Surfrider Foundation San Diego County Chapter
Surf Spot Monitoring Program – Year 1 report
September 3, 2013
Tom Cook (tom@surfridersd.org) and Julia Chunn-Heer (julia@surfridersd.org)

Executive Summary:
Surfrider Foundation San Diego Chapter has initiated a volunteer driven surf spot monitoring program with the goal of monitoring the response of five surf spots nearby RBSP II receiver beaches to the RBSP II beach fills. Funding assistance came from the County Neighborhood Improvement Grant Program. During the reporting period, a video camera network to record surf conditions was designed and deployed. Volunteer training was designed and multiple training sessions were held. The camera network recorded daily surf conditions, which trained volunteers reviewed and reported the observed surf quality parameters. Results from seven months of surf parameter reports are shown. Given that the beach fill component of RBSP II was not complete during this monitoring period, changes in surf spot quality were not tracked for this monitoring period. An initial assessment of the short-term impacts at Imperial Beach is provided.
# TABLE OF CONTENTS

1. Introduction  
2. Monitoring Methods  
   2.1 Video Camera Network Design  
   2.2 Monitored Surf Spots Description  
      2.2.1 Moonlight Beach  
      2.2.2 Cardiff Reef  
      2.2.3 Tide Park (Tabletops Reef)  
      2.2.4 Fletcher Cove  
      2.2.5 Imperial Beach Pier  
   2.3 Surf Quality Parameters  
      2.3.1 Surfer Counts  
      2.3.2 Number of Waves Ridden  
      2.3.3 Length of Ride  
      2.3.4 Wave Breaker Type  
      2.3.5 Wave Face Steepness  
   2.4 Volunteer Training  
3. Surf Spot Monitoring Data  
   3.1 Data Availability  
   3.2 Surf Parameter Distribution  
      3.2.1 Surfer Counts  
      3.2.2 Number of Waves Ridden  
      3.2.3 Length of Ride  
      3.2.4 Wave Breaker Type  
      3.2.5 Wave Face Steepness  
4. Monitored Surf Spot Conditions  
   4.1 Moonlight Beach  
   4.2 Cardiff Reef  
   4.3 Tide Park (Tabletops Reef)  
   4.4 Fletcher Cove  
   4.5 Imperial Beach Pier  
      4.5.1 Initial Response to RBSP II Beach Fill  
5. Conclusions
1. Introduction

Surfrider San Diego’s Surf Spot Monitoring was established in early 2012 to understand impacts of beach fill from the Regional Beach Sand Project II (RBSP II) on nearby surf spots. Surfrider’s volunteer network is utilized to provide reporting of surf quality parameters from visual observation of daily surf conditions. In order to provide a stable platform for the daily observations, a video camera network is employed with cameras at 5 surf spots nearby RSBP II receiver beaches. Trained volunteers analyze 10 minute long daily video clips and fill out a survey which includes surfer counts, length of ride, number of rides, and other wave quality parameters.

The camera network utilizes the services of CoastalCOMS to provide an internet-accessible video archive for the camera network. Additionally, CoastalCOMS will apply algorithms developed and tested by coastal scientists to extract wave parameter and shoreline estimates from the video.

The period of reporting covers October 2011 through October 2012. During this period, only the beach fill at Imperial Beach had been completed. Therefore, tracking changes or effects to surf spot quality from the RBSP II beach fill are not discussed in this report. Results from daily surf quality parameters are presented for all surf spots and separately for each individual surf spot.

The report proceeds with an explanation of the monitoring methods used for this project in Section 2. Section 3 presents results from the entire network, while Section 4 breaks down results to individual surf spots. Finally, a discussion of the results is presented in Section 5.

2. Monitoring Methods

Evaluating surf spot quality or “surfability” is a concept that has evolved within the coastal engineering and policy community. As recreation associated with surfing continues to be a major component of coastal and beach use, understanding distinguishing qualities and impacts to surf spots should be a component of coastal management policies. For the purposes of understanding impacts to surf spots from the RBSP II, a number of methods were researched. Importance was placed on a method that relied less on anecdotal evidence and surfer experience, but rather utilized a method that consisted of a stable platform for recording and analyzing data. Additionally, employing the volunteer-based structure of Surfrider Foundation was identified as a valuable resource for a successful program.

