volunteers and auxiliaries, and other persons who have been trained by proper authorities for emergency service. The emergency organization conforms in general to that of higher echelons, and reflects the performance of certain services by the County of Los Angeles.

During an emergency, the Civil Defense and Disaster Organization will be housed in the Emergency Operations Center, located below ground at the Redondo Beach Civic Center (**Figure 66**). The Emergency Operations Center (EOC) was designed and built to provide a protected, reliable and flexible communications system for rapid transmission of information, instruction and requests in emergencies.

The city has developed an effective municipal radio communications system, based primarily on centralized local government nets and common frequencies or links with other agencies. The city Emergency Operations Center will provide protected and improved facilities for emergency communications both intra- and inter-city. The City of Redondo Beach Fire Department has recently been given the responsibility for overseeing and managing the local emergency operations plan and emergency operations center during an emergency situation.

4.5.7 Summary of Conclusions

- The risk from uncontrolled urban fire within the City of Redondo Beach poses no significant threat due to good access to all areas of the community, a lack of large vacant areas, an adequate water supply, a modern inventory of fire fighting equipment, and the existence and maintenance of thorough local fire prevention and protection requirements.

- The City's existing facilities and practices for fire prevention and fire fighting are considered above average for cities of comparable population sizes and characteristics, according to the Commercial Risk Services Division of the Insurance Service Office, an independent, non-profit wing of the insurance industry charged with conducting and maintaining this rating system.

- Modern state and local building safety and fire safety codes and ordinances are thoroughly enforced by the City of Redondo Beach Building and Safety Department and Fire Department.

- The existing City of Redondo Beach Emergency Operations Plan establishes the community's contingency plans for responding to all types of major disasters in an effort to provide for the safety of life, public heath and property.

- The City's existing underground disaster-resistant Emergency Operations Center provides assurance that coordination and communication facilities will continue to function in all emergency situations.

4.5.8 Goals, Objectives, and Policies

Goal *It shall be the goal of the City of Redondo Beach to:*

12A Reduce the level of risk of structures and people in the City of Redondo Beach from property damage, injury, and loss of life due to fire and fire-related emergencies.

Issue <u>GENERAL FIRE PREVENTION AND FIRE PROTECTION</u>

Objective *It shall be the objective of the City of Redondo Beach to:*

12.1 Endeavor to implement and monitor all possible and necessary fire prevention, fire protection, and emergency preparedness measures to adequately protect residents, employees, visitors, and structures from the risk of and impacts due to fire and fire-related emergencies.

Policies *It shall be the policy of the City of Redondo Beach to:*

12.1.1 Continue to provide and strive to upgrade an adequate, modern system of fire protection to residents, employees, and visitors to the City of Redondo Beach.

12.1.2 Continue to cooperate with fire, paramedic, and emergency operations personnel in adjacent municipalities and the County of Los Angeles to assist each other in carrying out the existing regional fire protection agreement.

12.1.3 Assess the potential impacts of future increases in development density and related circulation impacts and patterns on local fire prevention and protection efforts and emergency response times; ensuring, through the design review and plan check process, that such new development will not result in a reduction of fire protection services below acceptable levels.

12.1.4 Continue to support public and private programs assisting in the further reduction of potential urban fires, including: weed and brush removal and installation and maintenance of fire retardant plantings.

12.1.5 Continue to monitor, maintain, and upgrade the condition and operation of the local water system and supply, the distribution and operation of local fire hydrants, fire alarm boxes, and fire hose cabinets on the Municipal Pier.

Issue <u>CITIZEN AWARENESS POLICIES</u>

Objective *It shall be the objective of the City of Redondo Beach to:*

12.2 Attempt to increase and maintain general public awareness regarding potential fire hazards and fire prevention/protection efforts, and create a greater understanding and appreciation of the importance of safety planning and emergency operations.

Policies *It shall be the policy of the City of Redondo Beach to:*

12.2.1 Initiate and conduct educational programs in local primary schools using displays and demonstrations which will expose younger children to the nature and strength of fire. Such programs would tend to replace their natural curiosity with a sense of respect. Proactive parental cooperation and assistance in overall fire education programs should be encouraged.

