City of Solana Beach

DRAFT

CITY OF SOLANA BEACH
PUBLIC RECREATION FEE REPORT

FEBRUARY 25, 2016

FOR SUBMITTAL TO:
THE CCC IN APRIL 2016

Michael Baker
INTERNATIONAL

CITY OF SOLANA BEACH

DRAFT
PUBLIC RECREATION
FEE STUDY

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Prepared by

Michael Baker International

9755 Clairemont Mesa Blvd. Suite 100

San Diego, California 92124

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INTRODUCTION TO THE UPDATED 2016 DRAFT FEE STUDY

On November 18, 2015, the Solana Beach City Council approved the release of the November 2015 updated Draft Public Recreation Impact Fee Study (2015 Draft Fee Study) for public review and comment. The City of Solana Beach (City) received six public and agency comment letters on the 2015 Draft Fee Study. City Staff and the consultant team conducted additional research and analysis efforts in response to the comments received. As a result of the additional analysis and research, some modifications to the 2015 Draft Fee Study were made and were reflected in a revised Draft Fee Study which was issued for public review and comment in February 2016 (2016 Draft Fee Study).

Some of the variables and assumptions contained in the 2015 Draft Fee Study were refined, resulting in a modified fee recommendation as described below. Some of the changes to the 2015 Draft Fee Study were editorial or cleanup changes or otherwise non-substantive in nature and helped to clarify the 2015 Draft Fee Study. Other changes were more substantive in nature and were needed to address the comments of stakeholders including California Coastal Commission (CCC) staff. This draft fee study (or report) reflects those changes and is simply referred to as the Draft Fee Study or 2016 Draft Fee Study.[1]

On balance, some changes to the 2015 Draft Fee Study had the effect of increasing the recommended fee while others had the effect of lowering the recommended fee. In summary, the key modifications that have been made and incorporated into the 2016 Draft Fee Study in response to comments are shown in **Table ES-1** below.

TABLE ES-1 DRAFT FEE STUDY COMPARISON

Assumption or Variable	November 2015 Draft Fee Study	February 2016 Draft Fee Study	Effect on Fee
Investment Rate	4%	2% (based on City of Solana Beach 20-year investment rate)	Increase
Consumer Price Index	2%	Updates Consumer Surplus using CPI through 2015, apply 2% minimum	Decrease
Consumer Surplus	Used 2010 Dollars	Uses 2016 Dollars	No Change

[1] This Draft Fee Study is the same document as the February 2016 Draft Fee Study (2-25-2016) approved by City Council under Resolution 2016-039 with final formatting and minor text revisions involved in accepting text that was shown in redline/strikeout.

TABLE ES-1 DRAFT FEE STUDY COMPARISON

Assumption or Variable	November 2015 Draft Fee Study	February 2016 Draft Fee Study	Effect on Fee
(Summer and Non Summer Values)	$17.50 / $13.42 – 33% of wages $32.33 / $19.09 – 67% of wages $53.67 / $25.52 – 100% of wages	$19.25 / $14.76 – 33% of wages $26.59 / $17.39 – 50% of wages $35.56 / $21.00 – 67% of wages	
Annual Average Coastal Bluff Erosion Rate	0.4' / yr (per LUP) to 0.673' / yr	Same	No Change
Beach Attendance	156,400	Same	No change
Timing of Seawall Construction	Before bluff failure	After bluff failure with flexibility to adjust fee for "before bluff failure" conditions	Decrease
Initial Area Impacted by Seawall for first-year period	8.2 square feet per 1-foot width of wall plus 2 square feet for physical location of seawall	0.4 square feet per 1-foot width of wall plus 2 square feet for physical location of seawall and additional calculations for 1) seawalls other than 2-feet thick, and 2) other conditions such as when lower bluff failure is imminent.	Decrease
Beach Visitor Growth Rates	0.8% average annual growth rate	None applied. Beach attendance density correlated with beach area at time of surveys (persons per acre or square foot)	Decrease
Available Public Recreational Beach Area	15.5 acres based on 13-year average from beach profile transect data collected between 2002-2014 as part of the SANDAG Regional Monitoring Program	18.8 acres based on LiDAR concurrent with beach attendance surveys (Apr 2008, Sept 2008, Mar 2009, and Oct-Dec 2009). (from Scripps Institute of Oceanography and NOAA's Office for Coastal Management)	Decrease
Recreational Beach Area Measurement	Toe of Bluff to MSL	Same	No Change
Fee Basis	Two impacts analyzed and combined into a single linear-foot fee	Two impacts analyzed and shown separately for flexibility in applying the fee to ensure proportionality. For informational purposes fee is shown as a combined fee on a per linear foot basis for a typical seawall.	No Change
Recommended Public Recreation Impact Fee	$870 per linear foot assuming seawall is 2-foot-wide assuming imminent bluff failure.	Minimum $431 per linear foot of seawall assuming no notch or imminent bluff failure; $939 per linear foot assuming imminent bluff failure depending on project specific conditions	Fee may be higher or lower in proportion to impacts

The 2015 Draft Fee Study recommended that the City establish a Public Recreation Impact Mitigation Fee of $870 per linear foot of seawall if permitted in 2016 with a fee escalation schedule that adjusts over time. Based on the comments received on the 2015 Draft Fee Study, the study was revised as reflected in this 2016 Draft Fee Study and the updated recommendation is that the City establish a Public Recreation Impact Mitigation Fee (or Public Recreation Fee) consisting of two parts to provide flexibility in the application of the fee to specific projects.

The Public Recreation Fee (consistent with the Sand Mitigation Fee) will be calculated on a project-specific basis to ensure the mitigation fees are proportional to the impact being mitigated. Variables to be considered in determining the fee imposed will depend on the impact to the beach area based upon (1) the specific physical configuration and footprint of the proposed coastal structure and (2) the absence of a bluff notch overhang or the depth of a coastal bluff notch overhang, as determined by the City's geotechnical engineer and confirmed to be in imminent danger of collapse.

The Public Recreation Fee addresses impacts to the loss of recreation based upon the loss of beach area described as (1) Initial Area and (2) theoretical 20-year Bluff Retreat Area (refer to Chapter 4). **Table ES-2** identifies separate rates to ensure proportionality between the impact and the mitigation fee to be applied to the Initial Area and Bluff Retreat Area. The rates in Table ES-2 are based on the recommendations contained in the *2016 Draft Public Recreation Impact Fee Study* prepared under a Local Coastal Program (LCP) Planning Grant provided to the City. The fees address the impacts to public recreation for a 20-year period consistent with the requirements of Land Use Plan (LUP) Policies 4.49 and 4.53, at which time they may be reassessed.

The Public Recreation Fee will be imposed as a condition of approval of any discretionary permit for a non-erodible coastal structure and will be payable to the City at the time the construction permits are issued. The fee will be paid to the City prior to construction of the coastal structure so that, in effect, the mitigation fee is paid before the anticipated impact is created.

City Staff will calculate the Public Recreation Fee on a project-specific basis during the discretionary permit approval process and will include the estimated fee as a condition of project approval. The fee will be finalized by City Staff at the time the City construction permit is issued and may be modified based on the final project design and condition of the bluff. This second fee review is warranted due to (1) the fact that there is often a considerable lapse of time between the point at which the City approves the initial discretionary permit and the time that the applicant comes back to the City to obtain the construction permit; and (2) changes to the project design that may result from the CCC permit review and approval process.

The Total Public Recreation Fee (PRF), for a 20-year period, shall equal the Initial Area multiplied by the Initial Area Rate plus the Bluff Retreat Length multiplied by the Bluff Retreat Rate for the Permit Year. The following formula calculates the Total PRF for the next eleven years based on Table ES-2, which reflects an increasing rate depending on Permit Year of the seawall. (Definition of terms is provided later in this chapter.)

PRF = (Initial Area x Initial Area Rate) + (Bluff Retreat Length x Bluff Retreat Rate)

TABLE ES-2 RECOMMENDED FEE RATES (FOR 20-YEAR PERIOD)

Permit Year	Bluff Retreat Rate (per linear foot)	Initial Area Rate (per square foot)
2016	$307	$62
2017	$322	$63
2018	$340	$64
2019	$358	$66
2020	$378	$67
2021	$400	$68
2022	$423	$70
2023	$448	$71
2024	$475	$73
2025	$503	$74
2026	$534	$76

For example, in Permit Year 2016 for a typical 2 foot x 50 foot seawall where no block failure is imminent, the fee would equal:

PRF = ((2 ft x 50 ft) x ($62 per sf)) + (50 ft x $307 per linear foot) = $21,550

However, if block failure were imminent, assuming a depth of 8.2 feet[2], and the seawall retains the bluff, the fee would equal:

PRF = (((2 ft x 50 ft) + (8.2 ft x 50 ft)) x $62 per sf) + (50 ft x $307 per linear foot) = $46,970

PURPOSE AND CONTEXT

The City of Solana Beach (City) developed its Local Coastal Program (LCP) Land Use Plan (LUP) through a multi-year process with extensive public participation. In February 2013, the Solana Beach City Council adopted the CCC-modified and -approved LCP LUP during a public hearing by Solana Beach City Council Resolution 2013-018.

City Staff is now preparing the LCP Local Implementation Plan (LIP) which is a companion document to the LUP and will codify and integrate the LUP policies into the Solana Beach Municipal Code. Completion of the LIP is intended to support certification of the City's LCP—an important goal that is shared by the City and the CCC. Once the LIP is approved, the City will have a fully certified LCP, which will enable the transfer of coastal development permit authority to the City of Solana Beach.

[2] The example uses 8.2 feet; if the overhang depth were 10 feet, 10 feet would be used in the calculation.

The LUP can be viewed online on the City's website and in person at the Community Development Department at the City of Solana Beach City Hall, 635 South Highway 101, Solana Beach, California, 92075. The LCP LUP reflects the collaborative effort of the various stakeholder groups. With the shared goal of identifying long-term solutions to Solana Beach's unique coastal issues, the certified LCP LUP reflects the effort to achieve a balance of interests, rights, and needs.

The certified LCP LUP, reflecting such balance, provides for the construction of sea walls and notch fills (or other protective devices collectively referred to as "bluff retention devices") under certain defined and limited conditions. One consideration in allowing a bluff retention device is the requirement to pay the City's Sand Mitigation Fee (see LUP Appendix A) and a Public Recreation Fee to compensate for the loss of sand and loss of public recreational use due to the presence of the shoreline protective device.

GOAL OF DRAFT FEE STUDY

The goal of this Draft Fee Study (study or report) is twofold: first, to provide a method for beach valuation for use in determining an impact mitigation fee (referred to as a public recreation fee) should a protective device be constructed in Solana Beach; and second, to provide an analysis of potential offsets to the Public Recreation Fee and Sand Mitigation Fee. Although initially considered with this fee study, the Sand Mitigation Fee is no longer included in this Draft Fee Study as the various stakeholder groups and the CCC recommended using the formula currently applied to projects by the CCC. Specifics of the Sand Mitigation Fee are incorporated into the certified LCP LUP Appendix A. However, the potential offset considered in this Draft Fee Study applies to both the Sand Mitigation and the Public Recreation Fees.

Potential effects of bluff retention devices, such as aesthetic and visual impacts, are addressed by policies and design requirements contained in the certified LCP LUP. Therefore, all new bluff retention devices must meet the City's aesthetic and visual design criteria in the LUP. The City's LUP aesthetic and design criteria are permit conditions required to be incorporated into the design for all new seawalls, notch, and seacave infills and all other bluff retention devices in the City. The following design criteria are intended to avoid, lessen and mitigate potential aesthetic and visual effects of bluff retention devices along the shoreline and are requirements for all such devices as outlined in LUP Appendix B.

- All bluff retention devices shall be located as far landward as possible to minimize encroachment on to the public beach;
- All bluff retention devices shall be designed to minimize the size of the device and preserve the maximum amount of native bluff face;
- All bluff retention devices shall be color matched to resemble the native bluff as closely as possible; and
- All bluff retention devices shall be hand-sculpted to resemble the native bluff to the maximum extent.

Potential effects on natural resources are currently being reviewed by the CCC in an analysis by San Francisco State University with funding provided by the CCC and the National Oceanic Atmospheric Administration (NOAA). An administrative draft provided to the City in November 2015 sets forth a preliminary process for such analysis but it is not an approved document to date. Therefore, these topics are not part of this Draft Fee Study. However, a baseline natural resources survey of shoreline resources was prepared by the City and is included in **Appendix 1** of this Draft Fee Study.

RECREATIONAL VALUE OF THE PUBLIC BEACH IN SOLANA BEACH

While it may be relatively easy to assign a value to public property that has a market corollary (such as a meeting hall), it is a complex challenge to develop a sound approach and methodology for assigning a value to public land in which no market exists, i.e., cannot be sold in the market. Public beaches in California are not for sale and as such cannot be purchased. However, public beaches have an inherent recreational value to the public and therefore, the value must be evaluated using other "non-market" mechanisms. PMC[3], referenced as Michael Baker from hereon, with CIC Research, Inc. as a sub-consultant, was retained by the City in June 2008 to prepare the fee study. To determine the recreational value of the public beach, CIC staff conducted random surveys of beach attendees in the City of Solana Beach and performed attendance counts from July 2008 through July 2009. Using the Travel Cost economic model, an average visitor trip value of $21.15 was established. In response to public feedback to consider consumer surplus, changes were incorporated into this 2016 Draft Fee Study, using the original data updated to 2016 dollars, whereby the resulting average recreational value of an adult visitor day equals $19.25 during summer months and $14.76 during non-summer months averaged over the entire length of the beach.

The attendance surveys were performed in such a way as to analyze small segments of beach area to potentially identify varying value along the length of the beach. The number of visitors within a beach area reveals the preference of one area over another. The more crowded the beach area, the more it is inherently valued; this approach then captures the heterogeneity of beach area such as quality, amenities including parking and restrooms, and surf conditions. Figure 1-1 shows the average annual beach visitors along the Solana Beach coast based on the survey results. The preliminary analysis divided the beach into 35 segments. Nine separate areas in Solana Beach were identified based on approximate beach densities. These were subsequently consolidated into a single City wide zone based on the results of the data and in recognition that the beach is subject to dynamic processes that ultimately affect beach density on a daily, weekly, and yearly basis. The consolidation into a single zone, based on the average recreational values of visitor day of $19.25 (summer) and $14.76 (non-summer), yielded an average annual public recreation value of $2.54 million dollars[4] (2016 dollars) over the entire 18.8 acres of the beach (area updated based on LiDAR data as discussed in Chapter 4) or $3.10 (2016 dollars) per square foot.

SUMMARY OF KEY CHANGES SINCE THE 2010 DRAFT FEE STUDY

A Draft Fee Study (2010 Draft Fee Study) was released in 2010 for public review and comment and the City received comment letters from the following:

- California Coastal Commission Staff
- Phillip King, PhD, San Francisco State University, Interested Party
- Jim Jaffee, Solana Beach Resident/Surfrider Foundation
- Shoecraft & Burton, LLP representing Mr. Joseph Steinberg, Solana Beach Property Owner

[3] PMC has been acquired by Michael Baker International.

[4] Including the value of the Junior Lifeguard Program.

- Axelson & Corn representing BBC and COOSA, Solana Beach Residents and Property Owners
- David Winkler, Solana Beach Resident
- Tom Cook, Interested Party/Surfrider Foundation

As noted previously, a 2015 Draft Fee Study was released in November 2015 for public review and comment and the City received six comment letters. Key changes between the 2015 Draft Fee Study and this updated 2016 Draft Fee Study are summarized in Table ES-1.

The City and the Michael Baker team evaluated the comments provided on the 2010 and the 2015 Draft Fee Studies and prepared responses which are included in **Appendix 2**. The updated 2016 Draft Fee Study reflects revisions that were required to address many of the comments received on the 2010 and 2015 draft fee studies. A summary of the key changes between the 2010 Draft Fee Study and this 2016 Draft Fee Study include the following:

- The City's beach area was revised to 18.8 acres (from 8.18 acres in the 2010 Draft Fee Study and 15.5 in the 2015 Draft Fee Study) using LiDAR data available from UCSD and NOAA covering the survey period time frame of July 2008 through July 2009 and corresponding to the area of the beach that was available during the survey period instead of a one-time "snapshot" of the beach area on a single day.
- Beach attendance was revised based on separate non-surfer and surfer expansion factors. The surfer count was revised to 66,800 annually (from 26,700) due to the likelihood that surfers were underrepresented in the original attendance counts due to the time of day that the beach population counts and visitor surveys were conducted. The surfer expansion factors were developed from available data trends from other Southern California beach sites that were deemed suitable to use as proxy sites.
- Attendance factors are based on one-hour time blocks (two-hour time blocks were used in 2010) as suggested by stakeholders to reduce potential of "over counting."
- Applied seasonal (monthly) expansion factors to the attendance figures, then expanded that to an annual estimate. As summer months were sampled more frequently than non-summer months, an annual expansion factor was included in 2010 overestimated attendance.
- Development of a demand curve to determine consumer surplus (what a person is willing to pay) for an adult beach visit using 1/3 of wages per convention (instead of 100% of wages) yielding an overall value of $14.76 for non-summer visits and $19.25 for summer visits (in 2016 dollars) compared to the 2010 figure of $21.15 (travel cost only assuming 100% of wages).
- Mean sea level impacts on bluff erosion using 0.4 feet per year per the City's Certified LCP LUP for the first 10 years and 0.673 feet per year for the next 20 years, assuming climate change and rising sea levels.
- Area of public beach not available for recreation is based on two components. The first component is related to the direct physical location of the public beach the seawall occupies and may also include an area that is imminently subject to episodic bluff failure. The second component considers the area lost to theoretical beach narrowing caused by stopping further erosion (e.g., fixing the back beach location), thereby preventing bluff retreat.

- Separate factors are used 1) to adjust the 2010 Consumer Surplus results to 2016 dollars, 2) to account for inflation over the next 20 years assumed to be 2%, and 3) to "present value" the fee to the Permit Year using a rate of 2% which is conservative and based on an actual 20-year City investment rate.

- The 2015 Draft Fee Study included a regional population growth factor of less than 1%. No growth rate was assumed in the original 2010 Draft Fee Study and this variable has been eliminated from the 2016 Draft Fee Study to ensure consistency with other aspects of the 2016 Draft Fee Study. A basic assumption is that the beach density is relatively constant and that the recreational value lost due to a seawall can be measured by the change in beach size (e.g., if the beach narrows, there is a proportional decrease in beach attendance). Conversely, a bigger beach achieved through beach nourishment would be anticipated to attract greater numbers of visitors to the public beach.

- Obligation to pay mitigation fees for 20-year increments instead of to Year 2081 (up to 75 years) consistent with the certified LCP LUP policies.

- Solana Beach Junior Lifeguard Program revenues have been added to the annual recreational value to capture that program's value. The counts/surveys did not include the Junior Lifeguard Program.

The net effect of those changes on the outcome and recommendations of the 2016 Draft Fee Study include:

- The total annual average beach attendance increased to 156,400 (86.2% adults) from 124,700 in 2010. There was no change in this variable between the 2015 and 2016 Draft Fee Studies.

- The recreational value of an adult visitor beach trip equals $19.25 for summer visits and $14.76 for non-summer visits in 2016 dollars. Although converted to 2016 dollars, there was no change in this variable between the 2015 and 2016 Draft Fee Studies.

- The annual recreational value for the entire beach is $2.54 million (2016 dollars) compared to $2.1 million in 2010 Draft Fee Study. Although converted to 2016 dollars, there was no change in this variable between the 2015 and 2016 Draft Fee Studies.

- The resulting annual public beach recreational value is $3.10 per square foot in 2016 dollars (based on a beach area of 18.8 acres) compared to $6.02 per square foot (based on a beach area of 8.18 acres) in the 2010 Draft Fee Study.

- The Public Recreation Fee (mitigation fees for public recreational losses) consists of two components. For impacts due to limiting bluff retreat, the fee is $307 per linear of foot of wall increasing to $534 per linear foot of wall in 2026. For impacts due to the direct physical area occupied by the structure, the fee is $62 per square foot increasing to $76 per square foot in 2026. The 2010 Draft Fee Study reflected these as a combined rate as did the 2015 Draft Fee Study, equaling $3,100 and $870 per linear foot, respectively.

