RESILIENT COAST SANTA CRUZ

City of Santa Cruz - Synthesis Summary of Outreach and Engagement

November 1, 2020

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Community Engagement Process

The Resilient Coast Santa Cruz Initiative's two projects unfolded over 2019 and 2020. Building on the City's Climate Adaptation Plan Update (2018) engagement, the team designed a living Engagement Plan for the Resilient Coast initiative that resulted in over 1,500 conversations with community members and stakeholders at over 50 meetings and events to date. The team employed a number of engagement strategies, and pivoted to online engagement with the advent of COVID-19. Promotion for each major engagement event was extensive and included flyers at public locations, emails to 300 person contact list, advertisements in local newspapers and community event calendars, Facebook postings and ads, and partnering with local community groups to share information through their networks. Materials were provided in English and Spanish. This effort was increased multifold with COVID-19 to try and reach people who typically are uncomfortable or unable to use digital tools. The range of tools utilized were all accessible from the Initiative's website www.cityofsantacruz.com/ResilientCoast. A google analytics report indicates that visits to the webpage increased by 10 fold in the transition between in-person to virtual engagement and the increase in promotion.

The graphic to the right documents how each engagement contributed to the key components of the two projects.

Flowchart of Stakeholder Engagement Process at each Stage

Uses and Values

Focus Groups

In the late summer and fall of 2019, the City of Santa Cruz hosted eight (8) focus groups focused on understanding different community groups' use of, concerns for, and interest in the coastal areas of Santa Cruz. University of California Santa Cruz Coastal Science and Policy graduate students assisted in developing the focus group structure and facilitation. Summaries of each focus group are contained in the document box at the Resilient Coast website.

The team also conducted specific activities aimed at identifying the range of coastal uses and values of the community at both the 2019 Earth Day and Open Streets events, giving out free stickers and raffling a bicycle, respectively, to encourage engagement.

Beach Flats One on One Interviews

One hundred twenty-five (125) one-on-one interviews conducted by City staff and San Jose State University instructors and graduate students took place through November 2019 with the front line Beach Flats and Lower Ocean neighborhoods. Dialogs were scheduled for December 2019 and early January 2020 that focused on specific socially vulnerable or under-represented groups within the community intended to further define unique needs and uses of our coastline along with understanding how adaptations considered might impact these groups. The following section is excerpted from the UCSC Coastal Science and Policy graduate program's analysis and summary of those interviews.

Many within the community focus groups responded similarly to their use of and access to the beaches and coastline of Santa Cruz. Common responses regarding coastal activities enjoyed by the community include sporting activities (swim, surf, run, bike, volleyball, kayak, and stand up paddle boarding), passive activities (walking, watching surf, walking dogs on Its Beach, observing wildlife, picnics, creating art, fishing, viewing sunset/sunrises), and visiting the Wharf/Boardwalk (i.e. exhibit and Sanctuary Exploration Center, movies nights, environmental events, dining and shopping). Amenities that improved/enhanced access to and enjoyment of the coast include the weather, the variety of available activities, room to accommodate activities, bike accommodation (lanes, racks, and jump bikes), and Open Streets events.

Challenges to access and coastal enjoyment noted by many include overcrowding (traffic issues, parking, rude people, bike/pedestrian conflict, keeping transportation affordable), pollution (waste/trash, Water quality, vehicle noise and emissions, plastics, dog feces, lack of garbage cans), lack of police presence (safety), and conflicts among user groups (bikes, pedestrians, cars, children, dogs).

Dissimilarities among respondents highlight the concerns, needs and values of subpopulations of coastal visitors. For example, focus groups indicate a clear inter-group and interpersonal disagreement on impacts that the Jump bike share has on the coast. Some participants enjoy the convenience of Jump bikes for transportation, while others noted concerns regarding the speed of Jump-bike bikers and the clutter when people park/leave Jump bikes along

walk areas, specifically how to deal with pedestrian/bicyclist conflict on West Cliff.

Also, as part of the academic collaboration on these projects a multicomponent analysis of the Beach Flats interviews as well as three other complementary mini projects were completed by the University of California Coastal Science and Policy graduate class. A collaboration publication is in preparation with both institutions' students and faculty.

Observational Study + Intercept Survey

Beginning in July 2019 and continuing through early 2020, the project team conducted over 700 intercept surveys to date along the coastline aimed at understanding coastal uses and values (also see West Cliff Drive Adaptation and Management Plan's Existing Conditions, 2019, and Benefit Cost Analysis, 2020).

Community Events and Talks

The team participated in two specific and well attended community events and conducted over 50 talks with community groups at this stage. The two large community events included Earth Day 2019 and Open Streets 2019, which had estimated attendance of 3,000 and 5,000 people, respectively. The team conducted knowledge building activities as well as those aimed at identifying the range and extent of coastal uses and values in the community. Through logistical partnerships with other city departments, we were able to incentivize engagement through distribution of free stickers (over 200 distributed) and a chance to win a bicycle raffle (over 500 raffle tickets issued). The Climate Action Manager also engaged organizations through a number of invited talks throughout the project to building the community's knowledge base and promote engagement in the Initiative as summarized in the table below.

Summary of Resilient Coast local community outreach and other engagement events

Event Date	Activity
10/4/2019	First Friday Museum of Natural History VR demo table
10/8/2019	Presentation to AMBAG energy advisory meeting
10/9/2019	Guest lecture at Sustainable Coastal Management Class @ MIIS
10/11/2019	Guest lecture at Sustainable Management Class at UCSC
10/12/2019	Beach Flats community clean up event
10/12/2019	Beach Flats neighborhood canvassing
10/13/2019	Open Streets
10/13/2019	Loma Prieta 30 Disaster Prep Event
10/13/2019	Gary Griggs article in Sentinel
10/19/2019	Lower Ocean Community Clean up event
10/21/2019	Climate Talk @ Santa Cruz Bible Church
10/21/2019	Resilient Coast Lower Ocean/Beach Flats Event at Familia Center
10/22/2019	Talk at Trinity Presbyterian Church

Event Date	Activity
11/4/2019	Cards against catastrophe pub night with climate action task force
11/6/2019	Cards against catastrophe game with Coastal Science and Policy class at UCSC
11/5/2019	Cards against Catastrophe pub night with Sustainability Team
11/12/2019	City Council meeting update
11/13/2019	UCSC Climate Science and Policy Course lecture
11/18/2019	Transportation and public works commission meeting resilient coast presentation
11/20/2019	Commission on the Environment meeting resilient coast presentation
11/21/2019	Planning Commission meeting resilient coast presentation
12/13/2019	ARCCA Meeting
12/17/2019	Las Posadas Beach Flats community event tabling
01/03/2020	Meeting with UCSC Women's Center
01/06/2020	Parks & Recreation Commission update
01/07/2020	Meeting with Santa Cruz High School Interact Club
01/08/2020	Meeting with Shared Adventures

Event Date	Activity
01/10/2020	Meeting with Amah Mutson Land Trust/UCSC American Indian Resource Center
01/13/2020	Meeting with Teen Center at Louden Nelson Community Center
01/14/2020	Climate Adaptation Talk in Carmel
01/17/2020	Meeting with Senior Network Services
01/21/2020	Meeting with Meals on Wheels
01/29/2020	Fisher people meeting
01/30/2020	UCSC Risk Intelligence Group & Risk Oversight Group
01/31/2020	Technical Advisory Committee Workshop
02/01/2020	Beach Flats Community Meeting
02/05/2020	Department Head Workshop
02/10/2020	UCSC talk with Dr. Juliano Calil, VR Adaptation
02/18/2020	Seaside Co./Boardwalk stakeholder meeting
02/20/2020	BAYCAN talk on Resilient Coast & Adaptation Pathways
02/21/2020	Sanctuary Exploration Tabling
02/22/2020	Virtual Reality Demo at opening of Felton Library Branch
02/25/2020	Homeless Garden Project Meeting

Event Date	Activity
02/26/2020	Surfer Focus Group
03/02/2020	Meeting with NAACP
03/04/2020	Guest Lecture Sustainable Cities and Social Equity Certificate Course UCSC
03/05/2020	Community Open House (Louden Nelson Community Center)
03/08/2020	Surfer tablet survey group activity
03/13/2020	California Coastal Commission Presentation on Resilient Coast - Equity, Adaptation Pathways
03/13/2020	Beach Flats Garden Outreach
03/19/2020	Regional Collaborative Forum Webinar on Resilient Coast and Adaptation Pathways
4/1/2020 - 6/1/2020	UCSC Class - CSP 244 Adaptation and Planning
4/23/2020	Cimpatico Studios Live Episode
4/28/2020	NOAA West Talk - Community Engagement
4/29/2020	UCSC Environmental Studies Senior Seminar: Guest Lecture - A Virtual Walking Tour of West Cliff Drive Adaptation and Management Plan
4/29/2020	Monterey Bay Economic Partnership Regional Economic Summit talk
5/19/2020	Meeting with Boardwalk
5/20/2020	UCSC Rachel Carson College's "Ask Me Anything" Instagram Pop Up

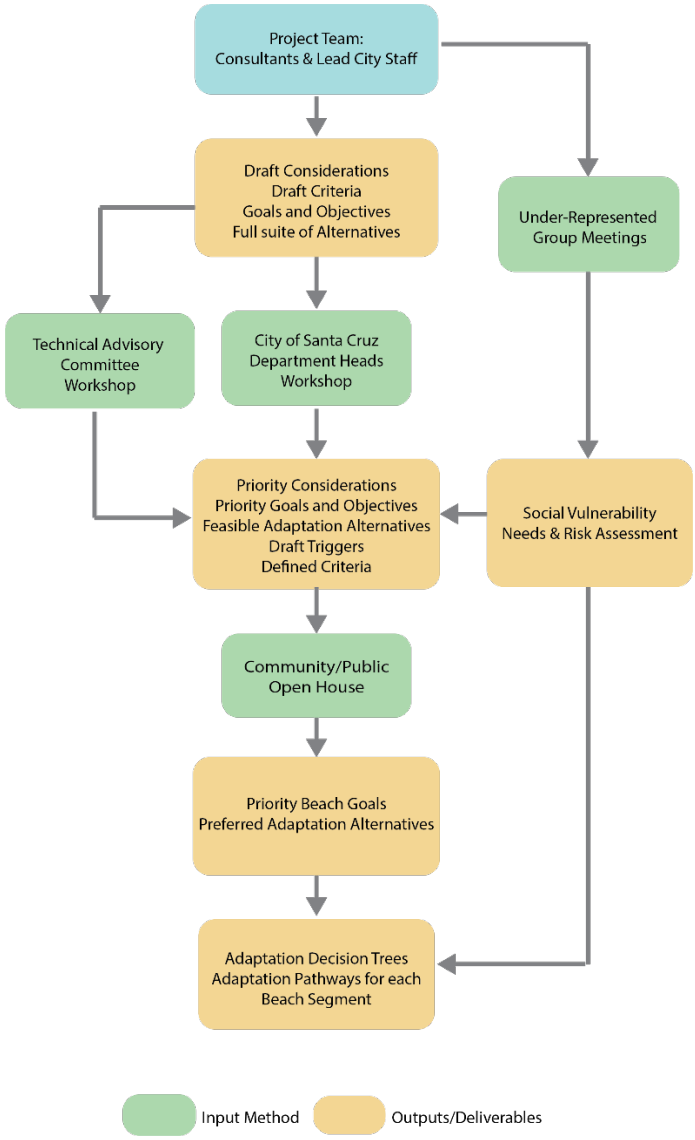
Event Date	Activity
5/21/2020	Presentation at Santa Cruz City School District's Green Schools Committee
6/4/2020	AdaptLA Virtual meeting Adaptation Pathways Presentation
6/15/2020	Presentation to Transportation and Public Works Commission
6/18/2020	Presentation to Planning Commission
6/22/2020	Junior Guards Summer 2020 interactive zoom on Climate Change and SCs beaches
6/29/2020	Sharing Equity-Focused Regional Reflections on the 2040 Vision Virtual Panelist hosted by Save our Shores
7/8/2020	Virtual Guards Summer 2020 interactive zoom on Climate Change and SCs beaches
7/20/2020	Virtual Guards Summer 2020 interactive zoom on Climate Change and SCs beaches
7/21/2020	Off the Lip Radio Hour / Santa Cruz Waves facebook live interview
7/30/2020	Virtual Guards Summer 2020 interactive zoom on Climate Change and SCs beaches
8/3/2020	Parks and Recreation Commission
8/3/2020-8/27/2020	Storymaps + surveys
9/24/2020	TAC meeting
9/14-11/17/20	Storymaps + surveys
11/17/2020	Resilient Coast Virtual Community Meeting

Developing Goals & Adaptation Strategies to Analyze

To complete this initial adaptation strategy prioritization effort, the Project Team, the Technical Advisory Committee (TAC), City of Santa Cruz Department Heads (DH), and the community provided input on beach resource and management goals, triggers, considerations for selecting adaptation strategies, and preferred adaptation options. Additionally, unique coastal resource uses and needs of under-represented groups as informed by one-on-one meetings with those groups was completed concurrently and helped to inform development of adaptation Decision Trees. Results from this evaluation are found in the Social Vulnerability Needs and Risk Assessment Report. The adjacent flowchart represents the process of how input was gathered and used to develop Adaptation Decision Trees and Pathways for each beach site.

