

## 4 THE CARMEL SHORELINE LANDSCAPE

Carmel's shoreline landscape constitutes everything that people see along the shore, including the ocean, beach, dunes and bluffs, flowers, shrubs, trees, and boulders, as well as the Pathway, guardrails, beach accessways, signs, and stone walls. Even the momentary changes of weather, wildlife, people, automobiles, and other transient scenery make up the landscape mosaic of the shoreline experience.

### 4.1 NATURAL LANDSCAPE

During the past one hundred years, people have changed much of Carmel's natural shoreline landscape. Photographs taken in the early 20<sup>th</sup> century depict a shore covered with low native scrub plants and very few trees (Photo 8). As the City of Carmel grew, much of the shoreline was planted with flowers, shrubs, and trees from other parts of the world.



L.S. Slevin photo

Pat Hathaway Photo Collection, Monterey

Photo 8 – Southern Carmel Shoreline (from 11<sup>th</sup> Ave. to Martin Way) 1908

#### 4.1.1 Native Species and Habitats

At one time, much of what is now the City of Carmel was covered with a surprisingly diverse community of native flora and fauna. Near the shoreline, these species were able to tolerate, and even thrive in, the area's harsh coastal conditions: exposure to salt, burial by shifting sand, lack of nutrients, and blasting by sand-laden winds. Today, there remain only a few remnants of Carmel's original native shoreline community – mostly in the North Dunes.

##### *Upper Beach*

Beaches are subjected to heavy disturbance by both natural forces and human activities. As a result, they are seldom vegetated. Along Carmel's upper beach, near the Tenth Avenue (North) stairway and just south of the Eleventh Avenue stairway, are thriving stands of a native beach/dune grass (*Elymus* [= *Leymus*] *mollis*). These plants grow well in the face of the shoreline's natural challenges, but are not very tolerant of trampling. (During the late 1980s, the City planted *Elymus* along the upper beach between Eighth and Ninth Avenues, but the plants eventually succumbed to trampling.)

##### *North Dunes*

The North Dunes represent one of the City's most significant native coastal biotic community. Jones and Stokes (1995) found bush lupine (*Lupinus arboreus*), beach sagewort (*Artemisia pycnocephala*), pink sand verbena (*Abronia umbellata*), and mock heather (*Ericameria ericoides*) along with several other native plant species.

Of special note is the presence of Tidestrom's lupine (*Lupinus tidestromii* var. *tidestromii*), a state- and federal-listed endangered plant species. Jones and Stokes (1995) documented the first record of Tidestrom's lupine at Carmel, reporting 280 individual plants within the North Dunes ecosystem. An informal survey conducted in 2001, in conjunction with this *Carmel Shoreline Management Plan*, confirmed the presence of several hundred plants.

The North Dunes may also be inhabited by the California Black Legless Lizard (*Anniella pulchra nigra*). In 1985, 12 specimens were located in Carmel area dunes by federal wildlife biologists;<sup>44</sup> suitable habitat is thought to exist in portions of the North Dunes. The status of the California Black Legless Lizard

---

<sup>44</sup> Bury, B.R. 1985. Status report. *Anniella pulchra nigra* Fisher, black legless lizard (Anniellidae: Sauria) in Central California. Ecosystems Studies Section, Denver Wildlife Research Center. Fort Collins, CA. Prepared for U.S. Fish and Wildlife Service, Office of Endangered Species, Portland, OR. (cited in Jones and Stokes, 1995).

has changed since the Jones and Stokes (1995) report: This species is currently designated as a "Species of Special Concern" by the California Department of Fish and Game, but is no longer a candidate for Endangered Species listing by the federal government.

Based on the presence of Tidestrom's lupine and potential habitat for the California Black Legless Lizard, the City has designated the North Dunes as an Environmentally Sensitive Habitat Area (ESHA). This is shown on Fig. 4.

The North Dunes are also haven to several exotic invasive plant species, including acacia and Hottentot-fig ice plant (*Carpobrotus edulis*). As described below, these aggressive plants tend to overwhelm native plants, replace habitats for native coastal wildlife, and simplify coastal ecosystems. In some portions of the North Dunes, expansion of aggressive ice plant growth could eventually crowd out slower growing native species, including the endangered Tidestrom's lupine.

Protection of the North Dunes and their native habitat will be studied during the upcoming Del Mar and North Dunes Master Plan process.

### *Del Mar Dunes*

Native plant- and wildlife habitats in the narrow Del Mar Dunes have been disturbed by occasional coastal erosion and by the growth of exotic, invasive ice plant and acacia. Jones and Stokes (1995) studied these dunes and determined that they represent potential habitat for native dune plants and animals. The Del Mar Dunes have been designated as an Environmentally Sensitive Habitat Area (ESHA); the restoration of the Del Mar Dunes native habitat would be consistent with the California Coastal Act. This area will also be part of Carmel's Del Mar and North Dunes Master Plan.

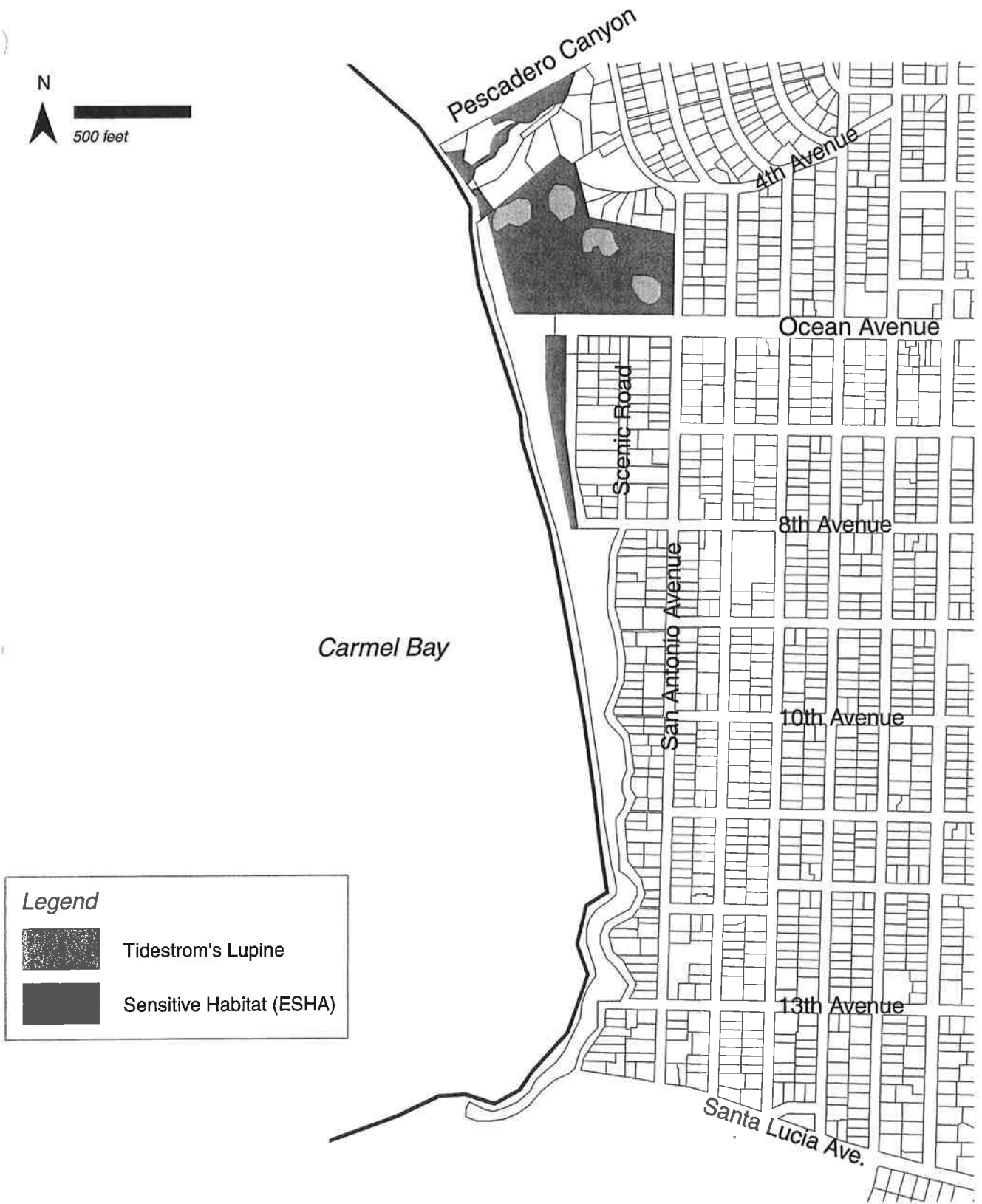


Figure 4  
**Environmentally Sensitive Habitat Areas**

#### 4.1.2 Horticultural and Introduced Plants

Most of the plants growing along Carmel's shoreline are native to other regions. Some were used to help stabilize the ever-changing coastal dunes. But most were introduced to serve as ornamental elements in a public or private landscape.

##### *Upper Beach*

Over the years, the stretch of upper beach extending between Pescadero Creek and Eighth Avenue has become vegetated mainly with Hottentot-fig ice plant (*C. edulis*), acacia (*Acacia* sp.), and sea rocket (*Cakile maritima*); both ice plant and acacia are exotic invasives. They grow aggressively, outcompeting, and eventually replacing, native California beach and dune plants. This produces a restrictive monoculture that can limit populations of native wildlife that are closely linked with the native plants. Sea rocket is also thought to be an introduced species, but its growth characteristics are not known to have a detrimental impact on California beach and dune communities.

##### *North Dunes and Del Mar Dunes*

The invasive exotics, Hottentot-fig ice plant and acacia, also grow in the North Dunes and Del Mar Dunes. In the past, City staff or residents purposely planted each of these species in an attempt to stabilize shifting dunes. Both species are now well established; without control, they out-compete neighboring plants and replace native wildlife habitats.

##### *Beach Bluff Pathway*

Plants growing along the remainder of Carmel's shoreline are primarily introduced horticultural species. With the exception of the ubiquitous Hottentot-fig ice plant and acacia, most other plants were introduced as part of the Beach Bluff Pathway landscape.

The original Pathway landscape plants were selected to serve two purposes: to enhance the aesthetic qualities of the Scenic Road/bluff top area, and to protect the City's fragile coastal bluffs from damage.

The palette of plants selected by the Pathway designers (landscape architects from Royston, Hanamoto, Alley, and Abey, in conjunction with the Carmel Beach Rehabilitation Task Force, City staff, and consultants) met several criteria. They were:

- tolerant of coastal conditions, especially exposure to salt spray;

- drought tolerant (or able to thrive on limited water);
- tolerant of human activity;
- suitable for erosion control;
- non-invasive;
- relatively easy to grow;
- commercially available; and
- “natural looking” (native or “native-like” - subtle in color).

The species originally selected for the Pathway landscape are listed in Table 2, below:

Table 2 – APPROVED CARMEL BEACH BLUFF PATHWAY  
PLANTS<sup>45</sup>

**Large Shrubs**

<i>Arbutus unedo</i>	Strawberry Tree
<i>Atriplex lentiformis</i> 'breweri'	Brewer's Saltbush
<i>Leptospermum laevigatum</i> 'compactum'	Australian Tea Tree
<i>Pittosporum crassifolium</i>	NCN
<i>Rhus integrifolia</i>	Lemonade Berry

**Barrier Plants**

<i>Ceanothus impressus</i> 'Joyce Coulter'	Joyce Coulter Ceanothus
<i>Ceanothus impressus</i> 'Julia Phelps'	Julia Phelps Ceanothus
<i>Echium fastuosum</i>	Pride of Madeira
<i>Escallonia</i> 'Newport Dwarf'	Newport Escallonia
<i>Griselinia lucida</i>	NCN
<i>Pinus mugo</i>	Mugo Pine

**Color Planting**

<i>Chrysanthemum leucanthemum</i>	Ox-Eye Daisy
<i>Erigeron glaucus</i>	Sea Daisy
<i>Eschscholzia californica</i>	California Poppy
Ferns	Ferns
<i>Iris douglasiana</i>	Pacific Coast Iris
<i>Lupinus chamissonis</i>	Lupine
<i>Limonium perezii</i>	Sea Lavender (Statice)

**Low Shrubs**

<i>Ceanothus griseus</i> 'horizontalis'	Carmel Creeper
<i>Cistus skabergii</i>	Hybrid Rockrose
<i>Cistus ladanifer</i>	Crimson Spot Rockrose
<i>Lavandula angustifolia</i>	English Lavender
<i>Lavandula dentate</i>	French Lavender
<i>Ribes viburnifolium</i>	Catalina
<i>Santolina chamaecyparissus</i>	Lavender Cotton
<i>Teucreum fruticans</i> 'compacta'	Dwarf Bush Germander

<sup>45</sup> These plants were part of the Beach Bluff Pathway landscape design that was approved by the Forest and Beach Commission, Planning Commission, City Council, and California Coastal Commission in 1987 (From: RHAA Landscape Plan for the "Carmel Beach Restoration Project.")

This plant list<sup>46</sup> is a critical feature of the City's overall plan for the shoreline. As part of the Carmel Beach Rehabilitation Project, the landscape plan was approved by two City commissions,<sup>47</sup> the City Council, and the California Coastal Commission<sup>48</sup> in 1987. Over the past decade, this landscape plan has been used as a guide for the re-vegetation of the coastal bluffs and bluff tops in several shoreline repair projects.<sup>49</sup>

The Carmel Beach Bluff Pathway floral landscape is in need of revitalization; steps required to achieve this renewal are described in Section. 4.3.1.

#### 4.1.3 Shoreline Trees

Carmel has been described as "a small village in a forest." The City's shoreline is also blessed with a large number of trees. Monterey cypress, Monterey pine, coast live oak and acacia are the most dominant and dramatic landscape features along the City's shoreline (Fig. 5).

Cypress overwhelmingly populate the bluffs, dunes and the Ocean Avenue/Del Mar parking lot area. All the Monterey cypress along our shore were planted from seedlings gathered from those native stands at Cypress Point to the north and Point Lobos across Carmel Bay to the south. These trees, some 100 strong, were planted by one of Frank Devendorf's<sup>50</sup> maintenance workers and his young daughter, who nurtured each for several years until established. Now, many are over a century old. Over the years, many cypress that were past their prime, declined and died. During the 1982/83 El Niño storms, 16 large cypress were lost.

Monterey cypress are the sentinels of our shoreline. Whether standing tall or twisted and gnarled, they define the transition and progression of our community's landscape. From the water's edge, past the tidal zone up to the bluffs and dunes, Monterey cypress provide the foundation for all other landscape plantings.

Monterey cypress are the primary arboreal element of the Carmel coastal landscape. Views of the beach, bluffs, and ocean through cypress boughs are a unique visual component of the City's shoreline. Plants that conflict with, or

---

<sup>46</sup> RHAA landscape plans, entitled "Carmel Beach Restoration Phase II." Copies of these plans are kept on file at the Carmel-by-the-Sea City Hall, and at the Departments of Community Planning and Building and Forest, Parks, and Beach.

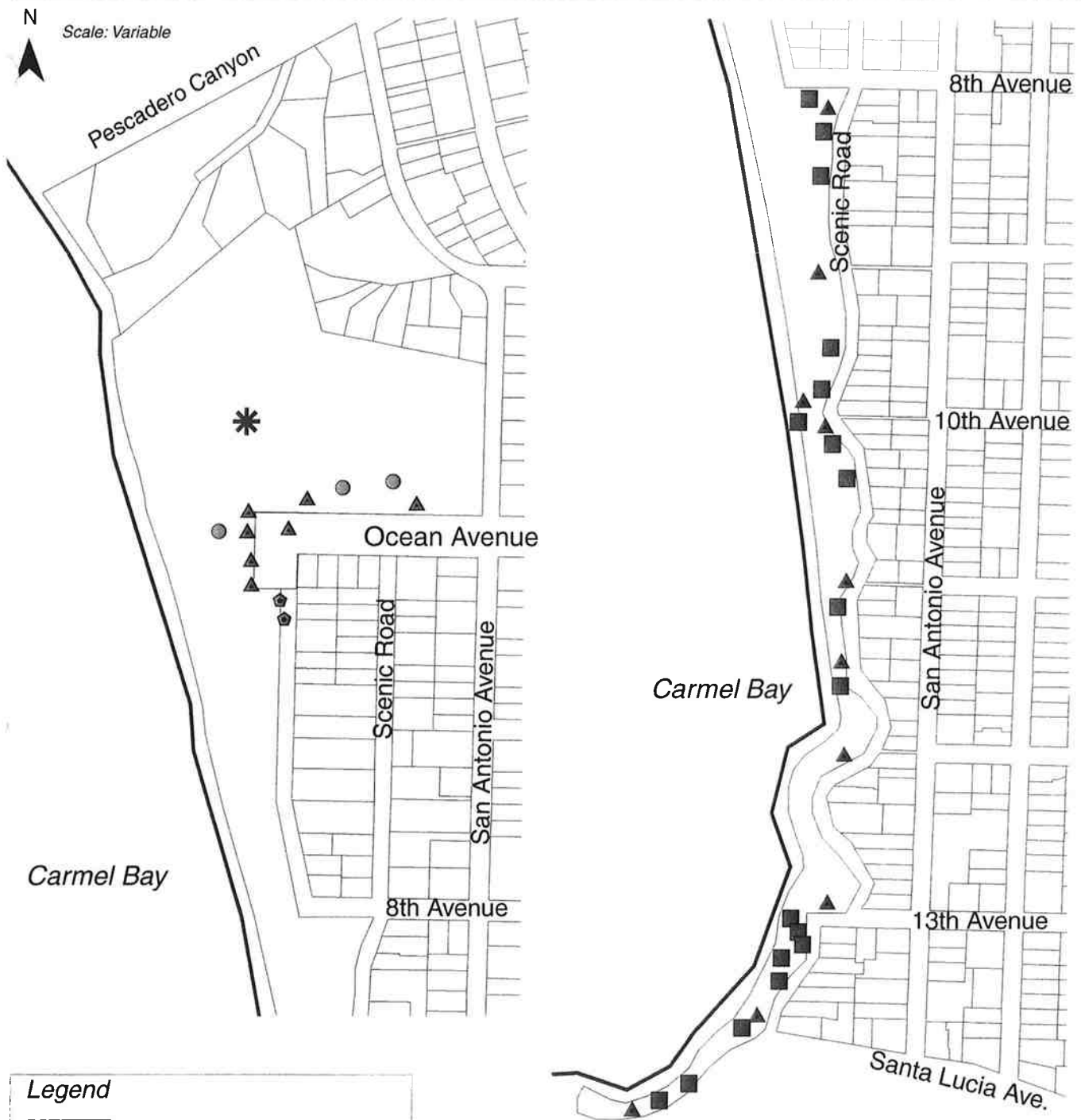
<sup>47</sup> Forestry Commission and Planning Commission

<sup>48</sup> Coastal Development Permit #3-83-217-A2, approved June 9, 1987.

