

SHORELINE PRESERVATION STRATEGY FOR THE SAN DIEGO REGION

JULY 1993

San Diego



ASSOCIATION OF
GOVERNMENTS

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ABSTRACT

- TITLE:** Shoreline Preservation Strategy for the San Diego Region
- AUTHOR:** San Diego Association of Governments (SANDAG)
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- ABSTRACT:** The Shoreline Erosion Committee, SANDAG staff, and its consultant have prepared the Shoreline Preservation Strategy for the San Diego region. It was adopted by the SANDAG Board of Directors on July 23, 1993. The Strategy proposes an extensive beach building and maintenance program for the critical shoreline erosion problem areas in the region, as well as a number of actions to support this program. The Strategy contains a comprehensive set of recommendations on the beach building program, and on financing and implementation. The Strategy also includes three appendices used in its development and for its implementation.



ACKNOWLEDGEMENTS

The Shoreline Preservation Strategy was prepared with guidance from the SANDAG Shoreline Erosion Committee.

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**San Diego
ASSOCIATION OF
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RESOLUTION

No. 94-2

**ADOPTING THE SHORELINE PRESERVATION STRATEGY
FOR THE SAN DIEGO REGION**

WHEREAS, the San Diego region's shoreline has, and is expected to continue to experience serious erosion of its sandy beaches; and

WHEREAS, the region's shoreline is a resource of local, regional, state and national significance; and

WHEREAS, the region's shoreline is an important part of the region's environment, economy and overall quality of life; and

WHEREAS, the Shoreline Erosion Committee was established by SANDAG to coordinate shoreline erosion studies and projects in the region, and to advise the region on erosion control policies and actions; and

WHEREAS, the Shoreline Erosion Committee has guided the preparation of the Shoreline Preservation Strategy and recommended that SANDAG adopt it; and

WHEREAS, the Shoreline Preservation Strategy identifies the region's shoreline erosion problem areas and contains objectives, policies and recommendations which address these problems; and

WHEREAS, the Strategy is a blueprint for cooperative action by local governments to implement proactive solutions to these problems which provide significant benefits to the region's environment and economy; and

WHEREAS, the adoption of the Strategy by SANDAG would make it the region's official policy on shoreline management and would position the region's local governments and SANDAG to take maximum advantage of state and federal funding and other opportunities for implementation action; NOW THEREFORE

BE IT RESOLVED that SANDAG adopts the Shoreline Preservation Strategy for the San Diego region.

PASSED AND ADOPTED this 23rd day of July, 1993.


CHAIRPERSON

ATTEST: 
SECRETARY



I. EXECUTIVE SUMMARY



I. EXECUTIVE SUMMARY

The Region's Shoreline A Valuable Resource in Trouble

The shoreline is a valuable asset to the environment and economy of the San Diego region and the State. It is also considered a resource of national significance. The beaches and seacliffs help define this area's quality of life; when we think of the region's positive image, we most often think of the climate and the shoreline.

Long time residents are aware that many of the area's beaches and seacliffs have been steadily eroding for the past decade. The Coast of California Study, a six-year, \$6 million scientific evaluation of the San Diego region shoreline conducted by the U.S. Army Corps of Engineers, documented the observations of local people about shoreline erosion and has projected trends of increasing beach loss and property damage in the future.

Figure 1 shows the critical shoreline problem areas in the region, including all or portions of each of the region's coastal cities: Imperial Beach, Coronado, San Diego, Del Mar, Solana Beach, Encinitas, Carlsbad, and Oceanside. The problem areas also include stretches of shoreline owned and managed by state and federal agencies.

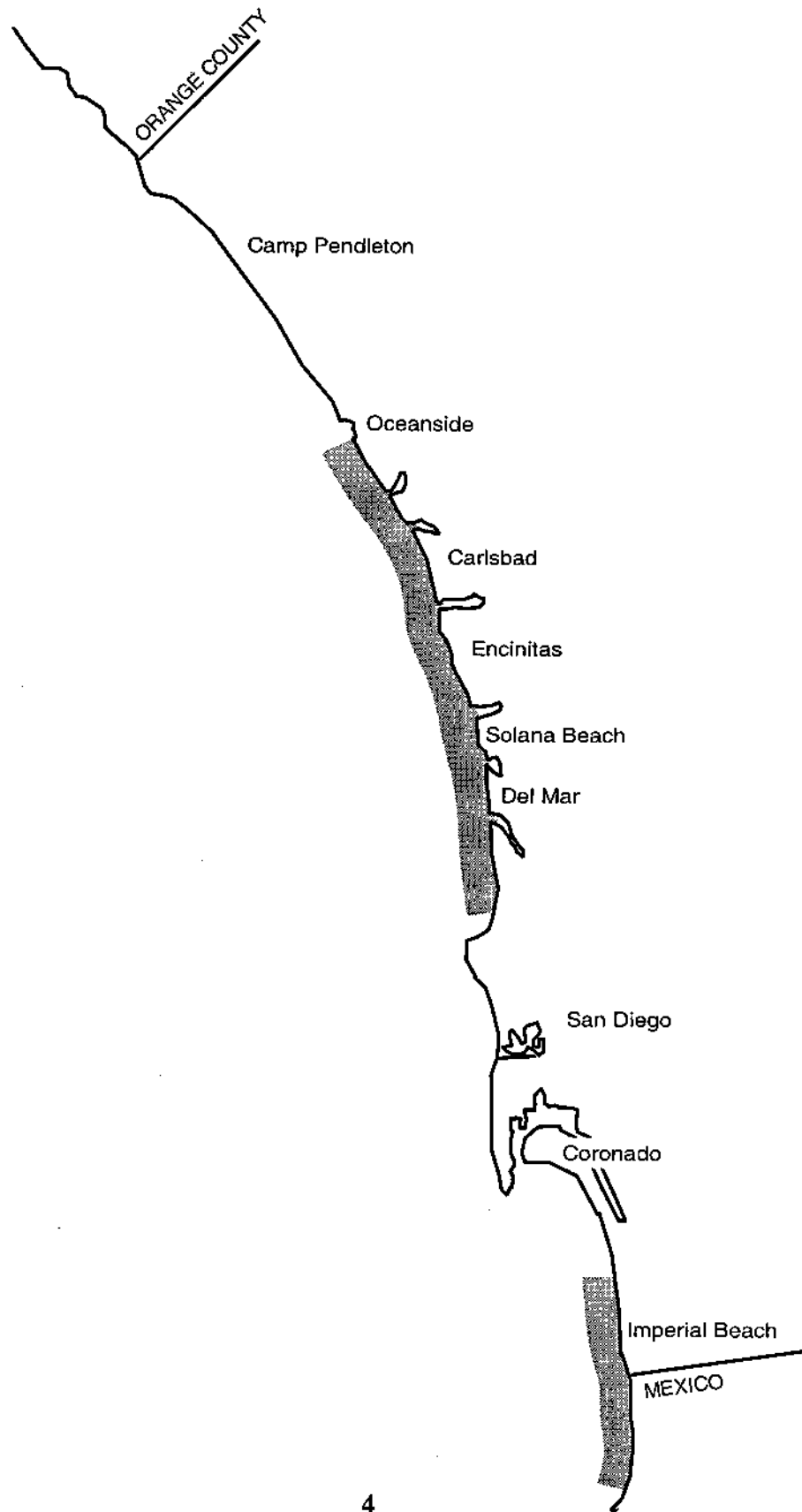
The Role of the Shoreline Preservation Strategy

The Shoreline Preservation Strategy is the San Diego region's response to the concerns about erosion voiced by citizens and communities up and down the coast, and by the thousands of residents of inland San Diego County who use and enjoy the shoreline.

The unprecedented amount of knowledge gained from the Coast of California Study allows us, for the first time, to be able to measure the extent of the region's current and future shoreline erosion problems and to identify potential solutions to manage these problems.¹ The menu of solutions, or tactics, includes: beach building by placing large amounts of sand on eroded beaches; structures to help hold sand in place, such as groin fields; structures to protect property, such as seawalls and sand berms; and policies and regulations regarding the use of the shoreline and its development, such as bluff top building setbacks. The Shoreline Preservation Strategy sets out regional objectives,

¹ The rocky headlands and seacliffs, and the small "pocket" beaches of La Jolla and Point Loma were not covered in the Coast of California Study. The information and recommendations of the Shoreline Preservation Strategy do not pertain directly to these areas.

Figure 1
CRITICAL SHORELINE EROSION PROBLEM AREAS



policies, and recommendation for implementing a coordinated list of solutions for each of the region's shoreline problem areas.

Who's Involved?

The Strategy is being put together by the SANDAG Shoreline Erosion Committee, which is made up primarily of elected officials from the region's coastal jurisdictions. They will rely on the advice and opinions of the technical advisory members of the Committee representing state and federal agencies involved in managing the shoreline, and of the many individuals and interest groups who will review and comment on preliminary strategy options -- the entire region will be involved in developing and deciding on the Strategy. In order for the Strategy to be effective, everyone in the region will also have to work together to carry it out.

Themes

The most important idea guiding the Strategy is coordination. Coastal science tells us that events in one part of the shoreline will affect beaches and seacliffs up coast and down coast, because sand moves laterally along the shoreline. We now have much of the knowledge needed to coordinate shoreline management actions occurring at different places and times, and to make sure positive impacts on beaches and seacliffs are reinforced, and negative ones minimized.

Another very important point about the Shoreline Preservation Strategy is that our role in preserving and enhancing the region's shoreline will have to be an ongoing, long-range, undertaking. This stewardship of the shoreline will involve a number of coordinated actions taking place on a continuing schedule over the years. The Shoreline Preservation Strategy is the action plan for this stewardship. The Strategy looks ahead 20 and 50 years in the future, to ensure that we can respond to the needs of shoreline structures and public improvements being implemented today, and to the future recreational needs of residents and visitors.

Finally, the Strategy proposes an action plan that will require a major financial commitment from people in our region, as well as funding help from the state and federal governments.

Objectives

The Shoreline Preservation Strategy has four main objectives:

1. Manage the region's shoreline to provide environmental quality, recreation and property protection.
2. Develop and carry out a cost-effective combination of shoreline management tactics that will have a positive impact on the region's economy.

3. Develop a program to pay for the shoreline management strategy which equitably allocates costs throughout the region, and among local, state and federal sources.
4. Obtain commitments to implement and finance the Shoreline Management Strategy.

