Carmel's Shoreline

Lessons from the Past
Considerations for the Future

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Considerations for the Future

Presented to the Carmel Climate Committee
by
David Shonman and Greg D'Ambrosio

November 19, 2020

Carmel's Shoreline
Storm Damage

Nov. 1982 – Mar. 1983

Carmel Beach Nov, 1982 - Mar, 1983

Storms batter Carmel coast

f Mother Nature wreaked havoc along Carmel tides in recent memory. Despite the fury of
storm and continual rains last weekend,

Storm Damage – Nov. 1982 - Mar. 1983

8th Ave.

Storm Damage – Nov. 1983 - Mar. 1983

Between 8th & 9th Ave.s

Storm Damage – Nov. 1982 - Mar. 1983

Stormwater Outfall – between 9th & 10th

Storm Damage – Nov. 1982 - Mar. 1983

Stormwater Outfall – between 9th & 10th

Edge of bluff
BEFORE storms

Storm Damage – Nov. 1982 - Mar. 1983

Bluff erosion between 9th & 10th Ave.s

Storm Damage – Nov. 1982 - Mar. 1983

Exposed Cypress roots between 9th & 10th Ave.s

Storm Damage – Nov. 1982 - Mar. 1983

Northside of 10th Ave. wall

Storm Damage – Nov. 1983 - Mar. 1983

10th Ave. (South) stairs

Carmel Beach Nov, 1982 - Mar, 1983

Carmel beach is almost demolished in worst storms in recent memory

By MICHAEL GARDNER

CARMEL ASSISTANT Police Chief Bob Fischer jokingly said he plans to order an "APB" (All Points Bulletin) for Carmel Beach.

Fischer's joke is really not too far from the truth as Carmel city crews begin to clean-up after what many claim to be the biggest storm in decades vented a mighty fury across the state.

In its wake, the storm has all but demolished the world famous two-mile stretch of Carmel white sand once known as the most beautiful beach in California.

The torrential rains and gusty winds also forced the evacuation of Big Sur area residents, brought down huge trees, caused a cable television outage that ruined the final episode of the popular television series *M.A.S.H* for many Carmelites, and carried with it tales of life-saving dogs and humans. *(See related stories throughout this issue.)*

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The city of Carmel suffered its worst damage from the storm at Carmel Beach. High tides combined with falling cypress trees devastated the banks and threatened Scenic Road.

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Storm Damage – Nov. 1982 - Mar. 1983

Stormwater Outfall – south of 10th Ave. wall

Storm Damage – Nov. 1982 - Mar. 1983

Remnants of ramps between 10th & 11th Ave.

Storm Damage – Nov. 1982 - Mar. 1983

12th Ave. stairs

Storm Damage – Nov. 1983 - Mar. 1983

Santa Lucia Ave. stairs

Carmel Beach Nov, 1982 - Mar, 1983

Carmel beach recovery to be slow

By MICHAEL GARDNER

THE WOUNDS Carmel Beach suffered in the recent series of savage rainstorms may be slow to heal.

The storms — including another which struck last weekend — have practically demolished what was once known as one of the most beautiful two mile stretches of beach in the world.

