

Preliminary Draft

Executive Summary

Cabrillo Marine Aquarium Master Plan 1995

City of Los Angeles Department of Recreation and Parks

The Potico Group Architects and Landscape Architects
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The Lyon Group

**Cabrillo Marine Aquarium
Preliminary Master Plan 1995**

Purpose of the Plan

Executive Summary

Purpose of the Plan

In 1995 The Cabrillo Marine Aquarium is celebrating its 60th year of service to the citizens and environments of Southern California. From its humble beginnings as a display of a lifeguard's collection of local marine specimens in the Cabrillo Beach Bathhouse, the Aquarium has grown into one of the premier teaching aquariums in the world. The Cabrillo Marine Aquarium is now one of the crown jewels of the City of Los Angeles Department of Recreation and Parks. The Cabrillo Marine Aquarium is unique. By offering exhibits of the marine ecology of the waters of Southern California and by interpreting the relationships between humans and the aquatic habitat, the Aquarium has enriched the appreciation and enhanced the understanding of the natural systems for the citizens of Los Angeles and for the entire region.

The present facility which was built in 1981 is no longer adequate to meet the demand of visitors and educational groups. The Cabrillo Marine Aquarium is now visited by over 320,000 people each year including 117,000 school children. The school programs are so popular that the Aquarium only takes reservations for one week each fall and fills all of the available program slots plus a significant waiting list.

In 1989 the aquarium staff along with representatives of the Volunteers and the Friends established an ad hoc committee to explore the expansion of the facility to meet the increasing program needs. The committee developed a document titled "Cabrillo Marine Museum Plan For The 1990's" in which it was determined that the mission of the institution needed to maintain its focus on education, grow to recognition as a major regional aquarium, be able to meet the needs of a much larger audience, and provide better visitor amenities.

In 1993 the City of Los Angeles Department of Recreation and Parks allocated funds to develop a Master Plan for the expansion of Cabrillo Marine Aquarium including identification of its potential attendance and revenues if it were to initiate an admission fee and its probable operating costs, its potential expanded size and physical program, site development and parking strategies, development of increased life support systems and sea water systems, cost and budgets for expansion and a plan for phasing the expansion construction. In 1994, the master planning team conducted a series of site meetings and workshops to review the existing plans with the Department of Recreation and Parks and Aquarium staff, representatives of the CMA Volunteers and CMA Friends, and members of the interested public. The results of the workshops and meetings were developed into this document.

Introduction

The Cabrillo Marine Aquarium (CMA) is a mid-sized aquarium located in Cabrillo Beach Park, Los Angeles. The aquarium currently serves nearly 400,000 visitors a year and has both indoor and outdoor exhibit spaces as well as a popular outreach program. The primary focus of the aquarium is marine education and environmental action. Approximately half of the public presently served are the school children of Southern California with the remaining half being families, adults and senior citizens. The aquarium was originally housed in the historic public beach house, but moved in 1981 to a nearby complex of buildings designed by Frank Gehry. With a small staff and a dedicated core of volunteers, the aquarium has been able to offer high-quality classes, tours and interactive exhibits. As more people become interested in marine biology, regional and global conservation, and more aware of their impact on the world around them, Cabrillo Marine Aquarium has been in a unique position to provide a forum for these issues. The popularity of these programs means that, once again, the aquarium has out-grown its home and is looking to expand its facilities.

The CMA Special Planning Committee developed the Cabrillo Marine Aquarium *Plan for the 1990's*, a ten year master plan to direct the aquarium's growth. The aquarium intends to become the primary public resource facility for marine education, focusing on the rich and varied marine life of Southern California. It plans to expand into a major public aquarium dedicated to providing opportunities for early and continued education for children and general audiences. In doing this, CMA will serve the vision of the city of Los Angeles Recreation & Parks Department to make Los Angeles a better place by educating, exploring and exhibiting the diverse history and environment which is unique to Los Angeles and Southern California.

In Accord with this plan, The Portico Group was selected to direct the development of a facility expansion master plan. Through a series of interactive workshops and meetings with the aquarium staff and volunteers, city employees, and the master planning team, the current problems and needs of the aquarium were identified. As a group, solutions were proposed and discussed. This Master Plan Report presents a compilation of the information generated by the workshops and planning, marketing, and life support systems studies.

History of Project

The CMA Master Plan Committee, Department of Recreation & Parks employees and the master planning team met in a series of interactive workshops. The first workshops focused on broad issues affecting the design of the aquarium: identifying the opportunities and constraints for the master plan and establishing agreement on the preliminary architectural program for the enlarged facility.

Subsequent workshops discussed the site and exhibit concepts in more detail. The starting point for the workshops was the CMA *Plan for the 1990's*. In it, several priorities were established:

- Maintain and expand a broad based audience reflective of Los Angeles, while continuing to focus on school-aged children.
- Continue an overall theme of conservation and protection of the ocean environment in all the exhibits (interdependence, stewardship, etc.)
- Develop a facility capable of responding quickly to current issues and new discoveries
- Increase focus on "outdoor aquarium" - the surrounding natural resources (living laboratories)
- Promote interactive, hands-on exhibits
- Increase volunteer and community involvement
- Reach out to audiences currently underrepresented at CMA (e.g., Spanish-language resources)

The report also presented exhibit and program ideas and goals to be taken into consideration in the planning of the expanded facility:

- Build a very large ring shaped aquarium to accommodate proposed projects and house large specimens from the Southern California marine environment.
- Provide a temporary exhibit hall to provide flexibility in covering current issues.
- Increase space for the Mobile Museum/Aquarium for educational outreach programs
- Develop a Discovery Lab where visitors can learn about ocean life in an interactive fashion.
- Continue and expand animal husbandry and ecological field research
- Display a Live Shorebird Exhibit in an enclosed simulated natural habitat
- Expand classes (scholarship program, teacher workshops, film & lecture series, etc.)
- Expand capacity for group tours.

The final schematic design proposes an expanded two story facility of approximately 100,000 sf of additional building expanding both east and west of the current complex along the base of the bluff. The first floor houses interior exhibit, education and support spaces and the second floor has open-air exhibit spaces, an outdoor terrace cafe and new administrative and support spaces.

The Master Planning Process

The work was broken down into five phases.

Phase I: Site Analysis / Facility Program

- Reviewed as-built documents for the existing facility and visited the site to document condition of building components and systems.
- Completed the initial review of site to identify potential constraints to expansion.
- Identified existing and potential traffic routes to serve CMA and potential effects on adjacent land uses.
- Researched and analyzed potential market for CMA .

Once the initial data gathering and data generation work was completed, the first workshop was held to review the data, identify the opportunities and constraints for the master plan and to establish agreement on the preliminary architectural program for the enlarged facility.

Phase II: Site Concept

This phase of the work focused on developing large scale site design/organization solutions to meet the growth needs of Cabrillo Marine Aquarium while maintaining the beach atmosphere of the park. Major issues identified were:

- Improve parking and traffic circulation.
- Identify how to meet the water needs for significantly increased life support systems.
- Plan the expanded facility to work elegantly with the existing buildings and other activities on the site.
- Identify the best use for the historic public bath house.
- Identify what facilities/improvements may be necessary to incorporate the existing site amenities of tide pools and salt marshes into the overall CMA program while protecting the environments.
- Determine how to handle dramatically larger numbers of visitors to the facility: where they will park, how they will arrive and what additional demands they may cause.

In order to develop a unified sense of purpose and partnership for this project between the Harbor Department and the Parks & Recreation Department, meetings were held with both groups to discuss relevant issues. Discussions with CMA staff ideas for the type and character for major new exhibits were held with consideration of what portions of the exhibit finishes will be accomplished by CMA staff. Preliminary estimates of costs were prepared.

Phase III: Exhibits Concepts

This phase of the work focused on developing more detailed design concepts for new exhibits at CMA. During this phase of the work. Alternative exhibit concepts, plant and animal lists were established.

Phase IV: Preliminary Master Plan

This phase of the work consisted of organizing the reports, information and drawings developed during the previous three phases of the process into an organized report document. This master plan document is comprised of two volumes:

- The Summary Master Plan Report featuring the key elements, concepts and conclusions of the master plan process, suitable for use as a fund raising tool and for public relations.
- The Comprehensive Master Plan Report encompassing in an organized manner all of the material generated during the master planning process, suitable as a document of the planning process and the methodology used to arrive at the final decisions of the master plan.

Phase V: Final Master Plan

This phase of the process will be completed with the submission of the two master plan documents and with the presentation of the master plan in written and oral form to the Cabrillo Marine Aquarium Master Plan Committee and subsequently to the Cabrillo Marine Aquarium Volunteers and to the Los Angeles Board of Recreation and Park Commissioners.

Site Analysis

There are several important existing site conditions that must be successfully dealt with in order for the aquarium to continue to grow in an aesthetically pleasing and functional way. Primary issues identified during the initial workshops are:

- Improve signage from Highway 110 and access from Pacific Highway into the park proper
- Increase the available parking without overwhelming the site.
- Improve the entry sequence to the aquarium
- Maintain beach park atmosphere

The access to Cabrillo Beach Park and the Cabrillo Marine Aquarium from the freeway system is not direct or well signed. The park is adjacent to the San Pedro residential neighborhoods and there is occasional traffic congestion within these areas due to park visitors. San Pedro is also home to two other significant visitor attractions: the cruise ship terminal and Ports of Call Village, a themed waterfront shopping and restaurant complex. It will be necessary to evaluate, and possibly reroute, traffic flow to the aquarium. This should be done in cooperation with the Port of Los Angeles (Harbor Department).

The current approach to the aquarium through the park is on Stephen White Way. It brings visitors down to the beach and bath house and then circles back toward the western side of the aquarium. This approach does not orient visitors to the entrance of the aquarium and is visually confusing and uninspiring. It has the effect of focusing attention on the back side of the complex rather than the on the entry plaza. In addition, the aquarium sits in a sea of parking. Despite this image, there are parking shortages that will continue to become more severe as the aquarium expands. The relocation of the boat launch facility to the West Channel will free up room to park approximately 100 autos and allows for the expansion of the aquarium without decreasing the available automobile parking within the park. Discussions with the Port of Los Angeles indicated that a large satellite parking facility with a shuttle to Cabrillo Beach Park could be located at their 22nd. street site if demand warranted.

The historic public bath house is the only other significant structure on the beach. There has been periodic interest by several local groups in rehabilitating the facility as a community center, food service facility, rental facility, and/or bath and shower rooms. The Department of Recreation and Parks is presently in the initial phases of stabilizing and rehabilitating the building for general community and beach use. It has been determined that it is not practical for the aquarium to expand major programs to the Bathhouse permanently; however, temporary classes and exhibits may be held there until the new facility is complete. CMA will need to retain some space on a permanent basis for public education outreach.

In October of 1994 the CMA staff, Friends and Volunteers met to review the progress of the Master Plan Study and developed a position paper titled *Cabrillo Marine Aquarium, Vision 2000: A Plan to Expand An Outstanding Teaching Aquarium* in which it was

determined that the Cabrillo Marine Aquarium as part of its vision and mission needed to take operational and management control of Cabrillo Beach Park and the Point Fermin Marine Life Refuge area and operate it as an innovative coastal environmental/recreational park to combine the existing marine recreational activities and add innovative educational and interpretive opportunities to the site as part of the overall Cabrillo Marine Aquarium experience. New educational and interpretive elements to be incorporated in the greater park area include:

- Add outdoor interpretive exhibits to the salt marsh area
- Add interpretive play areas to Cabrillo Harbor Beach
- Add a small shore station and research lab to the boat launch area
- Add outdoor displays at the Fishing Pier
- Improve controlled access to the tidepools at the Point Fermin Marine Life Refuge to make areas handicap accessible and safe for visitors and interpreters. Also add educational and interpretive signage
- Expand research project sites to document the environmental conditions of the area

Exhibits Concept

The Cabrillo Marine Aquarium is dedicated to the people and marine life of Southern California. It is uniquely located in an area that includes ocean and harbor beaches, a salt marsh, rocky shores with tidepools, a fishing pier, a massive rock jetty and one of the world's largest commercial harbors. The beach consistently draws one of the world's unusual phenomena, the grunion fish that come ashore in great numbers to spawn, and gray whales are seen right along the coast.

All are integrated into the learning experience. The techniques used to facilitate the learning experience include accurate, in-depth exhibits, hands-on activities, docent-guided tours, public lectures, field trips, laboratory studies, "Do-its" (learning through acting, song and dance), staff accessibility, and outstanding volunteer programs.