Policies

The following policies set an overall regional direction for meeting the objectives of the Strategy.

- A. The Strategy should provide a cooperative, coordinated, and long-range preservation program for the region's shoreline.
- B. The Strategy should consider the full range of shoreline management tactics, with emphasis on beachfilling to preserve and enhance the environmental quality, recreational capacity, and property protection benefits of the region's shoreline.
- C. Structural and mechanical management tactics to stabilize beaches, reduce sand losses and redistribute sand along the shoreline should be evaluated as complements to the regional beachfilling program and implemented where they have a positive impact on cost-effectiveness. Tactics which mimic natural processes should be preferred when they are equal in cost-effectiveness to other approaches.
- D. The Strategy should provide planning estimates of the amount, placement, timing, cost and sources of beachfill, and describe the process for implementation decisions.
- E. Policies and actions to promote the availability of offshore, coastal and upland sources of sand for beachfilling and natural beach replenishment should be developed.
- F. The Strategy should provide technical information to assist coordinated and consistent approaches to local level management tactics, including regulation of shoreline land use and development, and property protection measures such as artificial dunes, seawalls and revetments.
- G. The Strategy should evaluate local, state and federal policies and regulations and recommend changes to support the other policies and objectives.
- H. The Strategy should be based on the best available scientific data and analysis, and on sound engineering principles.

Recommendations

The Shoreline Preservation Strategy recommendations are based on the scientific information from the Coast of California Study and on Engineering and Economic analysis of the potential impact of shoreline erosion on coastal property, beach recreation demand

and revenues from tourism. The recommendations include proposals for each problem area, regionwide recommendations which apply to all of the problem areas, and implementation, financing and institutional recommendations for carrying out the Strategy.

BEACH BUILDING

A beach building and maintenance program is recommended as the primary shoreline management tactic for each of the problem areas. These problem areas, from south to north, are the shoreline segments for:

- Silver Strand State Beach in the southern part of Coronado, all of Imperial Beach, and extending about 2½ miles south into Mexico;
- The entire shoreline from Oceanside Harbor south to and including La Jolla Shores beach in San Diego.

These beach building and maintenance programs emphasize the nourishment of narrow beaches with sand to make them wide enough to provide increased property protection and recreational capacity, and the periodic resupply of sand to these beaches to maintain them. Potential major sources of sand to support these beach building activities have been identified at offshore sand bars. In addition, there are a number of "opportunistic" sources of sand for beach building such as harbor dredging, lagoon habitat enhancement projects, and water storage reservoirs. The development of the beach building programs will require detailed engineering, economic and environmental design studies. In addition to nourishment, the study design for each area should consider a full range of shoreline management tactics that can support beach widening and improve cost effectiveness. These tactics include shoreline stabilization, shoreline protection and shoreline development regulations.

Planning level analysis done in support of the Shoreline Preservation Strategy illustrates the general magnitude of activities and costs necessary to implement the most ambitious beach building and maintenance programs. The initial beach building program would require the placing of up to 30 million cubic yards of sand on beaches in the problem areas. The capital cost is estimated in the range of up to \$150 million. The annualized long-term cost of the total beach building and maintenance program for the region is estimated in the range of up to \$5.5 million per year. This annual cost would increase to up to \$12 million per year if it were financed using long-term government bonds. If the region can take advantage of opportunistic sand sources, these costs could be significantly reduced. The annual value to the region's economy of the full-scale beach building program expenditures in 2010 is estimated to be in the range of \$8 million in property protection and \$45 million in recreation revenues and benefits. By 2040, the annual values are estimated to be in the range of \$35 million and \$190 million, respectively. These cost estimates include shoreline property protection, recreation and tourist revenue, and local tax benefits. There are a number of other benefits that are not included, such as protection of public improvements and private structures. In addition, some costs are not included, such as impacts on streets from heavy trucks transporting sand from inland sites to

beaches. These planning estimates illustrate the cost-effectiveness of a beach building program for the region. The Strategy would be a sound investment for the future of our economy and environment.

The beach building program described above, and the associated costs and benefits, are for a program that builds and maintains all of the region's problem beaches to provide for recreational needs and to protect coastal property from damage caused by breaking waves and marine flooding. The design studies, when completed, could well recommend less extensive programs with significantly lower costs and benefits for two reasons. First, a full-scale beach building and maintenance program may not be technically or economically feasible in all shoreline areas, due to rates of sand movement offshore or downcoast. Second, in some areas full-scale beach building may not be acceptable due to concerns about stabilization structures that could be needed, concern about public funding, or the desire of coastal property owners to build seawalls and revetments to protect their land and buildings. Finally, a phased, or incremental, program could be recommended to reduce initial costs.

The scope and costs of the beach building programs that are implemented will be decided by the region's elected officials based on the results of the engineering, economic, and environmental design studies and public participation and comments.

FINANCING

Traditional state and federal funding sources should continue to be pursued, but can be counted on to cover only a portion of the total financing needed to carry out the Strategy. Therefore, a financing program is recommended that emphasizes regional and local funding sources, coordinated on a regionwide basis to ensure equity and build support. The local funding program could include: shoreline property owners who will receive major benefits, both directly due to protection from storm damage and indirectly in terms of property value; visitors to the region who use and enjoy the benefits of the shoreline; and all of the region's residents and businesses who benefit substantially through their use of shoreline beaches and parks, their property values, and economic activity resulting from beach related tourism.

INSTITUTIONAL

The cooperative and interjurisdictional nature of the recommended beach building and maintenance programs, and the significant amount of funds to be raised and expended to carry them out, will require additional cooperative intergovernmental arrangements among the region's local jurisdictions. These arrangements should provide for the involvement of appropriate state and federal agencies as well as Mexican officials. The purpose of these additional arrangements should be to formalize joint decision-making about the implementation of the Shoreline Preservation Strategy for each problem area, and to provide a mechanism for financing. The format of additional arrangements in each problem area could range from the designation of a lead agency and the signing of a Memorandum of Agreement, to the formation of a joint powers agency or shoreline

authority to carry out implementation. An example of an existing cooperative arrangement is the BEACH JPA in the Oceanside littoral cell. There may also need to be additional arrangements set up to coordinate financing and implementation on a regionwide basis. The most appropriate types of intergovernmental arrangements will depend to some extent on the financing mechanisms chosen. The institutional arrangements for implementation of the Strategy should therefore be developed concurrently with the financing program.

The Shoreline Erosion Committee and SANDAG should continue to coordinate shoreline preservation activities for the region, including the development of the beach building and maintenance programs design studies, the regionwide financing program, and the cooperative arrangements needed to implement the Strategy.

Currently, financing and institutional issues related to the Strategy and other regional needs are also being considered by SANDAG's Regional Revenues and Open Space Committees. These Committees are evaluating Shoreline Preservation needs in combination with other regional open space and sensitive lands needs in a coordinated program to provide institutional and financial support.

IMPLEMENTATION

The Shoreline Preservation Strategy identifies the region's shoreline problems and provides the policy direction and a process for coordinated decision-making to solve them. There are several key decisions the region will need to make, and several major work tasks required to provide the information to support those decisions, in order to implement the Strategy once it is approved.

The approval of the Strategy will signal the commitment of the region to pursue coordinated solutions to our shoreline erosion problems, and will set an overall direction in implementing the solutions. The Strategy necessarily provides for flexibility and latitude in implementation and financing for a number of good reasons:

Designing the most cost-effective solutions will entail additional field work and engineering and economic analysis. A good example is defining in more detail the quality and extent of offshore sand resources for beach building.

Detailed environmental studies will be required for any significant modifications to the shoreline. The impacts to be mitigated range from air pollution and noise from offshore dredging vessels and onshore sand moving equipment, to the effects of turbidity on nearshore plant and animal species.

Community involvement will need to be a major aspect of implementation. Each coastal jurisdiction will need to evaluate the technical options for beach building, review environmental and economic impacts, and balance local interests and viewpoints so projects can be supported. Of prime importance for many communities will be developing consensus on the appropriate balance between beach nourishment and replenishment, shoreline stabilization structures such as groins,

structures to protect property such as seawalls, and shoreline development regulations consistent with regional efforts to control beach erosion. Private sector initiatives and participation in implementing the strategy should be encouraged.

Finally, the implementation of the Strategy will need to be flexible to respond to funding and beach building opportunities as they arise. For example, the U.S. Army Corps of Engineers' studies of erosion and storm damage problems in various communities will provide a significant amount of information for some of the implementation steps listed below, and will therefore reduce the estimated costs and increase the quality of information available for making decisions. In addition, opportunistic sources of sand such as dredged material scheduled to become available from San Diego Harbor, Batiquitos Lagoon, San Dieguito Lagoon, the Tijuana Slough and other sources may significantly reduce the costs of beach building programs and the amount of sand needed from offshore sources.

The following implementation steps illustrate the major decisions and work tasks involved in implementing the Shoreline Preservation Strategy. Estimated costs and timing are provided. However, no funding commitments have been secured and specific funding sources have not been identified. The schedule and costs could change significantly based on the considerations discussed above.

		Estimated <u>Timing</u>	Estimated <u>Cost</u>
Decision:	Approval/Support of Strategy (Local Jurisdictions/State & Federal Agencies)	July-Oct. 1993	--
Work Tasks:	Scope of Work and Costs for Beach Building Design Studies *	FY93-94	\$100,000
Decision:	Agreement to Fund and Carry Out Design Studies (Local Jurisdictions, State & Federal Agencies)	Calendar 1994	--
Work Tasks:	Complete Engineering, Economic and Environmental Design Studies *	Calendar 1995	\$2,000,000
Decision:	Agreement to Fund and Carry Out Shoreline Management Program (Local jurisdictions, State & Federal Agencies)	Calendar 1996	--
Work Tasks:	Fund and Implement Projects *	1996	<u>Up to \$5 million/yr.</u> (\$12 million/yr. if financed)

* These work tasks will most likely consist of several work efforts carried out by different local, state or federal entities, but coordinated by SANDAG and the Shoreline Erosion Committee. For example, the U.S. Army Corps of Engineers erosion and storm damage studies, and possible future projects will contribute to all three of the work tasks.

II. BACKGROUND



II. BACKGROUND

The Region's Shoreline: A Valuable Resource

The shoreline is a valuable asset to the environment and economy of the San Diego region and the State. It is also considered a resource of national significance. The beaches and seacliffs help define this area's quality of life; when we think of the region's positive image, we most often think of the climate and the shoreline.