12.2.2 Support and sponsor exhibits and presentations in secondary schools which demonstrate the more involved aspects of fire hazards and fire dynamics, (including major contributing factors to fire hazard and the relationship of fire to the natural ecology). Proactive parental cooperation and assistance in overall fire education programs should be encouraged.

12.2.3 Support community outreach programs that attract and train volunteers to assist fire, and civil defense personnel to perform effectively during and after a local disaster or emergency.

12.2.4 Develop a public information release and program to expose and familiarize the citizens of the City of Redondo Beach with the Safety Element of the General Plan.

12.2.5 Encourage local school districts and public agencies related to or involved with the aged, handicapped, and susceptible industries to develop educational and informational programs relative to public safety awareness.

Issue <u>STRUCTURAL SAFETY POLICIES</u>

Objective *It shall be the objective of the City of Redondo Beach to:*

12.3 Insure that all high occupancy structures, critical facilities, other vital emergency facilities, and local residential, commercial, and industrial structures are designed and constructed to minimize the level of risk of structural failure in a fire or emergency situation.

Policies *It shall be the policy of the City of Redondo Beach to:*

12.3.1 Continue to require that all developments be submitted for governmental review according to the Planning and Land Use Section of the California Government Code.

12.3.2 Enforce all structural and fire safety regulations of the Uniform Building Code, Uniform Fire Code, State Fire Code and appropriate provisions of the Redondo Beach Municipal Code relating to sprinkler systems, smoke detector systems, and fire alarm systems.

12.3.3 Continuously re-evaluate and study the need to upgrade the specific provisions of the Redondo Beach Municipal Code relating to sprinkler systems, smoke detector systems, heat detector systems, and fire alarm systems.

12.3.4 Continue the existing program and practice of inspecting local residential, commercial, and industrial structures for compliance with state and local fire laws, regulations, ordinances, and practices.

Issue EMERGENCY OPERATION POLICIES

Objective *It shall be the objective of the City of Redondo Beach to:*

12.4 Ensure that its Emergency Operation Plan and Emergency Operations Center are at all times in a state of updated readiness.

Policies *It shall be the policy of the City of Redondo Beach to:*

12.4.1 Update the Emergency Operations Plan every two years to keep abreast of new development in fire hazard, fire safety, and emergency conditions and procedures.

12.4.2 Continue to update and make clear to the various local governmental departments their individual responsibilities in the case of an emergency.

12.4.3 Encourage local citizens to become aware of and participate in the Emergency Operations Plan.

12.4.4 Prepare Public Safety disaster information release programs for use in emergencies.

12.4.5 Ensure that the local Emergency Operations Center is in a constant state of readiness.

4.5.9 Implementation Programs

The following presents the respective programs which shall be carried out by the City of Redondo Beach (or the indicated designee) to implement the preceding goals, objectives, and policies of the Fire Hazards Section. Each implementation program is followed by a numerical reference (in parentheses) indicating the policy or policies which it is intended to help implement. Notwithstanding the language in specific implementation measures, action by the City is subject to the availability of funding and staff.

- Provide full-time local fire prevention, fire protection, and emergency medical (paramedic) services through the City of Redondo Beach Fire Department. Continue to conduct a comprehensive review of the provision of such services (in concert with the existing operational and budgetary review process put in place by the City of Redondo Beach). Institute changes

and new procedures, as feasible, to assure the achievement of the highest level of service and safety in the community *(Policy 12.1.1).*

- Continue to participate in the regional Mutual Aid Network fire protection and emergency medical and operation agreement/pact. Continue to meet formally with adjacent local fire departments and the County of Los Angeles Fire Department to discuss, review, and coordinate regional fire prevention, fire protection, and emergency medical and operations services, and ensure their continued effective operation and performance *(Policy 12.1.2).*

- Continue to formally review and comment upon discretionary development requests submitted to the City Community Development Department to ensure that appropriate fire safety elements are included within site designs, building designs, and building/planting materials *(Policy 12.1.3).*