The organizational concept for the exhibits sequence of the expanded Cabrillo Marine Aquarium is based upon a metaphorical journey through the marine environments from Los Angeles and Cabrillo Beach across the San Pedro Channel and around Santa Catalina Island to the open ocean. The exhibits will continue to emphasize the wide variety of smaller fishes and invertebrates which the Aquarium is noted for with the addition of several large aquariums containing large fish and marine communities. The major method of interpretation will continue to be the interaction between staff and volunteer docents and the aquarium visitors. It is extremely important for the aquarium to retain its character of visitor interface and its human touch. The exhibit experience will also emphasize the use of a wide variety of interpretive elements including models, hands-on artifacts, graphics, electronic systems and sound and lighting effects as well as living systems in the aquaria wherever possible.

The visitor exhibit sequence begins with an area devoted to aquaculture and living displays of the propagation and rearing of fish and other marine organisms. Here visitors will get the opportunity to see some of the daily activities of the aquarium staff and will begin to understand the complexity of maintaining living marine systems. Visitors will then enter the Discovery Lab where they will get to do hands-on activities with the help of docents and staff. The activities in the Discovery Lab will vary depending on the materials available and the season. After the Discovery Lab visitors will move through exhibits depicting the life and systems of the salt water marsh where they will get to see some of the life that grows in the muddy bottom through microscopes and aquaria as well as graphic displays. After the saltwater marsh, visitors will proceed through exhibits telling the story of the sandy shore with emphasis on the living systems found on the beaches of Cabrillo Park and then through an area devoted to the living systems of the rocky shore and out to a courtyard with tidepool touchtanks where people will be able to under the supervision of a trained docent or staff member, carefully see and touch many of the creatures found in the tidepools on the site.

After the tidepools courtyard, visitors will enter into an area focusing on the rocky reefs and breakwaters of the near shore. Here they will see abalone, spiny lobsters, anemones and a variety of small fish inhabitants of the near shore rocky habitat.

Visitors will then move through a glass tunnel through a breakwater and conceptually move to the off shore underwater environment of the kelp forest. Visitors will be immersed in an environment where they will encounter artificial kelp rising to a blue reflective ceiling with models of sea lions set as if they were playing in the underwater forest. Beyond the artificial kelp will be a living kelp forest aquarium with a broad cross section of the living community of a kelp forest. Tall viewing windows will wrap around visitors to allow visitors to vicariously experience the sensation of scuba diving off the coast. Small aquaria will encircle several of the kelp models and contain specific displays of the small animals living in the kelp forest. These animals will also be found in the large kelp forest aquarium but would tend to be missed by the casual visitor because of their size and camouflage. Graphics in the area will show the life cycle of kelp and indicate the value of the kelp forest to the economy and marine systems of California. Next to the kelp aquarium, is an aquarium featuring sea otters. Sea otters will be the only living marine mammals in the aquarium. The otters are likely to be rescued animals which are not able to be returned to the wild. The underwater view of the otters will be backed by a window into the kelp aquarium and a major story will be the interrelationship of the sea otter population with the health and extent of the kelp forests of the California coast.

Adjacent to the sea otter viewing will be several small displays depicting key small species from the San Pedro Channel environments including rocky bottom, sandy bottom and related environments. Beyond the channel environments displays visitors will travel through a glass tunnel into the Catalina viewing grotto, a large room encircled by the Catalina reef and channel aquarium. This aquarium, with 1 million gallons of water will offer visitors the ability to see large numbers of medium to large fish along with some sharks and rays. Staff divers will interact with visitors through the large viewing windows to explain the habitats and the inhabitants of the aquarium. The aquarium will also have the ability to be used for a swim-through experience for a limited number of special visitors. There is also mid-aquarium viewing along the east which is ramp and elevator accessible. Visitors will leave the Catalina grotto through a long glass tunnel and be able to experience the feeling of being totally under water. After the Catalina reef and channel aquarium, visitors will enter the zone of the open ocean where there will be a number of small aquaria housing small fish and invertebrates of the open ocean. A large graphic of a gray or humpback whale on the wall and models of dolphins, pelagic sharks and oceanic fish hanging from the ceiling will create an environment emphasizing to immensity and complexity of the oceanic realm. There will also be electronic displays of the pacific ocean indicating latest information about surface winds and temperatures and a feature area to track and display current information about the 'El Niño' effect.

Off the open ocean exhibit area is a classroom/theater which will have large underwater viewing windows into the Catalina aquarium. The classroom/theater will serve many purposes including classroom programs, public interpretive presentations, and quiet prolonged viewing into the Catalina aquarium as well as part of the sequence of open spaces available for after hours rental. The classroom/theater will also have

sound and projection capabilities and full electronic connection with the auditorium and with the rest of the world to allow for distance learning incoming and outgoing.

Beyond the open ocean display area is the circular 'Ocean of Jellies' exhibit space. This space is focused on quiet enjoyment of the beauty and grace of the rhythmically swimming jellyfish. visitors will be surrounded by tanks of jellies in a darkened space with quiet background music. Docents and staff will talk with individuals and small groups to explain the life cycle of the jellies and encourage visitors to see the jellyfish husbandry on display in the aquaculture exhibit area. From this area visitors will have the option of moving out to the entry plaza or up to the mid level viewing and upper level of the Catalina aquarium to see the surface of the Catalina aquarium, the kelp aquarium and the otter aquarium exhibit. The upper level terrace also has the Aquarium Cafe and access to the Whale Center and administrative offices.

The Whale Center will offer exhibits and displays about the largest of the marine mammals including interactive video of whale watching, information about whale tracking and programs being conducted by researchers in the Pacific, whale artifacts and models of whales.

The other indoor exhibit area planned for the expansion of the Aquarium is a multi-use temporary exhibits space. In association with the Aquarium's exhibit design and production facilities, the space for temporary exhibits will allow the Aquarium to develop traveling exhibits to send to other aquariums and natural history museums and generate outside income to develop additional exhibits.

One of the greatest hands-on assets of the aquarium is Cabrillo Beach. The aquarium has access to both a protected harbor beach and an open ocean beach, salt marshes and tidepools. Most of the classes and tours are conducted in the "living laboratories" on site. In addition, CMA offers off-site classes and trips for events like whale watching. Consequently, it is very important that the expansion of the aquarium does not alter the beach park atmosphere of the site. The outdoor resources of the park are integral to the appeal of the aquarium. Their situation within a natural environment in the environment of Los Angeles is central to their ability to educate the public about the interconnectedness of nature and the effects of urban development on the marine ecosystem.

Preliminary Master Plan

History and Mission of CMA

Cabrillo Marine Aquarium is an educational, recreational and research facility, dedicated to providing rich and varied opportunities for early and continued education of the general public about the marine environment of Southern California. As such, its appeal is broad based, reaching not only the school children who are their focus, but families, adults and senior citizens. Since 1935, the aquarium has offered visitors a chance to learn in an interactive, hands on way about the marine environment of Southern California. Their programs have continually grown in popularity and their research efforts have established them as a forward thinking institution dedicated to the preservation and understanding of the marine ecosystem and our impact on it. As part of their *Plan for the 1990's*, the CMA Master Planning Committee has commissioned this report to examine the aquarium's needs and goals as we approach the next millennium.

Market/Demand Analysis

One of the first studies undertaken was a marketing and development analysis to determine if there was an audience for the expanded aquarium facility and how to best attract potential visitors. The Lyon Group looked at the Southern California marketplace, other major attractions in Southern California, major aquariums in North America, and made preliminary estimates on attendance potential. They determined that both the resident and visitor markets were substantial and, with reasonable marketing efforts, the expanded facility could expect visitor attendance to expand to 800,000. CMA will be competing with several very popular and aggressively marketed attractions, including Disneyland, Universal Studios, and Six Flags Magic Mountain as well as with the proposed new Long Beach Aquarium. However, the Southern California public has demonstrated that it has the discretionary time and income to attend multiple attractions in their marketplace and across the country aquariums have become very popular during the past two decades. The advantage CMA has with regard to the proposed new Long Beach Aquarium is its established reputation for education, its public and school programs and its site with high quality real marine environments immediately available. Impediments to growth in attendance were identified as: absence of capital improvement moneys, absence of investment in distinguishing exhibits, relatively poor accessibility, lack of budget allocated to marketing, and competition from the area's other attractions.

Due to the timing of this master plan study, the market/economic study portion of this plan was completed before the proposals for the Long Beach Aquarium were solidified. The preliminary information available about the Long Beach Aquarium indicates that it is intended to have a Phase I area of approximately 120,000 sf and will include marine habitats from the Pacific Rim including a California/Baja Exhibit Section with a kelp tank containing sea lions with a glass tunnel through the middle, a swim-snorkel tank and a touch tank with rays; a Northern Waters Exhibit Section with a big tank for Alaskan otters and adjacent puffins or auks plus a whale theater with a 70mm film about whale migration; a Tropical Pacific Exhibit Section with a large tank containing coral reefs, tropical lagoons with mangroves open areas with yellow fin tuna and a glass

tunnel through the middle where divers talk with visitors; and a 6,000 sf temporary exhibits hall.

Site Concept

Several preliminary site studies were undertaken and key issues identified. The largest concern is access and parking. Currently, the access route from LA is not well signed and the approach to the aquarium is less than inspiring (visitors approach from the back of the aquarium). In addition, despite the feeling that the aquarium sits in a sea of parking, there is a parking shortage that will only get worse with the increased number of visitors. The challenge is to work with surrounding communities and the Port of LA to create a traffic plan that addresses everyone's concerns and preserves/improves the park. Suggestions include:

- Accessing the park via Shoshone Road by the Cabrillo Marina rather than on Stephen White Way . This would relieve congestion at the Pacific Highway and Stephen White Way intersection and improve the entry sequence to the aquarium by orienting visitors to the central entry plaza. This would have to be coordinated with the Port of LA.
- Creating satellite parking lots near either Ports of Call Village or the San Pedro business district. This would help connect the local attractions for easy access by tourists who are visiting for the day and boost the local economy by bringing aquarium visitors in contact with the local businesses.
- Building a parking deck on site to decrease the acreage of asphalt.

Facility Concept

The existing facilities, designed by Frank Gehry, will continue to function as the core of the aquarium with the new addition extending primarily westward. The expanded facility should significantly improve the entry sequence to the aquarium and blend gracefully with the existing structure. Because of the climate, it will be possible for a significant portion of the aquarium to be open air, either under cover or open to the sky. It was decided that the addition would be primarily located to the west of the existing buildings along the base of the bluff.. The temporary exhibit hall and several classrooms will be placed to the east. The building's siting will improve the entry sequence and visitor orientation to the entry plaza and will allow the old and new exhibit areas to work together. Entry will still be through the existing central courtyard; however, ticketing facilities and an extended entry plaza will be added in front of the complex.

During the workshops, a program was developed by the people who will be using the aquarium (staff, volunteers and visitors (Friends of the CMA)), the master planning design team, and Department of Recreation & Parks staff. The main concerns centered around severe space shortages in the existing facility that limits their ability to meet visitor demand and expand their research programs. The final schematic design includes space for exhibits, research and teaching. The outdoor exhibit spaces will be expanded as well to better accommodate large tour groups.