TAC and City Department Head Workshops

In late January and early February 2020, the Project Team, in collaboration with City staff leading the Santa Cruz Resilient Coast Initiative, held workshops for the TAC as well as the City of Santa Cruz DH. During these workshops, after a review of hazards and adaptation strategy tradeoffs, attendees broke into groups to discuss sea level rise related hazard issues at each beach site and potential adaptation strategies to address these issues. Groups documented their preferred short- and long-term adaptation strategies and reported them back to all participants. The workshops were followed up with a survey intended to clarify and



Flowchart of Stakeholder Engagement Process for informing Adaptation Decision Trees and Pathways

define workshop attendees' top priorities of beach management goals, considerations for selecting strategies, and selection of preferred adaptation strategies that were discussed during the workshops for each beach site. Twenty-three responses were collected for the follow-up survey, representing 67% of the TAC and 94% of DH or their representatives. Results from the survey are found in the pie charts in the individual beach segment sections below.

Community/Public Open House Workshop

Outputs from the TAC and DH Workshops were synthesized along with other useful information about each feasible adaptation strategy by beach site and used as a resource for the community to provide input on during a community open house workshop on March 5, 2020. Tables of the information presented at the Open House are found in the Beach Resources & Management Goals section. Approximately 100 people attended the open house and provided input on preferred adaptation strategies in the short and long term for each beach segment to be further evaluated in the adaptation pathway development process. Results of preferred adaptation strategies from the community workshop are shown in bar graphs in the individual beach segment sections.

Under-Represented Group Engagement

This section, building on the 2017 Social Vulnerability to Climate Change Assessment, defines under-represented groups socially vulnerable to climate change impacts, how they use coastal resources as informed by outreach and studies to date, and how coastal change and adaptation efforts might impact each group. This section will support future project efforts after refinement based on additional dialog with under-represented users of the coast to verify how users self-define and how each group may be impacted by coastal change and various adaptation efforts.

The 2017 Social Vulnerability Assessment identified five distinct drivers of social vulnerability using data from a combination of Census data and 2015 City crime data. These user groups included elderly (>65 years old), those that spoke English as a second language, those with low income, persons with disability, and those that lived in areas with high crime rates (violent and property crime). Some users may self-identify with more than one of these groups. While the social vulnerability assessment only focused on residents identifying with one or more of these groups, it is also acknowledged that out-of-town visitors may also identify with one of these groups.

While vulnerable and under-represented peoples mostly use the coast in similar ways as the broader community, with perhaps a few variations and accommodations required, these peoples' ability to cultivate awareness, prepare for, safely evacuate and recover from flood, extreme erosion events, and coastal storm may be hindered. The descriptions below are an initial attempt to highlight how each vulnerable or under-represented group uses the coast, what unique needs they have and (in some cases) how they might be impacted by coastal change as projected by other planning efforts.

Process of Ground Truthing Needs of Under-represented Groups

The City and project team conducted a number of engagement events with under-represented groups to better understand how coastal resources are valued by these communities and how these amenities support their unique use of the Santa Cruz coastline and beaches.

Under-represented Group Meetings

Dialogs conducted in December 2019 and January 2020 focused on specific under-represented groups within the community. The interviews helped further define unique needs and uses of our coastline along with understanding how adaptations considered might impact these groups.

Groups Interviewed

- Shared Adventures representing people living with disabilities
- Amah Mutsun Tribal Band who represent the Awaswas Tribe of the Santa Cruz area
- Fisher people represented by Mathers Rowely of Monterey Bay Salmon and Trout Project
- Meals on wheels representing elderly and those living with disabilities
- Nueva Vista Community Center representing the Beach Flats community (x 2 discussions at Beach Flats Garden and park
- High school youth representing themselves
- Louden Nelson Teen Center representing afterschool needs of teens
- UCSC resource centers representing diverse groups of people within the community
- Homeless Garden Project group of people living with homelessness

Community Needs and Concerns: Results from Engagement

Specific coastal amenities, access infrastructure and coastal recreational opportunities were compiled from interview notes of under-represented group meetings. The below listed specific information is intended to help identify coastal resources and infrastructure that these groups rely on to meet their unique access needs. This study then evaluates where these services and amenities are currently located and where services are limited for these groups. Some user groups defined earlier in this report were not available to provide input. Furthermore, results from the one-on-one beach flats interviews have not been cross referenced with this information. All modes of engagement with under-represented groups were utilized in the deliverable entitled, Socially Vulnerable Populations Impact Analysis, found at the Resilient Coast website.

Beach and Coastal access ways: ramps, stairs, paths

- **Elderly & People with Disabilities**
  - Accessible bathrooms
  - Events use a ramp to access Cowell Beach
  - Beach wheelchairs for public use
  - Parallel parking options
  - Beach parking with ADA permit
  - Room to stage equipment such as beach wheelchairs and outrigger canoes
- **Youth**
  - Beaches are important for summer camps
  - Value job opportunities due to tourism, especially at boardwalk
  - Proponents of expanding rental bikes as they use the service to get to the beach and cliff without fear of personal bike theft.
  - Would like to see improved water quality at Main and Cowell beaches
- **Tribal**
  - Access to cultural resources for traditional indigenous collecting & fishing
  - Special access privileges at State Parks/Beaches
- **Homeless**
  - Fire Pits
  - Public bathrooms
- **Low Income Residence**
  - Tourists take parking space accessibility away from residents
  - Open space is critical to Beach Flats community because of overcrowding
  - Storm drains need to be unclogged more regularly

Clifftop Access: bike paths, parking, walkways

- **Elderly & People with Disabilities**
  - Special/ADA designated parking
- **Youth**
  - There is a general feeling of unsafety while biking along West Cliff, either due to cars when on road, or pedestrians on path
  - Staircases accessing beach are steep and slippery
  - Increase public transportation options to West Cliff and Boardwalk area
  - Include more benches along West Cliff
- **Low Income Residence**
  - If adaptation measures are funded by tax increases, target hotels and parking fees, not Beach Flats residents
  - If managed retreat is planned, there must be same-cost alternative housing options
- **Youth**
  - Those surveyed like the food trucks at Steamer Lane
  - Include more recreation opportunities at beaches and on west cliff (basketball courts, etc.)

Viewshed: overlooks, viewing areas

- **Elderly & People with Disabilities**
  - ADA overlooks

Transportation: multi-modal corridors, roads, paths, parking

- **Elderly**
  - Public transit to coastal destinations,
- **Homeless**
  - Public transportation access to West Cliff/wharf area; consider bike trolleys

Habitats: intertidal, beaches, roosting, upland

- **Fishers**
  - Restoration of steelhead habitat including the San Lorenzo River Lagoon
  - Use beaches for fishing and storm drains are a nuisance
  - Coastal habitat (including lagoons, San Lorenzo river, etc.) to produce fish stock
  - Tourists contribute to leaving fishing line at popular fishing locations
  - Improve local estuarine lagoons due to importance to fish
- **Tribal**
  - Mouth of San Lorenzo River for salmon run
  - Invasive plant control, dune restoration, seaweed management, monitoring
  - Protect cultural sites
- **Homeless**
  - Greenspace and walkable neighborhoods

The uses and needs of historically under served and under-represented people is more fully described in the Urban Climate Adaptation Policy Implication and Response Strategy Evaluation Technical Report deliverable and its Socially Vulnerable Populations Needs, Risk and Impact Assessment.

Beach Resource & Management Goals

The Project Team, in collaboration with the California Coastal Commission, developed coastal resource and management goals to guide the selection of adaptation pathways and address sea level rise hazards on each beach segment. The TAC, DH, and public were asked to provide input on goal priorities. The goals were summarized in the City of Santa Cruz Beach Vulnerability and Adaptation Strategy (2019) deliverable.

TAC and City Department Head Priorities

During the survey that followed the workshops with the TAC and DH, respondents (23 total: TAC=16, DH=6, Undefined=1) were each asked to prioritize 4 beach resource and management goals from the overall list of goals. Below is a list of the top prioritized beach resource and management goals identified during this process, ranked by total number of votes received from the TAC and DH combined.

1. Monitor coastal access infrastructure and beach width long term and in response to extreme storm events; monitor how coastal change is impacting coastal use (13 votes)
2. Maintain/protect beach width where feasible (10 votes)
3. Minimize coastal habitat loss and maintain ecological connectivity (10 votes)
4. Ensure sufficient city beaches along the length of the city coastline remain accessible in order to minimize increases in visitor densities on specific beaches and preserve public and private visitor serving facilities in collaboration with other agencies holding jurisdiction (7 votes)
5. Maintain a distribution of beach access points by encouraging a variety of multi-mode transportation along the entire city coastline (7 votes)
6. Maintain public safety on beaches and when accessing beaches (7 votes)
7. Maintain and enhance water quality to the extent feasible (7 votes)

Community/Public Open House Outputs

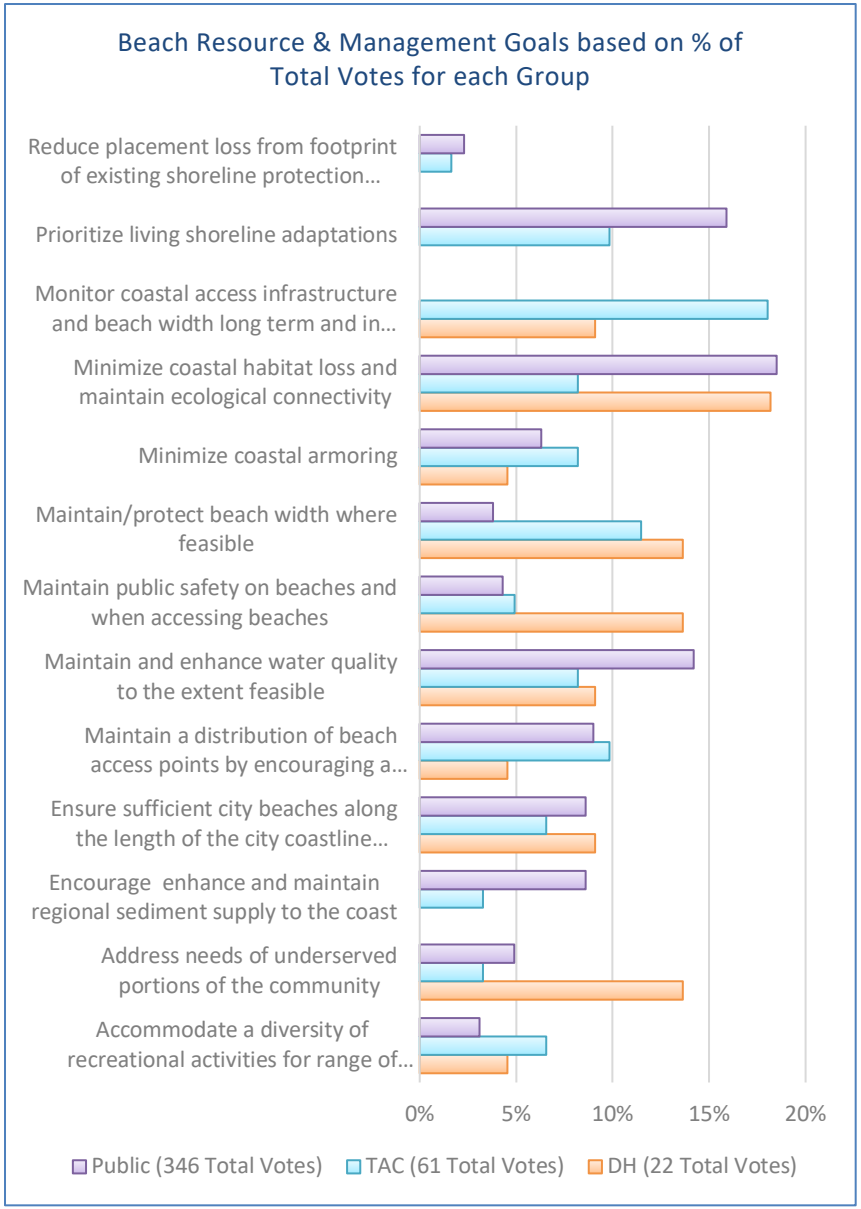
During the March 5, 2020 community open house event, attendees were asked to prioritize four beach resource and management goals from the overall list of goals. Approximately 100 community members provided input. Below is a list of the top prioritized beach resource and management goals identified during this process, ranked by total number of votes.

1. Minimize coastal habitat loss and maintain ecological connectivity (64 votes)
2. Prioritize living shoreline adaptations (55 votes)
3. Maintain and enhance water quality to the extent feasible (49 votes)

4. Maintain a distribution of beach access points by encouraging a variety of multi-mode transportation along the entire city coastline (32 votes)
5. Encourage, enhance and maintain regional sediment supply to the coast (30 votes)
6. Ensure sufficient city beaches along the length of the city coastline remain accessible in order to minimize increases in visitor densities on specific beaches and preserve public and private visitor serving facilities in collaboration with other agencies holding jurisdiction (Harbor District, State Parks, etc.) (30 votes)

Similarities and Differences Between Input Groups

The chart below shows the similarities and differences between the three groups (TAC, DH, public) who provided input. The TAC prioritized "monitoring coastal access and beach width long-term and in response to extreme events" the highest. The DH and public prioritized "Minimize coastal habitat loss and maintain ecological connectivity" the highest".