- City of Redondo Beach Fire Department staff shall meet, on at least an annual basis, with City Community Development Department and Department of Public Works staffs to review and discuss City-wide development and circulation patterns and projects, in order to determine the impacts of these actions on local fire prevention, fire protection, and emergency medical services. Changes suggested to such patterns and projects deemed to be necessary to improve local fire and emergency medical services and deemed to be financially and practically feasible shall be implemented *(Policy 12.1.3).*

- The City of Redondo Beach Fire Department shall work with the State Department of Transportation (CALTRANS) and the City of Redondo Beach Department of Public Works staffs to provide input and monitor weed abatement and brush trimming/clearing efforts in and around public rights of way and public properties to further reduce the potential for fire *(Policy 12.1.4).*

- City of Redondo Beach Fire Department staff shall meet, on at least an annual basis, with California Water Service Company (CWSC) and City of Redondo Beach Department of Public Works staffs to review, discuss, and critique the conditions and operation of the local water system and supply (including fire hydrants). Changes and upgrades suggested to the system and supply deemed to be necessary to improve local fire and emergency medical services and deemed to be financially and practically feasible shall be implemented *(Policy 12.1.5).*

- Establish and maintain a formal program of demonstrations and educational aids (through speaking to schools groups, field trips to fire facilities, etc.) in both the primary and secondary school systems to expose and explain fire dynamics, fire hazards, fire safety, and emergency operations to the school-aged populations. Parental involvement in or formal acknowledgement of

these events should be an integral aspect of these programs *(Policy 12.2.1, 12.2.2, 12.4.3, 12.4.4).*

- City of Redondo Beach Fire Department staff should conduct a formal local seminar and mini-training session, on at least an annual basis, to expose and familiarize the local resident population to the Safety Element of the General Plan and train volunteers to assist fire and civil defense personnel during and after a local disaster or emergency. This program should include the videotaping of a session to be played on a regular basis on the local government access cable television system, as overall program scheduling allows; written material or pamphlets should also be created for public distribution *(Policy 12.2.3, 12.2.4, 12.4.3, 12.4.4).*

- City of Redondo Beach Fire Department staff should meet with management of the local school districts and public agencies providing social services to the young, the aged, and the physically-challenged, to develop and provide programs (similar to those listed above for the overall population), to increase and improve safety, fire, and emergency operations awareness in these special populations of the community *(Policy 12.2.5, 12.4.3, 12.4.4).*

- Ensure, through the review and comment process outlined above, that discretionary development proposals submitted to and approved by the City of Redondo Beach comply with all applicable structural and fire safety regulations and requirements of the Redondo Beach Municipal Code, the Uniform Building Code, the Uniform Fire Code, and the State Fire Code *(Policy 12.3.1, 12.3.2).*

- The City of Redondo Beach Fire Department staff shall, on at least an annual basis, review the provisions of the City of Redondo Beach Municipal Code relative to fire prevention and fire protection system requirements. Changes and upgrades to the requirements shall be suggested and implemented, as necessary to improve local fire safety, and as financially practicable and feasible *(Policy 12.3.3).*

- The City of Redondo Beach Fire Department shall continue their program of local structural inspections, as staffing and budgetary conditions allow, to ensure compliance with state and local fire laws, regulations, ordinances, and practices, and to improve overall local fire safety conditions *(Policy 12.3.4).*

- The City of Redondo Beach Fire Department staff shall, on at least a biannual basis, review the provisions of the City of Redondo Beach Emergency Operations Plan. Changes and upgrades to the Plan shall be suggested and implemented, as necessary to improve local emergency response and operations, and as financially practicable and feasible. One major component of this review shall include formal meetings with all local government

departments involved in emergency response and operations, to establish and update the roles and responsibilities of these department in emergency response and operations activities, and to better inform staff-level employees of these practices *(Policy 12.4.1, 12.4.2).*

- The City of Redondo Beach Fire Department shall continue their existing practice of continually reviewing the physical and operational conditions of the Emergency Operations Center and rehearsing emergency drills involving the Center, to ensure that the facility is in a constant state of readiness and preparedness *(Policy 12.4.5).*