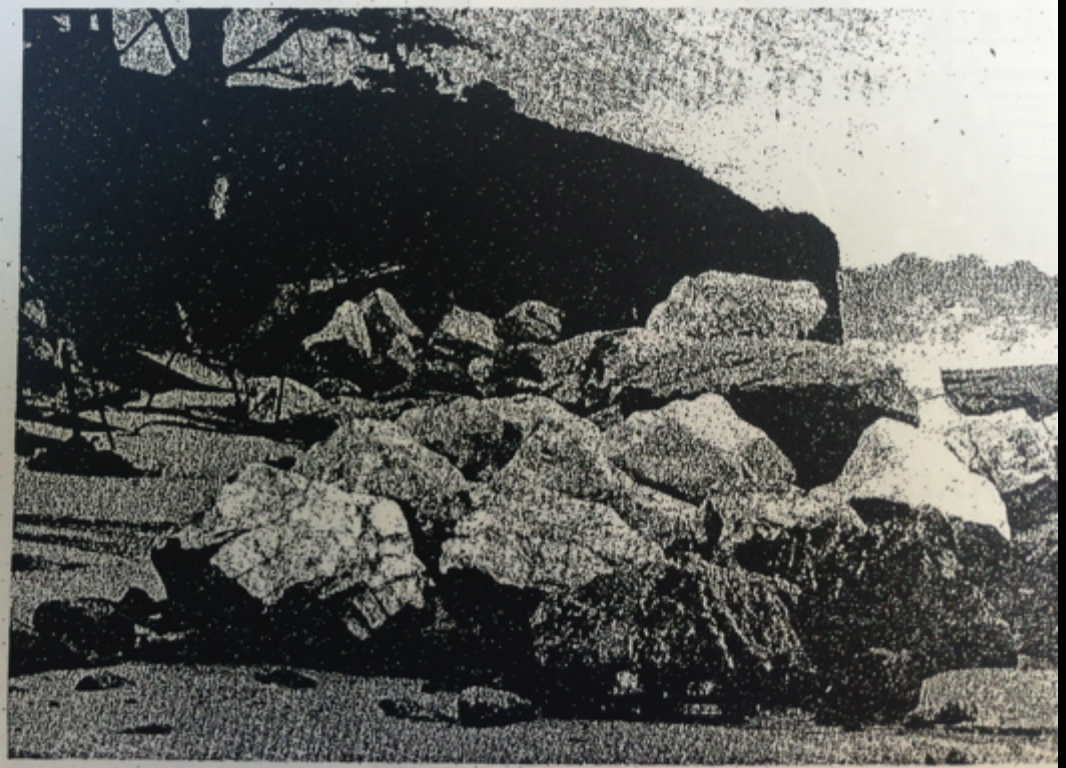
Erosion has turned sloping banks into 20 foot cliffs, at least 16 trees have fallen, debris is strewn everywhere and most of the sand has been washed out with the tide.

Because long range forecasts predict even more rain for the area, Carmel city officials plan to do very little repair work at the beach until the storm season is over.

"Right now we're doing nothing and we probably won't do much until the stormy season passes and we get the federal monitors in there," City Administrator Douglas Schmitz told the *Pine Cone/Outlook* March 10. "I don't want to do anything until after the storms and the federal monitors come down."

'I think we should pull everything together and do a comprehensive program, instead of looking at walks there, beach banks here and sea walls there,' Schmitz said.

Monitors from the Federal Emergency Management Agency are scheduled to inspect



ROCKS PILED up along the beach after a ... in a late January's storm. A second and more ... the first had left off and there are only

The Winter of 1982-83

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The 1982-83 winter storm season had all the ingredients reflecting what it will likely look and feel like as our future's "new normal."

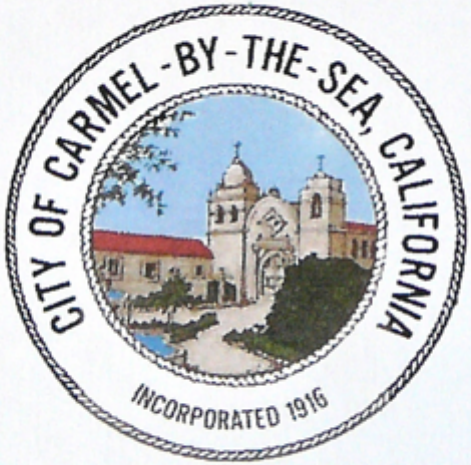
The Winter of 1982-83

by

Greg D’Ambrosio

City of Carmel-by-the-Sea

SHORELINE MANAGEMENT PLAN



"… a vast and powerful ocean whose sea level appears to be on the rise, and intense winter storms generated by weather patterns that seem to be less predictable than in the past."

Carmel Shoreline Management Plan (2003)
p. 1-1

The first step:

To better understand the basic elements of the shoreline

Carmel's Shoreline
Basic Elements

The Shoreline is not just a place, it's a process

Carmel's Shoreline
Basic Elements

The Shoreline is not just a place, it's a process

- It changes:

Carmel's Shoreline
Basic Elements

The Shoreline is not just a place, it's a process

- It changes:
  - hourly

Carmel's Shoreline
Basic Elements

The Shoreline is not just a place, it's a process

- It changes:
  - hourly
  - daily

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Basic Elements

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- It changes:
  - hourly
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Carmel's Shoreline
Basic Elements