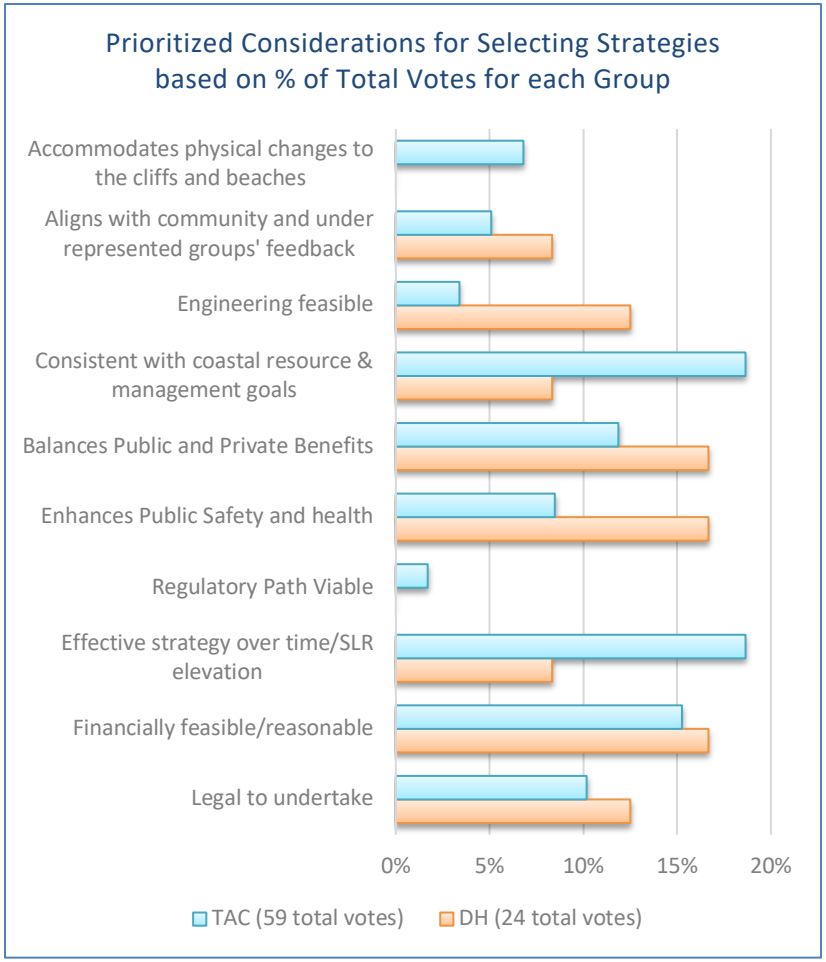
Considerations for Selecting Adaptation Strategies

The Project Team and City staff established a set of adaptation strategy considerations from which to guide development of adaptation pathways. The TAC and DH were each asked to prioritize four considerations from the overall list. During the next phase of engagement and prior to adoption of the three preferred beach adaptation strategies for each beach segment, City Staff, City Council and the public provided feedback about how well each adaptation pathway reflects these considerations.

Below is a list of priority considerations for selecting adaptation strategies, ranked by number of votes for the TAC and DH combined.

1. Financially Feasible/Reasonable (costs and benefits, construction, maintenance, funding potential, etc.) (15 votes)
2. Consistent with coastal resource & management goals (14 votes)
3. Effective strategy over time/sea level rise elevation (13 votes)
4. Balances Public and Private Benefits (11 votes)
5. Legal to undertake (9 votes)
6. Enhances public safety and health (9 votes)

The following chart shows the differences between the TAC (16 people and 59 votes total) and DH (6 people and 24 votes total) priorities when separated by group.



The TAC prioritized "Consistent with coastal resource and management goals", and "effective strategy over time" the highest. The DH prioritized "Balances public and private benefits", "enhances public safety and health", and "financially feasible" the highest.

Trigger Recommendations

The survey provided to the TAC and DH, following the February workshops, asked respondents to recommend triggers to use as an indicator to move from preferred short term strategies to long term strategies. The following triggers were recommended for each Beach Segment and West Cliff Drive Zone and helped inform potential triggers outlined in the Decision Trees. If the trigger was recommended by more than one person, this is noted in parentheses. Triggers were fully defined in the Urban Climate Adaptation Policy Implication and Response Strategy Evaluation Technical Report deliverable and more specifically, the Policy Strategy Analysis portion of the Adaptation Decision Trees and Draft Adaptation Pathways section.

Seabright State Beach

- Loss of public use or access (3)
- Beach width (2)
- Bluff failure (2)
- Habitat impacts or response
- Cost/benefit exceedances
- Infrastructure resiliency
- Mean high tide reaches threshold level
- Infrastructure effects
- Erosion extent
- Structural
- Environmental
- Potential for bluff failure
- Hazardous conditions
- Repetitive loss

Main and Cowell Beaches

- Loss of public use or access (5)
- Beach width (3)
- Flood elevations
- Financial feasibility
- Ocean level
- Mean high tide levels at the beaches
- Impending structural effects on infrastructure as seas rise
- Chronic beach loss of Main Beach
- Structural
- Environmental
- Hazardous condition
- Repetitive loss

West Cliff Pocket Beaches

Zone 1 (Pyramid Beach Area)

- Repetitive loss (4)
- Loss of public use or access (3)
- Loss or condition of protective structures (2)
- Bluff failure (2)
- Structural (2)
- Cost/benefit exceedances (2)
- Cumulative loss of use or access (1)
- Ocean levels
- Structural failure of the revetment
- Cliff failure event affecting the bike path or road
- Hazardous Conditions
- Beach width

Zone 2 (Mitchell's Cove Area)

- Cost/benefit exceedances (3)

- Loss or condition of protective structures (2)
- Cumulative loss of use or access (2)
- Infrastructure resiliency
- Repetitive loss
- Bluff failure
- Loss of use combined with duration of temporary loss
- Hazardous conditions
- Repetitive, serious damage to infrastructure
- Sea cave erosion that significantly undermines road
- Environmental
- Loss of public use or access
- Flood elevations
- Structural
- Prior to structural failure of existing bridge

Zone 3 (Its Beach, Lighthouse Point)

- Bluff failure (6)
- Loss of public use or access (4)
- Repetitive loss (2)
- Structural (2)
- Hazardous conditions
- Duration of temporary loss of use or access
- Erosion reaches a threshold point closer to the present lighthouse location
- Erosion of sea caves

Zone 4 (Bay Ave to Pelton Ave)

- Loss of public access or use (4)
- Bluff failure (3)
- Ocean levels (2)
- Structural (2)
- Financial feasibility
- Cumulative loss of use or access
- Loss of service or use
- Repetitive loss
- Stability of the bluff face & the surface below, near sea level
- Cliff or cave erosion event impacting road
- Loss or condition of cave fill
- Hazardous conditions

Natural Bridges State Beach

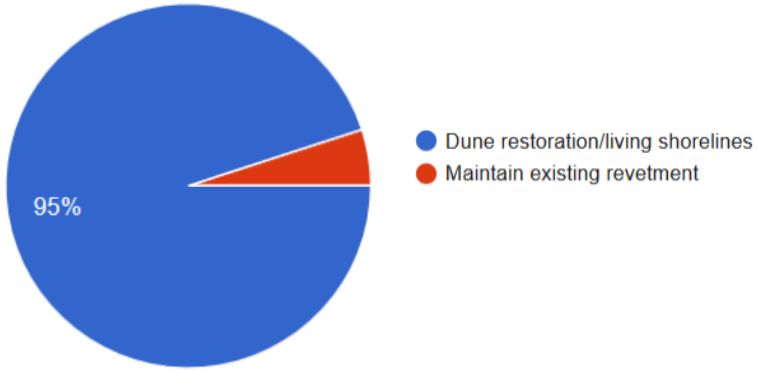
- Loss of public use or access (4)
- Habitat impacts or response (2)
- Beach width (2)
- Hazardous conditions (2)
- Cost/benefit exceedances
- Ocean levels
- Mean high tide thresholds
- Stability of the nearby bluff
- Erosion extent
- Structural
- Bluff failure
- Condition of protective services
- Environmental

Seabright State Beach Adaptation Strategy Preferences

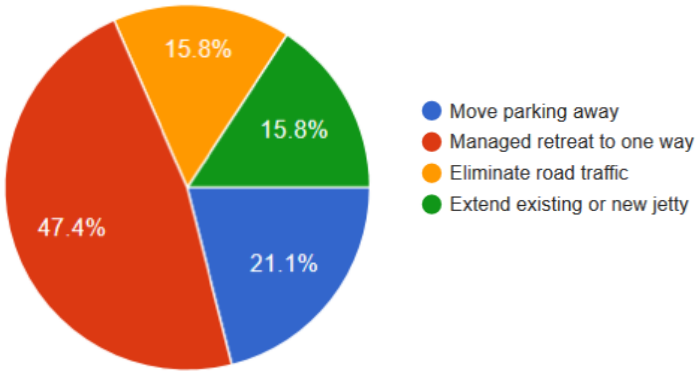
The following charts and tables show outputs of TAC, DH, and public preferences for various adaptation strategies at Seabright State Beach. The pie charts represent TAC and DH preferences of adaptation strategies, that were initially identified as recommended or feasible strategies during the respective TAC and DH workshops. The table of feasible strategies provides a synthesis of short- and long-term coastal adaptation strategies as well as corresponding transportation adaptation strategies. The table also provides additional general information on relative cost, certainty of success, lifespan, and secondary impacts of each strategy. The bar charts represent public input regarding their preferences of adaptation options reviewed within the adaptation strategy table. Outputs from this process were used to develop adaptation pathway decision trees.

Seabright State Beach TAC and City Department Head Preferences

Short-term Strategies



Long-term Strategies

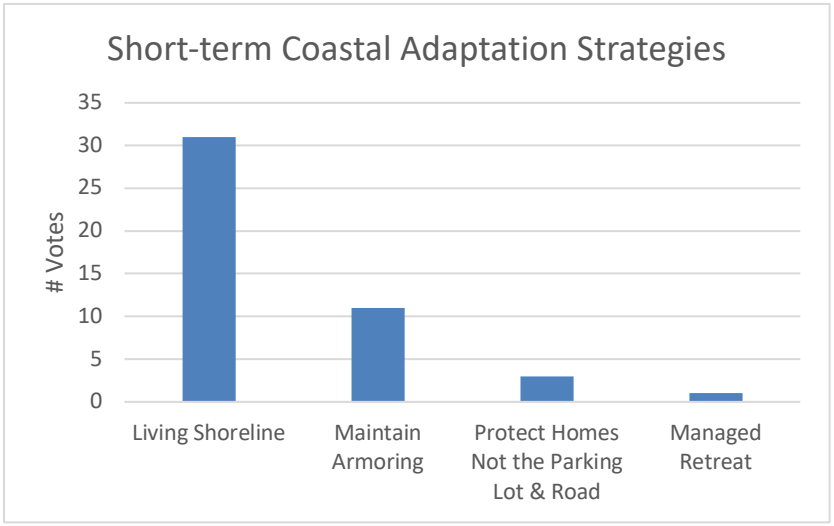


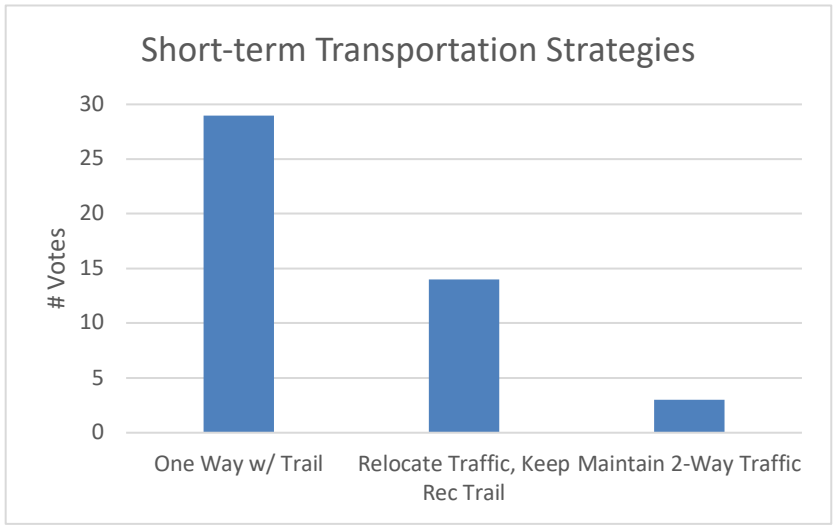
Seabright State Beach Feasible Adaptation Strategies and Criteria

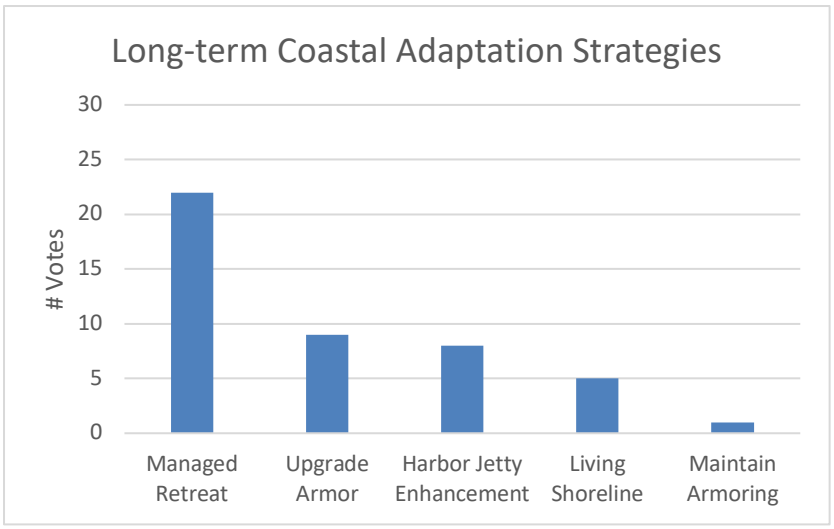
Seabright State Beach Strategies	Cost		Certainty of Success	Secondary Impacts			Lifespan
	Upfront	*Maintenance*		*Beach & Coastal*	*Access*	*Parking & Road*	
Short term adaptation							
Maintain armoring	$$	$	High	-	=	=	Medium
Living shoreline	$	$	Medium	+	=	=	Medium
Short term transportation							
Maintain 2 way traffic				-	-	=	
One way traffic with Rec Trail				+	+	-	
Relocate traffic, keep Rec Trail				+	+	-	
Long term adaptation							
Upgrade armoring	$$$	$	High	-	=	=	Medium
Harbor Jetty Enhancement	$$$	$$	High	+	=	=	Medium
Managed retreat	$$	$	High	+	=	-	Long
Long term transportation							
Maintain 2 way traffic				-	-	=	
One way traffic with Rec Trail				+	+	-	
Relocate traffic, keep Rec Trail				+	+	-	

