ECONOMIC ANALYSIS OF

RECONFIGURING THE

LONG BEACH BREAKWATER

By

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EXECUTIVE SUMMARY

- This paper was prepared as part of a 905(b) reconnaissance report for the City of Long Beach and the US Army Corps of Engineers to analyze the proposed reconfiguration of the Long Beach breakwater. We are a subcontractor under Moffatt and Nichol.
- Our report analyzes and provides some preliminary estimates of the recreational benefits and losses associated with the proposed reconfiguration of the breakwater at Long Beach. The report also provides estimates of State and local (City) economic impacts.
- The current breakwater configuration limits water circulation inside the San Pedro Bay adjacent to the beach. This, in conjunction with water emanating from the LA River, has lead to poor water quality at Long Beach, substantially reducing recreational value:
    - Poor water quality increases bacterial counts in Long Beach, leading to very poor water quality scores, and reducing recreational value.
    - Trash from the LA River also reduces recreational value despite City efforts to clean up this trash on the beach.
    - "Red Tide" events caused by algae also create fowl smells, poor aesthetics and, in some cases, potential health issues, reducing recreational value.
    - Reconfiguring the breakwater could mitigate all of these negative impacts, increasing recreational value.
- Reconfiguring the breakwater could also increase wave activity, increasing demand for surfing, bodyboarding and other wave activities.
- Our <u>preliminary</u> estimates, based on parking capacity, beach carrying capacity and densities at nearby beaches, indicate that, assuming a substantial increase in water quality and some wave activity:
    - An increase of beach visitation in the neighborhood of three million people per year is reasonable.
    - This increase in attendance and recreational quality will increase recreational benefits by $27.5 million per year, or $555 million (PV) over a fifty-year period.
    - For the City of Long Beach, the increase in spending is $52 million per year or just over $1 billion (PV) over 50 years. Increased beach tourism will generate $2.5 million per year in taxes and $4.3 million in parking revenues/fines. Over 50 years, this implies $52 million in taxes, $87.9 million in parking fees, totaling $140 million in revenues for the City of Long Beach.
    - Increased beach activity generates $58.6 million dollars spent in the State of California and $6.7 million dollars in taxes. Over 50 years the present value of this spending is just under $1.2 billion in spending and $136 million in taxes.
- An increase in wave activity could diminish recreational boating activity or value during periods where swells are significant, although, improved water quality, particularly the reduction in red tide events may offset some of these losses.

INTRODUCTION

The purpose of this study is to analyze and, in some cases, estimate, the most significant recreational economic benefits and losses associated with a potential reconfiguration of the breakwater at Long Beach. Recreational benefits and costs will be measured both in terms of non-market values and local economic impacts due to increased spending in Long Beach and in California. The main focus of the analysis is twofold:

1. The projected changes in recreational activity due to improved water quality. Reconfiguring the breakwater will increase the flow of water to the coast, in particular to water used by recreational bathers. Several water quality issues should be improved by reconfiguration:
    a. Improved circulation could lower coliform bacteria counts that are used by the EPA and nongovernmental organizations like Heal the Bay to rate water quality at beaches. These ratings influence the demand for beach recreation and perceptions of beach quality.
    b. Improved circulation could reduce "red tide" events that often occur in Long Beach, reducing the recreational value of the beach to swimmers and non-swimmers.
    c. Improved circulation could reduce the flow of trash that flows from the Los Angeles River to Long Beach (though this trash would be transported elsewhere). Trash substantially reduces the aesthetic value of coastal water and beach, reducing recreational value for everyone using the beach and potentially for boaters inside the breakwater as well.
2. Reconfiguring the breakwater will increase wave activity, which could significantly enhance surfing at Long Beach. It is also possible that surfing activity could improve the desirability of Long Beach to non-surfers, as friends and relatives accompany surfers and since watching surfers may enhance recreational benefits.

This section will also discuss potential impacts of breakwater reconfiguration on recreational boating, kiteboarding and other activities in the area.

ASSUMPTIONS

A 905(b) analysis does not require a full quantitative analysis or a complete analysis of every alternative and option. However, given the potential expense of this project, we thought it would be useful to present preliminary estimates of the key impacts that could be created by this project. The analysis contained below assumes a reconfiguration of the Long Beach Breakwater, which could substantially improve water quality issues inside the Breakwater. This analysis also assumes that wave activity in the two adjacent marinas could be fully mitigated and beach erosion due to increased wave action could be fully mitigated. Each of these alternatives should be considered in a full feasibility study, but not in a 905(b).

EXISTING COASTAL RECREATION STUDIES

Economic Impacts and Value for Changes in Coastal Water Quality

Few academic or government sponsored studies of recreational activities in Long Beach exist. The most relevant study is the Southern California Beach Valuation Model (SCBVM). In 2007, Leeworthy and Wiley released a report utilizing the SCBVM to predict the change in use, economic impacts and economic value for changes in water quality in the Long Beach surf zone[1] To model changes in water quality, the SCBVM employs counterfactual scenarios for changes in standardized Heal the Bay (HTB) water quality grades. Unfortunately, this study was confined to the western shoreline of Long Beach and only addressed changes in bacteriological water quality. The study did not account for the entire area that would need to be considered in this project, nor did it account for reductions in trash, "red tide" and other visible pollutants or potential increases in recreational demand associated with increased wave activity.

HTB standardizes California municipal surf zone water tests by analyzing a complex variety of shoreline bacteria levels – enterococcus, fecal coliform and total coliform. This data is published annually in the Beach Report Card, providing individuals pursuing water-based activities with coastal water quality information. The Beach Report Card provides water quality letter grades (A to F) for (1) AB 411 testing period from April to October, (2) year around dry season and (3) year around wet season. To standardize grades, HTB utilizes a geometric mean criterion to calculate scores ranging from 0 – 100 total available points. In recent years, Long Beach's coastal water quality, specifically on the shoreline west of Belmont Pier, has faired poorly in the HTB Beach Report Card. For three consecutive years, HTB has classified western potions of Long Beach's surf zone as a Top 10 California "Beach Bummer"[2] for its failure to meet defined coastal water quality standards. The widely distributed Beach Report Card invites concern for coastal locations like Long Beach when considering the difficulty of displacing environmental quality perceptions maintained by the public.

Environmental Perceptions by Coastal Users

A 1999 study conducted by the Southern California Beach Project[3] (University of Southern California) documents environmental perceptions held by Los Angeles County beachgoers. The study suggests that Los Angeles County residents often perceive the ocean as a place of contamination rather than a place for safe water-based recreation. Moreover, survey respondents'

[1] Wiley, Peter C., Leeworthy, Vernon R., and Stone, Edward, A. 2006. Economic Impact of Beach Closures and Changes in Water Quality for Beaches in Southern California. National Oceanic and Atmospheric Administration, National Ocean Service, Management and Budget Office, Special Projects: Silver Spring, Maryland. 16pp. http://marineeconomics.noaa.gov/SCBeach/Econ_Imp.pdf.

[2] In 2006-2007, Long Beach was recognized as a "Beach Bummer" for poor water quality grades at 14 testing sites (eighty-eight percent of testing sites in Long Beach); in 2007-2008 the City of Long Beach was identified as a "Beach Bummer" for multiple testing locations west of the Belmont Pier; and in 2008-2009, testing locations at the City of Long Beach LA River outlet resulted in the classification of Long Beach as a "Beach Bummer".

[3] Martin, Nicole, Linwood Pendleton, and D.G. Webster. Public Perceptions of Environmental Quality: A Survey Study of Beach Use and Perceptions in Los Angeles County. *Marine Pollution Bulletin* Vol. 42, No. 11 pp.1155-1160, 2001.

perceptions of local water quality starkly contrasted with bacteria water quality tests collected by local municipalities. To identify the source of misguided public perceptions of coastal water quality levels, researchers concluded, "perceptions of coastal water quality may be influenced less by current coastal education campaigns and more by media and other factors" (Pendleton, Martin and Webster, 1,555).

Respondents from the Southern California Beach Project provided their perceptions of important sources of water pollution. The most frequently volunteered response was that trash was the most important source of water pollution at 43% (± 4.8), followed closely industrial waste at 41% (±4.8%).[4] Bacterial sources of contamination were thought to be less important sources of pollution than visible pollutants – trash, industrial facilities, and storm drains. This evidence is particularly relevant for the City of Long Beach. The Los Angeles River mouth displaces significant amounts of trash on the western portion of the Long Beach shoreline. The presence of trash has significantly decreased in recent years because of an aggressive campaign by the City of Long Beach, however, trash and particulates continue to be deposited on the shoreline. The combination of visible pollutants, the large-scale distribution of the HTB Beach Report Card, and numerous media outlets that have publicized Long Beach's trend of poor coastal water quality have potential welfare impacts extending beyond the western shoreline.

The Southern California Beach Project developed a master list of publicly accessible beaches in Los Angeles and Orange Counties to assist in delineating beach visits and identifying mean water quality grades reported by HTB. Creating a master list required reducing an expansive list of all identified beaches in the Los Angeles and Orange Counties study area into 53 major publicly accessible beaches. For the stretch of shoreline within the City of Long Beach's borders, the Southern California Beach Project divided Long Beach into three distinct sites: Long Beach, from the western shoreline to approximately Coronado Ave.; Belmont Shore, ranging approximately from Coronado Ave. to 55th Place; and Alamitos Peninsula, from 55th Place to 72nd Place, including accessible portions of shoreline adjacent to Bay Shore Ave. and E. Bay Shore Walk.