Table ES-2 is repeated below showing the public recreation fee for each of the next eleven Permit Years (based on the year of bluff retention device construction). The table reflects the total mitigation fee required for a 20-year period.[5]

TABLE ES-2 RECOMMENDED FEE RATES (FOR 20-YEAR PERIOD)

Permit Year	Bluff Retreat Rate (per linear foot)	Initial Area Rate (per square foot)
2016	$307	$62
2017	$322	$63
2018	$340	$64
2019	$358	$66
2020	$378	$67
2021	$400	$68
2022	$423	$70
2023	$448	$71
2024	$475	$73
2025	$503	$74
2026	$534	$76

The Total Public Recreation Fee (PRF) then shall equal, depending on Permit year:

PRF = Initial Area x Initial Area Rate + Bluff Retreat Length x Bluff Retreat Rate

Where:

Initial Area - The Initial Area shall be that Useable Beach Area that is occupied by a seawall or other coastal structure measured as the width of the structure multiplied by the length of the structure plus any area determined by the City's Geotechnical Engineer to be subject to imminent bluff failure, measured in square feet. For the purposes of calculating the Initial Area, any area subject to imminent bluff failure shall be included.

Bluff Retreat Length - The Bluff Retreat Length shall be the length of the seawall measured along the bluff, measured in feet.

Initial Area Rate - The Initial Area Rate shall be the amount identified in Table ES-2, under the column titled Initial Area Rate dependent on the Permit Year.

Bluff Retreat Rate - The Bluff Retreat Rate shall be the amount identified in Table ES-2, under the column titled Bluff Retreat Rate dependent on Permit Year. The Bluff Retreat Rate is based on a linear foot of seawall or other coastal structure and incorporates the annual area impacted by the wall estimated by the erosion rate over a 20-year period.

[5] Additional mitigation fees will be assessed in 20-year increments as required by the certified LCP LUP.

Total PRF - The Total Public Recreation Impact Fee, for a 20-year period as calculated by the above formula.

Permit Year - The year the wall is considered permitted (construction year) as defined in the LCP LUP.

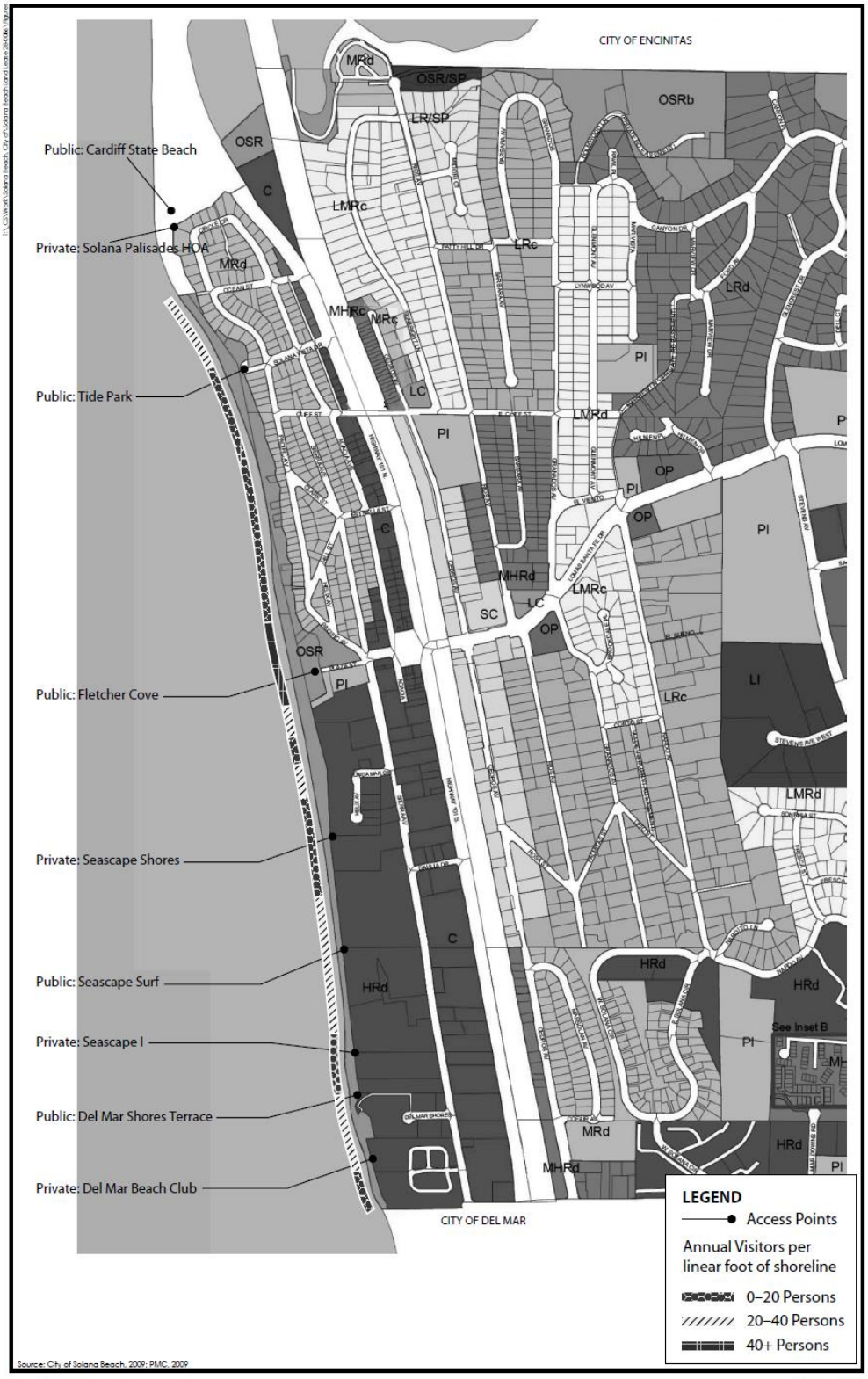
Useable Beach Area – That area of Solana Beach bound by the northern and southern city limits, the average width of the beach based on the distance between mean sea level and the toe of coastal bluff and that may extend landward of the toe of coastal bluff based upon recommendations of the City Geotechnical Engineer.

The Public Recreation Fee incorporates the annual recreational value of $3.10 per square foot in 2016 increasing to $5.51 per square foot in 2045. The Public Recreation Fee 1) assumes an average annual bluff erosion rate of 0.4 feet per year initially and 0.673 feet per year beginning in 2026, 2) can accommodate situations where bluff failure is imminent, and 3) can accommodate varying seawall footprint areas. The Public Recreation Fee assigns an annual CPI rate of 2%, then uses an estimated investment rate of 2% to calculate the present value of the annual fee over the 20-year period. (Note applying a 2% CPI rate and at 2% investment rate will offset one another. However, the 2015 and 2016 Draft Fee Studies identify these separately for informational purposes.)

The City currently collects a fee deposit of $1,000 per linear foot for the Public Recreation Fee and assesses a Sand Mitigation Fee per LCP LUP Appendix A.

Figure 1-1 shows the average annual beach population (by linear foot of shoreline) per segment of beach.

FIGURE 1-1 ANNUAL BEACH ATTENDANCE



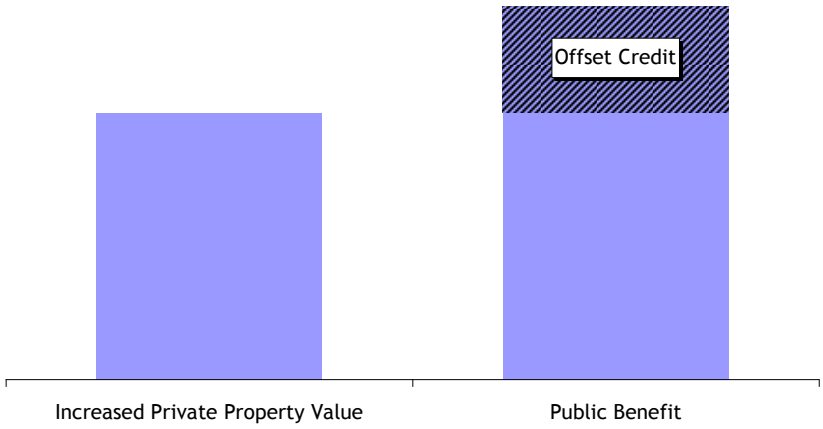
Not to scale

Figure 1-1
2010 Annual Beach Attendance

POTENTIAL OFFSETS TO PUBLIC RECREATION FEES AND SAND MITIGATION FEES

The average overall public safety benefit is estimated to be $31 per linear foot of wall per year, which is the result of the likelihood of a fatality occurring along any one stretch of beach but that is avoided as a result of the installation of the bluff protection device. The other major components of a bluff retention device-related public benefit would be protection of public property and the potential increased property tax revenue associated with a stabilized site. These amounts are then compared to the private benefit. Where the public benefit exceeds the private benefit, the City Council, at a public hearing, may consider allowing for an offset to the required fees as presented in Chapter 5. (See **Figure 1-2**.)

FIGURE 1-2 POTENTIAL OFFSET CREDIT



2. INTRODUCTION

SOLANA BEACH LOCAL COASTAL PROGRAM LAND USE PLAN

Solana Beach's efforts to establish a Local Coastal Program (LCP) have been ongoing for more than a decade. In June 2008, the City Council approved a Draft LCP Land Use Plan (LUP) for submittal to the California Coastal Commission (CCC) representing the collaborative planning effort initiated by the City and developed with the participation of various stakeholder groups including local environmental groups and property owners. Shortly thereafter, this Fee Study began to move forward. A Draft Fee Study was released to the public in March 2010 and a corrected version released in July 2010 for public review and comment. Several comments from interested parties were received during the 60-day comment period. The 2010 Draft Fee Study was subsequently put on hold while the City worked with the CCC and stakeholders to prepare revisions to the Draft LCP LUP. In October 2011, the City submitted its seventh draft LCP LUP to the CCC. In March 2012, the CCC rejected the City's LUP and instead approved a modified version of the LUP incorporating CCC staff-initiated changes to the City's LUP. The City Council adopted the CCC-modified LUP in February 2013. City Council also directed staff to begin preparation of an LUP Amendment to address policy changes primarily related to bluff top development and shoreline protection. The LUP Amendment was approved by the CCC in January 2014 with new findings made in April 2014. City Council approved the CCC-modified LUP Amendment in June 2014. The City now has a certified LCP LUP and is in the process of preparing the companion LCP Local Implementation Plan (LIP).

The City's LCP consists of a LUP and an in-development Local Implementation Plan (LIP). As part of the LCP and its implementation, the City of Solana Beach has established a long-term shoreline management program. Key elements of the City's shoreline management program are also part of the City's sea level rise adaptation strategies which are outlined in the certified LCP LUP. The primary elements include long-term coastal restoration through beach nourishment, increased bluff top setbacks for new development, and a ban on permanent irrigation systems within 100 feet of the coastal bluff edge.

The unique geology of the coastal area as well as regional sand depletion have all caused the loss of the beach area over time, accelerating the erosion process along the coastal bluffs, and threatening public and private property as well as public infrastructure. The City's shoreline management program is intended to achieve a comprehensive goal of restoring, preserving, and enhancing a safe, wide beachfront for use by the public, and protecting and preserving private property rights of individual bluff property owners. A key element of the shoreline management plan is the 50-year Coastal Storm Damage Reduction Project that the City is jointly developing with the City of Encinitas, US Army Corps of Engineers (USACE), and the California Department of Parks and Recreation (State Parks). It is the intent that with the LUP policies, bluff retention devices along the entire shoreline of Solana Beach will not be necessary. For instance, should the City implement a program to construct sand retention or multi-purpose reefs or other devices such as a living shoreline system and prefills the system with sand, the environmental quality of the public

beach in Solana Beach may be enhanced. It may also eliminate the long-term need for most additional Bluff Retention Devices (BRDs).

While the LUP allows the construction of coastal protection structures (e.g., BRDs) on public property, for the protection of private property as well as public property, it also sets forth the conditions for allowing such construction and the requirement to mitigate impacts. When a BRD is built, it establishes the back beach location with the goal of preventing further bluff erosion. However, without the ongoing erosion, bluff sediments are prevented from reaching the beach and the beach area that would have theoretically been created over time by a receding shoreline will not be available to the public for recreation, especially in light of future sea level rise predictions. As outlined in the certified LCP LUP, the City of Solana Beach requires payment of mitigation fees to compensate for the loss of sand and public beach area that is and may be available for public recreation.

As stated in Policy 4.39 of the certified LCP LUP:

> Provide for reasonable and feasible mitigation for the impacts of all bluff retention devices which consists of the payment of Sand Mitigation Fees and Public Recreation Fees to the City or other assessing agency.

Also stated, in part, in Policy 4.48 of the certified LCP LUP:

> Mitigation for the impacts to shoreline sand supply, public access and recreation and any other relevant coastal resource impacted by the coastal structure is required and shall be assessed in 20-year increments, starting with the building permit completion certification date. Property owners shall apply for a CDP amendment prior to expiration of each 20-year mitigation period, proposing mitigation for coastal resource impacts associated with retention of the coastal structure beyond the preceding 20-year mitigation period and shall include consideration of alternative feasible measures in which the permittee can modify the coastal structure to lessen the coastal structure's impacts on coastal resources.

This establishes the basis for developing a Public Recreation Fee as mitigation for the loss of public beach area and corresponding public recreational opportunities. The LCP LUP identifies the Sand Mitigation Fee formula and therefore it is not addressed here. This 2016 Draft Fee Study, then, is focused on determining an appropriate Public Recreation Fee formula that may be used to determine appropriate mitigation fees accounting for the loss of beach area and corresponding public recreational opportunities. As a first step, several economic methods to determine the recreational value of the beach were evaluated.

REVIEW AND SELECTION OF THE ECONOMIC MODEL

Various economic models were considered for establishing the recreational value of the public beach. These included the Random Utility Maximization Model, the Contingent Value approach, Benefits Transfer approach, and the Travel Cost Model. Michael Baker, including economist Dr. Gordon Kubota of CIC Research, recommended the Travel Cost Model as the most appropriate method for determining a recreational value for the beach.

Using the Travel Cost Model, based on specific surveys in Solana Beach, a recreational value per beach visitor per day was estimated based on the amount of time traveling to and from the beach and the associated cost of travel. Using standard mathematical modeling, the value that a visitor places on the beach can be determined. Multiplying that figure by the number of visitors

provides an estimate of the recreational value of the beach at Solana Beach which is then used to calculate the Public Recreation Fee for a 20-year period.

Each economic model has both value and limitations in such an application. The comparative advantages and disadvantages of each economic model are summarized below.

Travel Cost Model

Advantages:

- Relatively simple, short, straightforward questionnaire with high percentage of participation;
- Collects data on actual observed actions (revealed preference), not on stated preferences (as in a contingent value approach), and therefore is not subject to interviewee bias;
- Valid results with smaller sample size. Sample is collected by surveying on the beach being evaluated;
- Cost of survey is reasonable; and
- Survey is easy to replicate.

Disadvantages:

- It does not account for substitution, which means the approach assumes that the cost of choosing another beach reflects exactly the value of that other beach;
- Less responsive to measuring quality changes than the Random Utility Maximization Model; and
- Requires an "on-site" expansion factor for attendance.

Random Utility Maximization Model

Advantages:

- Captures and evaluates the substitution effect in the site visit decision;
- May evaluate quality differences in sites and impact on value; and
- Frequently used for non-market evaluation.

Disadvantages:

- Requires an extensive, large, and relatively expensive household phone survey to obtain sufficient sample points to provide a value of an individual beach such as Solana Beach;
- Higher percentage of non-respondents;
- Model is complex and may be difficult to resolve;

- Uses a large population for expansion and therefore is subject to large potential errors caused by multiplying any value by a large number;

- Although based on "revealed preference," respondents are sometimes questioned on the importance of selective characteristics used to arrive at that choice; therefore, some interviewee bias may be introduced; and

- Cost of the survey is considerably greater than the simpler Travel Cost Model.

Contingent Value Model

Advantage:

- Quantifies value of intangibles, such as views.

Disadvantage:

- Relies on survey of stated preference, instead of actual/revealed preference.

Benefits Transfer Model

Advantages:

- Utilizes available information from studies already completed in another location and/or context; and

- Option in lieu of other expensive and/or time-intensive techniques for gross estimates.

Disadvantages:

- Not site-specific.

The Travel Cost Model (TCM) was chosen over these other models, in part, due to it being replicable, specific to the needs of the study in Solana Beach, applicable, and cost effective, requiring a reasonable sample size.

PUBLIC OUTREACH AND INVOLVEMENT

City Staff and the Michael Baker/CIC team met with interested parties at a City-hosted workshop in September 2008 to present information regarding the proposed fee study. A subsequent follow-up meeting was conducted in November 2008 with the LCP LUP ad hoc committee. The focus of the November meeting was to discuss the economic model and consider comments to improve the surveys and attendance counts. As a result of that meeting, the survey period was extended through July 2009 to capture an entire year of data and certain adjustments were made to both the survey questions and the count approach.

A draft of the Public Recreation Fee Study was released in March 2010 with a revised (corrected) version released in July 2010 (2010 Draft Fee Study) for a 60-day public comment period. The City received many comments during this period. Efforts to complete the 2010 Draft Fee Study were placed on hold while the City focused its attention on the completion of the LCP LUP which was ultimately approved in 2013 (and amended in June 2014).

In January 2014, the City was awarded a CCC LCP Planning Grant to update the 2010 Draft Fee Study and to include an analysis of potential effects of sea level rise, separate surfer expansion factors, and other changes in response to stakeholder feedback on the 2010 Draft Fee Study.[6] Preliminary work on the revised Public Recreation Draft Fee Study began in July 2014. At a public meeting in September 2014, City staff and consultants summarized and presented the major comments made by the public on the 2010 Draft Fee Study. As part of the grant, the City and consultants prepared several technical analyses as well as responses to the comments made in 2010 and submitted these to CCC for review. CCC responded in March 2015. Excerpts from these materials are included in Appendices 12, 13, 16 and 17. After the CCC responded, the fee study continued to move forward and in November 2015, an updated study, the 2015 Draft Fee Study, was presented to Council. Council approved a resolution to release the updated 2015 Draft Fee Study to the public for review and comment. A workshop on the 2015 Draft Fee Study was held in January 2016. As mentioned earlier, the City received six comment letters on the 2015 Draft Fee Study and responses were prepared which are included in **Appendix 2**. Based on the comments received on the 2015 Draft Fee Study, an updated study (2016 Draft Fee Study) was prepared for Council consideration in February 2016.

SUMMARY OF KEY PROJECT MILESTONES AND OVERALL TIMELINE

June 2008	Michael Baker, and CIC Research as a subconsultant, retained by City to prepare a draft fee study on Public Recreation Fee (aka Land Lease/Recreation Fee in earlier versions of the LCP and draft fee studies) and Sand Mitigation Fee
July 2008	Michael Baker begins data collection
September 18, 2008	City public workshop conducted
November 6, 2008	City LCP ad hoc committee meeting
July 2009	Michael Baker concludes one year of beach visitor and attendance data collection
September 2009	City Council considers June 2009 LCP LUP
March 2010	Draft Fee Study released to public
July 2010	2010 Draft Fee Study, a corrected version of the March Draft Fee Study, released by the City for public review and comment
February 2013	Certified LCP LUP approved by City Council
January 2014	City awarded CCC LCP Planning Grant
June 2014	Certified LCP LUP Amendment approved by City Council

[6] The grant scope of work anticipated that a concurrent and related study (NOAA/CCC/SFSU Beach Evaluation Study), intended to be applicable statewide, would be completed and results could be reviewed and considered in this study, if applicable and relevant to local conditions in Solana Beach. An administrative draft was provided to the City on November 13, 2015. However, that study remains in progress.