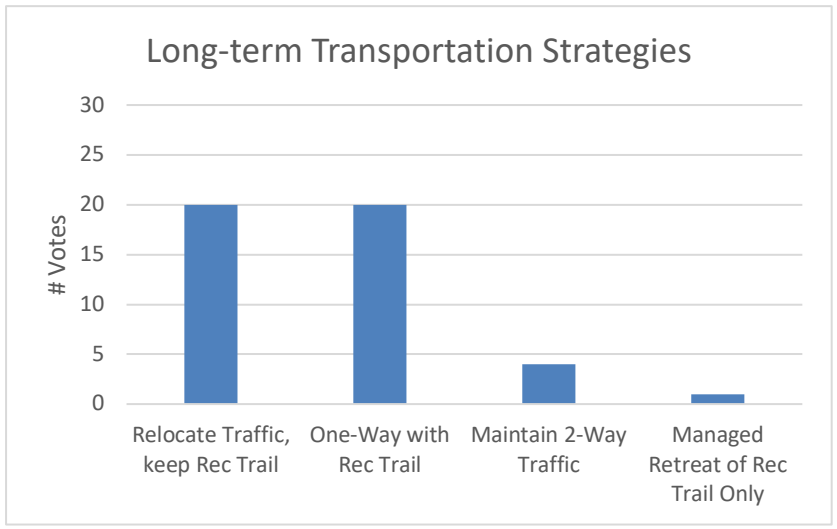
Upfront Cost: relative construction cost ($$$ = High, $$ = Medium, $=Low)
Maintenance Cost: relative cost associated with the lifespan of the project ($$$ = High, $$ = Medium, $=Low)
Certainty of Success: certainty that measure will function as intended for its projected lifespan (High, Medium, Low)
Secondary Impacts: consequences associated with the adaptation that could affect the beach or coastal resources, coastal access, or parking and roads. Plus (+) refers to an improvement from existing conditions, Minus (-) refers to a deterioration from existing conditions, Equal (=) refers to a similar to existing condition
Lifespan: the relative length of time the adaptation strategy functions (Short is <10 years, Medium is up to 30 years, and Long is 30+ years)

Seabright State Beach Community Workshop Preferences

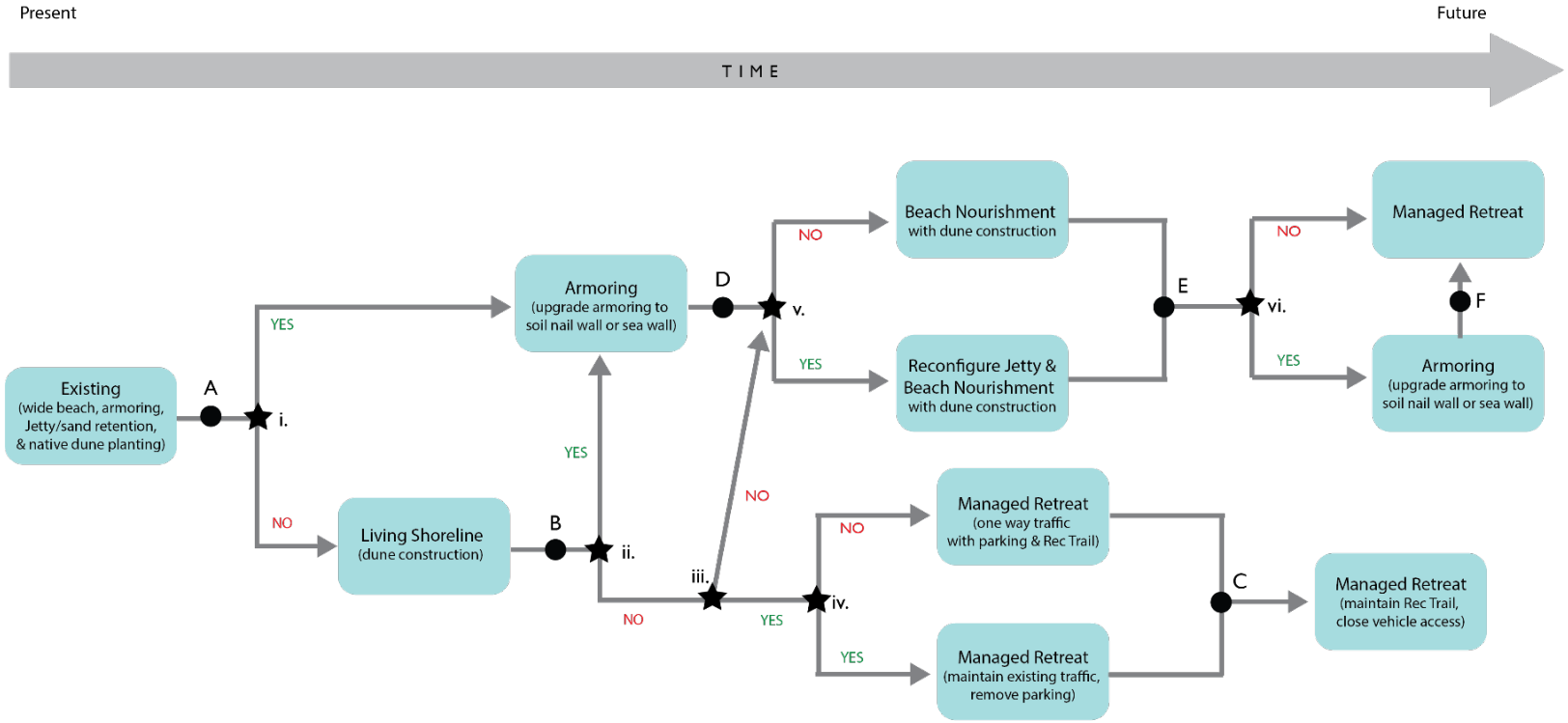








Seabright State Beach Adaptation Strategy Decision Tree



KEY

- Adaptation Strategy
- Trigger
- Decision Point

POTENTIAL TRIGGERS

A.
- Storm waves cover beach
- Beach width/height
- Distance from cliff edge to development
- Cliff erosion from waves
- Erosion of dune crest
- Reduced integrity of armoring

B.
- Storm waves cover beach
- Beach width/height
- Distance from cliff edge to development
- Cliff erosion from waves
- Erosion of dune crest
- Reduced integrity of armoring

C.
- Cliff erosion resulting in safety concerns for vehicle traffic
- Cliff erosion resulting in insufficient space for vehicle traffic
- Beach width/height

D.
- Beach width/height loss
- Reduced integrity of armoring

E.
- Reduced integrity of armoring
- Beach width/height

F.
- Distance from cliff edge to development
- Further cliff erosion inland; buildings deemed unsafe
- Further armoring ineffective/too costly
- Beach width

DECISION POINTS

i. Does severity of hazard require new armoring?

ii. Does infrastructure at risk necessitate new armor?

iii. Is it feasible to retreat?

iv. Does the City preserve two way traffic on East Cliff at the expense of parking?

v. Enhance the harbor jetty to help retain sand at Seabright Beach?

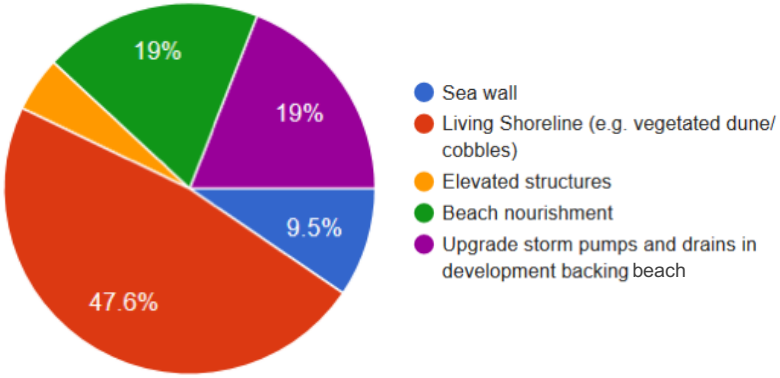
vi. Keep investing in costly armoring?

Main and Cowell Beaches Adaptation Strategy Preferences

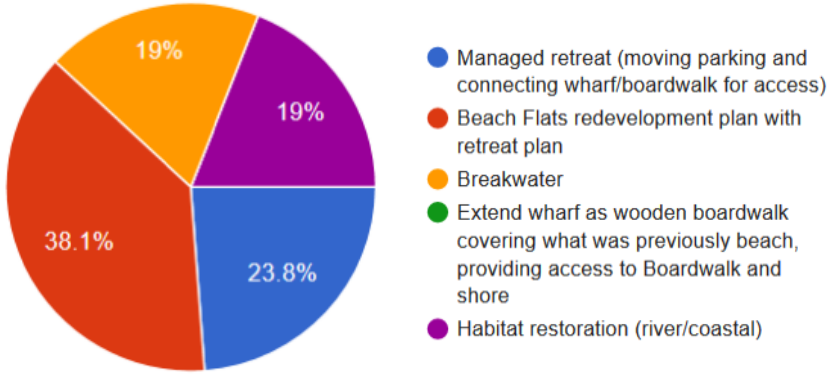
The following charts and tables show outputs of TAC, DH, and public preferences for various adaptation strategies at Main and Cowell Beaches. The pie charts represent TAC and DH preferences of adaptation strategies, that were initially identified as recommended or feasible strategies during the respective TAC and DH workshops. The table of feasible strategies provides a synthesis of short- and long-term coastal adaptation strategies as well as corresponding transportation adaptation strategies. The table also provides additional general information on relative cost, certainty of success, lifespan, and secondary impacts of each strategy. The bar charts represent public input regarding their preferences of adaptation options reviewed within the adaptation strategy table. Outputs from this process were used to develop adaptation pathway decision trees.

Main Beach and Cowell Beach TAC and City Department Head Preferences

Short-term Strategies



Long-term Strategies



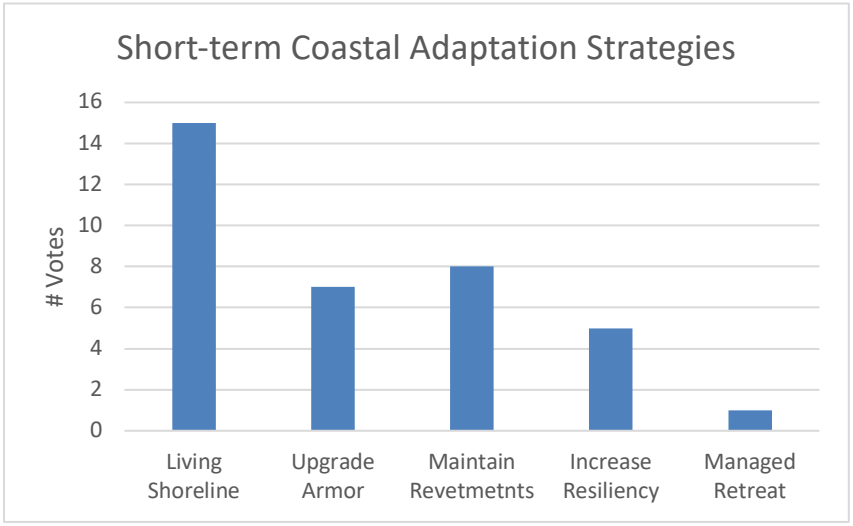
Main Beach and Cowell Beach Feasible Adaptation Strategies

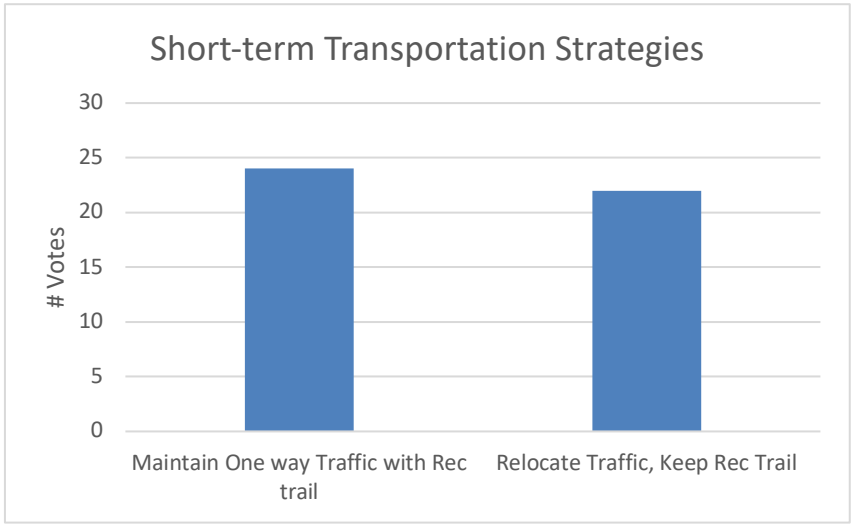
Main and Cowell Beaches Strategies	Cost		Certainty of Success	Secondary Impacts			Lifespan
	Upfront	*Maintenance*		*Beach & Coastal*	*Access*	*Parking & Road*	
Short term adaptation							
Maintain armoring	$$	$	Medium	-	-	=	Medium
Living shoreline	$	$	Medium	+	=	NA	Short
Increase structural resiliency/Elevate	$$$	$$	High	=	=	=	Long
Short term transportation							
Maintain one way traffic with Rec Trail				+	+	-	
Relocate traffic, keep Rec Trail				+	+	-	
Long term adaptation							
Upgrade armoring	$$$	$	Medium	-	-	=	Medium
Beach nourishment	$$	Variable*	Low	+	=	=	Short
Managed retreat	$$$	None	High	+	=	-	Long
Long term transportation							
Maintain one way traffic with Rec Trail				+	+	-	
Relocate traffic, keep Rec Trail				+	+	-	