The study was confined to the western end of Long Beach's shoreline, adjacent to the Los Angeles River mouth. This geographic area represents 18% of the accessible beach area on the Long Beach shoreline. Belmont Shore and Alamitos Peninsula are two additional beaches along the Long Beach shoreline where HTB produces water quality grades. These two sections of beach annually record far superior water quality levels than the beach on the western shoreline. Consistently poor water quality ratings adjacent to the western portion (defined as Long Beach by the Southern California Beach Project) may have significant welfare impacts on the areas of beach defined as Belmont Shore and Alamitos Peninsula if beachgoers fail to distinguish environmental quality standards associated distinct beaches along Long Beach's 5 miles of shoreline.

Red Tide

Red tide occurs when high levels of algae accumulate in a water source. Long Beach, primarily the western portion of the surf zone and the Marina Green docks, has been the host of significant red tide events. The discoloration of coastal water and pungent smells has had visible impacts on

[4] See Pendleton, Martin and Webster, 2001.

coastal recreation in this section of Long Beach's accessible coastline. According to Long Beach lifeguards, the limited wave activity and tidal circulation can result in the blooming of phytoplankton, resulting in water discoloration (i.e., red tides) and noxious odors, both of which have the capacity to deter costal visitors.

No specific study analyzing the economic impacts of red tide events has been conducted in Long Beach. Additionally, it is important to recognize that red tides are not synonymous with harmful algae blooms (HAB). Literature associated with HAB and red tide events indicate the large negative impact these events can have on beach visitation and tourism in general, as well as other economic activities.[5] Given the numerous red tide events that have occurred near the western marinas, boat owners could potentially benefit from increased tidal circulation, minimizing the effects of red tide and HAB events.

EXISTING ATTENDANCE AND RECREATIONAL AMMENITIES

Long Beach has numerous recreational opportunities to choose from. The primary recreational activities are: swimming, walking, biking, volleyball, kiteboarding, dog walking and boating. Multiple sites for beach volleyball-use are located along Belmont Shore. Adjacent to the volleyball courts is the off-leash dog zone. Long Beach dog beach is the only dedicated legal off-leash beach area in Los Angeles County and is one of the more frequented areas of beach utilized by beachgoers.

To obtain information on attendance and the composition of beach visitors at Long Beach, preliminary beach attendance counts and in-person surveys were collected on Long Beach's beaches from July 2008 to September 2008. Long Beach beachgoers were asked what activities they would be engaging in on the beach. The most frequented response was hanging out on the beach at 92%, followed by children swimming/playing at 55%, swimming at 27%, walking at 5% and other at 25% (see Appendix A for more detailed methods of the preliminary survey).

In addition to the survey data, beach attendance counts were collected to assist in estimating high-season (June – August) attendance estimates. High season estimates are based on these counts. Extrapolated attendance estimates are consistent with attendance estimates from the Southern California Beach Project and communication with the Long Beach Lifeguard Division. Estimates of attendance at Long Beach's beaches range from 50,000 per year to 500,000. Annual estimates of 250,000 (Table 1) are deemed reasonable given the data limitations, though there is obviously a significant error band around these estimates.

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[5] For example, a preliminary analysis of the economic impacts of HAB has demonstrated significant dollar impacts for isolated and individual instances of HAB. Recent events in Massachusetts resulted in $12 to $20 million in losses, a fraction of the impacts of a 1997 outbreak of HAB in the Chesapeake Bay tributaries where it was estimated that "the direct cost was at least $43 million dollars, based solely on the decline in seafood sales. When losses to tourism, recreational fisheries, and increased costs of monitoring and analysis are factored in, the economic impacts of this event were staggering" (www.whoi.edu).
Florida's Fish and Wildlife Institution list the major societal impacts of HAB' as:

* Massive fish mortalities that the corresponding deposits on local beaches
* Closure of recreational fisheries
* Beachgoer respiratory ailments contracted from aerosolized toxins
* Unpleasant and noxious piles of macroalgae that deposits on beaches

Table 1: Estimates of Beach Attendance at Long Beach Shoreline[6]

Weekend Average	Weekday Average	High Season	Low Season	Total
3,024	1,136	175,301	79,497	254,798

Veteran Long Beach lifeguards and Marine Safety personnel were contacted to comment on previous and existing beach visitation patterns, identify noticeable changes to the Long Beach shoreline (natural and human induced) and assess if collected survey, attendance and recreational data was representative of year-to-year beach visitation and recreational patterns. Summary statistics produced from the collected preliminary survey and attendance data were presented to the lifeguards. Lifeguards interviewed thought that our data was consistent with their experience. An effort was made to directly compare data collected for this study with official data recorded by the Long Beach Lifeguard Division. Official beach attendance estimates to assess data collected in the summer of 2008 and identify annual trends in beach visitation were not available.[7] The contacted personnel estimated that Long Beach's beaches from the Shoreline Marina to Alamitos Peninsula received 500,000 annual visitors.

Over the past two decades, there has been a general decline in annual beach visitation. Reduced visitation has been documented on the western shoreline. Decreasing attendance could be the consequence of increasingly poor bacteriological water levels, onshore trash deposits from the Los Angeles River and the 1980's extension of the Port of Long Beach that reduced wave activity and tidal circulation. Lifeguards noted the displacement of recreational users after expansion of the Port of Long Beach. Before the expansion, the western surf zone was used for water-based activities dependent on wave activity (i.e., bodyboarders, skimboarders). The eastern shoreline has maintained relatively similar visitation densities, highlighted by volleyball players, dog walkers and the recent phenomenon of kiteboarding in Belmont Shore coastal waters.[8]

[6] Low season estimates were based on an average ratio for the area. See Dwight, Ryan H., Mitchell V. Brinks, Gajapathi SharavanaKumar, and Jan C. Semenza. Beach attendance and bathing rates for southern California beaches. *Ocean & Coastal Management.* 50 (2007) 847-858.

[7] Circa 2003-2004, the City of Long Beach stopped maintaining attendance records. Around this time, the city opted to change their system of collecting parking fees at their beach lots from man-operated booths to metered parking. Previously, a system of estimating beach attendance from parking receipts was in use.

[8] Information on changes in beach visitation patterns, recreational use, and costal development come from personal communiqué in the form of an in-person interview with the Long Beach Lifeguard and Marine Safety personnel on April 16th, 2009.

ESTIMATED CHANGE IN WATER- BASED RECREATIONAL DEMAND

Potential Demand for Surfing and Bodyboarding

Reconfiguration of the Long Beach Breakwater and subsequent changes in bacteriological water quality levels and wave activity can significantly alter the existing recreational demand in Long Beach's coastal waters. Measurable changes in water quality levels and wave activity will directly influence the demand for water-based recreational activities, primarily surfing and bodyboarding. Analysis of beaches within close proximity of Long Beach - Seal Beach, Bolsa Chica State Beach and Huntington City Beach and Huntington State Beach - illustrate the popularity and demand for surfing and bodyboarding as recreational activities.

Our interviews with coastal users and lifeguards indicated that surfing is a recreational activity that is synonymous with southern California's beaches. Long Beach lifeguards noted the demand for surfing as a recreational activity and indicated that non-surfers also find surfing beaches more desirable. Visitors to Long Beach have approached lifeguards asking where are the surfers. Lifeguards respond to these inquiries by directing them east to Seal Beach and Huntington Beach.

Prior to the construction of the Long Beach Breakwater, Long Beach was renowned for its high-quality surfing conditions that are characteristic of many southern California beaches. We spoke with individuals at Surfline[9] to identify the potential demand for recreational surfing in Long Beach if the Long Beach Breakwater were to be reconfigured. Surfline maintains a significant archive of prior and predictive swell models allowing one to interpolate the potential wave energy and subsequent surfing conditions that would occur in Long Beach's coastal waters if the Long Beach Breakwater was to be partially reconfigured or completely removed. Archived swell models indicate that absent the Long Beach Breakwater, surfing conditions would closely mirror, if not exceed, the existing conditions at Seal Beach, the Alamitos Bay Jetty, and Bolsa Chica State Beach and that on an average year Long Beach could expect an upwards of 400,000 surfing visits if the Long Beach Breakwater was completely removed.

Existing infrastructure (e.g., oil islands, pier), a unique bathymetry, and an expansive shoreline stretching over 5 miles from west to east, would allow Long Beach to host a variety of surfing conditions at points along the shoreline. Also unique to Long Beach is the influence of the San Pedro Hill that provides shelter to the western shoreline from characteristic afternoon winds. This feature makes Long Beach one of the few Southern California locations protected from afternoon winds, providing surfable conditions from sunrise to sunset. This attribute has the capacity to draw surfers from north and south of Long Beach and increase the window of time where surfing can be pursued as a recreational activity.

While it is difficult to measure increases in attendance due to improved water quality and waves, our preliminary analysis indicates that increases in beach attendance at Long Beach could be

[9] "Surfline is one of the largest sports sites in the world with nearly 1.5 million unique people visiting the site each month. Over the past 30 years, Surfline has helped to develop a sophisticated, proprietary system of wave forecasting - much of which is currently used in LOLA, Surfline's Global Swell Model…Surfline provides weather and forecasting services to every lifeguard agency in California, the Coast Guard, US Navy Seals, National Weather Service, numerous television and movie production companies, multiple domestic and international governmental agencies and nearly every surf company in the world." http://www.surfline.com/surfaz/surfaz.cfm?id=784

substantial. As indicated above, the current recreational amenities and access at Long Beach are quite good, comparable in many ways to beaches like Huntington Beach, which has thirty to forty times the attendance of Long Beach. It is reasonable to assume that the demand for beach attendance by citizens of Long Beach would be similar to other nearby areas. In addition, it is likely that Long Beach State would also create a significant demand for beach recreation.