The Shoreline is not just a place, it's a process

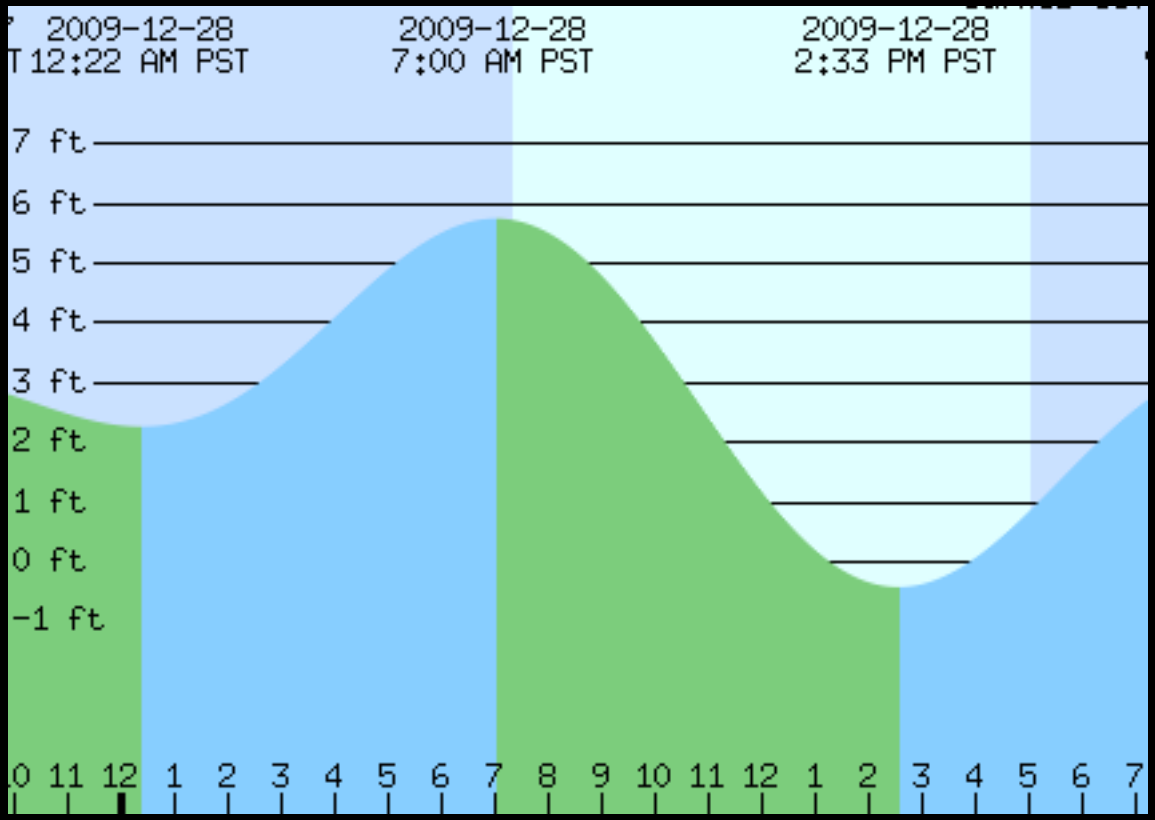
- It changes:
  - hourly
  - daily
  - monthly
  - yearly

Carmel's Shoreline
Basic Elements

The Shoreline is affected by:

- tides

Carmel Cove – Dec 28, 2009: High Tide +5.73 ft



Carmel's Shoreline
Basic Elements

The Shoreline is affected by:

- tides
- waves

Carmel's Shoreline
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The Shoreline is affected by:

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- storms

Carmel Beach Nov, 1982 - Mar, 1983

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Basic Elements

The Shoreline is affected by:

- tides
- waves
- storms
- Human actions


Bluff Cut

Carmel's Shoreline
Basic Elements

The Shoreline is affected by:

- tides
- waves
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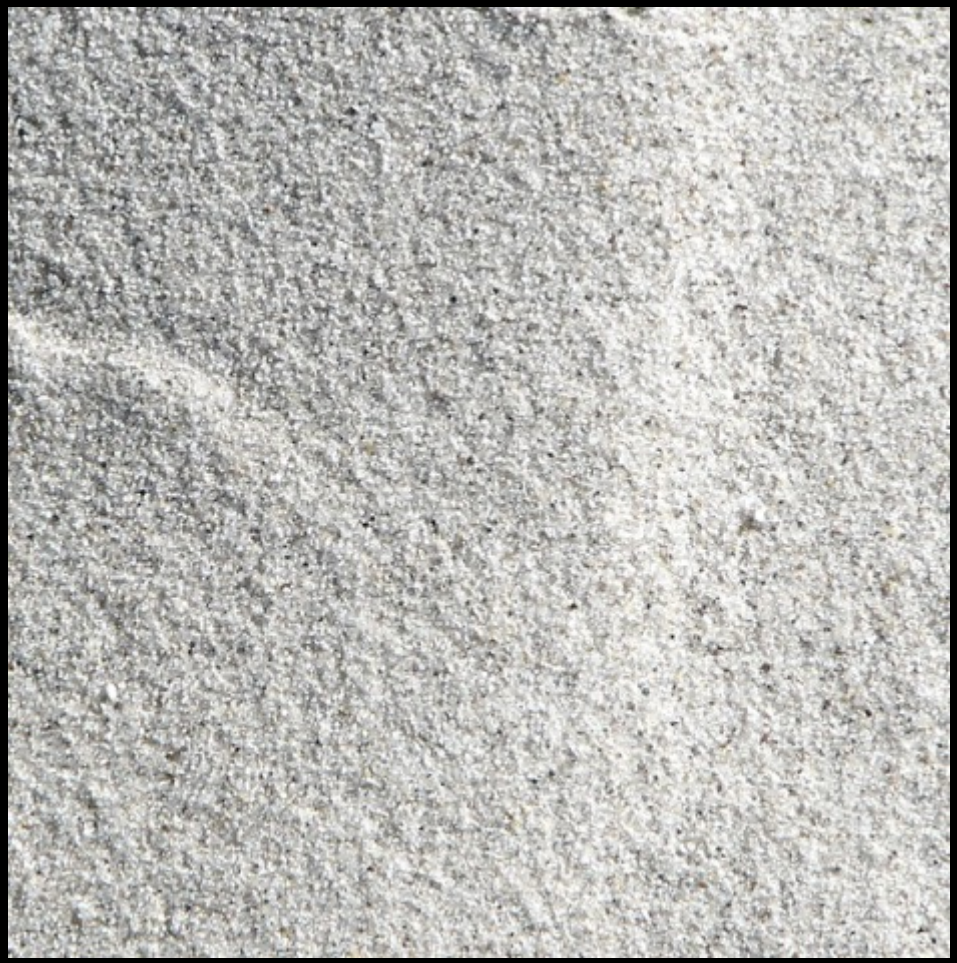
Carmel's Shoreline
Basic Elements

Sand



#sand61324

Carmel Beach – Sand Level – Spring
12th Ave. Cove

Carmel Beach – Sand Level – Spring
12th Ave. Cove

Carmel Beach – Sand Level – Winter
12th Ave. Cove

Carmel Beach – Sand Level – Winter
12th Ave. Cove

Carmel Beach – Sand Level – Winter
North of 12th Ave. Point

Carmel Beach – Sand Level – Winter
Santa Lucia Ave. Point

Carmel Beach – Sand Level – Winter
9th Ave. stairs

Carmel Beach – Sand Level - May

13th Ave. Cove

Carmel Beach – Sand Level - Dec

13th Ave. Cove

Carmel Beach – Sand Level - Feb

13th Ave. Cove

Carmel Beach – Sand Level - May

13th Ave. Cove

Carmel Beach – Beach Width

Carmel Beach – Beach Width

Ocean Ave.