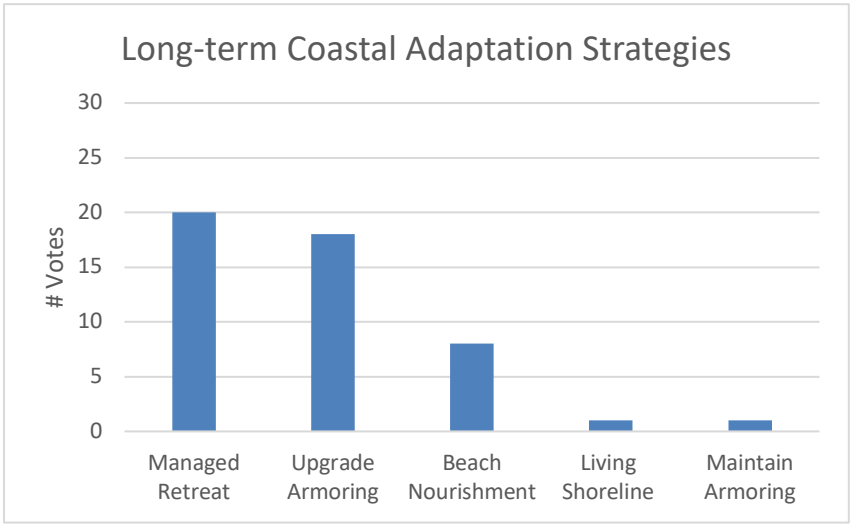
*Maintenance cost variable depending on frequency of beach nourishment

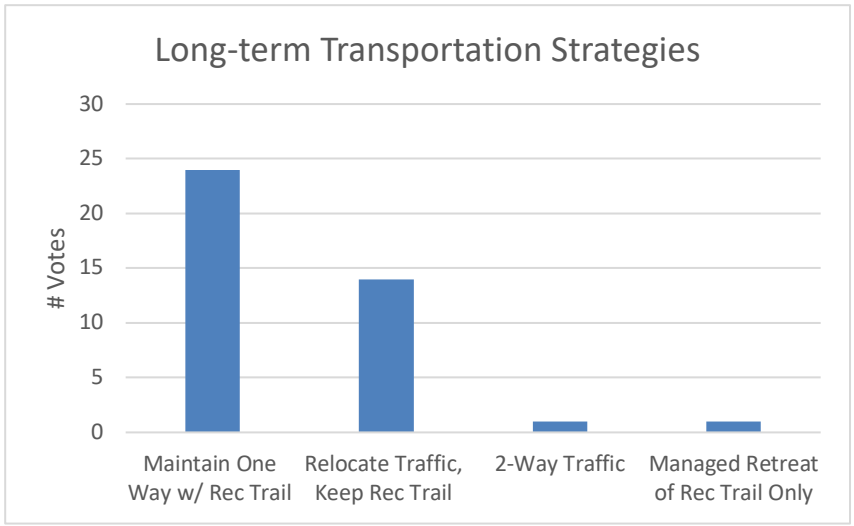
Upfront Cost: relative construction cost ($$$ = High, $$ = Medium, $=Low)
Maintenance Cost: relative cost associated with the lifespan of the project ($$$ = High, $$ = Medium, $=Low)
Certainty of Success: certainty that measure will function as intended for its projected lifespan (High, Medium, Low)
Secondary Impacts: consequences associated with the adaptation that could affect the beach or coastal resources, coastal access, or parking and roads. Plus (+) refers to an improvement from existing conditions, Minus (-) refers to a deterioration from existing conditions, Equal (=) refers to a similar to existing condition
Lifespan: the relative length of time the adaptation strategy functions (Short is <10 years, Medium is up to 30 years, and Long is 30+ years)

Main Beach and Cowell Beach Community Workshop Preferences

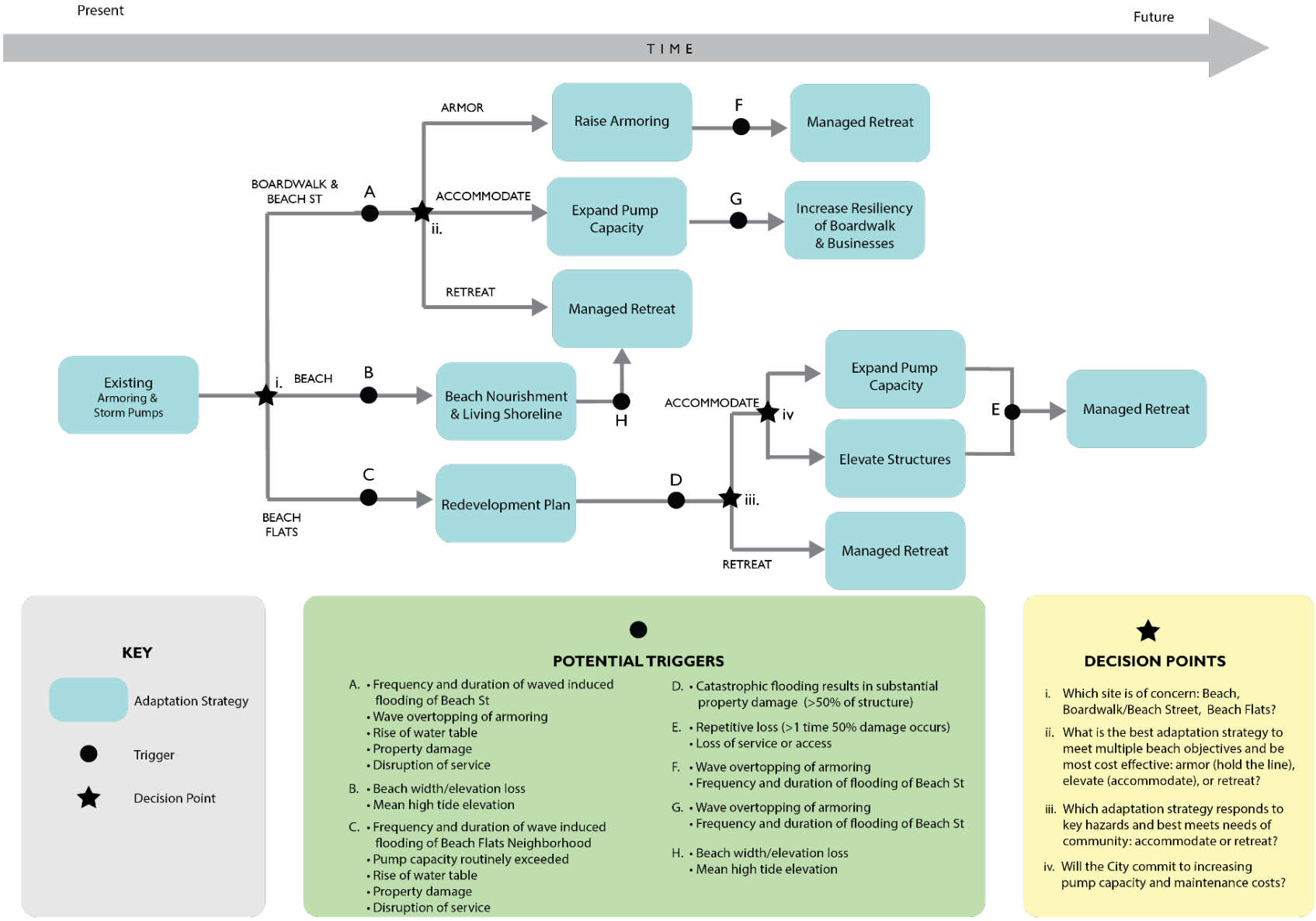








Main and Cowell Beaches Adaptation Strategy Decision Tree



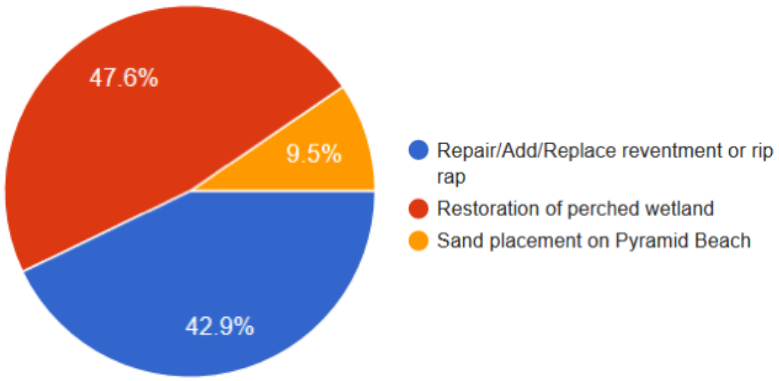
West Cliff Pocket Beaches Adaptation Strategy Preferences

The following charts and tables show outputs of TAC, DH, and public preferences for various adaptation strategies along West Cliff. Although primary pocket beaches are only located within West Cliff Zones 1-3, (Its Beach, Mitchell's Cove Beach, and Pyramid Beach), information provided here includes all four zones. The pie charts represent TAC and DH preferences of adaptation strategies, that were initially identified as recommended or feasible strategies during the respective TAC and DH workshops. The table of feasible strategies provides a synthesis of short- and long-term coastal adaptation strategies as well as corresponding transportation adaptation strategies. The table also provides additional general information on relative cost, certainty of success, lifespan, and secondary impacts of each strategy. The bar charts represent public input regarding their preferences of adaptation options reviewed within the adaptation strategy table. Outputs from this process were used to develop adaptation pathway decision trees.

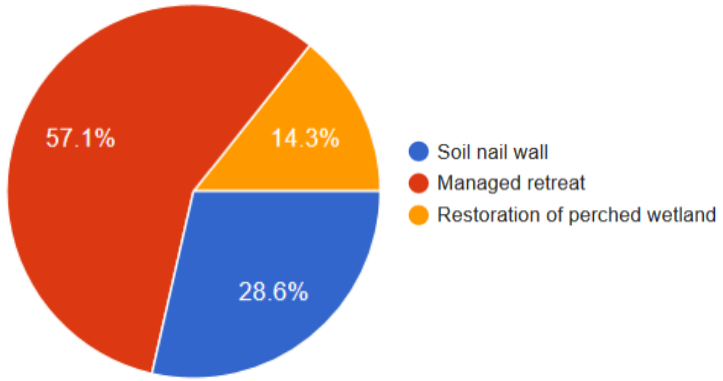
West Cliff Zone 1 (Pyramid Beach Area)

TAC and City Department Head Preferences

Short-term Strategies[1]



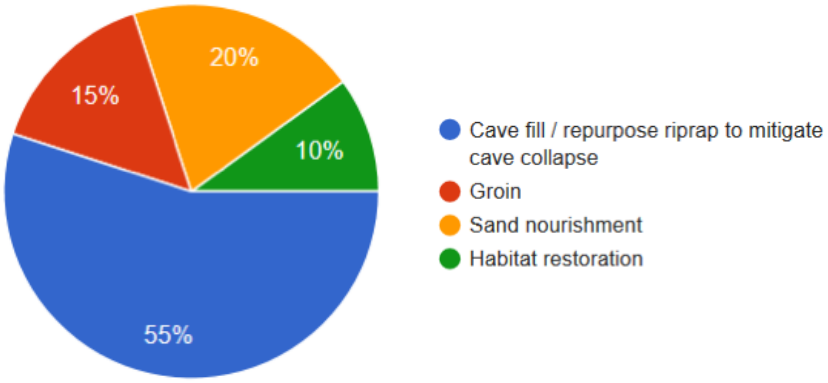
Long-term Strategies



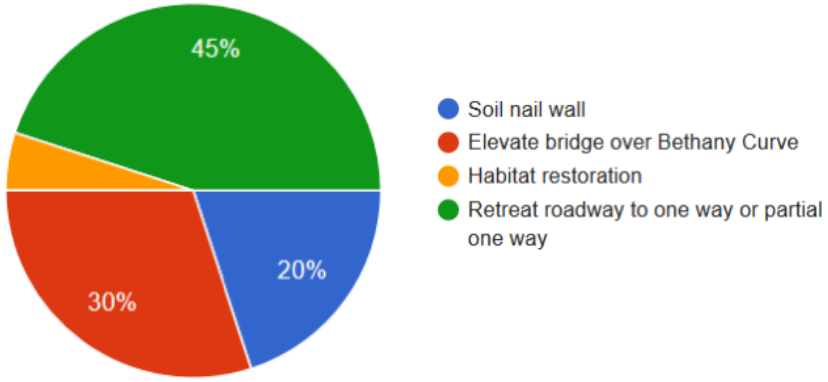
[1] Although "Restoration of Perched Wetland" was an output preference from the TAC and Department Head Workshop, this strategy was not seen as a primary adaptation strategy, but a strategy that would be done in conjunction with, or secondary to another strategy. Therefore, it was not included in the table of options (page 14) presented during the Community Open House Workshop.