We have assumed a substantial increase in water quality (reduced trash, red tide and e coli) due to the reconfiguration of the breakwater and wave activity on comparative levels to nearby Bolsa Chica State Beach and Seal Beach. Given the amenities and level of development (condos near the water, many hotels near the water) the demand for beach tourism at Long Beach should be higher than Seal Beach, Sunset Beach and Bolsa Chica State Beach. Even after the breakwater is reconfigured it is unclear if the water quality will be as good as other local beaches such as Huntington, however the gap should close substantially. Further, as discussed earlier, increased surf activity also adds to recreational amenities for non-surfers and provides a draw.

Given these factors, communication with Surfline that indicates Long Beach could draw an upwards of 1,500 surfers on days with quality surfing conditions, and the trend for surfing to grow in popularity annually, we believe that a conservative estimate of increased surfing activity is 200,000 surfer-days per year post reconfiguration.

Potential Effects on Existing Water-Based Recreational Activities

Increased wave activity and improved water quality has the potential to increase demand for water-based recreation activities like surfing and bodyboarding, yet, it is unclear how changes to wave activity could effect existing water-based recreational activities like boating and kiteboarding.

Boating is a highly visible recreational activity in the City of Long Beach. Long Beach has three marinas: Alamitos Bay Marina, Shoreline Marina, and the Rainbow Harbor Marina. These three marinas have a total capacity of 3,922 slips (Table 2) for recreational and commercial boaters. For the 2007-2008 the three marinas produced approximately $18 million in revenue through the leasing of boat slips. Further, the San Pedro Bay plays host to several annual events and major boating organizations and yacht clubs: Long Beach Marina Boat Owners Association (LMBOA); Shoreline Yacht Club; Alamitos Bay Yacht Club; Navy Yacht Club; Long Beach Yacht Club; Little Ships Fleet Yacht Club; and Seal Beach Yacht Club. These organizations, both large and small, represent a powerful interest group, whose opinions concerning the potential reconfiguration of the Long Beach Breakwater should be documented.

Table 2: Boat Slips in Long Beach

Marina	Type	Slips
Alamitos Bay Marina	Recreational	1,991
Shoreline Marina	Recreational	1,844
Rainbow Harbor Marina	Recreational-Commercial	87
Total		3,922

To incorporate the opinions of boat owners who utilize the waters in the San Pedro Bay, LMBOA was contacted to assist in providing information relevant to: the number of year-around regattas and boats in Long Beach's marinas marina; various boating and sailing events hosted in

the San Pedro Bay; and other constituent takings on the impact increased wave activity could have on boating. Board members from the LMBOA were provided with a survey instrument to distribute to their constituents, of which, has failed to be returned for analysis.

An additional group of recreational enthusiasts who could be impacted by the reconfiguration of the Long Beach Breakwater include kiteboarders who recreate in the surf zone adjacent to Belmont Shore. Representatives for the Southern California Kiteboarding Association (SCKA), a non-profit organization committed to promoting the image, safety and importance of kiteboarding in Southern California, were contacted to introduce any concerns they may have respective to potential reconfiguration scenarios. Additionally, efforts were made to contact kiteboarding businesses that provide individual and group lessons at Belmont Shore. At this point in time representatives from both the SCKA and local kiteboarding establishments have failed to respond to informational requests.

Review of coastal recreational literature and conversations with kiteboarders interviewed on Belmont Shore indicated that reconfiguration of the breakwater would not significantly reduce the current kiteboarding population utilizing the waters adjacent to Belmont Shore. Instead, increased wave levels could change the composition of users, with more intermediate and advanced kiteboarders recreating on days with sizeable wave conditions and beginners continuing to recreate when wave conditions are mild. Additional analysis and input from kiteboarders familiar with Long Beach will benefit any future analysis.

In any event, kiteboarders and boaters gain from any increases in coastal water quality. However, measuring the economic impacts of increased wave activity in coastal waters adjacent to the Long Beach shoreline is dependent on numerous factors, including the specific reconfiguration alternative selected and mitigation measures taken to reduce impacts to marina channels and within Alamitos Bay. A full analysis of these impacts should be performed in a full feasibility study but is beyond the resources and scope of this 905b study.

ESTIMATED CAPACITY FOR INCREASED RECREATIONAL ACTIVITY

Increased beach visitation and subsequent welfare impacts are contingent on Long Beach's capacity to host increased visitor densities. Preliminary survey results indicated that approximately 70% of coastal users utilize private forms of transportation to visit Long Beach's beaches (see Appendix A). Estimating the capacity for increased attendance levels was calculated by identifying the total available lot and street parking in a defined geographic range. Parameters for estimating parking capacity followed from our interviews with Long Beach lifeguards who are familiar with beach visitation patterns and maximum daily parking loads.

Table 3: Total Lot And Street Parking Spaces

Parking Type	Parking Spaces
Lot	2,005
Street	4,591
Total	6,596

Table 4: Estimated Daily Capacity Parking for Beach Use

Day Type	Beach Use Availability	Beach Use Spaces	Persons Per Vehicle	Vehicle Turnover	Daily Capacity
Weekend	20%	2,923	2.7	2.5	19,731
Weekday	30%	3,382	2.7	2.5	22,830

For our analysis, we examined all parking lots dedicated to beach use and street parking within a quarter mile radius of the beach. Given these parameters, we estimate that 2,000 beach parking lot spaces, and between 4,500 – 6,600 street spaces are available. It is important to note that street parking in neighborhoods adjacent to the beach are impacted at varying levels throughout the day. To account for existing parking demand and identify the percentage of available street parking for beach use, multiple site visits were made before and after primary commuting times. Preliminary estimates demonstrated that street parking capacity changes depending on the day (weekend vs. weekday), resulting in different capacity estimates. On weekend days, between the hours of 10:00 AM and 5:00 PM (primary beach visitation hours), a conservative estimate of 2 out of every 10 street spaces within the defined study area is available for beach patrons. On weekdays, when neighborhood residents are more likely to vacate parking spaces and commute to work, 3 out of every 10 spots within the study area were available for beach use.

For weekend days, when an estimated 20% of the 4,590 street spaces and 100% of parking lot spaces are available for beach use, there is a capacity for 4,600 cars to park within a quarter mile at a given time, and an estimated 19,700 people to visit the beach per day. Weekdays, when 30% of the 4,590 street spaces 100% of parking lot spaces are available for beach use, capacity estimates increase to 6,600 available spaces, producing a capacity estimate of 22,800 individuals per day. Our data indicates that parking capacity can support 2 million people in high season (Memorial day to Labor day). Low season demand is approximately half of high season demand and should not be influenced by parking capacity.[10]

BEACH CARRYING CAPACITY

Another way to look at beach recreational demand often used in USACE studies is to look at carrying capacity, particularly during peak days or seasons. Given the constraints of this study, a full carrying capacity analysis was not undertaken. However, the data provided below is indicative of the potential for beach recreation in Long Beach.

[10] See Dwight, Ryan H., Mitchell V. Brinks, Gajapathi SharavanaKumar, and Jan C. Semenza. Beach attendance and bathing rates for southern California beaches. *Ocean & Coastal Management.* 50 (2007) 847-858.

Table 5: Beach Area, Attendance and Density of Comparable Beaches in LA and Orange Counties[11]

Beach	Mean Width Ft.	Length Ft.	Area Sq. Ft.	Daily Carrying Capacity @ 100 sq ft/person100 Sq. Ft.	2008 Attendance & est. LB attendance	Annual Attendance/ Sq. Ft.
Huntington City	252	21,437	5,409,773	54,098	10,569,438	1.95
Seal Beach	389	7,022	2,732,941	27,329	2,200,000	0.80
Hermosa	399	8,870	3,540,872	35,409	2,146,500	0.61
Manhattan/El Segundo	666	23,443	8,027,831	80,278	4,332,900	0.54
Average						0.98
Alamitos Peninsula	206	7,286	1,503,344	15,033		
Belmont Shore	397	12,725	5,052,591	50,526		
Long Beach	199	7,867	1,563,763	15,638		
Total Reach at Long Beach			8,119,698	81,197	3,200,000	0.39

Table 5 presents data on length, average width, and total area of selected beaches in Los Angeles and Orange counties which are comparable in many ways to Long Beach. The last column divides beach area by estimates of annual beach recreation obtained from the US Lifeguard Association and Los Angeles County Beaches and Harbors, producing average annual densities per square foot. As one can see, Huntington State Beach has the highest density at 1.95 annual beach visitors per square foot and Seal Beach, Hermosa and Manhattan/El Segundo between 0.5 and 0.8 beach visitors per square foot.

For this study we assume an annual attendance rate of 3.2 million after the breakwater is reconfigured. This estimate corresponds to a density of 0.39 people per square foot per year, which is substantially lower than any of the comparable beaches and less than half of the average for this group. This is a reasonable estimate for beach attendance if water quality is significantly improved to the point where Long Beach becomes desirable again for water activities.