September 2014	City conducts public workshop on Draft Fee Study process/schedule
October/November 2014	Technical analyses and response to 2010 comments submitted to CCC for review
March 2015	CCC provides additional feedback to City on 2010 Draft Fee Study and the efforts on the 2015 Draft Fee Study proceeds[7]
September 2015	Presentation of 2015 Draft Fee Study to City staff
November 18, 2015	City Council Meeting to release 2015 Draft Fee Study and begin 65-day public comment period
January 12, 2016	City conducts public workshop on 2015 Draft Fee Study
February 5, 2016	City staff updates City Council on status of project and submits six comment letters received on the 2015 Draft Fee Study
February 10, 2016	Informational update provided to City Council
February 24, 2016	City conducts public workshop on 2016 Draft Fee Study and LUPA, recommended changes to the 2016 Draft Fee Study and approves releasing the study for 6-week public review and comment period.
April 13, 2016	Public hearing on 2016 Draft Fee Study to City Council. Council approves Draft Fee Study and related LUP Amendment for submittal to CCC
April 29, 2016	Submittal of 2016 Draft Fee Study and related LUP Amendment to CCC for certification

ORGANIZATION OF DRAFT FEE STUDY

This study is organized as follows:

Chapter 1 – Executive Summary

Chapter 2 – Introduction

Chapter 3 – Methodology and Surveys. This chapter includes the Travel Cost Model methodology, visitor and count (attendance) survey specifics and results, including count expansion factors, and development of demand curves. From the demand curves, the average recreational value of a visitor day is estimated for summer and non-summer months.

Chapter 4 – Draft Public Recreation Fee Study Recommendations. This chapter discusses the specifics for calculating the proposed fee using the average recreational value per square foot of beach in Solana Beach and applying that to the estimated beach area lost due to the seawall.

[7] See **Appendix 3** for California Coastal Commission comment letters.

The chapter includes discussion of sea level rise based on the Everest International Consultants, Inc. Technical Memorandum and the certified LCP LUP. The chapter provides tables for use in calculating the Public Recreation Fee which is dependent on the year of seawall construction.

Chapter 5 – Analysis of Potential Public Benefit Offsets. This chapter describes and quantifies the potential public benefit offsets that City Council may consider.

Chapter 6 – References and List of Preparers. This chapter cites the references used in the preparation of this study and identifies those entities that assisted in this effort.

This 2016 Draft Fee Study contains the following technical appendices:

Appendix 1 – Nearshore Marine Resources Existing Conditions
Appendix 2 – Response to Comments on 2010, 2015 and 2016 Draft Fee Studies
Appendix 3 – California Coastal Commission Comment Letters (April 2016, January 2016 and March 2015)
Appendix 4 – NOAA on Consumer Demand
Appendix 5 – Count Surveys
Appendix 6 – Visitor Surveys
Appendix 7 – Everest International Consultants Sea Level Rise Technical Memorandum
Appendix 8 – Non-Surfer Expansion Factors
Appendix 9 – Counts Excel File
Appendix 10 – Travel Cost Model Excel File
Appendix 11 – Demand Curve Data
Appendix 12 – CIC Research Report
Appendix 13 – Coastal Frontiers Report
Appendix 14 – CCC and City Fee Analysis
Appendix 15 – Related Studies
Appendix 16 – CCC Case Studies
Appendix 17 –Appraisal Critique
Appendix 18 – Additional Offset Information

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3. METHODOLOGY AND SURVEYS

INTRODUCTION

While it may be relatively easy to assign a value to public property that has a market corollary (such as a meeting hall) it is complex and challenging to develop an approach and methodology for assigning a value to public land in which no market exists, i.e., cannot be sold in the market. Public beaches in California are not for sale and as such cannot be purchased. However, public beaches have an inherent recreational value to the public and therefore, the value must be evaluated using other "non-market" mechanisms.

The four major economic models to evaluate recreational value of a non-market amenity were evaluated by the Michael Baker team: Contingent Valuation, Benefit Transfer, Random Utility, and Travel Cost. Based on its relative advantages for this specific application (outlined in Chapter 2 of this study), the Travel Cost Model was recommended to be employed by Michael Baker. The Travel Cost Model, used for the economic analysis, looks at actual (i.e., observable) human behavior and assigns a value based on the behaviors which are expressed in their decisions. In utilizing the Travel Cost Model, actual data is collected on the beach users relative to their travel to and from the activity (visit to the public beach in the City of Solana Beach) and then a value unique to that individual is calculated. The individual value is based on that individual's cost of traveling to the public beach based on their hourly income and specific mode of transportation utilized to get to the public beach. Based on this data collection effort, a demand curve was then developed using regression analysis software to determine the "consumer surplus," or the willingness of individuals to actually pay for an activity that is otherwise free (e.g., there is no entrance or parking fee required to access to the public beach in Solana Beach). See **Appendix 4** of this study for typical diagram of a demand curve and consumer surplus.

Two Primary Data Collection Efforts

Early in the development of the methodology for collecting data for the non-market evaluation it became clear that two data collection efforts would be required. One data collection effort would require surveying actual beach goers (beach visitors) to gather specific information related to their travels to the beach as well as income-related questions. Such information is one of the key inputs to the Travel Cost Model. A second data collection effort was needed to develop estimates as to the number of annual visitors to the beach, information not currently collected by Solana Beach. As it would be impractical to count every beach user, 24 hours a day on the beach or in the water for an entire year, this second data collection program utilized periodic counts (typically two-hour time blocks or less) of visitors to the beach which could then be expanded to estimate the average daily visitors, and then annual visitors, in Solana Beach. Representative survey sample sizes were chosen to accomplish the initial goal of providing an overall estimate of value for all beach activities. The sampling plan was random by month and season, day of the week, and the time of day to reflect such variables as tide conditions, weather, wave heights, month and season, time of day, and actual site location. The surveys were conducted over a

one-year, 52-week period from July 2008 through July 2009. The following describes the methodologies used in the two data collection efforts.

BEACH ATTENDANCE SURVEY/COUNTS

The beach was divided into 39 segments (from Encinitas to Del Mar), defined by 40 landmarks and generally identified using GPS-supplied coordinates. The three northernmost segments were discarded after it was determined they were located outside of the Solana Beach city limits and in the City of Encinitas. One other northern segment was discarded because of similarity with its adjacent northern area (in Solana Beach). On seven randomly selected days per month over the 12-month period, a field data collector counted attendance at the beach. The data collection days were reviewed to make certain that five of the seven days were weekdays and two were weekends. The data collector would enter the beach either from the north or southernmost entry point (alternating randomly) and traverse the entire beach counting visitors on the beach or in the water offshore. The attendance counts were then recorded into three categories: on the beach, in the water/swimming, and surfing. In addition, beach attendance counts were further distinguished as to whether the beach user was an adult or a child (e.g., under age 16 by observance), to correspond with the beach visitor survey which was only administered to those over age of 16.

The first beach population data count was conducted on July 25, 2008, and the final one was conducted on July 23, 2009. There were 88 individual counting days over this one-year period. Tally sheets and descriptions of segments are displayed in **Appendix 5** of this study.

BEACH VISITORS SURVEY

The beach visitor (or beachgoer) survey was developed by the Michael Baker team to obtain important data required to estimate the value that a given adult visitor to the beach places on going to that beach. The questionnaire was designed to obtain data on the mode of transportation used to get to the beach, the travel distance, annual income, occupation, and other information for categorizing the responses. A copy of the survey questionnaires and code book used are displayed in **Appendix 6** of this study. As noted above, the selected survey days and times were randomly selected throughout the one-year data collection effort. The interviewer would spend approximately four hours on the beach interviewing on any given day. The beach visitor survey was administered beginning on July 23, 2008, and ending on July 31, 2009. During that time, a total of 563 surveys were conducted on 34 days throughout the one-year period. See **Appendix 6** of this study for the individual surveys.

The beach visitor survey was modified after the stakeholder meeting in October 2008 to capture additional information to use in defining "expansion factors" to be applied to the beach population/attendance data. It was recommended that "expansion factors" be developed to expand the sample count data to daily attendance (and then to annual attendance) to better estimate total beach attendance rather than the initial approach of a single periodic mid-day count.

RESULTS OF DATA COLLECTION EFFORTS

Beach Attendance Counts

As stated previously, in order to obtain an estimate of the number of annual beach visitors, a count on random days was conducted. In all, on 88 randomly selected days, beach attendance counts were conducted starting on July 25, 2008, and finishing on July 23, 2009, capturing one full year of

data. The maximum count per day occurred in the summer (623 beach visitors on Saturday, August 16, 2008) and, as expected, the lowest per day counts occurred in the winter where there were several days with fewer than five people on the beach at the time of counting. **Table 3-1** displays the average count per day by month.

TABLE 3-1
AVERAGE COUNT OF BEACH VISITORS PER DAY BY MONTH

	Children	Adult	Total
July 2008	55.3	175.0	230.3
August 2008	66.8	197.0	263.8
September 2008	13.6	67.9	81.4
October 2008	12.3	60.3	72.6
November 2008	2.6	27.3	29.9
December 2008	4.6	22.1	26.7
January 2009	5.7	48.9	54.6
February2009	3.1	28.3	31.4
March 2009	6.1	42.7	48.9
April 2009	4.9	31.3	36.1
May 2009	21.6	64.6	86.1
June 2009	12.6	69.3	81.9
July 2009	47.9	125.3	173.1

Source: CIC Research, July 2009

Methodology for Developing Attendance Expansion Factors

An important step in estimating the "actual" annual beach attendance count was to determine how many visitors may have been missed on a particular day because they arrived and departed before the count was taken or after the count was taken or visited the beach on a day in which beach attendance data was not collected.

Hourly "expansion" factors for people on the beach or in the water (but excluding surfers) were developed using the visitor survey data. An estimate of the proportion of visitors missed was derived by examining the respondents' arrival time and estimated departure time and determining what proportion would not have been in the area during the counting time period on average. The raw data counts were then adjusted by the expansion factors to establish the estimated attendance for the entire day.

Hourly expansion factors for surfers were developed based on data collected and analyzed by Everest International Consultants (EIC). Separate expansion factors were developed because some studies have shown that surfer attendance spikes in the early morning and/or in the early evening which follows a different pattern than other beach goers. The visitor surveys conducted in 2008–2009 did not focus on this variable aspect of beach users. For that reason additional data was developed for use in this study. (See **Appendix 7** for the EIC report which details the methodology.) **Tables 3-2** and **3-3** below show the attendance expansion factors used in this analysis.

TABLE 3-2
EXPANSION FACTORS FOR BEACH USERS (EXCLUDING SURFERS) BY TIME BLOCK

Time Block	Missed %	Captured %	Expansion Factor = 1/Capture %
6:00-7:59 am	97.6%	2.4%	41.100
8:00-8:59 am	89.3%	10.7%	9.341
9:00-9:59 am	82.5%	17.5%	5.708
10:00-10:59 am	74.7%	25.3%	3.952
11:00-11:59 am	65.0%	35.0%	2.854
12:00-12:59 pm	59.6%	40.4%	2.476
1:00-1:59 pm	63.0%	37.0%	2.704
2:00-2:59 pm	65.9%	34.1%	2.936
3:00-3:59 pm	68.1%	31.9%	3.137
4:00-4:59 pm	78.3%	21.7%	4.618
5:00-11:59 pm	92.0%	8.0%	12.455

*See **Appendix 8** for summary data and calculations.*

TABLE 3-3
EXPANSION FACTORS FOR SURFERS BY TIME BLOCK

Time Block	Expansion Factor
6:00-6:59 am	4.4
7:00-7:59 am	2.6
8:00-8:59 am	2.5
9:00-9:59 am	3.3
10:00-10:59 am	4.3
11:00-11:59 am	5.6
12:00-12:59 pm	8.9
1:00-1:59 pm	15.2
2:00-2:59 pm	18.8
3:00-3:59 pm	19.4
4:00-4:59 pm	16.8
5:00-5:59 pm	16.3

Source: Everest International Consultants 2015

The differences in expansion factors for non-surfers and surfers indicate that surfers frequent the beach more often during the early morning hours and non-surfers frequent the beach more often around the noon hour.

The following simplified example, tabulated in **Table 3-4**, illustrates how the expansion factors for non-surfers were developed using information collected in the visitor surveys. (See the EIC report in **Appendix 7** for details on development of the surfer expansion factors.)

Example: On a given day, five people visit the beach (as shown below in the first column) and are on the beach during the time blocks shown. A "Y" (yes) in the column means the visitor was there during that time block and an "N" (no) in the column means the visitor was not there during that time block. For instance, visitor 4 was on the beach from 9:00 am until 11:59 am.

TABLE 3-4
EXAMPLE: BEACH VISITOR TIME BLOCKS

	Time Block				
Counted Visitors	**8am 8:00-8:59**	**9am 9:00-9:59**	**10am 10:00-10:59**	**11am 11:00-11:59**	**12pm 12:00-12:59**
Visitor 1	N	N	Y	Y	N
Visitor 2	Y	N	N	N	N
Visitor 3	N	N	N	N	Y
Visitor 4	N	Y	Y	Y	N
Visitor 5	N	Y	Y	Y	N
Capture # ($\sum$Y)	1	2	3	3	1
Expansion Factor	5	2.5	1.67	1.67	5

The expansion factor for each time block equals the reciprocal of the capture number divided by the total visitor count for the day (1/(capture # for that time block/5). The expansion factors were then applied to the count survey data. According to the above example, if the count for that day occurred during time block 11 (i.e., 11 a.m.), three visitors would be counted. To estimate the visitors for the entire day, the figure of three is multiplied by the expansion factor, in this case 1.67, yielding a daily beach count of 5 for that day. Without the expansion factors, the data would not represent all the visitors on the beach on a particular day. The results of applying the time block expansion factors are shown in **Table 3-5**.

TABLE 3-5
APPLYING TIME BLOCK EXPANSION FACTORS TO BEACH VISITORS – BY SEGMENT

	Beach		Wading/Swimming		Surfing		Total		
Segment	**Adults**	**Children**	**Adults**	**Children**	**Adults**	**Children**	**Adults**	**Children**	**All**
4	657	93	188	34	1,701	0	2,546	127	2,673
5	834	311	82	103	370	0	1,287	413	1,700
6	251	31	34	53	17	9	302	93	395
7	170	55	24	17	67	34	261	106	367
8	172	3	6	3	44	0	222	6	228
9	235	3	27	6	90	0	352	9	361
10	118	8	6	0	35	0	159	8	167

TABLE 3-5
APPLYING TIME BLOCK EXPANSION FACTORS TO BEACH VISITORS – BY SEGMENT

	Beach		Wading/Swimming		Surfing		Total		
Segment	Adults	Children	Adults	Children	Adults	Children	Adults	Children	All
11	180	30	12	0	0	0	191	30	221
12	89	12	3	3	0	0	91	15	106
13	648	103	29	3	781	0	1,458	106	1,565
15	1,994	445	279	269	2,690	38	4,963	751	5,715
16	1,844	702	383	358	632	49	2,859	1,109	3,968
17	268	56	77	36	364	0	710	92	802
18	333	15	72	46	333	0	738	61	799
19	103	11	56	26	220	0	379	37	416
20	16	5	43	5	72	17	130	27	157
21	235	8	5	13	150	0	390	21	411
22	181	19	31	11	74	0	286	30	316
23	241	15	26	14	161	0	428	29	457
24	169	8	21	3	72	0	261	11	272
25	453	44	46	17	112	0	610	61	671
26	640	69	82	58	376	0	1,098	127	1,225
27	432	99	90	84	275	0	797	183	979
28	407	146	93	123	368	0	868	268	1,136
29	469	171	92	106	347	22	908	298	1,207
30	314	145	92	93	461	0	867	238	1,106
31	336	28	83	56	467	15	887	98	985
32	477	17	49	37	718	4	1,243	58	1,301
33	241	33	22	14	911	0	1,173	46	1,219
34	256	24	35	21	645	0	936	45	981
35	152	19	12	13	529	9	692	40	732
36	545	68	25	35	393	0	963	103	1,067
37	474	75	74	34	1,292	19	1,840	129	1,969
38	1,368	414	276	332	1,148	0	2,792	746	3,538
39	149	27	29	40	198	19	376	85	462
Total	**15,451**	**3,310**	**2,506**	**2,062**	**16,110**	**235**	**34,066**	**5.606**	**39,672**[8]

[8] Based on the sample count data, a few of the counts could be identified to be in one of two time blocks. To estimate this impact, calculations were made using two scenarios. The total then varies between 39,672 as shown in the table and 39,747.

Solana Beach Average Annual Beach Attendance Estimate

The count data represented 88 survey days occurring over a one-year period. To expand 88 days of data collection to a 365-day annual average count, monthly expansion factors were developed and applied to the data in the table above. The monthly expansion factors are shown in **Table 3-6** and the results of applying the monthly expansion factors are shown in **Table 3-7**.

The annual average attendance for Solana Beach is estimated to be 156,400 and is broken down as follows:

- 58% are non-surfers
- 42% are surfers
- 86% are adults
- 14% are children

TABLE 3-6
MONTHLY BEACH ATTENDANCE DATA EXPANSION FACTORS (ALL BEACH VISITORS)

Month	Expansion Factor
July	3.100
August	3.875
September	4.286
October	4.429
November	4.286
December	4.429
January	4.429
February	4.000
March	4.429
April	4.286
May	4.429
June	4.286

TABLE 3-7
ESTIMATED NUMBER OF ANNUAL BEACH VISITORS IN EACH SEGMENT AFTER APPLICATION OF EXPANSION FACTORS

	Beach		Wading/Swimming		Surfing		Total		
Segment	Adults	Children	Adults	Children	Adults	Children	Adults	Children	All
4	2,450	388	750	140	6,938	0	10,139	527	10,666
5	3,284	1,231	317	405	1,533	0	5,135	1,636	6,770
6	982	115	131	193	70	34	1,183	343	1,526
7	688	235	99	71	253	144	1,040	449	1,489
8	674	13	24	12	190	0	889	25	914

TABLE 3-7
ESTIMATED NUMBER OF ANNUAL BEACH VISITORS IN EACH SEGMENT AFTER APPLICATION OF EXPANSION FACTORS

	Beach		Wading/Swimming		Surfing		Total		
Segment	Adults	Children	Adults	Children	Adults	Children	Adults	Children	All
9	897	14	107	26	358	0	1,363	40	1,403
10	499	25	24	0	130	0	654	25	678
11	714	132	41	0	0	0	755	132	887
12	383	53	13	13	0	0	396	66	462
13	2,584	395	116	13	3,265	0	5,965	408	6,373
15	7,706	1,767	1,039	988	11,007	152	19,753	2,907	22,659
16	7,190	2,689	1,479	1,366	2,644	212	11,314	4,267	15,581
17	1,052	230	310	138	1,364	0	2,726	369	3,095
18	1,250	60	265	152	1,224	0	2,739	212	2,951
19	412	35	212	87	843	0	1,467	122	1,589
20	63	21	177	20	291	74	531	115	646
21	998	35	17	46	631	0	1,646	81	1,727
22	697	71	112	33	281	0	1,090	104	1,194
23	937	60	89	55	594	0	1,619	115	1,734
24	668	30	79	13	283	0	1,030	43	1,074
25	1,752	165	168	57	448	0	2,368	222	2,590
26	2,580	275	339	235	1,477	0	4,396	510	4,905
27	1,664	380	347	297	1,061	0	3,072	677	3,749
28	1,557	529	337	415	1,512	0	3,406	944	4,350
29	1,851	698	324	399	1,384	91	3,559	1,188	4,747
30	1,215	561	340	329	1,906	0	3,461	890	4,351
31	1,270	97	298	200	1,855	47	3,424	345	3,769
32	1,770	64	185	147	2,952	13	4,907	224	5,131
33	881	108	82	42	3,725	0	4,688	150	4,838
34	946	93	131	79	2,627	0	3,703	172	3,875
35	597	77	41	52	2,035	28	2,673	157	2,830
36	2,047	272	93	146	1,549	0	3,689	418	4,107
37	1,863	296	283	126	5,202	83	7,348	505	7,853
38	5,268	1,560	1,209	1,232	4,747	0	11,045	2,792	13,837
39	580	96	100	137	805	58	1,485	291	1,777
Total	**59,971**	**12,871**	**9,502**	**7,663**	**65,186**	**937**	**134,659**	**21,471**	**156,130**

Based on the sample count data, a few of the counts could be identified to be in one of two time blocks[9]. To estimate this impact, calculations were made using two scenarios to determine a range of values between 156,130 as shown in the table and 156,785. The rounded figure of 156,400 represents the average between the two figures (to the nearest 100).[10] The annual attendance figure of 156,400 annually was then used in all subsequent calculations contained in this study. Additional detail is provided in **Appendix 9**.