The Problem

Long time residents are aware that many of the area's beaches and seacliffs have been steadily eroding for the past decade. The Coast of California Study, a six-year, \$6 million scientific evaluation of the San Diego region shoreline conducted by the U.S. Army Corps of Engineers, documented the observations of local people about shoreline erosion and has projected trends of increasing beach loss and property damage in the future.

How We Got Where We Are Today

Over the past half century, man's actions have been the major influence affecting our shoreline. Through urban development, including water reservoir and dam building, flood control systems and sand mining, we have cut off the primary natural source of sand for our beaches -- sediment carried from inland areas by rivers and streams. This sand is also the primary buffer protecting seacliffs and coastal development from erosion and storm damage. At the same time, our activities have made up, and some places even exceeded, the natural sand sources no longer reaching the shoreline, through the building of "man made" beaches. Most of the sand for this purpose has come from massive and expensive harbor dredging projects in San Diego Bay and at Oceanside Harbor. While sources of sand as large as these dredging projects will probably never be available in the future, we have no choice but to continue our stewardship of the shoreline, or see the gradual thinning and disappearance of our beaches and increasing destruction of coastal property and development.

How the Shoreline Preservation Strategy Will Help

The Shoreline Preservation Strategy is the San Diego region's response to the concerns about erosion voiced by citizen and communities up and down the coast, and by the thousands of residents of inland San Diego County who use and enjoy the shoreline.

The unprecedented amount of knowledge gained from the Coast of California Study allows us, for the first time, to be able to measure the extent of the region's current and future shoreline erosion and to identify potential solutions to slow or reverse erosion problems. The menu of solutions, or tactics, includes: beach building by placing large amounts of sand on eroded beaches; structures to help hold sand in place, such as groin fields; structures to protect property, such as seawalls and sand berms; and policies and regulations regarding the use of the shoreline and its development, such as bluff top building setbacks. The Shoreline Preservation Strategy will consist of a coordinated list of tactics for each of the region's shoreline problem areas.

Shoreline Management Tactics

Figure 2 shows the shoreline management tactics considered in developing the San Diego Region's Shoreline Preservation Strategy. The tactics are grouped into six categories. They all have the potential to contribute to meeting the two basic goals of the strategy:

1. Preserve and enhance the region's beaches as an environmental and recreational resource.
2. Protect property and development from storm wave damage and coastal flooding.

Descriptions of all of these tactics and methods that can be used to evaluate their application to particular reaches (lengths) of shoreline in the region can be found in the Planner's Handbook in the Appendix.

The first four groups of shoreline management tactics on the chart -- a) and b) beach building and maintenance, c) reducing sand losses, and d) redistributing sand along the coast -- are primarily regional scale actions aimed directly at increasing the amount of sand on the region's beaches. They will usually affect all or a significant portion of one of the region's three littoral cells. (A littoral cell is a self contained shoreline unit in which actions taken in one reach of the cell will eventually affect the other reaches.)

The last two groups of shoreline management methods on the chart -- e) regulation of shoreline land use and development, and f) protection of property from storm waves and flooding -- are primarily local scale methods of dealing with shoreline problems. While these methods can do little to add sand to the shoreline, they can make the sand management techniques in the first three groups on the chart more effective.

Figure 2

POTENTIAL SHORELINE MANAGEMENT TACTICS

REGIONAL SCALE TACTICS

- A. Beach Building and Maintenance, Using Coastal Sources of Sand From:
- harbor and lagoon dredging
 - offshore sand deposits
 - undeveloped seacliffs and coastal terraces
- B. Beach Building and Maintenance, Using Upland Sources of Sand From:
- reservoirs
 - rivers and streams
 - grading of development construction sites
 - other upland sources
- C. Reduce Sand Losses to:
- submarine canyons
 - offshore sand deposits
- D. Redistribute Sand Along the Shoreline by:
- bypassing (moving sand down coast past barriers such as harbor jetties)
 - backpassing (moving sand up coast, to recirculate it along its natural direction of flow down the coast)
 - groins (to hold sand in a particular reach, or length, of the shoreline)
 - offshore breakwaters (to minimize the ability of waves to move sand from a particular reach; includes research on kelp beds as well as development of hard structures)

LOCAL SCALE TACTICS

- E. Regulate Shoreline Land Use and Development by:
- minimizing construction on beaches and in front of seacliffs
 - requiring setbacks from seacliffs, beaches and low lying coastal areas
 - regulation of sand mining
- F. Protect Property from Storm Waves, Flooding and Seacliff Erosion by:
- artificial dunes
 - seawalls and revetments
 - blufftop erosion management measures such as irrigation controls
 - beach replenishment



**III. SHORELINE PROBLEMS
AND NEEDS**



III. SHORELINE PROBLEMS AND NEEDS

Present and Future Beach Widths - The Effects of Erosion

One of the most important tasks in developing the Shoreline Preservation Strategy involves estimating the present and future widths of the region's beaches and comparing them to the beach widths estimated to be needed for property protection and recreation. These estimates were made possible by the extensive data on the region's shoreline collected by the Coast of California Study. Figures 3, 4, and 5 show the estimated annual mean beach widths for the region's three littoral cells for the years 1990, 2010 and 2040. Littoral cells are stretches of shoreline which are physically interconnected. Occurrences in one part of a littoral cell will ultimately have an impact on other parts. The estimated beach widths needed for property protection and recreation are also shown on those maps. Each of the three littoral cells shown in Figures 3, 4, and 5 has been divided into segments, or reaches, designated by dashed horizontal lines. The segments roughly correspond to city boundaries, and state and federal ownership in some cases.

These three littoral cells are: the Silver Strand cell which extends from south of the international border to the Zuniga jetty at San Diego Bay and includes the Shorelines of the Cities of Imperial Beach and Coronado; the Mission Bay Cell which includes Ocean, Mission, and Pacific beaches in the City of San Diego; and the southern half of the Oceanside Cell including shorelines of the Cities of San Diego, Del Mar, Solana Beach, Encinitas, Carlsbad and Oceanside. The northern half of the Oceanside cell extends north from Oceanside Harbor to Dana Point in Orange County. Data for this area is included in the appendix.

The significant decrease in annual mean beach width estimated for future years in the Oceanside and Silver Strand littoral cells illustrates the effects of shoreline erosion on the region. The figures show that the most critical areas are located at Imperial Beach and South Oceanside and that extensive erosion will also take place in the rest of the Oceanside Cell, in the southern half of the Silver Strand Cell. The Mission Bay Cell has relatively stable beaches compared to the other littoral cells.

There are several points to take into consideration regarding the estimated beach widths:

- beach width is defined as the distance between mean sea level and a point delineating the back of the beach, such as a road, structure or the base of a seacliff;

ESTIMATED ANNUAL MEAN BEACH WIDTHS

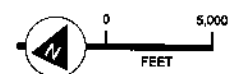
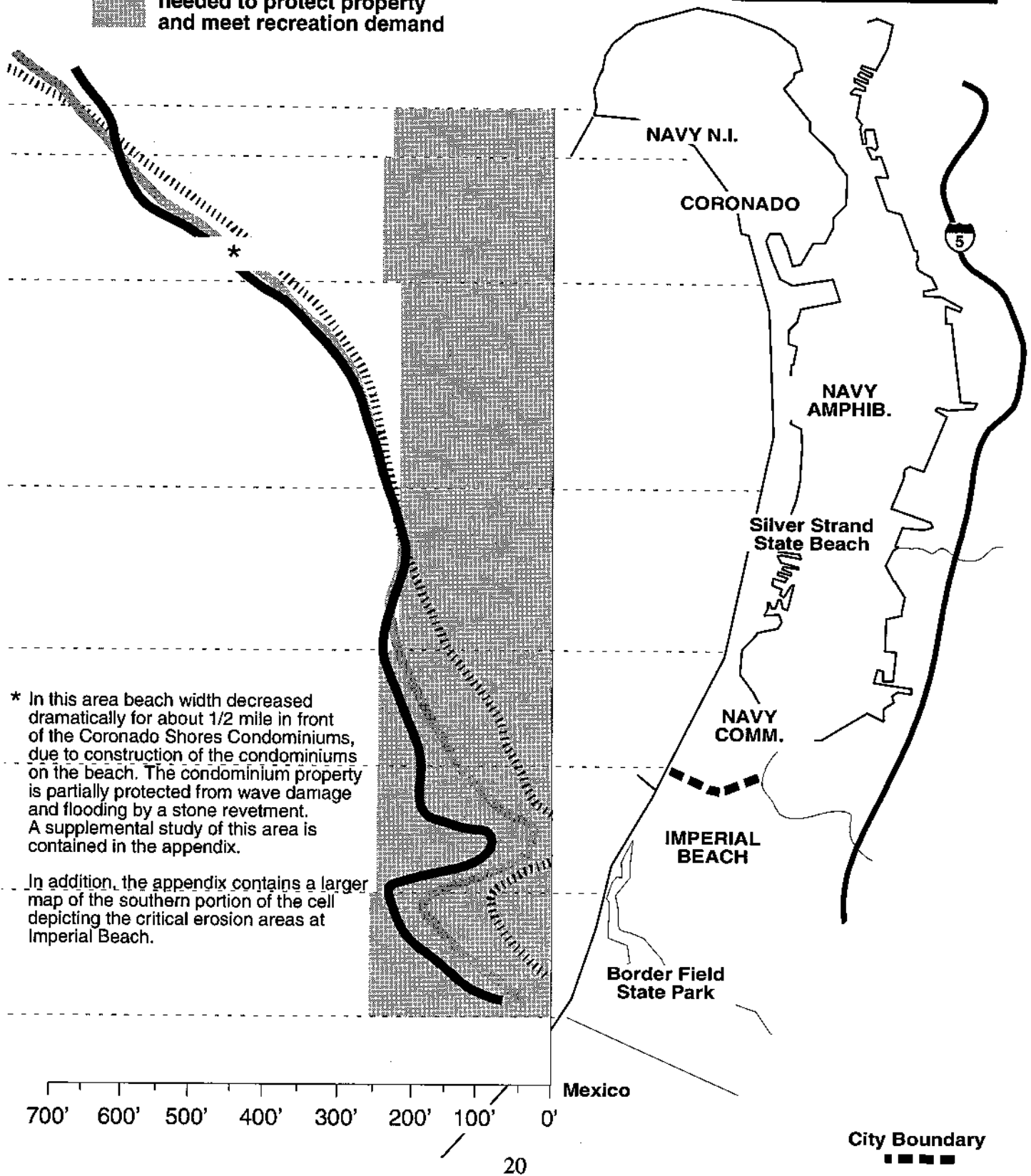
1990 

2010 

2040 

 Estimated annual mean beach width needed to protect property and meet recreation demand

**FIGURE 3
SILVER STRAND
LITTORAL CELL**

* In this area beach width decreased dramatically for about 1/2 mile in front of the Coronado Shores Condominiums, due to construction of the condominiums on the beach. The condominium property is partially protected from wave damage and flooding by a stone revetment. A supplemental study of this area is contained in the appendix.