ECONOMIC BENEFITS AND IMPACTS

Given estimates of increased attendance, one can estimate economic benefits and impacts. To estimate economic benefits a standard procedure used by the USACE was followed, applying unit day values for beach recreation. The unit day value depends on the level of amenities at the recreation site. The USACE has a standard methodology for assigning point values, which was used here.[12]. Given the point values, a unit day value was assigned for different types of recreational activities:[13]

[11] The area for Alamitos Peninsula, Belmont Shore and Long Beach beaches is consistent with the aforementioned spatial references of these three sections of beach defined by the SCBVM and the Southern California beach Project.
[12] See US Army Corps of Engineers, Economics Guidance Memorandum, Unity Day Values for Recreation, Fiscal ear 2007: http://www.usace.army.mil/CECW/PlanningCOP/Documents/egms/egm07-03.pdf and USACE Planning Guidance Notebook: http://www.iwr.usace.army.mil/waterresources/docs_wr/11052100.pdf
[13] Since Long Beach provides a relatively low level of amenities due to trash and pollution and little opportunity water activities, we felt there was no need to separate high and low season estimates. Surfing activities are dependent upon waves more than season.

1) Current recreational value for Long Beach's beaches,

2) High season recreational value for the beach after breakwater reconfiguration,

3) Low season recreational value for the beach after breakwater reconfiguration,

4) Recreational value of surfing after breakwater reconfiguration.

Given our estimates of attendance and unit day values, the potential recreational benefits from reconfiguring the breakwater can be estimated. An expanded discussion is contained in the detailed economic report contained in Appendix C.

Table 6: Economic Benefits from Increased Beach Recreation after Breakwater Reconfiguration[14]

Recreational Activity	Unit Day Value	Estimated Visitation	Total Recreational Value	PV over Project Life (50 years)
High Season Beach Visitation (Non-surfing)	$ 8.10	2,000,000	$ 16,200,000	$ 327,017,250
Low Season Beach Visitation (Non-surfing)	$ 7.06	1,000,000	$ 7,060,000	$ 142,514,925
Surfing	$ 26.58	200,000	$ 5,316,000	$ 107,310,105
Total after Project		3,200,000	$ 28,576,000	$ 576,842,280
Current Recreational Value	$ 4.36	250,000	$ 1,090,000	$ 22,003,013
Net Project Benefit		2,950,000	27,486,000	554,839,268

Our estimates indicate that reconfiguring the breakwater would increase recreational value of the beach by $27.5 million per year (Table 6 above, bottom line, fourth column). We assume that this gain would be maintained over a fifty year period and that the present value of the benefits over a 50 year period would be equal to just under $555 million.[15]

Economic Impacts

In addition to increases in recreational value, the increase in beach tourism will also create State and local economic impacts. To estimate these impacts a study by King and Symes[16] was used to provide estimates of beach spending in southern California. In addition, the City of Long

[14] A full feasibility study should also estimate the reduction in recreation at substitute sites.

[15] A 4.625% discount rate was applied as dictated by USACE methodology. See http://www.usace.army.mil/CECW/PlanningCOP/Pages/egms.aspx.

[16] See King, Philip and Douglas Symes, *The Potential Loss in GNP and GSP From a Failure to Maintain California's Beaches*, prepared for the California Resources Agency, 2002, http://userwww.sfsu.edu/~pgking/pubpol.htm l. The study found that key factor influencing spending was whether a visitor was a day-tripper or overnight visitor. We used survey data at Long Beach to estimate the % overnight visitors.

Beach will also obtain substantially increased parking revenues from increased beach tourism which are also estimated here. The methodology for these estimates is discussed in more detail in Appendix E.

Table 7: Economic Impacts to State of California from Increased Beach Recreation[17]

Season	Overnight Spending per Person (CA)	% Overnighters	Day Tripper Spending per Person (CA)	Avg. Spending per Person	Total Spending (CA)	Taxes Generated	PV Spending	PV Taxes
Current	55.00	28%	$ 16.00	$ 19.88	$ 4,970,000	$ 571,550	$ 11,537,451	$ 11,537,451
After Reconfiguration	55.00	28%	$ 16.00	$ 19.88	$ 63,616,000	$ 7,315,840	$ 147,679,375	$147,679,375
Net Impact					$ 58,646,000	$ 6,744,290	$ 1,183,842,818	$136,141,924

Table 8: Economic Impacts to the City of Long Beach from Increased Beach Recreation[18]

Scenario/Fee	Overnight Spending per Person (Local)	% Over-nighters	Day Tripper Spending per Person (Local)	Avg. Spending per Person	Total Spending (Local)	Local Sales Tax Generated	Local TOT's Generated	Taxes/Fees Generated	PV Spending	PV Taxes
Current	50.00	28%	$ 13.20	$ 17.70	$ 4,424,000	$ 50,669	$ 168,000	$ 218,669	$ 89,303,970	$ 4,414,107
After Reconfiguration	50.00	28%	$ 13.20	$ 17.70	$ 56,627,200	$ 648,563	$ 2,150,400	$ 2,798,963	$ 1,143,090,816	$ 56,500,571
Net Spending/Taxes					$ 52,203,200	$ 597,894	$ 1,982,400	$ 2,580,294	$ 1,053,786,846	$ 52,086,464
Net Parking Fees								$ 4,354,359		$ 87,898,174
Net Impact					$ 52,203,200			$ 6,934,653	$ 1,053,786,846	$ 139,984,638

Overall, we estimate that increased beach activity will generate $58.6 million dollars spent in the State of California and $6.7 million dollars in taxes (Table 7 above). Over a fifty-year period the present value of this spending (4.625% discount rate) is just under $1.2 billion in spending and $136 million in taxes.

For the City of Long Beach, the net increase in (local) spending is $52 million per year and the present value of this spending over a fifty-year period is just over $1 billion (Table 8 above). City beach tourism will generate an estimated increase of $2.5 million per year in local taxes (transient occupancy taxes and sales taxes) and $4.3 million in increased parking revenues and fines. Over a fifty-year period, this generates a present value of $52 million in taxes, $87.9 million in parking fees, for a total of just under $140 million in revenues for the City of Long Beach. In addition, it is anticipated that beach activity would generate a significant amount of revenue from other taxes such as the utility users tax, which is not estimated here. Property taxes could also rise, especially on commercial property, but no attempt has been made to estimate this impact.

[17] Based on data from the State of California's Statistical Abstract and from the Board of Equalization, we assumed that 11.5% of state spending would translate into state taxes.

[18] All data for this analysis was taken from King and Symes, previously cited. It was assumed that the City share of sales tax is equal to 1%, even though 0.25% of this amount was recently rescinded. We anticipate the traditional 1% will be restored. Sales taxes were estimated from survey data in King and Symes for food/takeaway, sundries, beer and liquor, sit down restaurants, and gas. For food/takeaway it was assumed 75% was not subject to sales tax. For day trippers average taxable sales per day were $15.70 and $32 for overnight visitors. Hotel spending per capita was assumed to be $20 per person per day, which is very conservative; transient occupancy tax for Long Beach is 12%.

Additional Costs to the City of Long Beach

The increased attendance created by reconfiguration will also increase the City of Long Beach's expenditures on public safety and create an increased demand for public facilities, in particular bathrooms on or near the beach. (The current capacity and maintenance of bathrooms on the beach is an issue.) Estimating the full fiscal impacts of reconfiguration, which would include not only revenues and taxes generated, but also the increased costs to the City of Long Beach[19] (and possibly the State as well) is well beyond the scope of a 905b analysis. Indeed, fiscal impact studies are not common or required even in a full Corps of Engineers feasibility study, though the City of Long Beach may want to consider requesting that a fiscal impact analysis be performed as part of a feasibility study, if the reconfiguration project moves to the feasibility study stage. This study will not attempt a full fiscal impact analysis. However, we very tentatively estimate that the additional costs to the City will be on the order of several hundred thousand dollars a year, for increase lifeguard, police and other public safety staff and increased restroom facilities (assuming this is financed over time). This estimate is small in relationship to our estimates or taxes and parking revenues generated but could be considered in a full feasibility study.

ADDITIONAL ISSUES

Water Quality and Public Health

Academic and policy studies assessing the economic and ecological effects of coastal water quality primarily utilize bacteriological measures of water quality. The reasoning for this is threefold: (1) virus monitoring techniques are costly (approximately $1,000 per sample), (2) virus monitoring does not provide an accurate measure to quantify the number of viruses per a given measure of unit volume and (3) at this time, there is a deficiency of authoritative data that connects health risks associated with human water contact to levels of virus concentrations.

Finally, improvements in water quality should also lead to lower rates of water borne illness, although with the substantially increased attendance, it is quite possible that one would see an increase in such illnesses. High levels of bacterial coliform are documented to having significant economic impacts for coastal bathers.

CONCLUSION

Although it is difficult to estimate the recreational benefits and impacts of the potential reconfiguration of the breakwater (and not required in a 905b report) we have attempted to provide preliminary estimates of benefits. Our preliminary results our based on a familiarity with beaches in southern California, where Dr. King has been preparing reports for 14 years. Our estimates are also based on interviews with a number of folks who have particular expertise. Nevertheless, we do not claim that these estimates are precise or sufficient for the project to go

[19] An economic impact analysis typically estimates spending and taxes. A fiscal impact analysis typically includes all the elements of an economic impact analysis plus an estimate of increased costs to a City, State or other government.

forward, but these results would aid in the decision on whether a full feasibility study needs to be conducted.