<sup>49</sup> Coastal Commission approval of the recent Carmel Bluff and Beach Access Improvement Project was based, in part, on the City's promise to follow the RHAA landscape plans when re-vegetating areas affected by the project.

<sup>50</sup> J. Frank Devendorf was one of Carmel's founders.





**Legend**

■	Benches
●	Stone Fire Pits
▲	Trash Enclosures
✱	Volleyball Courts (4)
⬠	Water Storage Tanks

Figure 5  
Shoreline Support Facilities

disrupt, the cypress viewshed should be carefully trimmed to avoid encroachment on this viewshed.<sup>51</sup>

Even in death, the Monterey cypress is a noble, majestic feature of our shoreline landscape. Its wood resists decay when other tree species have long since crumbled and returned to the soil. Over the years, those that have died have been allowed to remain as part of the scenic landscape for thousands to appreciate, photograph and paint. Only when they finally weaken and succumb to nature's constant attack are they removed from the shoreline.

The Forest, Parks and Beach Department inspects the structural integrity of all trees along the bluffs and the dunes. If a tree is determined to be a hazard and presents a clear and present danger to the public, then the Department will remove that tree and replace it. In many cases, mature trees are replaced with young seedlings germinated from local seed stock well in advance of their removal. By continuing these management practices, our forested beach lands will remain in balance.

In the North Dunes, when trees are removed, the trunk(s) should remain as part of the landscape and only those portions that would be considered a fire hazard (small limbs and branches) should be disposed. This practice would create a more interesting dune environment; one that provides shelter and protection, and aids in the dune building process.

Other tree species have established themselves in small groves in and around the North Dunes. A small stand of Monterey pines (and more seedlings) are thriving on the sands near the northern City border very close to the Fourth Avenue pedestrian access. Two groups of coast live oak are at home in the heart of the dunes just north of the Ocean Avenue parking lot; they hug the edge of the "Sand and Sea" residences near Fourth Avenue. All of these trees have germinated from seed transported there by some natural means. A lone eucalyptus, the largest in the City, dominates the North Dunes and beach parking lot entry at the corner of Ocean and N. San Antonio Avenues.

Finally, acacia thickets grow at several locations in the City's coastal area: throughout the North Dunes, along the northern bluffs, in many pockets on the Del Mar dunes, and on shoreline bluffs south to the Santa Lucia stairway. These thickets promote landform stability by trapping sand and binding bluff soils. Conversely, acacia's aggressive growth enables it to dominate some areas of the upper beach landscape, out-competing and replacing native species, leaving less room for shoreline visitors to enjoy. Acacia thickets have become convenient

---

<sup>51</sup> See Carmel Coastal Land Use Plan (approved June 2003) Policy P5-35.

places for illegal trash disposal, and are attractive sites for transients to set up residency.

Carmel's shoreline trees and shrubs are trimmed periodically. Trimming of the massive Monterey cypress trees reduces the length and weight of upper boughs, protecting the tree from structural damage during periods of high winds; this also protects the safety of people who walk, park, or live under these trees. Trimming of acacia and *Myoporum* helps maintain coastal viewsheds and protects neighboring plant habitats from encroachment. Thinning of acacia thickets discourages transient activity and illegal trash dumping.

#### 4.1.4 Beach Landscape Progression

The landscape design of the Carmel Beach Bluff Pathway affects, and is affected by, private property landscapes along Scenic Road between Eighth Avenue and Martin Way. One goal of the original Pathway design was to create a landscape link between public lands and adjacent private property. This landscape progression concept would help unify the visual experience of the shoreline. This goal has been only partially achieved. Progress in this area could result in a revitalized holistic landscape theme for the City's entire shoreline.

#### 4.1.5 Coastal Viewshed

Carmel's shoreline affords extraordinary views of the ocean and coastline. Protection of this unparalleled coastal viewshed is one of the cornerstones of the City's shoreline management program. Designers of the Beach Bluff Pathway sought to avoid structures or dense plantings that conflict with the coastal viewshed. Plants that have grown tall enough to partially obscure these special views are continuously noted during independent shoreline assessments and, when necessary, are attended to by City staff and/or contractors.

The City, however, allows a limited amount of short-term coastal viewshed interference by some of the adolescent Monterey cypress trees that line the public shoreline. As described above (Sec. 4.1.2), Carmel values views of the coast through the open boughs of its Monterey cypress. When young, these trees are characterized by dense foliage. Only as they mature do Monterey cypress grow into the tall, open "sentinels of the shoreline." To achieve this valued shape, some loss of coastal viewshed must be tolerated during a tree's early years.

## 4.2 STRUCTURAL LANDSCAPE

The Carmel shoreline landscape is also composed of many inanimate structural elements that were designed to serve the public in myriad ways. Some are required for public safety (guardrails), others support and/or protect the shoreline and its landscape (walls and revetments, boulders, irrigation system), while still others provide important public amenities (stairways, restrooms, benches, drinking faucets) or information (signage). Though artificial, their design and construction should reflect the important role they play in the Carmel shoreline's visual landscape.<sup>52</sup>

### 4.2.1 Guardrails

At many locations, the City uses wooden guardrails as a barrier between the Pathway and the beach bluffs. Guardrails, in conjunction with landscape plantings and boulders, help prevent beach visitors from trampling vegetation or walking on fragile and sometimes dangerous slopes. Guardrails are substantial structures, and are usually built no higher than 30 inches. City personnel must be prepared to install additional guardrails, plants, and/or boulders, if changes in pedestrian traffic patterns threaten other less-protected areas.

### 4.2.2 Walls and Revetments

For nearly fifty years, the City has responded to erosion of its coastal bluffs by building seawalls, retaining walls, and engineered rock revetments. These structures are discussed in detail in Section 6 of this *Shoreline Management Plan*.

### 4.2.3 Rocks and Boulders

One special component of the shoreline's natural landscape is the use of rocks and boulders. All public walls along Carmel's beach and bluffs are either built from stone or from reinforced concrete that has been faced with stone.

The Eighth Avenue stairway is built of "Carmel stone," flat pieces of "soft" limestone that were quarried locally. Two patios located near Eleventh Avenue and the entries to all stone trash/recycling container enclosures are built with "Arizona sandstone," an imported "hard" stone that creates an excellent walking surface.

At most other locations, the City used locally quarried golden granite rocks. Some of the earliest shoreline walls were built with golden granite rocks and mortar.

---

<sup>52</sup> See City of Carmel Coastal Land Use Plan (approved June 2003) Policy P5-12 and P5-5.

Walls constructed after 1978 are constructed of reinforced concrete faced with golden granite. This style is used for seawalls, retaining walls, and on many stairways and trash/recycling container enclosures.

Large granite boulders are an integral part of the shoreline landscape and undeniably contribute to its aesthetic character. Boulders punctuate planting areas. They also serve as natural benches. At strategic locations, they are used to help guide pedestrian flow along the Pathway.

#### 4.2.4 Water Storage Tanks

Irrigation water for the Beach Bluff Pathway landscape is supplied by an innovative system that collects spring water in two underground storage tanks. These 10,000 gallon fiberglass tanks are buried in the dunes just south of the Del Mar portion of main beach parking lot.

At this site, spring water flows continuously throughout the year. During the drought of 1978, the City recorded flows of 12 gallons per minute, and during the peak of the 1982/83 El Niño winter storms, flows of 60 gpm were recorded.

In 1985, the City installed a single underground water storage tank; three years later, a second tank was connected in series. Water from these reservoirs is now pumped through a two-inch diameter underground PVC pipe to the Pathway irrigation system controller at Eighth Avenue. From there it is piped to numerous sites along the Beach Bluff Pathway.

Water from these storage tanks is also used to fill the City's street sweeper, sidewalk-cleaner, tree-planting/watering trucks, and fire apparatus. In addition, this water could serve as an emergency back-up for water commercially supplied to the City.<sup>53</sup> Use of this spring water has greatly reduced both the amount and cost of Carmel's potable water consumption.

#### 4.2.5 Benches

Pathway designers wanted to ensure ample places for people to sit along the bluff top and enjoy the shoreline's scenic vistas. In keeping with the project's design philosophy, they chose to build benches of a simple style, made of wood and/or stone.

---

<sup>53</sup> This spring water has been tested and found to range from pure to containing low levels of coliform bacteria. This water could easily become potable if treated using standard water purification techniques.

Some benches were fashioned from large pieces of driftwood that washed up on Carmel Beach. City personnel began setting these aside, even before the final plan had been approved. During the Pathway's construction phase, the most suitable driftwood was sanded, attached to cement plinths, and installed at strategic locations. These informal benches have become a popular design element of the Beach Bluff Pathway.

In addition to benches, the City has also placed large boulders in selected locations to be used for sitting.

#### 4.2.6 Signage

Signs provide information for shoreline visitors. They identify traffic and parking regulations, give directions to nearby beach accesses, warn of hazardous conditions, and inform about City ordinances regarding alcohol use, beach fires and fragile slope protection.

Of all the topics dealt with by the Carmel Beach Rehabilitation Task Force, signage was the subject of the most intense deliberations. The final design was a compromise between notifying beach visitors of pertinent information and not causing them to be overwhelmed or the unique coastal viewshed to be disrupted.

The number of signs along the Pathway was limited by consolidating information at selected locations (e.g. signs on trash/recycling container enclosures and on "access" sign posts). All informational signs were of muted earth tones to sustain the integrity of the landscape design. To avoid unsightly rust, non-metal signs and fasteners were used. When signs were legally required to be made of metal (e.g. traffic and parking signs); they were enclosed within a wooden frame.

One type of sign purposely stands out from the others. The signs that warn of hazardous surf conditions are standard dark brown with bright yellow lettering and made of metal. They were designed by a consortium of Monterey Bay municipalities, in conjunction with the California Department of Parks and Recreation and the U.S. Coast Guard. They are placed mid-level on each beach accessway and are double-sided to be seen from both the beach and the bluff.

Over the years, the number and types of signs have gradually increased. Sign colors and locations have expanded beyond the original design and intent. At some locations, signs are now competing with the natural viewshed.

Signage is a critical part of Carmel's shoreline management program. To ensure that signs enhance, rather than detract from, the City's coastal resources, adopted policies require that signs.<sup>54</sup>

- provide information in a clear, accurate and concise manner;
- are visible to the public without detracting from protected coastal viewsheds;
- are consistent in design style, use of color and materials;
- are efficiently used, limiting overall numbers and avoiding a cluttered appearance; and
- reflect the aesthetic sensitivities of the Carmel community.

#### 4.2.7 Shoreline Amenities/Recreational Support Facilities

The shoreline landscape also contains many elements that serve those who walk, run, or play throughout the Carmel shoreline area (Fig. 6).

##### *Beach Access Stairways*

The stairways that provide public access to and from Carmel Beach are discussed in Section 3.

##### *Restrooms*

Carmel's shoreline visitors are served by restroom facilities located at nearly opposite ends of Scenic Road (Fig. 7). The main restroom is sited at the foot of Ocean Avenue, adjacent to the City's primary beach parking lot. This facility contains separate restrooms for men and women. Each is complete with running water, sinks, and appropriate toilet facilities. The women's side also includes a fenced privacy area for changing clothes.

The outside of this facility is faced with golden granite stone, and its appearance fits well with other structures along the City's coastline. The inside of the restroom was designed to facilitate cleaning, including gently sloping floors and drains for easy cleaning. This facility meets ADA requirements for disabled accessibility.

In 1995, the City established temporary restroom facilities at "Lloyd Point," near Santa Lucia Avenue. These facilities consist of two portable toilets screened by a few Monterey cypress trees and a wooden fence. Both facilities may be used by men and women; one provides accessibility to the physically

---

<sup>54</sup> The City of Carmel plans to implement a comprehensive shoreline area sign program once its Local Coastal Program has been certified.

N  
Scale: Variable

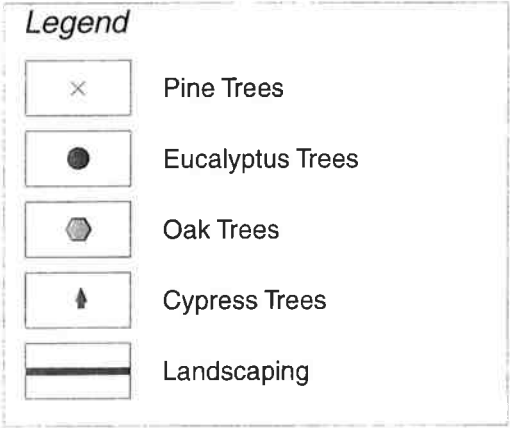
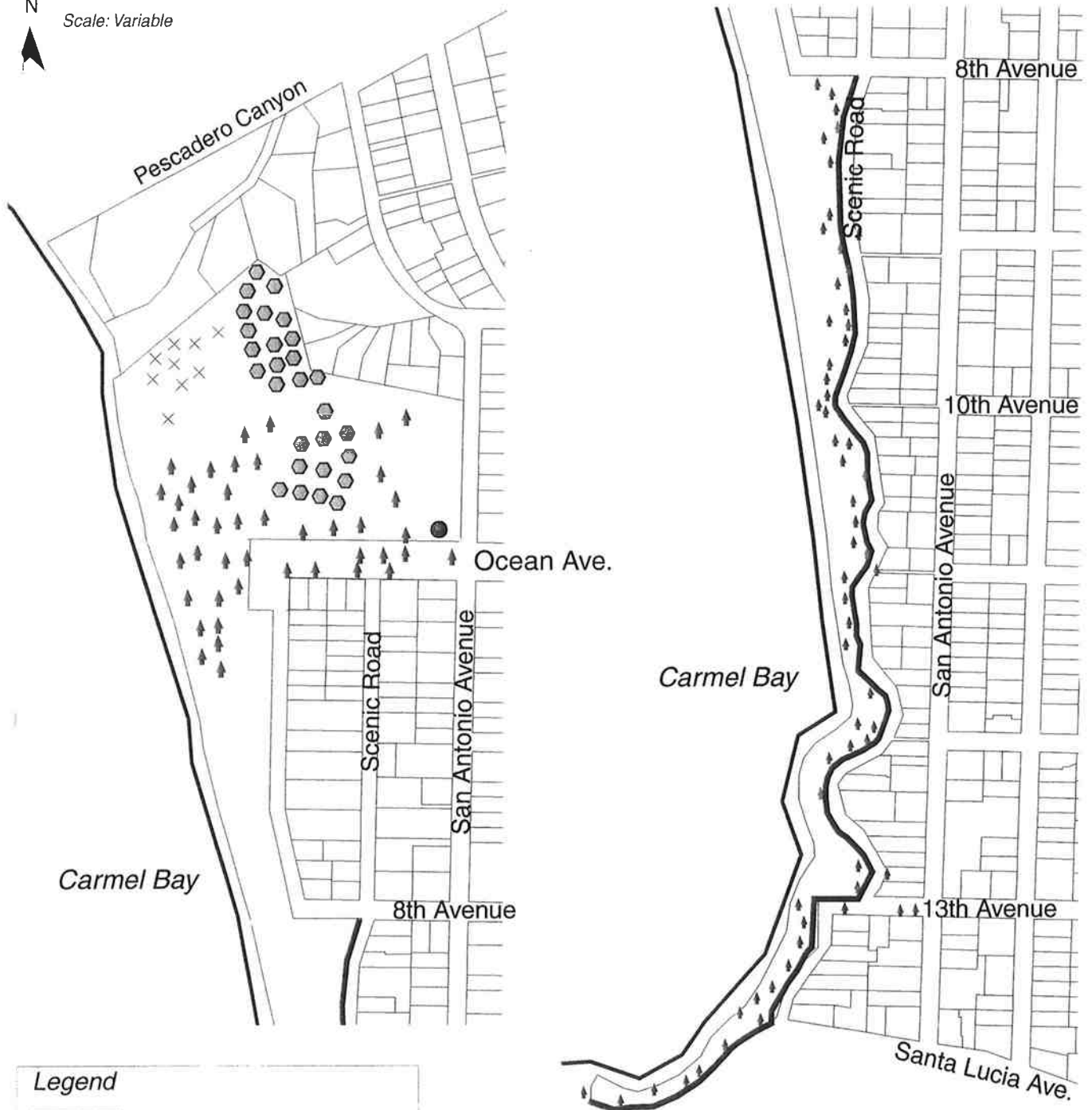