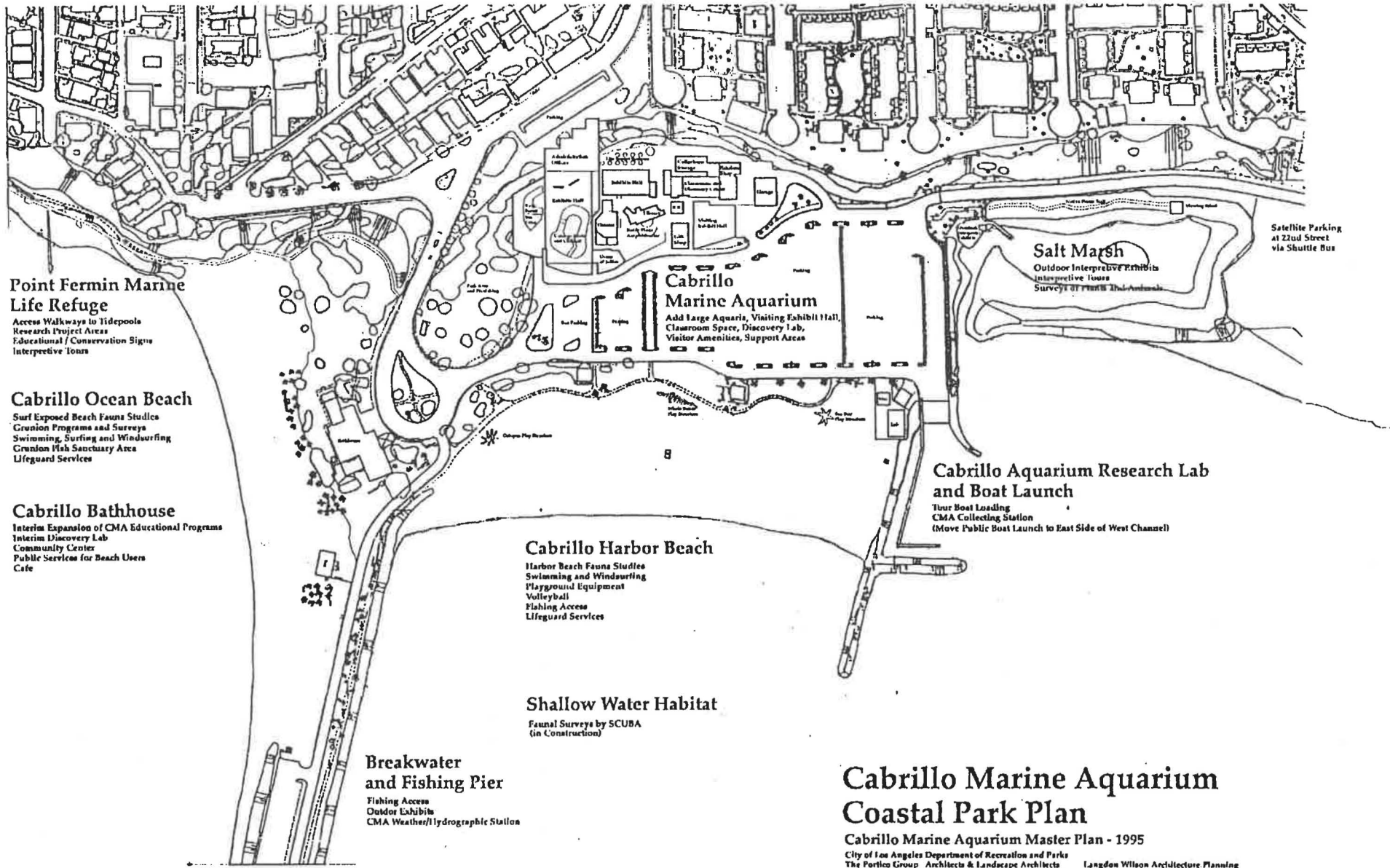
The aquarium achieves its mission of education of the public about the marine environment of Southern California in three ways: exhibits, research, and education programs. The proposed addition increases the amount of exhibit space by four times to accommodate school tours and ever increasing numbers of visitors. Currently, the aquarium has to turn down schools' requests because their space and time is limited. The exhibition hall will contain a one million gallon aquarium as well as several smaller tanks and exhibits that will significantly increase their visitor appeal as well as increase educational opportunities.

Laboratory, prep, life support, and office space is also quadrupled to allow research programs to expand and to maintain the increased exhibit space. To facilitate the outreach and education programs, there will be several new classrooms and an expanded library, as well as a media lab for publications, brochures and exhibit graphics and a new garage to house the mobile aquarium vehicles and research vehicles and boats.

Costs and Phasing Approach

The expansion of the Aquarium and the development of the park into an educational resource along with its use as a recreational resource will most logically be developed in a number of phases over the next six to ten years. The proposed sequence of development is a reflection of the immediate needs of the Aquarium to meet its visitor demand and the rationale of being able to keep the facility open during construction sequences.

Phase 1	Site Development Phase	
	Bath House Renovation	\$1,000,000
	Shore Facilities and Research Lab at Boat Launch	1,000,000
	Interpretive Nodes	300,000
	Signage/ Urban Design.....	300,000
	Tidepool Access Boardwalks	1,300,000
	Interpretive Play Structures	300,000
	Fees / Expenses	800,000
	Phase 1 Total	\$5,000,000
Phase 2	Catalina Reef Tank and Offices Phase	
	Building	\$7,000,000
	Exhibits	7,500,000
	Life Support with new sea water intake	6,000,000
	Fees / Expenses	3,000,000
	Phase 2 Total	\$23,500,000
Phase 3	Classrooms/ Storage/ Shops/ Garage/ Renovations/ Plaza Phase	
	Buildings.....	\$4,000,000
	Exhibits	700,000
	Plaza and Entry Fountain.....	1,000,000
	Fees / Expenses	900,000
	Phase 3 Total	\$6,600,000
Phase 4	Jellies, Kelp/Otter and Multi-Use Hall Phase	
	Buildings.....	\$5,000,000
	Exhibits	3,000,000
	Life Support	1,000,000
	Fees / Expenses	1,400,000
	Phase 4 Total	\$10,400,000
Total all Phases		\$45,500,000



Point Fermin Marine Life Refuge
 Access Walkways to Tidepools
 Research Project Areas
 Educational / Conservation Signs
 Interpretive Tours

Cabrillo Ocean Beach
 Surf Exposed Beach Fauna Studies
 Crustacean Programs and Surveys
 Swimming, Surfing and Windsurfing
 Crustacean Fish Sanctuary Area
 Lifeguard Services

Cabrillo Bathhouse
 Interim Expansion of CMA Educational Programs
 Interim Discovery Lab
 Community Center
 Public Services for Beach Users
 Cafe

Cabrillo Marine Aquarium
 Add Large Aquaria, Visiting Exhibit Hall,
 Classroom Space, Discovery Lab,
 Visitor Amenities, Support Areas

Salt Marsh
 Outdoor Interpretive Exhibits
 Interpretive Tours
 Survey of Plant and Animal

Satellite Parking
 at 22nd Street
 via Shuttle Bus

Cabrillo Aquarium Research Lab and Boat Launch
 Tour Boat Loading
 CMA Collecting Station
 (Move Public Boat Launch to East Side of West Channel)

Cabrillo Harbor Beach
 Harbor Beach Fauna Studies
 Swimming and Windsurfing
 Playground Equipment
 Volleyball
 Fishing Access
 Lifeguard Services

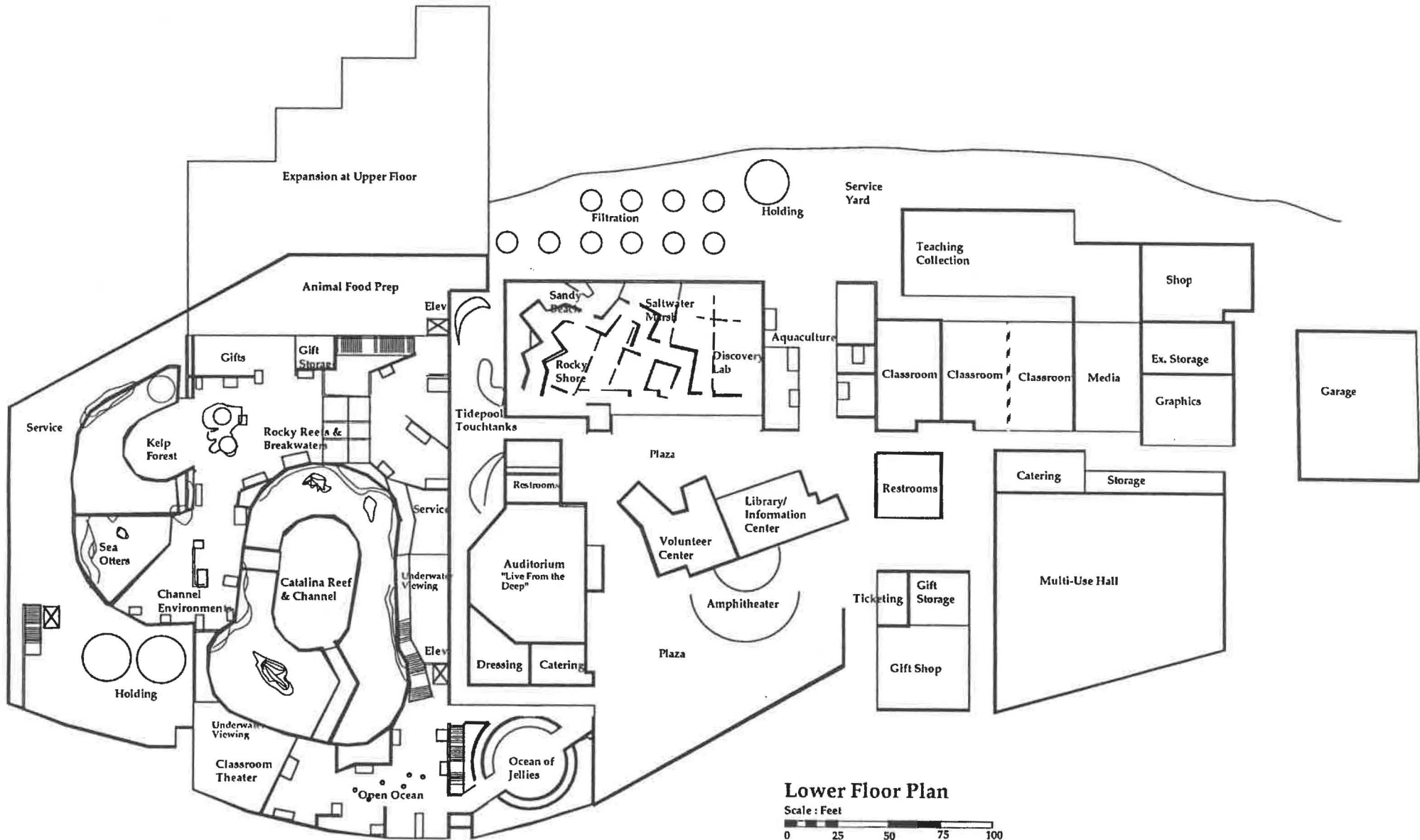
Shallow Water Habitat
 Faunal Surveys by SCUBA
 (in Construction)

Breakwater and Fishing Pier
 Fishing Access
 Outdoor Exhibits
 CMA Weather/Hydrographic Station

Cabrillo Marine Aquarium Coastal Park Plan

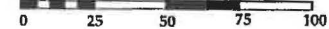
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Lower Floor Plan

