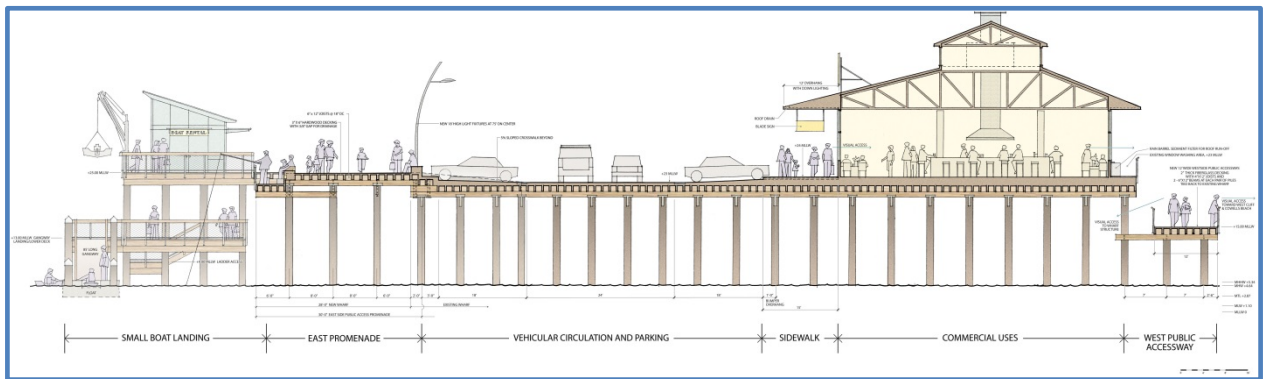


# Santa Cruz Wharf Master Plan and Engineering Report Briefing Paper

Prepared by:

The City of Santa Cruz  
September 2014



## Santa Cruz Wharf Master Plan and Engineering Report

Prepared by:

**ROMA Design Group  
and  
Moffatt & Nichol**

*Funded by a grant from the  
U.S. Department of Commerce  
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and administered by  
the Seattle Regional Office*



# EDA





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*“To lead the federal economic development agenda by promoting innovation and competitiveness, preparing American regions for growth and success in the worldwide economy.”*

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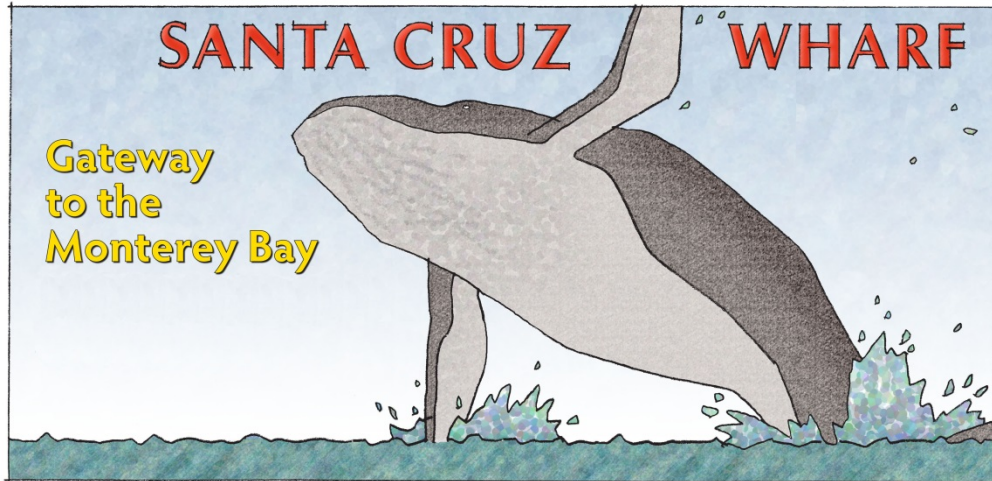
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# **Santa Cruz Wharf Master Plan and Engineering Report Background**

In March 2012 the US Department of Commerce Economic Development Administration issued a Notice of Funding Available under the 2012 Disaster Relief Opportunity Appropriation Act for communities experiencing economic impacts from federally declared natural disasters.

The impacts resulting from the 2011 tsunami qualified Santa Cruz as an applicant, and in October 2012 the City was awarded an \$850,000 grant to develop the Santa Cruz Wharf Master Plan and Engineering Report. The City provided a local match in the amount of \$170,000 from its Parks and Recreation Facilities Tax Fund bringing the total project budget to \$1.02 Million Dollars.

ROMA Design Group was selected to lead the Wharf Master Plan and Engineering Report effort. Based in San Francisco, ROMA has extensive experience in preparing planning documents and design guidelines for commercial, retail, recreational, and other uses of marine oriented tourist facilities in waterfront settings.

Moffatt & Nichol, engineering subconsultant to ROMA and nationally recognized expert in the analysis and design of timber-supported marine structures, conducted the engineering evaluation of the Wharf.

## **The Wharf Master Plan focuses on:**

- The identification of economic development opportunities;
- The establishment of design and development standards for existing and new buildings;
- The re-visioning of public spaces and enhancement of recreational use and public access;
- Integration of educational and scientific resources and assets;
- Evaluation and recommendations related to public safety;
- The identification of studies and permits necessary to implement the recommendations and best practices resultant from the Wharf Master Plan.

## **The Engineering Report encompasses:**

- An inspection and structural evaluation of the Wharf's pilings, support structures, and decking;
- An evaluation of existing boat landings, roadways, pedestrian walkways, and parking areas;
- An analysis of sewer, refuse handling, lighting, and fire suppression systems;
- The identification and evaluation of measures designed to reduce environmental impacts related to climate change and severe seismic and weather events;
- An evaluation of a new boat landing capable of handling research and passenger vessels;
- The preparation of plans and specifications for the correction of structural deficiencies and recommended improvements to the Wharf's infrastructure.

# **Santa Cruz Wharf Master Plan and Engineering Report Concepts, Proposals, and Recommendations**

The Santa Cruz Wharf will celebrate its 100 year anniversary on October 4, 2014. Capital improvements proposed by the Santa Cruz Wharf Master Plan are intended to strengthen the Wharf's relationship to Monterey Bay and the scenic and environmental qualities it offers. This strategy will enhance the Wharf as a recreational resource and the opportunity to engage in a variety of coastal experiences, thus contributing to the quality of life in the city. In addition, it will broaden the appeal of the Wharf and off-season visitation and will create a basis for updating the image and identity of the Wharf, create new branding opportunities and, most importantly, become one of the most effective ways to improve the economic vitality of the commercial uses and the viability of the Wharf as a real estate asset for the City.

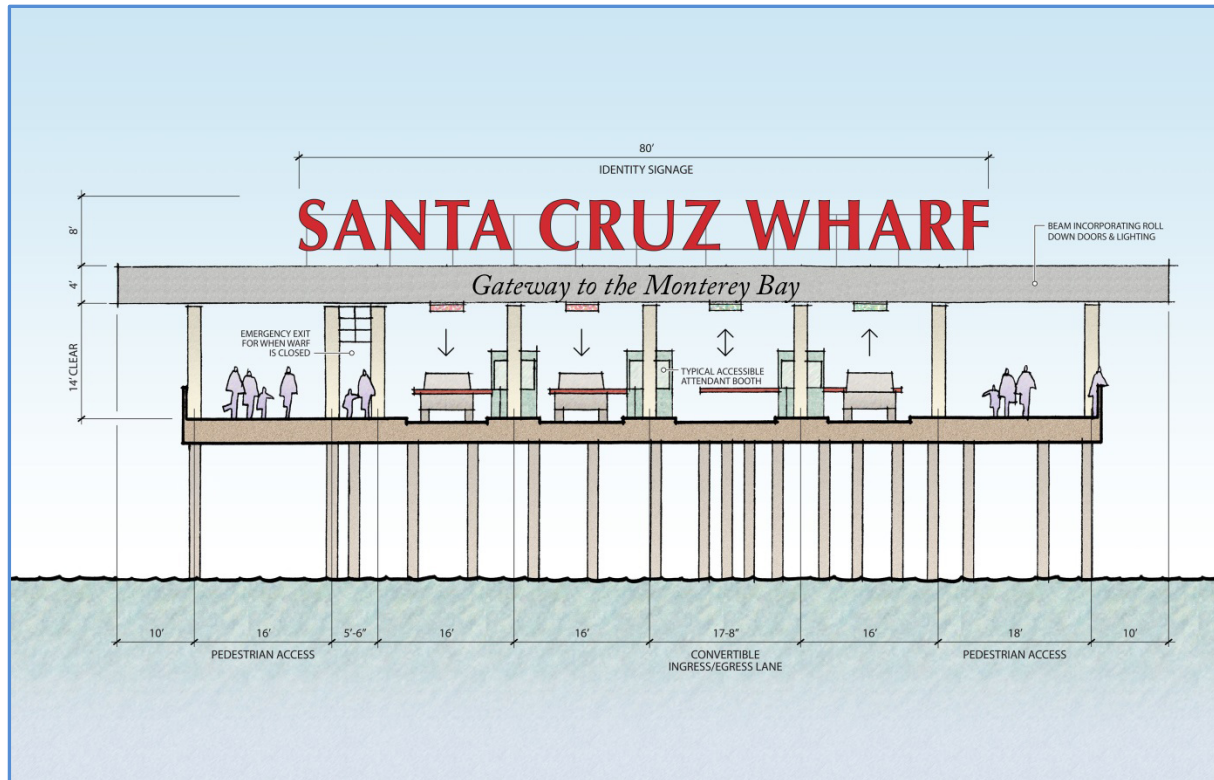
As of the date of this Briefing Paper, the Santa Cruz Wharf Master Plan and Engineering Report is in the administrative draft phase. Slated for presentation to the Santa Cruz City Council in October 2014, the following forward-thinking concepts and proposals from the Wharf Master Plan and the findings and recommendations of the Engineering Report are intended to help usher the Wharf into its second century of existence.