Beach Visitor Surveys and Travel Cost Model

For one year, starting in July 2008, 563 beach visitors (representing 0.36% of the estimated annual beach visitors) were interviewed while on the beach. The survey data was used to collect information necessary for determining the beach value and to collect other general information about visitors to the public beach in Solana Beach.

As a first step to determining the beach value via the Travel Cost Model, the visitor survey data was utilized to estimate the "cost" of the beach trip. This was accomplished by calculating a cost per day based on the distance traveled (*D*), mode of transportation, and annual individual salary (*I*). The individual calculations per questionnaire are:

$$T = D * fM$$

And

$$V = I/2080*T + fC(T)$$

Where V = Value per Beach Visitor

T = Travel Time

D = Distance

I = Income

fM = Mode of Transportation Travel Time Factor as follows:

- For Auto (including dropped off) less than 6 miles distance $fM= 2\ min/mile*2/60$
- Auto more than 6 miles $fM= 1.5\ min/mile*2/60$
- Walking/Skateboarding $fM= 30\ min/mile*2/60$
- Bike and Public Transportation $fM= 7.5\ min/mile*2/60$

fC(T) = Cost of Transportation Factor as follows:

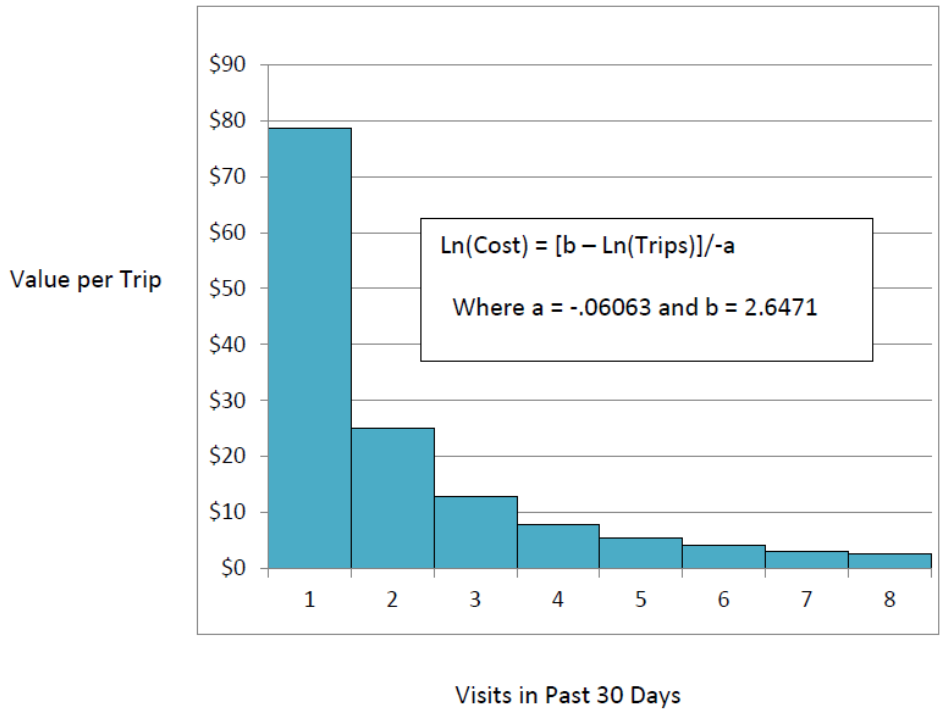
[9] The issue arose when adjusting the count survey from 2-hour time blocks in the 2010 Draft Fee Study to 1-hour time blocks in the 2015 Draft Fee Study, all based on the original survey data.

[10] The attendance figure equals 156,400 ± 8,343 at a 95% confidence interval.

- For Auto (including dropped off) *fC(T)= $0.54/mile*D*2*
- Bike/Walking/Skateboarding *fC(T)= 0*
- Public Transportation *fC(T)= $5.00*

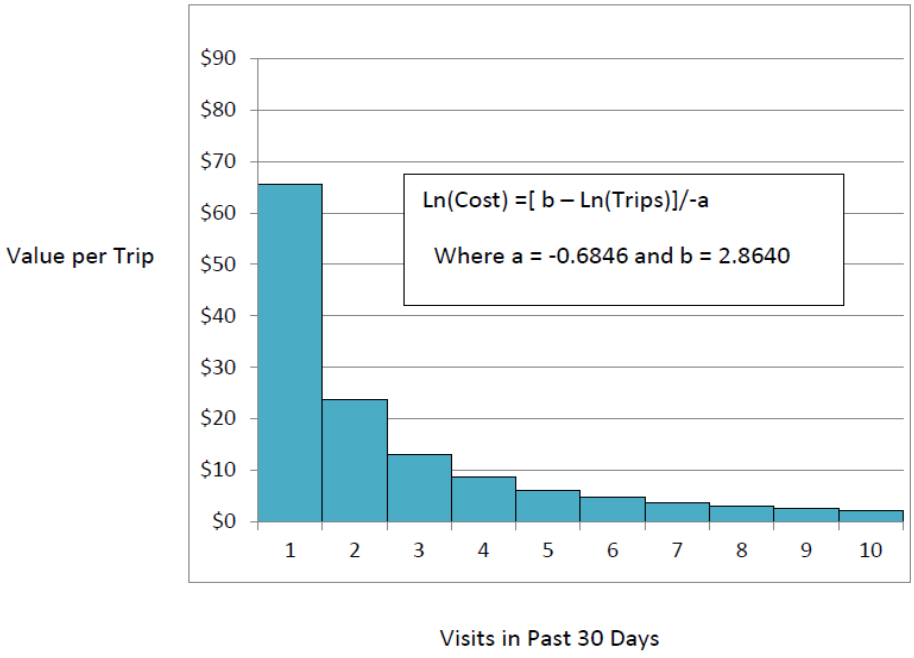
See **Appendix 10** for the Travel Cost Model calculations. This data was then used to create a demand curve in order to calculate "consumer surplus," using the cost as the independent variable and number of visits as the dependent variable. Consumer surplus is the difference between the total amount that consumers are willing and able to pay for a good or service (indicated by the demand curve) and the total amount that they actually do pay (in this case the travel cost associated with getting to the beach.[11]) The resulting demand curves, using standard mathematical modeling, are shown in **Figures 3-1** and **3-2** below and are based on applying 33% of stated wages. Summary data for the regression analysis is provided in **Appendix 11**.

FIGURE 3-1
DEMAND CURVE FOR SOLANA BEACH USING 33% OF WAGES – SUMMER VISITS



[11] See **Appendix 4** for an example demand curve and consumer surplus.

FIGURE 3-2
DEMAND CURVE FOR SOLANA BEACH USING 33% OF WAGES – NON-SUMMER VISITS



The area under the demand curve represents the consumer surplus which is then divided by the average number of visits in a 30-day period (8 for summer and 10 for non-summer visits) to determine the average consumer surplus per visit. **Table 3-8** shows that the summer months' consumer surplus is higher than the non-summer months, meaning that summer demand is greater than non-summer months (people are more willing to travel farther to get to the beach during the summer season). The analysis was performed using 33%, 50%, and 67% of wages to provide a range of values. (Michael Baker also analyzed 100% of wages, which is not reflected in this 2016 Study.)

TABLE 3-8
MEAN VALUE OF A BEACH VISIT BASED ON PERCENT OF WAGES (2016 DOLLARS)

Wage Percentage	Mean Beach Visit Cost	Summer/Non-Summer	Average Consumer Surplus Per Visitor	Average Consumer Surplus Per Visitor (2016 Dollars)
33%	$12.18 ± $1.18	All Months	$14.96	$16.46
		Summer	$17.50	$19.25
		Non-Summer	$13.42	$14.76
50%	$14.45 ± $1.35	All Months	$18.86	$20.75
		Summer	$24.17	$26.59
		Non-Summer	$15.81	$17.39
67%	$16.69 ± $1.53	All Months	$21.18	$23.30
		Summer	$32.33	$35.56
		Non-Summer	$19.09	$21.00

There is no general agreement in the literature as to how to measure the opportunity cost of time. In King's "*Economic Analysis of Beach Spending and the Recreational Benefits of Beaches in Solana Beach,*"[12] he uses 33% of the respondent's wage rate which he identifies as convention (referencing "*Economic Valuation of the Environment*"[13]). Using the low-range figures resulting from using 33% of wages in the Travel Cost Model represents the best curve fit for the data, and therefore the average values of $17.50 and $13.42 per visit adjusted to 2016 dollars equal to $19.25 and $14.76[14] are recommended by Michael Baker for estimating the annual recreational value of the public beach in Solana Beach. The recommendation should be considered a conservative estimate. On the other hand, Dr. Gordon Kubota of CIC Research has indicated that he supports the original 2010 Study where the recreational value of the beach is based on $21.15 per adult visitor trip. A comparison of the two approaches is provided in the following paragraph.

Summer attendance of 72,500 (multiplied by 86.2%) and non-summer attendance of 83,900 (multiplied by 86.2%) are multiplied by the average visitor value of $19.25 and $14.76, respectively. The annual adult attendance, representing 86.2% of total attendance, is used because the children's value is assumed to be captured in the adult values.[15] The result is an estimated public beach recreational value of $2.27 million in 2016 dollars. However, children in the City of Solana Beach Junior Lifeguard Program were not captured in the 2008–2009 attendance counts and therefore the fee study recommends adding the value of that program's annual City fee revenues to the annual beach value calculated above. Including the Junior Lifeguard Program revenues yields an annual beach value of $2.54 million in 2016 dollars.[16] For comparison, using Dr. Kubota's recommendation, adjusting the per adult visitor trip to 2016 dollars ($23.26) and applying that rate to the 2016 attendance data results in an estimated annual recreational beach value of $3.1 million.

For comparison to the aforementioned King study, this study's attendance figures are applied to the consumer surplus values of Dr. King's study. Dr. King estimates the high season consumer surplus for Solana Beach at $23.56 and the low season consumer surplus at $2.72 (adjusted to 2016 dollars). The result is an annual recreational value for the public beach of $1.7 million or approximately an average consumer surplus of $13 per adult visitor (2016 dollars). This study's results, at 33% of wages, are greater than the Dr. King study. For a brief discussion of other studies, refer to the Response to Comments on the 2015 Draft Fee Study (**Appendix 2**) and the CCC letter dated January 2016 (**Appendix 3**).

[12] Circa 2001.

[13] Garrod, Guy, and Willis, Kenneth G. (1999). Edward Elgar, Northampton, MA, pp.70-73.

[14] From Consumer Price Indices, California, Calendar Year Averages, All Urban Consumers, use a multiplier of 1.1 for adjustment from beginning 2010 to beginning 2016.

[15] This study conservatively assumes that the consumer surplus of children is captured in the adult consumer surplus values. Actual children consumer surplus is likely somewhere between that of an adult and zero.

[16] For information purposes only, at 50% of wages the Solana Beach recreational value increases to $3.2 million and at 67% of wages the Solana Beach recreational value increases to $4.0 million.

Model Choice and Statistics

A logarithmic model was developed, where the natural logs of both the dependent and independent variables were utilized versus a simple linear model because it was the best fit statistically (R-squared) versus a linear model. The regression model output is shown in **Table 3-9**.

TABLE 3-9
REGRESSION MODEL OUTPUT STATISTICS

			Models							
			OLS				Log-Log			
			Trips				LnTrips			
			Summer		Non-Summer		Summer		Non-Summer	
Model	Variables		Constant	Beta	Constant	Beta	Constant	Beta	Constant	Beta
67% Income										
	Cost67	Coeff.	10.947	-0.165	13.552	-0.251				
		S.E.	0.0894	0.036	0.692	0.031				
		R-squared	0.097		0.207					
	LnCost67	Coeff.					2.703	-0.531	3.318	-0.688
		S.E.					0.198	0.075	0.174	0.065
		R-squared					0.205		0.294	
50% Income										
	Cost50	Coeff.	11.151	-0.267	13.8	-0.251				
		S.E.	0.872	0.041	0.692	0.031				
		R-squared	0.117		0.207					
	LnCost50	Coeff.					2.697	-0.569	3.063	-0.71
		S.E.					0.181	0.072	0.132	0.056
		R-squared					0.241		0.368	
33% Income										
	Cost33	Coeff.	11.336	-0.264	13.911	-0.359				
		S.E.	0.839	0.046	0.704	0.04				
		R-squared	0.143		0.23					
	LnCost33	Coeff.					2.647	-0.606	2.864	-685
		S.E.					0.156	0.067	0.112	0.051
		R-squared					0.293		0.398	
N			197		273		197		273	

Beach Visitor Survey Findings

An analysis of the data obtained in the visitor surveys provided other interesting information about the Solana Beach visitor. Over one quarter (26%) said that their primary purpose for being at the beach was surfing. This was closely followed by sunning/lying on the beach (24%) and walking/running on the beach (22%). See **Table 3-10**.

TABLE 3-10
PRIMARY PURPOSE FOR BEACH VISIT

Stated Primary Purpose	Percent
Surfing/water sports	26%
Sunning/lying on beach	24%
Walk/run on beach	22%
People watching	9%
Swimming/play in water	7%
Collecting shells, beachcombing, etc.	5%
Fishing	3%
Special event	3%
Picnic	1%
Total	**100%**

Source: CIC Research, July 2009

Nearly a third of those interviewed were from Solana Beach. As indicated in **Table 3-11**, nearly a third were from outside of San Diego County (23% other U.S. and 6% foreign).

TABLE 3-11
LOCATION OF RESIDENCE

Residence	Percent
Solana Beach	30%
Other location in San Diego County	41%
Other U.S. location	23%
Foreign	6%
Total	**100%**

Source: CIC Research, July 2009

The median age of respondents was 39 years old. As can be seen in **Table 3-12**, those over 65 made up 13% of the respondents which correspond to the 13% who stated they were retirees.

TABLE 3-12
AGE OF BEACH SURVEY RESPONDENTS

Age of Respondent	Percent
16-18	3%
18 - 24 years	14%
25 - 34 years	23%
35 - 44 years	23%
45 - 54 years	16%
55 - 64 years	8%
65 years or over	13%
	100%

Source: CIC Research, July 2009

Additional results of the beach visitor surveys are presented in **Appendix 12**.

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4. DRAFT PUBLIC RECREATION FEE RECOMMENDATION

RECREATIONAL VALUE

The purpose of the Public Recreation Fee is to compensate the public for the loss of recreational use of the beach due to the presence of a seawall. To determine the value per square foot of beach area for use in the Public Recreation Fee, the annual estimated recreational value in 2016 of $2.54 million is applied to the beach area in Solana Beach based on the results described in Chapter 3 of this study.

BEACH AREA ZONES

The beach attendance, or count, survey was conducted along 35 north-to-south beach segments in order to assess whether there were substantial differences in attendance, and any heterogeneity in the value of the beach. Michael Baker initially considered consolidating these beach areas into nine zones based on estimated beach density. According to the beach attendance data collected as part of this fee study, the highest density of people on the beach for the survey period is Fletcher Cove and the lowest is the area located just north of Fletcher Cove.

Michael Baker also considered an alternate approach whereby all of Solana Beach was considered a single zone and all property owners building seawalls would be subject to the same Public Recreation Fee. This approach eliminates the disparity between adjoining neighbors' obligations and recognizes that the beach, and consequently the beach population density, along the Solana Beach coast is likely dynamic, not static, on a daily, weekly, yearly, or other time measurement basis. The dispersion of beach visitors is also dependent on beach access, width and quality of beach, parking availability, presence of public restrooms, and other factors. These factors may change during the seawall permit period due to local, regional, and federal beach nourishment projects being planned by the City, thereby affecting future beach densities among other variables.

Beach walkers and other recreational users may also move north and south through the different areas of the beach. For these reasons, Michael Baker recommended an aggregation of all of the beach areas into a single zone, averaging the attendance over the entire Solana Beach beach area. Such averaging is further justified when considering the interdependence of bluff retention devices. A seawall constructed by one property owner may assist in protecting its neighbor's property as well, if the neighbor's property has not been protected by a bluff protection device already. In recognition of these dynamic and interdependent processes, it is recommended that a single Citywide Public Recreation Fee be established in Solana Beach. Such an approach then averages all of the data to calculate a single per square foot value for the Public Recreation Fee, adjusted and assessed annually.

The initial 36 photo points (photo points 4 through 40, creating 35 segments) are shown **in Figures 4-1 through 4-5**. These points were initially chosen based in part on a subjective estimation of similar access, beach width, sand, and wall location, as well as being locations that were easily identifiable to the survey team. A greater or lesser number of points could have been chosen but these were the starting point for this analysis. See Chapter 3 for the attendance data associated with the 35 beach segments.

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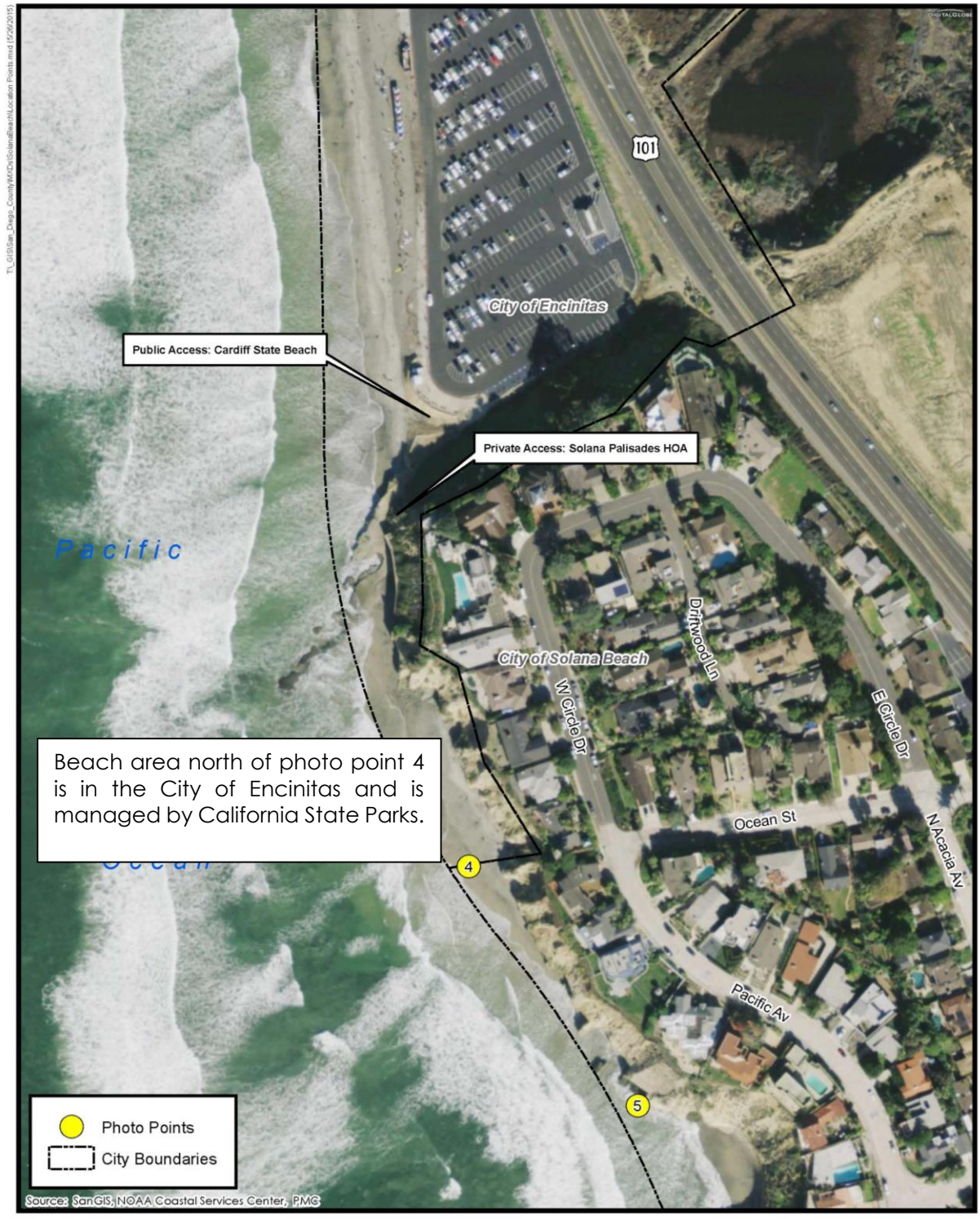