Scale : Feet

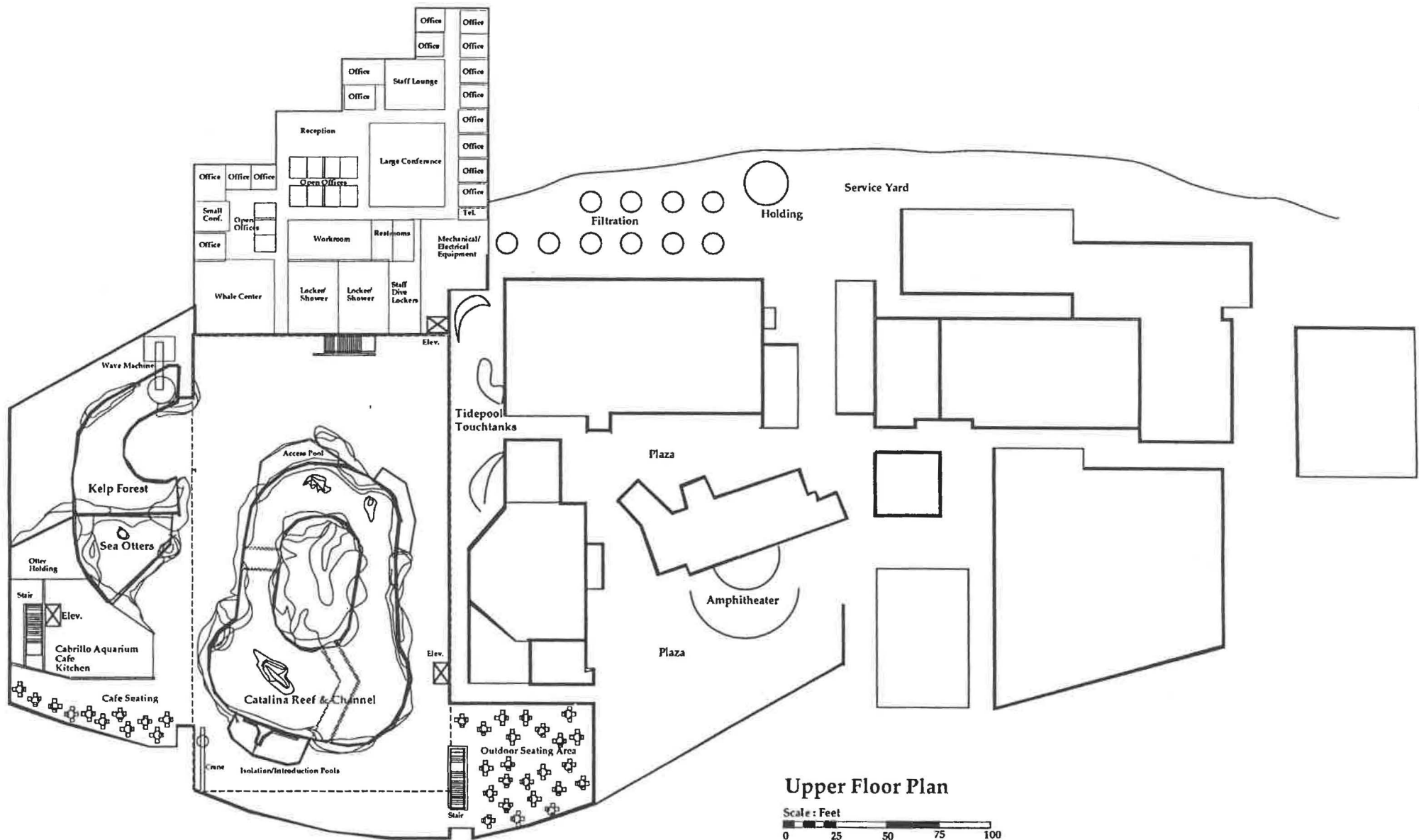


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Upper Floor Plan

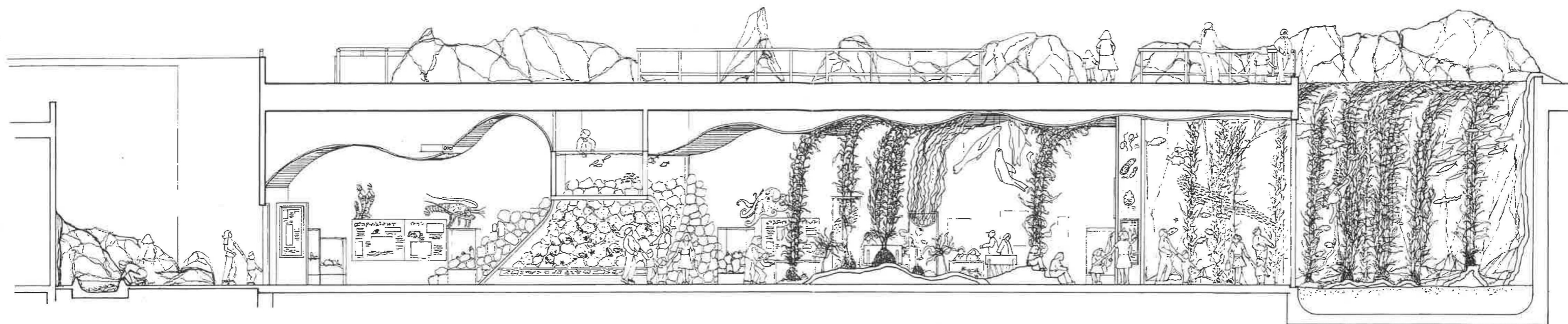


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TIDEPOOL TOUCHABLES

Exhibit Feature: Tidepool(s) with Hands-On Specimens

- Rock Louse
- Chitons
- Mussels
- Periwinkles
- Shore Crabs
- Hermit Crabs
- Sea Stars
- Sea Urchins
- Sea Cucumbers
- Gooseneck Barnacles
- Keyhole Limpet
- Abalone
- Rock Scallops
- Worms
- Sponges
- Snails

ROCKY REEFS AND BREAKWATERS

Exhibit Feature: Walk-Through Breakwater "Tunnel"

- California Spiny Lobster
- Anemones: Giant Green, Corynactus, Bright Red
- Abalone: Black, Green, Red, Pink, White
- Crabs: Hairy Hermit, Porcelain
- Sea Stars: Giant (Knobby), Ochre
- Gobies: Black-Eyed, Catalina, Blue-Banded
- Biennies
- Painted Greenlings
- Rockfish
- Rock Wrasse

KELP FOREST

Exhibit Features: Live Kelp Forest with Associated Lifeforms, Related Hands-On Exhibitory

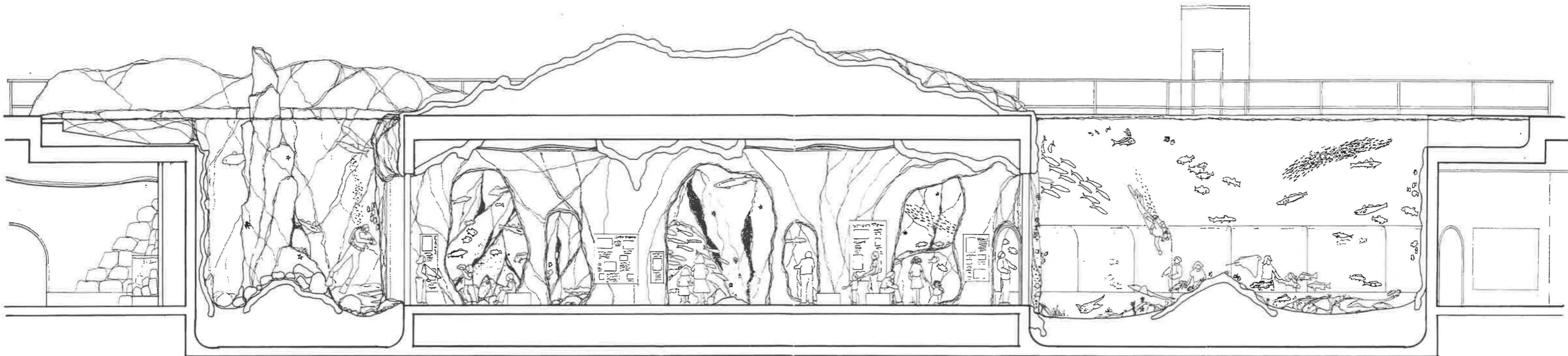
- Southern Kelp Crabs
- Purple Urchins (Related story: Eaten by Sea Otters)
- Sea Cucumbers
- Kelp Bass
- Island Kelpfish
- Garibaldi

Cabrillo Marine Aquarium Master Plan 1995

City of Los Angeles Department of Recreation and Parks

The Portico Group Architects and Landscape Architects
Enartec Engineering Planning Architecture

Langdon Wilson Architecture Planning
The Lyon Group



ROCKY REEFS AND BREAKWATERS

CATALINA REEF

Exhibit Feature: Towering Walls of the Encrusted Living Reef, with Associated Lifeforms

- Octopus
- Morey Eel and Cleaner Shrimp
- Shrimps
- Sea Hares and Navanax
- Nudibranchs (Sea Slugs): Spanish Shawl, Thick Horned Aeolid, Sea Lemon, Macfarland's Dorid, Santa Barbara, Rainbow
- Snails: Chestnut Cowrie, Large and Little Coffee Bean, Kelle's Whelk, Wavy Top and Red Turban, Blue Top Shell, Bubble Shell, 3 Wing Murex, California Cone
- Sun Stars: Orange Sun, Sunflower, Morning Sun, Rose
- Bat Star, Soft Star, Fragile Star, Blood Star, Brittle Star
- Sea Urchins: Purple, Giant Red
- Sea Cucumbers: Southern California (Common), Sweet Potato, White Sea (Include models demonstrating reaction to stress, muscular changes, extrusion of sticky internal organs)
- Sea Squirts: Light Bulb Tunicate, Sea Peach, Stalked, Elephant Ear
- Corals: Purple, Solitary (Stony)
- Hydroids
- Sea Fans
- Worms: Flat (in mussel beds), Annelids - Feather Duster, Plume, Fragile, Tube, Colonial Sand Castle

THE CATALINA VIEWING GROTTO

Exhibit Feature: Cavern with Views into Catalina Exhibits; Rocky Reefs and Breakwater Interpretive Exhibitory

- Concepts of Ocean Biomes and Their Components
- Abyssal Realm/Aphotic Zone/Photic Zone etc.
- Methods of Reproduction
- Unique/Specific Species Characteristics (Biological Sonar, Excurrent Siphon, Pectoral Girdle, Peduncle, Radula, Ink Sac, Nettle Cell, etc)
- Parasitism
- Symbiotic Relationships
- Food Chain/Food Web/Predation
- Definitions of Classes
- Nannoplankton, Macroplankton, Larva, Other Organism States
- Metamorphosis

CATALINA CHANNEL

Exhibit Feature: Larger Fishes, Diver Demonstration, Replication of Channel Bottom and Walls

- Ham Shark
- Morey Eel and Cleaner Shrimp
- Wolf Eel
- Manta Ray
- Lingcod
- Cabezon
- Sculpin
- Black Seabass
- White Seabass
- Ocean Whitefish
- Jack Mackerel
- Sargo
- Opaleye
- Halfmoon
- Perch
- Blacksmith
- Sheepshead
- Senoria Fish
- Basking Shark (?)

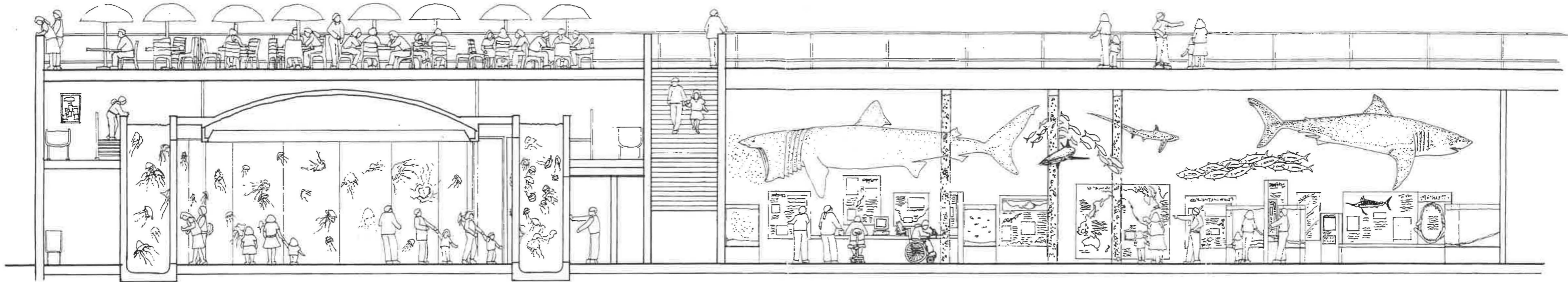
ENTRANCE TO OPEN OCEAN

Cabrillo Marine Aquarium Master Plan 1995

City of Los Angeles Department of Recreation and Parks

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Enartec Engineering Planning Architecture

Langdon Wilson Architecture Planning
The Lyon Group



OCEAN OF JELLIES

Exhibit Feature: Tall aquariums filled with jellyfish illuminated from overhead surrounding a circular gathering space.

Moon Jellies
California Purple Striped Jellies
Comb Jellies

OPEN OCEAN

Exhibit Feature: Life size graphics and models of oceanic fish and sharks, interactive laboratory character, water bubble columns and medium aquariums.

Zooplankton (brine shrimp)
By the Wind Sailors
Sponges
Sea Bass
Groupers
Concepts of open Pacific Ocean biome
Environmental Parameters of the Pacific Basin
Winds
Currents
Weather Patterns
Surface Temperatures
Satellite Data
El Niño
Oceanic Food Chain
Phytoplankton
Zooplankton
Squid & Jellies
Small Pelagic Fish
Large Fish: Mackerel, Yellowtail, Albacore, Bonito
Pelagic Sharks
Oceanographic Studies
Seamounts
Oceanic Trenches
Plate Tectonics
Vent Communities
Mysterious Animals
Megamouth Shark
Giant Squid

Cabrillo Marine Aquarium Master Plan 1995

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Site Analysis Memorandum

Location

The Cabrillo Marine Aquarium is located in Cabrillo Beach Park in the City of Los Angeles Community of San Pedro. The park is situated at the northern terminus of the Worldport LA harbor breakwater and is unique in the region because of its having both an open ocean beach with surf and access to tidepools as well as having a beach fronting on the protected waters of the harbor. Cabrillo Beach Park also contains a small salt water tidal marsh and a City of Los Angeles youth recreation facility.

Cabrillo Beach Park is adjacent to the Cabrillo Marina, a Worldport LA facility with major small boat harbor and related facilities including a large hotel, several restaurants and other marine oriented retail facilities.