West Cliff Zone 2 (Mitchells Beach Area)
TAC and City Department Head Preferences

Short-term Strategies

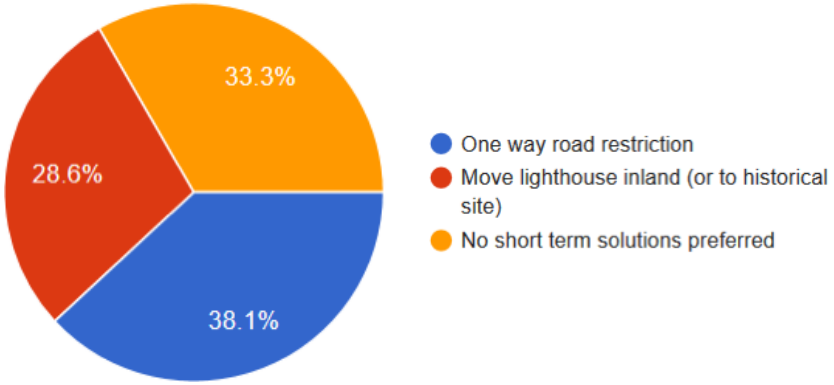


Long-term Strategies

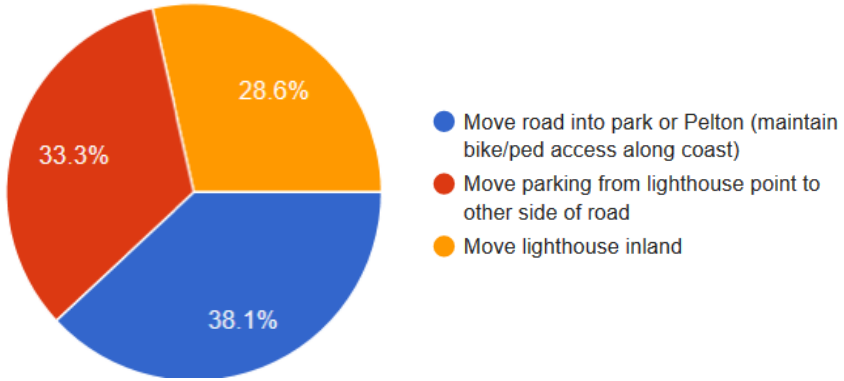


West Cliff Zone 3 (Lighthouse Point/Its Beach Area)
TAC and City Department Head Preferences

Short-term Strategies

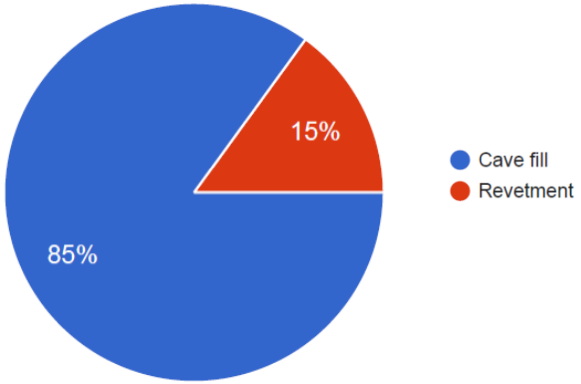


Long-term Strategies

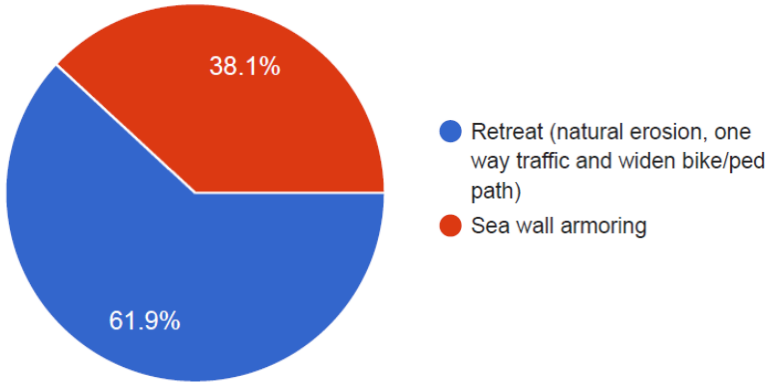


West Cliff Zone 4 (Bay St to
TAC and City Department Head Preferences

Short-term Strategies



Long-term Strategies



West Cliff Zone 1 (Pyramid Beach Area) Feasible Adaptation Strategies

West Cliff Drive Zone 1 Strategies	Cost		Certainty of Success	Secondary Impacts			Lifespan
	Upfront	*Maintenance*		*Beach & Coastal*	*Rec Trail*	*Road*	
Short term adaptation							
Upgrade Armoring	$$$	$	High	-	=	=	Medium
Sand placement on Pyramid Beach	$-$$	$	Low	+	?	?	Short
Maintain Armoring	$$	$$	Medium	-	-	=	Medium
Short term transportation							
Maintain 2 way traffic				-	-	=	
One way traffic with Rec Trail				+	+	-	
Relocate traffic, keep Rec Trail				+	+	-	
Long term adaptation							
Soil nail wall	$$$	$	High	-	=	=	Medium
Managed retreat	Variable	$	High	+	=	-	High
Sand placement on Pyramid Beach	$	$	Low	+	?	?	Short
Long term transportation							
Maintain 2 way traffic				-	-	=	
One way traffic with Rec Trail				+	+	-	
Relocate traffic, keep Rec Trail				+	+	-	

Upfront Cost: relative construction cost ($$$ = High, $$ = Medium, $=Low)
Maintenance Cost: relative cost associated with the lifespan of the project ($$$ = High, $$ = Medium, $=Low)
Certainty of Success: certainty that measure will function as intended for its projected lifespan (High, Medium, Low)
Secondary Impacts: consequences associated with the adaptation that could affect the beach or coastal resources, coastal access, or parking and roads. Plus (+) refers to an improvement from existing conditions, Minus (-) refers to a deterioration from existing conditions, Equal (=) refers to a similar to existing condition
Lifespan: the relative length of time the adaptation strategy functions (Short is <10 years, Medium is up to 30 years, and Long is 30+ years)

West Cliff Zone 2 (Mitchell's Cove Area) Feasible Adaptation Strategies

West Cliff Drive Zone 2 Strategies	Cost		Certainty of Success	Secondary Impacts			Lifespan
	Upfront	*Maintenance*		*Beach & Coastal*	*Rec Trail*	*Road*	
Short term adaptation							
Cave fill + Soil nail wall	$$$+	?	High	-	=	=	Medium
Sand management	$	$	Low	+	?	?	Short
Maintain revetments	$$	$	Medium	-	=	=	Medium
Short term transportation							
Maintain 2 way traffic				-	-	=	
One way traffic with Rec Trail				+	+	-	
Relocate traffic, keep Rec Trail				+	+	-	
Long term adaptation							
Sand management	$	$	Low	+	?	=	Short
Groin	$$$	$	Medium	+	?	-	Medium
Managed retreat	$	$	High	+	-	-	Long
Long term transportation							
Maintain 2 way traffic				-	-	=	
One way traffic with Rec Trail				+	+	-	
Relocate traffic, keep Rec Trail				+	+	-	

Upfront Cost: relative construction cost ($$$ = High, $$ = Medium, $=Low)
Maintenance Cost: relative cost associated with the lifespan of the project ($$$ = High, $$ = Medium, $=Low)
Certainty of Success: certainty that measure will function as intended for its projected lifespan (High, Medium, Low)
Secondary Impacts: consequences associated with the adaptation that could affect the beach or coastal resources, coastal access, or parking and roads. Plus (+) refers to an improvement from existing conditions, Minus (-) refers to a deterioration from existing conditions, Equal (=) refers to a similar to existing condition
Lifespan: the relative length of time the adaptation strategy functions (Short is <10 years, Medium is up to 30 years, and Long is 30+ years)

West Cliff Zone 3 (Lighthouse Point and Its Beach) Feasible Adaptation Strategies

West Cliff Drive Zone 3 Strategies	Cost		Certainty of Success	Secondary Impacts			Lifespan
	Upfront	*Maintenance*		*Beach & Coastal*	*Rec Trail*	*Road*	
Short term adaptation							
Cave fill	$$$+	?	High	-	=	=	Medium
Maintain revetments	$$	$	Medium	-	=	=	Medium
Managed retreat	$	$	High	+	+	-	Long
Short term transportation							
Maintain 2 way traffic				-	-	=	
One way traffic with Rec Trail				+	+	-	
Relocate traffic, keep Rec Trail				+	+	-	
Long term adaptation							
Managed retreat	$	$	High	+	+	-	Long
Long term transportation							
Maintain 2 way traffic				-	-	=	
One way traffic with Rec Trail				+	+	-	
Relocate traffic, keep Rec Trail				+	+	-	

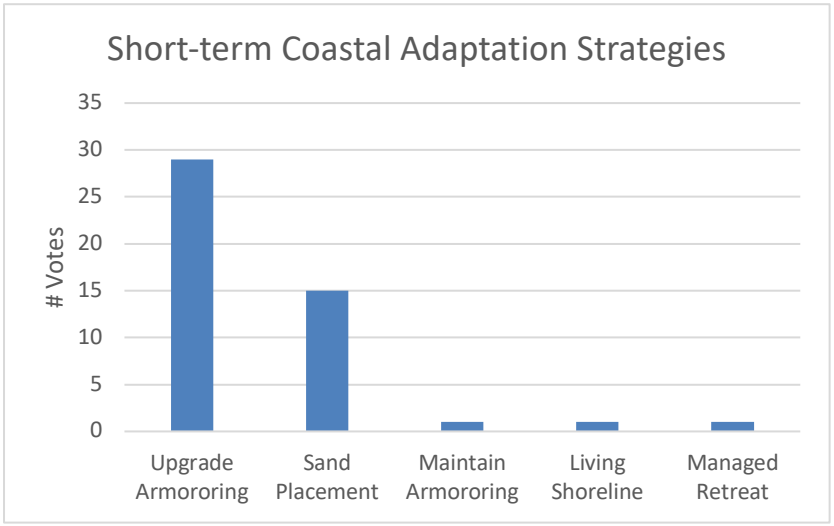
Upfront Cost: relative construction cost ($$$ = High, $$ = Medium, $=Low)
Maintenance Cost: relative cost associated with the lifespan of the project ($$$ = High, $$ = Medium, $=Low)
Certainty of Success: certainty that measure will function as intended for its projected lifespan (High, Medium, Low)
Secondary Impacts: consequences associated with the adaptation that could affect the beach or coastal resources, coastal access, or parking and roads. Plus (+) refers to an improvement from existing conditions, Minus (-) refers to a deterioration from existing conditions, Equal (=) refers to a similar to existing condition
Lifespan: the relative length of time the adaptation strategy functions (Short is <10 years, Medium is up to 30 years, and Long is 30+ years)

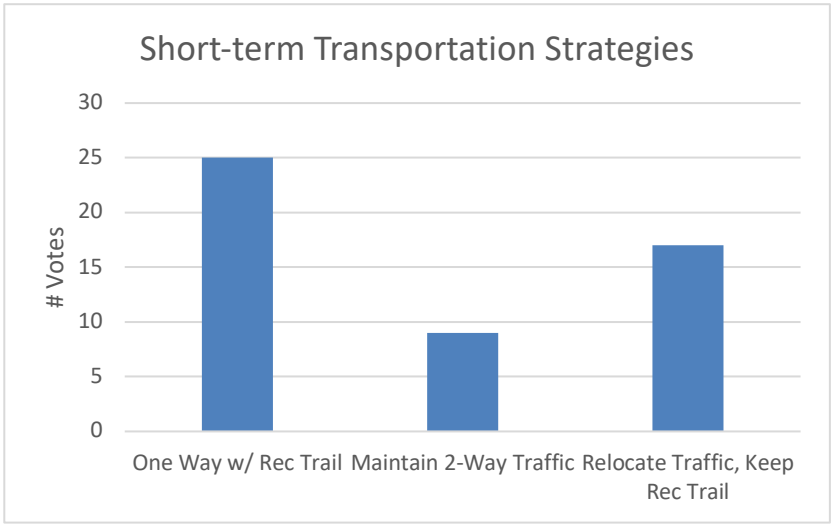
West Cliff Zone 4 (Bay St to Pelton Ave) Feasible Adaptation Strategies