2.1 Video Camera Network Design

In order to provide a stable platform for observing surf conditions at a surf spot, a video camera network is used. Video cameras were placed at locations based on close proximity to a surf spot, proximity to RBSP II receiver beach and sites where permission to install was attained. Video camera sites required power and internet connection. Where internet was not available, 4G data service was used. All cameras are installed at lifeguard buildings, which were arranged through contacts in the SANDAG Shoreline Working Group. Some attempts were made at
placing cameras on private property, however none were successful. The list of cameras and their install date are shown in Table 1. A Map of camera locations is show in Figure 1. Most video cameras were installed in February-March 2012, however, permitting issues forced the Cardiff State Beach camera to be delayed until September 2012.

Cameras are programmed to have a fixed view that is monitored for 10 minutes a day at 8 am. Video recordings are streamed to a Digital Asset Manager using Milestone Systems products provided by CoastalComs. The choice to use 8 am was chosen based on input from Surfrider volunteers, with the generalization that light wind conditions in the morning are more desirable for surfers. This does not allow adjustment of the report to the phase of tide, which is often related to surf quality, but may differ from surf break to surf break. The video archive retains 45 days of video for each camera site, and is accessible to Surfrider volunteers using the XProtect Client software provided by Milestone Systems. The software runs on Windows platforms only, but many volunteers would use “Virtual Machine” software to run the software on Mac computers.

<table>
<thead>
<tr>
<th>Camera</th>
<th>Location</th>
<th>Video Recording Start Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moonlight Beach</td>
<td>Moonlight Beach Lifeguard tower</td>
<td>3/11/2012</td>
</tr>
<tr>
<td>Cardiff Reef</td>
<td>Cardiff State Beach Lifeguard tower</td>
<td>9/3/2012</td>
</tr>
<tr>
<td>Tide Beach Park</td>
<td>Tide Beach Park Lifeguard tower</td>
<td>3/11/2012</td>
</tr>
<tr>
<td>Fletcher Cove</td>
<td>Solana Beach Lifeguard HQ</td>
<td>3/11/2012</td>
</tr>
<tr>
<td>Imperial Beach</td>
<td>Imperial Beach Lifeguard HQ</td>
<td>2/22/2012</td>
</tr>
</tbody>
</table>

Table 1: Locations and recording start dates for Surf Spot Monitoring cameras.

Cameras were installed and calibrated by CoastalComs USA, a subsidiary of CoastalComs, an Australian based company. CoastalComs USA was also contracted to provide maintenance and technical support during the two-year period of the Surf Spot Monitoring program. Unfortunately, CoastalComs USA was dissolved in late 2012 and was unable to provide maintenance and technical support after the cameras were installed. The maintenance of the cameras was transferred to Surfrider San Diego, and technical support was transferred to CoastalComs, which is headquartered in Gold Coast, Queensland, Australia. The time difference between San Diego and Gold Coast is 17 hours, which made it difficult for communication between CoastalComs and Surfrider, but also other service providers such as Internet service providers.
Figure 1: Map of Surf Spot Monitoring video cameras. Yellow line refers to the extent of sand placement at RSBP II receiver sites.

2.2 Monitored Surf Spots Description
2.2.1 Moonlight Beach

Beach break. Moonlight beach is a high use city park located in Encinitas, CA. The location hosts many surf camps and schools, as well as surf contests and concerts. The surf typically ranges from walled to closed out, but may become peaky and very good at times. The camera view is shown in Figure 2.

Figure 2: Camera view of Moonlight Beach.
2.2.2 Cardiff Reef

Cardiff Reef is one of the premier reef breaks in Southern California. Cardiff Reef produces a long peeling right for shortboarders and longboarders, and a short steep left for shortboarders. It can handle larger and longer period swell, and has multiple breaks to support a large crowd. It is a cultural center within the San Diego County surfing community, and its close proximity to a very busy campground ensures there are usually people surfing regardless of conditions. The camera view is shown in Figure 2.

Figure 2: Camera view of Cardiff.
2.2.3 Tide Beach Park (Tabletops Reef)

Tide Beach Park is located in Solana Beach, CA and is a reef break with a long right and an occasional fast left. It can handle larger, longer period swells and is usually very crowded on large, long period swells. The camera view is shown in Figure 3.