In addition, the appendix contains a larger map of the southern portion of the cell depicting the critical erosion areas at Imperial Beach.

ESTIMATED ANNUAL MEAN BEACH WIDTHS

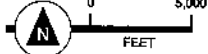
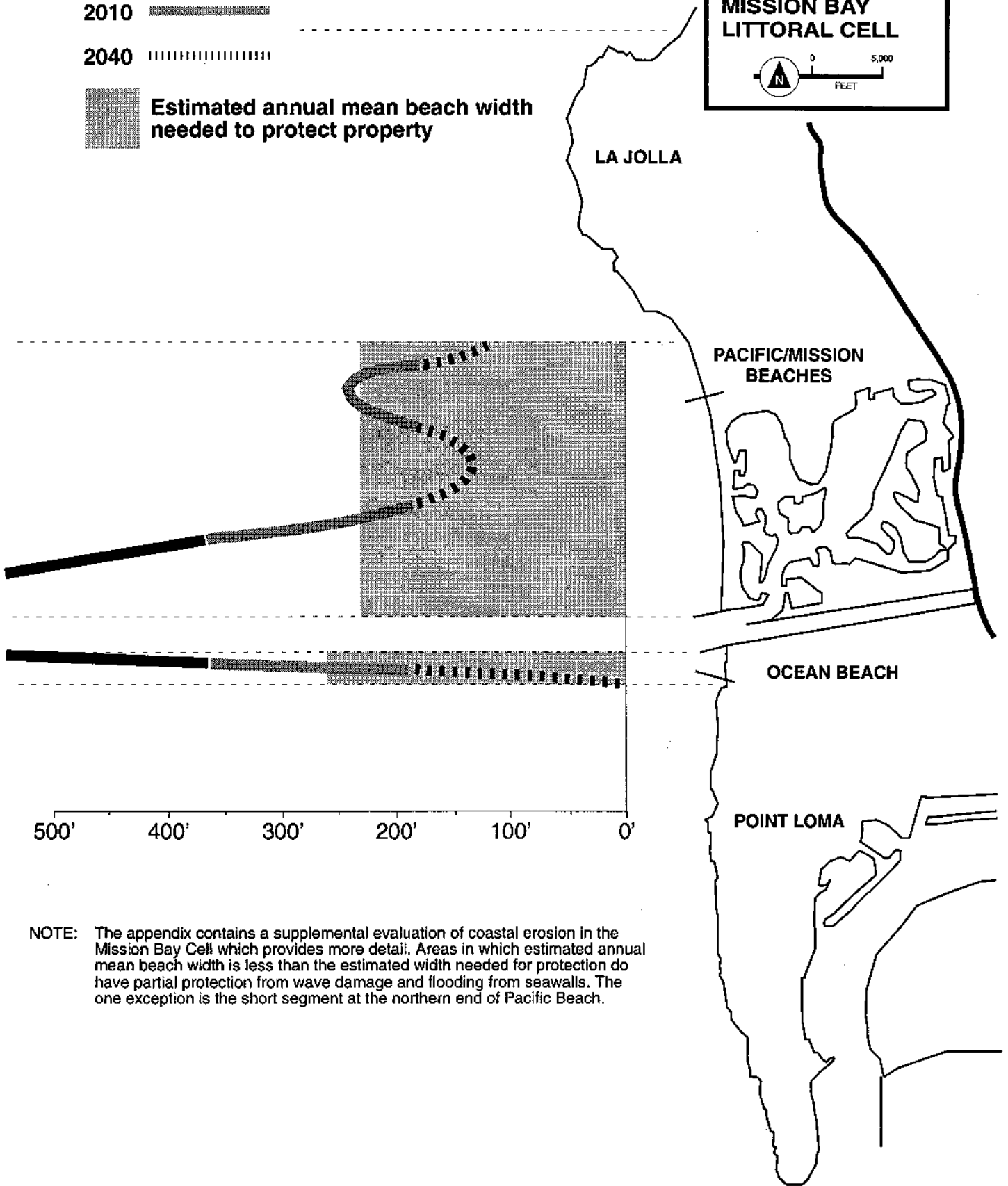
1990 

2010 

2040 

 Estimated annual mean beach width needed to protect property

**FIGURE 4
MISSION BAY
LITTORAL CELL**

NOTE: The appendix contains a supplemental evaluation of coastal erosion in the Mission Bay Cell which provides more detail. Areas in which estimated annual mean beach width is less than the estimated width needed for protection do have partial protection from wave damage and flooding from seawalls. The one exception is the short segment at the northern end of Pacific Beach.

ESTIMATED ANNUAL MEAN BEACH WIDTHS


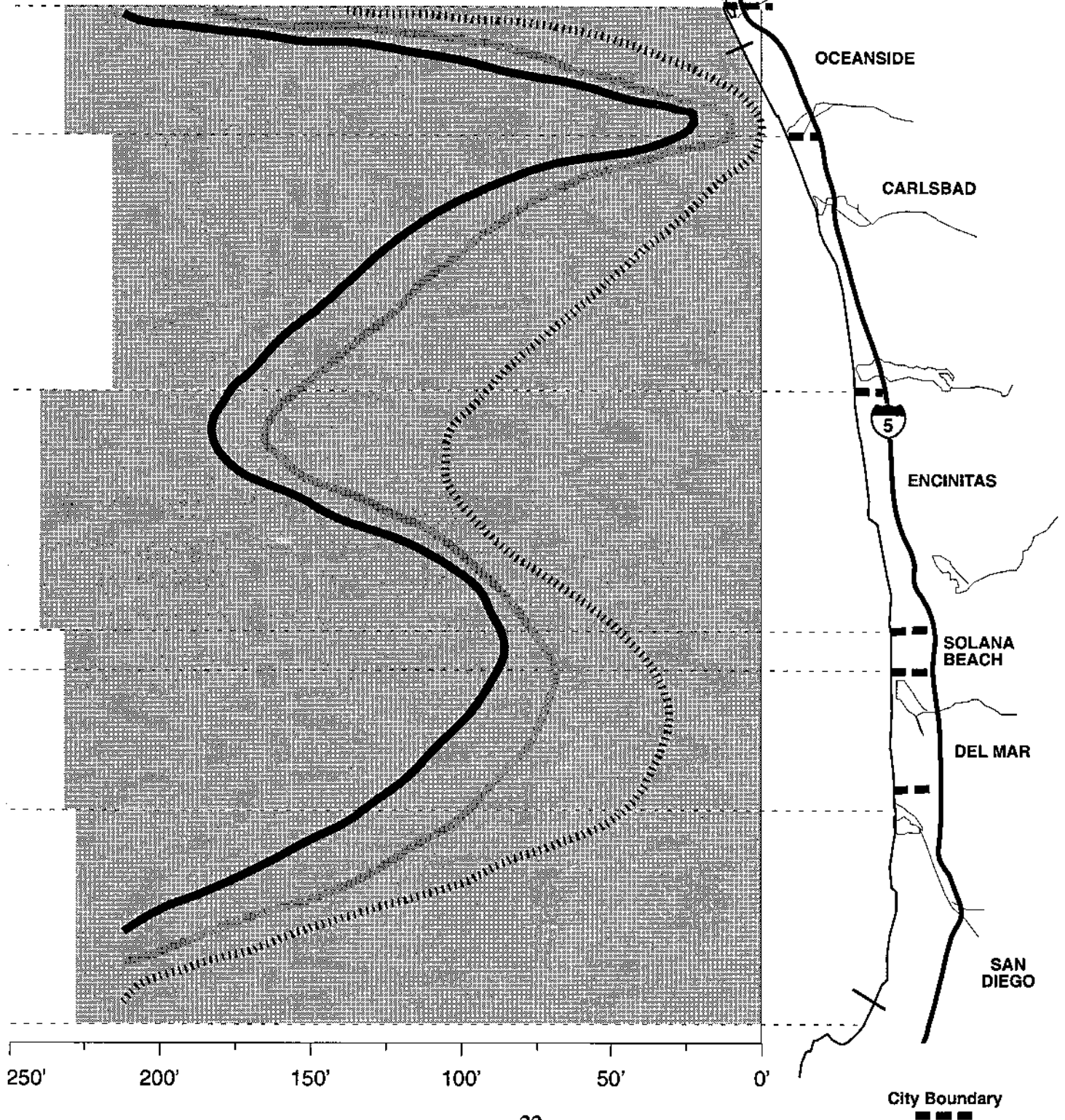
1990 

2010 

2040 

 Estimated annual mean beach width needed to protect property and meet recreation demand

**FIGURE 5
OCEANSIDE
LITTORAL CELL
(Southern Half)**

- the beach widths shown are annual averages that take into account significant seasonal fluctuations which usually result in narrower beaches during the winter and wider beaches in the summer;
- future beach width estimates do not assume any future beach replenishment projects but do include the effects of ongoing sand bypassing projects at Oceanside Harbor and Agua Hedionda Lagoon, and of periodic dredging of Mission Bay and beach replenishment at Ocean and Mission beaches;
- the widths in the Oceanside Cell assume that currently unprotected seacliffs will continue to retreat at their natural rate, adding sand to the beaches, beach widths will decrease at an accelerated rate if additional seawalls and revetments are built;

Shoreline Erosion Problems and Needs

Figure 6 compares in chart form the data presented in Figures 3, 4, and 5: the estimated annual mean beach widths, averaged for each reach, to the estimated beach width needed for property protection and to accommodate recreation demand. Reaches where erosion is expected to cause losses of shorefront property and of beach recreation capacity are highlighted. The assumptions, data and methods used in deriving these estimates are described in the appendix, along with maps showing the comparison of needs and beach widths.