*Constructed on a base of over 4,400 Douglas-fir piles, the Santa Cruz Wharf is the longest timber-supported structure in the United States. The Wharf Master Plan proposes a 2.5 acre expansion for public access, recreation, and engagement with the Monterey Bay National Marine Sanctuary.*

## The Gateway Entrance

Create a new and more attractive gateway to the Wharf to be more visible, create a more positive transition from the land to the Monterey Bay, and provide a better sense of arrival.



*Restructuring and relocation of the entrance gates creates a sense of arrival and identity for visitors to the Wharf and Beach Area.*

- Provides a large gateway sign that can be viewed from the Beach Area, the Boardwalk, and from the Pacific Avenue approach to the Wharf.
- Designed to accommodate two entrances and two exit gates, one entrance gate can be configured to an exit lane during summer evenings or other peak periods when exiting volume exceed arrivals.
- The center-most lane, which aligns with the roadway on either side of the gates, is wide enough to accommodate emergency vehicle access when needed.
- The columns between gates provide support for overhead lighting, signage, and storage for roll up gates for security purposes when the Wharf closes in the early morning hours.
- Pay-on-foot stations strategically located on the Wharf shorten transaction times at the exit gates, reducing traffic back-ups on high volume days.

## The Welcome Center

Construct a Welcome Center at the beginning of the line of buildings on the west side of the Wharf, facing the shore and graciously greeting visitors to the commercial and recreational experiences that follow.



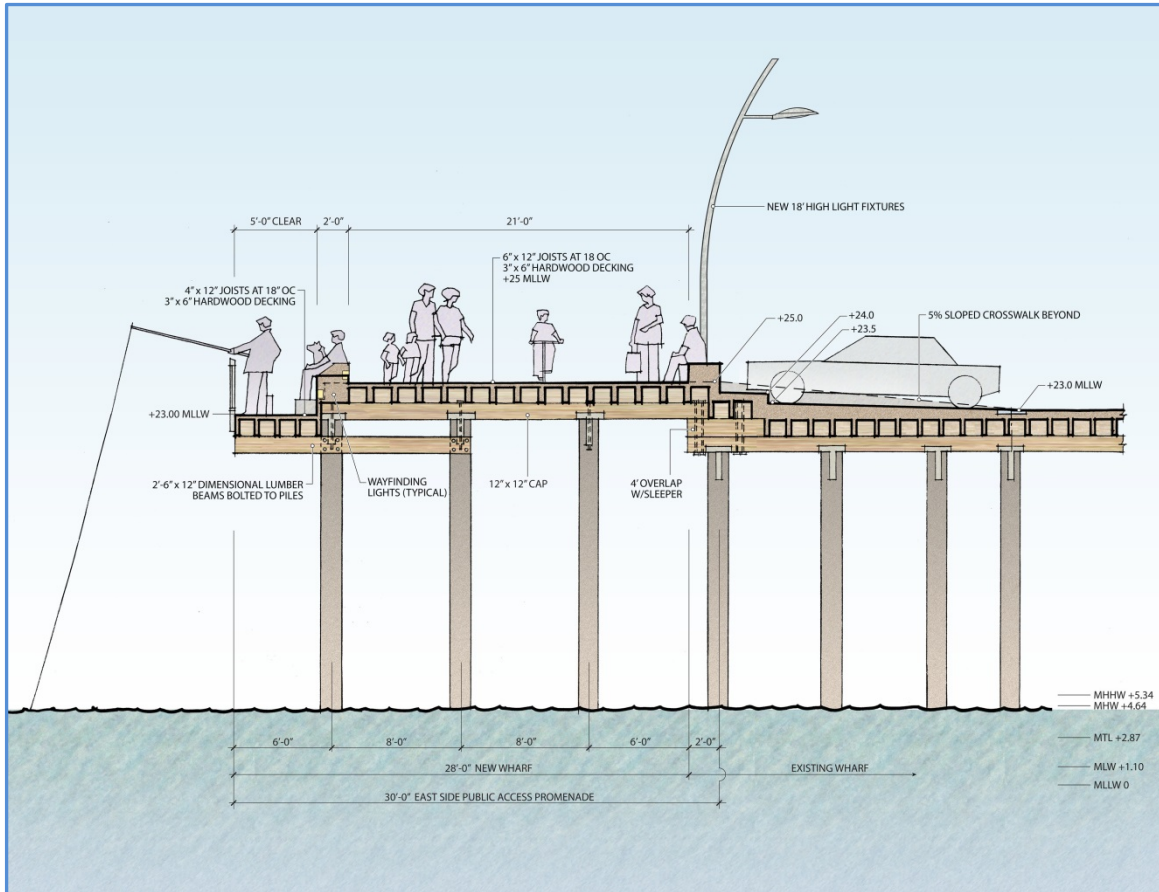
*The Welcome Center is conceived as a simple pierhead building reminiscent of maritime structures built upon the Wharf in earlier times.*

- Opens to an attractive public space where visitors can gather prior to venturing further out onto the Wharf.
- The 3,000 square feet building will feature information on the Wharf and its businesses.
- May contain a non-profit museum style gift shop with selected items specific to the Monterey Bay National Marine Sanctuary.
- Can accommodate the placement of interactive displays and exhibits related to science, education, and the Monterey Bay.
- A non-profit aquatic club open to the public could provide showers and changing rooms as well as ADA accessible access for swimmers to the protected waters off Cowell Beach.



## The East Promenade

Construct a 24' wide promenade along the Wharf's eastern edge to create uninterrupted opportunities for recreation, to reduce pedestrian/vehicular conflicts, and to provide for an alternate emergency access route.

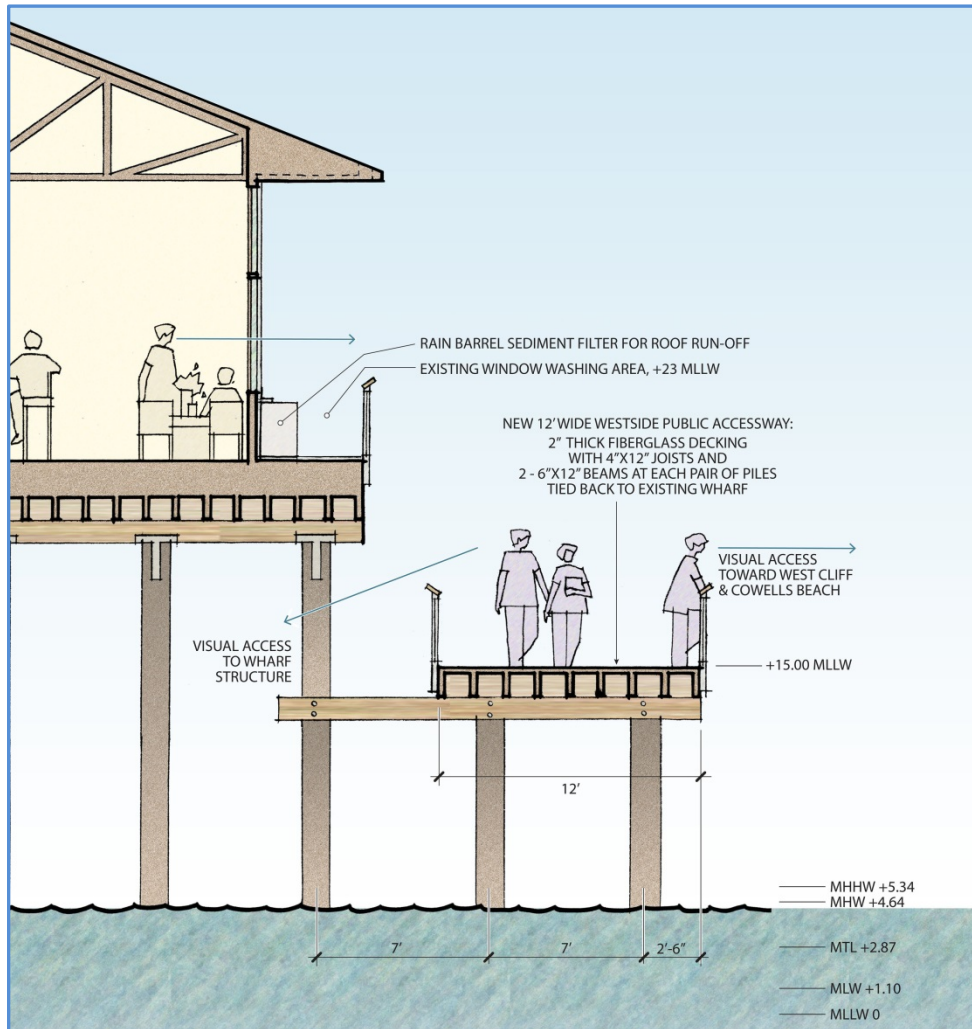


*The East Promenade creates an unparalleled half-mile long access to the Monterey Bay for pedestrians, bicyclists, joggers, and fishermen.*

- Provides public access.
- Allows promenading, jogging, fishing, and family bicycling.
- Provides a platform for interpretive exhibits and educational and scientific activities.
- Allows for tours and activities hosted by the nearby Monterey Bay National Marine Sanctuary Exploration Center.
- Provides a second means of emergency access/egress for emergency vehicles.
- Provides additional lateral stability to the Wharf.