Figure 6  
Shoreline Public Trees and Landscaping



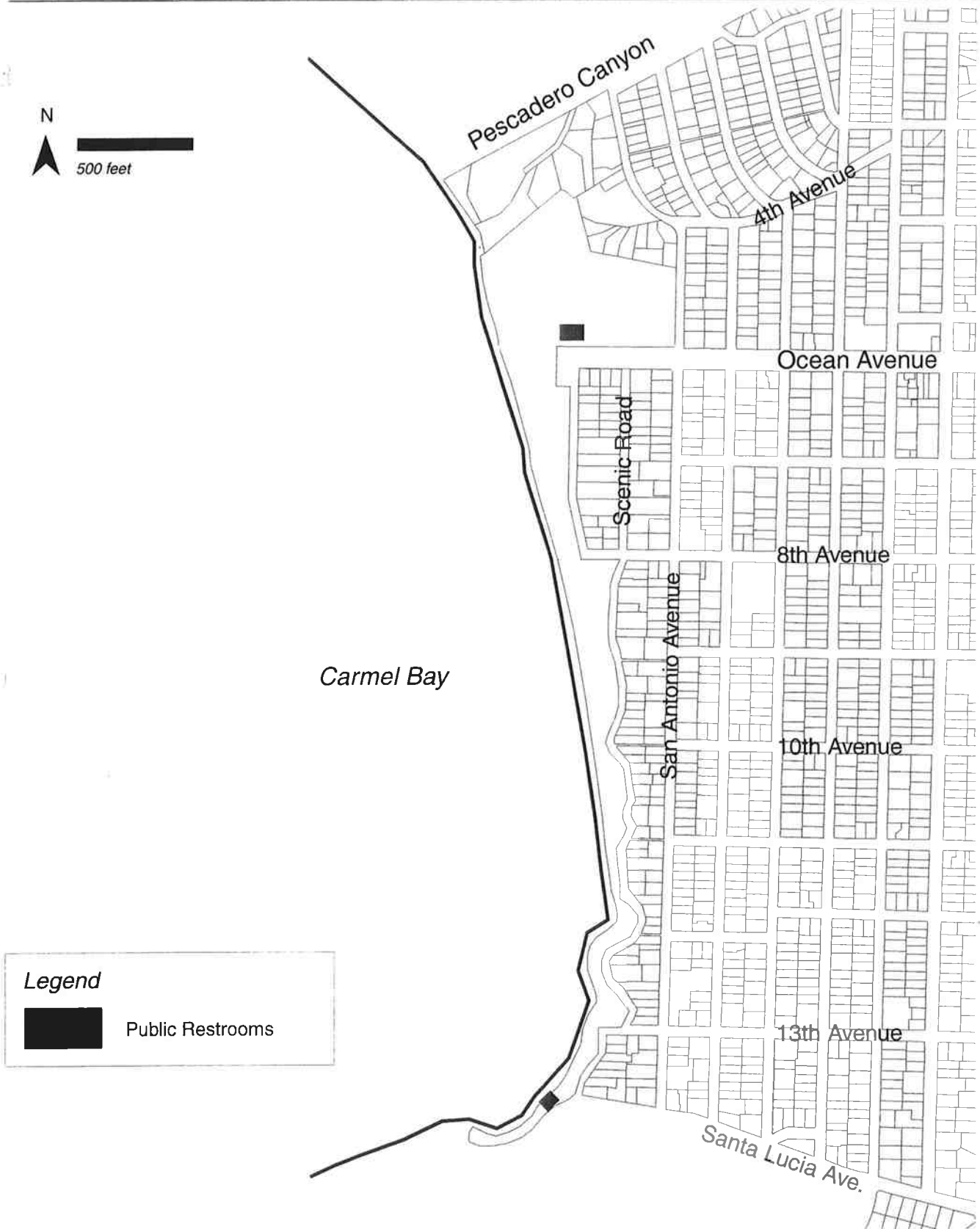


Figure 7  
Public Restroom Facilities

disabled. Both facilities have water containers for hand-washing. These restroom facilities are serviced by a private company under contract to the City.

### *Foot Wash-Off Stations*

The City has installed foot wash-off stations at four beach access stairways (Eighth,<sup>55</sup> Eleventh, Thirteenth, and Santa Lucia Avenues). Each supplies potable water for rinsing sand and watering pets. All wash-off stations consist of a concrete floor (with drain)<sup>56</sup> surrounded by low granite-faced walls; each is served by a self-closing faucet.

### *Drinking Fountains*

Drinking fountains are located at the main beach restroom (Ocean Avenue) and at the top of the Thirteenth Avenue stairway. Each draws from the City's commercial water source.

### *Trash/Recycling Containers and Enclosures*

Throughout the Carmel shoreline area, the City has built enclosures for its trash and recycling containers. These enclosures serve many purposes:

- They screen the containers from public view;
- They protect the containers from being knocked over;
- They are located at sites easily accessible to the City's trash disposal contractors;
- They are easily cleaned by City maintenance personnel; and
- They serve as appropriate sites for posting beach informational signs.

At present, there are 17 trash/recycling container enclosures along the shoreline. The seven enclosures located in the Ocean Avenue/Del Mar parking lot are made of wood, while the ten enclosures located along the Pathway are built of reinforced concrete and faced with golden granite. Enclosures in each area face different sets of conditions, and, so, were built in different styles and of different materials.

---

<sup>55</sup> The wash-off facility at Eighth Avenue has never been connected to the commercial (potable) water system.

<sup>56</sup> Unfortunately, the wash-off station drains have a tendency to become clogged with sand. At present, they require more frequent cleaning; in the long-term, they will need redesigning/rebuilding.

### *Fire Pits*

City ordinance limits recreational beach fires to that portion of the beach located south of Tenth Avenue and seaward of the high tide line.<sup>57</sup> In addition, Carmel also allows fires to be built in three stone fire pits located near the Ocean Avenue/Del Mar parking lot – these pits are located a very short distance from convenient parking spaces and are popular with beach visitors.

### *Volleyball Courts*

In the dunes near the foot of Ocean Avenue, the City has installed posts for four sand volleyball courts; players must supply their own net and ball. These are often used on weekends and during the summer.

## **4.3 FUTURE PROJECTS**

### **4.3.1 Revitalization of the Beach Bluff Pathway Landscape**

The Beach Bluff Pathway landscape is now in need of revitalization. Since its initial planting in 1988, the landscape has strayed from its original design theme. Species, locations, and densities of horticultural plants have changed, but unfortunately, these changes have not been documented. In some areas, plants have grown tall enough to obscure portions of Carmel's unique coastal viewshed. At other sites, landscape plants that had successfully grown to maturity, became senescent and died. These were rarely replaced by younger, more vigorous plants. There are now entire Pathway planter areas where plants have completely disappeared and replaced by a sterile medium of wood chips.

These conditions were described in recent shoreline assessments; some have been addressed by City staff and/or contractors. The Pathway landscape, however, continues to be affected by the lack of: 1) an operational program that guides staff in their daily efforts, and 2) adequate staff-time and funding to perform tasks necessary to maintain the landscape.

Renewal of the Pathway landscape, if based on a combination of the project's original design concepts and lessons learned during the past fifteen years, would help return the Pathway to its award-winning condition. As mentioned above, the Pathway's landscape plants are important for their aesthetic qualities as well as for the protection they give to Carmel's fragile shoreline bluff tops. Steps recommended for the revitalization of the Pathway landscape are listed below.

---

<sup>57</sup> Recreational beach fires are discussed in greater detail in Section 5.

### *Landscape Plans and Concepts*

The original plans and design concepts should be reviewed. They were the result of a very active process involving a citizen task force, world-renown landscape architects, City staff and consultants, along with ideas that grew out of several public hearings. Each species, its color, size, and location, was selected to perform a specific function in the overall landscape design. The original Pathway was greeted by wide acclaim and was the recipient of several awards. The Task Force understood that not all plants would be successful and future adjustments would be necessary. These changes, however, should be made with an understanding and appreciation for the project's original design intent.

### *Plant Selections*

With experience gained during the past fifteen years, the original Pathway plant selections can be assessed, perhaps at the rate of one block per year. Many plants have been successful; others have not. Some failed to thrive because they could not tolerate the harsh forces of nature or the intense human impacts that characterize Carmel's shoreline. Others may have failed because they lacked proper care. Some of the plants were unable to thrive in their planned locale. Others proved to grow too slowly or too tall for their intended purpose. All plantings that do not appear successful should be assessed according to a standard procedure:

#### **If a given plant is not thriving:**

- **Is it not suitable for its location?**  
*Perhaps this species will grow well in a different section of the Carmel shoreline landscape.*
- **Was its failure due to trampling or other human/dog activity?**  
*Perhaps the addition of guardrails or boulders could help achieve success.*
- **Was there a problem with watering or fertilizing?**  
*These should be adjusted before removing a species from the plant list.*

If, after these assessments, it is determined that a planting should be modified or a species replaced, then new plants/species must be selected that fit well with the Pathway landscape design criteria, stated above. Any changes to the plant selection must be recorded, and periodically considered by the Carmel Forest and Beach Commission.

### *Staffing*

Changes to the Pathway landscape should take into account the availability of Forest, Parks, and Beach staffing. New plantings have little value if there is not enough staff (or funding for contract labor) to maintain them.

### *Training*

One key to the success of the Pathway landscape project will be staff training. The City's shoreline differs from landscapes in other parts of Carmel. The important role that the Pathway plays in bluff top protection, the protection of coastal viewsheds and the ability of plants to withstand harsh coastal conditions are concepts in need of discussion.

The day-to-day work performed by City staff is as important as the deliberations, plans, and reports produced by commissions, task forces, and consultants. Most projects will not succeed if on-site workers do not "buy into" the plan. Conversely, staff must also be able to share their knowledge and insights, often gained through years of field experience.

#### 4.3.2 Restrooms at Santa Lucia Avenue at Scenic Road)

The two portable restrooms located along the bluff top near Santa Lucia Avenue help meet an important need for all who visit the Carmel shoreline. The City intends to continue use of these temporary facilities until permanent restrooms can be built at an appropriate location, somewhere along the shoreline between Eighth Avenue and the south City limit.<sup>58</sup>

## **4.4 MANAGEMENT POLICIES**

- Provide adequate facilities that will serve the needs of the public, mitigate damage to the environment, and respect the neighborhood. (G4-3)
- Limit development along the Carmel shoreline to facilities that support passive and active recreational activities, beach access, bluff protection and protection of infrastructure. Bluff protection and protection of infrastructure shall be permitted only when required to protect existing structures that are in danger from erosion. (O4-6 excerpt)

---

<sup>58</sup> City of Carmel Coastal Land Use Plan (approved June 2003) Policy P4-41

- Discourage any further incursion of recreational activities into the North Dunes habitat. Sensitive resources in the North Dunes habitat area shall be protected. (P4-48)
- Provide restroom facilities consistent with the volume of people who use the beach and Beach Bluff Pathway. (O4-7)
  - Retain the existing restroom facility at the Ocean Avenue/Del Mar parking lot and consider improvements to increase its capacity. (P4-40)
  - Retain the current second restroom facility at Santa Lucia Avenue until it can be replaced by a permanent site. Remove this facility upon construction of one or more additional permanent restrooms south of Eighth Avenue. (P4-41)
  - Maintain as operational all wash-off stations located adjacent to the stairways at Eighth, Eleventh, Thirteenth, and Santa Lucia Avenues. (P4-55)
- Perpetuate the mix of native dune and horticultural plants in an informal natural beach landscape. (O5-3)
  - Sustain and maintain the Beach Bluff Pathway design concept and landscape plant selection. Authorize the Forest and Beach Commission to review and approve minor design changes and plant selections. Require a coastal development permit for significant changes or any change that would substantially alter the design concept. (P4-13)
  - Evaluate the Pathway landscape, including plant selection and associated design elements in consultation with a coastal landscape specialist; identify sites that require revitalization and implement restoration based on the Pathway Design Plan. Address the most severely impacted sites first. (P5-32)
  - Install more seating along the beach pathway. (P4-14)
  - Keep the vegetation on San Antonio Avenue near pedestrian access easements pruned for safe visibility of pedestrians by motorists. (P4-6)
  - Continue the use of Monterey cypress as the predominant tree species on the beach bluff and North Dunes. The exact number of

- trees may vary over time, but whenever a tree dies or is lost during a storm, replacement trees should be planted in approximately the same location. Maintain a low-to-medium density of trees (40 to 60 trees) in the North Dunes. (P5-25)
- Protect Monterey cypress from structural damage caused by high winds. Develop a proactive trimming program to reduce length and weight of limbs and branches. (P5-33)
  - Encourage neighborhood cooperation and volunteers to assist City staff with the care of the landscape along the pathway. (P5-26)
  - Maintain an attractive mix of plant material that favors native species and other drought-tolerant, non-invasive species. (P5-27)
  - Encourage the extension of the City's Pathway landscape style onto neighboring properties:
    - Bring all City-owned property along this portion of Scenic Road into compliance with the approved Pathway plan.
    - Encourage private property owners to draw from the broad palette of plants used in the Pathway design.
    - Make presentations to the Scenic Road Property Owners' Association about this concept and share with the Association the plant list and a list of local suppliers.
    - Encourage the use of plants from this palette when reviewing projects on Scenic Road through the Design Review processes. (P5-31)
  - Maintain the vegetation and trees along the shoreline in a safe and healthy condition. (O5-4)
    - Encourage the use of existing stairs, trails, and pathways, and discourage off-trail "short-cuts" on or over the bluff face. Install landscaping barriers at each "short cut" on the face of the bluffs and immediately restore damaged landscaping. (P5-7)
    - Prune or repair trees immediately following limb failure to mitigate any safety hazards. At other times, trees may be pruned in accordance with City policy, keeping public safety, access and the tree's health as the primary goals. (P5-34)
    - Pruning of vegetation will be done as needed for the health of the plants. This is a natural landscape and formal garden pruning is to be avoided. The Pathway must be kept clear of overgrowth and periodic

pruning is desired. However, neat straight edging is discouraged. Prevent shrubs from growing too high and blocking views of the ocean through the Cypress trees along the Beach Bluff Pathway. (P5-35)

- Ensure that long-term management activities maintain the natural dune ecology of Carmel Beach in a manner consistent with public safety. Protect areas of the beach from loss of habitat where special status plant species are growing. (O5-40)
  - Restore dune areas to improve habitat for Tidestrom's lupine and other native dune plants. (P5-28)
  - Improve habitat values for the preservation of the California black legless lizard. (P5-30)
  - Avoid disturbance or degradation of resources when maintenance vehicles and equipment enter sensitive habitat areas. (P5-161)
  - Retain a qualified botanist to monitor the population of Tidestrom's lupine and other special status species on the North Dunes of Carmel Beach. The population should be assessed annually (or based upon a schedule agreed upon by the Department of Fish and Game, Coastal Commission and US Fish and Wildlife Service) to determine if the population is stable and if measures to protect the population should be instituted. If the population appears heavily affected by public use, the City should consider fencing or placing barriers around the lupine habitat on the beach. (P5-173)
- Protect the fragile dunes and sensitive plants in the Del Mar Dunes and North Dunes against any significant disruption of habitat values. (O5-7)
  - Prohibit planting and control the spread of invasive non-native plants. (P5-29)
  - Restore, maintain and enhance the degraded habitat in the Del Mar Dunes area to enhance environmental resources and aesthetics. Protect sensitive habitat and special-status species through development and implementation of the Del Mar and North Dunes Master Plan. (P5-42)



- Prevent further planting and spread of invasive horticultural species within the dunes at Carmel Beach. (P5-174)
- Remove any non-native invasive vegetation from special status habitat to eliminate competition and implement a dune restoration plan. (P5-175)
- Implement a Dune Restoration Plan. (P5-176)
- Minimize spread of non-native plants. (P5-177)
- Conduct black legless lizard surveys and manage appropriately. (P5-178)
- Identify, protect and manage Environmentally Sensitive Habitat Areas (ESHAs) to ensure their long-term integrity and the biological productivity of these habitats. (G5-12)
  - Monitor, study and develop effective management programs for the City's parks and ESHAs. Endeavor to reduce conflicts between environmental protection and use of public and private property within ESHAs. (O5-36)
    - Maintain and enhance the resource value of environmentally sensitive habitat areas in consultation with a qualified biologist and in coordination with the California Department of Fish and Game. Remove any non-native, invasive vegetation from sensitive habitats. (P5-159)
  - Reduce the introduction and spread of invasive horticultural species into and within identified ESHAs. (O5-37 excerpt).
  - Provide beach users with information about Carmel Beach, its vegetation, facilities, amenities, and limitations (rules). (O4-4 excerpt)
  - Establish a uniform signage program for the beach and bluffs to better inform beach users of regulations governing activities on the beach. (O4-5)
    - Post "beach access/pedestrians only" signs at the top of pedestrian easements to help visitors locate these access routes including North Dunes access routes and the easement from San Antonio through Sand and Sea. (P4-29)

- Install signage along Scenic Road to direct traffic and indicate beach parking hours. (P4-30)
- Use as few signs as possible to accomplish the desired purpose. Rely on design features and/or public education to influence behavior first. Establish standards for the total number of informational signs along the shoreline. (P4-31)
- Consider locating signs at the bottom of the bluff if appropriate. (P4-32)
- Use signs that are aesthetically pleasing, easily seen, minimal in size, brief in content, of muted color and uniform in design. (P4-33)
- Post educational/interpretive signs where appropriate along Scenic Road and in the North Dunes area. (P4-34)
- Use international symbols whenever possible, along with a brief explanation of prohibitions and Municipal Code Section citations. (P4-36)
- Maintain all signs to ensure that they are legible. Signs that are vandalized or defective shall be replaced or repaired as soon as possible. (P4-37)
- Maintain signs at each stairway indicating fires must be at least twenty-five feet from the base of the bluffs and that they are not allowed north of Tenth Avenue. (P4-38)
- Use trash containers as a location for educational and regulatory signs. (P4-39)
- Provide signage prohibiting fires in the dunes area. Consider using doors on restroom stalls for posting beach rules and regulations. (P5-40)
- New development shall minimize risks to life and property, assure stability and structural integrity over the life of the development, and neither create nor contribute significantly to erosion, geologic instability, or destruction of the site or surrounding area. (G5-1)

## **5 RECREATIONAL ACTIVITIES AND EVENTS**

### **5.1 RECREATIONAL ACTIVITIES**

Carmel Beach and its shoreline area provide opportunities for a wide variety of recreational activities. Beach visitors participate in swimming, surfing, diving, jogging, walking, sandcastle building, volleyball, picnics, and other beach-related activities.