There would be significant recreational benefits from this project. Our study indicates that over a fifty year period these benefits would be on the order of one-half billion dollars (discounted present value). The City of Long Beach would also gain substantial increases in local taxes and parking fees, likely over $100 million (discounted) over a fifty year period.

An increase in wave activity could diminish recreational boating activity or value during periods where swells are significant although the increased water quality, particularly the reduction in red tide may offset some of these losses.

REFERENCES

Adams, C., S. Larkin, and K. Morgan. 2005. "Red Tides and Coastal Business: Measuring Economic Consequences in Florida," pp. 41. Proceedings of the 14th Biennial Coastal Zone Conference, NOAA Coastal Services Center, Charleston, SC.

Boyle, Kevin J., Joan P. Poor, Laura O. Taylor, and Roy Bouchard. 2001. Objective versus Subjective Measures of Water Clarity in Hedonic Property Value Models. *Land Economics* (2001) 77(4): 482-493

Chapman, David J, and Michael W. Hanemann. (2001). Environmental Damages in Court: The American Trader Case. *The Law and Economics of the Environment.* Anthony Hayes, Editor, pp. 319-367.

Dwight, Ryan H., Mitchell V. Brinks, Gajapathi SharavanaKumar, and Jan C. Semenza. 2007. Beach attendance and bathing rates for southern California beaches. *Ocean & Coastal Management.* 50, pp. 847-858.

Dwight, Ryan H., Linda M. Fernandez, Dean B. Baker, Jan C. Semenza, Betty H. Olson. 2005. Estimating the economic burden from illnesses associated with recreational coastal water pollution – a case study in Orange County, California. *Journal of Environmental Management.* 76, pp. 95-103.

Florida Fish and Wildlife Marine Institution. http://www.floridamarine.org

Hanemann, Michael, Linwood Pendleton, Craig Mohn, James Hilger, Koichi Kurisawa, David Layton, Chris Busch, and Felipe Vasquez. 2004. Using Revealed Preference Models to Estimate the Effect Of Coastal Water Quality on Beach Choice in Southern California, A Report from the Southern California Beach Valuation Project**.** 70 pp.

Hermosa Beach Parking. http://www.hermosabch.org/departments/cityclerk/agenmin/4a-61201.html

Jiang, Sunny C., Nathaniel D. Osgood, David J. Turbow. 2003. Evaluation of Recreational Health Risk in Coastal Waters Based on Enterococcus Densities and Bathing Patterns. *Environmental Health Perspectives,* Vol. 111, No. 4, pp. 598-603.

King, Philip, *Estimating Beach Attendance and Calibrating the Beach Counters for the City of Encinitas*, February 15, 2006.

King, Philip, *The Economic and Fiscal Impact of Carlsbad's Beaches: A Survey and Estimate of Attendance*, December 12, 2005,

King, Philip and Douglas Symes, *The Potential Loss in GNP and GSP From a Failure to Maintain California's Beaches*, prepared for the California Resources Agency, 2002, http://userwww.sfsu.edu/~pgking/pubpol.htm.

Manhattan Beach Parking Revenue. http://www.citymb.info/Modules/ShowDocument.aspx.

Morgan, K. and S. Larkin. (2006). "Economic Impacts of Red Tide Events on Restaurant Sales," *Journal of Agriculture and Applied Economics* (abstract).

Nelsen, Chad, Linwood Pendleton, and Ryan Vaughn. 2007. A socioeconomic study of surfers at Trestles Beach. Shore and Beach. Vol. 74, No. 4.

Pendleton, Linwood, Martin, Nicole, , and D.G. Webster. 2001. Public Perceptions of Environmental Quality: A Survey Study of Beach Use and Perceptions in Los Angeles County. *Marine Pollution Bulletin* Vol. 42, No. 11, pp.1155-1160.

Shoup, Donald. The Price of Parking on Great Streets. *Planetizen.* http://www.planetizen.com/node/19150.

State of California, Board of Equalization, http://www.boe.ca.gov/sutax/sutprograms.htm.

US Army Corps of Engineers, Economics Guidance Memorandum, Unity Day Values for Recreation, Fiscal ear 2007: http://www.usace.army.mil/CECW/PlanningCOP/Documents/egms/egm07-03.pdf

US Army Corps of Engineers, USACE Planning Guidance Notebook: http://www.iwr.usace.army.mil/waterresources/docs_wr/11052100.pdf.

Wiley, Peter C., Leeworthy, Vernon R., and Stone, Edward, A. 2006. Economic Impact of Beach Closures and Changes in Water Quality for Beaches in Southern California. National Oceanic and Atmospheric Administration, National Ocean Service, Management and Budget Office, Special Projects: Silver Spring, Maryland. 16pp. http://marineeconomics.noaa.gov/SCBeach/Econ_Imp.pdf.

Woods Hole Oceanic Institution. http://www.whoi.edu

Appendix A: Attendance and Recreational Estimates

To obtain information on attendance and the composition of beach visitors at Long Beach, beach attendance counts and in-person surveys were collected on Long Beach's beaches from July 2008 to September 2008. Counts and surveys were conducted between 72nd Place in the east to Alamitos Beach in the west. Attendance counts and surveys were conducted during peak visiting periods – primarily on weekends and during the hours of 11:30 AM – 3:30 PM from July-September. It is important to note that the design of the survey as well as the frequency of data collection was intended for preliminary results to guide beach attendance and activity estimates for the reconnaissance study. Because of budget and time constraints and challenges posed by non-market valuation techniques, we do not claim that this preliminary survey will yield the same statistical accuracy as a full survey with ample controls to ensure random sampling and a larger sample size. However, efforts were made to ensure a representative sample at the time of data collection. The survey instrument and protocol are detailed below, followed by the results of the survey are provided below.

Survey Instrument and Protocol

The instrument used for this analysis was a written, mostly closed end preliminary instrument. Respondents were given a choice between filling out the survey themselves or having the surveyor read the survey to the respondent and while the surveyor filled it out. We have found that this type of survey yields an extremely high rate of response (90%) as compared to surveys where respondents are asked to mail back their responses; mail-back surveys from beaches typically yield only 33-50% response rates even after the respondent agrees to participate. Our sampling strategy minimizes the possibilities for any selection bias (and research indicates that there are serious biases that occur from this type of sample selection).

Surveys were given by a research assistant who was trained to sample randomly. Days were chosen to reflect typical beach attendance patterns (i.e., weekend days were sampled more often). The surveyor zigzagged across the beach covering the entire beach area in one day. They were instructed to survey every nth group, where n depended on the number of surveys they expected to collect that day and the density of the crowd. Surveyors were trained how to help respondents if they asked without biasing the responses. Most respondents found the survey straightforward and there were few glitches (though a significant number did not report income or other variables).

Surveyors introduced themselves by stating that they were conducting a survey for the Federal government and their response would be appreciated.

All surveyors were trained on-site and supervised. The following protocol was given to all surveyors:

1) Since you are on the beach dress accordingly, but try to look neat, friendly and professional nevertheless. If someone asks "do I get anything for the survey" you can offer them a mechanical pencil and smile.
2) Wear SUNSCREEN and bring plenty of water.
3) The survey should be RANDOM and should be a representative sample. To ensure this you should try to cover the entire beach in a day and zigzag up and down the beach choosing every nth party.

a) Your sample should also reflect attendance patterns—i.e., the number of people in the sample surveyed on weekends should be in line with attendance on weekends. As a rule of thumb about 40% of beach attendance occurs on Saturday and Sunday with heavy attendance on Friday as well, but this varies by beach.

b) Make sure you cover all parts of the beach in accordance to attendance.

c) Keep in mind the sample group is a **household**. Often one group will contain several households.

4) Before or right after surveying make sure you fill out the top part of the survey (where it says "to be completed by surveyor") with the time and date as well as who you are (nickname or initials are fine) and use a consistent number system so we can refer to each survey if we need to. The best way is to number the surveys consecutively for each beach. That way we will have a good count of how many in the sample.

a) It is possible to have several people filling out surveys at the same time; just make sure you are available for questions.

b) Never cajole respondents—they are doing us a huge favor-but politely reminding them is fine.

c) Some people like to converse, some will fill it out quickly—every respondent has a different style.