Figure 3: Camera view of Tide Beach Park.

2.2.4 Fletcher Cove

Fletcher Cove is a municipal beach park in Solana Beach, CA. It is peaky beach break, with an occasionally breaking outside reef break. The park is one of few beach access points in Solana Beach with a parking lot and facilities and is well used. The camera view is shown in Figure 4.
2.2.5 Imperial Beach

The Imperial Beach camera is focused on the area south of the Imperial Beach Pier. Imperial Beach in general is mostly walled beach break, but can be good when sandbars form and the waves become peaky. The around the pier is a high use area and can become crowded during summer and special events. The camera view is shown in Figure 5.
2.3 Surf Quality Parameters

In order to assess surf quality, a list of desirable surf characteristics was compiled given input from Surfrider Foundation volunteers. A major goal for the project is to assess each surf spot with the same parameter set and track changes with time. The parameters and suitable values used in the study are listed in Table 2.

<table>
<thead>
<tr>
<th>Surf Quality Parameter</th>
<th>Descriptor</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Number of Surfers</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>- All Surfers</td>
<td></td>
</tr>
<tr>
<td>- Standup Paddler</td>
<td></td>
</tr>
<tr>
<td>- Body Surfer/Body Board</td>
<td></td>
</tr>
<tr>
<td>Number of waves ridden</td>
<td>Number</td>
</tr>
<tr>
<td>Ride Length</td>
<td>Number in seconds</td>
</tr>
<tr>
<td>Wave Breaker Type</td>
<td>Not Breaking, Backing off, Peaky, Peeling, Sectioning, Walled, Close out</td>
</tr>
<tr>
<td>Wave Face Steepness</td>
<td>Mushy, Hollow, Steep, Dumping</td>
</tr>
</tbody>
</table>

Table 2: Surf Quality Parameters and possible reported values.

### 2.2.1 Surfer Count

San Diego County is a populated area with a wide variety of surf spots. Most breaks are surfed daily and can be extremely crowded with good swell conditions. The number of surfers using the break is a reasonable estimate of its quality, and it is assumed that if a break improves the number of surfers will increase. For the purpose of the study, surfers are counted, as well as specialized boards including Standup Paddleboard (SUP) and Body Board/Body Surfer are counted separately. It is straightforward to distinguish a SUP from a regular surfer, but can be difficult to differentiate a body board from a surfer. Reporters observe surfer count at beginning and end of each 10-minute clip and report the average.

### 2.2.2 Number of Waves Ridden

The number of waves ridden in a surf session can be seen as a general indicator of surf consistency. It can be seen as an indicator of quality, as a larger number of waves ridden is generally desirable to surfers. But, number of waves ridden may be related to offshore swell characteristics or local spot topography. For example, close outs may occur when sandbars are overloaded with sand. Volunteers are trained to count the number of waves where a rider catches a wave. Wipeouts on take off count as a wave ridden, as it may indicate poor surfing rather than poor quality wave.

### 2.2.3 Ride Length

The length of a ride is a general indicator of surf quality, as longer rides are more desirable. Volunteers are trained to use the time tools in the video client software to measure ride length in seconds. Time tools in the video client allow increased accuracy as compared to visual observations. The volunteer will report the maximum observed ride length within the 10-minute clip.

### 2.2.4 Wave Breaker Type

Wave breaker type is characterized using surfer vocabulary to describe how the wave breaks along the sandbar, reef or point. Peaky waves are desirable for many surfers, and may be
associated with reduced crowding, as surfers can spread out and surf other peaks. Peeling waves are desirable as they provide longer ride length and the opportunity for surfers to do maneuvers. Close outs or Backing off surf can be due to phase of tide or bottom topography of surf spot. Volunteers choose one wave breaker type, taken from the list below, to describe the 10-minute surf session.

a) Not Breaking: Essentially flat. No rideable surf.

b) Backing off: The action of a wave as it passes from shallow water into deeper water closer to shore. The wave becomes less steep, or the broken whitewater fades away. Tends to occur shoreward of offshore reefs or sandbars. The wave may reform and break again in even shallower water closer to shore.

c) Peaky: A wave with a distinctly higher central point of the wave, tapering down smaller toward the shoulders or sides of the wave. A peak will offer rides to go both left and right with most rides starting from the center of the peak. Similar to an A-Frame.

d) Peeling: A wave condition in which the wave breaks perfectly from takeoff all the way down the line, the lip creating a curve or arc of similar angle from start to finish.

e) Sectioning: A surf condition in which waves approach the beach and break apart into different peaks/lines with a clear separation between the rideable shoulders.

f) Walled: Not quite closing out. Surfers can ride a short distance before the end of the wave. Somewhere between Sectioning and Closed Out.

g) Close out: When all parts of the wave along crest break at the same time. Generally avoided by all surfers.