Several City facilities and amenities enhance these beach activities. The main beach restroom, at the Ocean Avenue/Del Mar parking lot, offers restroom facilities and changing areas. Four of Carmel's beach access stairways have foot wash-off stations (Eighth, Eleventh, Thirteenth, and Santa Lucia Avenues). Two parking spaces marked white for "loading," located on Scenic Road near Eighth and Eleventh Avenues, enable people to move supplies to and from their vehicles.

#### **5.1.1 Regulated Shoreline Activities**

Some recreational activities have significant impacts on the surrounding environment and are dealt with by City ordinance.<sup>59</sup>

##### *Recreational Fires*

Recreational fires have long been part of the Carmel Beach tradition. Histories of Carmel's earliest days are full of tales of writers and artists enjoying fires on the beach and dunes. As the City's popularity and population grew, it became clear that coals and ash from the numerous fires were discoloring Carmel's characteristic white sands – portions of the beach and dunes were turning gray.

As described in Section 2, the beach is cleansed by the natural cycle that annually removes sand during winter and re-deposits sand the following spring. But this process cleans only a portion of the Carmel's shoreline. Beach sands located above the reach of high-energy storm waves, including nearly all of the City's dune sands, are not affected by this yearly cleansing. Any discoloration of these sands can remain for years.

---

<sup>59</sup> City ordinances that deal with activities along the Carmel shoreline are listed in section 9B.

In 1995, the City passed an ordinance to limit the location and size of beach fires.<sup>60</sup> Fires are now limited to portions of the beach south of Tenth Avenue and west of the high tide line, where white beach sands may be cleansed and/or renewed by daily or monthly tidal cycles, or by the annual onshore/offshore sand cycle. According to Carmel Police Department personnel,<sup>61</sup> this ordinance has reduced many problems associated with shoreline recreational fires:

- fires are no longer permitted in the dunes; and
- people no longer remove live wood from trees and bushes for use as fuel.

The City's current beach fire ordinance also restricts the building of fires closer than 25 feet from "any wall, vegetation or combustible material not intended to be used in the fire." This has significantly reduced the potential for beach fires to spread, endangering neighboring areas. In spite of the success of the 1995 ordinance, Carmel Beach sand south of Tenth Avenue remains discolored from spring through late fall.

The existing program represents a compromise between two competing values: the tradition of building recreational beach fires vs. the purity of Carmel's signature white sands. Extending the area where fires may be built would enhance one value at the expense of the other.

The City has attempted to use concrete fire rings at several sites, but these have not proven successful. The heavy rings were difficult to move when threatened with either burial by sand or inundation by seawater. They also tended to be used as receptacles for trash and broken bottles.

### *Other Activities*

The City allows alcohol on Carmel Beach, but camping and overnight sleeping on the beach and dunes are prohibited, as is the use of unauthorized vehicles. Riding a horse, mule, or donkey, is lawful if it occurs seaward of mean high water, though access to the beach may be difficult.<sup>62</sup> Operation of motorized personal watercraft (including jet skis) anywhere in Carmel Bay is prohibited by Monterey Bay National Marine Sanctuary regulation.

Many people bring dogs to Carmel's shoreline area. On Scenic Road, dogs must be leashed, but on Carmel Beach they need only to be under voice

---

<sup>60</sup> Carmel Municipal Code Section 8.32.160

<sup>61</sup> Carmel Police Sergeant Terry Chandler (pers. comm.)

<sup>62</sup> The ordinance cited describes suitable beach access at Santa Lucia Avenue. In the years since that ordinance was approved, storm damage and the City's repairs have made Santa Lucia Avenue unsuitable for equine access.

control. As in all parts of the City, people must pick up and properly dispose of their dog's wastes. The City has installed dispensers for special plastic waste-disposal bags ("Mutt-Mitts") at near the top of each beach access stairway along the Pathway.

## **5.2 SPONSORED EVENTS**

People may hold private events on Carmel Beach, including parties and weddings. Any event attended by more than 50 people, or that uses commercial- or City support, requires a Carmel Special Event Permit, as described below.

Every year, the Carmel shoreline becomes the site of several public events. All events are free admission and open to the public. Popular activities, including the Fourth of July and the Great Sand Castle Contest, intensify traffic and parking conditions and require enhanced City support services (e.g. additional trash collection services, increased removal of litter and trash from the beach, and placement, servicing and removal of a significant number of portable restrooms).

Each public event requires a Special Event Permit from the City. Event sponsors must make a presentation to the Special Events Committee, describing their event. Sponsors must also submit plans for parking, trash collection/recycling, portable toilets, and beach/vegetation monitoring. The City's Special Events Committee has oversight responsibility for each event and prepares an "after-event" impact analysis report.

A list of Carmel's annual Special Events appears in Table 3, following:

Table 3 - ANNUAL SPECIAL EVENTS

<b>Event</b>	<b>Date</b>	<b>Location</b>	<b>Description/ Impact on Traffic and Parking</b>
<b>Resolution Run</b>	January 1st	Scenic Rd, south of Eighth Ave.	A 5K-10K Walk-Run/ Minimal impact on traffic and parking
<b>Kite Festival</b>	Spring	Carmel Beach	Kite flying for children and adults/Increased traffic and parking.
<b>Surf-About</b>	Spring/Summer	Carmel Beach	Surfing contest/ Minimal impact on traffic and parking.
<b>Fourth of July<sup>63</sup></b>	July 4th	Carmel Beach	Beach activities/ Restrictions on traffic and parking. <sup>64</sup>
<b>Movies on the Beach</b>	Summer	Thirteenth Ave. cove	Evening films/ Minimal impact on traffic and parking.
<b>Great Sand Castle Contest</b>	Fall	Carmel Beach	Sand castle building/ Increased traffic and parking.

<sup>63</sup> The Fourth of July celebration on Carmel Beach is not an organized/sponsored event. Use of fireworks on Carmel Beach is prohibited (CMC 8.32.170).

<sup>64</sup> During Fourth of July celebration event or during any other temporary event, if travel and parking are restricted on Scenic Road and on portions of Ocean, San Antonio, Carmelo, Eighth, Thirteenth, and Santa Lucia Avenues a Coastal Development Permit is required.

### 5.3 MANAGEMENT POLICIES

- Provide for a wide variety of passive and active recreational experiences for all beach users while protecting the resource values of beach environs. (G4-4)
- Maintain the City's beach, park and open space resources in a manner to encourage use and enjoyment by residents and visitors. (O4-9)
  - Establish and maintain in public ownership the entire sandy beach on Carmel's shoreline from the north to the south City boundary. (P4-45)
  - Allow surfing, hiking, picnicking, horseback riding, and typical beach games, such as Frisbee and volleyball on the beach without restriction. Allow dogs on the beach when on a leash or under voice control. Require dogs on the Beach Bluff Pathway to be on a leash. However, if the dog policy combined with educational efforts does not promote a safe environment for beach users and dogs, a leash law for certain times should be considered. (P4-47)
  - Prohibit percussion instruments on Scenic Road, the Beach Bluff Pathway, and beach bluff without a permit. Prohibit sound amplifying equipment on the City Beach without a permit. (P4-49)
  - Prohibit sales or other commercial activities on Carmel Beach, along the bluff or in the Ocean Avenue/Del Mar parking lot. (P4-50)
  - Prohibit overnight camping on any portion of the beach and bluffs. (P4-51)
  - Allow alcohol consumption on the beach until 10:00 p.m. (P4-52)
  - Prohibit bicycles and skating on pedestrian access easements between Scenic Road and San Antonio Avenue and on the Beach Bluff Pathway. (P4-53)
  - Prohibit private dune buggies and motorized marine vehicles on the beach. (P4-54)

- Implement procedures and regulations for temporary events on the beach that will protect public access and environmental resources. (P4-56)
- Prohibit motorized vehicles and motorized recreational equipment on Carmel Beach, sand dunes and other City owned parkland. This prohibition does not apply to city and contracted maintenance vehicles or public safety vehicles. (P5-24)
- Restrictions on parking and traffic along Scenic Road, the Del Mar parking lot, San Antonio and the public rights-of-way west of San Antonio shall require a Coastal Development Permit.
- Allow beach users the opportunity to enjoy a fire for warmth or cooking, while protecting the sand from degradation. (O4-10)
  - Allow beach fires until 10:00 p.m. south of Tenth Avenue but at least twenty-five feet from the base of bluffs. Install appropriate signage to indicate this distance and time limit and to indicate methods for correct extinguishing of fires with water. (P4-57)
  - Continue Police Department enforcement of the no-fire regulation north of Tenth Avenue and especially in the North Dunes and Del Mar Dunes areas. (P5-41)



## 6 CARMEL SHORELINE EROSION AND RESPONSE

Like most of coastal North America, Carmel's shore has experienced significant erosion during at least the past century. Even though it is protected by granite headlands at each end, Carmel Bay faces toward the west-southwest, and receives nearly the full brunt of high-energy winter storm waves.

### 6.1 EROSION HISTORY

Johnson (1984) reviewed reports describing damage from Monterey Bay/central California storms that occurred between 1910 and 1983. Over the past two decades, Carmel's shoreline has been severely damaged by storms associated with the El Niño weather patterns. The most recent El Niño periods (Winters of 1982/83, 1986/87, and 1997/98) were characterized by extended periods of heavy rain, strong winds, and high surf. The extensive damage during these El Niño winters resulted, in part, from the nearly continuous battering of the shoreline by powerful storm waves and the weakening of water-saturated beach bluffs. During the 1982/83 El Niño period, severe winter storms struck Carmel nearly every ten days. More sand was removed from the beach than at any previous time in the memory of long-term residents or documented history.

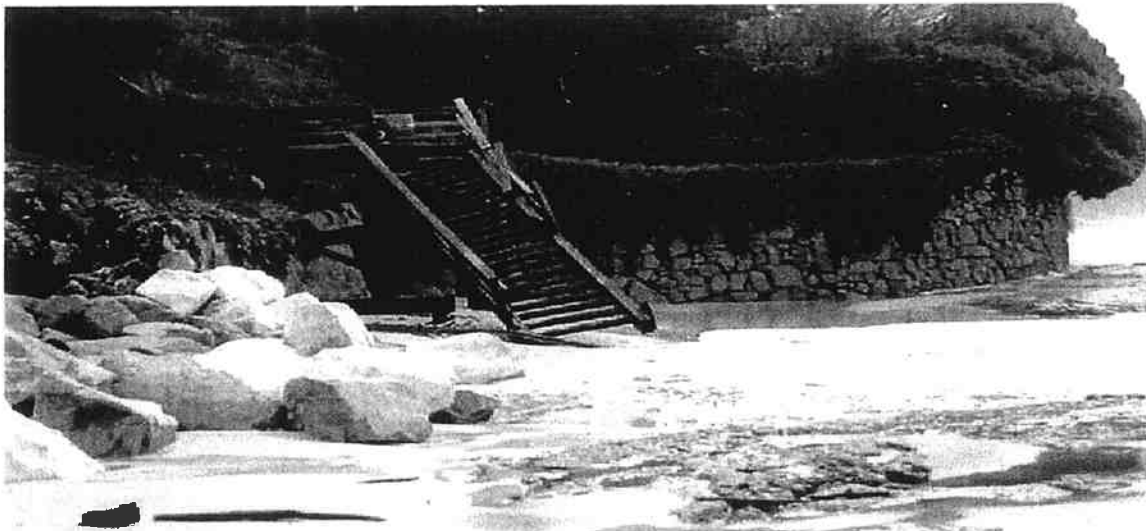


Photo 8 – *Severe Erosion and Boulder Migration at Tenth Avenue (North) Stairway*

## 6.2 EROSION PROCESSES

Erosion of Carmel's shoreline can be divided into two distinct categories: beach erosion and coastal bluff and dune erosion.

### 6.2.1 *Beach Erosion*

#### *Short-term Erosion*

As described in Section 2, Carmel Beach experiences seasonal changes in sand volume. The "constructive" low-energy waves during the spring and summer months and the "destructive" high-energy waves, from late fall through early spring, combine to create the beach's annual onshore/offshore sand cycle. In this cycle, beach erosion during the winter is usually offset by beach-building ("accretion") during the summer. After a severe El Niño winter, more than a single year of accretion may be required before the beach returns to its "normal" level.

In contrast to its characterization, "short-term" beach erosion can have significant and long-lasting impacts on Carmel's shoreline. Low winter beach sand levels can make both vertical and lateral beach access difficult, hazardous, or even impossible (see Sec. 3). In addition, low beach levels reduce the ability of sand to absorb the impact of incoming storm waves. This allows waves to strike Carmel's shoreline bluffs, dunes, and structures (i.e. stairways, seawalls, storm water outfalls, etc.) without the buffering protection of beach sand. Finally, low winter sand levels may threaten seawalls, stairways, and other structures, by exposing their supporting base and footings directly to the tremendous power of winter waves.

#### *Long-term Erosion*

Along some shorelines, the annual onshore/offshore sand cycle becomes out-of-balance, resulting in a long-term sand deficit. This produces a beach that grows narrower and, in extreme cases, eventually disappears, leaving boulders, cobbles, and bedrock. Unlike the short-term erosion described above, this long-term erosion cannot be remedied by seasonal coastal cycles.

Long-term beach erosion may sometimes be caused by an interruption in the beach's sand supply. Though the full details of Carmel's sand supply are not well understood, long-term beach loss due to sand supply interruption is not likely.

A more common cause of long-term beach erosion is the loss of sand associated with seawalls and revetments. This phenomenon can best be explained by understanding that as an unprotected shoreline erodes, its beach width tends to remain roughly the same<sup>65</sup> – it is usually the bluffs and dunes behind the beach that erode (see below). Over time, the resulting beach appears to move farther inland. When encountering a hard (and less erodible) structure at the back of a beach, high-energy storm waves tend to erode the easily-moved sand grains in the immediate vicinity. Eventually, the area seaward of a hard structure will be denuded of beach sand. This “fixing” of the back-beach will occur whether the hard structure is a “natural” rock, an engineered rock revetment, or a reinforced concrete seawall. This is one of the reasons that broad beaches rarely form along rocky points. This process also accounts for the “peninsula effect,” by which the hard, protected portion of a shoreline is left protruding seaward while the more-erodible adjacent areas are eaten away.

Long-term erosion via back-beach fixing has been reported along other shorelines, but has not yet been documented at Carmel. Storlazzi and Field (2000) analyzed aerial photographs from 1949, 1970, and 1990, and stated that Carmel Beach “has narrowed noticeably in the last 40 yr.” Unfortunately, their study lacked important information (tidal conditions) required for a clear and accurate assessment.

Accurate information about whether Carmel Beach (or even a portion of the beach) is experiencing long-term erosion will be an important tool in the City’s shoreline management program. Steps required to obtain the necessary data are discussed in Section 8.