The park is bordered on the north by a moderately high bluff. At the top of the bluff are residential areas of the San Pedro community and of Fort MacArthur, a U.S. Government installation.

The primary vehicular access for visitors from the rest of Los Angeles is via Interstate 110, the Harbor Freeway to San Pedro and then through the San Pedro central business district on Pacific Avenue. The present access to Cabrillo Beach Park is via Stephen White Way from Pacific Avenue. There is also a fully developed access road between the Cabrillo Marina and the park but it is closed to general traffic and only serves for access for the San Pedro waterfront trolley and for fire truck access.

The Cabrillo Marine Aquarium is a group of buildings situated on the north side of the park 270 ft across the parking lot from the harbor waters beach. It sits at the base of the sandstone bluff near Stephen White Way. Its entrance is on the south side of the building group. The only other major structure in the beach area of the park is the bathhouse building which is where the Cabrillo Marine Aquarium had its beginnings. A consideration for meeting the additional space needs of the aquarium is to renovate the existing bathhouse. The distance between the bathhouse and the present aquarium is approximately 700 ft. This separation may present a significant obstacle to efficient operation of the expanded aquarium facility utilizing space in both

Visual Setting

The aquarium is generally an interior experience but has a feel of orientation toward the south across the parking lot to the harbor waters. The existing aquarium is a single story complex of structures hugging the base of a sandstone bluff. The height of the building complex is low enough not to disturb views from the residences located at the top of the bluff.

The approach to the aquarium with the present access from Stephen White Drive brings visitors down into the beach and bathhouse circle then back toward the western side of the aquarium. This approach to the aquarium does not orient visitors to the entrance of the facility but rather has the effect of focusing on the back side of the complex. It appears that the intent of the architect for the preferred and designed approach and arrival of visitors was from the east past the Cabrillo Marina and into the site from Shoshone Road. The present arrival is visually confusing and uninspiring.

Parking is rather direct and available close to the entrance either to the south or to the east. There is little buffer around the aquarium and no significant view corridors toward the water in either the south or west directions. The visual effect is that the aquarium is surrounded by a sea of asphalt and land yachts.

The expansion opportunities at the site of the present aquarium are severely restricted to the north due to the proximity of the sandstone bluff. Possible expansion area may be available to the east, south and west. Expansion to the west would occupy space currently used for a parks maintenance yard and would improve the visual continuity of the development along the base of the bluff. An expansion to the west could improve the present arrival sequence with better recognition of the facility and visual clues to entrance and welcome. Two to three story building mass in this area will not adversely affect views for upslope residents.

Expansion toward the east would allow continuance of the visual continuity but would not necessarily improve the visual clues necessary for good visitor arrival from the Stephen White entrance. A two story building expansion is not likely to affect views from the houses at the top of the bluff.

Expansion toward the south offers the opportunity to reorient the entrance and improve the arrival sequence. Any expansion to the south would bring the aquarium closer to the beach and water offering the opportunity

for the facility to develop some view orientation toward the water of the harbor. An expansion to the south will increase the visual presence of the aquarium. The impact on the views from upslope residents would need to be carefully studied but would unlikely block water views.

Climate

The climate at Cabrillo Beach is similar to the climate at all Southern California beach areas. The usual description of the climate is "wonderful" but it is sometimes referred to as "fantastic." The climate is described by climatologists as Mediterranean and is tempered by the effects of the ocean and harbor. The normal temperature range allows for many or most of the public areas to be naturally ventilated without additional cooling. Heating capability is required for winter operations but will only be required during periods of rare extreme weather. Air conditioning is required for areas normally completely enclosed such as the offices, auditorium and possibly some classrooms.

Winds are normally moderate but can reach very high levels during storm conditions. The southern orientation of the site exposes the aquarium and the beaches to the direct force of low pressure storm systems moving on shore. There is great opportunity for partial enclosure of many elements of the expanded aquarium with roofs and walls required only for light control and wind and rain protection.

The location of the aquarium at a south facing beach area results in air that is high in salt and water content. This causes a rather severe corrosion concern for structures containing concrete and steel. The present building contains many areas where there is visible corrosion of the galvanized steel including connectors, hollow metal doors and frames, and life support systems. Future work needs to emphasize use of plastics, wood and other corrosion resistant materials.

Urban Design Considerations

Cabrillo Beach Park and the Cabrillo Marine Aquarium do not have easy or well signed and directed access from the freeway system. The park is adjacent to a residential neighborhood and there is occasional traffic congestion within the residential areas of San Pedro due to park visitor access. San Pedro is also home to two other significant visitor attractions: the cruise ship terminal and Ports of Call Village, a themed waterfront shopping and restaurant complex. Development of an expanded

aquarium at Cabrillo Beach will require improvements in the transportation infrastructure to allow interconnection of all of the area visitor attractions. This will make it easier for visitors to confidently plan excursions to San Pedro for whole day visits. At present the aquarium's 350,000 visitor annual attendance is not likely to be providing a significant boost to the San Pedro economy.

With a larger facility and reasonable marketing, it is likely that the aquarium will attract at least 1 million visitors per year which will have a much more significant impact on the local business economy. The incorporation of satellite parking, possibly near the business district or Ports of Call Village would serve to help maximize the economic impact of added visitors to the aquarium. It is possible that significantly more than 1 million visitors per year may be attracted to the aquarium. If that occurs, there may need to be significant upgrading of the transportation infrastructure to meet the need.

Additional Recommended Site Studies

Soils and Geology, Foundation Investigations

The soils at Cabrillo Beach Park are likely composed of various natural and artificial fill materials. It is likely that a pile supported foundation structure may be required for any significant structures at the site. Once the size and location of expansion facilities is identified, a complete geotechnical investigation of the site will be necessary.

Utilities and Drainage

The existing condition and size adequacy of the utilities serving the aquarium is not presently known. The Cabrillo Marine Aquarium is served by city sewer and water services. When the aquarium was initially constructed, there was inadequate water main capacity to support fire flow requirements. To mitigate this problem, a large water storage tank was located behind the aquarium building on the west side. It is believed that the water supply has subsequently been upgraded and that there is presently adequate fire flow available. A detailed study of the condition and capacity of the utility services will be needed as part of the initial work toward design of the aquarium expansion.

Site Survey and Topography

No detailed site survey was able to be located in the city files. The aquarium is located on Port of Los Angeles property. The Port of Los

Angeles provided a recent aerial survey at a scale of 1"=100'. This information is adequate for planning purposes. A new aerial survey with ground verification and topographic contours will be needed as part of the initial work toward design of the aquarium expansion.

Traffic Planning and Parking

The existing traffic flow into Cabrillo Beach Park is routed along Pacific Avenue to turn left on Stephen White Way to enter the park. Residents of the nearby neighborhood report that there are times on weekends when traffic trying to enter Cabrillo Beach Park is backed up onto Pacific Avenue and causes dangerous congestion. At present, during times of most severe traffic problems, the police department provides a traffic officer to direct and control the traffic at the intersection of Pacific Avenue and Stephen White Way. The alternate route of arrival to Cabrillo Beach Park along Via Cabrillo Marina and Shoshone Road is presently closed to traffic into the park area. We recommend a traffic engineering study to determine the most efficient and safest routes of traffic flow to the park and aquarium.

The Port of Los Angeles has expressed concern about accessing the park from the east with traffic flowing past the Cabrillo Marina. Their concern is about the amount of traffic and maintaining the high quality atmosphere and security for the Marina and the Youth Center. These concerns will need to be addressed in the traffic study. It is our opinion that there are several ways to address and mitigate the concerns and that having primary access from the east may improve traffic flow and safety especially on Pacific Avenue near Stephen White Way.

At present there is room for approximately 500 automobiles in the main parking area near the aquarium plus approximately 105 boat trailer spaces at the boat launch. There is additional parking on the breakwater near the fishing pier. If the boat launch were moved to a better location with better access an additional 370 parking spaces would become available with only simple restriping of the pavement.

A visitor facility such as Cabrillo Marine Aquarium which attracts around 1 million visitors per year, needs to have between 1,000 and 1,250 parking spaces available. With the maximum of 870 spaces on grade to serve both the beach activity and the aquarium it is obvious that additional parking is needed for summer design days and for peak days. It may be possible to add 200 to 300 spaces with a parking deck along the north side of the existing parking. It is also recommended that a study be conducted to

Cabrillo Marine Aquarium	
Master Plan	
The Portico Group, Architects & Landscape Architects	
Langdon Wilson, Architecture - Planning	
Draft Facilities Program	
Space Description	Area: SF
Proposed Facilities	
1 Discovery Cove Swim-Thru Aquarium	13,000
1 Public Lockers & Showers	4,000
1 Aquarist Dive Quarters	4,000
1 Aquarist Prep Lab	1,120
1 Aquarist Office (5 People)	800
1 Visiting Exhibits Hall	10,000
1 Temporary Exhibits Receiving Area	2,000
1 Exhibit Lab (5 People)	1,000
1 Exhibit Storage	800
1 Workshop & Material Storage	800
1 Discovery Center	
1 Media Center	1,500
1 Sea Search Laboratory	1,500
1 Animal Husbandry Lab	1,600
1 Collections Storage	800
1 Collections Office & Prep	400
1 Library Expansion	600
Submarine Simulator	2,500
Submarine Simulator Expansion Space	7,500
1 Giftshop	2,500
1 Giftshop Office & Storage	750
1 Offices for 17 & Lounge	3,600
1 Graphics Lab	480
1 Office Storage	400
1 Conference Room	1,440
1 Volunteer/Friends Offices for 6	1,440
1 Volunteer Center	1,440
1 Outdoor Stage with Roof	9,000
1 Programs Storage	800
1 Garage	4,000
1 Custodial Office for 2	300
1 Multi-Purpose Room Expansion	400
Entrance/Aquarium Introductory Area	900
1 Live Shorebirds	3,000
Live Shorebirds Holding	400
1 Kelp Tank	4,225
Marine Mammals Exhibit	2,500
Marine Mammals Holding	300

Cabrillo Marine Aquarium	
Master Plan	
The Portico Group, Architects & Landscape Architects	
Langdon Wilson, Architecture - Planning	
Draft Facilities Program	
Space Description	Area: SF
1 Life Support System	8,000
Mobile Aquarium Holding	400
Off Exhibit Aquarium Holding	1,600
Quarantine Aquarium Holding	400
Restrooms	672
Food Service	560
Rental Space	1,200
Boat Moorage/Service Area	720
Total Proposed Facilities	105,347
Existing CMM Facilities	
Auditorium	3,151
Projection Booth	200
Loading Dock	300
Multi-Purpose	560
Restrooms	780
Exhibit Area	7,560
Aquarist Lab	608
Exterior Wet Lab	480
Touch Tank	1,177
Information	168
Physical Plant	400
Shop	560
Collections Prep/Storage	680
Classroom	1,728
Projects Lab	1,024
Administration	2,589
Library	300
Total Existing Facilities	22,265
Central Court	5,570
Fenced Service Yard	12,321
Existing Bathhouse Renovation	
2 First Floor:	
Lobby	1,500
Cafe	1,200
Kitchen/ Food Prep	920
Education Offices	150
Beach Rental/Storage (Men's Shower)	1,266
Discovery Center/Lib Reading Rm/Open Specir	1,750
Discovery Center Wet Lab/Research	1,050
Collection Specimen Storage/Wet Lab (Womer	1,590
Program Storage	480
Police Substation	388
Restrooms	375
Bathhouse Office	165
Friends of CMA Offices	512
Community Meeting Room	1,050

Cabrillo Marine Aquarium	
Master Plan	
The Portico Group, Architects & Landscape Architects	
Langdon Wilson, Architecture - Planning	
Draft Facilities Program	
Space Description	Area: SF
Weight Room	390
Polar Bear Club Room	510
Program Storage	195
Stair	182
Unassigned (Men's Restroom & Dressing)	474
Total First Floor	14,147
2 Second Floor:	
Community Room (Old Ballroom)	2,040
Media Center	276
Spectators Gallery	430
Storage	150
Unassigned	660
Stair	200
Balcony	816
Tower: Weather Station and Observation	144
Restrooms	540
Total Second Floor	5,256
Total First and Second Floor	19,403
Footnotes:	
1. Cabrillo Marine Museum, Plan for the 1990's	
Revised Proposal, January 1990	
Table II, Long Range Plan for the 1990's	
Space Requirements	
2. Acquisition Study, Old Cabrillo Marine Aquarium	
Date: September 21, 1993	

LIFE SUPPORT SYSTEMS

A. INTRODUCTION

The first part of this section discusses the various aspects of Life Support Systems (LSS) in a general sense, followed by a brief discussion of the existing systems. The last part discusses the proposed overall water management strategy and LSS requirements of the exhibits proposed in the Master Plan.