Carmel Beach – Beach Width

Carmel Beach – Beach Width

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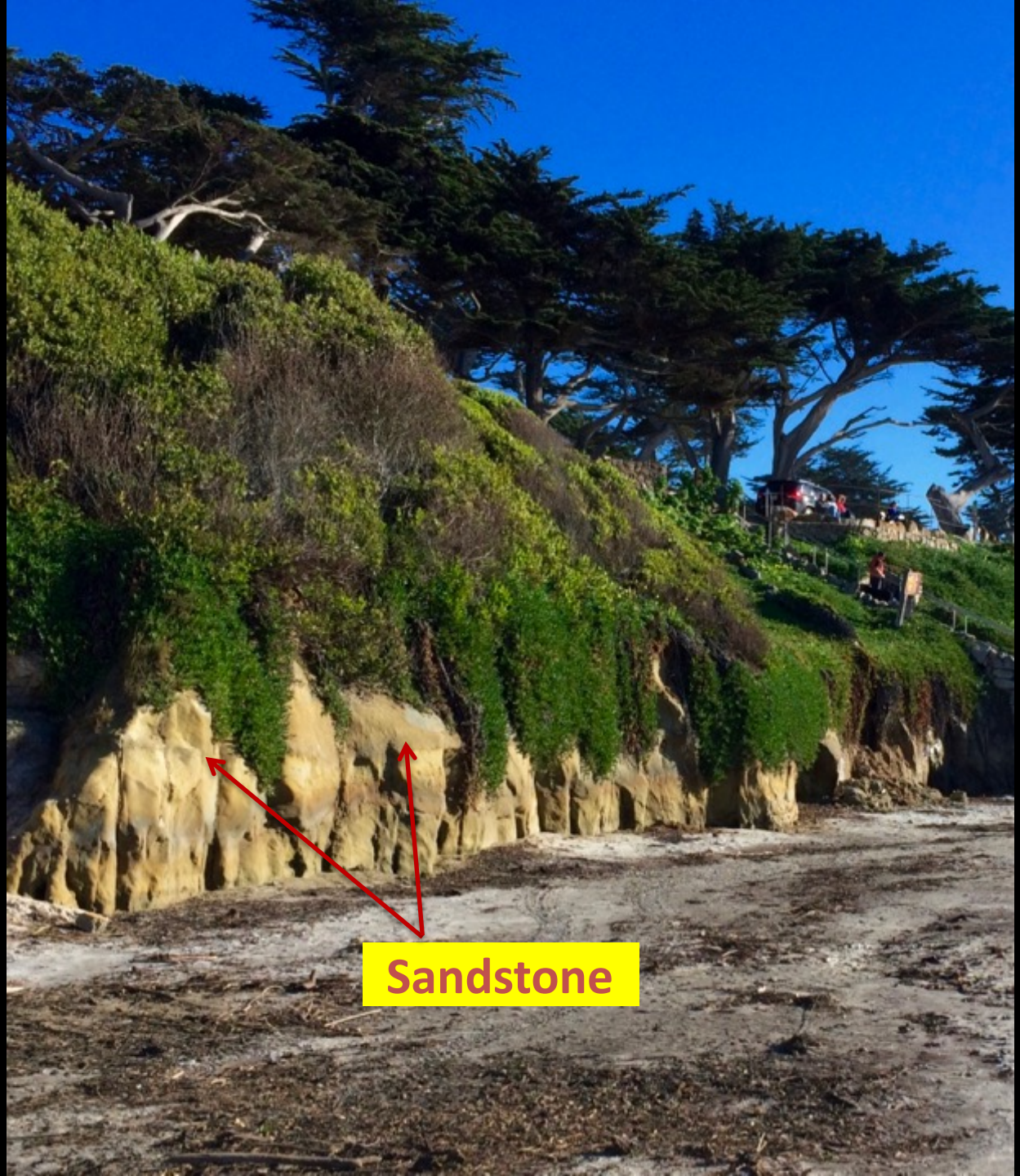
Carmel Beach – Beach Width

Carmel Beach – Beach Width

Carmel's Shoreline
Basic Elements

The Shoreline:

Dunes and Bluffs


Sandstone

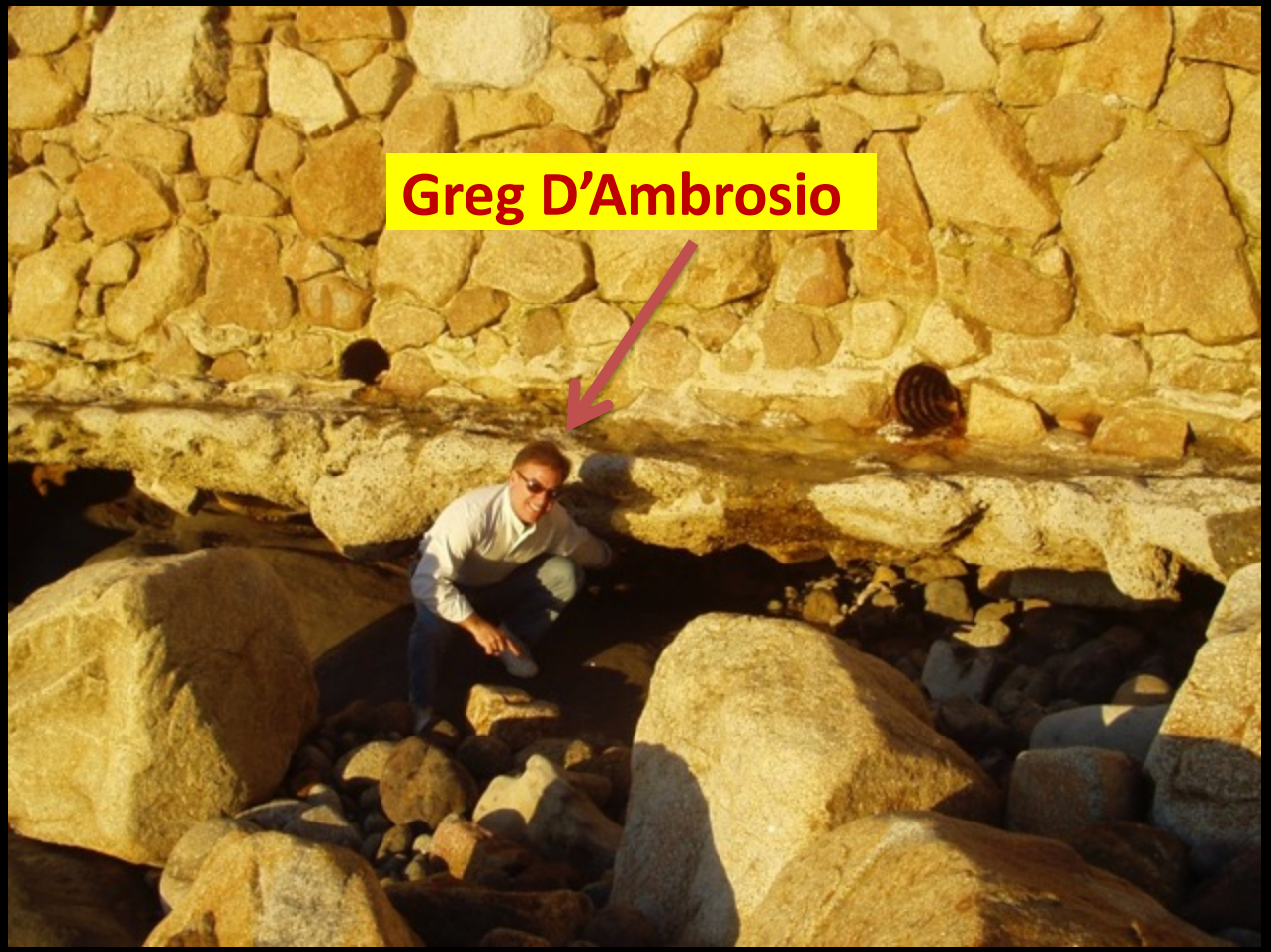
12th Ave. Point & Retaining Wall


Undercut


Differential Erosion


Sandstone level – 1986
Nov 2015.


Undercut


Greg D’Ambrosio


Undercut


Undercut


Stormwater
Outfall


Stormwater
Outfall

Stormwater Outfall - 4th Ave.

Stormwater Outfall - 4th Ave.

Stormwater Outfall - 4th Ave.

Stormwater Outfall - 4th Ave.

Stormwater Outfall - 12th Ave. cove

Stormwater Outfall - 12th Ave. cove

Stormwater Outfall - 12th Ave. cove

Stormwater Outfall - 12th Ave. cove


Bluff Cut


Bluff Cut

4th Ave.

9th Ave.

10th Ave. (North)

10th Ave. (North)

10th Ave. (North)

10th Ave. (North)

10th Ave. (North)

10th Ave. (South)

10th Ave. (South)

Martin Way

Martin Way

12th Ave. cove

12th Ave. cove

12th Ave. cove

Martin Way

Martin Way

Martin Way

Carmel's Shoreline

Repairs & Improvements

1983 – 1988

Revetments

Bottom of Ocean Ave.