## The Western Walkway

Construct a 12' wide walkway on the western side of the Wharf that provides for continuity of access in a manner that does not conflict with visual access from adjacent commercial uses.

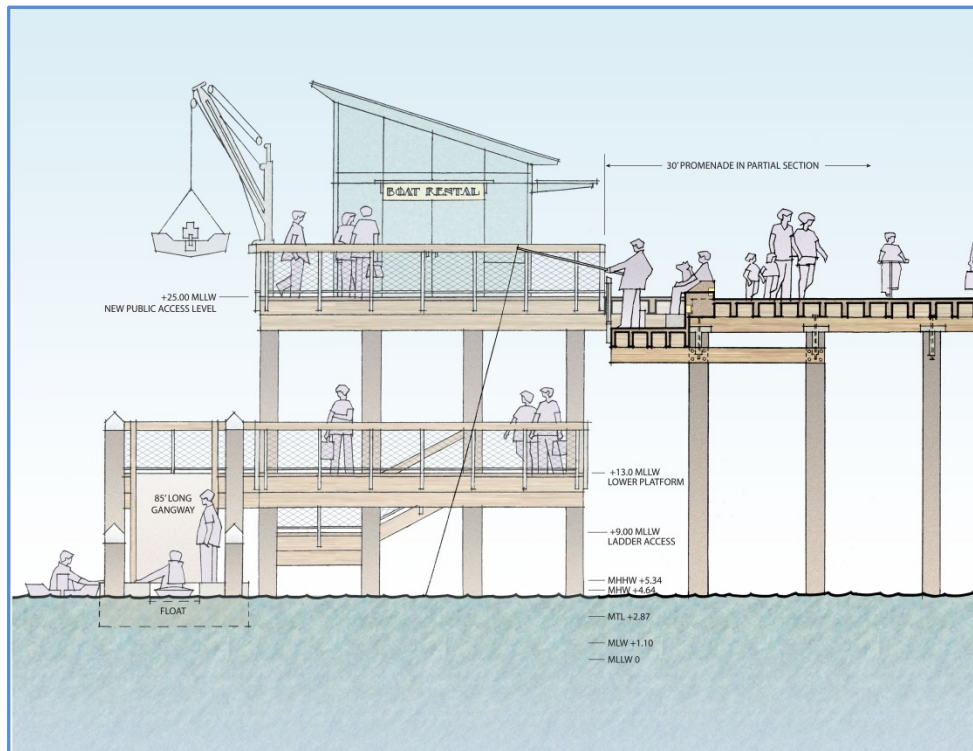


*The Western Walkway provides the necessary linkage to complete a full one-mile circuit of pedestrian movement around the entire Wharf.*

- Establishes previously unavailable public access along the west side of the Wharf.
- Used for walking, viewing, fishing, and for discovery of the unique marine environment.
- Allows for viewing the “forest” of timber piles supporting the Wharf.
- Protects the main structure of the Wharf from storm-driven debris from the west.
- Built below the Wharf’s main deck so as to not restrict view from the restaurants above.

## The Small Boat Landing

Construct a small boat landing facility on the east side of the Wharf adjacent to the new East Promenade for kayak, paddleboard, and fishing boat rentals as well as for Wharf Operations.

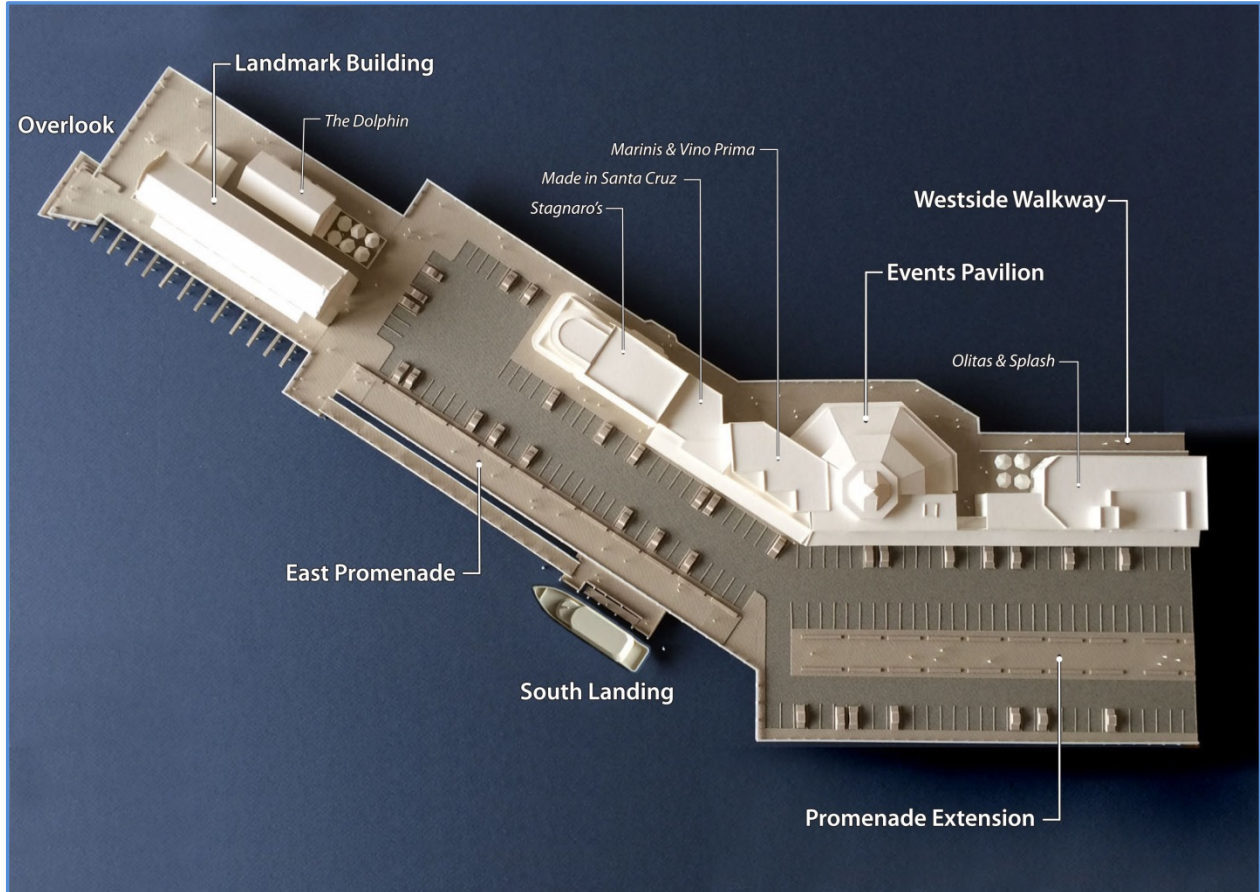


*The Small Boat Landing is ADA accessible and enhances the opportunity for residents and visitors to experience the Monterey Bay.*

- Provides expanded and ADA accessible docking facilities through a vertical circulation system that includes stairs and ramps.
- Relocates kayak and boat rental businesses away from vehicle traffic areas on the Wharf.
- Creates a lower platform area large enough for kayak and rental boat storage and Wharf operations equipment.
- Includes outdoor shower and changing room.
- Floating dock provides a shaped berthing space for stable access to kayaks.

# The South Landing

**Construct a landing facility for the docking of larger vessels at the end of the Wharf for science, education, research, sports fishing and whale watching.**



*The South Landing provides transient mooring for vessels up to 200 tons and 120' in length.*

- Located where the Wharf bends to the southwest, the South Landing allows vessels to approach bow-on to the prevailing ocean swells, allowing for easier docking and safer embarkation of passengers.
- ADA access provided by a 200' long 12' wide ramp servicing a 20' wide, 75' long fixed platform.
- Intended for use by educational and scientific research vessels, as well as for ecotourism, whale watching, bay cruises, and sport fishing.
- Not envisioned as a terminus for cruise ships of any tonnage or their excursion boats.
- Creates new opportunities for accessing and experiencing the Monterey Bay National Marine Sanctuary.