It is important to note that the beach width estimates in Figure 6 are averages for the entire reach. There are variations in beach width within each reach and sometimes they are significant. In addition, recent observations of beach widths in many areas indicate that the maps and data in Figures 3, 4, 5, and 6 are optimistic regarding 1990 beach widths.

Figure 6

SAN DIEGO REGION
ESTIMATED ANNUAL MEAN BEACH WIDTHS
COMPARED TO NEEDS
(FEET)

<u>Shoreline Segment (Reach)</u>	<u>Year</u>	<u>Estimated^a Actual</u>	<u>Estimated Total^b Need For Design Property Protection</u>	<u>Estimated Total Need to^c Accommodate 100% of Recreation Demand</u>
<u>Silver Strand Cell</u>				
<u>Border Field</u>	1990	150	250	26
	2010	100	250	26
	2040	40	250	26
<u>Imperial Beach</u>	1990	150	238	119
	2010	110	238	149
	2040	60	238	196
<u>Navy-Communications</u>	1990	210	236	-
	2010	190	236	-
	2040	90	236	-
<u>Silver Strand</u>	1990	220	210	43
	2010	210	210	55
	2040	175	210	73
<u>Navy-Amphibious</u>	1990	270	209	-
	2010	265	209	-
	2040	260	209	-
<u>Coronado</u>	1990	560	232	59
	2010	570	232	80
	2040	560	232	110
<u>Navy-North Island</u>	1990	640	216	-
	2010	680	216	-
	2040	690	216	-

- a. Widths are averaged over the length of each reach.
- b. The design width is estimated to protect shorefront property from storms up to and including the estimated 100-year storm. In some areas, it may not be technically or economically feasible to extend beach width to the extent needed.
- c. Assumes 100 square feet of beach per person at peak use. In many areas, there are factors in addition to beach width limiting the potential to accommodate recreational demand, such as access to the beach, parking and traffic. The last two columns in this figure are not additive. For example, if the beach were widened from a mean width of 110 feet to 238 feet at Imperial Beach in 2010, both property protection and recreation needs would be met.

Figure 6

SAN DIEGO REGION
 ESTIMATED ANNUAL MEAN BEACH WIDTHS
 COMPARED TO NEEDS
 (FEET)
 (Continued)

Mission Bay Cell

Ocean Beach	1990	215	220	753
	2010	200	220	914
	2040	185	220	1159
Mission & Pacific Beaches	1990	270	200	415
	2010	270	200	503
	2040	270	200	638

Oceanside Cell

San Diego	1990	155	228	130
	2010	130	228	179
	2040	100	228	256
Del Mar	1990	105	232	94
	2010	75	232	130
	2040	30	232	189
Solana Beach	1990	80	232	167
	2010	70	232	228
	2040	35	232	325
Encinitas	1990	125	240	97
	2010	115	240	136
	2040	90	240	195
Carlsbad	1990	105	216	107
	2010	90	216	145
	2040	40	216	207
Oceanside	1990	55	232	79
	2010	40	232	111
	2040	20	232	161
Camp Pendleton	1990	270	240	-
	2010	290	240	-
	2040	295	240	-
San Onofre	1990	205	222	29
	2010	230	222	42
	2040	250	222	63
Orange County	1990	180	224	57
	2010	140	224	80
	2040	100	224	120



IV. RECOMMENDATIONS



IV. RECOMMENDATIONS

The Shoreline Preservation Strategy recommendations are based on the information, evaluation, and policies and objectives presented in the previous sections of the Strategy. The recommendations include proposals for each littoral cell, regionwide recommendations which apply to all of the littoral cells, and implementation, financing and institutional recommendations for carrying out the Strategy.

A beach building and maintenance program is recommended for each of the region's shoreline problem areas. These programs emphasize the nourishment of narrow beaches with sand to make them wide enough to provide property protection and recreational capacity. In addition to nourishment, the design of each beach building and maintenance program should consider a full range of shoreline management tactics that can support beach widening and make it more cost effective. These tactics include shoreline stabilization, shoreline protection, and shoreline development regulation.

It should be noted that full property protection and recreation capacity can never be guaranteed by beach building, protective structures, or any other combination of tactics. However, proper design of a management program can provide a fairly high level of confidence that protection and recreation objectives can be met.

The specific types and scope of projects for each problem area will be identified in the recommended engineering, economic, and environmental design studies. The studies will identify detailed costs, benefits and carryout environmental evaluation requirements.

Silver Strand Littoral Cell

1. Design and carry out a cost-effective beach building and maintenance program for the southern half of the cell, from Silver Strand State Beach south past the International Border, focusing on the Imperial Beach Shoreline.
 - a. The initial volume of sand needed for beach building (increasing the width of the beach) in this area could be as much as 3 million cubic yards and cost in the range of up to \$15 million.² Maintaining the increased beach width could require as much as 90,000 cubic yards of sand per year at an annual cost in

² The cost estimates in the Shoreline Preservation Strategy are based on an average cost of \$5 per cubic yard of sand. This cost includes design, construction, transportation and placement of sand including management and contingency.

the range of up to \$500,000. It is estimated that the economic benefits from property protection and recreation will exceed the costs of the beach building and maintenance program within 10 years. Over the long term (20 to 50 years), economic benefits will substantially exceed costs.

- b. The major sources of sand for the beach building and maintenance program include offshore borrow sites near Imperial Beach (estimated 32 million cubic yards of sand) and near Silver Strand State Beach (estimated 348 million cubic yards of sand). Other potential sand sources include onshore borrow sites in the Sweetwater and Tijuana Rivers, habitat enhancement projects in the Tijuana Estuary, San Diego Bay dredging, and water storage reservoirs. Figure 7 identifies the potential sand sources for this cell.
 - c. An engineering, economic, and environmental design study for the beach building and maintenance program should be completed. It should include consideration of: the two part role of the Tijuana River delta in protecting the Imperial Beach shoreline from erosion (as a source of sand that replenishes the beach at Imperial Beach and the rest of the cell, and as a buffer from wave energy that reduces alongshore transport of sand away from Imperial Beach); the relationship of beach width to shoreline retreat and amount of beachfill needed; the relationship of alongshore to offshore sand transport rates and amount of beachfill needed; variations in annual mean beach width, and in seasonal changes in beach width within the littoral cell; tactics for dealing with cobble beaches; the need for groins or offshore breakwaters in particular areas to regulate the movement of sand up and down coast; the level of property protection, recreation demand accommodation and beach width desired; the role of development regulation and shoreline protective devices in reducing the need for beach building and maintenance in particular areas; recreation, safety, water use and liability issues related to shoreline management structures; the issue of compatibility of sand at borrow sites with the needs of nearby beaches; locations for beachfill placement; effects on surfing conditions; environmental impacts on water quality, plant and animal species and their habitats; and the start date for the program. Finally, the program design should be flexible, and could be incremental, to respond to changing shoreline conditions and new information.
2. Determine the feasibility and cost effectiveness of capturing sand at the northern end of the cell near Zuniga jetty, and backpassing it to the southern portion of the cell where beaches are narrower. Design and carry out a backpassing project if it is a feasible and cost-effective method of supplementing the beach building and maintenance program.
 3. Provide information from the recommended design study to the Coronado Shores Property Owners Association to assist their evaluation of potential wave damage and flooding at the shoreline in front of their property.

**POTENTIAL SAND SOURCES FOR
BEACH BUILDING AND MAINTENANCE**

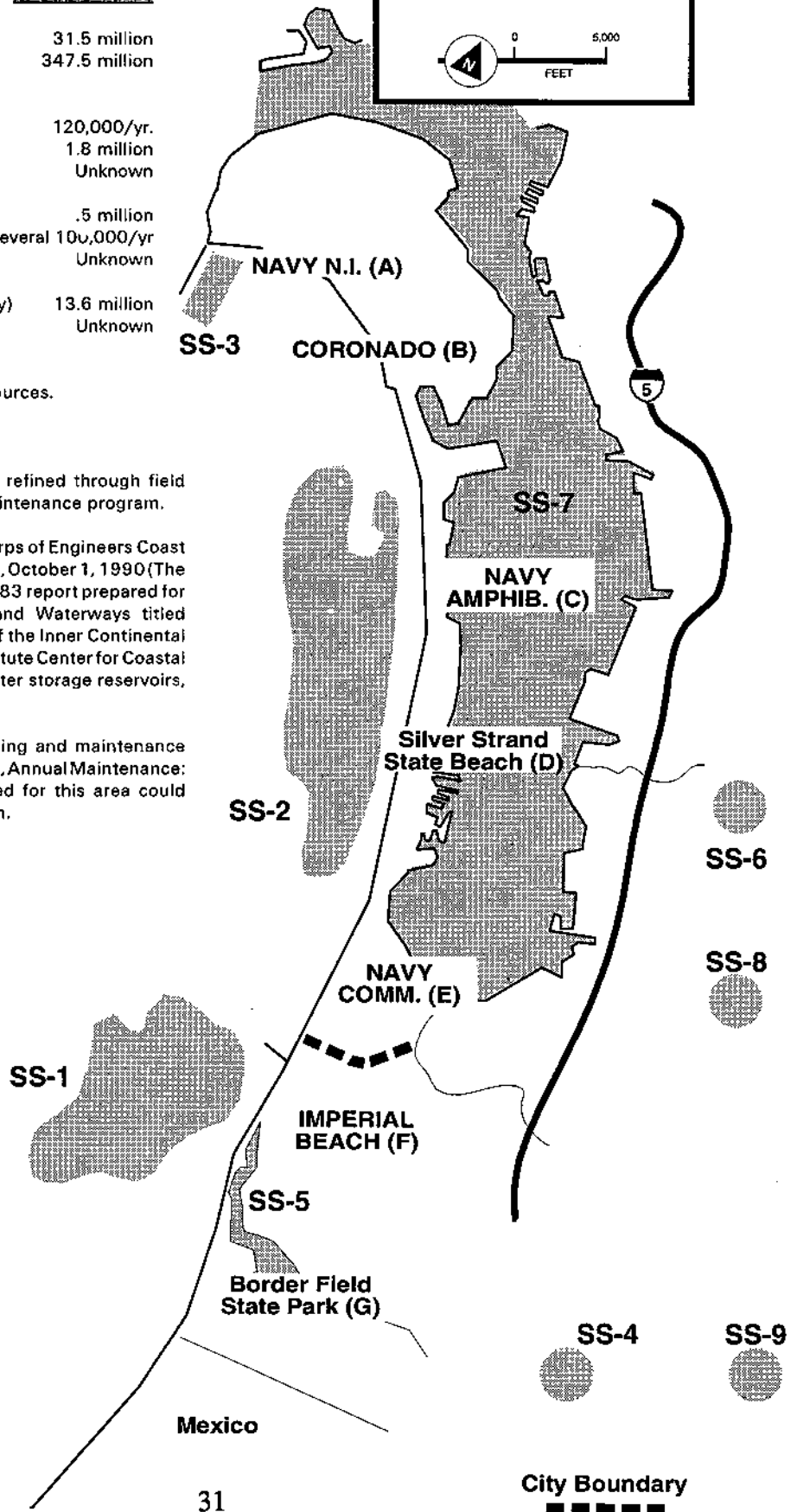
Source	Estimated Volume in Cubic Yards
SS-1 (Offshore Imperial Beach)	31.5 million
SS-2 (Offshore Silver Strand)	347.5 million
SS-3 (Collection of sand moving offshore at Zuniga Jetty)	120,000/yr.
SS-4 (Tijuana River)	1.8 million
SS-5 (Tijuana Estuary Enhancement)	Unknown
SS-6 (Sweetwater River, east of mapped area)	.5 million
SS-7 a. (San Diego Harbor dredging)	0-several 100,000/yr
SS-7 b. (San Diego Bay enhancement)	Unknown
SS-8 (In the following water storage reservoirs: Barrett, Loveland, Morena and Upper Otay)	13.6 million
SS-9 Rodriguez Reservoir in Mexico	Unknown