Figure 4-1
Solana Beach Location Points

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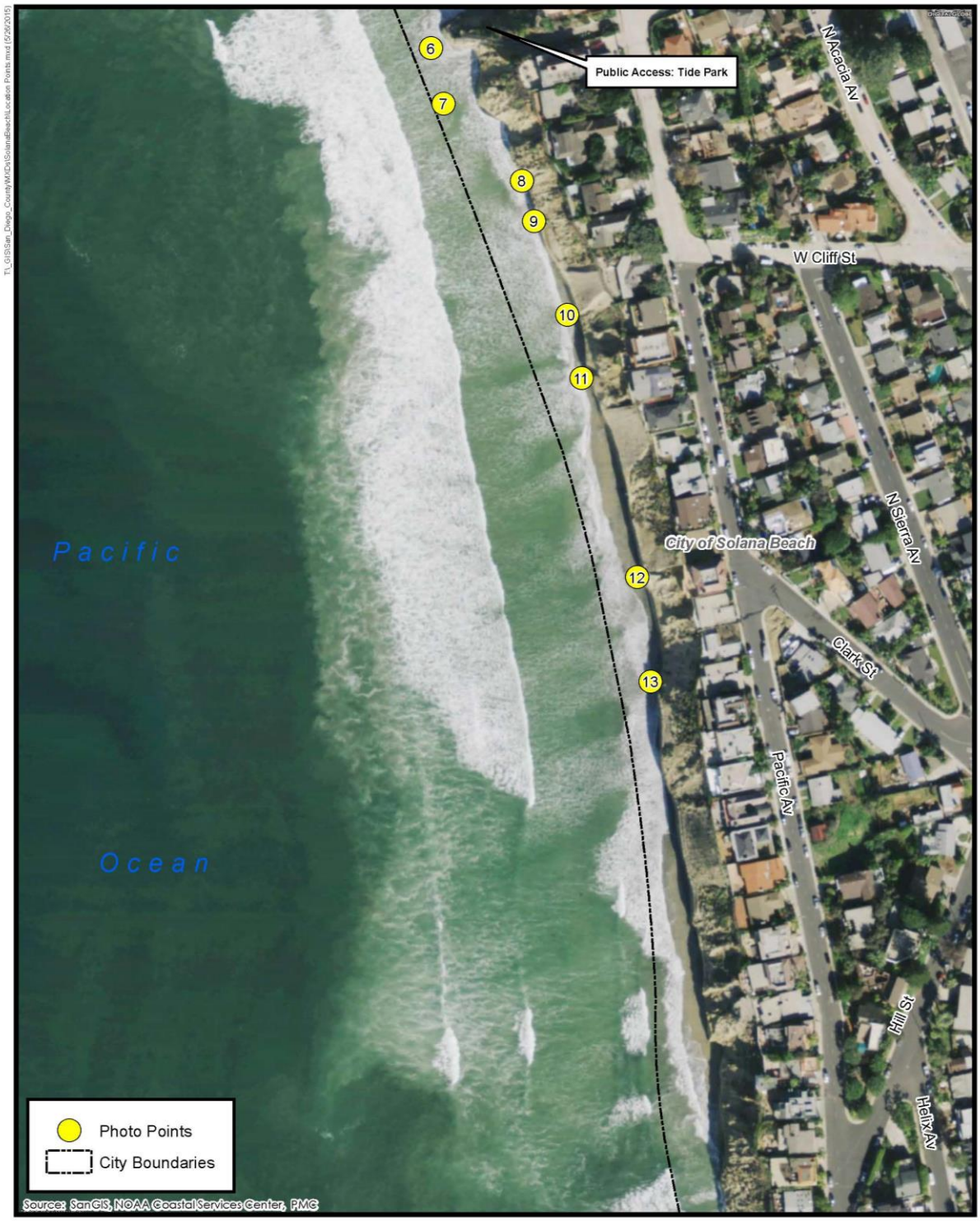

Figure 4-2
Solana Beach Location Points

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Figure 4-3
Solana Beach Location Points

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Figure 4-4
Solana Beach Location Points

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Figure 4-5
Solana Beach Location Points

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PUBLIC BEACH AREA ESTIMATES AND RECREATIONAL BEACH VALUES PER SQUARE FOOT

A critical factor in determining the recreational value per square foot of beach is the area of public beach that was actually available to users during the one-year survey period. The width of the beach changes throughout the day and year depending on tides, season, beach nourishment, weather and volume, and movement of sand. This study assumes that beach density (persons per square foot of useable beach) is relatively constant over the study period. A wide beach will attract more people and a narrow beach will attract fewer people. Consequently, it is recommended that the measurement of beach area correspond to the survey period. EIC, in response to stakeholder feedback, obtained LiDAR data from UCSD Scripps Institution of Oceanography and NOAA's Office for Coastal Management in order to estimate total useable beach area bounded by Ocean Avenue in the north, the southerly City boundary, the toe of the bluffs, and the mean sea level contour (2.55 feet NAVD 88).

Table 4-1 shows the variation of beach widths measured to mean sea level in Solana Beach during the survey period beginning in July 2008 and ending in July 2009. Historical beach data over a greater time frame and a map of the area is shown in the EIC Technical Memorandum in **Appendix 7**.

TABLE 4-1
FALL AND SPRING BEACH AREAS ABOVE MEAN SEA LEVEL

Survey Timing	Beach Area Above MSL (acres)
Spring 2008	12.4
Fall 2008	26.2
Spring 2009	11.9
Fall 2009	24.6
Average	*18.8*

The average beach area is 18.8 acres as measured in 4 seasonal shoreline profile analyses during the survey period. Using the estimated annual recreational value of the beach within city limits of $2.54 million (2016 dollars) and dividing that figure by 18.8 acres yields a square foot value of $3.10 (1 acre equals 43,560 square feet). Recreational values are adjusted annually applying a future CPI rate of 2% as shown in **Table 4-2**.

TABLE 4-2
PUBLIC BEACH RECREATION VALUE IN SOLANA BEACH BY YEAR

Year	Value of the Public Beach (SF)
2016	$3.10
2017	$3.16
2018	$3.22
2019	$3.28
2020	$3.35
2021	$3.42

TABLE 4-2
PUBLIC BEACH RECREATION VALUE IN SOLANA BEACH BY YEAR

Year	Value of the Public Beach (SF)
2022	$3.49
2023	$3.56
2024	$3.63
2025	$3.70
2026	$3.77
2027	$3.85
2028	$3.93
2029	$4.01
2030	$4.09
2031	$4.17
2032	$4.25
2033	$4.34
2034	$4.43
2035	$4.52
2036	$4.61
2037	$4.70
2038	$4.79
2039	$4.89
2040	$4.99
2041	$5.09
2042	$5.19
2043	$5.29
2044	$5.40
2045	$5.51

These per square foot values shall be applied to area impacted by the construction of a seawall.

FUTURE POTENTIAL CHANGES IN MEAN SEA LEVEL ELEVATION

In order to apply a recreational value to the public beach area lost due to the installation of shoreline protective devices, the loss in beach area must be estimated. To get at this figure, the average annual erosion rate affecting the Solana Beach shoreline and bluffs must be estimated using the best estimate for sea level rise during the life of the seawall. The City of Solana Beach retained EIC to recommend the likely mean sea level rise rates and corresponding erosion rates for use in this Public Recreation Fee study.

The EIC Technical Memorandum dated February 2016 (see **Appendix 7**) considers various sea level rise scenario predictions. The EIC Technical Memorandum looks at the range of mean sea level

projections and recommends using the mid-range of values. The erosion rate is then estimated based on an approximate linear rate of erosion of 0.7 feet per year. However, the certified LCP LUP references a rate of 0.4 feet per year for the first ten years as an average bluff erosion rate based on work by Group Delta (1988) for the LCP LUP. Preparation of the LCP LUP was developed with significant coordination and input of CCC staff. In all, the City's LUP went through eight iterations with CCC staff with reference to 0.4 feet per year being the average bluff erosion rate for the near term (first ten years) which has remained consistent throughout the planning process. Therefore, consistent with the certified Solana Beach LCP LUP, this 2016 Draft Fee Study recommends using 0.4 feet per year for the first ten years. The EIC Technical Memorandum indicates that the erosion rate based on most recent data would be 0.673[17] feet per year and if using 0.4 feet per year for the first ten years, then to apply a higher erosion rate for the subsequent years of 0.8 feet per year. However, doing so would intentionally overcharge a later fee payer, which is not permitted in a fee program; the fee must be proportional. Therefore, Michael Baker recommends applying the actual estimated rate of 0.673 feet per year from 2026 through 2046 consistent with the findings of the EIC Technical Memorandum. Prior to a permit extending beyond 2046, the City should consider any additional data that may have affected erosion rates and beach area surveys and any impact these may have on the Public Recreation Fee program.

ESTIMATED LOSS IN PUBLIC BEACH AREA

The coastal bluffs in Solana Beach are subject to ongoing erosion. If left uncorrected, sea caves and undercut portions of the bluffs will eventually lead to block failures of the lower sandstone, exposure of the clean sand lens, and landward bluff retreat. These failures expose the clean sand lens of the upper bluff terrace deposits, triggering rapid erosion and landward retreat of the upper bluff, which eventually endangers the structures at the top of the bluff. If treated at this stage, a bluff retention device will minimize the need for a future higher seawall and future upper bluff repair.

Direct wave attack erodes the beach and the bluffs and over time results in block failures which expose the clean sand layer in the mid-bluff section (i.e., approximately elevation 25 feet–35 feet above mean sea level). Exposure of this clean sand layer then places the bluff top structures in imminent danger from bluff erosion and/or collapse. Once the clean sand lens is exposed, the City and the CCC will typically approve construction of a seawall to protect the bluff top property (e.g., when the static Factor of Safety approaches 1.0 underneath the bluff top structure).

To estimate the loss in public beach area due to construction of a seawall, it is critical to understand what the initial (e.g., day one) impact of the seawall has on the public beach. While previous drafts of this study considered a single approach to estimating "day 1" areas impacted, it became clear that the study needed more flexibility to account for the varying situations of each property or even within a single property to address whether or not the seawall is preventing imminently available beach from being created.

[17] EIC provided the future projected sea level rise increased erosion rate to Michael Baker to 3 significant digits while its technical memorandum rounded up from 0.673 to 0.7 feet per year.

Areas Impacted by Seawalls

The CCC has typically identified three impacts to seawalls: 1) the loss of sand to the littoral cell due to armoring of the bluff, 2) the loss of recreational area due to the placement of the structure on the useable beach area (and area imminently available), and 3) the loss of recreational area due to limiting bluff retreat. The first impact is addressed by the Sand Mitigation Fee contained in the LCP LUP Appendix A.

The next impact, due to placement of the structure on the useable beach area, referred to as the Initial Area, is defined as the width of the seawall multiplied by the length of the seawall plus any area determined by the City's Geotechnical Engineer to be subject to imminent bluff failure, measured in square feet. **Figure 4-6A** shows a typical bluff cross-section. **Figure 4-6B** shows Case 1 where the seawall is placed at the bluff face and there is not any substantial undercutting of the lower bluff. (This may also be the case when block failure has just occurred.) The seawall is located as landward as possible consistent with the requirement of City regulations and the LCP LUP. The Initial Area then is only the direct footprint of the seawall (for example, if the seawall is 2 feet by 50 feet, the Initial Area is 100 square feet). In **Figure 4.6C**, Case 2, there is substantial undercutting of the lower bluff creating an overhang above the notch but failure has not occurred. The seawall is then placed seaward of the lower bluff face, at the dripline of the bluff overhang, and the undercut area is back filled. If the City's Geotechnical Engineer determines the area beneath the overhang to be imminently available to the public had the undercut area not been backfilled, this area, landward of the seawall, should be included in the Initial Area.

FIGURE 4-6A
TYPICAL BLUFF CROSS-SECTION (USACE)