B. GENERAL DESCRIPTION

1. Introduction

Life Support Systems are the mechanical, biological and chemical processes that provide the animals with aquatic environments as close as practical to those encountered in their natural habitats, and as free of debris and pathogenic bacteria and viruses as technically feasible. The design of the LSS must comply with regulatory requirements for animals in captivity, and standards established by the industry. For exhibit reasons, the water must also be aesthetically pleasing. Just as important, the LSS must be relatively simple in its operation, fail-safe, and economical to operate and maintain. These systems sustain the animals' life and must function uninterrupted; therefore, they must be reliable and conservatively designed.

2. Filtration and Circulation of Water

The purpose of filtration and circulation of exhibit water is to remove, rapidly and efficiently, the wastes introduced by the animals and the surrounding environment, and to bring the water to the air interface for re-oxygenation. Water recirculation, currents and movement, in general, is also thought to be necessary for the growth of certain plants and organisms.

Animal wastes contain:

- Solid particles, which can vary in size from several inches (e.g., uneaten food) to very small colloidal size particles which detract from the visual quality of the water.

- Pathogenic bacteria and viruses, which, if allowed to proliferate, can cause the animals to become sick and possibly die.
- Ammonia and other substances that change the chemical balance over time and are toxic to fish.

For good filtration, the water is circulated through the exhibits at a rate commensurate with the rate at which wastes are introduced. The rate of circulation is often referred to as the "turnover" period, which reflects the theoretical time it takes to circulate and filter all the water of an exhibit.

The filters most commonly used in modern LSSs are low pressure, medium rate sand filters. The advantages of these filters include:

- Space efficiency
- Energy efficiency
- Desired water quality is achieved
- Ease of maintenance and operation
- Nonproprietary and economical to fabricate (as designed by ENARTEC)
- Can be fabricated from either steel or fiberglass
- Used very successfully in similar exhibits

For smaller exhibits, cartridge filters are frequently used. A significant advantage of cartridge filters is that they do not require backwashing.

Biological "filters" are also incorporated in most of the exhibits. Biological filtration enhances the growth of nitrifying bacteria, which oxidize the fishes' toxic nitrogenous waste, ammonia and nitrates, to relatively nontoxic nitrates. In addition to the "incidental" surfaces in contact with the water, biological filtration is aided by flowing the exhibit water through the substrate media of the exhibit tanks, trickling filters, and vessels packed with media with a high specific surface area.

3. Heating and Cooling

The heating and cooling requirements of exhibits vary with the species of animal. Different animals require different temperatures, which, for good health, should be as close as possible to their natural environment, and constant.

Heat transferred to the exhibit water occurs through convection, conduction, radiation, evaporation/condensation, and friction of the moving water. To maintain a desired temperature or range of temperatures, exhibit waters are warmed or cooled indirectly by the use of heat exchangers.

4. Ozonation

Ozone gas is used to provide disinfection and enhance the water clarity in exhibits. Ozone is a strong oxidant and has been successfully used to treat the water of aquatic exhibits for both fish and mammals for 20 years. The techniques of application to aquatic systems have been greatly improved in the last several years for maximum efficiency and safety.

5. Chemical Treatment

Other chemical treatments of the water may include sodium hydroxide (caustic soda), lime, sodium carbonate, or bicarbonate to raise water pH; and hydrochloric acid to lower the pH. Aluminum sulfate and polyelectrolytes are sometimes used as flocculents and filter rates. Chlorine may also be used for periodic washdown of the sea otter exhibit.

6. Filter Backwash Recovery System

In closed and semi-closed systems it is cost-effective to install a system to reclaim filter backwash water. This is performed by a *backwash recovery system*. When the exhibit recirculation filters become dirty, they are backwashed with exhibit water. This water is then cleaned or reclaimed by *recovery filters*. Thus, the loss of seawater, which has a high value because it is disinfected and temperature adjusted, as well as the need for new makeup water, is minimized.

A recovery system consists of tanks for holding the dirty and reclaimed backwash water, and small recovery filter(s). The recovery filter(s) clean the dirty backwash water, which is then stored for reuse. When the recovery filter(s) become "plugged" they are backwashed with freshwater from the domestic water supply system, and this backwash water is discharged to the sanitary sewer.

7. Automated System Operation

Automation is not only an investment which pays for itself in a short time with saved manpower, but it also has intangible benefits sometimes overlooked. These benefits include smoother system operation, better water quality, and closer control and monitoring of essential functions. The LSS should include, as a minimum, the following automated operations:

- Filter flow control (for uniform filtration rates)
- Filter backwash (to conserve water and operator time, and to ensure timely cleaning)
- Backwash recovery
- Temperature control
- Level control of exhibits and support tanks

The use of microcomputers makes these control and monitoring systems economical and flexible.

C. EXISTING SYSTEMS

A straight beach well (no radial collectors) serves as the seawater supply. The water is pumped from the beach well to the Aquarium through what is thought to be about a three inch pipe. Therefore, the flow rate is probably on the order of 150 gpm. This water is used only to replenish water lost due to backwashing of the filters.

The filters are backwashed with system (display) water, and the backwash water is discharged directly to the sewer. The City apparently monitors the Aquarium's discharges on a somewhat informal basis.

The beachwell water is pumped to a 10,000 gallon underground tank where it is aerated. From there the water is filtered through diatomaceous earth (DE) filters to remove iron and polish it, and discharged to a second underground tank for storage. This system seems to work well except that the filter pump and related valves are in an extremely small underground vault, making it very difficult to maintain them.

There are four water systems. These originally were devoted to different families of species, a practice which has gone by the wayside. System 1 is dedicated to the

tide pool; the remainder of the exhibits are divided among the other three systems. There are a total of about 35 exhibits, ranging from about 20 to 1,000 gallons; and the exhibit water totals about 10,000 to 15,000 gallons.

The systems typically operate as follows: Exhibit water overflows the exhibit tanks via Hartford Loops (downflow biofilters in the exhibit tanks), and flows to one of three sumps (500 to 1,000 gallons each). The water is pumped through a heat-exchanger, foam-fractionator, and back to the exhibits.

System 1 has a dedicated 3 foot diameter sand filter. For the other systems there are two 6 foot diameter vertical steel filters which alternately provide filtration for Systems 2, 3 and 4. That is, Systems 2, 3 and 4 are each filtered, in rotation, for about eight hours a day. A side stream of these sand filters is run through activated carbon.

Each of the exhibits is set-up so the public can see them from all four sides. That is, in addition to the formal viewing side, the back of the exhibit is also on display. The apparent theory of this approach was to share with the public the "workings" of the exhibits, LSS techniques, etc. Therefore, all the piping, valves, etc. are exposed. This creates maintenance problems for the staff, and there seems to be a desire to get away from this approach by, perhaps, only displaying the working parts of one exhibit.

In general, the systems were originally constructed of mechanical components not suitable for seawater. Much of the original systems have been replaced over the years with non-corrosive materials, but there are still remnants of carbon steel. Also, the LSS area generally suffer from deferred maintenance. The Aquarium has to rely on the City for much of its maintenance needs, and equipment generally does not get looked at until it breaks.

As a general observation, in consideration of new, larger, modern LSS, the Aquarium's maintenance program must be improved, as well as an emphasis put on dedicated LSS operating staff. This will require an overall re-thinking of the Aquariums operation and maintenance strategy.

Due to the age of the existing system, and the fact that most of the components are in poor condition, it will not be used, for the most part, in the new Aquarium. Early in design, however, all components will be carefully examined to determine if they can be salvaged for the new facilities. And, in any case, some components can

probably be used for "back-area" holding and quarantine tanks, or support facilities of a similar nature.

The fact that the existing beachwell water system is in place also makes it a logical back-up source of water, although requiring treatment for iron removal and low dissolved oxygen. Therefore, if and how to incorporate the beachwell into the new facilities will also require discussion in the early stages of design.

D. PROPOSED NEW SYSTEMS

1. Overall Strategy

The overall Life Support System components will consist of an intake and discharge system, a backwash recovery (or discharge treatment system), and the filtration/disinfection systems for the exhibits themselves.

The Aquarium desires to introduce unfiltered seawater into the exhibit tanks, particularly the Kelp Bed Exhibit, on a routine basis as a means of enhancing the growth of the flora and fauna. This approach, augmented by mechanically generated water movement, has been very successful at other institutions—most notably, the Monterey Bay Aquarium—to achieve spectacular, live displays, as opposed to attempting to achieve the same "look" with artificial representations.

There are a number of ways to configure an intake system to achieve this objective, the specifics of which need considerable discussion in the early stages of design. However, all alternatives incorporate the following basic components:

- Intake pipe drawing from a suitable ocean depth.
- Intake pumps.
- Dual intake pipes from the shore facilities to the Aquarium site.
- Seawater filters to provide filtered make-up water to those exhibits where unfiltered water is not desired.
- Means of discharging "wasted" seawater.

Additionally, basins are usually required to store filtered and unfiltered seawater.

In adopting this type of operation—specifically, the handling of unfiltered seawater—it must be realized that significant regulatory issues will have to be resolved, and the Aquarium's current operation and maintenance requirements will be increased

Aquarium's current operation and maintenance requirements will be increased substantially. In short, the advantages of unfiltered water come at a price, which must be considered carefully.

Further, although the Aquarium is supplied with a source of "fresh" seawater, provisions must also be made to "close-up" the systems in the event of temporary manmade or natural pollution at the seawater intake. Thus, there will still be the need to reclaim and reuse all water for perhaps extended periods of time. Therefore, the incorporation of a recovery system for the filter backwash water is necessary unless significant water storage is provided. However, the equivalent of a backwash water recovery system will probably be necessary in any case to clean this water up prior to discharge to the storm drain, sanitary sewer or ocean.

As pointed out above, these issues must be discussed and explored with the appropriate regulatory agencies before a final strategy is adopted.

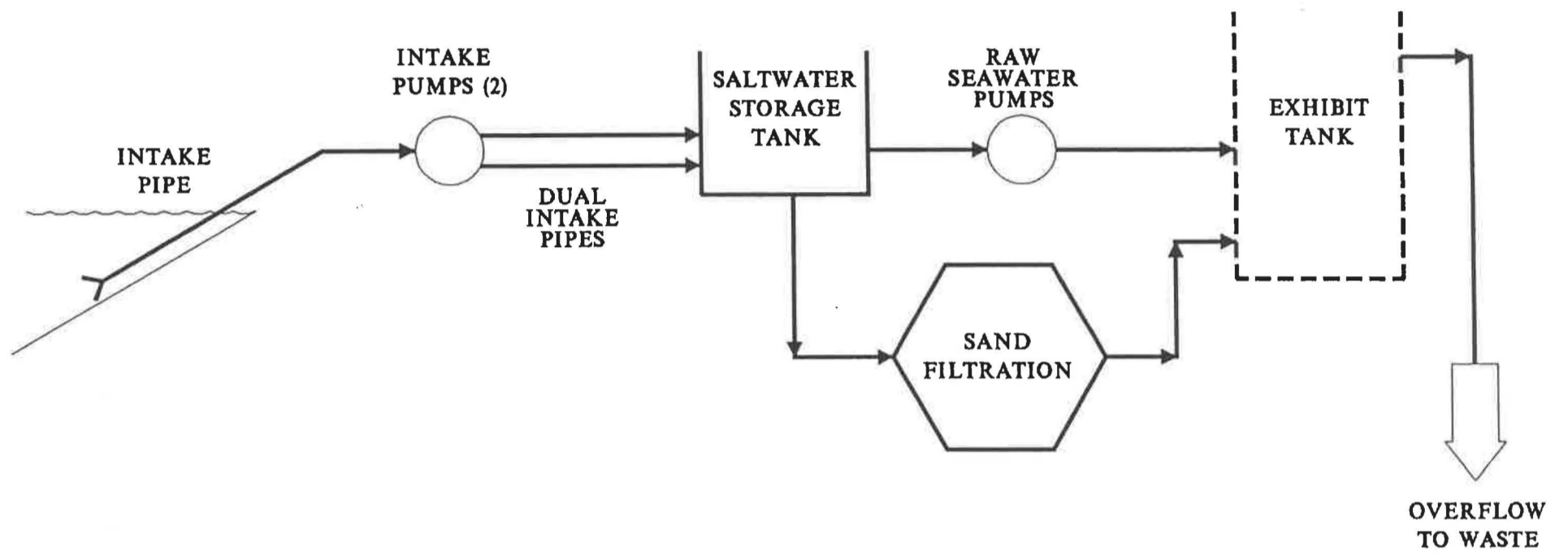
2. Intake System

The preliminary concept for the intake system is as follows. The basic components will be as listed above, and a schematic drawing of the conceptual intake system is shown in Figure 1. An intake pipe will draw from a depth of at least 30 feet in the vicinity of Point Fermin Marine Life Refuge. The length of the intake pipe is anticipated to be 50 to 200 yards, which must be defined by further study.