### *Passive Erosion*

Experts generally agree that where the shoreline is eroding and armoring is installed, armoring will eventually define the boundary between the sea and the upland. On an eroding shoreline fronted by a beach, the beach will be present as long as some sand is supplied to the shoreline and the beach is not submerged by sea level rise. As erosion proceeds, the beach also retreats. This process stops, however, when the retreating shoreline comes to a revetment or a seawall. While the shoreline on either side of the armor continues to retreat, shoreline retreat in front of the armor stops. Eventually, the shoreline fronting the armor protrudes into the water, with the mean high tide line fixed at the base of the structure. In the case of an eroding shoreline, this represents the loss of a beach as a direct result of the armor.

---

<sup>65</sup> This assumption is valid only if such factors as sand availability and wave intensity do not change.

In addition, sea level has been rising slightly for many years. In the Carmel Beach area, the trend for sea level rise for the past 25 years has been an increase resulting in a rate of nearly one foot per hundred years. Also, there is a growing body of evidence that there has been a slight increase in global temperature and that an acceleration in the rate of sea level can be expected to accompany this increase in temperature. Some shoreline experts have indicated that sea levels could rise as much as 3 feet by the year 2100<sup>66</sup>. Mean level affects shoreline erosion several ways and an increase in the average sea level will exacerbate all these conditions. On the California coast the effect of a rise in sea level will be the landward migration of the intersection of the ocean with the shore. On a relatively flat beach with a slope of 40:1, every inch of sea level rise will result in a 40-inch landward movement of the ocean/beach interface<sup>67</sup>. This too leads to loss of beach as a direct result of the armor. These effects are also known as “passive erosion”.

### 6.2.2 Coastal Bluff and Dune Erosion

Coastal bluff erosion is both ongoing (i.e. long-term) and episodic. Unlike the beach sand, Carmel’s coastal bluffs cannot easily be replenished by natural cycles. Bluffs and dunes that were built by meteorologic and geologic forces over millennia can be eroded or lost by storms lasting just days or even hours. Long-term coastal bluff erosion at Carmel was documented by Johnson (1984), who analyzed maps and aerial photographs spanning a 75-year period (1908 to 1983). He determined that Carmel’s coastal bluffs had eroded at a rate of 0.4 feet/year in the north and 0.3 – 0.7 feet/year in the southern portion. Analysis of aerial photographs showed several periods of extreme bluff erosion, including the loss of at least 20 feet of bluff (near Thirteenth Avenue and near Martin Way) between 1968 and 1970.

The best-documented episodic erosion of Carmel’s coastal bluffs occurred during the El Niño storms of 1982/83. Johnson (1984) recorded several areas of significant erosion:

- loss of 20 feet of bluff north of Eighth Avenue;
- loss of 25 feet of bluff between Tenth and Eleventh Avenues;

---

<sup>66</sup> Gary Griggs, as quoted in “Living on the Edge; a saga of seawalls, who wants them, who doesn’t, and the fate of California’s disappearing coastline” by Bruce Willey (in the “Good Times”, February 27-March 5, 2003 issue). Mr. Griggs is quoted as also indicating that some estimates show that it will be higher than three feet, some lower, but that the three feet rise by 2100 is “probably the median”.

<sup>67</sup> In other words, a one-inch rise in sea level can result in over 3 landward feet of dry sandy beach loss. For the 3 foot rise estimated by 2100, that would translate into a 120-foot landward movement of the wet-dry intersection on a beach sloped at 40:1.

- loss of 30 feet of bluff between Eighth and Ninth Avenues;
- loss of 30 feet of bluff near Santa Lucia Avenue; and
- loss of 40 feet of bluff between Ninth and Tenth Avenues.

### *Wave-caused Bluff Erosion*

At Carmel, the primary cause of coastal bluff and dune erosion is wave attack. The same high-energy storm waves that remove sand from the winter beach are responsible for eroding the City's coastal bluffs and dunes. As described above, Carmel's bluffs become even more vulnerable to erosion once the beach sand has been scoured.

Not all locations along Carmel's shoreline are equally vulnerable to erosion. Factors such as sand level, rock type, and the presence of faults or joints, may increase the severity of erosion at specific sites.

An additional factor may be the orientation of exposed outcrops of sandstone bedrock on the beach. These large rocks are located seaward of the coastal bluffs. They are usually hidden under many feet of beach sand, and are only exposed during the harshest winters. Johnson (1984) noted that deep channels exist between some of these bedrock outcrops. These "re-entrants" lie perpendicular to the beach bluffs. They may act to direct and focus wave energy toward specific locations along Carmel's coastal bluffs, Scenic Road and City infrastructure, producing more severe erosion or damage.

### *Lateral Current-caused Bluff Erosion*

Johnson (1984) also described a fast moving "inshore current" that flows laterally along the beach, eroding material from the base of Carmel's bluffs. This current apparently becomes trapped between the naturally occurring sand berm and the bluff face. It moves along the bluff face toward the south end of Carmel Beach, which is at a slightly lower elevation. City personnel have observed this lateral current causing severe erosion at certain locations along the Carmel shore. When present, the lateral flow also creates difficult or hazardous conditions for people attempting to use several beach access stairways.

### *Storm Water Drainage-caused Bluff Erosion*

Another force known to cause significant shoreline erosion is excessive storm water runoff. During the 1982/83 El Niño storms, heavy rains overwhelmed the City's storm water system. Uncontrolled storm water flows washed away portions of the City's coastal bluffs and undermined beach access stairways.

The impact of storm water runoff on Carmel's coastal bluffs is described in more detail below.

### 6.3 RESPONSES TO EROSION

For over 40 years, Carmel has responded to threats of coastal erosion with a number of effective public works projects.

#### 6.3.1 Storm Water Runoff Control

Carmel's shoreline is at the bottom of a large hill and receives storm water runoff from the City's streets and drains above. Before 1983, the City's storm water system actually contributed to coastal erosion. This became most evident during the 1982/83 El Niño storms:

- All of the existing storm water pipes were undersized;<sup>68</sup>
- In some areas, Scenic Road sloped away from its drain inlets, allowing water to pond along the seaward curb; and
- The high seaward curb (8-12 inches) had openings at each beach access stairway, allowing storm-water runoff to flow down stairs and then onto the beach or adjacent bluffs. This redirected storm water caused bluff erosion that undermined the stairways.

Between 1983 and 1988, the City remedied these problems during Phase I of the Carmel Beach Rehabilitation Project. Based on a storm water flow study by Carmel's City Engineer,<sup>69</sup> Scenic Road was re-paved and its seaward curb was redesigned to drain more efficiently. The entire Scenic Road storm water system was completely rebuilt, utilizing larger drainpipes and catch basins, and placing outfalls in locations where storm water runoff would not erode the bluffs or cause damage to access stairways.<sup>70</sup> The City's Department of Public Works instituted a beach area maintenance program that included the cleaning of debris from protective grates, ensuring that storm water would flow directly into the new drainage systems.<sup>71</sup>

---

<sup>68</sup> In one case, water in a large-diameter pipe flowed into a pipe of smaller diameter.

<sup>69</sup> 1983 Drainage Study for Carmel-by-the-Sea. Neill Engineers. The City's storm water drainage system was studied again by the City Engineer in 1995, and updated in 1997.

<sup>70</sup> Redesigning the City's storm water drain system was one of the most important features of the Carmel Beach Rehabilitation Project. During the 1997/98 El Niño storms, more rain fell than during the '82/83 storms, but without any damage caused by excessive runoff.

<sup>71</sup> The peak period for storm drain system monitoring and maintenance begins in late fall, prior to the winter storm season. Monitoring continues throughout winter.

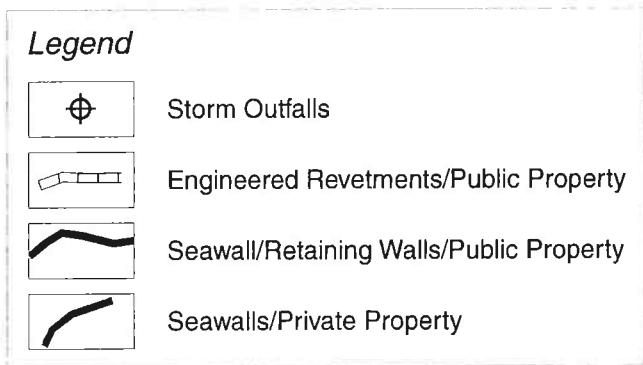
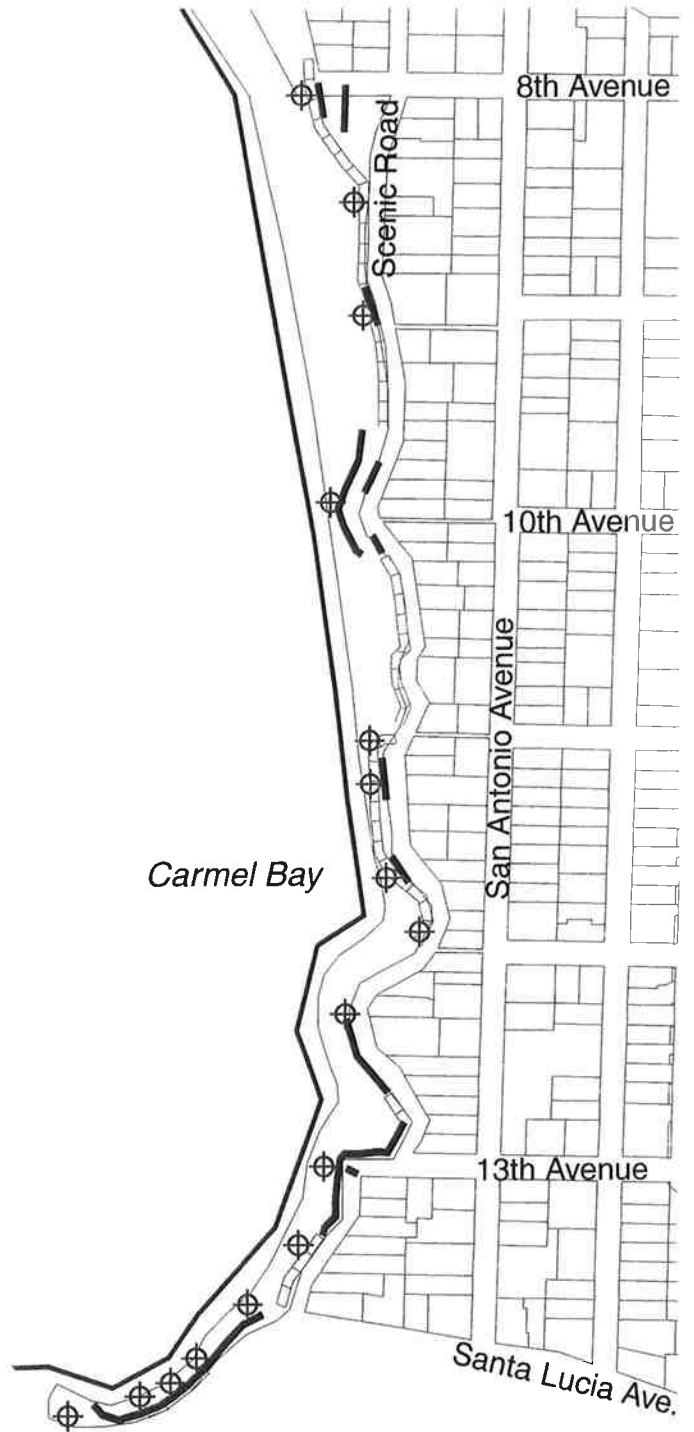
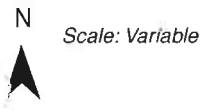


Figure 8  
Coastal Protection Structures

Storm water runoff also eroded bluffs at locations where protective vegetation had been destroyed by people walking or climbing on Carmel's fragile coastal bluffs ("bluff-cutting"), instead of using the stairways. The City's program of building convenient beach access stairways and using plants, boulders, and guardrails in its landscaping significantly reduced the overall incidence of bluff-cutting, reducing the vulnerability of its coastal bluffs to erosion from storm water runoff.

As described in Section 3, pedestrian pathways along Ninth, Tenth, Eleventh, and Twelfth Avenues were designed to also carry storm water runoff between San Antonio Avenue and Scenic Road. Each pathway/drainageway directs runoff water into a drain inlet at Scenic Road. Near the western end of the Eleventh Avenue pathway/drainageway, a large Monterey cypress tree interferes with the efficient drainage of storm water. In response, the City installed a special drain inlet that can be opened prior to each rainstorm and then closed after the storm has passed. This task is performed by personnel from the Department of Public Works who also install a special barrier with hazard lights over the open drain inlet.

At least half the water captured by the City's storm water runoff system discharges onto Carmel Beach through 19 outfalls of varied design and composition (Fig. 8). To prevent erosion of beach sand and soft bedrock, the City has placed boulders under selected outfalls to dissipate the erosive energy of storm drainage water.<sup>72</sup>

Storm water runoff often transports debris into the ocean. In keeping with Federal requirements to remove all gross pollutants<sup>73</sup> and greatly reduce the amount of suspended solids that would otherwise flow into Carmel Bay, the City installed Continuous Deflection Separation (CDS) units into its storm water system. Since 2001, CDS units have been effectively removing debris from Carmel's two largest storm water outfalls: at the foot of Ocean Avenue and at the intersection of Fourth and San Antonio Avenues.

### 6.3.2 Sand Redistribution

Beach sand plays a critical role in the protection of Carmel's shoreline (Sec.s 2 and 6). Since the early 1960s, Carmel has used heavy equipment to redistribute beach sand, moving it from the lower beach to the upper beach. Originally, this procedure was used only along the beach below the Ocean Avenue/Del Mar parking lot. Sand was pushed up the hill during late spring/early summer, to compensate for sand that would be moved downhill by foot traffic. By the end of

---

<sup>72</sup> Many storm drain outfalls drain onto natural rock.

<sup>73</sup> Gross pollutants are defined as debris (including paper, plastics, cans, bottles, etc. and natural material) that is greater than five mm in size.



summer, a significant portion of the bulldozed sand was again returned back to the lower beach.

Since 1984, the City has expanded its sand redistribution program, using bulldozed sand to cover the numerous rock revetments (described below) installed along the shoreline. Covering revetments with sand achieves two goals. It enhances the aesthetic appearance of Carmel Beach by camouflaging a pile of hard-edged boulders under a thick layer of white beach sand.<sup>74</sup> It also returns to safe public use an area previously occupied by rocks and voids.

The covering of revetments is not ordinarily recommended. In his final report on the Carmel's Phase I Beach Rehabilitation Project, Johnson (1984) cautioned that:

"(f)illing in the voids of the rip-rap will reduce the efficacy of the revetment somewhat. The voids absorb some of the wave energy that reduces wave runup and reflected wave energy. Generally, however, if the material filling the voids is not solid, e.g. concrete or tightly compacted soil, the waves soon remove the material and allow the (revetment) to function as designed."

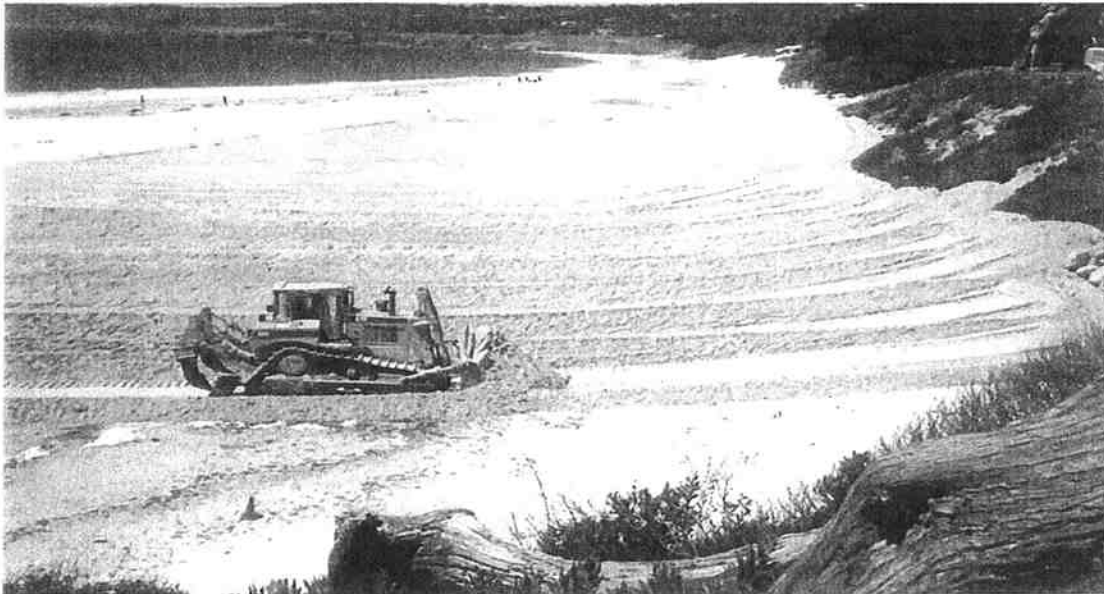


Photo 9 – *Sand Redistribution*

Carmel's use of sand to cover its revetments has, thus far, proven successful. From late spring through early winter, the public has regained the use of beach land that might have otherwise been lost. During severe winter storms, bulldozed sand is rapidly stripped from each revetment, allowing the structure's boulders and voids

<sup>74</sup> During its sand redistribution program, the City covers each revetment with at least three feet of sand.

to reflect and absorb the force of incoming waves. The California Coastal Commission has accepted Carmel's revetment camouflaging as mitigation that helps offset potential adverse impacts (i.e. loss of beach access) associated with revetment installation.