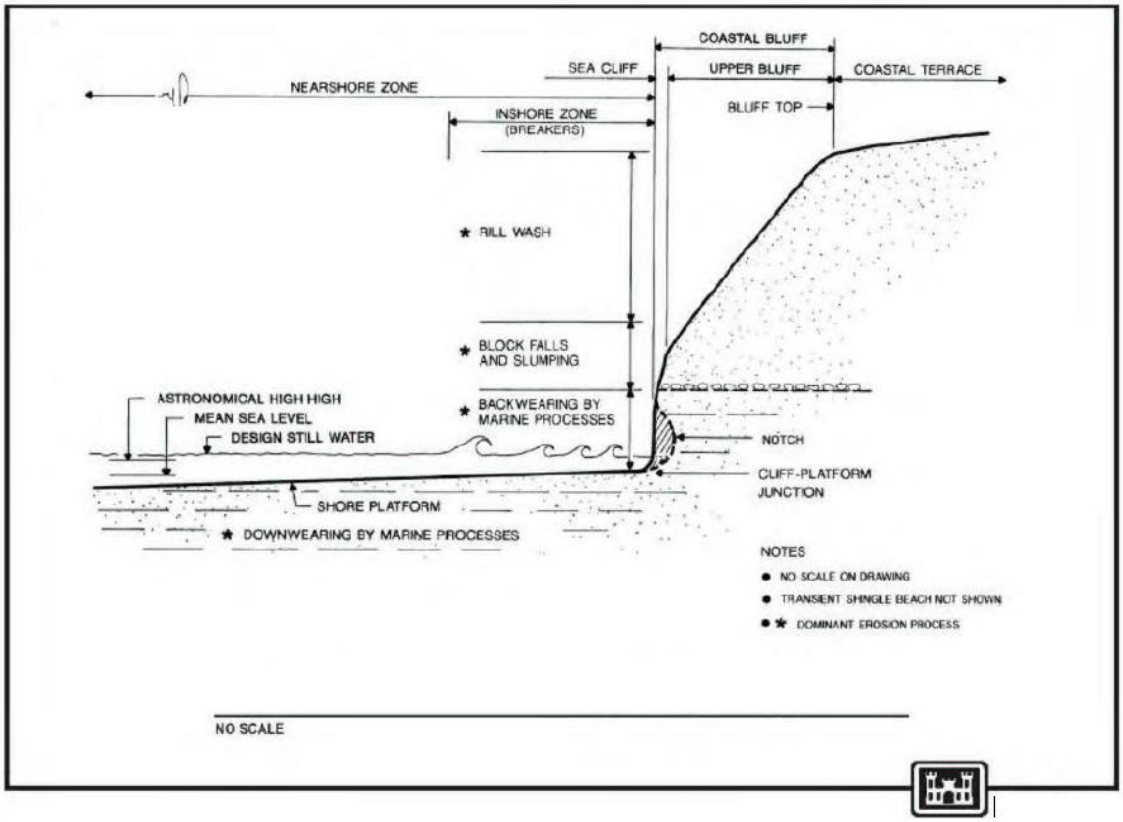


FIGURE 4-6B – CASE 1
INITIAL AREA OF BEACH NO LONGER AVAILABLE FOR RECREATION AFTER BLOCK FAILURE

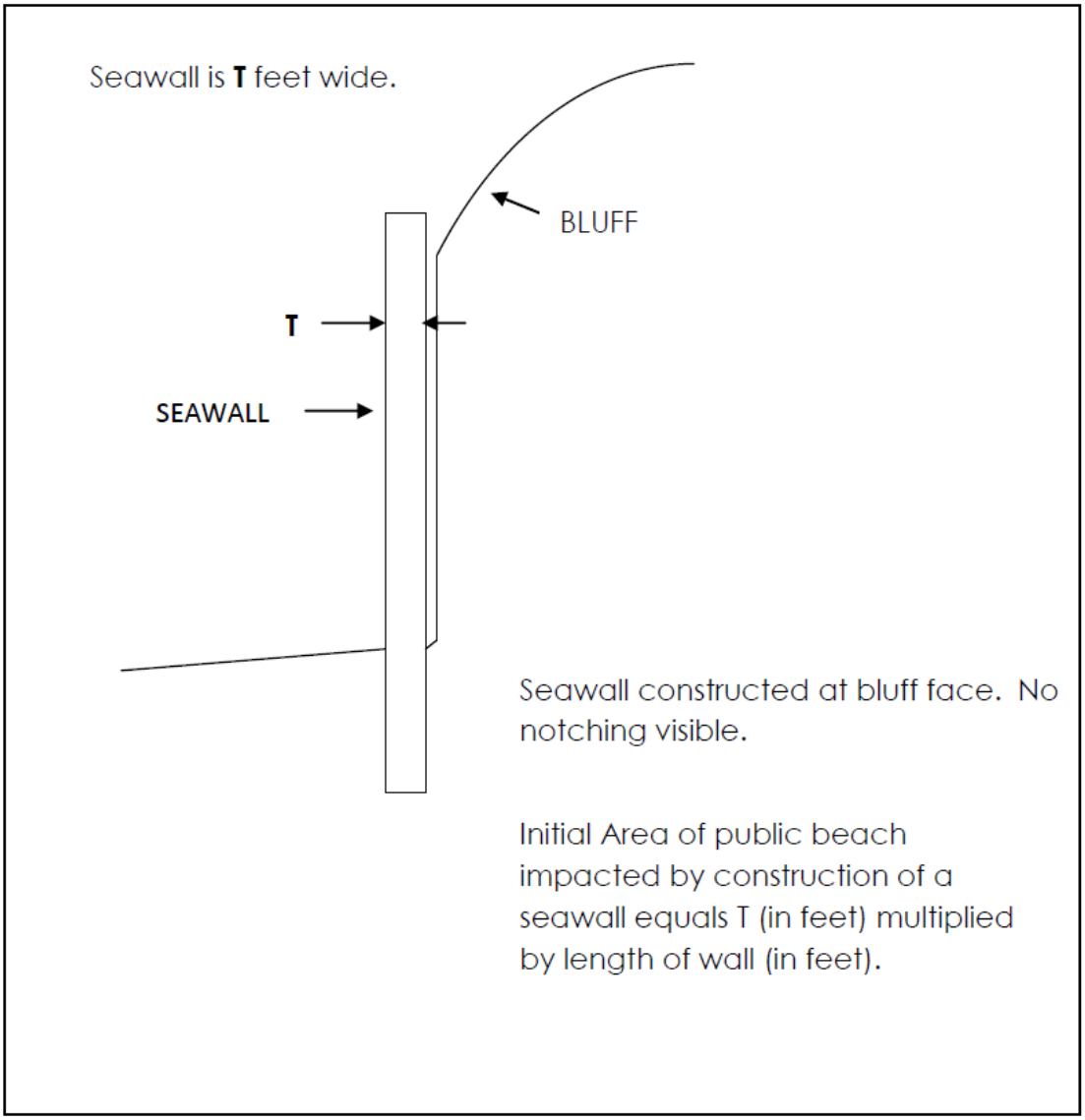


FIGURE 4-6C – CASE 2
INITIAL AREA OF BEACH NO LONGER AVAILABLE FOR RECREATION ASSUMING IMMINENT BLOCK FAILURE

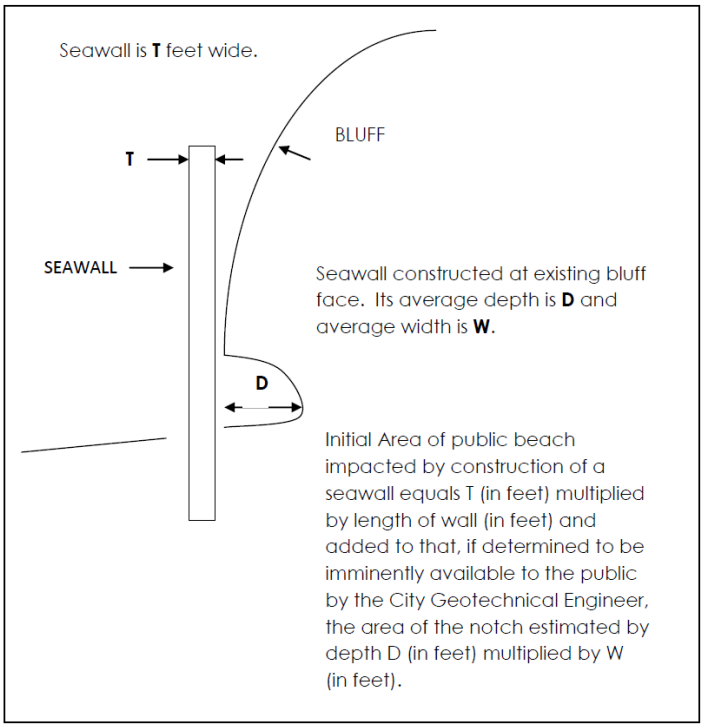
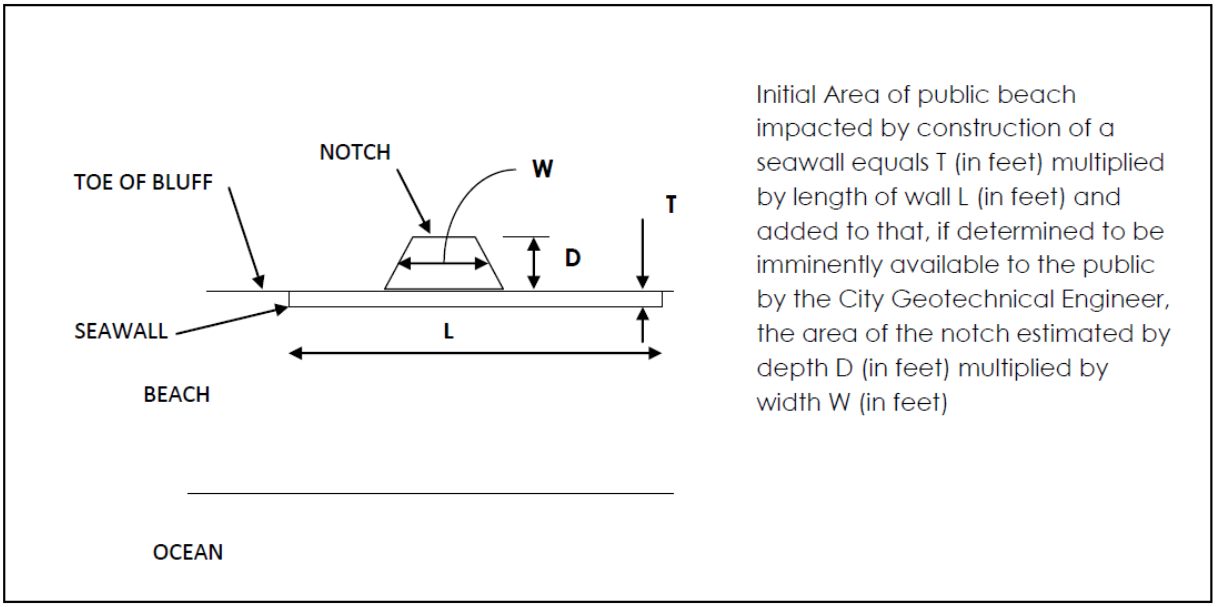
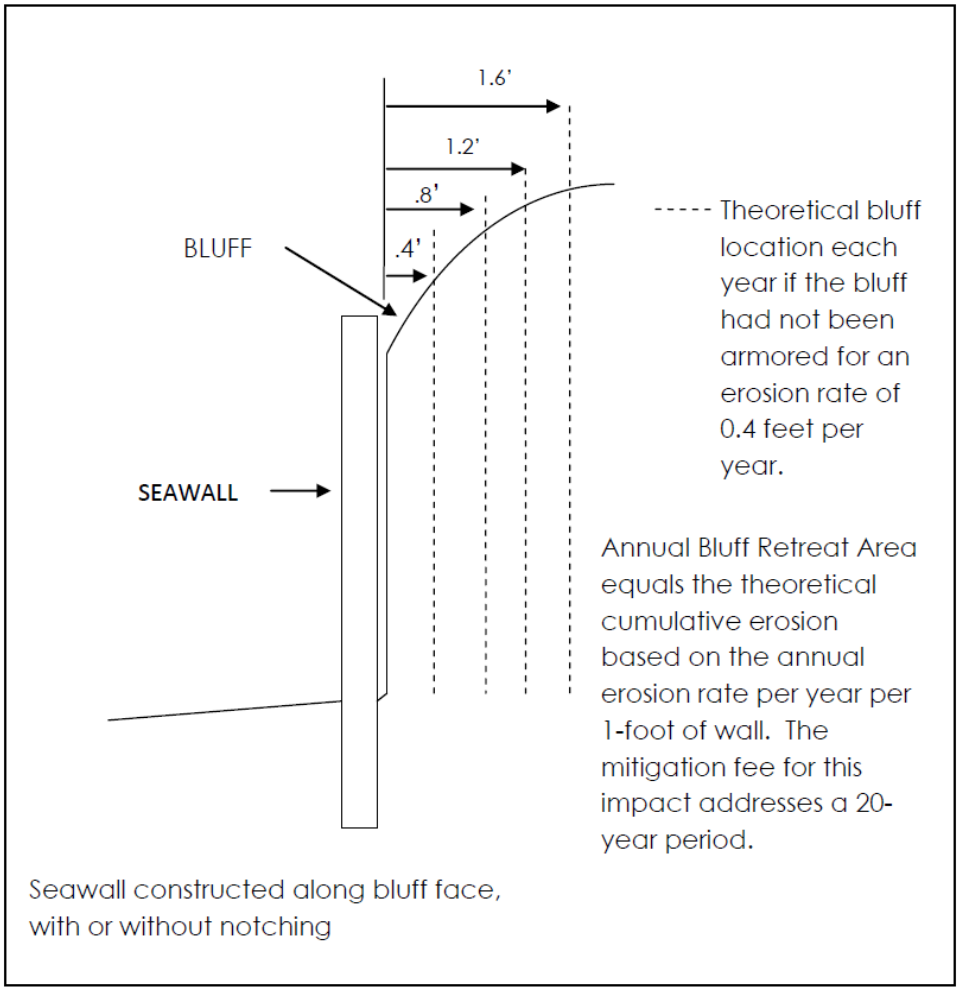


FIGURE 4-6D – CASE 2
INITIAL AREA OF BEACH NO LONGER AVAILABLE FOR RECREATION ASSUMING IMMINENT BLOCK FAILURE



In addition to the direct impact of the seawall on the beach, there is the impact on the area that could have been made available over time. Without coastal erosion the beach will not retreat and narrowing of the beach may occur, especially if sea levels rise. It is assumed then that there is an area of beach impacted over time equal to the annual erosion rate multiplied by the number of years the seawall is in place per 1-foot width of wall.

FIGURE 4-6E
BLUFF RETREAT AREAS



For instance in, Permit Year 2016, the erosion rate is 0.4 feet per year and this study assumes the beach then will narrow by 0.4 feet per 1 foot of seawall. In Permit Year 2017, the erosion rate is 0.4 feet per year and this study assumes the beach will have narrowed another 0.4 feet or 0.8 feet total. Each year the wall is in place, an area equal to the erosion rate multiplied by the length of the wall is assumed to be impacted. The fee then has to take into account future erosion rates to determine the likely amount of beach narrowing. Using the average annual bluff erosion rates of 0.4 feet per year through 2025 and 0.673 feet per year through 2046, the estimated beach area (that theoretically would not be available for public recreation due to the presence of the seawall designed to stop erosion) is calculated for each year over a 20-year period, consistent with Policy 4.49 of the certified LCP LUP. The policy states that mitigation fees for the impacts to the shoreline

and sand supply, public access and recreation shall be assessed in 20-year increments, starting with the building permit completion certification date.

The estimated beach area also will depend on the year in which the seawall is completed, noted as "Permit Year" in this study and as building permit completion certification in the certified LCP LUP.

Table 4-3 identifies the Permit Year and the theoretical public beach area impacted by sea level rise and fixing the back beach location preventing further bluff retreat for Permit Years 2016 through 2026. Data is not provided past 2026 because it is assumed, consistent with the LCP LUP, that an update to the study will occur within 10 years. Table 4-3 reflects the estimated theoretical cumulative area of beach loss due to sea level rise by year over a 20-year period.

TABLE 4-3 BLUFF RETREAT AREA
CUMULATIVE THEORETICAL LOSS OF PUBLIC BEACH RECREATIONAL AREA
CAUSED BY STOPPING FURTHER COASTAL EROSION
FOR EACH PERMIT YEAR COVERING A 20-YEAR PERIOD

Theoretical or Potential Cumulative Loss of Public Beach Recreation Area (square footage) By Year (per linear foot of wall)	Permit Year (2016–2026)										
	'16	'17	'18	'19	'20	'21	'22	'23	'24	'25	'26
2016	0.4										
2017	0.8	0.4									
2018	1.2	0.8	0.4								
2019	1.6	1.2	0.8	0.4							
2020	2.0	1.6	1.2	0.8	0.4						
2021	2.4	2.0	1.6	1.2	0.8	0.4					
2022	2.8	2.4	2.0	1.6	1.2	0.8	0.4				
2023	3.2	2.8	2.4	2.0	1.6	1.2	0.8	0.4			
2024	3.6	3.2	2.8	2.4	2.0	1.6	1.2	0.8	0.4		
2025	4.0	3.6	3.2	2.8	2.4	2.0	1.6	1.2	0.8	0.4	
2026	4.7	4.3	3.9	3.5	3.1	2.7	2.3	1.9	1.5	1.1	0.7
2027	5.3	4.9	4.5	4.1	3.7	3.3	2.9	2.5	2.1	1.7	1.3
2028	6.0	5.6	5.2	4.8	4.4	4.0	3.6	3.2	2.8	2.4	2.0
2029	6.7	6.3	5.9	5.5	5.1	4.7	4.3	3.9	3.5	3.1	2.7
2030	7.4	7.0	6.6	6.2	5.8	5.4	5.0	4.6	4.2	3.8	3.4
2031	8.0	7.6	7.2	6.8	6.4	6.0	5.6	5.2	4.8	4.4	4.0
2032	8.7	8.3	7.9	7.5	7.1	6.7	6.3	5.9	5.5	5.1	4.7
2033	9.4	9.0	8.6	8.2	7.8	7.4	7.0	6.6	6.2	5.8	5.4
2034	10.1	9.7	9.3	8.9	8.5	8.1	7.7	7.3	6.9	6.5	6.1
2035	10.7	10.3	9.9	9.5	9.1	8.7	8.3	7.9	7.5	7.1	6.7

TABLE 4-3 BLUFF RETREAT AREA
CUMULATIVE THEORETICAL LOSS OF PUBLIC BEACH RECREATIONAL AREA
CAUSED BY STOPPING FURTHER COASTAL EROSION
FOR EACH PERMIT YEAR COVERING A 20-YEAR PERIOD

Theoretical or Potential Cumulative Loss of Public Beach Recreation Area (square footage) By Year (per linear foot of wall)	Permit Year (2016–2026)										
	'16	'17	'18	'19	'20	'21	'22	'23	'24	'25	'26
2036		11.0	10.6	10.2	9.8	9.4	9.0	8.6	8.2	7.8	7.4
2037			11.3	10.9	10.5	10.1	9.7	9.3	8.9	8.5	8.1
2038				11.5	11.1	10.7	10.3	9.9	9.5	9.1	8.7
2039					11.8	11.4	11.0	10.6	10.2	9.8	9.4
2040						12.1	11.7	11.3	10.9	10.5	10.1
2041							12.4	12.0	11.6	11.2	10.8
2042								12.6	12.2	11.8	11.4
2043									12.9	12.5	12.1
2044										13.2	12.8
2045											13.5

For a seawall whose construction was completed in 2016, the table reflects that the beach would be theoretically narrowed by 0.4 feet per 1-foot of wall in the first year. The next year, another 0.4 feet of beach per 1-foot of wall would theoretically disappear and the area impacted would be a cumulative 0.8 feet in the second year. Table 4.3 reflects two annual erosion rates, 0.4 feet for the first ten years and increasing to 0.673 feet beginning in 2026. The table does not reflect the Initial Area, the direct physical area impacted by the coastal bluff structure itself. It should be noted that the City will conduct a LiDAR bluff survey in 2016 which will be used to establish an average annual coastal bluff erosion rate baseline, which will be updated every 10 years as required by Solana Beach LUP Policy 4.51.

DRAFT PUBLIC RECREATION FEE CALCULATION

The Public Recreation Fee is based on the Initial Area and the Bluff Retreat Area. The annual recreational values in Table 4-2 are applied to the two areas separately. **Table 4-4** shows the public recreation component related to the Initial Area on a per square foot basis.

TABLE 4-4 INITIAL AREA RATE
ESTIMATED PUBLIC BEACH RECREATION LOSS DUE TO SEAWALL FOOTPRINT (PER SQUARE FOOT)

	Permit Year										
	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
2016	$ 3.10										
2017	$ 3.16	$ 3.16									
2018	$ 3.22	$ 3.22	$ 3.22								
2019	$ 3.28	$ 3.28	$ 3.28	$ 3.28							
2020	$ 3.35	$ 3.35	$ 3.35	$ 3.35	$ 3.35						
2021	$ 3.42	$ 3.42	$ 3.42	$ 3.42	$ 3.42	$ 3.42					
2022	$ 3.49	$ 3.49	$ 3.49	$ 3.49	$ 3.49	$ 3.49	$ 3.49				
2023	$ 3.56	$ 3.56	$ 3.56	$ 3.56	$ 3.56	$ 3.56	$ 3.56	$ 3.56			
2024	$ 3.63	$ 3.63	$ 3.63	$ 3.63	$ 3.63	$ 3.63	$ 3.63	$ 3.63	$ 3.63		
2025	$ 3.70	$ 3.70	$ 3.70	$ 3.70	$ 3.70	$ 3.70	$ 3.70	$ 3.70	$ 3.70	$ 3.70	
2026	$ 3.77	$ 3.77	$ 3.77	$ 3.77	$ 3.77	$ 3.77	$ 3.77	$ 3.77	$ 3.77	$ 3.77	$ 3.77
2027	$ 3.85	$ 3.85	$ 3.85	$ 3.85	$ 3.85	$ 3.85	$ 3.85	$ 3.85	$ 3.85	$ 3.85	$ 3.85
2028	$ 3.93	$ 3.93	$ 3.93	$ 3.93	$ 3.93	$ 3.93	$ 3.93	$ 3.93	$ 3.93	$ 3.93	$ 3.93
2029	$ 4.01	$ 4.01	$ 4.01	$ 4.01	$ 4.01	$ 4.01	$ 4.01	$ 4.01	$ 4.01	$ 4.01	$ 4.01
2030	$ 4.09	$ 4.09	$ 4.09	$ 4.09	$ 4.09	$ 4.09	$ 4.09	$ 4.09	$ 4.09	$ 4.09	$ 4.09
2031	$ 4.17	$ 4.17	$ 4.17	$ 4.17	$ 4.17	$ 4.17	$ 4.17	$ 4.17	$ 4.17	$ 4.17	$ 4.17
2032	$ 4.25	$ 4.25	$ 4.25	$ 4.25	$ 4.25	$ 4.25	$ 4.25	$ 4.25	$ 4.25	$ 4.25	$ 4.25
2033	$ 4.34	$ 4.34	$ 4.34	$ 4.34	$ 4.34	$ 4.34	$ 4.34	$ 4.34	$ 4.34	$ 4.34	$ 4.34
2034	$ 4.43	$ 4.43	$ 4.43	$ 4.43	$ 4.43	$ 4.43	$ 4.43	$ 4.43	$ 4.43	$ 4.43	$ 4.43
2035	$ 4.52	$ 4.52	$ 4.52	$ 4.52	$ 4.52	$ 4.52	$ 4.52	$ 4.52	$ 4.52	$ 4.52	$ 4.52
2036		$ 4.61	$ 4.61	$ 4.61	$ 4.61	$ 4.61	$ 4.61	$ 4.61	$ 4.61	$ 4.61	$ 4.61
2037			$ 4.70	$ 4.70	$ 4.70	$ 4.70	$ 4.70	$ 4.70	$ 4.70	$ 4.70	$ 4.70
2038				$ 4.79	$ 4.79	$ 4.79	$ 4.79	$ 4.79	$ 4.79	$ 4.79	$ 4.79
2039					$ 4.89	$ 4.89	$ 4.89	$ 4.89	$ 4.89	$ 4.89	$ 4.89
2040						$ 4.99	$ 4.99	$ 4.99	$ 4.99	$ 4.99	$ 4.99
2041							$ 5.09	$ 5.09	$ 5.09	$ 5.09	$ 5.09
2042								$ 5.19	$ 5.19	$ 5.19	$ 5.19
2043									$ 5.29	$ 5.29	$ 5.29
2044										$ 5.40	$ 5.40
2045											$ 5.51
Total	$ 75	$ 77	$ 78	$ 80	$ 82	$ 83	$ 85	$ 87	$ 88	$ 90	$ 92
PV to Permit Yr	$ 62	$ 63	$ 64	$ 66	$ 67	$ 50	$ 70	$ 71	$ 73	$ 74	$ 76

Note: PV refers to the present value of the stream of payments.

The table includes the annual increase in recreational value. In Permit Year 2016, the recreational loss is equal to $3.10 per square foot in the first year, $3.16 per square foot in the second year, $3.28 in the third year, and so forth. The sum of these annual amounts, over a 20-year period and present valued to the Permit Year, is shown in the last row of the table. The Initial Area rate is represented by this last row where in Permit Year 2016 it equals $62 per square foot of wall. In Permit Year 2017, the Initial Area component of the Public Recreation Fee equals $63 per linear foot and so forth.

The second part of the Public Recreation Fee, due to the theoretical narrowing of the beach caused by armoring the bluff, equals the cumulative areas in Table 4-3 multiplied by the annual recreational value of the beach from Table 4-2. **Table 4-5** shows the results. For instance, for Permit Year 2016 in the first year, the impact to recreation equals 0.4 feet multiplied by 1 foot of wall multiplied by $3.10 per square foot or $1.24 per foot of wall. For the second year, the impact to

recreation equals 0.8 feet multiplied by 1 foot of wall multiplied by $3.16 per square foot or $2.53 per foot of wall.