A pump station will be located where the intake pipe comes ashore; there duplex pumps will pump the seawater approximately 1,000 feet to the Aquarium site. The seawater will be alternately pumped through dual pipelines: one pipeline will normally be out of service for organism kill-off and cleaning, while the other pipeline is in service.

The seawater will be discharged to a storage basin at the Aquarium. From the storage basin, unfiltered seawater will be pumped directly into the exhibit(s), or to filters to supply filtered seawater to the exhibits. It is anticipated that the intake pumps will send a constant supply of seawater to the aquarium, and water not used will discharge to the storm drain. Likewise, any water displaced by the addition of new seawater will overflow to the storm drain.

FIGURE 1
SEAWATER INTAKE SYSTEM
PROCESS SCHEMATIC



3. Backwash Recovery System

Contrary to the current practice of discharging filter backwash water to the storm drain, it is anticipated that backwash water from the exhibit filters will have to be treated.

There are a number of reasons for this. First, it is not prudent for the Aquarium to be completely reliant on the intake for its source of water. The occurrence of natural or manmade pollution at the intake would put the aquarium in a precarious position—thus, the need to recycle. Secondly, with the expansion of the exhibits in number and size, and the associated substantial increase in the quantity of backwash water, it is unlikely the regulatory agencies will allow untreated backwash water to be discharged to either the sanitary sewer or storm drain because of either the pollutant load or salinity. Lastly, the exhibit water has intrinsic value due to the fact that it is disinfected and temperature adjusted, and should not be disposed of unnecessarily.

A schematic drawing of a backwash water recovery system is shown in Figure 2. As indicated, filter backwash water is concentrated in sand filters, which are in turn backwashed to the sanitary sewer with potable water. Following, removal of solids from the exhibit backwash water, the treated backwash water is then returned to the exhibits on demand, or discharge to the storm drain or sanitary sewer.

4. Exhibit Systems

With regard to the LSSs, the exhibits will generally consist of two classifications of water, as follows:

- Seawater/fish
- Seawater/mammal (sea otter)

Each of these types of water must be managed separately. The various sizes of exhibits, which range from less than a hundred gallons to over two million gallons, and the species of animal displayed necessitate a number of different LSS processes. In addition to fish and mammals, certain exhibits will also exhibit invertebrates, which must also be addressed in designing the respective systems.

THE LYON GROUP

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21 June 1994

The Portico Group
106 Lenora Street
Seattle, WA 98121-2210

Re: Economic and Financial Outlook of the CMA

Dear The Portico Group:

This memorandum provides The Portico Group findings on our scope of services for work on the Cabrillo Marine Aquarium ("CMA"). Specifically, the following discussion provides statements on the following topics:

- o The Southern California Marketplace
- o Major attractions in Southern California
- o Major aquariums in North America
- o Attendance Potential
- o Physical Requirements
- o Financial Potential

THE MARKETPLACE

The marketplace consists of residents (potential day-trippers to the aquarium) and tourists (persons staying overnight in the area). These two market segments are discussed briefly below.

The Resident Market

The CMA is located in a very populous area of the United States. There are approximately 18 million people residing within 100 miles of the site (roughly a two-hour drive). More

impressive, there are more than 13 million residents living within 50 miles of the aquarium. These data are shown in Table 1 below.

Table 1

POPULATION OF RESIDENT MARKET
AND PROXIMATE CITIES

<u>ZONE</u>	<u>POPULATION</u>
Primary Resident Market (0-50 mi)	13.2 Mil
Secondary Resident Market (50-100 mi)	4.8 Mil
TOTAL RESIDENT MARKET	17.9 Mil

OTHER POPULATION DATA

City of Long Beach	0.4 Mil
City of Los Angeles	3.6 Mil
City of Santa Ana	0.3 Mil

Source: Sales & Marketing Management's, "1993 Survey of Buying Power" and The Lyon Group.

The age characteristics of the resident market are somewhat younger than normal, as depicted by Table 2. The median ages for Los Angeles and Orange Counties are 31.1 and 31.9 years, as compared to the national average of 33.4 years. In the main, this is due to a more youthful marketplace. In fact, some communities, such as Santa Ana are very young. This is a positive characteristic for an aquarium.

With respect to household income (effective buying income -- EBI), the characteristics are reasonably solid as well. Both Los Angeles and Orange Counties are well above the

national median values; there are pockets of marginally low incomes, such as the City Of Los Angeles. However, there appear to be no major abnormalities to expect the Aquarium to behave other than normal.

Table 2

AGE CHARACTERISTICS

<u>Jurisdiction</u>	<u>Age Distribution</u>			<u>Median Age</u>
	<u>0-17yrs</u>	<u>18-49yrs</u>	<u>50+yrs</u>	
City of Long Beach	26.1%	53.3%	20.6%	30.5 yrs
City of Los Angeles	25.4%	53.4%	21.2%	31.1 yrs
City of Santa Ana	31.3%	55.1%	13.6%	26.1 yrs
Los Angeles County	26.8%	52.1%	21.1%	31.1 yrs
Orange County	24.9%	53.8%	21.3%	31.9 yrs
State of California	26.6%	51.1%	22.3%	31.9 yrs
United States	25.9%	48.6%	25.5%	33.4 yrs

Source: Sales & Marketing Management's, "1993 Survey of Buying Power," and The Lyon Group.

THE TOURIST MARKET

There are a variety of estimates of overnight tourism to the Los Angeles area; the estimates vary from fewer than 20 million visitors to in excess of 50 million visitors.

According to the Los Angeles Visitor & Convention Bureau (CIC Research, Inc.), there were approximately 25 million overnight visitors in 1992; this value has been relatively constant over the past few years. Approximately 36 percent of the visitors stay in a commercial lodging facility and the balance in a private home. Thus, by appealing to the resident population, there is a built-in marketing opportunity for most tourists.

The length of stay in the area is significant. For tourists staying in commercial lodging facilities, the estimate is that the average length of stay is approximately 3.6 nights. For those staying in a private home, the average length of stay is much longer -- 8.2 nights.

Thus, there is considerable opportunity for tourists to partake of leisure-time activities while in the Los Angeles area.

Table 3

MEDIAN HOUSEHOLD EFFECTIVE BUYING INCOME
Calendar Year 1992

<u>JURISDICTION</u>	<u>EBI (\$)</u>
City of Long Beach	33,945
City of Los Angeles	32,902
City of Santa Ana	37,294
Los Angeles County	36,869
Orange County	47,774
State of California	37,686
United States	33,178

Source: Sales & Marketing Management's, "1993 Survey of Buying Power."

It is noted that these tourism values are for Los Angeles County only and do not include either Orange County or pass-through tourists. Thus, the tourist population is large and stays for a long period of time. This information is summarized in Table 4 below.

Table 4

TOURISM TO LOS ANGELES COUNTY, 1992

	<u>Number</u>	<u>Visitor Nights</u>	<u>Length of Stay</u>
Hotel/Motel Guests	9.0 Mil	32.3 Mil	3.6 nights
Private Home Guests	<u>16.1 "</u>	<u>132.7 "</u>	<u>8.2 nights</u>
Total	25.1 Mil	165.0 Mil	6.6 nights

AREA ATTRACTIONS

There are many, well-attended attractions in the Greater Los Angeles area. On the one hand, the populations (residents and tourists) are accustomed to visiting attractions in the area. However, on the other hand, the CMA must compete with these attractions, most of which are both commercial and aggressively marketed.

To note a few of the area's attractions, Table 5 is provided below.

Table 5

<u>Estimated Recent Attendances (millions)</u>			
<u>Los Angeles/Orange County</u>		<u>San Diego County</u>	
Disneyland	11.6-14.4	Sea World	3.3-3.8
Universal Studios	4.2- 5.1	S.D. Zoo	3.0-3.8
Knott's Berry Farm	4.0- 5.0	Wild Animal Park	<u>1.1-1.5</u>
S.F. Magic Mtn	3.0- 3.2		7.4-9.1
Q. Mary/S. Goose	<u>0.8- 1.0</u> (E)		
	23.6-28.7		

It also is noted that multiple attractions can co-exist in the same marketplace in Southern California is made evident when one notes that several major attractions perform well in the Southern California marketplace. For example, one has Disneyland, Universal Studios Hollywood, Six Flags Magic Mountain, Knott's Berry Farm, the Queen Mary/Spruce Goose (now trivial), Sea World, the San Diego Zoo, and the San Diego Wild Animal Park.

The Southern California public has demonstrated that it has the discretionary time and the discretionary income to attend multiple attractions in their marketplace, as seen below.

The values are not to be taken literally. While there are sources for these values (such as Amusement Business and USAMA), some values include complimentary admissions and others do not; also, the Knott's attraction counts visitors to their complex and not only the theme park, the latter of which may be 75 percent of the total attendance. What the data do convey are more than 30 million annual visits to these major Southern California attractions.

Comments on the industry which this Consultant believes are germane are as follows:

- o Most conventional attraction products achieve their market capture rather fast, often in the opening year; their struggle, then, becomes one of maintaining their attendance levels through new investments and creative marketing.
- o Major increases in attendance are related to major increases in investment and entertainment capacity.

One final comment: A seeming advantage which the CMA has is that it is an educational and cultural facility that is non-commercial in nature; also, the existence of live species gives it a special place in the marketplace -- as do zoos and Sea World, as examples.

INFORMATION ON SELECTED AQUARIUMS

The purpose of this section is to present information on selected aquariums in North America.

Aquariums have become very popular during the past two decades, especially as a component of water-oriented, redevelopment projects such as Boston or Baltimore. Typically, the mission statements of these facilities focus on education and science; several are owned by government agencies, but the majority are operated by private, non-profit organizations. These facilities are usually tied in some manner to either the local, regional, or federal governments for either the land or the initial capital, and/or operating support. Eleven major North American aquariums are discussed below. It is noted that these facilities attract more attendance than will be expected at a moderately expanded CMA; this is due primarily to the marketing constraints of the CMA, the accessibility to the aquarium, and the scope and quality of the visitor experience. The quality of these facilities, however, is akin to the quality expected of new exhibits and, therefore, it is meaningful to discuss them.

The existing facilities reviewed include:

- Aquarium of the Americas -- New Orleans, LA
- Monterey Bay Aquarium -- Monterey, CA
- Mystic Marineline Aquarium -- Mystic, CT
- National Aquarium in Baltimore -- Baltimore, MD
- New England Aquarium -- Boston, MA

New York Aquarium -- New York, NY
Seattle Aquarium -- Seattle, WA
John G. Shedd Aquarium -- Chicago, IL
Steinhart Aquarium -- San Francisco, CA
Texas State Aquarium -- Corpus Christi, TX
Vancouver Aquarium -- Vancouver, BC Canada

Pertinent characteristics of the eleven major aquariums are summarized on the following table (Table 6). One of the newest aquariums on this list and the facility with the highest attendance in 1991 is the Aquarium of the Americas in New Orleans which hosted an estimated 2.36 million visitors in its first full year of operations (Sep '90-'91). Very comparably, the Monterey Bay Aquarium attracted approximately 2.4 million visitors in its opening year (1984), and this state-of-the-art facility has set the pace consistently for aquarium attendance since it opened. As shown on the fore-referenced table, the size of these facilities ranges from 43,000 sf at the new Texas State Aquarium in Corpus Christi, Texas to the recently enlarged, 400,000 sf John G. Shedd Aquarium in Chicago, Illinois.

The above aquariums have been in operation for at least one full calendar year. There are three new aquariums which have completed a full year's operation, though not a full calendar year. These three are:

- o New Jersey State Aquarium -- Camden, NJ
- o Oregon Coast Aquarium -- Newport, OR
- o Tennessee Aquarium -- Chattanooga, TN.

These aquariums are listed in Table 7 and discussed later.