Not shown on this map: development grading sources.

Notes:

- Volumes are rough estimates which should be refined through field sampling in designing a beach building and maintenance program.
- Source of estimated volumes is the U.S. Army Corps of Engineers Coast of California Study, Draft State of the Coast Report, October 1, 1990 (The estimates for offshore volumes are based on a 1983 report prepared for the California State Department of Boating and Waterways titled "Potential Offshore Sand and Gravel Resources of the Inner Continental Shelf of Southern California") and the Scripps Institute Center for Coastal Studies (1991 estimates of volumes in listed water storage reservoirs, unpublished).
- Volumes of sand needed for a full beach building and maintenance program in this cell: Initial Fill: 3 million cubic yards, Annual Maintenance: 90,000 cubic yards. The design study proposed for this area could recommend a less extensive, less costly program.

**FIGURE 7
SILVER STRAND
LITTORAL CELL**



Mission Bay Littoral Cell

1. Evaluate the limiting effects on beach attendance from overcrowding on the beach, and from parking and access problems, for Ocean, Mission and Pacific Beaches and determine the feasibility and cost effectiveness of beach building and maintenance programs to meet recreational needs. Design and carry out a cost-effective beach building and maintenance program for these beaches if it is determined that recreational beach use will increase as a result, and that a parking and access program can be developed to accommodate additional beach users that is acceptable to local communities and the City of San Diego.
 - a. The initial volume of sand needed for beach building to accommodate potential recreational demand in the Mission Bay littoral cell could be between 500,000 and 6.2 million cubic yards³ and cost in the range of up to \$31 million. Beach maintenance could require up to 5,000 cubic yards per year at an annual cost in the range of up to \$25,000. It is highly unlikely that a program of the larger magnitude would be technically and economically feasible, or that parking and access could be expanded to accommodate it. The economic benefits of the increased recreational use accommodated by maximum width beaches would exceed the costs of the beach building program in the first year and the long term economic benefits would exceed costs substantially if beach use increases as assumed.
 - b. A potential major source of sand for the beach building and maintenance program is an offshore borrow site off Mission Beach (estimated 192,000,000 cubic yards of sand). Other potential sand sources include an onshore borrow site in the San Diego River (excluding dog beach), Mission Bay dredging, and water storage reservoirs. Figure 8 identifies the major sand sources for this cell.
 - c. If it is determined appropriate by local communities and the City of San Diego, an engineering, economic, and environmental design study for a beach building and maintenance program should be completed. It should include consideration of: the relationship of beach width to shoreline retreat and amount of beachfill needed; the relationship of alongshore to offshore sand transport rates and amount of beachfill needed; variations in annual mean beach width, and in seasonal changes in beach width within the littoral cell; strategies for dealing with cobble beaches; the need for groins or offshore breakwaters in particular areas to regulate the movement of sand up and down coast; the level of property protection, recreation demand accommodation and beach width desired; the role of development regulation and shoreline protective devices in reducing the need for beach building and maintenance in

³ 500,000 cubic yards could extend the beach width about 45 yards at Ocean Beach. The 6.2 million cubic yard program would extend the beach to accommodate estimated peak recreation demand at all the beaches in the Mission Bay cell.

**POTENTIAL SAND SOURCES FOR
BEACH BUILDING AND MAINTENANCE**

<u>Source</u>	<u>Estimated Volume in Cubic Yards</u>
MB-1 (Offshore Pacific and Mission Beaches)	192 million
MB-2 (Collection of sand moving offshore at Mission Bay North Jetty)	11,000/yr.
MB-3 (Mission Bay dredging)	20,000/yr.
MB-4 (San Diego River, east of mapped area)	2.8 million
MB-5 (In the following water storage reservoirs: Cuyamaca, Chet Harritt)	3.4 million

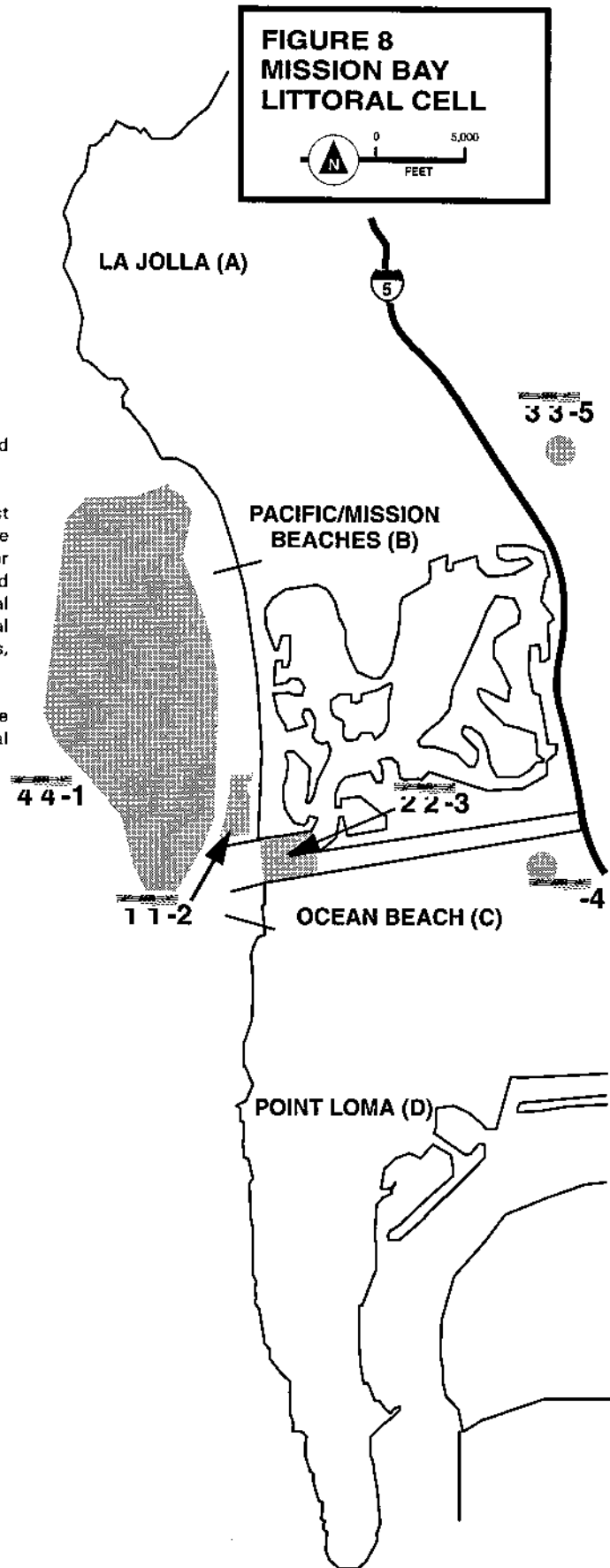
Not shown on this map: development grading sources.

Notes:

*Volumes are rough estimates which should be refined through field sampling in designing a beach building and maintenance program.

*Source of estimated volumes is the U.S. Army Corps of Engineers Coast of California Study, Draft State of the Coast Report, October 1, 1990 (The estimates for offshore volumes are based on a 1983 report prepared for the California State Department of Boating and Waterways titled "Potential Offshore Sand and Gravel Resources of the Inner Continental Shelf of Southern California") and the Scripps Institute Center for Coastal Studies (1991 estimates of volumes in listed water storage reservoirs, unpublished).

Volumes of sand needed for a full beach building and maintenance program in this cell: Initial Fill: 500,000 to 6.7 million cubic yards, Annual Maintenance: up to 5,000 cubic yards.



particular areas; recreation, safety, water use, and liability issues related to shoreline management structures; the matching of sand at borrow sites with the needs of nearby beaches; locations for beachfill placement; effects on surfing conditions; environmental impacts on water quality, plant and animal species and their habitats; and the start date for the program. Finally, the program design should be flexible, and could be incremental, to respond to changing shoreline conditions and new information.

3. Determine the feasibility and cost effectiveness of capturing sand at the southern end of Mission Beach near the San Diego River jetty and backpassing it to the north and south where beaches are narrower. Design and carry out a backpassing project if it is a feasible and cost-effective method of supplementing the beach building and maintenance program.