Recently, the City began using its sand redistribution program to address problems caused by ponded water on Carmel Beach.<sup>75</sup> In 2001, the City used a bulldozer to cut a channel through the berm, allowing ponded water to drain back out to the ocean. In areas where ponded water had gathered at the base of a stairway, preventing beach access, the water was drained and then sand was moved laterally to level-out these low areas, returning beach access to the public.

During recent years, the City has moved only sand that was located above the high tide line. The actual volume of sand moved each year varies according to several factors, including the amount of sand already on the upper beach, the degree of revetment cover needed, and the amount of lower beach sand available for movement. For example, the need for sand redistribution following a mild winter will be less than after a severe winter. The City estimates that the amount of sand moved varies between 50,000 – 100,000 cubic yards, depending on conditions. Carmel Beach sand redistribution usually requires two to three weeks to complete.

Because sand redistribution is conducted early in the natural beach-building process, removal of sand from the lower beach apparently does not contribute to any significant beach erosion. In fact, the amount of sand on Carmel Beach continues to build during the remainder of summer. By the end of the peak beach-use period (mid-September), some of the sand that had previously been bulldozed uphill will have returned back down to the lower beach where it will now be ready to absorb the impact of upcoming winter storm waves.

### 6.3.3 Shoreline Armoring

Since 1958, the City has built seawalls, retaining walls, and rock revetments to protect portions of its shoreline bluffs (see Fig. 8). Most of these structures are located along the southern half of Carmel Beach, from Eighth Avenue to the City limit south of Martin Way, where they line nearly the entire shoreline

#### *Seawalls and Retaining Walls*<sup>76</sup>

---

<sup>75</sup> Described in Section 2.2.3

<sup>76</sup> The City classifies a wall whose footing will be reached by seawater under normal tidal conditions, and whose purpose is to protect the bluff against direct wave impact, as a "seawall." A wall built higher on the bluff that is only exposed to ocean spray or wave splash, and that is designed to retain or support bluff soils, is classified as a "retaining wall."

Approximately 50% of the City's shoreline protection structures are seawalls. They are visible at all times, and contribute to the Carmel Beach visual experience. Some of Carmel's earliest shoreline walls were built of local "golden granite" rocks, held together by mortar. More recently, walls have been built of reinforced concrete and faced with golden granite. Many of the City's coastal walls are built upon a foundation sunk deep into the bedrock and some of these walls have "tie-backs" that anchor the wall into the bluff.

All coastal walls are outfitted with ample "weep holes" to promote drainage. This helps relieve the tremendous pressure caused by the build-up of water-laden soils behind the wall, which could cause the wall to lean or collapse.

In general, Carmel's seawalls and retaining walls have held up well under the onslaught of coastal storms. The City's only major seawall loss proved the need for solid design and construction. In 1978, a newly built seawall<sup>77</sup> was struck by storm waves. When built, this wall's footing was not founded into bedrock along its complete base. Waves first undermined the wall's base where it bridged over the sand; once this section failed, the rest of the wall was soon destroyed. All seawalls and retaining walls built since are completely founded into the underlying bedrock.

At the extreme north end of Carmel's beach lands is a privately owned seawall. It was originally constructed in 1983 to protect the owner's property against further wave attack and additional bluff erosion. Over the ensuing years, this wall was modified several times in an attempt to improve its structural stability and appearance.<sup>78</sup> In 1999, Carmel accepted, in fee title, beach lands seaward of this wall, legitimizing the prescriptive right of public access that existed across this area of the beach. The City is committed to maintaining unimpeded public access and use of the entire beach from the south to north City limits.

### *Revetments*

Since 1978, the City has installed rock revetments to protect nearly one-quarter of its total shoreline. All of Carmel's rock revetments are located along the shore south of Ocean Avenue (see Fig. 8). Some early revetments consisted of rocks dumped up against the bluff face.<sup>79</sup>

---

<sup>77</sup> Located south of 12<sup>th</sup> Avenue Point.

<sup>78</sup> Copies of engineering and landscaping plans for this private seawall are recorded with the Carmel Department of Community Planning and Building.

<sup>79</sup> These have all been replaced by engineered revetments or seawalls.



Photo 10 – *Shoreline Armoring Along Carmel Beach*

In 1983, Carmel responded to extensive shoreline bluff damage (from the 1982/83 El Niño storms) by installing several engineered revetments.<sup>80</sup> These were designed by the City's consulting engineering-geologist, Rogers E. Johnson & Associates. Their size, shape, and slope were based on calculations that predicted the size of waves expected to strike the toe of each revetment. The lowest course of boulders was placed into a "keyway" dug into the bedrock at the base of each structure. Filter fabric was laid down before placing the boulders to allow the free flow of water in and out of the structure, and reduce the erosion of sand or bluff soils.<sup>81</sup> Within two summers, these structures were completely covered by sand as a result of the beach's natural sand deposition processes and the City's extensive sand redistribution-bulldozing efforts. In the years since their installation, these revetments have remained mostly hidden from view. During most years, few Carmel Beach visitors are aware of their presence.

Revetments are made of hundreds or more individual boulders, ranging from 700 lb. core stones up to larger "armor" stones typically weighing as much as five tons. A revetment's bluff protection abilities are due to a combination of factors, including the irregular surfaces of each boulder and the spaces ("voids") between them. As a wave strikes the revetment, its energy is quickly

---

<sup>80</sup> These engineered revetments were installed in 1983/84 during Phase I of the "Carmel Beach Rehabilitation Project."

<sup>81</sup> All work was conducted under the guidance of a certified engineering geologist.

dissipated by reflecting off the many boulder faces. At the same time, wave energy is absorbed by the void spaces between boulders.

A revetment's individual boulders eventually respond to the forces of wave action and gravity. Over time, boulders can be expected to change position. Some boulders may eventually "migrate" seaward, away from the revetment (Photo 8). Movement of the keystones (those boulders located at the base of a revetment) can drastically change the entire revetment structure and critically compromise its erosion-protection abilities – as well as public safety. Maintenance of the City's revetments is described in Section 8.

## 6.4 FUTURE PROJECTS

### 6.4.1 *Future Shoreline Armoring*

Carmel's seawalls are a collection of structures built in different years, using varied techniques. Because of their age, the earliest walls were built using materials and techniques that do not meet current standards.<sup>82</sup> It is reasonable to expect that some existing walls, especially the oldest ones, will need repair or eventual replacement. Because coastal erosion often damages unprotected bluffs and dunes adjacent to armor structures, it is also likely that the ends of some older seawalls may need to be extended at some future date. Consistent with the Coastal Act, new armoring will occur only if existing coastal structures, accesses or infrastructure become threatened by erosion.

Carmel's shoreline revetments were all built within the last two decades and all were engineered to meet current standards. Maintenance of existing revetments should be anticipated (see Sec. 8). After exposure to winter storm waves, some revetment boulders may need to be repositioned. And, as with seawalls described above, the unprotected bluffs adjacent to existing revetments may eventually require additional protection.

South of Eighth Avenue, only one area remains unarmored by either wall or revetment: the section between Twelfth Avenue and the Twelfth Avenue promontory. This area is characterized by high, steep bluffs that may be protected from direct wave attack (by the Twelfth Avenue point), but are exposed to scouring by the laterally flowing inshore current (described in Sec. 6). This area may be a future candidate for some form of shoreline armoring to protect the Pathway and beach access facilities from bluff erosion.

---

<sup>82</sup> Some of these early walls were built without engineering plans.

Accurate prediction of future events is not possible. In addition, there is no way to guarantee that existing walls and revetments will continue to protect against storms of unexpected intensity. Scientists who study coastal-related phenomena warn that higher sea levels and less predictable weather patterns may be expected during this century.

City policies allow permanent structures to be built on the beach only when required to protect existing structures in danger from erosion and when designed to eliminate or mitigate adverse impacts on local shoreline sand supply. The design of new shoreline structures must be consistent with the aesthetic character established by existing structures. City policy also calls for the evaluation of the potential to replace its existing shoreline revetments with vertical seawalls and to reduce the amount of sandy beach covered by revetment structures.<sup>83</sup>

The City is committed to protecting the Carmel shoreline and its access facilities, along with Scenic Road, its houses and infrastructure. As new shoreline challenges arise, the City will evaluate each situation and respond with appropriate measures that are in keeping with its approved coastal policies.

#### 6.4.2 Beach Nourishment

As discussed throughout this *Shoreline Management Plan*, Carmel's beach sand plays an essential role in protecting its shoreline from erosion. The City has always depended upon natural processes (see Sec. 2.2) to transport sand onto Carmel Beach.<sup>84</sup> During the past few decades, other coastal communities, however, have conducted "beach nourishment" programs to bring additional sand to their shores. Some use trucks to import sand from a different location, while others, like the nearby City of Santa Cruz, use dredges and pumps. There are even a few communities on the East Coast that bring up sand from offshore sand bars.

It is City policy<sup>85</sup> to explore the feasibility of beach nourishment if long-term shoreline monitoring determines that Carmel Beach is losing significant volumes of sand or that the beach is becoming demonstrably narrower.

To be considered successful, a beach nourishment program would need to match Carmel's characteristic beach sand. This task might be both difficult and expensive—but importing new sand that differs in color or texture from Carmel's native sand would be extremely unpopular.

---

<sup>83</sup> City of Carmel Coastal Land Use Plan (approved June 2003) Policies P5-6, -11, -12, -15, and -17.

<sup>84</sup> Carmel's sand redistribution program moves sand that is already on the beach to areas where it can bring the most benefit; this process does not import any "new" sand to the shoreline.

<sup>85</sup> City of Carmel Coastal Land Use Plan (approved June 2003) Policy P5-20.

One possible source of suitable sand might be the subtidal sand bar understood to exist just offshore from Carmel Beach. This sand bar is thought to be the repository of the white sand that moves onshore and offshore during the beach's annual sand cycle. At present, there have been no detailed oceanographic studies that document the location, size, or dynamics of such a sand bar, but future study might help the City understand this potential sand source. Movement of any offshore sand onto Carmel Beach would, of course, be expensive, but might appear worthwhile if Carmel ever shows signs of permanently losing its beach sand.

Beach nourishment should also not result in environmental degradation, nor conflict with the goals and policies of agencies responsible for protecting local offshore habitat, including the Monterey Bay National Marine Sanctuary and the California Department of Fish and Game. At present, the environmental and recreational impacts of using nearshore sand for beach nourishment are not understood.

## 6.5 MANAGEMENT POLICIES

- Continue implementation of the *Shoreline Emergency Action Response Plan* to minimize the dangers to public safety and facilities that may be caused by winter storms or other natural disasters. (O5-5)
  - Prepare as-built plans showing the extent of all armoring in the SMP plan area in relation to the existing topography and other relevant features (including the top of bluff, base of bluff, sand-bluff interface, sandstone platforms, Scenic Road, Scenic Road pathway, and utilities in the Scenic Road rights-of-way, etc). The as-built plans shall indicate vertical and horizontal reference distances from the surveyed benchmarks to the survey points on each structure for use in future monitoring efforts. (P5-4)
  - Construct new shoreline armoring in areas previously unprotected only when required to protect existing structures in danger of erosion and when designed to eliminate or mitigate adverse impacts on local shoreline sand supply. Require any approved structures to include native landscaping (screening), be visually compatible with existing seawall designs, address drainage, incorporate visual mitigation, sand coverage for revetments, and golden granite facing for seawalls. (P5-6)

- Evaluate the storm-water outfall system for purposes of reducing impacts to the beach environment. Consider options to modify and/or remove outfalls from the beach and replace or retrofit storm drains with filters or treatment devices to reduce impacts on the shoreline environment. (P5-9)
- Runoff from storm water outfalls shall be conveyed onto Carmel Beach in a non-erosive manner (i.e. runoff shall be discharged so as to minimize erosive forces.) (P5-10)
- Prohibit any construction of substantial or permanent structures on the beach or within Carmel Bay except where required to protect existing structures in danger from erosion. Require design review for any structure proposed and minimize conflict with the scenic and aesthetic character of the shoreline environs through such review. (P5-11)
- Ensure that the design of seawalls and engineered revetments are consistent with the aesthetic character of established structures. Continue to use golden granite (or better materials) for exposed vertical seawalls in locations where shoreline protection has been determined necessary. If vertical seawalls are not feasible, but engineered revetments may be feasibly installed, minimize the seaward encroachment of these structures and reduce the visual impact by burying stone revetments with beach sand and/or topsoil and native landscaping. (P5-12)
- Evaluate the potential to replace existing revetments with faced vertical seawalls or sea walls designed to mimic the natural bluff face, to reduce sandy beach area coverage and the need for sand bulldozing. All replacement structures must be found compatible with the areas' aesthetic qualities. Recognize that physiographic conditions may dictate a better alternative (e.g. when a specific area of the beach is more susceptible to reflected wave energy and consequent accelerated scour). (P5-15)
- Any project (including but not limited to repair, maintenance, expansion, modification, or replacement) involving the shoreline armoring structure that extends along the Carmel Beach bluff southeast from the mouth of Pescadero Creek shall require the façade to use materials that are complementary to shoreline armoring structures located along the Carmel Beach bluff south of 8<sup>th</sup> Avenue. (P5-17)



- Maintain records of the volumes of sand moved and the volumes needed to cover each engineered revetment. When revetments fail or need to be substantially reconstructed or replaced, consider vertical seawalls as a preferred alternative unless monitoring data and/or engineering requirements favor an engineered revetment design. (P5-22)
  
- Where unavoidable, minimize and mitigate all impacts to both marine and terrestrial resources when performing sand redistribution. (P5-23)

## **7 PUBLIC SAFETY**

Carmel's shoreline presents challenges to public safety that are unique to coastal areas. The very combination of ocean and shore that attracts so many people to the coast can also pose potential dangers.

### **7.1 RECREATIONAL HAZARDS**

Carmel's white sand beach, clear waters, beautiful vistas, and proximity to town, combine to make this site one of central California's most popular coastal recreation venues. Throughout the year, many people engage in water sports, including wading, swimming, kayaking, surfing and wind-surfing. These activities are sources of enjoyment for residents and visitors alike; they also represent very real dangers.

Conditions at Carmel Beach are no more dangerous than those encountered at other open-coast central California beaches. The level of potential hazard depends upon an individual's experience, skill level and physical conditioning, as well as environmental conditions (i.e. water temperature, wave size and energy, presence of undertow or rip current, etc.). People engaged in these activities do so at their own risk.

The City of Carmel, like many other local coastal municipalities, does not provide on-site lifeguards. The City has posted warning signs on all beach-access stairways and sand ramps. These signs, approved by the State of California Attorney General's office, provide warning of hazardous shoreline and ocean conditions and notify visitors that the beach has no lifeguards.

When emergencies occur along the shoreline, a telephone call to 911 will alert the appropriate emergency personnel. With current technology, many emergency calls are made with mobile phones, but some parts of the Carmel shoreline have poor cell phone reception. In response, the City has recently installed emergency phone stations at two locations along the Carmel Beach Bluff Pathway: at Eighth and Thirteenth Avenues. These phones are connected directly to the Carmel Police Department dispatcher. Information about an emergency will then be forwarded to the Carmel Fire Department, which is the primary responder to any medical or rescue emergency on the beach. Emergency calls can also be made from a pay

telephone located outside of the City's public restroom near the Ocean Avenue/Del Mar parking lot.

In cases where a person in distress is beyond the surf line, City of Carmel personnel are prohibited by policy from entering the water to attempt rescue. Fire Department personnel follow the Monterey County *Coastal Incident Response Plan*<sup>86</sup> and may call in a rescue craft from Point Lobos State Reserve (California Department of Parks and Recreation) or a U.S. Coast Guard helicopter. During emergency situations, "four-wheel drive" vehicles can use the City's vehicle/equipment access ramp, located between Eighth and Ninth Avenues. If this ramp is not usable, emergency vehicles are authorized access to the beach via the dunes adjacent to the Ocean Avenue/Del Mar parking lot.

## 7.2 COASTAL STORM HAZARDS

From late fall through early spring, residents and visitors may also be exposed to dangers posed by coastal storms (heavy surf, powerful waves, high tides, strong winds, and erosion of Carmel's beach, dunes and bluffs). Under these conditions, pedestrian activity on the beach, bluffs, rocks, or stairways, may be dangerous. Extremely large waves have been known to carry individuals into the ocean at several locations in Monterey and Carmel Bays. In spite of posted warnings, some visitors purposely stand on shoreline bluffs, promontories, and/or stairs in order to experience the raw power of stormy seas. Rescue during stormy conditions is especially difficult.