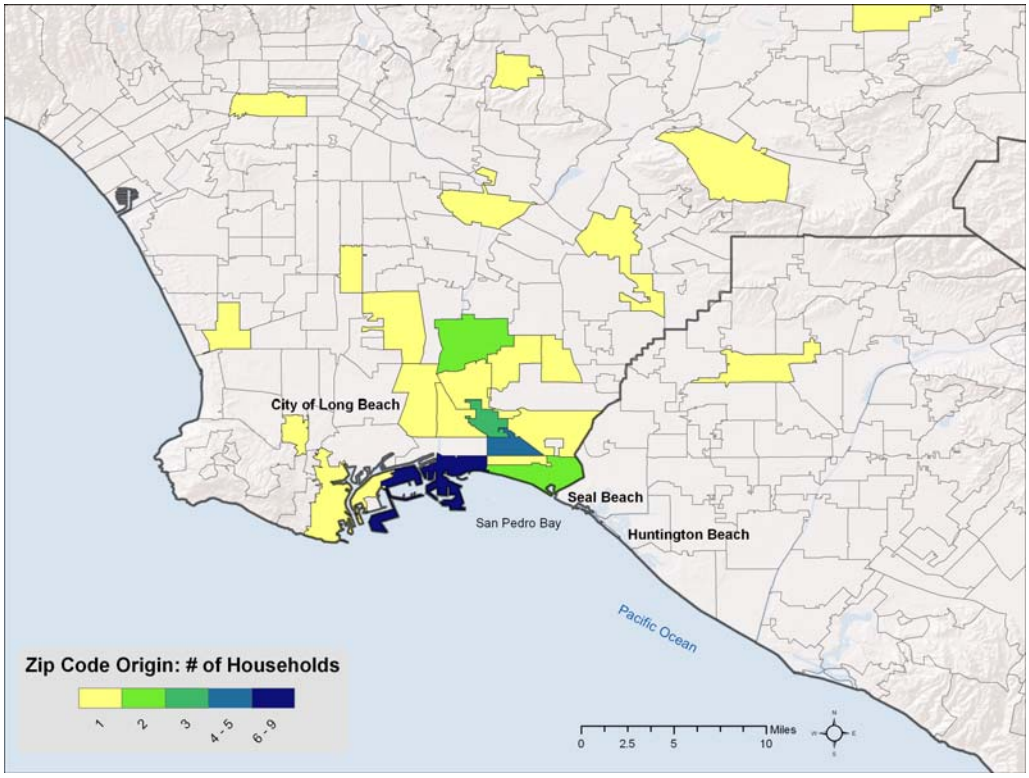
d) Often people will want to know more about the survey. You should always mention the city and the government, but don't say things like "this will help the beach" since that could bias responses. You can say this will help the Federal government make intelligent decisions.

Preliminary Survey Results

Question 1: Is your **primary** residence within the City of Long Beach?

Within the City of Long Beach	Outside the City of Long Beach
35%	65%

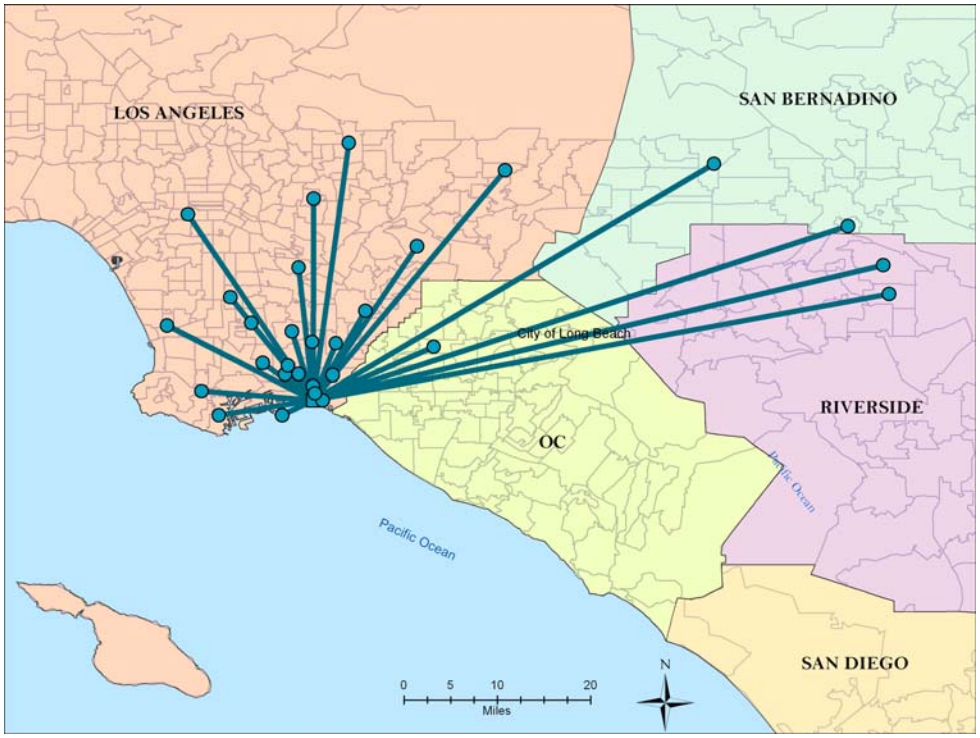
Map A.1: Number of Surveyed Households by Zip Code



Question 1a: How far from this beach is your **primary** residence?

Within 20 Miles	Within 60 Miles	More than 60 Miles, in California	In US, outside California	Outside US
49%	18%	11%	17%	5%

Map A.2: Network Analyst of Households in Four Surrounding Counties



Question 2: How many people from your **household** are with you at the beach?

Group Size	Percent
1	22%
2	28%
3	19%
4	14%
5,6	14%
7,8	2%
9,10	2%

Question 3: How did you get to the beach today?

Car	Foot	Bicycle	Other
83%	11%	1%	5%

Question 4: **If you frequent another beach more often than this beach, please list this beach and compare this alternative beach to Long Beach. Compare your overall satisfaction, including amenities available.** Do not **consider travel time.**

Worse than Long Beach **Same** **Better than Long Beach**

I----------I----------I----------I----------I----------I----------I----------I----------I

0% 25% 50% 75% 100% 125% 150% 175% 200%

Beach	Frequency	Comparison to Long Beach
Bolsa Chica	1	125%
Corona Del Mar	1	200%
Dockweiler	1	200%
Heromosa	3	150%
Huntington	19	152%
La Jolla	1	200%
Laguna Niguel	1	200%
Malibu	3	108%
Newport	4	163%
Oxnard	1	200%
Redondo	2	175%
Santa Monica	2	125%
Seal Beach	4	144%
Venice	2	100%
Long Beach	18	100%
Santa Cruz	1	100%

Question 5: Please check the most appropriate box for trip type.

Day Trip	Vacation
72%	28%

Question 6: How would you rate the quality of water at Long Beach?

High	Relatively High	Acceptable	Poor
3%	5%	61%	31%

Question 7: What activities are you engaging in on the beach today?

Swimming	Children Swimming	Surfing	Walking	Hanging Out	Other
27%	55%	0%	5%	92%	25%

Question 8: How many hours will you spend at the beach today?

Length of Time	1-2 hours	2-3 hours	3-4 hours	4-6 hours	More than 6 Hours
Frequency	14%	31%	26%	22%	7%

Table A.1: Attendance Counts [20]

Date	Time	Attendance	Beach	Volleyball	Kiteboarding	Sky	Mean Temp	Mean Wind
7/24/08	11:30-15:00	508	92%	0%	8%	Sunny	69	7 MPH
8/9/08	11:00-14:30	1288	95%	5%	0%	Sunny	72	6 MPH
8/29/08	11:30-14:30	353	95%	5%	0%	Overcast	72	5 MPH
8/30/08	11:30-14:30	725	84%	16%	0%	Sunny	73	5 MPH
9/20/08	12:30-16:00	557	87%	12%	1%	Sunny	67	4 MPH

Long Beach lifeguards and Marine Safety personnel attendance estimates of 500,000 were approximately two-times greater than estimates derived from collected survey and attendance data in the summer of 2008. One account for this variation could stem from the time of day that survey and beach counts were proctored. According to Long Beach's coastal personnel, visitation patterns at Long Beach are dissimilar to visitation patterns at a majority of southern California's beaches. Visitors to Long Beach's beaches begin arriving at 1:00 PM, resulting in a peak visitation time between 4:00 PM and 5:00 PM. This pattern of beach visitation is unusual for southern California, where beachgoers commonly arrive between 10:00 AM and 11:00 AM and peak visitation occurs between 1:00 PM and 3:00 PM. In accordance with widespread beach visitation patterns, survey and attendance counts were proctored between 11:00 AM and 3:00 PM. Collected beach counts were applied to a Los Angeles County beach visitation multiplier for the respective collection hours. The applied multipliers, which were representative of adjacent beach use, could have resulted in underestimation of high season and low season counts. However, it is important to consider that on multiple days when data was collected, special events were being held on the beach, resulting in relatively unrepresentative samples.

Prior to 2003-2004, the City projected their annual beach visitation by incorporating a standard methodology as developed by the City of Huntington Beach. Long Beach would account for daily attendance by (1) totaling the number of day-use parking receipts collected at man-operated pay booths located at the entrance of their parking lots and (2) estimating the total number of visitors who utilized adjacent non-metered street parking. Long Beach's attendance methodology was the output of the American Trader Oil Spill legal suit in Huntington Beach, which utilized beach attendance estimates to estimate to the economic impact of a hazardous oil spill and the corresponding closure of multiple Southern California beaches.

In addition to the aforementioned survey data, beach attendance counts were collected to assist in estimating high-season (June – August) attendance estimates. Initial high-season statistics were computed, resulting in a weekend day average of 3,024 beachgoers and a weekday average of 1,136 beach goers. High-season daily attendance projections were extrapolated to calculate a

[20]Weather records were extracted from http://www.wunderground.com at Lat. 33.75, Lon. -118.11, and Elev. 7ft
7/24/08 – AVP Professional Beach Volleyball tournament hosted at Alamitos Beach.
8/9/08 – Sand castle competition at Belmont Shore, between Prospect Ave. and La Verne Ave.
9/20/08 – Alamitos Beach parking lot closed for Long Beach Triathlon preparation.

high-season total of 152,436 beachgoers. Walkers and cyclists utilizing the bike path were not reported in our estimates. To account for this population of beachgoers, weekend and weekday estimates were increased by 15%[21], resulting in a total high-season count of approximately 175,000 beachgoers. Interpolative techniques were used to estimate low-season attendance at roughly 79,500 beachgoers for a annual visitation total of 254,500 beachgoers.[22] Long Beach reported a total visitation of 1,075,000 visits for 2008. This number represents beachgoers at the geographic area under investigation and at the Bay Shore beaches, which are not part of the study focus. Long Beach lifeguards believed the annual attendance estimates in the Long Beach surf zone to be approximately 500,000 visits, two-times greater than our preliminary estimates.