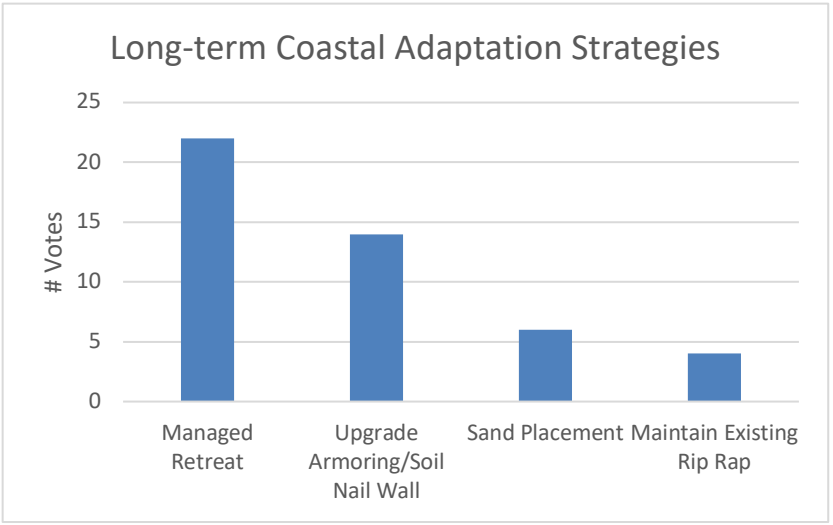
West Cliff Drive Zone 4 Strategies	Cost		Certainty of Success	Secondary Impacts			Lifespan
	Upfront	*Maintenance*		*Beach & Coastal*	*Rec Trail*	*Road*	
Short term adaptation							
Cave fill	$$$+	?	High	-	=	=	Medium
Maintain revetments	$$	$	Medium	-	=	=	Medium
Soil nail wall	$$$	?	High	-	=	=	Medium
Short term transportation							
Maintain 2 way traffic				-	-	=	
One way traffic with Rec Trail				+	+	-	
Relocate traffic, keep Rec Trail				+	+	-	
Long term adaptation							
Soil nail walls	$$$	?	Medium	-	=	=	Medium
Managed retreat	$	$	High	+	+	-	Long
Long term transportation							
Maintain 2 way traffic				-	-	=	
One way traffic with Rec Trail				+	+	-	
Relocate traffic, keep Rec Trail				+	+	-	

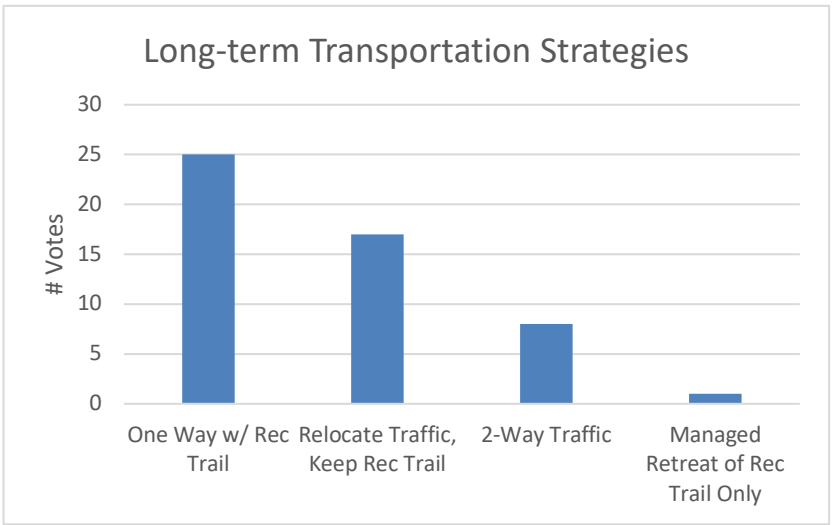
Upfront Cost: relative construction cost ($$$ = High, $$ = Medium, $=Low)
Maintenance Cost: relative cost associated with the lifespan of the project ($$$ = High, $$ = Medium, $=Low)
Certainty of Success: certainty that measure will function as intended for its projected lifespan (High, Medium, Low)
Secondary Impacts: consequences associated with the adaptation that could affect the beach or coastal resources, coastal access, or parking and roads. Plus (+) refers to an improvement from existing conditions, Minus (-) refers to a deterioration from existing conditions, Equal (=) refers to a similar to existing condition
Lifespan: the relative length of time the adaptation strategy functions (Short is <10 years, Medium is up to 30 years, and Long is 30+ years)

West Cliff Zone 1 (Pyramid Beach area) Community Workshop Preferences

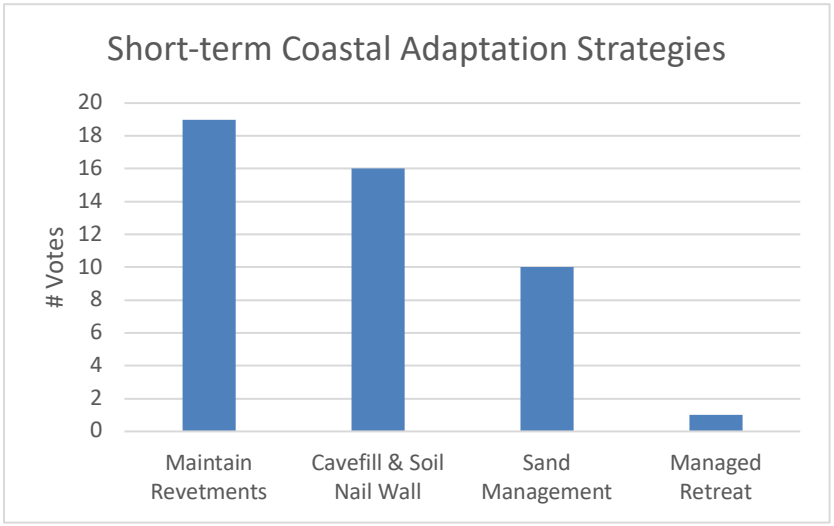


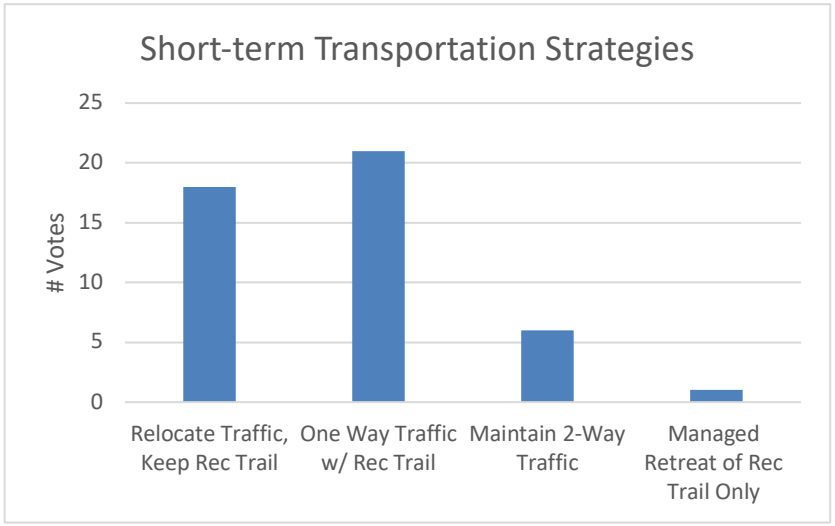


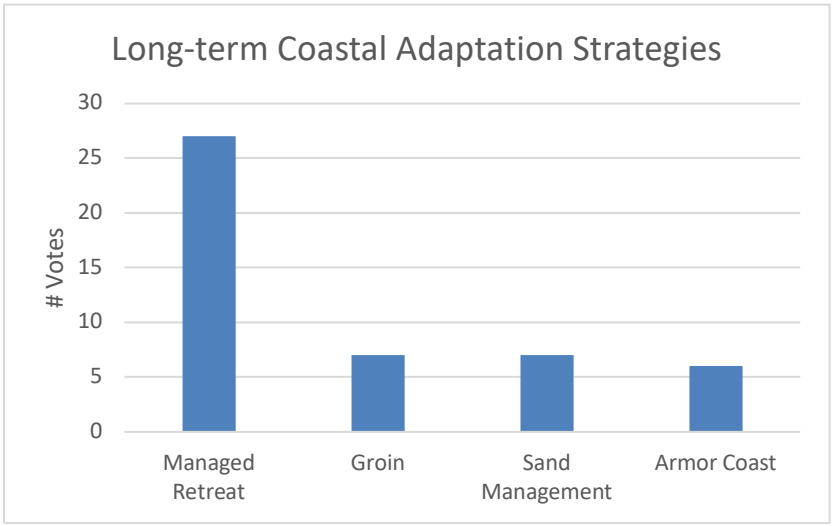


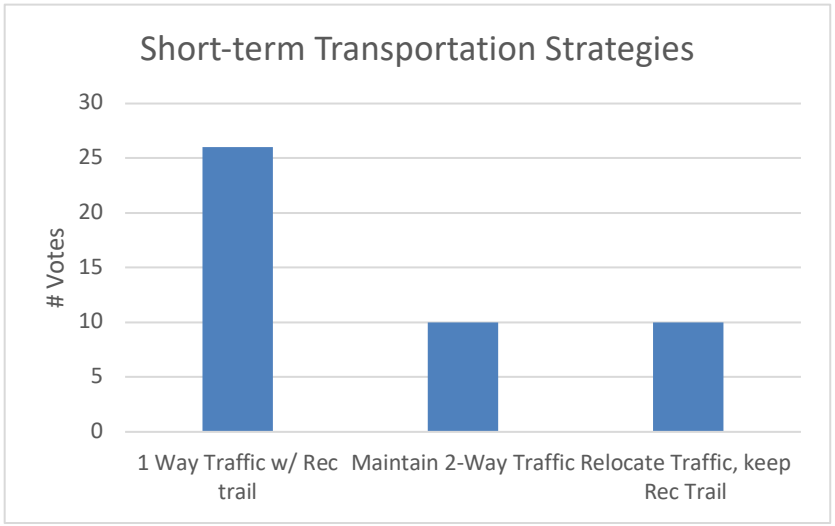


West Cliff Zone 2 (Mitchell's Cove area) Community Workshop Preferences

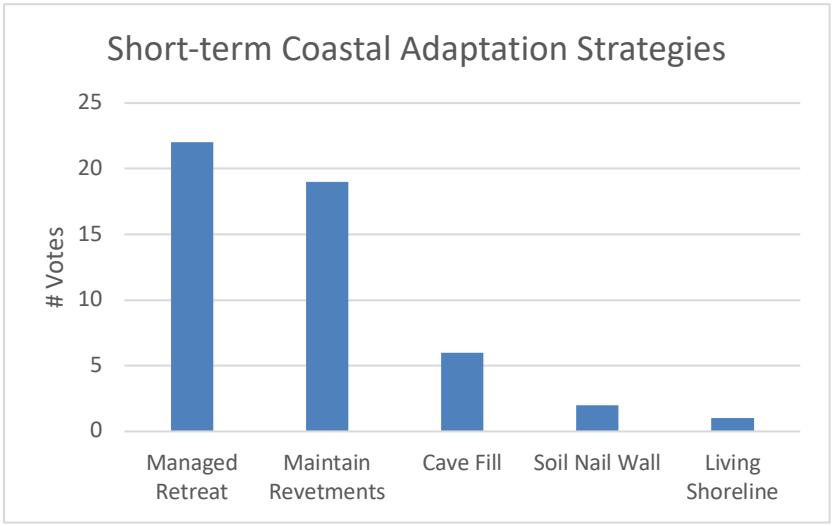


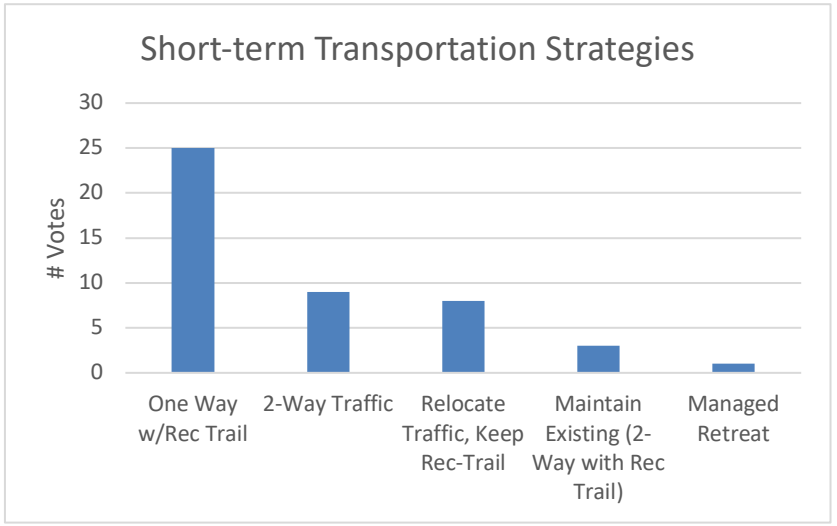


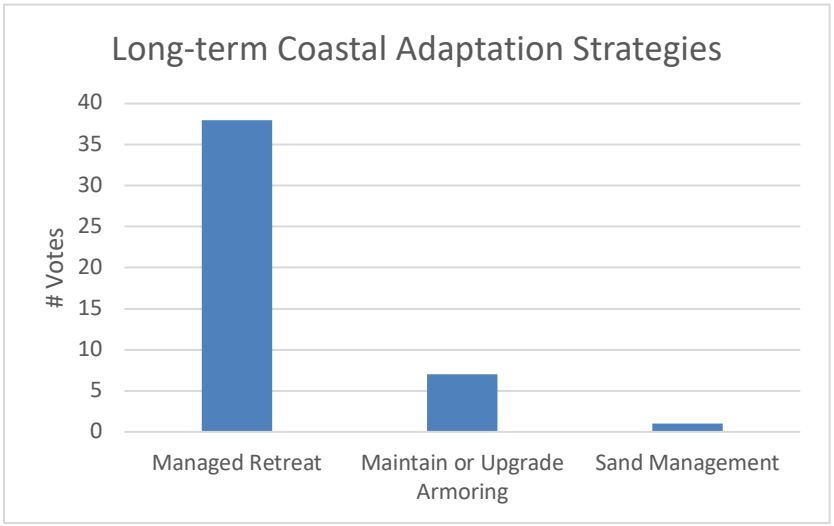


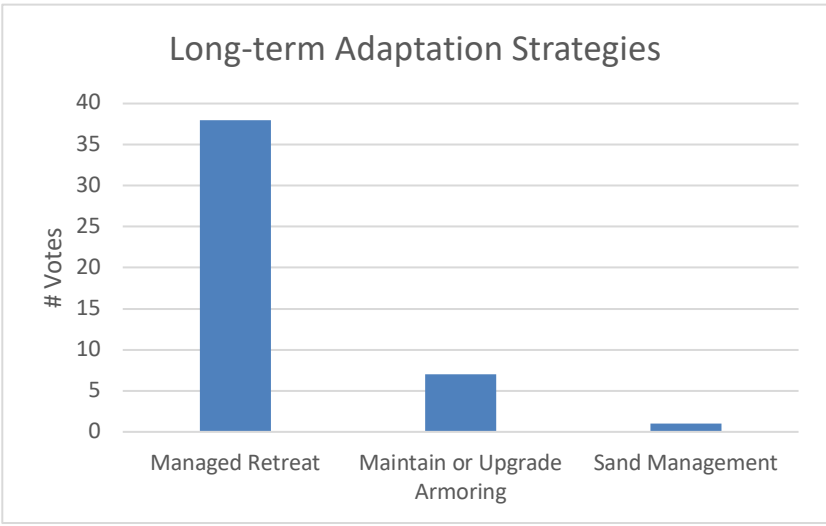


West Cliff Zone 3 (Lighthouse Point and Its Beach) Community Workshop Preferences