## The Events Pavilion

**Construct a multi-sided Events Pavilion that creates a continuity of the commercial uses where the Wharf bends to the southwest and provides a large, weather-protected space.**

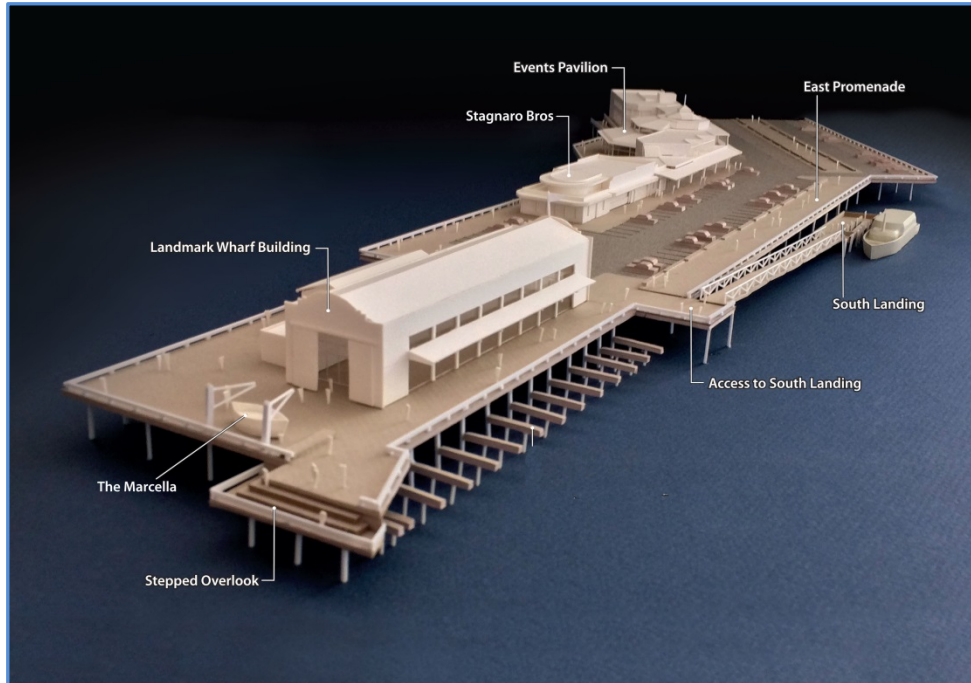


*The Events Pavilion activates the South Commons area, a windblown public space infrequently used, through the creation of a multi-use structure capable of transitioning from interior to exterior use with 12' high roll-up or sliding glass panels.*

- Creates a highly transparent, 6,000 square foot weather-protected space that counters the chilly winds and fog currently limiting use of the South Commons. On nice days, the Events Pavilion converts to an open air, natural light-infused space all can enjoy.
- Adjoins an outdoor waterfront space ranging in width from 15' to 35'.
- Heightens the level of activity within the South Commons area and provides opportunities for evening events and during inclement weather.
- Links adjacent commercial spaces.
- Provides meeting/classroom space for small scale conferences and meetings.
- Public activities that can be accommodated within include educational and environmental programs, lectures, performances and festivals as well as birthdays, weddings and other celebrations.
- Incorporates existing stairways and ADA accessible elevator and enhances access to nearby second floor businesses.

## The Stepped Overlook

Heighten the experience of the dynamic qualities of water, the variability of waves and tides, and the exhilaration of being out over water by creating a Stepped Overlook that extends out into the Monterey Bay.



*The Stepped Overlook extends the East Promenade down to the water's surface with amphitheatre-like steps.*

- The Stepped Overlook provides dramatic views to seaward, and creates the sensation of being on the prow of a ship, surrounded by water and exposed to the natural sights, sounds, and smells of the marine environment.
- Three amphitheater steps leading down to a 7' wide area provide exceptional opportunities for viewing marine life.
- 180° plus views are afforded to Steamer Lane to the west, the Monterey Peninsula to the south, and Main Beach and the Boardwalk to the east.

## The Landmark Building

Construct a new Landmark Building reminiscent in scale and form of the structure once located at the end of the Wharf. Provide a visual focus and destination attraction which entices visitors to venture out to the end of the Wharf.



*The Landmark Building juxtaposes the architectural style of the past with modern day activities and programming.*

- Consider carefully the programming and use of what will become the prominent Wharf landmark.
- Allow public-spirited activities that integrate indoor and outdoor activities within the 6,000 square foot space.
- Consider use proposals from a broad spectrum of non-profit and for-profit entities.
- Include a combination of cultural, educational, and commercial uses.
- Explore the potentials of a facility that could include a satellite museum space such as the one proposed by the Santa Cruz Surfing Museum incorporating exhibits, a café, and shop.
- Activate “maker” culture activities within the space, such as a boat building class or surfboard shaping.

# Alternatives to Refuse and Recycling Collection System

**Enhance the public realm of the Wharf and improve the visitor experience with alternatives to key Wharf Operations.**

The impact of heavy garbage and delivery trucks has been identified as one of the most significant causes of damage to the Wharf roadway. In addition, the existing trash enclosures are unsightly, take up valuable space, and interrupt the flow of public access. Alternative methods for trash collection and recycling, along with the potential elimination of centralized garbage collection areas and reliance on heavy trucks for collection, are needed.

- One alternative is an automated vacuum collection system recently adopted for use in the US. An American vacuum trash collection company, Memios, has made a proposal to the City which features the collection of trash and recyclables directly from each of the individual businesses as well as from public locations on the Wharf. Trash and recyclables are transported via a vacuum system through a 20" stainless steel pipe under the Wharf to an off-site collection center.
- If implemented for the Wharf, the system could be expanded to serve adjacent uses in the Beach Area and, if the quantity of garbage is sufficient, the system can also be used to generate energy.
- The implementation of such a system would be a first on the West Coast and would distinguish the Wharf and the City for its forward thinking and commitment to green infrastructure.
- Other alternatives include using smaller collection trucks and more frequent pick-ups combined with a close-by offsite collection center to which refuse and recyclables can be delivered by electric or other alternatively-powered vehicles.



*On-demand vacuum assisted removal of trash and recyclables reduces Wharf roadway maintenance costs and is a forward thinking green technology.*

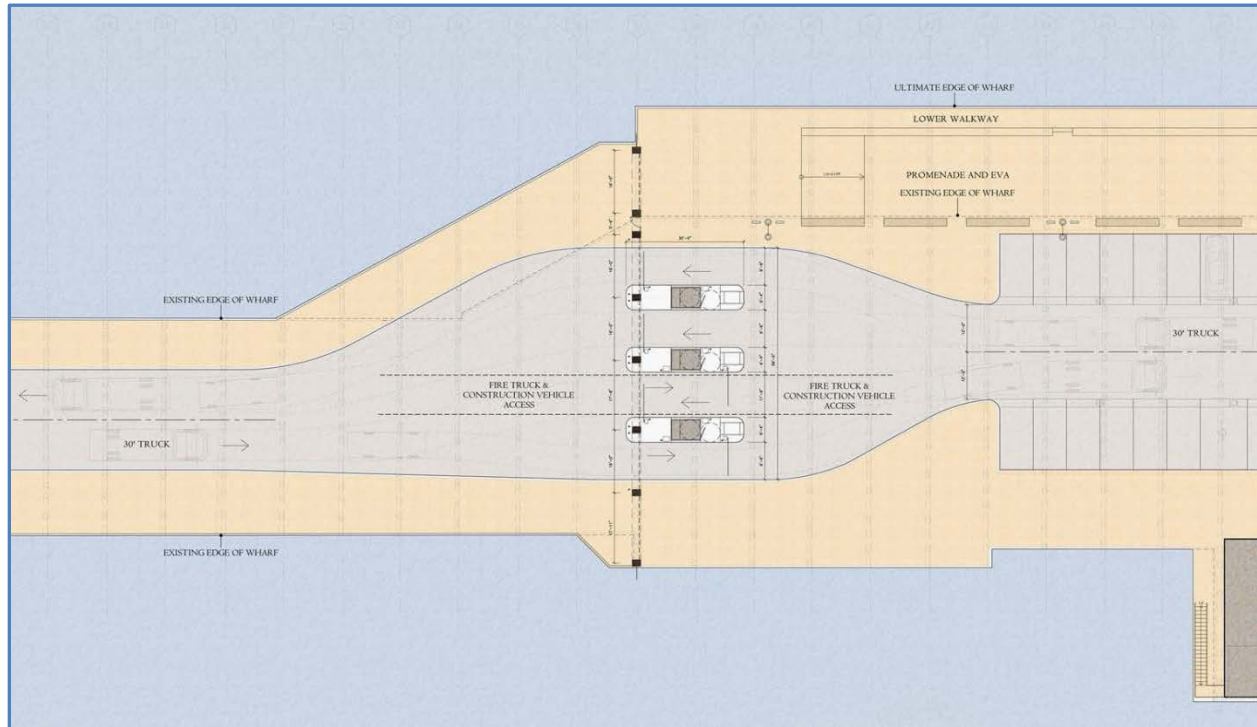


*Load centers in each Wharf business eliminate the need for trash enclosures on the Wharf.*



## Parking and Circulation

Utilize the existing parking supply more efficiently, facilitate traffic flow, increase efficiency and speed of the pay-to-park system, modify parking management policies, and encourage alternative methods of access to the Wharf.