Oceanside Littoral Cell

1. Design and carry out a cost-effective beach building and maintenance program for the southern half of the cell, from Oceanside Harbor south to La Jolla.
 - a. The initial volume of sand needed for beach building in this area could be as much as 25 million cubic yards and cost in the range of \$126 million. Maintenance could require as much as 320,000 cubic yards of sand per year at an annual cost in the range of \$1.6 million. It is estimated that the economic benefits from property protection and recreation will exceed the costs of the beach building and maintenance program within 2 years. Over the long term, economic benefits will substantially exceed costs.
 - b. The major sources of sand for the beach building and maintenance program include eight offshore borrow sites located along the shoreline from Oceanside Harbor south to La Jolla (estimated 112 million cubic yards of sand). Other potential sand sources include onshore borrow sites in various rivers and coastal terraces, dredge material from the Batiquitos Lagoon enhancement project, and water storage reservoirs. Figure 9 identifies the major sand sources for this cell.
 - c. An engineering, economic, and environmental design study for beach building and maintenance program should be completed. It should include consideration of: the sand bypassing projects already in effect at Oceanside Harbor and Agua Hedionda Lagoon; the relationship of beach width to shoreline retreat and amount of beachfill needed; the relationship of alongshore to offshore sand transport rates and amount of beachfill needed; variations in annual mean beach width, and in seasonal changes in beach width within the littoral cell; strategies for dealing with cobble beaches; the need for groins or offshore breakwaters in particular areas to regulate the movement of sand up and down coast; the level of property protection, recreation demand accommodation and beach width desired; the role of development regulation and

POTENTIAL SAND SOURCES FOR BEACH BUILDING AND MAINTENANCE

Source	Estimated Volume in Cubic Yards
SO-1 (Offshore La Jolla)	5 million
SO-2 (Collection of sand moving down Scripps and La Jolla submarine canyons)	30,000/yr.
SO-3 (Offshore Torrey Pines)	3.1 million
SO-4 (Offshore Los Penasuitos Lagoon)	2.9 million
SO-5 (Offshore San Dieguito Lagoon)	10.3 million
SO-6 (Offshore San Elijo Lagoon)	12.4 million
SO-7 (Offshore Batiquitos Lagoon)	16.5 million
SO-8 (Offshore South Oceanside)	27.1 million
SO-9 (Offshore North Oceanside)	32.6 million
SO-10 (Collection of sand moving offshore at North Oceanside Harbor Jetty)	146,000-440,000/yr.
SO-11 (Los Penasquitos and Soledad Creeks)	61 million
SO-12 (Los Penasquitos Lagoon Enhancement)	Unknown
SO-13 (San Dieguito Lagoon Enhancement)	Unknown
SO-14 (San Dieguito Terrace, east of mapped area)	34.8 million
SO-15 (San Elijo Lagoon Enhancement)	Unknown
SO-16 (Batiquitos Lagoon Enhancement)	2.7-3.7 million
SO-17 (San Marcos Terrace, east of mapped area)	46.5 million
SO-18 (Agua Hedionda Lagoon Enhancement)	Unknown
SO-19 (Buena Vista Lagoon Enhancement)	Unknown
SO-20 (San Luis Rey River, east of mapped area)	2.8 million
SO-21 (Santa Margarita Marsh Enhancement)	Unknown
SO-22 (Santa Margarita River, east of mapped area)	34.8 million
SO-23 (In the following water storage reservoirs: Hodges, Henshaw, Wohlford, San Dieguito, Sutherland)	27.5 million

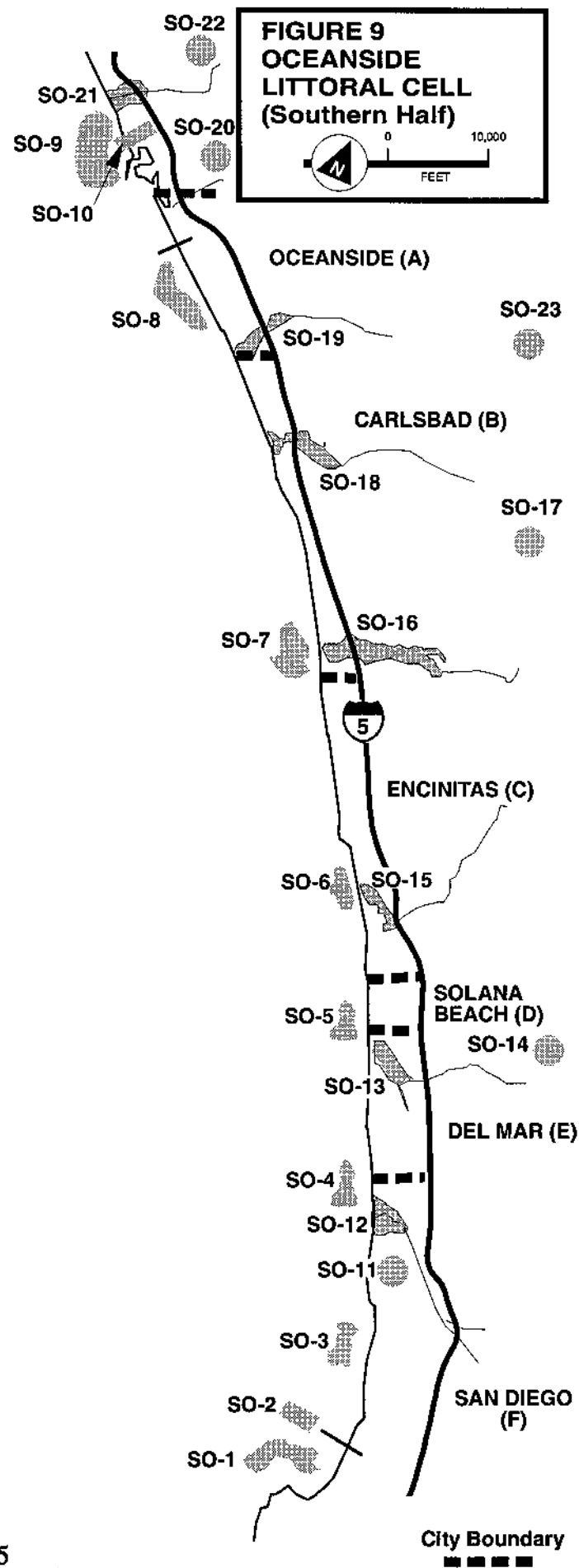
Not shown on this map: development grading sources.

Notes:

*Volumes are rough estimates which should be refined through field sampling in designing a beach building and maintenance program.

*Source of estimated volumes is the U.S. Army Corps of Engineers Coast of California Study, Draft State of the Coast Report, October 1, 1990 (The estimates for offshore volumes are based on a 1983 report prepared for the California State Department of Boating and Waterways titled "Potential Offshore Sand and Gravel Resources of the Inner Continental Shelf of Southern California") and the Scripps Institute Center for Coastal Studies (1991 estimates of volumes in listed water storage reservoirs, unpublished).

Volumes of sand needed for a full beach building and maintenance program in this cell: Initial Fill: 25 million cubic yards, Annual Maintenance: 320,000 cubic yards. The design study proposed for this area could recommend a less extensive and less costly program.



shoreline protective devices in reducing the need for beach building and maintenance in particular areas; recreation, safety, water use and liability issues related to shoreline management structures; the matching of sand at borrow sites with the needs of nearby beaches; locations for beachfill placement; effects on surfing conditions; environmental impacts on water quality, plant and animal species and their habitats; and the start date for the program. Finally, the program design should be flexible, and could be incremental, to respond to changing shoreline conditions and new information.

2. Determine the feasibility and cost effectiveness of capturing sand before it is lost down Scripps and La Jolla Submarine Canyons, and backpassing it to upcoast areas with narrow beaches. Design and carry out a backpassing project if it is a feasible and cost-effective method of supplementing the beach building and maintenance program.
3. Determine the feasibility and cost effectiveness of capturing sand before it moves offshore of Oceanside Harbor, and bypassing it to downcoast areas with narrow beaches. Design and carry out a bypassing project if it is a feasible and cost-effective method of supplementing the beach building and maintenance program and the existing Oceanside Harbor bypassing project. The active movement of sand offshore at Oceanside Harbor should be conclusively determined before this work is pursued in the design study.

REGIONWIDE

1. Develop guidelines for the acceptable composition of beachfill material from all sand sources (including innovative sources) considered in the Shoreline Preservation Strategy, for use by the appropriate state, federal, and local regulatory and planning agencies. The type, composition and location of placement of dredge material should be carefully determined to maximize the amount of sand that gets to beaches.
2. Develop technical information regarding the issues of shoreline land use and protective structures for use by local jurisdictions. The information should include discussion of the use of setbacks from beaches and seacliffs and beach building over the use of seawalls and revetments to protect property, and the adverse impacts of protective structures on beaches and ways to mitigate these impacts. It should be noted that beach building and shore protective structures do not solve bluff failure problems caused by inland groundwater migration and poorly designed storm drains.
 - a. The technical information should provide for local flexibility in implementation based on local conditions and existing commitments. Given the wide range of local situations, each local jurisdiction should develop its own standards and guidelines consistent with the regional guidelines. There could be provisions for the use of visually unobtrusive protective structures in combination with beach building where cost effective, and for the use of protective structures

where the use of setbacks and beach building are infeasible and where buildings or major public improvements such as roads are in imminent danger.

- b. Shoreline development issues (new development and protective structures) are not of equal importance in all jurisdictions, and local conditions and past actions make dealing with shoreline development a unique problem for each jurisdiction. In several communities, for example Coronado and Carlsbad, shoreline development does not appear to be a major concern because protective structures are already in place. Del Mar has a very detailed ordinance and strategy for dealing with shoreline development in place, as does Oceanside. Solana Beach and Encinitas are very concerned about shoreline development and are actively seeking solutions. The steep seacliffs and narrow beaches in this part of the coast make the problem urgent.
 - c. There is a consensus that the best way of dealing with shoreline development issues is through citywide proactive planning, rather than through case-by-case decisions on permit applications. There are several potential advantages of the citywide, proactive approach. It allows the local government, shoreline property owners and the beach-using public to work out tradeoffs on the benefits and costs of a comprehensive solution. It may also offer some negotiating opportunities with the Coastal Commission regarding the interpretation of Coastal Act policies which strictly protect the beach and natural seacliff environment at the expense of private property loss.
 - d. The issue of balancing public use and enjoyment of the beach with property protection in addressing shoreline development was a volatile one in every workshop where it was discussed. Shoreline property owners are typically, and understandably, adamantly opposed to the strict implementation of the Coastal Act policies which would eventually result in their losing land to shoreline erosion. Other members of the public are generally in favor of protecting the beach and natural shoreline environment as a first priority. A similar dichotomy exists for the issue of requiring mitigation of the adverse beach impacts of shoreline protective structures. For both of these issues, it appears that community level resolution will work the best.
 - e. Local jurisdictions should use the information in the technical report in their consideration of shoreline development issues. SANDAG should continue to assist local jurisdictions through the development of additional technical information where appropriate.
3. Review harbor, bay and lagoon dredging proposals to ensure that appropriate dredge material is incorporated in the beach building and maintenance programs recommended for each littoral cell. This action constitutes implementation of the Regional Dredging policy approved by SANDAG in May, 1991. Evaluation of controls on sand mining operations should be completed to determine if there could be a positive