To help protect the public when these unsafe conditions occur, the City has developed the *Beach Emergency Closure Plan*, which enables the Carmel Police Chief, in consultation with the Beach Emergency Action Committee (BEAC), to close Carmel Beach to the public. Beach closure will be undertaken based on information from City staff or from organizations such as the Monterey County Office of Emergency Services and the U.S. Weather Service, etc. Public Works personnel will then install standardized signs and erect suitable barricades at specified shoreline access points. The *Beach Emergency Closure Plan* appears in Appendix 9.3 of this *Shoreline Management Plan*.

---

<sup>86</sup> County of Monterey. 2001. Operational Area Coastal Incident Response Plan (Draft). Office of Emergency Services.

## 7.3 CARMEL SHORELINE HAZARDS

### 7.3.1 Tripping Hazards

Not all shoreline hazards are directly related to coastal storms. Pathways that become uneven and landscape plants that become overgrown may pose potential hazards for pedestrians. In addition, the dynamic and very harsh conditions that characterize seaside environments may increase the “wear and tear” on fasteners that secure guardrails, stairway planks and hand rails, etc.

At any time, foot traffic on Carmel’s coastal bluffs may be hazardous. Some portions of these bluffs may be steep and slippery. Other areas may have poor footing, or be the site of unseen hollows that can develop as a result of wave impacts eroding coastal bluff soils behind retaining walls or revetments. To protect the public from these hazards (and to protect the fragile bluffs and vegetation from intrusive foot traffic), Carmel’s Municipal Code prohibits walking on, or traversing, the City’s shoreline bluffs.<sup>87</sup>

### 7.3.2 Revetment Hazards

Carmel Beach’s numerous engineered rock revetments may at times represent a hazard to some beach visitors. As described in Section 6, these revetments consist of large boulders installed to achieve a specified angle of repose. Occasionally, some of these boulders may shift under the impact of high-energy storm waves. People who climb or play on the revetments may encounter dangerous conditions, including perched boulders and voids between rocks. In late spring or summer, when conditions allow, the City covers each revetment with at least three feet of sand as part of its annual sand redistribution program. In most years, storm waves can strip away much of Carmel’s beach sand and bluff material, exposing the underlying revetment boulders. Under these conditions, climbing on Carmel’s shoreline revetments is inherently hazardous, and is prohibited.

### 7.3.3 Ground Squirrel Hazards

As discussed in Section 2, Carmel’s expanding population of California ground squirrels also pose potential public safety hazards, from spreading disease to undermining bluffs. Control of these rodents is discussed in Section 8.

---

<sup>87</sup> CMC 12.32.165

### 7.3.4 Monitoring

Most of the potential problems discussed above can be remedied through a program of regular monitoring and responsive maintenance. City of Carmel policy encourages all employees to watch for, and report, conditions that could be hazardous to public safety.<sup>88</sup> Regular monitoring and inspections are augmented with a series of Shoreline Assessments, performed twice per year (spring and fall). Each of these monitoring and maintenance activities is a vital component of Carmel's on-going commitment to protecting public safety. These programs are described in more detail in Section 8.

## 7.4 MANAGEMENT POLICIES

- To provide a safe environment for all beach users.
  - Educate the public about the danger of the beach and ocean environment and provide emergency response capabilities. (O4-4 excerpt)
    - Consider establishing and budgeting for the position of an educational officer who would patrol the beach and adjacent areas to educate people about beach usage and prevent damage to the environment. This person should have the authority to issue citations. (P4-25)
    - Maintain emergency 911 phones along the shoreline. (P4-28)
    - Post signs warning beach users about dangerous ocean conditions. (P4-35)

---

<sup>88</sup> According to the Guidelines for Emergency Beach Closure, "(a)ny City employee who becomes aware of an existing or potential shoreline condition (this includes any condition on Scenic Road or any property West of Scenic Road including, but not limited to, the beach slope), that threatens the public safety, health, or welfare of persons on the beach or shoreline, shall immediately notify their respective Supervisor." (Carmel City Council Policy C03-03, approved 1 Apr 2003)

## **8 CARMEL SHORELINE MANAGEMENT PROGRAMS**

Like all coastal areas, the City of Carmel must deal with constantly changing conditions along its shoreline. The natural forces and human activities responsible for these changes have been described throughout this *Shoreline Management Plan*. In response, the City has implemented numerous projects and programs designed to protect its shoreline (and associated infrastructure) and enhance public access to the beach.

Clearly, Carmel will continue to be faced with challenges to its shoreline. To remain effective, the City's shoreline protection measures must be combined with effective monitoring, inspection, maintenance and repair programs.

### **8.1 MONITORING AND INSPECTIONS**

There is a common perception that shoreline damage is usually the result of catastrophic and uncontrollable forces. But experience has shown that many problems encountered along our shore could be fixed with greater ease and less expense if dealt with at an early stage. This requires a program of regular and timely monitoring and inspections. Monitoring refers to "watching, checking, or keeping track of" on-going processes along the Carmel shoreline. Inspections involve detailed examinations of shoreline structures by engineers or other trained personnel.

#### **8.1.1 Shoreline Assessments**

The City contracts for a series of biannual independent shoreline assessments. These are performed by a specialist familiar with coastal processes in general, and the Carmel shoreline in particular. Each year, one assessment is conducted in the fall, before the beginning of the winter storm season, and the other is performed in early spring, after winter storms have abated.

Each assessment covers the complete shoreline within Carmel's city limits and includes evaluation of:

- the beach (from the tide line to the base of the dunes, bluffs, walls, or revetments);
- the dunes (including North Dunes) and bluffs;
- the Ocean Avenue/Del Mar parking lot;

- all seawalls, retaining walls, revetments, beach access stairways (including handrails) and sand ramps;
- all portions of the Carmel Beach Bluff Pathway and landscaping, including guardrails;
- all storm drains, drop inlets, grates, and access covers (especially following the Fall Catch Basin Cleaning by Public Works staff), and storm water outfalls; and
- all warning signs and other informational signs along the City's shoreline.

The pre-winter assessment focuses on steps needed to prepare the City's shoreline for the coming winter. This assessment also includes a report of long-range winter weather forecasts by the National Oceanic and Atmospheric Administration (NOAA). The post-winter assessment surveys each of the above-described areas, with a special focus on steps needed to repair any damage caused by the previous winter's storms. During each assessment, conditions determined to pose an imminent threat to public safety, shoreline facilities or to environmental resources are brought directly to the attention of the appropriate department directors or other responsible personnel.

Results of each assessment are reported to the directors of Carmel's departments of Public Works and Community Planning and Building, the City Forester, and the City Engineer.

### 8.1.2 Shoreline Surveys

A much longer-term element of the City's shoreline monitoring program is the development of baseline information and periodic surveys to document changes in beach width, sand volume, rates of bluff erosion, and any movement of seawalls, retaining walls, and revetment boulders. These data help supply information necessary on long-term shoreline trends. Questions such as "Is the shoreline losing sand?" "Is the beach becoming narrower?" "Are the seawalls and revetments contributing to local coastal erosion?" can only be answered through a program of accurate shoreline surveys, repeated over a period of years or decades.

The results of these surveys will be of great value to staff and consultants tasked with protecting Carmel's coastal assets. This information will also help answer questions raised by the California Coastal Commission during development of Carmel's Local Coastal Program.

#### *Permanent Shoreline Benchmarks*

To facilitate shoreline surveys, the City has installed seven permanent benchmarks along the upper shoreline, along with a set of associated survey

points on seawalls and revetments. The location of each benchmark was surveyed and described in accordance with Coastal Commission requirements.<sup>89</sup> They were placed by the City Engineer in October 2002, after consultation with the Director of Public Works and the City's consulting engineering-geologist.

### *Profiling the Beach*

The Coastal Commission has required the City to conduct beach profile surveys along its shore to "facilitate future long-term trend evaluation."<sup>90</sup> These profiles are to measure changes in elevation along lines plotted from the bluff top out to the water's edge; all measurements are to be interpreted in relation to the permanent shoreline benchmarks described above.

City staff and consultants have selected a series of seven transect lines to be surveyed (Fig. 9). These cover a variety of shoreline conditions including open beach sand, revetments, and seawalls. (Some of the proposed transects include sites profiled in 1983 by the City's consulting engineering-geologist, Rogers E. Johnson and Associates, as part of the Carmel Beach Rehabilitation Project.) For comparison, the most northern of the proposed transect lines represents an area not affected by the City's annual sand redistribution program.

The City has committed<sup>91</sup> to profiling its beach four times per year:

- at mid-Winter when sand is at its lowest;
- at Spring, prior to sand redistribution activities;
- at early Summer, immediately following sand redistribution; and
- in the early Fall, before sand begins its retreat offshore.

Profiles are slated to be performed in 2003 and 2005 (to establish a baseline), then repeated at five-year intervals beginning in 2010.<sup>92</sup>

After each five-year period, the City will review all available data. Analysis of these profiles will document several important factors, including the

---

<sup>89</sup> California Coastal Commission required the City to establish a "series of permanent surveyed benchmarks inland of the bluff edge running the length of Carmel Beach ...."<sup>89</sup> These benchmarks were to be "... described in relation to National Geodetic Vertical Datum (NGVD) and identified through permanent markers, benchmarks, survey position, written description, reference numbers, et cetera." (from Special Condition 2(i)(1) of the City's Coastal Development Permit #3-00-140, approved April 13, 2001.)

<sup>90</sup> Special Condition 2(f) of Coastal Development Permit #3-00-140

<sup>91</sup> City of Carmel Coastal Land Use Plan (approved June 2003) Policy P5-19.

<sup>92</sup> City of Carmel Coastal Land Use Plan (approved June 2003) Policy P5-20.





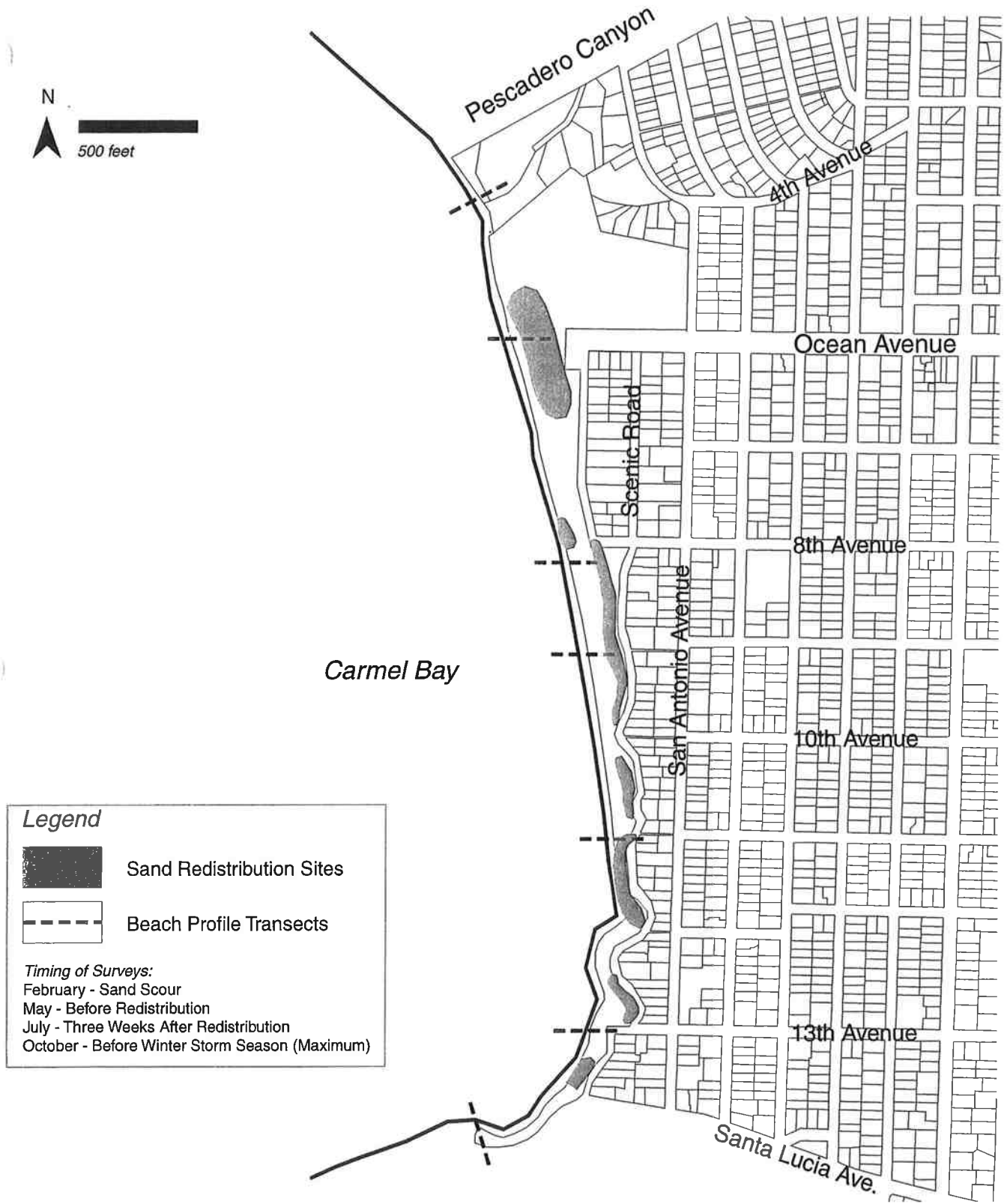


Figure 9  
Sand Redistribution and Profile Transects



approximate volume of sand<sup>93</sup> on Carmel Beach at the period of maximum sand scour, the approximate volume of sand returned by the natural sand cycle, the pattern and approximate volume of sand redistributed by the City's sand redistribution bulldozing, and the approximate amount of sand moved back downhill by summer beach visitors.

Long-term beach profile surveys will enable the City to quantitatively assess the impact of its sand redistribution program. As described in Section 6.3.2, the City has been re-contouring sand on portions of Carmel Beach for nearly forty years, but has only anecdotal information about the program's impacts. Analysis of beach profile surveys could lend credence to the City's continued use of sand redistribution as an important shoreline management tool, or it could help the City modify the methods or timing of this critical program.

Analysis of beach profiles could also help answer questions related to the impact of hard shoreline protective structures on beach width and sand volume. As described in Sections 2.2.4 and 6.2.1, seawalls and rock revetments have been associated with long-term sand loss along other shorelines, but this phenomenon has not been documented at Carmel.

Beach profile information can be obtained in a number of ways, including aerial photogrammetry and ground-based surveys that use laser-measuring systems and/or GPS. Each technique varies in cost, accuracy, and applicability to Carmel's unique features.

The value of long-term profiling cannot be overstated. The benefits of this monitoring program will increase with time. The longer the period of profiling, the clearer any trends will be. It is reasonable to expect that new beach profile sampling and assessment techniques will become available in the future. The City should ensure that any new techniques will continue, whenever possible, to utilize previous data.

### *Monitoring Shoreline Armor Structures*

The Coastal Commission has also required the City to establish survey points at several locations on all of its shoreline armor structures (walls and

---

<sup>93</sup> It is not possible to measure the exact volume of sand on Carmel Beach, but experienced shoreline surveyors using beach profile surveys to analyze beach dynamics, can estimate changes in sand volume over time. (In fact, some of the pioneering beach dynamics studies were based on surveys of transects conducted along Carmel Beach by noted oceanographer Willard Bascom in the mid-1940s.) When repeated over time, the impact of short-term temporal changes (such as those caused by severe storms, extremely high tides, etc.) can be modulated, and the usefulness of the studies increases.

revetments).<sup>94</sup> The City was further directed to survey the locations of these survey points (in relation to the permanent bluff top benchmarks) to determine if any portions of the revetments or walls have moved. These surveys of the City's armoring structures are to be conducted at five-year intervals, commencing in 2002, though City staff and consultants recommend more frequent surveys during periods of severe storm conditions.

### 8.1.3 Monitoring by City Staff

Perhaps one of the most important forms of monitoring is that conducted by City staff during the course of their regular duties. Many of Carmel's Public Works and Forest, Parks, and Beach workers are very familiar with the City's shoreline. They are experienced and knowledgeable, and often spend many hours each week working along the shore. They are often the first to see signs of developing problems: fractures in concrete, water draining down stairways, plants growing onto walkways, cavities forming in bluff fill, trails and gullies being carved on coastal slopes. If ignored, these conditions will surely evolve into larger, more expensive, and, possibly, dangerous problems. The City must encourage and respond to reports of perceived problems by its field employees.

### 8.1.4 Structural Inspections

All of Carmel's shoreline structures require periodic detailed inspections by skilled specialists. These structures, including seawalls, retaining walls, revetments, and beach access stairways, are all subject to damage. Wave action, including run-up and overtopping, can damage walls, displace revetment boulders, and shift stairways. In addition, exposure to salt air rusts metal hardware and weakens stairs and safety rails.

Carmel's beach access stairways are inspected annually by the Director of the Department of Public Works and the City's Building Official. This inspection assesses the structural integrity of all stairways and handrails, examines cracks or displacement of concrete stairs and corroded hardware, loose or damaged boards in wooden stairways.

The City's shoreline storm water system is inspected each year before the on-set of winter storms. This inspection is conducted by the Department of Public Works Streets Supervisor, and includes all inlets, drain pipes, and outfalls.