2.2.5 Wave Face Steepness

Wave face steepness is characterized as surfer vocabulary for the shape of the wave face. In general, hollow waves are more highly regarded by intermediate and expert surfers, but steep waves are appealing to most levels of surfers. Volunteers choose one wave face steepness descriptor, taken from the list below, to describe the 10-minute surf session.

a) Mushy: A crumbly and soft wave without any steepness or much energy.

b) Hollow: A wave that has a barrel or tube forming.

c) Steep: A fast breaking wave, somewhere between Mushy and Hollow.

d) Dumping: Used to describe waves that are very hollow and hard breaking. Difficult to short- or long-board surf.

2.3 Volunteer Training

Surfrider volunteers are trained on installing and operating the video archive client. Volunteers are required to make a 6-month commitment and have their own computer with Internet access. Training also includes an explanation of the surf quality parameters, and how to file a daily report that is entered into a Google Docs form. Forms are saved as a spreadsheet that allows further analysis.

Volunteers are encouraged to file reports weekly, but have some flexibility given the 45 days of video retention in the video archive. There are some cases where more than one volunteer is
actively monitoring a camera, and there is more than one set of daily surf quality parameters reported at a camera.

3. Surf Spot Monitoring Data

3.1 Data availability

Video data availability depends on power and Internet connections at the site. Internet connections were more problematic than power connections. Three of the five sites use 4G network connections, and cellular signal along the coast is not the most reliable. In addition, there were a number of server outages where cameras were running fine, but were not acquired by CoastalComs successfully. The video data availability is shown in Figure 6.

The availability of volunteer daily reports are shown in Figure 7. Reports may not be filed on days where video is available for reasons including incomplete video, camera positioning, and obstructed views (dirty lens or fog). The percentage of reports filed where video is available is listed in Table 3. Volunteers have a comment section in the daily reporting form that can be used to describe connection or camera issues.

Figure 6: Availability of video recorded.

Figure 7: Timeline of Surf Spot Monitoring reports filed by Surfrider volunteers.
<table>
<thead>
<tr>
<th>Camera</th>
<th>Percentage of Reports Filed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moonlight Beach</td>
<td>72%</td>
</tr>
<tr>
<td>Cardiff Beach</td>
<td>47%</td>
</tr>
<tr>
<td>Tide Beach Park</td>
<td>63%</td>
</tr>
<tr>
<td>Fletcher Cove</td>
<td>82%</td>
</tr>
<tr>
<td>Imperial Beach</td>
<td>91%</td>
</tr>
</tbody>
</table>

Table 3: Percentage of reports filed given available video.

3.2 Surf Parameter Distribution

Distribution plots of surf quality parameters over all cameras in the study are shown in the following section. The plots show the number of occurrences of a parameter during the reporting period. In order to calculate basic statistics, the daily surf parameters are not counted when surfer count equals zero. This limits the number of zero values that go into the statistical analysis.

3.2.1 Surfer Counts

Before plotting the distribution of surfer count (Figure 8), all zero value surfer count data was removed. This is to limit the number of zero valued data that are analyzed. Generally, surfer count of 1 to 3 is typical, but values exceeding 20 are possible. It is expected, that as more data from Cardiff Reef, which is a very popular surf spot, are included the surf count average will increase. It should be noted that volunteers take a count at the beginning and the end of the 10 minute video clip, and report the average value. The fixed view of the camera does not allow a complete count of all surfers at a particular spot, and surfers may paddle in and out of the camera view. While bodyboarders (Figure 9) and SUP (Figure 10) are counted, they consist of a very small amount of total surfers, and both have a mean close to zero.
Figure 8: Distribution of total Surfer Count from all cameras in Surf Spot Monitoring network from Feb 1 2012 through Oct 31 2012.