TABLE 4-5 BLUFF RETREAT RATE
ESTIMATED PUBLIC BEACH RECREATION LOSS DUE TO FIXING THE BACK BEACH LOCATION (PER LINEAR FOOT)

	Permit Year										
	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
2016	$ 1.24										
2017	$ 2.53	$ 1.26									
2018	$ 3.86	$ 2.58	$ 1.29								
2019	$ 5.25	$ 3.94	$ 2.62	$ 1.31							
2020	$ 6.70	$ 5.36	$ 4.02	$ 2.68	$ 1.34						
2021	$ 8.21	$ 6.84	$ 5.47	$ 4.10	$ 2.74	$ 1.37					
2022	$ 9.77	$ 8.38	$ 6.98	$ 5.58	$ 4.19	$ 2.79	$ 1.40				
2023	$ 11.39	$ 9.97	$ 8.54	$ 7.12	$ 5.70	$ 4.27	$ 2.85	$ 1.42			
2024	$ 13.07	$ 11.62	$ 10.16	$ 8.71	$ 7.26	$ 5.81	$ 4.36	$ 2.90	$ 1.45		
2025	$ 14.80	$ 13.32	$ 11.84	$ 10.36	$ 8.88	$ 7.40	$ 5.92	$ 4.44	$ 2.96	$ 1.48	
2026	$ 17.62	$ 16.11	$ 14.60	$ 13.09	$ 11.59	$ 10.08	$ 8.57	$ 7.06	$ 5.55	$ 4.05	$ 2.54
2027	$ 20.58	$ 19.04	$ 17.50	$ 15.96	$ 14.42	$ 12.88	$ 11.34	$ 9.80	$ 8.26	$ 6.72	$ 6.72
2028	$ 23.65	$ 22.08	$ 20.51	$ 18.94	$ 17.37	$ 15.79	$ 14.22	$ 12.65	$ 11.08	$ 9.51	$ 7.93
2029	$ 26.83	$ 25.23	$ 23.63	$ 22.02	$ 20.42	$ 18.81	$ 17.21	$ 15.61	$ 14.00	$ 12.40	$ 10.79
2030	$ 30.12	$ 28.49	$ 26.85	$ 25.21	$ 23.58	$ 21.94	$ 20.31	$ 18.67	$ 17.03	$ 15.40	$ 13.76
2031	$ 33.52	$ 31.85	$ 30.18	$ 28.51	$ 26.85	$ 25.18	$ 23.51	$ 21.84	$ 20.17	$ 18.51	$ 16.84
2032	$ 37.02	$ 35.32	$ 33.62	$ 31.92	$ 30.22	$ 28.52	$ 26.82	$ 25.12	$ 23.42	$ 21.72	$ 20.02
2033	$ 40.73	$ 38.99	$ 37.25	$ 35.52	$ 33.78	$ 32.05	$ 30.31	$ 28.57	$ 26.84	$ 25.10	$ 23.37
2034	$ 44.55	$ 42.78	$ 41.01	$ 39.24	$ 37.46	$ 35.69	$ 33.92	$ 32.15	$ 30.38	$ 28.60	$ 26.83
2035	$ 48.50	$ 46.69	$ 44.88	$ 43.08	$ 41.27	$ 39.46	$ 37.65	$ 35.84	$ 34.04	$ 32.23	$ 30.42
2036		$ 50.72	$ 48.88	$ 47.04	$ 45.19	$ 43.35	$ 41.50	$ 39.66	$ 37.82	$ 35.97	$ 34.13
2037			$ 53.00	$ 51.12	$ 49.24	$ 47.36	$ 45.48	$ 43.60	$ 41.72	$ 39.84	$ 37.96
2038				$ 55.32	$ 53.40	$ 51.49	$ 49.57	$ 47.66	$ 45.74	$ 43.82	$ 41.91
2039					$ 57.81	$ 55.85	$ 53.90	$ 51.94	$ 49.99	$ 48.03	$ 46.07
2040						$ 60.35	$ 58.36	$ 56.36	$ 54.37	$ 52.37	$ 50.37
2041							$ 62.95	$ 60.92	$ 58.88	$ 56.85	$ 54.81
2042								$ 65.61	$ 63.53	$ 61.45	$ 59.38
2043									$ 68.32	$ 66.20	$ 64.08
2044										$ 71.21	$ 69.05
2045											$ 74.16
Total	$ 400	$ 421	$ 443	$ 467	$ 493	$ 520	$ 550	$ 582	$ 616	$ 651	$ 691
PV to Permit Yr	$ 307	$ 322	$ 340	$ 358	$ 378	$ 400	$ 423	$ 448	$ 475	$ 503	$ 534

Note PV refers to Present Value of the stream of payments.

In Permit Year 2016, the recreational loss is equal to $1.24 per linear foot in the first year, $2.53 per linear foot in the second year, $3.86 in the third year, and so forth. The sum of these annual amounts, over a 20-year period and present valued to the Permit Year, is shown in the last row of the table. The Bluff Retreat Rate is represented by this last row where in Permit Year 2016, it equals $307 per linear foot of wall. In Permit Year 2017, the Bluff Retreat rate equals $322 per linear foot, and so forth.

Consistent with the LCP LUP, mitigation fees shall be paid in 20-year increments. This requires that the annual stream of payments be converted to Permit Year dollars. A discount rate of 2% is used

to present value[18] the stream of payments shown in Tables 4-4 and 4-5. The City's historic investment rate is slightly less than 3%; hence the City recommends using a discount rate of 2%[19].

The Public Recreation Fee (PRF), addressing impacts for a 20-year period, is calculated by the following formula.

PRF = Initial Area (sf) x Initial Area Rate + Bluff Retreat Length (ft) x Bluff Retreat Rate

Based on information of the permit application and the Permit Year, the Initial Area of the structure shall be determined (e.g., length times width) and the Initial Area Rate applied to it. Next the Bluff Retreat Rate shall be applied to the length of the wall (Bluff Retreat Length). The sum of these will be determined on a case-by-case basis and would equal the Public Recreation Fee for the 20-year period.

Examples:

Example 1: In Permit Year 2016, for a 2-foot-wide by 50-foot-long seawall (e.g., Figure 1C, Figure 2, and Figure 3 of LUP Appendix B) that is constructed post-bluff failure, the footprint of the seawall or Initial Area is 100 square feet. A mitigation fee for this component is then 100 square feet multiplied by the Initial Area Rate of $62 per square foot (Table 4-4) or $6,200. For mitigation of the impacts of narrowing of the beach due to fixing the back beach location, the fee is based on the length of the seawall multiplied by the Bluff Retreat Rate of $307 per linear foot. A mitigation fee for this component is then 50 feet multiplied by $307 per linear foot equaling $15,350. The total Public Recreation Fee is then the sum of the two components, or $21,550 for a 20-year period. For comparison and reference back to the 2010 and 2015 Draft Fee Studies, this equates to an overall fee of $431 per linear foot.

Changing to Permit Year 2020 in the above example, the total Public Recreation Fee would equal 100 sf x $67/sf + 50 ft x $378/ft or $25,600 for a 20-year period (the equivalent of $512 per linear foot).

Example 2: In Permit Year 2016 for a 2-foot-wide by 50-foot-long seawall (e.g., Figure 1C, Figure 2, and Figure 3 of LUP Appendix B) that is constructed prior to imminent bluff failure, the footprint of the structure covers 100 square feet of useable beach. As bluff failure has not occurred and imminent failure is probable due to the confirmed presence of a significant bluff notch overhang, the area of the notch shall be included in the Initial Area. For an existing notch of approximately 8 feet by 20 feet the Initial Area would equal 100 square feet plus 160 square feet, or 260 square feet. A mitigation fee for this component equals 260 square feet multiplied by the Initial Area Rate of $62 per square foot or $16,120. For the mitigation of impacts of narrowing of the beach due to fixing the back beach location, the fee is based on the Bluff Retreat Length (the length of the seawall) multiplied by the Bluff Retreat Rate or $15,350 (50 feet x $307/lf) . The total Public Recreation Fee is then the sum of the two components, or $31,470, for a 20-year period. For

[18] Present valuing takes into account that a lesser amount may be paid today for a payment due in the future because of its investment opportunity. If a dollar is due one year from now, but is paid today, one year in advance, the payment need be only $0.98. That $0.98 invested conservatively at 2% annually for one year would yield $1.00 a year from today.

comparison and reference back to the 2010 and 2015 Draft Fee Studies, this equates to an overall fee of $629 per linear foot.

Example 3: In Permit Year 2016 for a small erodible concrete notch infill structure (e.g., Figure 1A, LUP Appendix B), where bluff failure was not imminent, that does not protrude onto the useable beach and will erode at approximately the same rate as the bluffs, there would be no requirement to pay the City's Public Recreation Fee.

Example 4: In Permit Year 2016 for a larger infill structure that does not protrude onto the useable beach (e.g., Figure 1B, LUP Appendix B), where bluff failure is imminent, a mitigation fee shall be paid for the area estimated to be imminently available to the public for recreational use. For a notch depth of 4 feet that is 10 feet wide, the Initial Area equals 40 square feet and the Public Recreation Fee is then $2,480 (40 square feet x $62 per square foot) for a 20-year period. For comparison and reference back to the 2010 and 2015 Draft Fee Studies, this equates to an overall fee of $248 per linear foot.

Information used in the mitigation fee calculation shall be based on the approved City permit application. The City's Geotechnical Engineer should be consulted in making these determinations.

Michael Baker has also calculated the payment of fees, at City staff direction, if amortized at 4% Annualized Percentage Rate (rate assumed for comparison purposes only) at 10-year intervals or 5-year intervals, assuming payment at the beginning of those periods. City Council shall make the controlling decisions regarding payment options and terms, if not paid in full at the time that the City issues the construction permit. **Table 4-6** identifies a sample payment schedule based on each $1,000 due in the Permit Year.

TABLE 4-6
PAYMENT SCHEDULE (PER $1,000 IN PUBLIC RECREATION FEE)

Single Payment Paid Upfront	Pay in 1st and 10th Year[20]		Pay in 1st, 5th, 10th, and 15th Year[21]			
$1,000	$597	$597	$328	$328	$328	$328

Applying the payment schedule to Example 1 from above, where the Public Recreation Fee equals $21,550, the pay in 1st and 10th year equals $12,865 ($21,550/$1,000 x $597). The pay in 1st, 5th, 10th, and 15th year equals $7,068 ($21,550/$1,000 x $328.)

The following chapter (Chapter 5) discusses the potential for an offset credit to the Public Recreation Fee and Sand Mitigation Fee based on potential public benefits that may be derived from seawall construction. The following section discusses potential credit to future mitigation fees should sea level changes vary from the 2016 Draft Fee Study assumptions.

[20] Assumes a loan rate of 21.67% at 5-year intervals, and first payment due prior to Permit Date.

[21] Assumes a loan rate of 48.02% at 10-year intervals, and first payment due prior to Permit Date.

CREDITS TO FUTURE MITIGATION FEE PAYMENTS

There is some uncertainty in predicting sea level rise rates as well as future bluff erosion rates. In addition, the City is actively pursuing a long-term (50-year) coastal storm damage reduction project in conjunction with the City of Encinitas and the USACE, which would enhance sand volumes on the beach and reduce beach and coastal bluff erosion.

According to LCP LUP Policy 4.51, sea level rise predictions and bluff erosion rates should be revisited in ten-year intervals. Changes in the rate of sea level rise would impact the mitigation fees. To ensure that each owner subject to a mitigation fee pays only its proportional amount, it is recommended that the Public Recreation Fee program include a process to account for subsequent sea level changes. If sea level rise is less than predicted in this study, an overpayment of mitigation fees would have been made for the first 20-year period. To account for this potential overpayment, a credit to subsequent mitigation fees could be applied. If sea level rise is greater than predicted in this study, an underpayment of mitigation fees would have been made for the first 20-year period. To account for this potential underpayment, the difference could be required with payment of any subsequent 20-year-interval mitigation fee. A simplified example is shown below.

Based on an average annualized bluff erosion rate in the City which is estimated at 0.4 feet per year per the certified LCP LUP (and increasing in 2026 to 0.673 feet per year as recommended in this study), the payment of mitigation fees related to the narrowing of the beach for a seawall permit issued in Permit Year 2016 would be $307 per linear foot of wall. Twenty years later (2036), the mitigation fee for the next 20-year period is to be assessed. However, based on observed data, the erosion rate remained constant at 0.4 feet per year or is reduced due to the implementation of the City's 50-year Coastal Storm Damage Reduction Project.

Had that information been known in Permit Year 2016, the amount due as mitigation fees in 2016 would have equaled 15% less or 261 per linear foot of wall. The difference of $46 per linear foot of wall then shall be applied as a credit to the mitigation fees due for the second 20-year interval (2036 through 2055). This element would only be implemented as a credit (or additional payment) to subsequent fees. Implementing language would be included in subsequent study updates and approving resolutions as this study covers only a ten-year time frame. **Table 4-7** provides a summary by Permit Year of the percent of fee due to sea level rise and the resulting 0.673 foot per year erosion rate.

TABLE 4-7
PERCENT OF FEE DUE TO INCREASE OF SEA LEVEL RISE AND FIXING THE BACK BEACH LOCATION
ESTIMATING THE FEE PERCENT DIFFERENCE IF USING 0.4'/YEAR EROSION RATE
OR IF USING 0.4'/ YEAR AND 0.673'/YEAR

Permit Year	Percent due to sea level rise & corresponding loss of beach area (applies to Beach Retreat component of the Fee)
2016	15%
2017	18%
2018	20%
2019	23%
2020	25%

Permit Year	Percent due to sea level rise & corresponding loss of beach area (applies to Beach Retreat component of the Fee)
2021	28%
2022	31%
2023	33%
2024	36%
2025	38%
2026	41%

In other words, in Permit Year 2016, if the fee is $307, 15% of that or $46 would be due to erosion exceeding 0.4 feet per year.

USE OF CITY COLLECTED FEES

According to Policy 4.50 in the City's certified LCP LUP, a Sand Mitigation Fee shall be collected by the City which shall be used for beach sand replenishment and/or retention purposes. The mitigation fee shall be deposited in an interest-bearing account designated by the City Manager of Solana Beach in lieu of providing sand to replace the sand that would be lost due to the impacts of any proposed protective structure. The methodology used to determine the appropriate mitigation fee has been approved by the CCC and is contained in LUP Appendix A. The funds shall solely be used to implement projects which provide sand to the City's beaches, not to fund other public operations, maintenance, or planning studies.

Sand Mitigation Fees must be expended for sand replenishment and potentially for retention projects as a first priority and may be expended for public access and public recreation improvements as secondary priorities where an analysis done by the City determines that there are no near-term, priority sand replenishment Capital Improvement Projects (CIP) identified by the City where the money could be allocated. The Sand Mitigation funds shall be released for secondary priorities only upon written approval of an appropriate project by the City Council and the Executive Director of the Coastal Commission.

Similar to the methodology established by the CCC for the Sand Mitigation Fee, the City and the CCC are jointly developing a methodology for calculating a statewide Public Recreation Fee. To assist in the effort, the City has shared the results of its draft study with the CCC to support its development of a uniform statewide Public Recreation Fee. Until such time as an approved methodology for determining this fee has been established, and the methodology and payment program has been incorporated into the LCP through an LCP amendment, the City will collect a $1,000 per linear foot interim fee deposit. In the interim period, the CCC will evaluate each project on a site-specific basis to determine impacts to public access and recreation, and additional mitigation may be required. The City shall complete its Public Recreation Fee study within 18 months of effective certification of the LUP.

Project applicants have the option of proposing a public recreation/access project in lieu of payment of Public Recreation Fees (or interim deposits) to the City. At the City's discretion, these projects may be accepted if it can be demonstrated that they would provide a directly related recreation and/or access benefit to the general public.

Public Recreation Fees must be expended for public access and public recreation improvements as a first priority and for sand replenishment and retention as secondary priorities where an analysis done by the City determines that there are no near-term, priority public recreation or public access CIPs identified by the City where the money could be allocated. The Public Recreation funds shall be released for secondary priorities only upon written approval of an appropriate project by the City Council and the Executive Director of the CCC.

City Staff is currently developing a list of capital improvement projects and operations and maintenance projects that are needed throughout the City to improve public access and public recreation for residents and visitors. Since the entire City of Solana Beach is located within the Coastal Zone, this list will include both beach projects and inland projects.

FEES COLLECTED BY OTHER AGENCIES

The LCP LUP (Policy 4.50) states that the Solana Beach mitigation fees shall not be duplicative of other agency fees, specifically, the Sand Mitigation Fee collected by CCC and the land lease payments collected by the California State Lands Commission (CSLC). A technical analysis providing details of the mitigation fees is included in **Appendix 14**. The analysis shows that the Public Recreation Fee is not duplicative of the City's Sand Mitigation Fee because the City's Sand Mitigation Fee does not include a "loss of recreation component." However, the Public Recreation Fee would be duplicative of the CCC Sand Mitigation Fee, which does include a loss of recreation component. Therefore, the City as the first permitting entity shall assess and collect the Sand Mitigation Fee per the LCP LUP.

In addition, the CSLC requires lease payments for the use of public land (e.g., land located seaward of the mean high tide line). The CLSC staff has stated that what the CSLC collects for seawall encroachments on state sovereign land in the Solana Beach area (among others) is annual rent for the use of the state's property. Rents of this type are based on the square footage of the encroachment, and go directly into the state's General Fund. The setting and payment of rent is accomplished through the CSLC's surface leasing process, which allows the CLSC broad discretion in the methods used and the amount of rent that is charged. In the Solana Beach area (as well as other areas throughout the state), the CSLC uses a "benchmark" value, specific to leases in the Solana Beach area, because of the numbers of leases maintained there. This approach saves the CSLC from the need to conduct a new appraisal every time a new lease is authorized, or when rent is revised for existing leases. The benchmark value is based on an appraisal of the upland property and so provides a means for establishing rent to reflect market value for a non-market good.

While these may seem similar in nature to the Public Recreation Fee, the CSLC lease is a rent for use of the land; the Public Recreation Fee is a mitigation fee for the loss of public recreation. The CSLC staff has indicated that they do not believe the fees imposed by the City for Sand Mitigation per the certified LCP LUP and Public Recreation would be redundant or duplicative.

RELATED STUDIES AND CCC CASE STUDIES

Numerous studies have been performed over the years in/or near Solana Beach addressing the economic benefits of the beach as well as the recreational value of the beach in connection with the permitting of seawalls. A summary of these related studies is presented in **Appendix 15** for informational purposes.

CCC Coastal Development Permit (CDP) Case Studies

Several CDP cases were also reviewed as part of this fee study. The full analysis is included in **Appendix 16** and is summarized here.

When issuing a CDP, the CCC considers on-site mitigation as a first choice, off-site mitigation as its second choice, and then in-lieu mitigation fees. For the sand component of the mitigation fee, it is typically based on the volume of sand that will not reach the public beach/ littoral cell due to the seawall which is then multiplied by a unit cost of sand. To mitigate for the loss of beach area due to encroachment and fixing the back beach location, the CCC has recently used four strategies to determine the amount of in lieu fees as described below.

Sand Volume Approach – The CCC identifies the impacts of seawalls as loss of beach area due to encroachment on the public beach and fixing the back beach location preventing long-term erosion. The beach area loss is then converted to an equivalent volume of sand, based on certain assumptions. The volume is then multiplied by the unit cost of sand to determine an in-lieu fee amount. However, more recent CCC reports found that this approach underestimates the actual impacts; it therefore now uses other methods to determine a better estimate for the loss of recreational value and public access due to loss of beach area.

Appraisal Approach – The CCC identifies the impacts as encroachment on the public beach and fixing the back beach location preventing long-term erosion. For the loss of beach area due to encroachment and fixing the back beach location, the CCC applies a unit cost of land, based on nearby coastal land values or an appraisal of the bluff top land value, to the area lost.[22]

Negotiated – The CCC identifies the impacts as encroachment on the public beach and fixing the back beach location preventing long-term erosion. The CCC may consider a payment and make comparison to other recent and relevant projects to determine the reasonableness of the proposed in-lieu fee and/or compare it to an appraisal-based approach.

Recreational Valuation – The CCC again identifies the impacts as encroachment on the public beach and fixing the back beach location preventing long-term erosion which creates a loss of beach area available for public recreation and public access. To determine the value of public recreation and public access, several tools and methods have been developed by economists to measure "non-market" environmental resources. These approaches include Contingent Valuation, Benefit Transfer, Random Utility, and Travel Cost, each with advantages and disadvantages. These methods can then be used to determine a recreational value per square foot or acre of beach.

The following table summarizes the mitigation for impacts to recreation and public access (not loss of sand to littoral cell) of the case studies described in **Appendix 16**. The cost per square foot for loss of beach area due to encroachment and/or fixing the back beach location have been estimated by the CCC staff to be as low as $25 and as high as $181.

[22] See **Appendix 17** for a critique of the appraisal approach.