- impact on beaches. Recommendations should be developed as a result of this evaluation.
4. Review of water storage and reservoir studies and projects to encourage consideration of using beach compatible sediment from these sources as beachfill. Consideration of water quality impacts on water supply reservoirs and impacts from transportation of sand to beaches should be taken into account.
 5. Determine the feasibility and cost effectiveness of encouraging the placement of beach compatible material from land development grading at the region's beaches. Develop regional guidelines for use by local jurisdictions in using this source of sand in the beach building and maintenance programs recommended for each littoral cell, if feasible and cost effective.
 6. Pursue the evolving legal interpretation of the "public trust doctrine" as it applies to beach sand for use in implementing recommendations 3, 4, and 5. This concept could play a significant part in implementing the Shoreline Preservation Strategy.
 7. Develop guidelines for the use of temporary methods of protecting shoreline property from storm damage, such as improved storm warning programs, the use of sand bags, and the use of temporary sand berms, for use by appropriate state, federal, and local agencies.
 8. Determine the feasibility and cost effectiveness of using beach compatible dredge material from lagoon and estuary enhancement projects in the region's beach building and maintenance program, as enhancement projects are planned. Incorporate sand from lagoon and estuary enhancement projects in the beach building and maintenance programs recommended for each littoral cell, if feasible and cost effective.
 9. Determine the feasibility and cost effectiveness of transporting sand from reservoirs, riverbeds (including commercial sandpits) and debris catch basins to the region's beaches. This evaluation should include The Tijuana River and Rodriguez Reservoir in Mexico. It should include consideration of impacts of sand removal on public facilities in floodways (e.g., bridges, utilities) and the costs of transporting sand to beaches. The cooperation of the County Water Authority and its member agencies should be obtained. Design and carry out a program of projects which incorporate these sources of sand in the beach building and maintenance programs recommended for each littoral cell, if feasible and cost effective.
 10. Develop guidelines for land use planning, regulation and development which encourage the continued contribution of sand to the region's beaches from natural sources such as seacliffs in undeveloped areas, coastal terraces and ravines, and upland sources. These guidelines should be coordinated with other land use planning programs and policies in the region such as open space planning efforts, and should be used by appropriate state, federal, and local agencies.

11. Determine the capacity of local transportation and parking facilities to accommodate increases in recreational beach use which will be provided for by the beach building and maintenance programs recommended for each littoral cell. Local jurisdictions and state and federal agencies should use this information to identify parking and access problems and to develop solutions, emphasizing transit.
12. Design and carry out a regional shoreline monitoring program to evaluate the effectiveness of the recommended actions.
 - a. A minimum, low cost monitoring program would involve aerial photo measurements of beach width annually or semi-annually. Also, the existing wave measuring gauges off the region's coast should be retained by the state and federal agencies operating them.
 - b. A more effective monitoring program with more frequent beach width measurements and periodic measurements of littoral zone beach profiles should be pursued. Both innovative, high technology approaches such as satellite archives; and simple, low technology methods such as tape measurement of beach widths by city staff or citizen volunteers should be considered in supplementing the basic monitoring program.
 - c. More detailed monitoring efforts may be included in the design of the beach building and maintenance programs developed for each littoral cell, and for specific projects.
13. An annual "State of the Region's Beaches" report should be prepared by SANDAG to describe progress made in implementing the Strategy and identify problem areas that need emphasis.

FINANCING

(See institutional recommendations for a discussion of responsibilities.)

1. Traditional state and federal funding sources such as the State Department of Boating and Waterways, the Coastal Conservancy and State Bond Act grants and loans, and federal assistance through the U.S. Army Corps of Engineers should continue to be pursued by organizations implementing the Shoreline Preservation Strategy. Special sources of state and federal funds that may become available from time to time through agencies such as the California Coastal Commission, State Lands Commission, the federal Environmental Protection Agency, and the National Oceanic and Atmospheric Administration should also be pursued. In most instances, these funds will have to be legislatively initiated. It is anticipated that state and federal funds will cover only a portion of the total financing needs.
2. The financing program should be developed on a regional basis to ensure equity and to build understanding and support. It should be selected by the region's elected

officials based on the design studies and public participation and comment. The cooperation and needs of involved state and federal agencies should be considered in financing decisions. It should take into account the cost incurred by cities to provide beach related functions such as; lifeguard services, maintenance, insurance, etc.

3. The financing program should be designed to consider the high front end costs of beach building and should be flexible to allow for the setting of priorities where program needs exceed funds available, and to incorporate new sources of financing as they become available. It should recognize that a major portion of the needed funds will have to come from local and regional sources.
4. Shoreline property in the areas of the region where the beach building and maintenance programs are focused will receive major benefits from the program results, both directly from property protection and indirectly in terms of property value. A financing mechanism which includes shoreline property for an equitable share of the needed funds should be considered.
 - a. One appropriate financing mechanism to obtain funds from shoreline property is an assessment district.
 - b. State and federal agencies owning shoreline property should contribute funds for the beach building and maintenance program in proportion to their benefits.
5. It is estimated that visitors to San Diego County account for about 20% of the region's beach users. A financing mechanism which collects an equitable share of the needed funds from visitors should be considered. Transient occupancy taxes are one source for these funds.
6. San Diego County residents and businesses benefit substantially from living close to the region's shoreline. They benefit directly from their use and enjoyment of beaches and parks, and indirectly in terms of property value and economic activity. A financing mechanism which targets residents for an equitable share of funds should be considered.
 - a. There are several potential financing mechanisms that can be used to collect funds from residents. They include assessment district(s), a parcel tax, an increase in the local sales tax and an increase in the property tax.
 - b. A regional impact fee on new development for its fair share of costs could be considered.
 - c. Creation of a utility by local agencies which could charge fees for shore and beach services could be considered. This innovative financing method has been used by several local agencies in the U.S.

7. Financing of the Shoreline Preservation Strategy should be coordinated with other Open Space and Natural Resource Financing needs and programs through the Regional Growth Management Strategy being developed by SANDAG. The SANDAG Regional Revenues Advisory Committee and Open Space Citizens Advisory Committee should include financing of the Shoreline Preservation Strategy in their work.
8. The first priority for use of public funds should be for protection, preservation and enhancement of publicly owned resources.

INSTITUTIONAL

1. The Shoreline Erosion Committee and SANDAG should continue to coordinate shoreline preservation activities for the region, including the design studies and implementation of the beach building and maintenance programs for the region's shoreline problem areas.
2. Financing and the cooperative institutional arrangements that may be needed to implement the Strategy should be developed through the cooperative work of the SANDAG Open Space Citizens Advisory Committee, Regional Revenues Advisory Committee, and the Shoreline Erosion Committee.
3. Local jurisdictions and state and federal agencies will be responsible for a number of implementation actions, as specified in the recommendations. Some of these actions will need to be implemented locally through amendments to Local Coastal Plans (LCP's), General Plans, and ordinances. Local corollaries to the first three regional objectives in the Strategy should be incorporated into LCP land use plans.
4. The interjurisdictional nature of the recommended beach building and maintenance programs, and the significant amount of funds to be raised and expended to carry these programs out, could require additional cooperative intergovernmental arrangements for implementation.
 - a. The purpose of additional arrangements would be to formalize joint decision making about the implementation of the Shoreline Preservation Strategy, and to provide a mechanism for financing.
 - b. The arrangements should provide for the involvement of appropriate state and federal agencies as well as Mexican officials.
 - c. The format of additional arrangements could range from the designation of a lead agency and the signing of a Memorandum of Agreement, to the formation of a joint powers agency or shoreline authority to carry out implementation. An example is the BEACH JPA in the Oceanside littoral cell. There may also need to be additional arrangements set up to coordinate financing and implementation on a regionwide basis.

- d. The most appropriate types of intergovernmental arrangements will depend to some extent on the financing mechanisms chosen. The institutional arrangements for implementation of the Strategy should therefore be developed concurrently with the financing program.

IMPLEMENTATION

- 1. The implementation of the Shoreline Preservation Strategy should provide for flexibility and latitude to accommodate the following:
 - a. Additional field work and engineering and economic analysis.
 - b. Detailed environmental studies.
 - c. Community involvement. Of prime importance for many communities will be developing consensus on the appropriate balance between beach nourishment and replenishment, shoreline stabilization structures such as groins, structures to protect property such as seawalls, shoreline development regulations, and impacts on upcoast and downcoast shorelines.
 - d. Funding and beach building opportunities that may arise. For example, the U.S. Army Corps of Engineers' studies of erosion and storm damage problems in various communities will provide a significant amount of information applicable to implementation and may lead to federal funding opportunities. Opportunistic sources of sand that may become available could reduce program costs.
- 2. The following implementation steps, and timing and cost estimates, illustrate the major decisions and work tasks involved in implementing the Shoreline Preservation Strategy:

<u>Implementation Step</u>	<u>Timing</u>	<u>Cost</u>
a. Approval/Support of Strategy (Local Jurisdictions/State & Federal Agencies)	July-Oct. 1993	--
b. Scope of Work and Costs for Beach Building Design Studies *	FY93-94	\$100,000
c. Agreement to Fund and Carry Out Design Studies (Local Jurisdictions, State & Federal Agencies)	Calendar 1994	--
d. Complete Engineering, Economic and Environmental Design Studies *	Calendar 1995	\$2,000,000

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| e. Agreement to Fund and Carry Out Shoreline Management Program (Local jurisdictions, State & Federal Agencies) | Calendar
1996 | -- |
| f. Fund and Implement Projects * | 1996 | <u>Up to \$5 million/year</u>
(\$12 million/year
if financed) |

* These work tasks will mos. likely consist of several work efforts carried out by different local, state or federal entities, but coordinated by SANDAG and the Shoreline Erosion Committee. For example, the U.S. Army Corps of Engineers erosion and storm damage studies, and possible future projects will contribute to all three of the work tasks.

A flowchart, describing in more detail the tasks and decisions described above, and their relationship, is contained in the Appendix.