Figure 9: Distribution of Body Boarder Count from all cameras in Surf Spot Monitoring network from Feb 1 2012 through Oct 31 2012.
Figure 10: Distribution of Standup Paddler Count from all cameras in Surf Spot Monitoring network from Feb 1 2012 through Oct 31 2012.

Figure 11: Distribution of Number of Rideable Waves from all cameras in Surf Spot Monitoring network from Feb 1 2012 through Oct 31 2012.
Figure 12: Distribution of Maximum Ride Length from all cameras in Surf Spot Monitoring network from Feb 1 2012 through Oct 31 2012.

Figure 13: Distribution of Wave Breaker Type from all cameras in Surf Spot Monitoring network from Feb 1 2012 through Oct 31 2012. Gray bars show total occurrences for all cameras, and colored bars refer to individual cameras as shown in legend.
3.2.2 Number of Waves Ridden
The distribution of the number of waves ridden during a 10-minute clip (Figure 11) shows that most surf sessions have 2-4 waves ridden. It is likely that the number of waves ridden will have different values during different swell conditions. For example, shorter period swell or windswell will have more rideable waves than a longer period swell. In the case of an inconsistent long period swell, there may be any rideable waves observed during a 10-minute clip.

3.2.3 Length of Ride
The maximum length of ride is only recorded when there is at least one wave ridden during a 10-minute clip. A maximum ride length of 0-1 seconds will reflect close out conditions. As shown in the distribution plot of Maximum Length of Ride (Figure 12), typical values range between 3-12 seconds. At better breaks, such as Cardiff Reef, length of ride can exceed 20 seconds under normal conditions.

3.2.4 Wave Breaker Type
The distribution plot of Wave Breaker type (Figure 13), shows that Peeling and Walled waves are the most common over the camera network. Peeling waves typically occur at point and reef breaks, and the reef breaks at Cardiff Reef and Tide Beach Park are typically described as a peeling wave. Walled waves occur mostly at beach breaks and provide more length of ride than a close out, but much less than a peeling wave.

3.2.5 Wave Face Steepness
The distribution of wave face steepness (Figure 14) shows that the most typical descriptors were Mushy and Steep. Mushy waves are similar to collapsing waves in that they do not have a well-defined “lip” or crest that allows high performance surfing maneuvers. On the other hand, steep waves do have a lip that allows top turns and aerial maneuvers. Hollow and Dumping waves were much less frequent. Dumping waves will typically occur along beaches without any feature (i.e. sandbar or reef) for the wave to break. Hollow waves are very desirable and need a combination of swell, tide and wind direction to be realized at most of San Diego’s surf spots.

4. Monitored Surf Spot Conditions

The overarching goal of the Surf Spot Monitoring program is to observe the surf quality parameters over a period of time and track any changes that may occur due to the sand input from RBSP II. Establishing a baseline of the surf quality parameters is a necessary step to achieve this goal. Ideally, the baseline would include data collected over a multi-year period and under various swell conditions. Unfortunately, the surf spot monitoring cameras were installed only months before the beach fill project started. However, the data collected does have value and gives a snapshot of surf quality throughout the network. For instance, the camera at Imperial Beach provided an interesting view of the fill being installed, which is shown in section 4.5.1.

Since the time period covered in this monitoring report does not include post-fill conditions at most locations, it is not yet possible to discern impacts of the RBSP II beach fill. Instead, surf quality parameters from each surf spot are compared with the overall distributions presented in Section 3.2.

4.1 Moonlight Beach

Moonlight Beach had more reports filed than the other cameras in the network. During multiple months of the study there was more than one volunteer monitoring the site. The surf parameters describe the surf as Steep and Walled (Figures 13 & 14). The distribution of Maximum Ride Length (Figure 15c) is greatest around 5-6 sec, which is consistent with a Steep and Walled beachbreak.

4.2 Cardiff Reef
Unfortunately, the Cardiff Reef camera had only been installed for one month before the end of the reporting period, and not enough time to consider as baseline data. However, the mean values of Surfer Count and Maximum Ride Length (Figure 16 a & c) seem consistent with a reef break.