TABLE 4-8
SELECTED STATEWIDE CCC CDP RECREATION/PUBLIC ACCESS MITIGATION FEE OVERVIEW

Project Name	Location/ CDP #	Year Filed	Mitigation Approach/Years	In Lieu Fee	Area Loss (sf)	Cost per Square Foot (sf)
Ocean Harbor House	Monterey County 3-02-024	2005	In Lieu-Recreational 50 years	$5,300,000	43,500	$122
Las Brisas	Solana Beach 6-05-72	2005	In Lieu-Recreational 22 years	$248,681	1,372.8	$181
Sea Breeze	Santa Cruz County 3-08-019	2009	Project Based	~	0	~
Oceanus	San Diego 6-11-010	2010	In Lieu-Negotiated 20 years	$86,000[23]	780	$110
O'Neill	Santa Cruz County 3-09-042	2010	In Lieu-Sand Volume compared to Project Based 20 years	$93,000-$190,000	3,716	$25–$50
Li	Encinitas 6-07-133	2010	In Lieu-Appraisal 20 years	$136,606	801	$170
City of Pacifica	Pacifica 2-11-009	2011	In Lieu-Appraisal or Project Based 17 years	$263,581	7,944	$33
Lands End	Pacifica 2-11-039	2011	In Lieu-Appraisal and Project Based[24]	$1,600,000	37,895	$42
Lynch/Frick	Encinitas 6-88-464	2011	Project Based[25]	~	~	~
Caltrans	Ventura County 4-11-26	2012	Project Based	~	~	~
Lampl/Baskin	Encinitas 6-12-041	2012	In Lieu-Appraisal 20 years	$122,716	796.8	$154
Bannasch	Solana Beach 6-13-0948	2013	In Lieu-Interim Deposit 20 years	$31,000	241	$129

FUTURE FEE STUDY UPDATE CONSIDERATIONS

It is anticipated that this fee study will be reviewed for necessary updates at approximately ten-year intervals after adoption or more frequently if necessary by changed conditions or changes

[23] Total in-lieu payment equaled $86,000 of which $5,000 was for sand loss to public beach and littoral cell.

[24] The project-based improvements were valued at $1.2 million which offset the in-lieu fee.

[25] The project made an additional 425 square feet of beach available to the public because the seawall was located landward of the existing bluff.

in any of the key assumptions on which this fee study is predicated. Any update to the program should take into consideration refinements to the survey process. These may include the following:

1. Beach attendance counts and visitor surveys should consider that there are two daily peaks in attendance, one for surfers and one for non-surfers.

2. Visitor surveys should be developed and conducted to reduce bias to the maximum extent practicable. Improvement to the survey protocols may include larger sample size and sampling the surfer population.

3. The City may want to consider performing ongoing beach attendance counts.

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5. ANALYSIS OF POTENTIAL PUBLIC BENEFIT OFFSET CREDITS

OVERVIEW

As part of the fee determination process, draft versions of the LCP LUP contemplated an offset to those fees for any proven quantified monetary public benefit flowing from a Coastal Structure, Sea Cave or Notch Infill (collectively referred to as a bluff retention device (BRD)) that exceeds the quantified monetary private benefit.

This chapter analyzes the potential for offset credits to the Public Recreation Fee and Sand Mitigation Fee. It should be noted that the chapter ultimately finds that the private benefit exceeds any potential public benefit and therefore no offsets will be realized in most cases. The chapter identifies the potential offset credits for Council consideration based on:

- Public safety
- Protection of public infrastructure/access
- Property tax revenue increase

Based on a typical example provided in this chapter, where the Public Recreation Fee is assumed to be $21,550 (single payment for a 50-foot BRD permitted in 2016), the private benefit is estimated at $250,000 and the public benefit at $71,600 including increased property taxes and public safety benefits. Consequently, no offset would be applied to the payment of the Sand Mitigation and Public Recreation Fees. Also note that the example assumed a Public Recreation Fee payment of $431 per linear foot; it does not address the Sand Mitigation Fee. From 2007 through 2012, the City collected $1,000 per linear foot deposit toward both the Sand Mitigation Fee and the Public Recreation Fee. Since approval of the LCP LUP in 2013, the City collects a Sand Mitigation Fee based on the methodology contained in LUP Appendix A as well as $1,000 per linear foot fee deposit to be applied toward the Public Recreation Fee once established.

BASIS OF THE PUBLIC BENEFITS OFFSET CREDIT

While the certified LCP LUP no longer contains a policy regarding the potential for "offset credits," the intent of the collaborative process was to have the fee study consider offsets such that:

> The Sand Mitigation and Public Recreation Fees shall be offset over time by an amount determined by the City Council, after a public hearing to account for any proven quantified monetary public benefit flowing from the bluff retention device that exceeds the quantified monetary private benefit (e.g., the increase in the value of the bluff property). Any such credit … shall not exceed the dollar amount of the total of the Sand Mitigation and Public Recreation Fee paid by the Bluff Property Owner.

The public benefit offset credit is therefore associated with the private benefit realized from the construction of a BRD and is limited by two quantities:

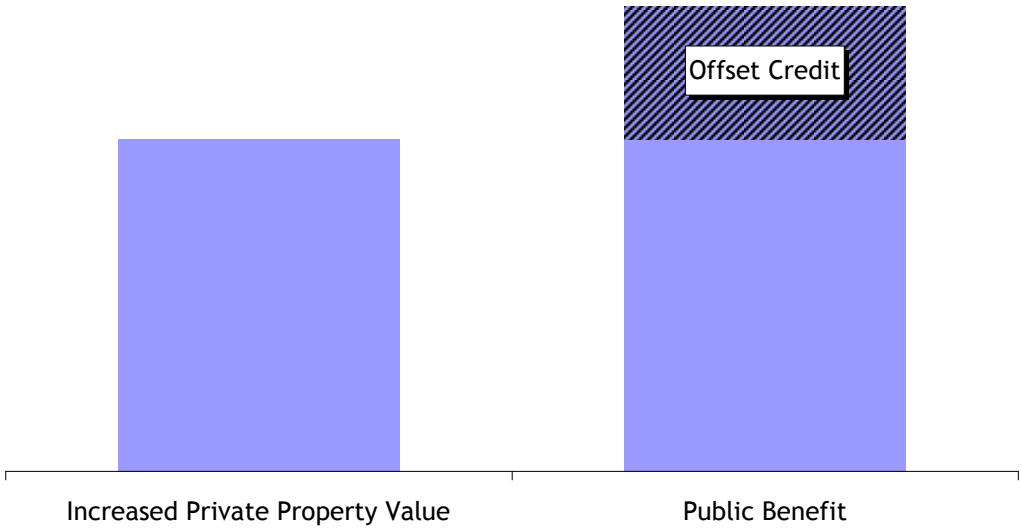
- The amount which the public benefit exceeds the private benefit
- The total of the Sand Mitigation and Public Recreation Fees

The first limiting quantity derives from the presumption that while the public may benefit from the BRD, the bluff top property owner also benefits from the BRD which is placed on public property and enhances the stability of the bluff and therefore the value of the bluff top property. If these two benefits are equal there should be no offset, since the public and the property owner are deriving the same utility from the BRD. However, if the public's benefit exceeds the private benefit, then the property owner is seen as subsidizing the public (or, conversely, the public is benefiting at the property owner's expense and as a result of their actions) in the amount of the difference. This subsidy is eliminated if the Sand Mitigation and Public Recreation Fees (mitigation fees) are offset by the amount of the difference.

From the above considerations, at least two potential outcomes arise:

- The real increase in property values attributable to the BRD will exceed any quantifiable public benefit and thus no offset would ensue.
- Public benefits will exceed any increase in real property values attributable to the BRD; therefore, an offset in the amount of the difference should be applied, even to the extent that the net fee is zero.

FIGURE 5-1
POTENTIAL OFFSET CREDIT



Derivation of the Offset Credit

To establish the applicable offset credit requires that public benefits be quantified. The most direct way to quantify these benefits is to evaluate the costs that the public would have incurred over a period of time had the BRD not been in place. Therefore benefits may be assumed as stemming from the avoidance of costs absorbed by the public (either the general public or the City itself). The public costs correspond to the quantifiable public benefits created by constructing a BRD, which may include:

- Public safety.
- Protection of public property and infrastructure, including but not limited to public beach access stairways, parking lots and public roads.
- Increased taxable, assessed private property valuation.

The corresponding real costs from bluff erosion and eventual failure include injury and loss of life, damage and/or destruction to City property and infrastructure (access stairways, roadways, utilities, City-owned buildings), potential loss of sales tax revenues from fewer visitors, and private property losses leading to reduced assessed property valuations and taxes collected.

These costs are due to episodic geologic events: damage to public infrastructure and claims due to loss of life and limb that may occur from a single bluff failure episode or series of episodes over the course of time.

Episodic Cost Evaluation – Probabilistic Event Modeling

Evaluation of the expected episodic cost involves the likelihood that a bluff failure causing a specified loss occurs within a given period of time and the quantification of that loss. In any one year, the cost can be represented by the following formula, which is specific to a particular bluff location:

Expected cost in year (i) = Probability of a cost-incurring event in year (i) x cost of event

For some costs (e.g., damage to infrastructure or bluff top homes) the probability will be zero throughout many of the earlier years[26] until progressive bluff retreat begins to threaten landward infrastructure and properties.

On the other hand, for any given location along the bluff face, there is a non-zero probability of a bluff failure in any one year having the potential to cause injury or death. The probability of failure is a function of the bluff stability which is related to the bluff factor of safety and may be assigned a value (from zero to 1) based on the geologic characteristics of the particular section of bluff. The likelihood of a bluff failure causing injury or death is increased by the density of beach users. The loss due to injury or death may be formulated as follows:

Expected cost due to injury or death = P(SF) x M x D x C

[26] The analysis assumes bluff failure is imminent when the notch depth reaches 8.2 feet.

Where:

P(SF) = Probability of bluff failure in a location as a function of a bluff stability conditions described by a site geologic assessment.[27]

M = Mortality factor, or the rate at which bluff failure causes death or injury. It is determined by dividing total number of documented bluff failures that have occurred over a given period of time in a given section of beach by the number of fatalities or injuries as a direct result of bluff failures over that same period within the same section.

D = Beach occupancy density factor that shall be defined as the ratio of the average occupancy per unit length of beach at the particular location, as determined by the zonal beach survey data, to the average occupancy per unit length of the entire relevant study area.

C = Mortality cost factor is the cost of a single death. The Environmental Protection Agency's statistical value of $10.1 million is used as the cost factor.[28]

Average Fatality Loss over Encinitas-Solana Beaches 1990–2009

An average fatality loss analysis requires two sets of data:

- The number of bluff failures that have occurred during a specified period of time.
- The number of fatalities that occurred as a result of the bluff failures.

No bluff-related fatalities have occurred along Solana Beach since documentation of bluff failures began. Therefore, in order to obtain failure-fatality data upon which to base an average fatality loss analysis, it is necessary to extend the analysis beyond Solana Beach to include Encinitas where both failures and fatalities (one) have occurred. Over the 19-year period between 1990 and 2009 there were approximately 126 documented bluff failures along the Encinitas and Solana Beach coastlines, or about 6.6 failures per year.[29] One of these failures resulted in a fatality for a mortality rate per documented failure of 1/126 = 0.008.[30]

[27] The probability of failure at a given bluff location may be related to the probability that internal resisting forces or capacity is less than the load or driving force at that location. Resistance and load are variables which are dependent on a basic set of site-specific parameters that are fundamentally uncertain, such as presence of internal cracks, water, and sand lenses *(Lu, Qin and Williams, page 2746)*.

[28] "Guidelines for Preparing Economic Analyses, *Appendix B: Mortality Valuation Estimates*", Environmental Protection Agency, December 2010. The recommended value is $7.4 million in 2006 dollars updated to current year 2015 using the GDP deflator inflation index, which increased 13.7% since 4th quarter 2006.

[29] USACE 2000d, cited in California Beach Restoration Study report, Jan. 2002 and Solana Beach bluff failure log 2002-2009. The City of Solana Beach maintains a bluff failure log that is current to April 2015. However, the City of Encinitas does not, so comprehensive data for Encinitas is limited to what the USACE has reported.

[30] Other bluff failures, resulting in fatalities, have occurred along the coast. See **Appendix 18** for analysis.

The combined length of bluffs from Batiquitos Lagoon (South Carlsbad State Beach, at the southerly parking lot) to the southerly end of Solana Beach is approximately 17,300 feet[31]. From this data, a bluff failure rate for a segment of bluff corresponding to the width of a typical bluff property in Solana Beach, 50 feet, is approximately 0.019 failures per year (6.6/346 50-foot segments). This is the overall failure rate along the bluff face in any given year and does not consider the specific bluff conditions with respect to failure at any particular location. The product of the rate of bluff failure, the mortality rate, and the statistical value of life equals the expected cost per year due to loss of life from bluff failures generally over the entire Encinitas-Solana Beach bluff frontage: 0.019 x 0.008 x $10,100,000 = $1,535 per year per 50-foot section of bluff, or $30.70 per foot per year (in 2015 dollars).

Potential Public Benefit Credit Offset to the Mitigation Fee

The calculation of potential offset to the mitigation fee requires an evaluation of the private as well as the public benefits attributable to the BRD. An example offset calculation is presented below that assumes the private benefit is equivalent to the construction cost of the BRD. The study assumes that whether a BRD is constructed or not is an economic decision where the cost of the BRD is compared to the before-and-after differential of the value of the property that is to be protected. Presumably, one would not pay more to have a BRD constructed than the value such construction adds to the property. Consider the extreme case, where the before-BRD property value is zero (as in the case where, due to the geologic hazard, there would be no offers to purchase the property) and the after-BRD value is equal to the market value of similar, BRD-protected, bluff top homes which is, for example, $3.5 million. The net property value increase/private benefit is $3.25 million (market value less the cost of a 50-foot BRD at $5,000 per foot)[32]. However, the extreme case neglects the latent value of the property that is inherent due to the possibility of remedying the geologic hazard by obtaining all necessary permit and approvals constructing a BRD. Therefore, the market would dictate that a minimum value exists for the market value of a bluff top property before installation of a BRD that is equivalent to difference between full market value and the cost of a BRD that, if constructed, would restore the property to that full market value. A possible additional value-added increment that may also be considered is the current market differential between BRD-protected and non-BRD protected properties, if any such differential is found to exist among otherwise comparable properties.

In the following example, the public safety benefit calculated above is added to the present value of the potential increased property tax revenue stream (due to the increase in property value) over 20 years—$40,900—and compared to the private benefit:

[31] Only beach frontage along sandstone bluffs that are geologically similar to those along Solana Beach were included in this total; measurements were taken from Google Earth and the California Coastal Records Project series of oblique photos.

[32] The US Army Corps of Engineers uses a total seawall construction cost of $13,400 per lineal foot in *Encinitas-Solana Beach Coastal Storm Damage Reduction Project*, *Appendix E*. A figure of $5,000 is conservatively used here for the analysis (as the lower boundary).

Offset Calculation

Potential Public Safety Benefit = Expected Avoided Loss over 20 years (50 ft x $30.70 per ft. per yr. x 20) :	$30,700
Potential increased property tax revenue over 20 yrs (present valued)[b]:	$40,900
Total Public Benefit:	$71,600
Private Benefit (increased property value) attributable to BRD[a]:	$250,000
Potential Offset: Private Benefit of $250,000 > Public Benefit of $71,600	$0

[a] Valuation based on cost of BRD assuming 50 foot length, $5,000 per foot

[b] Total of property tax revenue (1% of the increase in assessed valuation) present value discounted at 2%)

In this example the private benefit exceeds the total public benefit by $178,400; thus there would be no offset to the mitigation fee. Note, also, that the increased property value is assumed to occur following construction of the BRD. However, the trigger for assessing increased property value likely would not occur until after the sale of the property.

Expected Loss of Public improvements from Future One-time Episode

The probabilistic model described above is used to evaluate the public's stream of benefits stemming from the avoidance of one type of episodic cost from the cyclical failure events: avoidance of risk due to an ongoing hazard to life and limb. The timing of single-episode events that occur at some point in the future which cause either total or partial damage to public or private improvements (the latter resulting in a loss to the public of property tax revenues), depend on: 1) distance of the public or private improvements from the top of the upper bluff slope that would be protected by the proposed BRD, and 2) the geologic characteristics affecting bluff stability and retreat (notch depth, thickness and integrity of the sandstone, presence of sand lens, slope angle, etc.). An initial assessment of the existing conditions would reveal the relative imminence of bluff failure and also the longer-term prognosis for bluff failures that would threaten improvements.

The first step in evaluating the potential loss due to damage to improvements is to assess the level of risk that public or private improvements are subject to given the site configuration, distance of improvements from bluff, or condition of bluff (notch or sea cave depth, steepness of upper bluff, presence of exposed sand lens, etc.). The expected loss—the probability-weighted cost of damage that would have occurred had the BRD not been in place—is calculated over the 20-year period and is dependent on location of the improvements relative to the bluff. Most public improvements may fall into one of two categories based on location and risk time frame:

Near-term risk—Near-term risk involves threats to improvements from bluff failures that may occur within a one- to four-year period, similar to the episodic evaluation in that failure is fairly imminent. Impending failure such as this would be indicated by a factor of safety approaching or less than 1. Improvements such as the public beach access stairways/walkways, bluff top improvements such as public parking lots, structures, pedestrian viewpoints, railings, and drainage facilities are exposed to bluff failure risk in public areas such as Fletcher Cove and Tide Park and the three public access points south of Fletcher Cove. In Fletcher Cove, potential damage to the lifeguard station and the Community Center on Pacific Avenue may occur within a few years if measures are not taken. These measures may include some type of BRD; however, a BRD that is constructed to protect adjacent private property would not necessarily benefit the Fletcher Cove

improvements unless the BRD were extended specifically to benefit the public improvements. In fact, there exists no situation along the bluff face where the installation of a BRD for the primary purpose of protecting a private bluff top property would also provide direct protection to any public improvement.

Long-term risk—Other improvements, such as Pacific Avenue and other public streets in the vicinity, are threatened only in the long term, after several bluff failure cycles have occurred. An example is a section of Pacific Avenue north of Fletcher Cove. There is a section of the 300 block of Pacific Avenue that is about 65 feet from edge of pavement to top of slope and could potentially benefit from a BRD constructed for the sole purpose of protecting the adjacent bluff top principal structure. At the accelerated bluff retreat rate of 0.673 feet per year, this section of Pacific Avenue would not be threatened for approximately 96.6 years (65 feet/0.673 feet per year), well beyond the 20-year period. Adjacent private properties, however, could be threatened much sooner. Due to end erosion effects, even private properties protected by a BRD would be threatened if either adjacent property were not also protected. Depending on the position of the private improvements, the threat to adjacent property could become imminent within the next failure cycle.

Near-term Risk Evaluation

Near-term impacts are those that would occur within the initial failure cycle, typically within one to four years depending on geologic parameters of the slope or bluff face. The only public asset that is potentially threatened in the near term are the public improvements located in and adjacent to Fletcher Cove. However, the protection measures for these public improvements would be the City's responsibility and intended to be of entirely public benefit.

Conclusion

The analysis in this chapter represents a conservative approach to the calculation of potential offset credits, conservative in that the lower boundary of private benefit is considered. In response to comments received in 2010, additional analysis has been completed and is included in **Appendix 18**. However, the outcome is the same. It is not likely that there will be any offset credits realized by property owners for constructing a seawall or BRD.

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LIST OF PREPARERS AND THOSE CONSULTED IN PREPARATION OF THE FEE STUDY

City of Solana Beach

Greg Wade, City Manager
David Ott, Former City Manager
Bill Chopyk, Community Development Director
Wendé Protzman, Former Deputy City Manager/Community Development Director
Marie Berkuti, Finance Manager/Treasurer
Johanna Canlas, City Attorney
Leslea Meyerhoff, AICP, Project Manager
James Knowlton, Geopacifica

Michael Baker International (PMC)

Tom Bandy, Public Finance Manager
Donna Snider, PE
Dino Serafini, PE
Larry Ponseggi, Economic Analyst and Survey Manager

CIC Research, Inc.

Gordon Kubota, PhD

Everest International Consultants, Inc.

David Cannon, MCE, PE
Seamus Ian Innes, MSc, PE

Merkel & Associates, Inc.

Lawrence Honma, Principal Biologist

California Coastal Commission Staff

Sherilyn Sarb, Deputy Director
Deborah Lee, District Manager
Gabriel Buhr, Coastal Program Manager
Eric Stevens, Coastal Program Analyst II

California State Lands Commission Staff

Kenneth Foster