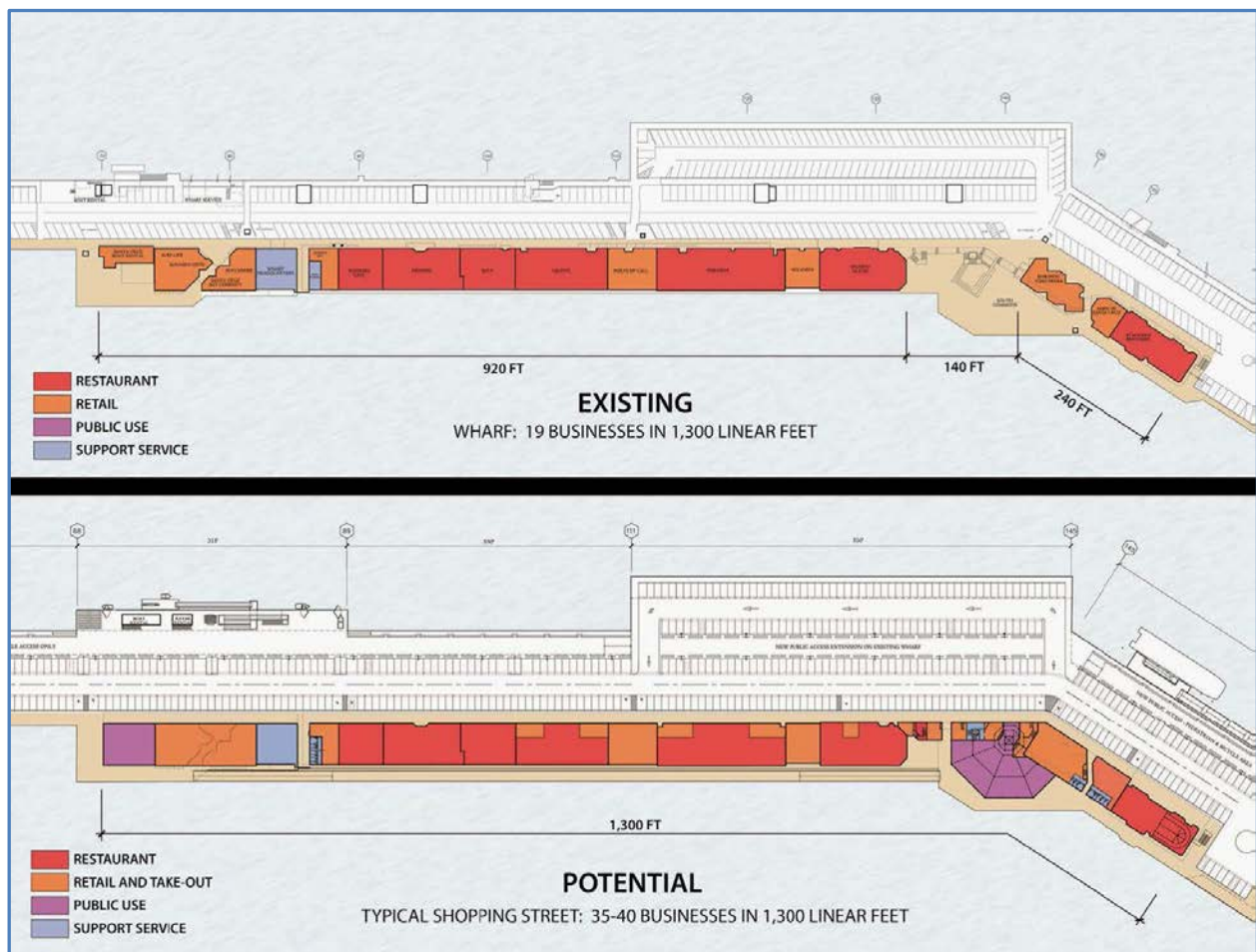
*Reconfigurable entry and exit booths at the Gateway Entrance will speed transaction time and reduce back-ups while providing access for delivery and emergency vehicles.*

- About 50% of the Wharf is used for vehicular circulation and parking. At a minimum, maintain the existing 440 parking spaces, but allow the potential for a modest 10-15% increase upon implementation of parking management recommendations.
- Reconfigure parking stalls on the west side of the Wharf from diagonal to perpendicular, thus allowing vehicles moving toward the Wharf exit to access those spaces.
- Restripe parking stalls from 9' wide to 8.5' wide to be consistent with current City standards.
- Gain additional spaces through the removal of trash compactors and outdated informational kiosks.
- Institute a demand pricing strategy to help flatten demand during peak periods while making parking more attractively priced in non-peak periods.
- Provide up to 150 bicycle parking spaces in the transition area between vehicular parking areas and the East Promenade,
- Encourage car sharing, transit shuttle connections, bike rentals and other alternative modes of access to the Wharf.

## Improving Commercial Dynamics and Opportunities

**Use existing commercial areas of the Wharf more efficiently and effectively to enhance market potential and economic viability.**

- Broaden support for the commercial ventures on the Wharf by increasing the market appeal of the Wharf to a more diverse group of residents and visitors.
- Augment City resources to enhance marketing, tenanting, and promotional efforts.
- As businesses evolve and change, promote greater diversity and a finer mix of retail and restaurant uses.
- Do not expand the commercial footprint, but initiate infill and intensification as leases expire, buildings are renovated, and as market demand warrants.
- Encourage the development of second floor uses such as rooftop dining with vertical access.
- Utilize design development standards to improve curb appeal of businesses, encourage the creation of more extroverted places with a strong indoor/outdoor relationship, and to develop a collective identity and sustainable design while allowing for individual expression, variety, and circumstance.



*Infill commercial areas and intensify uses within the existing commercial footprint in order to accommodate additional businesses with a greater variety and diversity.*

## Santa Cruz Wharf Engineering Report

The Santa Cruz Wharf was constructed in 1914 and at 2,750 ft. long is the longest timber pier in the United States. The basic timber structure and decking that support the Wharf are essential to its continued existence and performance. Therefore, one of the first steps for the Moffat & Nichol engineering team was to undertake a comprehensive review of the Wharf structure to assess what might be needed in the future. The engineering assessment addressed the condition of the piles, the overall integrity of the structure and the paving and substrate of roadways, parking areas and sidewalks.

The engineering evaluation involved a visual and underwater survey of the piles and Wharf sub-structure to determine their viability and the need for replacement and repair. What was found is that the Wharf is generally in good and serviceable condition, primarily due to the fact that it has been well maintained over the years by the Wharf staff. Under some of the existing buildings there is a need for pile replacement in locations that have been difficult to access. This has required remedial bracing for an interim period awaiting replacement or major reconstruction of the buildings thus providing access for the placement of new piles. With the continuation of on-going maintenance and replacement on an as-need basis of the structural elements, the life of the Wharf will be extended well into the future.

The Engineering Report contains 11 sections that correspond to the tasks identified by the City of Santa Cruz, and has been prepared in conjunction with the Wharf Master Plan study conducted by ROMA Design Group.



*The 1914 Wharf was approximately 4 acres in size. Between the 1950's and 1980's, it was increased by 3.3 acres for commercial uses and parking.*

# I. Piling Survey

An inspection was performed of all 4,450 (approx.) piles of the 100 year old Santa Cruz Wharf.

The piles are the most critical element of the Wharf as they transmit all loads to the supporting seafloor soils. The Moffat & Nichol inspectors were engineer-divers who observed every pile from the ocean floor to the pile top and recorded the results of their observations and testing, which included coring samples of the pile interiors.

The piles are in good condition overall.