Also, it has been estimated that as many as 70 cities have considered or are planning large-scale aquatic facilities. Currently, there are at least three cities which have formally announced plans or are under construction with aquarium facilities. These include:

Cleveland Aquarium -- Cleveland, OH
Florida Aquarium -- Tampa, FL
South Carolina Aquarium -- Charleston, SC

CMA ATTENDANCE OUTLOOK

Given the size of the marketplaces -- resident and tourists -- annual attendance to the Aquarium has an upper bound that is considerably larger than its current annual attendance

Table 6
 INFORMATION ON SELECTED AQUARIUMS

Attraction/Location	1992 Total Attendance (millions)	1993 Admission Prices			Building Size (s.f.)	Year Opened
		Adult	Special	Child (ages)		
Aquarium of the Americas New Orleans, LA	1.43	\$8.75	\$6.50	\$4.50 (2-12)	108,000	1990
Monterey Bay Aquarium Monterey, CA	1.76	\$10.50	\$7.75 M,Sr,St	\$4.75 (3-12)	216,000	1984
Mystic Marineline Aquarium Mystic, CN	0.74 FY92	\$9.00	\$8.00 Sr	\$5.50 (5-12)	57,000	1973
National Aquarium in Balt. Baltimore, MD	1.52	\$11.50	\$9.50 Sr	\$7.50 (3-11)	209,000	1981
New England Aquarium Boston, MA	1.33	\$7.50	\$6.50 Sr	\$3.50 (3-11)	75,000	1969
New York Aquarium New York, NY	0.74 FY92	\$5.75	\$2.00 Sr	\$2.00 (2-12)	75,000	1896
Seattle Aquarium Seattle, WA	0.62	\$6.50	\$5.00 D,Sr \$4.00 Y	\$1.50 (3-5)	67,000	1977
John G. Shedd Aquarium Chicago, IL	2.24	\$7.00	\$5.00 Sr	\$5.00 (3-11)	400,000	1930
Steinhart Aquarium San Francisco, CA	1.28	\$6.00	\$3.00 Sr,Y(12-17)	\$1.00 (6-11)	125,000	1923
Texas State Aquarium Corpus Christi, TX	0.50	\$7.00	\$6.00 Sr	\$3.75 (4-17)	43,000	1990
Vancouver Aquarium Vancouver, BC	0.74	\$9.50 Cdn	\$8.25 Cdn Sr,Y(13-18)	\$6.25 Cdn (5-12)	99,000	1956

Notes: (1) D=Disabled, M=Military, Sr=Senior, St=Student, Y=Youth; (2) Information as of August 1993

(3) Steinhart = Calif. Academy of Sciences; (4) NY Aquarium = Aquarium for Wildlife Preservation, attendance = paid only

Source: Individual aquariums and The Lyon Group.

Table 7
SUMMARY OF SELECTED NEW MAJOR AQUARIUMS

Attraction/Location	Building Size (s.f.)	Opening Date (year)	Estimated Total Cost (mil)	Annual Attendance (mil)
New Jersey State Aquarium Camden, NJ	115,000	1992	\$52.0	1.2
Oregon Coast Aquarium Newport, OR	40,000*	1992	\$24.0	0.8
Tennessee Aquarium Chattanooga, TN	130,000	1992	\$45.0	1.5

* Plus 1-2 acres outdoors.

Source: Individual aquariums and The Lyon Group.

range. It is our preliminary view that an expanded, first class, accessible aquarium in the Los Angeles area could attract between one and two million annual visitors, and possibly more.

The impediments to growth in attendance at the CMA are the following, among others:

- o Absence of capital improvement monies
- o Absence of investment in distinguishing exhibits
- o Accessibility and vehicular signage
- o Lack of budget allocated to marketing
- o Absence of strong connectivity with Ports 'O Call
- o Competition from the area's attractions.

The opportunities for growth in attendance are the following, among others:

- o A large resident and tourist marketplace
- o A beach setting
- o The absence of significant "aquarium" competition, at present.

This memorandum report is a judgmental document -- not a feasibility study. Thus, for purposes of discussing the master plan and its physical and financial implications, a judgment is made to use an annual attendance value ranging from 600,000 to 800,000 annual visitors. While it is judged that the annual attendance could be much greater under conditions cited above, in the reasonably near-term, it is felt that is prudent to utilize the 600,000 to 800,000 annual visitors range.

Given that the master plan provides for a 300% increase in the visitor engagement area, and with exciting and engaging experiences, the attendance range of 600,000-800,000 would appear achievable if the resources are available and the utilization of those resources are properly directed.

PHYSICAL PLANNING IMPLICATIONS

Based on this judgmental range, the physical implications can be preliminarily assessed.

Table 8 is provided on the following page to convey the physical implications of attendance. The table details the physical planning guidelines based on two attendance levels: 600,000 annual visitors and 800,000 visitors. Only the physical implications at the 600,000 visitors level is discussed below; the 800,000 scenario parallels this discussion.

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The primary determining factor of the required the square footage at a given attendance level is the peak in-facility crowd. To determine this number, the annual attendance level to the CMA is first estimated at a peak monthly level under an expanded aquarium and a well-marketed facility (as opposed to CMA's past performance which was heavily influenced by school groups). The peak monthly attendance, based on other Southern California attractions is expected to be approximately 18 percent of the annual attendance and occur in July or August. Based on the 600,000 visitor annual attendance level, the peak monthly attendance expected is approximately 108,000 visitors.

Going further, to determine the peak weekly attendance based on the peak monthly attendance, the monthly figure of 108,000 visitors is divided by 4.43 (weeks in a 31-day month) yielding 24,350 visitors.

Design-day attendance, the peak crowd of the peak week, typically occurs on a Saturday or Sunday. Based on industry performance, the level of attendance is received on design-day approximates 21 percent of the peak weekly attendance. Taking 21 percent of the peak weekly attendance expected at the CMA yields 5,100 visitors.

Of the design-day crowd, the peak in-facility crowd is taken at 40 percent of the design-day yielding 2,040 visitors to the CMA.

If the aquarium accommodates the demand and does so in an indoor/outdoor visitor experience, it is judged that approximately 70 percent of the peak in-facility demand will be within a structure of the facility (indoors) and 30 percent outdoors. For the indoor crowd expected, 1,425 people, 50 square feet per person is allocated yielding a demand for approximately 71,400 square feet indoors. For the outdoor demand, 90 square feet is allocated per person (615 people) yielding a demand for approximately 55,000 square feet outdoors. This is equivalent to a totally indoors aquarium of approximately 100,000 square feet.

An important factor that can reduce additional capital costs is the implementation of *metering* the design-day attendance, that is limiting the number of individuals in the facilities by offering adjacent activities for a potential visitor to participate in to pass time. It is not always possible or advisable to meter attendance, especially is there are no "walk-to" activities for those waiting to enter the aquarium. However, some of the major aquariums cannot and do not accommodate the demand; fire code alone may hold the attendance to 15-20 percent of daily demand. However, where this occurs, there usually are walk-to activities for waiting guests to go to (Monterey's Cannery Row or New Orleans' French Quarter or Riverwalk, as examples).

If it would be possible to "meter" demand to 20 percent of the design-day level of demand, then the facility requirement might be cut in half, program permitting.

Metering at the CMA would be difficult to accommodate without the development of other activities near to the CMA and/or a major thrust in shuttling people to and from Ports 'O Call, for example.

FINANCIAL OUTLOOK

The 1993 level of total on-site attendance to the CMA was approximately 310,000 visitors, of which more than one-third were group visits (mostly school groups); adding off-site activities, the attendance was 360,000 annual visitors. Attendance has grown significantly over the past 8 years -- by 70 percent.

The current financial picture is one of break even, although the picture is clouded by the absence of admission charges and the subsidy by the City of Los Angeles. The aquarium is operated under the City of Los Angeles; this operation runs at "break even" at a budget of approximately \$1.2 million; in addition, volunteers to the Aquarium, generate approximately \$320,000 and, of this, two-thirds goes to cover costs and the balance is donated to the CMA for programs and operations.

One model is presented to speak to the financial potential for the CMA. If the CMA were operated as a separate entity, say as a 501(c)(3) private, non-profit corporation and would charge admission, then the pro-rata experience of the Oregon Coast Aquarium would result in the following budget:

REVENUE:		\$5.5 million
Admissions:	\$3.3 million	
Retail Sales:	\$1.1 million	
Contrib./Grants:	\$0.7 million	
Member Dues:	\$0.2 million	
Other:	\$0.2 million	
EXPENSES:		\$4.1 million
Salaries/wages:	\$1.6 million	
Depreciation:	\$0.6 million	
Cost of Merchand.:	\$0.5 million	
Marketing:	\$0.3 million	
Other:	\$1.1 million	

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Thus, an operating surplus of \$1.4 million could be achieved (actually, \$2 million if depreciation would not be included as an expense; however, annual changing exhibits and other improvement would absorb an amount equivalent to depreciation).

What can be seen is that the CMA has been handicapped severely by being admission-free and the potential for a significant financial improvement exists.

GOVERNANCE

The majority of the major aquariums of North America are operated by private, non-profit corporations; many are also owned by the non-profit corporations. It appears that when an aquarium is operated by a private, non-profit corporation, there is more accountability, resulting in more business-like operations.

It is the view of The Lyon Group that the issue of governance should be studied thoroughly; in the absence of significant change, the aquarium experience will be a good one, but severely limited in what it could deliver as an educational and cultural facility. It is the conjecture of this Consultant that if there were a transition from a public, non-profit operator (the City) to a private, non-profit operator (a new corporation) in which the land and capital improvements would remain property of the City, the CMA would be on the way to a much better institution.

Sincerely yours,
THE LYON GROUP



Richard K. Lyon
President

ADDENDUM

CURRENT AQUARIUM INFORMATION

INFORMATION ON SELECTED AQUARIUMS

Attraction/Location	1993 Total Attendance (millions)	1994 Admission Prices			Building Size (s.f.)	Year Opened
		Adult	Special	Child (ages)		
Aquarium of the Americas New Orleans, LA	1.31	\$9.25	\$7.00	\$4.75 (2-12)	108,000	1990
Monterey Bay Aquarium Monterey, CA	1.70	\$11.25	\$7.75 M,Sr,St	\$5.00 (3-12)	230,000	1984
Mystic Marinclife Aquarium Mystic, CN	0.77 FY93	\$9.00	\$8.00 Sr	\$5.50 (5-12)	57,000	1973
National Aquarium in Balt. Baltimore, MD	1.55	\$11.50	\$9.50 Sr	\$7.50 (3-11)	209,000	1981
New England Aquarium Boston, MA	1.28	\$8.50	\$7.50 Sr	\$4.50 (3-11)	74,000	1969
New Jersey State Aquarium Camden, NJ	0.70	\$9.00	\$7.50 Sr,St	\$6.00 (2-12)	120,000 + outdoors	1992
New York Aquarium New York, NY	0.77 FY93	\$6.75	\$2.00 Sr	\$2.00 (2-12)	75,000	1896
Oregon Coast Aquarium Newport, OR	0.78	\$7.35	\$5.25 Sr	\$3.50 (4-12)	39,000 + outdoors	1992
Seattle Aquarium Seattle, WA	0.61	\$6.75	\$5.25 D,Sr \$4.25 Y	\$1.75 (3-5)	67,000	1977
John G. Shedd Aquarium Chicago, IL	1.86	\$8.00	\$6.00 Sr	\$6.00 (3-11)	400,000	1930
Steinhart Aquarium San Francisco, CA	1.21	\$7.00	\$4.00 Sr,Y(12-17)	\$1.50 (6-11)	125,000	1923
Stephen Birch Aquarium La Jolla, CA	0.51	\$6.50	\$5.50 Sr \$4.50 St	\$3.50 (4-12)	49,400	1992
Tennessee Aquarium Chattanooga, TN	1.40	\$8.75	\$8.75 Sr	\$4.75 (3-12)	130,000	1992
Texas State Aquarium Corpus Christi, TX	0.50	\$7.00	\$5.00 M,Sr	\$3.75 (4-17)	43,000	1990
Vancouver Aquarium Vancouver, BC	0.83	\$9.50 Cdn	\$8.25 Cdn Sr,Y(13-18)	\$6.25 Cdn (5-12)	99,000	1965

Notes: (1) D=Disabled, M=Military, Sr=Senior, St=Student, Y=Youth; (2) Information as of March 1994; (3) Steinhart = Calif. Academy of Sciences; (4) NY Aquarium = Aquarium for Wildlife Preservation, attendance = paid only

Source: Individual aquariums and The Lyon Group.