Carmel's Shoreline
Repairs & Improvements

Nov. 1982 – Mar. 1983

Engineered Revetments


Reliance


CATERPILLAR

Carmel's Shoreline
Repairs & Improvements

1983 – 1988

Sand Ramps


Sand Ramp #1


Sand Ramp #1
Sand Ramp #2

Sand Ramp #1

Sand Ramp #2

Carmel Beach – Beach Width

Carmel Beach – Beach Width

Carmel's Shoreline
Repairs & Improvements

1983 – 1988

Shoreline Pathway

"Landscape may be icing on the cake, but it's not just for show"

- Greg D'Ambrosio

Carmel's Shoreline
Repairs & Improvements

1983 – 1988

Stairway Design


WARNING

Beach Stairway - 12th Ave. cove

Beach Stairway - 12th Ave. cove

Standard Design

Beach Stairway - 10th Ave. (North)

Beach Stairway - 10th Ave. (North)

Break-away Design

Carmel's Shoreline
Lessons Learned

Protection of the shoreline, and the residents & visitors who use it, requires the cooperative efforts of different City departments:

Carmel's Shoreline
Lessons Learned

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- Public Works

Carmel's Shoreline
Lessons Learned

Protection of the shoreline, and the residents & visitors who use it, requires the cooperative efforts of different City departments:

- Public Works
  - Forestry, Parks & Beaches
  - Streets Maintenance
  - Environmental Compliance

Carmel's Shoreline
Lessons Learned

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Carmel's Shoreline
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- Community Planning & Building

Carmel's Shoreline
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- Public Safety

Carmel's Shoreline
Lessons Learned

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- Public Safety
- Financial Services

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Carmel's Shoreline
Lessons Learned

- Utilize advice from coastal geotechnical specialists (i.e. coastal engineering-geologists)

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Carmel's Shoreline
Lessons Learned

- Develop and conduct protocols for

Carmel's Shoreline
Lessons Learned

- Develop and conduct protocols for shoreline monitoring

Carmel's Shoreline
Lessons Learned

- Develop and conduct protocols for shoreline monitoring, maintenance

Carmel's Shoreline
Lessons Learned

- Develop and conduct protocols for shoreline monitoring, maintenance, and repair

Carmel's Shoreline
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Carmel's Shoreline
Lessons Learned

- Develop and conduct protocols for shoreline monitoring, maintenance, and repair
  - Be sure to monitor beach, dunes, bluffs, stairways, outfalls, shoreline trees, & Pathway after storms to note damage & public safety hazards

Carmel's Shoreline
Lessons Learned

- Develop and conduct protocols for shoreline monitoring, maintenance, and repair
- Ensure that these protocols are an integral part of staff training

Carmel's Shoreline
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- Ensure that these protocols are an integral part of staff training, permitting

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- Ensure that these protocols are an integral part of staff training, permitting, & funding
  - Establish Restricted Reserve Fund for Emergency Response Programs

Carmel's Shoreline
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  - Establish Restricted Reserve Fund for Emergency Response Programs

Carmel's Shoreline
Lessons Learned

- Pay special attention to conditions that are only visible when tides and/or sand levels are low

Carmel's Shoreline
Lessons Learned

- Repair damaged footings and/or boundaries between walls and surrounding rock

Carmel's Shoreline
Recommendations

- Re-stack migrating revetment rocks

Carmel's Shoreline
Recommendations

- Clear large driftlogs from the beach

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  - When propelled by storm waves, driftlogs can act like battering rams & damage shoreline structures

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- When possible, find appropriate uses for large driftlogs at shoreline sites not subject to wave run-up

Carmel's Shoreline
Recommendations

- Clear large driftlogs from the beach
  - When propelled by storm waves, driftlogs can act like battering rams and damage shoreline structures
- When possible, find appropriate uses for large drift at shoreline sites not subject to wave run-up

Carmel's Shoreline
Recommendations

- Conduct annual Sand Redistribution

Carmel's Shoreline
Considerations

Shoreline Stairways

Carmel's Shoreline
Considerations

Shoreline Stairways

- Provided by the City for public access to and from the beach 24 hours a day

Carmel's Shoreline
Considerations

Shoreline Stairways

- Provided by the City for public access to and from the beach 24 hours a day
- Exposed to changing conditions:
  - Direct wave action
  - Ponded water/lateral flow
  - Changing sand level

Carmel's Shoreline
Considerations

Shoreline Stairways

- Must be monitored to assure public safety
- Must be closed if users will be exposed to unsafe conditions
- Should be re-opened when safe conditions return

Carmel's Shoreline
Considerations

- Private shoreline structures

Carmel's Shoreline
Considerations

- Private shoreline structures
  - Potential Liabilities

Carmel's Shoreline
Considerations

- Private shoreline structures
  - Potential Liabilities
    - Drainage outlets

Carmel's Shoreline
Considerations

- Private structures: Potential Liabilities
  - Shoreline armoring

Carmel's Shoreline