---

<sup>94</sup> "... at least one survey point at both the upcoast and downcoast end of each structure, and at appropriate locations between each end." Special Condition 2(i)(1) of Coastal Development Permit #3-00-140.

No regularly scheduled inspection program of Carmel's seawalls, retaining walls and shoreline revetments has yet been established. These structures should be periodically reviewed by licensed engineers and/or certified engineering geologists.

## **8.2 MAINTENANCE**

Of all City activities conducted along the Carmel shoreline, a strong commitment to timely maintenance must rank among the most important. The scenic Monterey cypress, the best designed beach access stairway, the efficient storm water system, and the most beautiful landscape, all will fail without a well-planned and fully implemented maintenance program. Maintenance of Carmel's shoreline must be an on-going, never-ending effort. Protection of shoreline visitors and the effectiveness of the City's programs and projects require no less.

Maintenance activities should meet all approved methodologies. Repairs should always strive to achieve equal or superior quality of design and materials. Modifications or changes to designs should be reviewed and approved by the responsible governing bodies of the City before implementation.

Maintenance tasks for Carmel's shoreline are described below. A checklist of these tasks is shown in Appendix 9.4. An effective maintenance program must be dependent upon regular monitoring and inspection programs (see Sec. 8.1) and prompt and timely responses. Anything less may compromise public safety and the integrity of the shoreline. Experience has shown that delays in addressing shoreline maintenance problems inevitably lead to remedies that are more difficult to accomplish and more expensive to build. Delay may also constrain the available options for addressing shoreline damage.

### **8.2.1 Carmel Beach Sand**

The primary maintenance issues affecting Carmel Beach are related to keeping the beach sand clean and free of litter, trash, fire coals, and the occasional bodies of deceased wildlife, including birds and marine mammals (O5-6, P5-38, P5-39). This entails the timely emptying of beach trash receptacles and the cleaning of adjacent beach areas.

Beach maintenance also involves the annual redistribution of Carmel's beach sand. This activity is described in Section. 6.3.2.

### 8.2.2 Dunes

Since Carmel's dunes are not swept clean by waves and tides, manual control of litter, trash, garbage, etc. is essential. Sand from the dunes between Ocean and Ninth Avenues sometimes blows onto the City's roads, parking lots, and paths. These require timely clearing. Special attention must be paid to places where wind-blown sand covers walkways, curb-ramps, and other structures used by the physically disabled.

Maintenance tasks related to dune fauna and flora are discussed in Section. 8.2.6, below.

### 8.2.3 Bluffs

Prevention and repair of bluff damage caused by (illegal) "bluff-cutting" requires prompt and continuous maintenance. Repairs that involve re-vegetating trails, installation of guardrails, boulders, and/or signs, are strongly encouraged.

Timely maintenance is also needed to repair slumps and hollows that may form in shoreline bluffs. Investigation into the cause of a slump may uncover evidence of a broken or leaking water (or drainage) pipe.

Maintenance issues that deal with bluff vegetation and wildlife are discussed below.

### 8.2.4 Beach Bluff Pathway

Protection of public safety on the Beach Bluff Pathway can be enhanced by maintenance activities that keep the Pathway surface smooth and free of loose gravels, depressions, encroaching vegetation, and uneven interfaces (e.g. between Pathway and stairway landings). The Pathway will need to be resurfaced periodically.

### 8.2.5 Structures<sup>95</sup>

Beach access stairways must have handrails that are securely attached, and must be kept clear of encroaching vegetation or draining water that can make passage hazardous. Loose and/or perched revetment boulders must be repositioned or removed. Storm water structures must be kept clear of encroaching vegetation and debris, and the Continuous Deflection Separation (CDS) units must be maintained on an appropriate schedule. Plants and trees must be pruned to keep signs visible.

---

<sup>95</sup> Note that previous sections deal with monitoring and inspection of these structures.

Sign text must be kept legible through periodic refurbishment or replacement. Guardrails must remain secure. All components of the Pathway irrigation system should be regularly maintained for effective operation.

#### 8.2.6 Native Fauna and Flora

Habitats for native biota must be kept free of competition from aggressive, invasive exotic plants. Maintenance and protection of Environmentally Sensitive Habitat Areas should be conducted in consultation with qualified specialists and in coordination with applicable state and federal agencies and policies.<sup>96</sup>

#### 8.2.7 Horticultural Plantings

The Beach Bluff Pathway landscape plantings should be revitalized to better achieve the project's intended purposes (see below). Plants that encroach on the coastal viewshed, or on Carmel's shoreline cypress viewshed, must be pruned, removed, and/or replaced with appropriate species. Over time, areas of Hottentot-fig ice plant, acacia, and other aggressive invasive species should be replaced with plants from the approved list that complement the shoreline landscape. Young plants should be interspersed, over time, among mature plants, to ensure the continuation of this vital landscape.

#### 8.2.8 Trees

Monterey cypress must be trimmed consistent with professional arboricultural standards to promote healthy growth and prevent structural damage during strong winds.

#### 8.2.9 Wildlife

##### *California Ground Squirrels*

Control of Carmel's ground squirrel population can help protect citizens' health, welfare, and safety. When ground squirrel control is needed, the City will use population control techniques that are both effective and have no, or minimal, impact on other species. The City may also consider a public information program that explains the need for control, while describing the undesirable results that would follow if ground squirrel populations grow unchecked along the Carmel shoreline.

---

<sup>96</sup> City of Carmel Coastal Land Use Plan (approved June 2003) Policy P5-159.



### *Stranded/Deceased Marine Mammals and Birds*

Like their human counterparts, many marine birds and mammals make annual visits to the central California coast. Other marine mammals (sea otters and harbor seals) live along our coast throughout the year. Occasionally, some of these animals may become stranded on Carmel Beach. At other times, their bodies may wash up onto the beach.

All marine birds and mammals are protected by Federal law. When these animals, or their bodies, appear on Carmel Beach, only certain government agencies or certified organizations are allowed to handle them. City personnel should contact the appropriate agency or organization listed below.

Stranded marine mammals should be protected from disturbance by people or dogs. Mammals that are injured or sick may feel vulnerable, and may act aggressively toward people or dogs that venture too close. Sometimes, sick marine mammals carry diseases that are transmissible to other species, including humans or dogs.

#### Contact List<sup>97</sup>

Sea Otters (alive or dead)	Monterey Bay Aquarium	648-4840 <sup>98</sup>
Seals and sea lions (alive)	Marine Mammal Center	633-6298
Seals and sea lions (dead)	NOAA	1-877-466-9155 <sup>99</sup>
Birds (live)	Monterey County SPCA	646-5534

## 8.3 EROSION RESPONSE

Successful management of the Carmel shoreline should be based on the following paradigm: coastal erosion will continue to occur. While the City's seawalls and revetments appear to have slowed the pace of erosion of Carmel's coastal bluffs, the impacts of storm and wave will continue to pose threats to the beach, dunes,

<sup>97</sup> This list should be updated annually.

<sup>98</sup> This is the Monterey Bay Aquarium's 24-hour security phone number. MBA sea otter resource personnel will be notified.

<sup>99</sup> Representatives from the National Oceanic and Atmospheric Administration (NOAA) have asked to be notified whenever seal or sea lion carcasses wash up on any portion of the Monterey National Marine Sanctuary, including the Carmel shoreline. This telephone number connects to the pager for NOAA's local law enforcement personnel. Once they have determined that the animal died of natural causes, then the City can dispose of the carcass. Carmel Department of Public Works personnel bury these carcasses with a sand cover of at least four feet. If a carcass is not too decayed, it may be buried under the beach near Pescadero Creek, where the sand is deeper and where there are fewer beach visitors.

and bluffs. By dealing with erosion threats, the City can enable the continued use and enjoyment of the Carmel shoreline far into the foreseeable future.

As described in Sections 8.1 and 8.2, the City's erosion control program must be based on effective monitoring, inspection, and maintenance of the shoreline's natural and structural elements, as conditions change throughout the seasons and over the years. Activities such as the timely trimming of trees, the clearing of vegetation and debris from storm water systems, the prompt repair of bluff-cut trails, and other maintenance actions recommended in Section 8.2 and listed in Appendix 9.4, can each help lessen the impact of winter storm damage.

If erosion is severe enough to require the construction of new shoreline protection structures or the modification of existing structures, then guidelines described in Section 6.4 and in City policies P5-5, P5-6, P5-11, P5-12, P5-15, P5-16, and P5-17 should be followed.

## 8.4 FUNDING

The steps described above involve continuous and often immediate action on the part of the City. This requires that adequate funding be available in the annual operating budgets of each responsible City department.

The City also has committed to establishing and sustaining adequate capital reserve funds to respond to both on-going and infrequent shoreline management projects. These include beach profile surveys, engineering inspections of all beach facilities and protective structures, and timely incremental rehabilitation of the Beach Bluff Pathway and landscaping. A minimum reserve level of \$150,000 should be maintained (and adjusted annually based on the rate of inflation) to cover these expenses.

Significant funds are also set aside exclusively for the Carmel shoreline and Carmel Beach in the City's Capital Improvement Reserve Fund. These funds allow the City to respond to catastrophic events where the cost of restoration would place a major financial burden on the City's budget if reserves were not available. Historically, these types of damages inevitably occur along the shoreline as a result of severe winter storms. A minimum reserve level of \$500,000 should be maintained (and adjusted annually based on the rate of inflation). These recommendations are in keeping with City policy.<sup>100</sup>

---

<sup>100</sup> City of Carmel Coastal Land Use Plan (approved June 2003) Policy P5-36

## 8.5 PERMITS

Inevitably, on-going management activities will result in changes to the Carmel shoreline. Erosion protection, facility maintenance, access improvement, and restroom construction all will require physical work. In each case, the City's first responsibility will be to determine whether a Coastal Development Permit is required. The *Shoreline Emergency Action Response Plan* (Appendix 9.2) can serve as a general guide and should be read in conjunction with ordinances on Coastal Development Permit procedures adopted in Title 17 of the Carmel Municipal Code. In cases when there is an urgent need to take action to protect public safety or forestall further damage to shoreline structures, infrastructure or environmental resources, an emergency permit can be issued. This allows for immediate but temporary action. Once the emergency condition is stabilized, a permanent remedy or improvement can be designed and permitted through normal Coastal Development Permit processes, including full public review.

## 8.6 MANAGEMENT POLICIES

- Establish and implement a comprehensive shoreline management program for the beach, bluffs and dunes that mitigates degradation caused by public use and natural forces. (G5-2)
- Minimize erosion of the bluffs. (O5-1)
  - Obtain and maintain an accurate digitized map of the Carmel shoreline to develop the City's beach management and maintenance policies. Analyze historic beach trends using aerial photo analysis and other available tools. Update topographic information at least every 5 years and analyze shoreline changes to facilitate early identification of erosion hot spots, sand sediment losses/gains, migration of engineered revetments, and other long-term impacts. (P5-2)
  - Place a series of permanent surveyed benchmarks inland of the bluffs running the length of Carmel Beach. The surveyed benchmarks shall be described in relation to National Geodetic Vertical Datum (NGVD) and identified through permanent markers, benchmarks, survey position, written description, reference numbers, et cetera to allow measurements to be taken at the same location in order to compare information between years. (P5-3)

- Protect public access, Scenic Road, and the aesthetic character of the coast by maintaining existing seawalls and engineered revetments. When any existing seawalls or revetments need to be replaced or substantially reconstructed, review seawall and revetment design alternatives, as well as other beach management strategies and determine the best balance among objectives for access, aesthetics and protection of coastal resources (biological, geological, and recreational). Protect the natural character and features of the Del Mar and North Dunes by prohibiting the construction of any new shoreline protective structures unless required to protect existing structures in danger of erosion. For the beach and shoreline area, only consider the installation of new protective structures after careful review of alternatives and when required to protect existing structures in danger of erosion. Mitigate the impacts of shoreline protective structures on visual quality and beach dynamics using landscaping, sand management and prudent engineering. (P5-5)
- Encourage the use of existing stairs, trails, and pathways, and discourage off-trail “short cuts” on or over the bluff face. Install landscaping barriers at each “short cut” on the face of the bluffs and immediately restore damaged landscaping. (P5-7)
- Perform monitoring and maintenance of shoreline facilities and protective structures throughout the year including restoration of damaged vegetation, public facilities, infrastructure and access facilities. Restore sand levels annually and replace or repair damaged vegetation as needed. (P5-8)
- Prohibit the placement of loose rock on the beach except where such rock is placed as part of a revetment allowed to protect an existing structure in danger from erosion. When any part of a rock revetment migrates from an engineered structure reposition it to maintain engineering stability or remove it from the beach. (P5-13)
- Protect the flat area/tidal zone of the beach for recreational use and, to the extent feasible, avoid shoreline protective structures that reduce the amount of beach area available for public recreation. (P5-14)
- Modification of existing shoreline structures shall adhere to the same standards for establishing need, obtaining permits, as well as landscaping, visual impacts, drainage and design as new seawall projects. (P5-16)

- Explore alternatives to maintain the sand elevation at the foot of Ocean Avenue to ensure public access and to cover with sand all exposed engineered revetments along the length of Carmel Beach. (O5-2)
  - Each spring inspect the volume of sand at locations along the backshore and determine if it is appropriate and timely to re-establish the sand to a higher elevation. The use of heavy equipment is authorized for redistributing beach sand to rebuild the dunes and cover revetments. Minimize beach encroachment, impacts on public access and protect public safety during this process. (P5-18)
  - As described in the Shoreline Management Plan, sand and bluff profiles shall be surveyed in 2003 and again in 2005 to establish a baseline. Thereafter, a set of sand profiles shall be taken at five-year intervals (beginning in 2010) to establish an ongoing record of shoreline trends (i.e., volume and natural rate of accretion and/or loss of beach sand) on Carmel's beaches and bluffs. For each set of profiles measurements shall be taken (1) at mid-Winter when sand is at its lowest, (2) at Spring, prior to sand redistribution activities, (3) at early Summer, immediately following sand redistribution and (4) in the early Fall, before sand begins its retreat offshore. (P5-19)
  - After each five-year period of monitoring beach sand elevations (beginning in 2010 after data from 2003, 2005 and 2010 are available), review all available data and make preliminary determinations regarding the effects of seawall structures and sand redistribution activities. If the results of the City's beach monitoring program indicate that the beach has been losing sand over time investigate options for beach nourishment using offshore deposits or other sources that match Carmel Beach sand to replenish the beach and protect its width. The program shall at a minimum: 1) identify potential sources of beach quality sand; 2) include testing and screening for determining the acceptable quality and quantity of beach material; 3) identify placement locations; 4) establish placement methods and any restrictions on work timing or methods. (P5-20)
  - Maintain Carmel Beach as a public recreational resource. If the results of the City's beach monitoring program indicate that the beach has been losing sand over time, develop, implement, and then further monitor and evaluate a beach nourishment program to maintain or increase the available volume of sand. (P5-21)

Maintain the existing shoreline maintenance and emergency reserve account. Build fund balances over time, to the extent feasible, to handle future emergency repairs at the beach. (P5-36)

- Consider beach-related projects that address public safety and access as high-priority projects when preparing budgets. (P5-37)
- Keep the beach free of refuse. (O5-6)
  - Provide sufficient trash containers at the beach. Regularly patrol the beach and Del Mar area to remove all litter and excess charcoal from the sand, bluffs and parking lot. (P5-38)
  - Encourage volunteer programs for beach and bluff clean-up activities. (P5-39)

#### Shoreline Armoring Maintenance and Monitoring.

- (1) **Monitoring.** The Permittee shall ensure that the condition and performance of existing seawalls and revetments are regularly monitored by a licensed civil engineer with experience I coastal structures and processes. Such monitoring evaluation shall at a minimum address whether any significant weathering or damage has occurred that would adversely impact its future performance, and identify any structural damage requiring repair to maintain the as-built revetment profile.

At a minimum, annual monitoring reports shall be prepared by a licensed civil engineer with experience in coastal structures and processes and shall contain recommendations, if any, for necessary maintenance, repair, changes or modifications to each existing revetment or the bedrock benches adjacent to and below it. All monitoring reports shall include photos of the structures and surrounding areas taken during low sand elevations in the winter months.

- (2) **Maintenance Activities.** It is the Permittee's responsibility to maintain any shoreline armoring structures and all irrigation, drainage, and vegetation in a structurally sound manner and its approved state until such a time that the seawalls and/or revetments are removed or replaced. At a minimum, the Permittee shall:

- a. **Rock Retrieval.** Any armor rocks that move seaward of the as-build seawall and/or revetments shall be immediately retrieved and either (1) restacked within the approved rock slope profile inland of the seawall; or (2) removed of the beach to a suitable disposal location. Any existing rock retrieved in this manner shall be recovered by excavation equipment positioned landward of the waterline (i.e. excavator equipment with mechanical extension arms).
- b. **Debris Removal.** The Permittee shall remove all materials and/or debris that may fall from the bluff top area inland of the seawall onto the beach below.
- c. **Landscaping and Drainage Maintenance.** The Permittee shall maintain all upper bluff drainage, vegetation, and/or irrigation elements above seawalls and/or revetments.