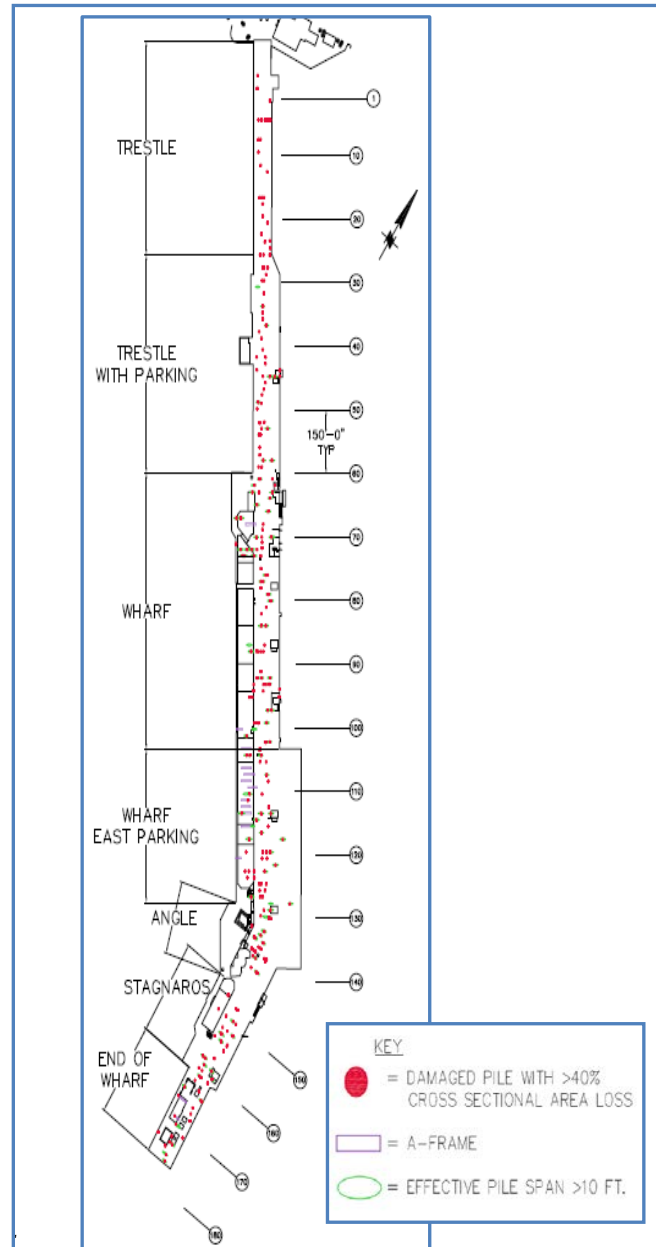
Less than 5% of the 4,450 piles need replacement. Notable exceptions are underneath buildings where replacement is difficult with the building structure in place.

A major factor contributing to the longevity of the piles is the practice of using Douglas fir piles treated with preservative (creosote, ACZA or poly-urea coating).

Observed damage to the piles is caused by storm waves, floating logs and marine borers.

### Key Recommendations:

- Continuing full time maintenance crew to replace piles as damaged.
- Use of treated piles for replacement.
- Addition of piles for lateral stability and where required for additions to the Wharf.
- All piles with greater than 40% section loss and effective spans larger than 10 ft. should be replaced or repaired.
- New piles should be installed at locations where the span is greater than 10 ft.



Approximately 5% of the more than 4,450 piles need replacement.

## II. General Structural Evaluation

The structural evaluation of the Santa Cruz Wharf included assessment of the condition of the existing structural members and analysis of their capacity to safely support the imposed loads (weight, waves, earthquake, etc.).

In addition, analyses were performed to inform the Wharf Master Plan designs. The condition of the structure is good, due to the quality of original construction and continuous maintenance.

There are some areas that have deterioration (rot, corroded steel connections, and other damage).



*The Wharf's framing system: piles, cap beams, stringers and decking.*

### **Key Recommendations:**

- Add piles for additions for the Wharf Master Plan elements to increase lateral stability to the Wharf.
- Provide additional bolts or side plates at the unsupported cap splice locations.
- Replace deteriorated structural members.
- Provide markings to restrict trucks from parking spaces and lower capacity areas.
- Retrofit turnaround areas to increase the load capacity.
- Design the new East Promenade for a minimum capacity of 36,000 lbs. axle load.
- Provide connections (bolt) to stringers at lap splice ends to provide longitudinal continuity.

### III. Roadways and Parking Areas

The Santa Cruz Wharf has had vehicle access along its length since its construction 100 years ago. Providing vehicle access for delivery, public access, and emergency vehicles is a continuing requirement of operation. The need for a durable yet flexible road surface is a challenge that requires considerable maintenance. Providing a system that bridges across the deck board cracks and reducing large vehicle loads onto the Wharf will help to reduce pavement deterioration and ongoing maintenance.

The Wharf's roadway and parking areas are covered with a two inch (nominal) thick asphalt pavement supported by flexible timber decking and framing beneath.

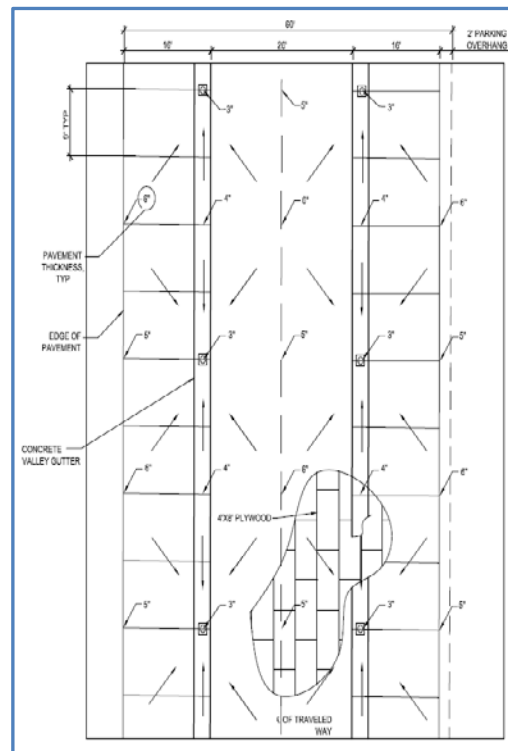
The pavement has extensive cracking, reflected up from the decking joints beneath and is essentially porous to rain water. There is no existing storm water collection system - except at localized washdown and trash enclosures; all storm water runoff flows through the deck into the bay.



*The roadway surface is subject to reflective cracking from below.*

#### **Key Recommendations:**

- Pavement should be replaced across the entire wharf.
- Install plywood/waterproofing layer between AC and deck boards to minimize cracking.
- Install a test section to determine best construction methods.
- Alternate deck board joint locations.
- Consider rubberized asphalt in place of conventional asphalt.
- Install drain inlets in vehicle area to treat runoff with media filtration to address water quality.
- Limit truck traffic to the greatest extent possible to minimize damage.



*New pavement conceptual design.  
(Mesiti-Miller Engineers)*

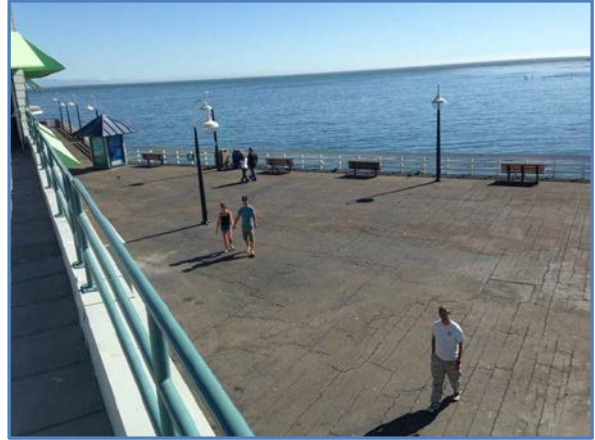
## IV. Walkways and Common Areas

The walkways on the Santa Cruz Wharf are in fair to good condition and have sufficient capacity to support the imposed pedestrian load although there are areas of deterioration in the substructure.

The walkways are surfaced with a mix of materials, consisting of concrete, stamped concrete, and asphalt. The walkways are less able to accommodate pedestrians on the main portion of the Wharf as they could be. There are a number of ramps and other structures that protrude into sections of the walkways.

Cracks in the surfacing are minor and there are no significant areas of unravelling of the pavement. A notable exception is the South Commons area that has reflective cracks in the asphalt surfacing. These cracks are visually apparent but do not present a significant trip hazard or reduce the function of the walkway.

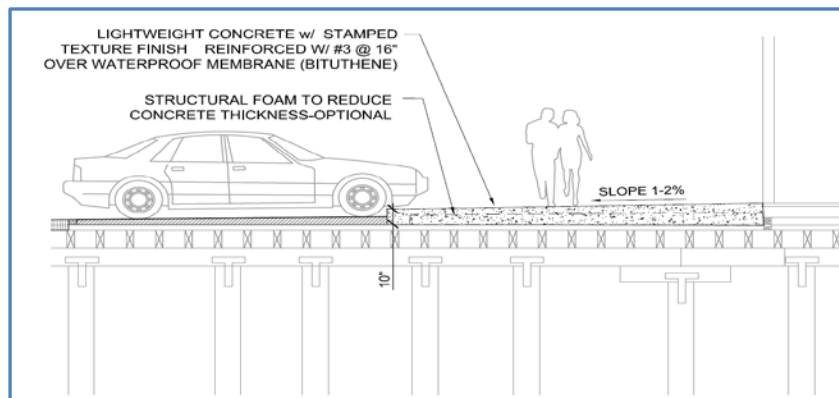
The supporting substructure is in fair to good condition and adequate to support the walkway loads.



*Non-hazardous reflective cracking at the South Commons area.*

### **Key Recommendations:**

- Expose and replace rotted timber below the walkways as part of the sidewalk replacement.
- Provide the following walkway structures as set out in the companion Wharf Master Plan:
  - East Promenade - Hardwood decking on timber substructure.
  - Sidewalk in front of buildings and South Commons - stamped concrete
  - West Promenade - Fiberglass grate on steel framing.



