Carmel’s Shoreline
Lessons from the Past
Considerations for the Future
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Presented to the Carmel Climate Committee
by
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November 19, 2020
Lessons from the Past
Considerations for the Future
Carmel's Shoreline

Storm Damage

Nov. 1982 – Mar. 1983
Storms batter Carmel coast

Mother Nature wreaked havoc along Carmel coast of weeks. The brunt of the damage was from tides in recent memory. Despite the fury of storm and continual rains last weekend, the area...
Storm Damage – Nov. 1982 - Mar. 1983

8th Ave.
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 9\textsuperscript{th} & 10\textsuperscript{th}

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
10th Ave. (South) stairs
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.)

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.

What were once rolling slopes have been eroded away to cliffs with sheer drops of up to 40 feet. The entire Scenic Road beachfront has been roped off because of the danger.

“It certainly is the worst that I have ever seen. I haven’t seen such devastation to Carmel Beach as long as I’ve been here,” said Assistant Police Chief Bob Fischer, who has served on the force for 30 years.

“I was thinking about putting a ‘lost beach’ poster,” he said. “It’s a tear to see.”

“I’ve never seen it quite as bad as it’s been,” said Public Works Super William Askew.

The stability of Scenic Road was threatened if the storm had no somewhat over the weekend.

The rain began to fall again last night, but stopped through Monday.

“Scenic Road is in no danger at the moment,” Askew said.

If it continues to rain, then we have some problems,” he said.

City Forester Gregory D’Ambrosio shook his head when asked about Carmel Beach.

“I have no idea what’s going to the beach. I can’t even fathom going to do,” D’Ambrosio said.

The city has applied for a federal services grant of $195,000 to help with the damage caused by a late December storm.

However, the latest storm may damage but two beach access stairways at...
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
Santa Lucia Ave. stairs
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."

Monitors from the Federal Emergency Management Agency are scheduled to inspect...
The Winter of 1982-83
• The winter of 1982-83 was the perfect storm for the entire season.
• The highest cumulative rainfall in 93 years - Carmel's rain gauge tallied 41.35 inches
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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

City of Carmel-by-the-Sea, California
INCORPORATED 1916
“... 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.”

The first step:

To better understand the basic elements of the shoreline
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:
   • Hourly
   • Monthly
   • Annually
Carmel’s Shoreline
Basic Elements

The Shoreline is not just a place, it’s a process
• It changes:
  • hourly
• monthly
• annually
The Shoreline is not just a place, it’s a process

- It changes:
  - hourly
  - daily
Carmel’s Shoreline
Basic Elements

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

- It changes:
  - hourly
  - daily
  - monthly
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
Basic Elements

The Shoreline is affected by:
• tides
• waves
• storms
Carmel beach is almost demolished in worst storms in recent memory

By MICHAEL GARDNER

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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.

The city of Carmel suffered its worst damage from the storm at Carmel Beaches. High tides combined with falling cypress trees devastated the banks and threatened Scenic Road. What were once rolling slopes have been eaten away to cliffs with sheer drops of up to 40 feet. The entire Scenic Road beachfront has been roped off because of the danger.

“It certainly is the worst that I have ever seen. I haven’t seen such devastation to Carmel Beach as long as I’ve been here,” said Assistant Police Chief Bob Fischer, who has served on the force for 30 years.

“I was thinking about putting a lost beach,” he said. “It’s a terr to see.

“I’ve never seen it quite as bad as it (the storms) never ever let up. It just kept us,” said Public Works Supervisor William Askew.

The stability of Scenic Road was threatened if the storm had no somewhat over the weekend of March and April. The rain began to fall again last night, but stopped through Monday. ‘Scenic Road is in no danger at. But if it continues to rain, then we have some problems,’ Askew said.

Askew has cast a wary eye to the horizon at March, and April.

“April is a wet month too. We just play it by ear and regroup and take it then. If it (the weather) has treated rough so far,” he said.

City Forester Gregory D’Ambrosio said Monday the city has applied for a federal services grant of $195,000 to repair the damage caused by the latest December storms. However, the latest storm damaged two access stairways at
Carmel’s Shoreline
Basic Elements

The Shoreline is affected by:
• tides
• waves
• storms
• Human actions
Carmel’s Shoreline
Basic Elements

The Shoreline is affected by:
• tides
• waves
• storms
• Human actions
Carmel’s Shoreline
Basic Elements

Sand
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
12\textsuperscript{th} Ave. Cove
Carmel Beach – Sand Level – Winter North of 12th Ave. Point
Carmel Beach – Sand Level – Winter
Santa Lucia Ave. Point

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

Bedrock
Carmel Beach – Sand Level - May 13th Ave. Cove
Carmel Beach – Sand Level - Dec 13\textsuperscript{th} 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

Santa Lucia Ave.
Carmel Beach – Beach Width
Carmel Beach – Beach Width

Tide: + 5.1 ft
Carmel Beach – Beach Width

Tide: + 5.1 ft
Carmel Beach – Beach Width

Tide: + 5.1 ft
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
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

Edge of bluff in 1983/84
Stormwater Outfall - 12th Ave. cove

Nov, 2015
Stormwater Outfall - 12th Ave. cove

Outfall Pit

Nov, 2015
Bluff Cut
4th Ave.
9th Ave.
10th Ave. (North)
10th Ave. (North)

Retaining Wall
10th Ave. (North)

Retaining Wall
10th Ave. (North)
10th Ave. (North)
10th Ave. (South)
10th Ave. (South)
Martin Way

Lateral Flow
12th Ave. cove
12th Ave. cove

Broken steps & Handrail
12th Ave. cove
Martin Way

Kelp
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
Carmel’s Shoreline Repairs & Improvements

1983 – 1988

Sand Ramps
Carmel Beach – Beach Width

Bedrock
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
Beach Stairway - 12th Ave. cove
Beach Stairway - 12th Ave. cove
Standard Design
Beach Stairway - 10th Ave. (North)
Beach Stairway - 10\textsuperscript{th} 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

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

• Public Works
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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• 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
• Community Planning & Building
Carmel’s Shoreline Lessons Learned

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

- Public Works
- Community Planning & Building
- Public Safety
- Financial Services
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
- Community Planning & Building
- Public Safety
- Financial Services
Carmel’s Shoreline
Lessons Learned

- Utilize advice from coastal geotechnical specialists (i.e. coastal engineering-geologists)
Carmel’s Shoreline
Lessons Learned

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

• Develop and conduct protocols for shoreline monitoring, maintenance, and repair
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 Lessons Learned

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

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

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Carmel’s Shoreline
Recommendations

- Clear large driftlogs from the beach
  - When propelled by storm waves, driftlogs can act like battering rams & damage shoreline structures
Carmel’s Shoreline Recommendations

- Clear large driftlogs from the beach
  - When propelled by storm waves, driftlogs can act like battering rams & damage shoreline structures
- 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