4.3 Tide Park (Tabletops Reef)

Tide Beach Park is described as a Mushy and Peeling wave in Figures 13 & 14. Additionally, the mean Maximum Ride Length is larger than most camera locations. Both are consistent with the longer, peeling waves associated with reef breaks.

4.4 Fletcher Cove

Given the information in Figures 13 & 14, Fletcher Cove is described as Walled and Steep. These qualities are consistent with surf at a typical beachbreak. Fletcher Cove is also the most Peaky of all sites in the network, which is a desirable quality for beachbreaks.
4.5 Imperial Beach

The surf at Imperial Beach pier can be described as Mushy and Peeling, as shown in Figures 13 & 14. This is not expected for a beach break like Imperial Beach, where Steep and Walled descriptors are more typical. Additionally, the mean Maximum Length of Ride is the shortest for all sites, and not indicative of a peeling wave.

4.5.1 Initial Response to RBSP II Beach Fill

The video camera at Imperial Beach provided a unique view of the construction of the RBSP II beach fill as shown in Figure 20. Figure 20 uses time exposure images, which are images consisting of a succession of video frames averaged over 1-minute of time. Figure 20a shows conditions days before the beach fill progressed towards the camera. Figures 20b-c show the progression of the fill construction and Figure 20d shows the post-fill conditions. The white blur over water seen in a time exposure image is the wave-breaking zone. The succession of images in Figure 20 shows the beach fill extending into the pre-fill wave-breaking zone. This is further illustrated by using edge detection techniques to select the pixels in the video image where the shoreline is positioned. Figure 21b shows the edge detection of the post-fill shoreline.
superimposed over the pre-fill time exposure image, and clearly shows that the location of the post-fill shoreline on top of the wave breaking zone.

Figure 20: Progression of RBSP II beach fill at Imperial Beach captured from a surf spot monitoring camera. a) Pre-fill 09/29/2012, b) 10/03/2012, c) 10/04/2012, d) Completed 10/06/2012.
5. Discussion

Before commencing the Surf Spot Monitoring program, a review of the few existing surfability methodologies was carried out. Emphasis was placed on designing the Surf Monitoring Study to utilize the volunteer structure of the Surfrider Foundation and to create a video archive. The method that was chosen uses a parameter set to describe surf quality based on Surfrider Foundation volunteer input, as well as input from other existing surfability methodologies. The study will track the changes of the parameter set to determine any impacts (positive or negative) to surf spot quality from the sand added as part of RBSP II. The analysis will focus on trends rather than the absolute values of the parameters, and in order to effectively determine impacts, baseline levels need to be established. Unfortunately, the timing of the start of the Surf Monitoring Study did not allow enough time to observe surf spots over all types of swell. The baseline data, which was collected over most of this reporting period, includes spring and summer conditions, but does not include winter swell conditions. In spite of that, the baseline data presented here still provides useful information describing the quality of surf spots in the camera network.

The methodology of the Surf Monitoring Study has evolved given the experience and input of the volunteers. After its initial design, the surf parameter form was simplified to alleviate confusion with selection and definition of the surf quality parameters. Additionally, the communication between volunteers and study moderators has proven crucial in maintaining the camera network so the goals can be realized. This included alerts about network downtime, camera cleaning and camera position adjustment. Regrettably, the dissolution of CoastalComs USA means that Surfrider San Diego needs to provide on site maintenance. The structure of Surfrider San Diego is not suited for providing service calls or onsite tech support. Communicating issues with network downtime has been especially difficult given the time delay and distance between San Diego and Gold Coast.

Regardless of these challenges, the Surf Monitoring Study has provided useful insight into San Diego County surf spots. Given surfing’s importance in the area economy, tracking changes in
surfer count has importance to local municipalities and businesses. Characterizing surf spots using the set of surf quality parameters presented here provides the surfing community a resource for monitoring and protecting the unique surf breaks of San Diego. This is well illustrated in the case of the Imperial Beach fill. Imagery from the Surf Monitoring Study has shown that the beach fill at Imperial Beach extended into the surf zone. The impacts from this were immediate, as surf was breaking directly on the shore. The period for this report ends around the time Imperial Beach surfers began to contact Surfrider San Diego complaining about the degradation of surf conditions along Imperial Beach. These impacts will be further explored in the next update for the Surf Monitoring Study.