*Typical section of new walkway.*

## V. Gravity Sanitary Sewage System

The sanitary sewage system on the Wharf conveys waste to the shore where it connects to the citywide sewage system. It is unknown when the original sewage collection system was installed on the Wharf but it was likely sometime after the original construction in 1914. When retail buildings were added, the existing gravity main collectors for the system were installed in 1986 (based upon drawings received from the City of Santa Cruz).

An analysis was performed to determine the flow capacity of the existing sewage system. An estimate of the total demand on the system was made by surveying the fixtures (sinks toilets, drains) in building spaces and applying a weighted formula that assigns the flow contribution from each type of fixture.

The analysis shows that the existing gravity mains are well within their capacity carrying about 50% of the total possible flow rate that they could carry.

Given the present age and condition of the existing gravity mains, it is estimated they have at least 25 years of serviceable life remaining. The age and condition of the laterals is more varied and a single value cannot be assigned. The ABS laterals, installed within the past 10 years are estimated to have a 20 year minimum remaining service life. The gravity sewer lines are subject to wave impact during large storms because they are designed to slope and have a lower elevation under the wharf deck. All of these lines may experience damage within the remaining service life that would require repair.



*Sewer mains and laterals are in serviceable condition.*

### **Key Recommendations:**

- Remove all abandoned piping beneath the Wharf.
- Replace all mild steel hangers with hot-dipped galvanized or stainless steel.
- Require pressure tests be performed on all new laterals installed on the Wharf.
- Perform monthly inspections for leaks of the sewage system during times of highest demand ( typically 11 AM - 2 PM).
- Perform inspections for leaks of the sewage system within 3 days (wave conditions permitting) after major wave storm events where wave crests have been observed within 5 feet of the Wharf deck.



## VI. Fire Warning and Suppression Systems

Originally constructed in 1914, the Wharf has been widened in various locations from the 1950s to the 1980s. During this time, there were no codes or standards directly applicable to fire suppression systems on piers and wharfs.

Over the past 35 years, fire warning and suppression systems have been added to the Wharf as use increased and applicable codes and standards were established. Currently the Wharf is protected by a fire suppression system along the full length that includes hydrants, sprinklers (full coverage in buildings and partial coverage on the substructure), access hatches to the substructure, fire truck access on the Wharf and a zoned fire alarm system.

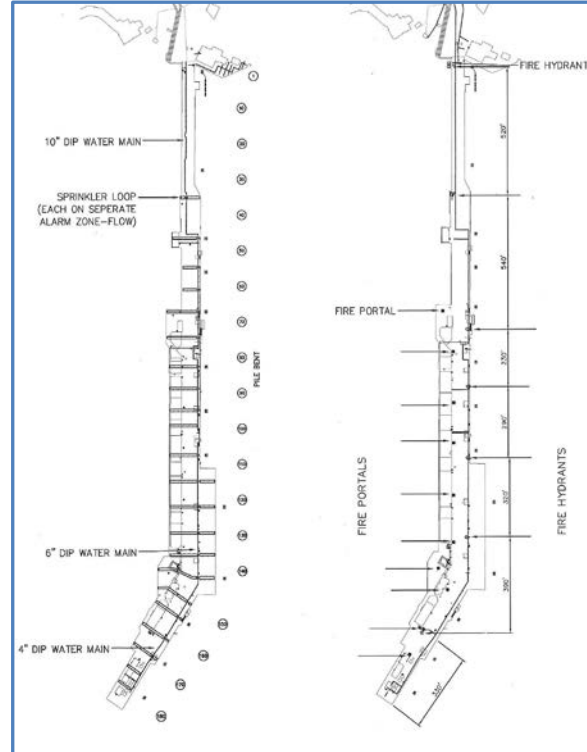


*The allowable vehicle axle load the Wharf can support is between 29,000 and 31,000 lbs. With improvements to the existing Wharf all SCFD apparatus would fall within the allowable range.*

The existing suppression and alarm systems are in overall good condition and are tested regularly.

### **Key Recommendations:**

- Extend the coverage of the under deck fire suppression system at the public access dock and boat rental dock.
- All expansions to the Wharf to be fully sprinklered as provided in the current NFPA code.
- Provide markers to assist the fire department to locate the access portals at night in the dark.
- Limit boat anchorage to outside 200 feet of the west side of the Wharf to minimize the risk of boat collision and one of the largest potential ignition sources to the substructure.



*The existing fire suppression system is in good condition.*

## VII. Wharf Structure Supporting Buildings

The Santa Cruz Wharf currently supports multiple buildings, including a life guard station and commercial spaces. Part of the Wharf Master Plan tasking is to evaluate the construction of new buildings or alterations to the existing ones. Preliminary calculations were performed (Mesiti-Miller Engineers) for new one- and two-story vertical building loads. These loads were then analyzed for the capacity of the Wharf substructure to support these loads.

The Wharf structure has adequate structural capacity to support one- and two-story buildings, including those identified in the Wharf Master Plan. Future buildings on the Wharf should follow the recommendations in this section to avoid loads from being improperly located on the Wharf structure. When buildings are replaced, the supporting structure should be thoroughly inspected and all deteriorated members (decking, stringers, caps and piles) replaced.

Building Type and Load Type	Adequate Support of Wharf Structure?		
	4x12 Stringer	6x12 Stringer	Pile Cap
1 - Story Building			
Type of Load			
Bearing Wall	Yes, if 3+ are bundled together	Yes, if 2+ are bundled together	Yes, up to 10 ft. span
Interior Column	No	No	Yes: For 9 ft. span, it must be within 3.5 ft. of the pile centerline; for an 8 ft. span or less it can land anywhere on the cap
2 - Story Building			
Type of Load			
Bearing Wall	Yes, if 8+ are bundled together	Yes, if 4+ are bundled together	Yes, up to 10 ft. span
Interior Column	No	No	Yes: For 9 ft. span, it must be within 6 in. of the pile centerline

### *Building Load Analysis Conclusions*

#### **Key Recommendations:**

- Provide additional stringers beneath bearing wall loads.
- Locate column point loads to be directly over pile and limit point load to 40 kips.
- Install additional piles to support column point loads that are in excess of 40 kips.

## VIII. Existing Landings and Dock Serviceability

There are 5 active landings presently on the Wharf for boat access. Two are available to the public, two for boat and kayak rental, and the landing used by Wharf Operations. These landings are functional but subject to seasonal wave damage to the inherent location. Floating docks are in use and convenient for small boats, but must be removed in winter.

The floating docks used by the kayak rental business and Public Landing 1 are frequently occupied by sea lions to haul out. This is both a source of enjoyment to visitors to observe and an impediment to boaters wishing to utilize the docks. Fencing or some physical barrier is required to block sea lion access onto the docks and even the fixed landings. Nearby Moss Landing Harbor has a similar if not larger sea lion population. A study was performed at that facility that utilized low current to cause the sea lions to get off the dock without injury to them.

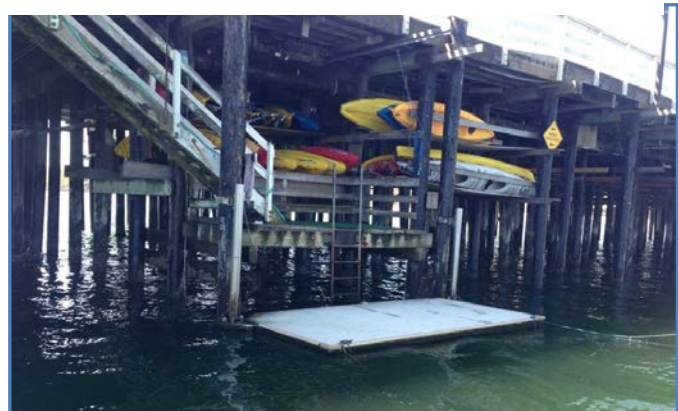
All of the fixed landings are at elevation 8 ft., MLLW, above high tide. Waves will overtop or more commonly strike the bottom of the deck boards of the landing and lift them out of place. The floating docks are all removed in the winter to avoid damage in the large wave storms.

### **Key Recommendations:**

- Replace timber decking on existing landings with pultruded fiberglass.
- Utilize pultruded fiberglass at all new landings.
- Utilize non-lethal sea lion deterrents to avoid marine mammal impacts to existing and new landings.