Surveying beachgoers provides numerous challenges. An obstacle to in-person surveying is approaching individuals participating in a recreational activity at the time survey instrument are proctored. Walking, biking, volleyball, swimming, surfing, boating and kiteboarding are some examples of recreational activities where it is difficult to intercept the beachgoer for the purpose of survey participation. To account for this obstacle, in addition to surveying, beach counts were recorded for individuals utilizing the volleyball facilities and kiteboarders in the surf zone. From the total population of beachgoers accounted for, 8% were utilizing the volleyball facilities and kiteboarders accounted for approximately 1% of the population. Relative to beachgoers, kiteboarders comprised a small amount of the total population. However, kiteboarding, like other recreational activities, is dependent on sensitive weather conditions – primarily high winds. When attendance counts were recorded corresponding to measurable wind conditions, kiteboarders accounted for over 8% of the total beachgoing population.

[21] Personal communiqué with Long Beach lifeguards alluded that the percentage of beachgoers using the bike path to be approximately 20% of the total beach population. Walkers and cyclists are two groups of beachgoers that are difficult to accurately estimate utilizing in-person surveying and recreation counts. A majority of these beachgoers utilize the bike path, which was not incorporated in this analysis because of complexities associated with double counting this population of beachgoers and the bike path relative separation from other recreational activities.

[22] Interpolative techniques to estimate low-season attendance were based on monthly beach visitation frequencies recorded by Dwight (2007).

Appendix B: Parking Capacity and Revenue

Parking capacity estimates were generated by accounting for all parking lots dedicated to beach use and street parking from the Marina Green parking lot at 500 E. Shoreline Dr., north to 800 E. First St., west to 80 Bay Shore Ave., south to 5400 E. Ocean Blvd, west to 7200 E. Ocean Blvd., and all areas bordered by E. Bay Shore Walk, E. Seaside Walk and the beachfront bike path. Parameters for street parking were developed from site reviews and conversations with Long Beach lifeguards familiar with beach use parking. Parking spaces and occupancy rates were determined by multiple site visits accounting for weekday v. weekend use and were confined to a quarter-mile radius of accessible beach. Because the neighborhoods adjacent to the beach are built on a grid, it would be fair to estimate the increased capacity offered from E. First St. to E. Second St. and everything in between. A rough estimate would be that there is an additional capacity for 5,000-7,000 individuals per day – similar to the amount of parking between E. Ocean and E. 1st First St. - if parking parameters were extended one block north.

Table B.1: Lot Parking Adjacent to Long Beach's Shoreline

Parking Lot	Hr. Rate	Operating Hours	Operator	Restrictions	Type	Spaces
Marina Green	$1.00	8 AM-6 PM, Mon-Sun	City of Long Beach	2 Hrs.	Pay Station	250
Alamitos Beach	$1.00	8 AM-6 PM, Mon-Sun	City of Long Beach	None	Meter	131
Junipero Beach	$1.00	8 AM-6 PM, Mon-Sun	City of Long Beach	None	Meter	460
Belmont Veteran Memorial Pier	$1.00	8 AM-6 PM, Mon-Sun	City of Long Beach	None	Meter	263
Granada Beach	$1.00	8 AM-6 PM, Mon-Sun	City of Long Beach	None	Meter	540
La Verne	$1.00	8 AM-6 PM, Mon-Sun	City of Long Beach	None	Meter	162
54th Place	$1.00	8 AM-6 PM, Mon-Sun	City of Long Beach	None	Meter	54
72nd Place Overflow	$1.00	8 AM-6 PM, Mon-Sun	City of Long Beach	None	Meter	50
72nd Place	$1.00	8 AM-6 PM, Mon-Sun	City of Long Beach	None	Meter	95
Total						2,005

Table B.2: Street Parking in a 400-Yard Radius of Long Beach's Shoreline

Street	Restrictions	Spaces
E. Ocean Blvd	Street Sweeping 2 Hr./week	2,424
E. Ocean Blvd - E. First St	Street Sweeping 2 Hr./week	1,548
1st Pl. - 15th Pl. Cul-De-Sacs	Street Sweeping 2 Hr./week	161
E. Seaside Walk - E. Bay Shore Walk	Street Sweeping 1 Hr./week	408
Olympic Plaza	Street Sweeping 2 Hr./week; 2 Hr. Parking	50
Total		4,591

Appropriately pricing lot and street parking can (1) generate public revenue, which can be used to maintain sidewalks, streets, restrooms, and other public facilities and (2) encourage the balance between supply and demand so not too few or too many spaces are available for patrons. Performance-based parking studies have identified an 85 percent occupancy rate as ideal to maintain revenues and allow patrons to find parking without circling lots and increasing accident related risks.[23] To estimate the potential revenue of existing City operated beach-lot parking, an 85% lot occupancy rate and a mean of 4 hours of use per day between the hours of 8:00 AM and 6:00 PM were assumed. Annual parking revenues generated from $1.00 per hour fees total approximately $2,488,205.

[23] Shoup, Donald. The Price of Parking on Great Streets. *Planetizen.* http://www.planetizen.com/node/19150.

Beyond meter revenue, municipalities can generate significant amounts of revenue, often exceeding parking meter revenue, from parking violations. Municipal revenues generated from metered parking and parking violations vary significantly. For example, in the 2000-2001 fiscal year, the nearby City of Hermosa Beach generated revenues totaling $780,000 for parking meters and approximately $828,000 from parking fines.[24] From May to October 2008-2009, neighboring City of Manhattan Beach generated $1,355,803 in revenues from parking meters and $1,102,356 from parking violations. For every $1.00 in revenue generated from parking meters in the City of Hermosa Beach, $1.06 was generated in parking violation revenue. In the City of Manhattan Beach, for every $1.00 generated in parking meter revenue $0.81 was generated in parking violations.

Given the similar coastal amenities and proximity of Long Beach to Hermosa Beach and Manhattan Beach, a conservative rate of $0.75 in parking violation revenue was estimated for every $1.00 in parking meter revenue. Applying the parking violation estimate to our estimated potential annual parking revenue results in an annual estimate of $1,866,154 in parking violation revenue for a combined annual meter and violation revenue of $4,354,359.

Table B.3: Estimated Annual Revenue from Lot Parking

Hr. Fee	Occupancy %	Occupancy Hrs.	Parking Revenue	75% Violation Revenue	Tota Annual Revenue
$1.00	85%	4	$2,488,205	$1,866,154	$4,354,359

It is important to note that a majority of the beach parking lots east of the pier are under utilized. Easily accessible fee-free street parking on Ocean Ave. encourages beach users to avoid metered lot parking when accessing the beach. Appropriately pricing existing metered parking, accompanied by increased demand for Long Beach's beaches could result in significant parking revenues. Additional analysis of parking finance strategies is suggested, including the possibility of regulating street parking adjacent to the beach.

[24] http://www.hermosabch.org/departments/cityclerk/agenmin/4a-61201.html.

Appendix C: Estimates of Recreational Benefits

Recreational Benefits were estimated using unit day values and following the procedure laid out in the U.S. Army Corps of Engineers Economic Guidance Memorandum. In particular, the Corps guidelines examine recreational values depending upon the quality of recreation, the number of substitutes available, crowding, etc. The Corps memo assigns criteria for assessing point values (Table B.1 below) and then a dollar unit day value given the point value. For more information on this methodology, please consult this memo.[25]

Table C.1: U.S. Army Corps of Engineers Point Values for Recreation

USACE Benefits Transfer Methodology	
Criteria	**Total Possible Points**
Recreation Experience	30
Availibility of Opportunity	18
Carrying Capacity	14
Accessibility	18
Environmental	20
Total	100

For the purposes of this study, we first examined current recreational amenities at Long Beach. As discussed in the main text, current recreational amenities are severely limited by poor water quality. The lack of waves also limits a number of beach recreational activities such as surfing and boogie boarding.

Table C.2: Unit Day Value of Current Recreation at Long Beach

Current Recreational Value		
Criteria	**Total Possible Points**	**Total Points Assigned**
Recreation Experience	30	3
Availibility of Opportunity	18	6
Carrying Capacity	14	5
Accessibility	18	10
Environmental	20	2
Total	100	26
Day Use Value 2007		$ 4.36

- **Recreation Experience**: The current recreational experience is very poor. Very few people swim due to poor water quality and few people lay on the beach due to the trash, though the City does collect trash deposited on the beach periodically. There is limited

[25] See US Army Corps of Engineers, Economics Guidance Memorandum, Unity Day Values for Recreation, Fiscal ear 2007: http://www.usace.army.mil/CECW/PlanningCOP/Documents/egms/egm07-03.pdf and USACE Planning Guidance Notebook: http://www.iwr.usace.army.mil/waterresources/docs_wr/11052100.pdf.

activity on the boardwalk and volleyball. The lack of waves prevents any wave activity such as boogie boarding or surfing.

- **Availability of Opportunity**: There are a number of similar recreational opportunities within 30-60 minutes depending upon traffic.
- **Carrying Capacity**: Long Beach contains the basic facilities for a beach.
- **Accessibility**: Access is good. Traffic and parking are potential impediments.
- **Environmental**: Environmental Conditions are poor, among the worst for a southern California Beach. Water quality and trash on the beach are particular concerns.