*Public Landing No. 2 is available for public use for short term loading and offloading.*



*The kayak and small boat rental operations are served by similar arrangements of fixed and floating docks.*



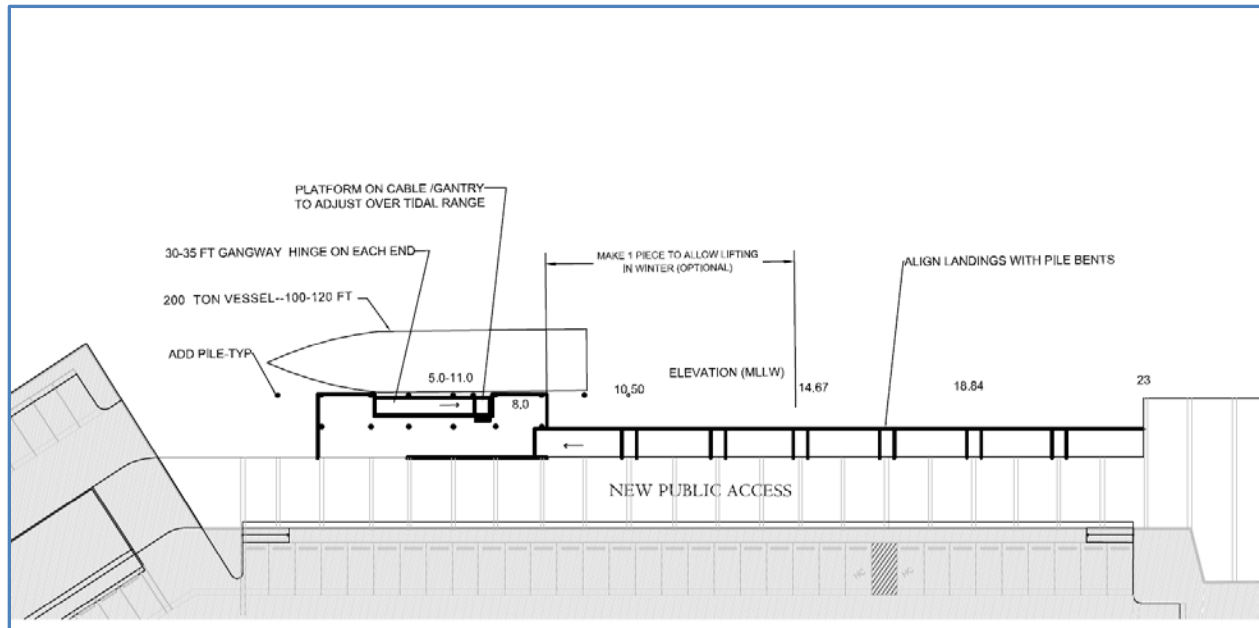
*The Wharf Operations dock utilizes a 3-ton crane to launch Wharf and SCFD Marine Rescue equipment.*

## IX. Potential for Construction of New Landing

The Wharf Master Plan proposes a landing for research and visitor-serving vessels up to approximately 120 ft. in length and 200 tons at the south east end of the Santa Cruz Wharf for better access to the Monterey Bay National Marine Sanctuary. Public Landing No. 2 is at this approximate location and has served smaller vessels visiting the Wharf for loading and off-loading in the past. In addition to providing transient berthing, a larger, improved landing will add to the ability to evacuate the Wharf in the event of an emergency.

An engineering assessment was conducted for the purpose of recommending the optimal size, shape, type, and location of a new landing capable of handling research and visitor-serving vessels. The existing Wharf structure was evaluated at the proposed location for enhancements/reinforcements/revisions necessary to accompany a new landing.

A preliminary berthing analysis was performed in order to determine the berthing energy demand for the design of the landing structure. The design vessel was a 200 LT Coast Guard Marine Protector Class vessel, with a 110 ft. length overall.



*Plan of the Wharf deck, ADA accessible ramp, fixed landing and gangway.*

### **Key Recommendations:**

- The fixed landing system is the most feasible for all year access at the Wharf.
- Situate the landing at the same elevation as the existing landing to be above the high tide yet be low enough to minimize the difference in heights between the landing and boat deck.
- Provide access onto vessels by means of a 30 ft. long gangway that is hinged on the landing and can be lowered and raised to match the elevation of the boat deck access over the range of tides the boat can access the Wharf

## X. Environmental Impacts

The Santa Cruz Wharf is situated to the northeast of Lighthouse Point and benefits from the natural shelter provided at this location. Although protected from the prevailing swell direction, the Wharf is subject to the inherent forces of the sea. The Wharf's orientation and deck elevation (23 ft. MLLW) is sufficient to keep the Wharf above all but the infrequent, highest waves which can be up to 20 ft. in height.



*The Wharf's deck elevation of 23' (MLLW) puts it above all but the most extreme waves.*

The Engineering Report provides a summary of the following existing and changing environmental conditions and their potential impacts to the Wharf:

- Bathymetry
- Tide levels (astronomical, surge, extreme)
- Future climate change
- Increased Storminess
- Coastal erosion
- Sea Level Rise
- Tsunamis and Earthquakes
- Coastal Flooding
- Tidal Currents (winds, wave environment, currents)

The method of analysis in determining environmental forces was to use existing data from reputable sources and using established methods of coastal engineering for forecasting future events.

### **Key Recommendations:**

- Because of its location and deck elevation (+23' MLLW), and with continued maintenance and strengthening, the Wharf should continue to function well into the future.
- Widen the Wharf with vertical timber piles to increase its resistance to lateral wave and tsunami forces.
- Close the Wharf prior to predicted periods of extreme waves such as occurred with the 2011 tsunami.

## **XI. Permits, Consultations, Studies and Support Materials**

The section describes the anticipated environmental review and permitting efforts required to support Federal grant funding for the Santa Cruz Wharf Master Plan (April 2014). This is based upon the Administrative Draft Wharf Master Plan and discussions with the City.

### **NEPA**

The project would be required to comply with the National Environmental Policy Act (NEPA) if any of the following are involved:

- Federal funding.
- Federal action (i.e. if a Corps permit for significant fill of waters of the US is required)
- The project has significant impacts on federally listed/threatened/endangered species.

It is likely that one or more of these criteria would apply to the project and would therefore require analysis under NEPA, which could be any one of the following (in increasing order of complexity):

- Categorical Exclusion (CE)
- Environmental Assessment (EA) and Finding of No Significant Impact (FONSI)
- Environmental Impact Statement (EIS)

The NEPA analysis will require the following elements:

- Identification of a Federal lead agency who will prepare the document.
- Purpose and Need Statement for the Project.
- Development and detailed analysis of alternatives (e.g.: no project, other location, various widths, etc.) showing avoidance, minimization and/or mitigations measures have been considered and that the preferred alternative is the least environmentally damaging practicable alternative (LEDPA).
- Supporting technical information and/or studies to provide information on the existing setting (cultural/historical/archaeological, biological such as macroalgae and habitat surveys, hydrological, geotechnical, coastal and sea-level rise, noise, traffic, etc.) Much of this information may be available from existing studies (Wharf Master Plan/Engineering report; Desalination DEIR cited below), anticipated additional supporting studies are listed below.
- A Biological Assessment could be required for species listed under the Endangered Species Act if present within the project area (to be determined at pre-application meeting).
- Identification of potential impacts of the project (both beneficial and adverse) and any proposed minimization or mitigation measures (including Best Management Practices, monitoring, etc.).

Supporting Technical Studies:

- Biological Surveys - (Macro Algae (Caulerpa/Eel grass); Noise study (possibly - pile driving); Essential Fish Habitat Assessment (possibly))
- Sea Level Rise

## US Army Corp of Engineers

The project will most likely require a US Army Corps of Engineers (USACE) Individual Permit and NEPA compliance should be coordinated early to clearly outline the lead and requirements for compliance.

It is desirable and planned to have a pre-application meeting with the likely regulatory agencies that would be involved. Many of the specifics of the process would likely be identified or strongly suggested during that meeting:

1. Level of NEPA analysis (anticipate an EA/FONSI)
2. Federal Lead agency for NEPA review (USACE or other)
3. Identification of species of concern (benthic, fisheries, marine mammals, etc.)
4. Potential impacts to sensitive species and habitat, historical/archaeological resources, public uses, the human environment, etc.
5. Other specific concerns

The following agencies, their jurisdictional authority and permit that may be required for the project are shown in the following table:

Agency	Authority	Permit Required
U.S. Army Corps of Engineers  Consultation with:  NOAA/National Marine Fisheries Services  NOAA/NMFS/Monterey Bay Marine Sanctuary  US Fish and Wildlife Service  California Department of Fish And Wildlife	Section 10 Rivers and Harbors Section 404 of the Clean Water Act  Marine Mammal Protection Act, Magnuson-Stevens Fisheries  Conservation and Management Act  Endangered Species Act  California Endangered Species Act	Individual Permit
California Coastal Commission	California Coastal Act 1976	Coastal Development Permit/Inclusion to Local Coastal Plan
Regional Water Quality Control Board	Section 401 of the Clean Water Act, Porter-Cologne Water Quality Control Act	Water Quality Certification
City And County of Santa Cruz	Municipal Code	Building Permit Planning Approval

The project will also need to comply with the state California Environmental Quality Act (CEQA). Both NEPA and CEQA review and documentation can often be combined even though some discrepancies exist between the regulations. Consideration of joint documentation needs should be addressed early within the planning phase for all supporting studies.

The pending desalination project for the Santa Cruz-Soquel Creek Water District (scwd2) has recently completed studies under the CEQA process. A significant element to that proposed project is the consideration of an open water intake pipeline under the Santa Cruz Wharf. It is anticipated that the information gathered for the scwd2 project would also provide recent baseline data for the Wharf Master Plan NEPA/CEQA efforts.

***Key Recommendations:***

Conduct a preliminary scoping meeting with the agencies described in this section to identify agency concerns and confirm level of analysis they may require.

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For questions or additional information regarding the Santa Cruz Wharf Master Plan and Engineering Report, please contact:

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