After Project Unit Day Values

For after project conditions (if the breakwater is reconfigured), we divided recreation into three categories: high season general beach use (swimming, lying on beach, walking/biking/skating on path, boogie-boarding, volleyball, etc.), low season general beach use, and surfing. We assigned separate point values for each activity as discussed below.

Table C.3: Unit Day Value of High Season General Beach Recreation after Project

Recreational Value for High Season			
Criteria	**Total Possible Points**	**Total Points Assigned**	
Recreation Experience	30	22	
Availibility of Opportunity	18	14	
Carrying Capacity	14	11	
Accessibility	18	12	
Environmental	20	12	
Total	100	71	
Day Use Value 2007		$	8.10

- **Recreation Experience**: The recreational experience after breakwater reconfiguration should be much better. Water quality should be improved for swimming. Wave activity would allow surfing and bodyboarding. The trash generated on the beach from the LA River should be reduced.
- **Availability of Opportunity**: Congestion is an issue here. Although there are other activities in the area, (e.g. Huntington Beach), these are at capacity on many summer days, hence the relatively high score.
- **Carrying Capacity**: This assessment assumes some improvement in facilities.
- **Accessibility**: This is the same as before.
- **Environmental**: Environmental Conditions would improve substantially due to better water quality and reduced trash.

Table C.4: Unit Day Value of Low Season General Beach Recreation after Project

Recreational Value for Low Season			
Criteria	**Total Possible Points**	**Total Points Assigned**	
Recreation Experience	30	9	
Availibility of Opportunity	18	9	
Carrying Capacity	14	11	
Accessibility	18	12	
Environmental	20	12	
Total	100	53	
Day Use Value 2007		$	7.06

- **Recreation Experience**: The recreational experience after breakwater reconfiguration should be better but mitigated somewhat by colder weather which limits beach activities.
- **Availability of Opportunity**: Reduced trash on beach and improved water quality imply somewhat fewer substitutes available locally.
- **Carrying Capacity**: This assessment assumes some improvement in facilities.
- **Accessibility**: This is the same as before.
- **Environmental**: Environmental Conditions would improve substantially due to better water quality and reduced trash.

Surfing

Surfing is considered a specialized recreational activity. Numerous studies assign higher values to surfing than general beach activity.[26] For this study, we used the Corps' unit day value for specialized recreation.

Table C.5: Unit Day Value of Surfing after Project

Recreational Value for Surfing (Year Round)			
Criteria	**Total Possible Points**	**Total Points Assigned**	
Recreation Experience	30	19	
Availibility of Opportunity	18	15	
Carrying Capacity	14	12	
Accessibility	18	12	
Environmental	20	12	
Total	100	70	
Day Use Value 2007		$	26.58

[26] For example, see Chapman and Hanemann, 2001.

- **Recreation Experience**: Note that this is for good surfing days only. Reconfiguration of the breakwater should provide adequate wave height for surfing though not as good as at some other beaches such as Huntington Beach.
- **Availability of Opportunity**: While nearby Seal Beach and Bolsa Chica State Beach have surfing, Long Beach has more parking capacity and better access for people who live in Long Beach.
- **Carrying Capacity**: This assessment assumes some improvement in facilities.
- **Accessibility**: This is the same as before.
- **Environmental**: Environmental conditions should improve substantially due to better water quality and reduced trash.

Appendix D: Economic Impact Estimates

Policy makers want to know how much economic activity is generated by beach recreation. This appendix will provide estimates of direct total spending generated at the State and local (City) levels as well as taxes generated from this spending.

Dr. King has quantified this for the State and for a number of communities in several studies.[27] The estimates used in this report are based on survey data conducted at similar beaches in southern California. Local spending is lower than State spending simply because visitors may not spend all of their dollars in town. For example, a visitor to Long Beach may drive in from Los Angeles - some of her travel expenditures will be out of the City. Local taxes generated do not include increases in property taxes generated by improvements in the beach or water quality. Adequate data does not exist to make such an estimate, but it is clear that this impact is significant and thus our estimates are conservative.

Dr. King's previous studies indicate that the primary determinant of beach spending is whether a visitor has come in for the day or is staying overnight. For a beach with the amenities of Long Beach, after reconfiguration, we estimate that, on average, overnight visitors will spend $50 per person. This figure may seem small given hotel and meal rates, however it includes people who stay with friends or relatives and is per person, not per group. We estimate that day trippers will spend on average $13.20 per day. For more information on how these numbers were derived, please see to King and Symes.[28] We also estimated the increased parking revenue. A more detailed discussion of this estimate is contained in Appendix A.

Our preliminary survey followed up by our discussions with lifeguards, indicate that currently 28% of visitors to Long Beach's beaches are on overnight trips and we have assumed, conservatively, that this proportion will not change. If the percentage of overnight visitors increase (which is quite possible as amenities improve) then the economic impacts would be larger than estimated here.

Spending per person was multiplied by estimated attendance before and after reconfiguration (250,000 and 3.2 million respectively—see main text for a discussion of how these figures were derived). State taxes were estimated as a fixed percentage of total spending as is standard in most economic impact models. We used data from the California Statistical Abstract[29] to estimate the percentage of spending that would accrue as State taxes.[30] Following the U.S. Army Corps methodology, we used a discount rate of 4.65% for all calculations of present value.

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[27] See, in particular: "The Potential Loss in GNP and GSP from a failure to Maintain California's Beaches," prepared for the California State Resources Agency, 2002, http://userwww.sfsu.edu/~pgking/pubpol.htm and "The (Economic) Benefits of California's Beaches," prepared for the California State Resources Agency, 2002.

[28] Ibid.

[29] See http://www.dof.ca.gov/HTML/FS_DATA/STAT-ABS/Statistical_Abstract.php.

[30] 11.5% of spending was assumed to go to State taxes including sales taxes, excise taxes, income taxes, etc.

Table D.1: Economic Impacts to the City of Long Beach from Increased Beach Recreation[31]

Scenario/Fee	Overnight Spending per Person (Local)	% Over-nighters	Day Tripper Spending per Person (Local)	Avg. Spending per Person	Total Spending (Local)	Local Sales Tax Generated	Local TOT's Generated	Taxes/Fees Generated	PV Spending	PV Taxes
Current	50.00	28%	$ 13.20	$ 17.70	$ 4,424,000	$ 50,669	$ 168,000	$ 218,669	$ 89,303,970	$ 4,414,107
After Reconfiguration	50.00	28%	$ 13.20	$ 17.70	$ 56,627,200	$ 648,563	$ 2,150,400	$ 2,798,963	$ 1,143,090,816	$ 56,500,571
Net Spending/Taxes					$ 52,203,200	$ 597,894	$ 1,982,400	$ 2,580,294	$ 1,053,786,846	$ 52,086,464
Net Parking Fees								$ 4,354,359		$ 87,898,174
Net Impact					$ 52,203,200			$ 6,934,653	$ 1,053,786,846	$ 139,984,638

Table D.1 above presents our estimates of the economic impacts to the City of Long Beach. For the City of Long Beach, the net increase in (local) spending is $52 million per year and the present value of this spending over a fifty-year period is just over $1 billion (Table 8 above). City beach tourism will generate an estimated increase of $2.5 million per year in local taxes (transient occupancy taxes and sales taxes) and $4.3 million in increased parking revenues and fines. Over a fifty-year period, this generates a present value of $52 million in taxes, $87.9 million in parking fees, for a total of just under $140 million in revenues for the City of Long Beach. In addition, it is anticipated that beach activity would generate a significant amount of revenue from other taxes such as the utility users tax, which is not estimated here. Property taxes could also rise, especially on commercial property, but no attempt has been made to estimate this impact.

Table D.2: Economic and Tax Revenue Impacts of Breakwater Reconfiguration to California

Season	Overnight Spending per Person (CA)	% Overnighters	Day Tripper Spending per Person (CA)	Avg. Spending per Person	Total Spending (CA)	Taxes Generated	PV Spending	PV Taxes
Current	55.00	28%	$ 16.00	$ 19.88	$ 4,970,000	$ 571,550	$ 11,537,451	$ 11,537,451
After Reconfiguration	55.00	28%	$ 16.00	$ 19.88	$ 63,616,000	$ 7,315,840	$ 147,679,375	$147,679,375
Net Impact					$ 58,646,000	$ 6,744,290	$ 1,183,842,818	$136,141,924

Table D.2 presents our estimates of the economic impacts to the State of California. Reconfiguration of the breakwater would generate $58.6 million in State spending and generate $6.7 million in taxes per year.[32] The present value of this spending over a fifty-year period is just under $1.2 billion; for State revenues the corresponding level is $136 million.

[31] All data for this analysis was taken from King and Symes, previously cited. It was assumed that the City share of sales tax is equal to 1%, even though 0.25% of this amount was recently rescinded. We anticipate the traditional 1% will be restored. Sales taxes were estimated from survey data in King and Symes for food/takeaway, sundries, beer and liquor, sit down restaurants, and gas. For food/takeaway it was assumed 75% was not subject to sales tax. For day trippers average taxable sales per day were $15.70 and $32 for overnight visitors. Hotel spending per capita was assumed to be $20 per person per day, which is very conservative; transient occupancy tax for Long Beach is 12%.

[32] Based on data from the State of California's Statistical Abstract and from the Board of Equalization, we assumed that 11.5% of state spending would translate into state taxes.