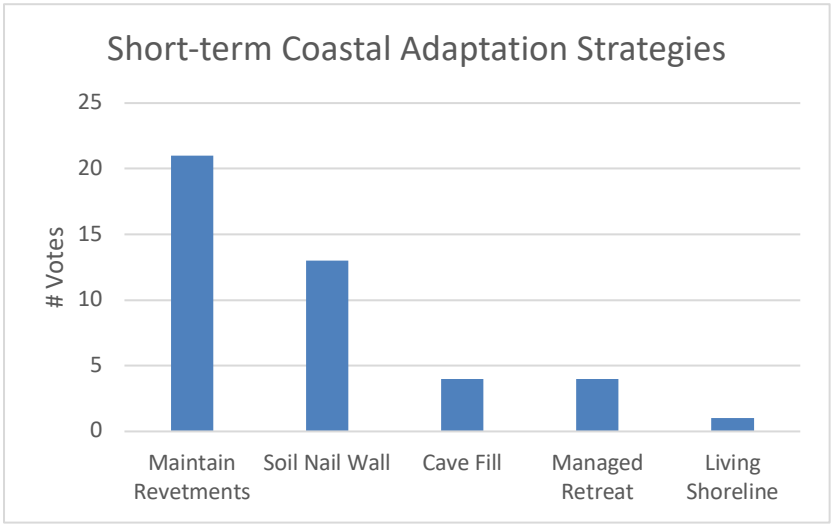


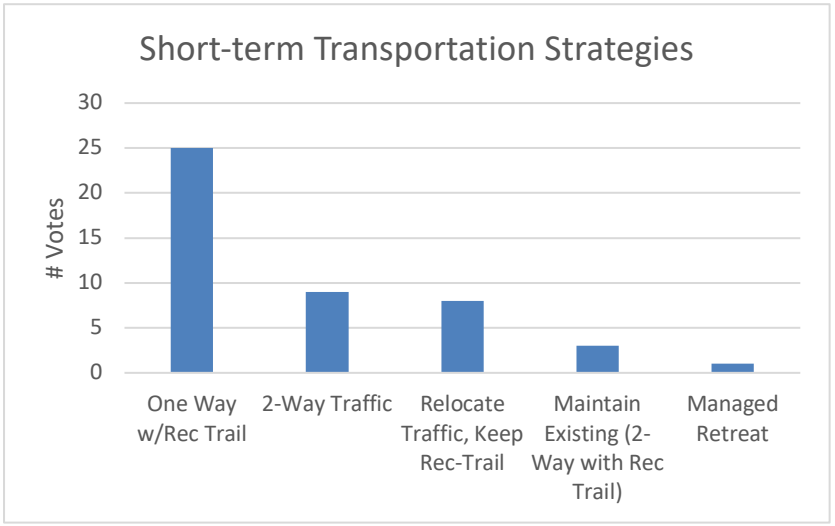


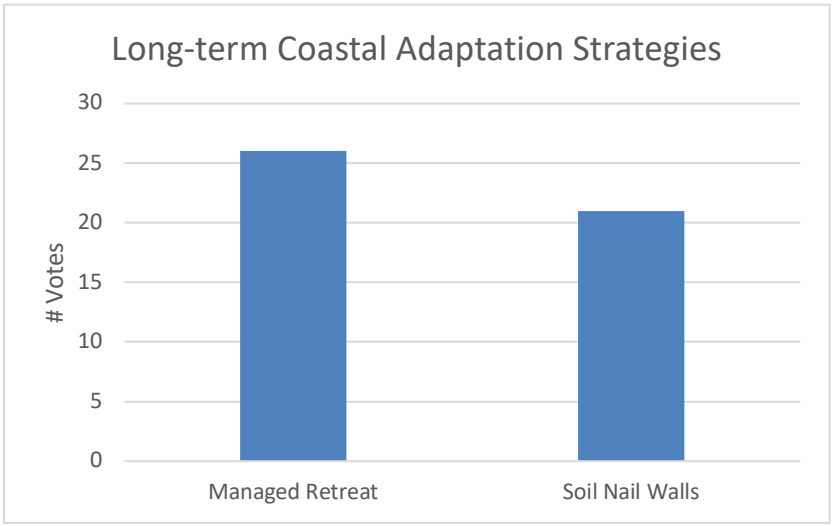


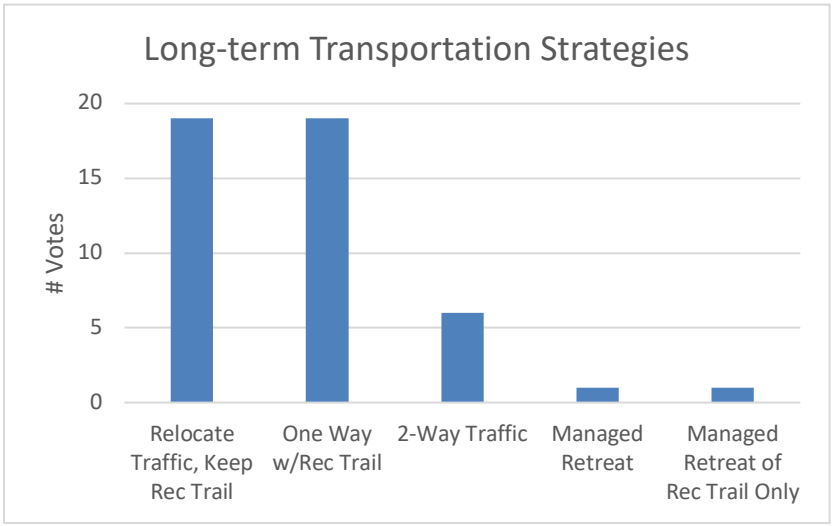


West Cliff Zone 4 (Bay St to Pelton Ave) Community Workshop Preferences

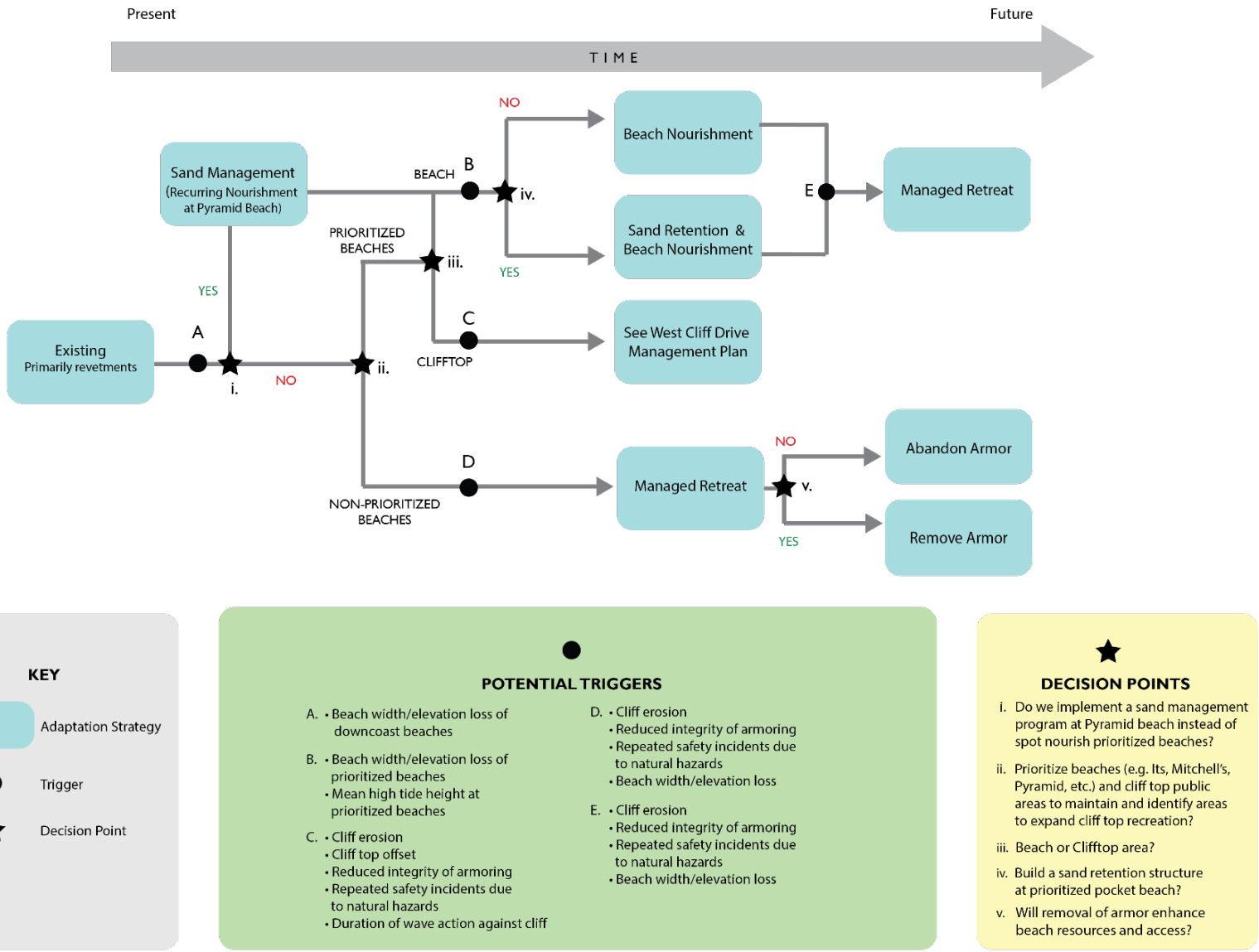








West Cliff Pocket Beaches Adaptation Strategy Decision Tree

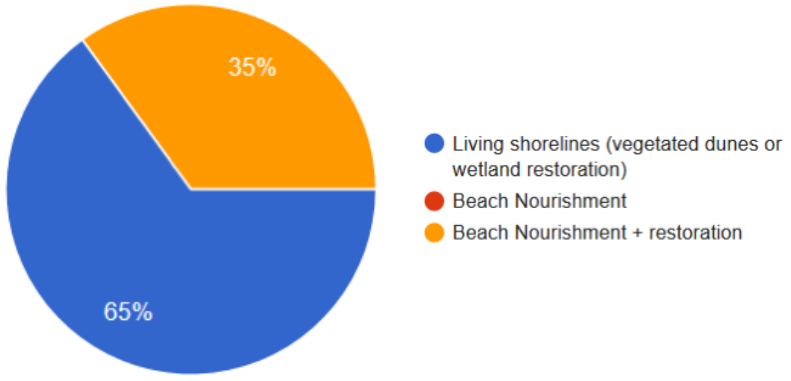


Natural Bridges State Beach Adaptation Strategy Preferences

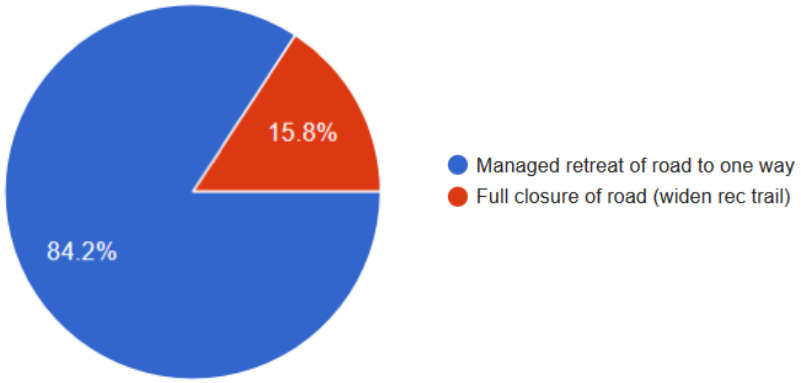
The following charts and tables show outputs of TAC, DH, and public preferences for various adaptation strategies at Natural Bridges State Beach. The pie charts represent TAC and DH preferences of adaptation strategies, that were initially identified as recommended or feasible strategies during the respective TAC and DH workshops. The table of feasible strategies is a synthesis of the outputs from the TAC and DH survey. The table also provides additional general information on relative cost, certainty of success, lifespan, and secondary impacts of each strategy. The bar charts represent public input regarding their preferences of adaptation options reviewed within the adaptation strategy table. Outputs from this process were used to develop adaptation pathway decision trees.

Natural Bridges State Beach TAC and City Department Head Workshop Preferences

Short-term Strategies



Long-term Strategies

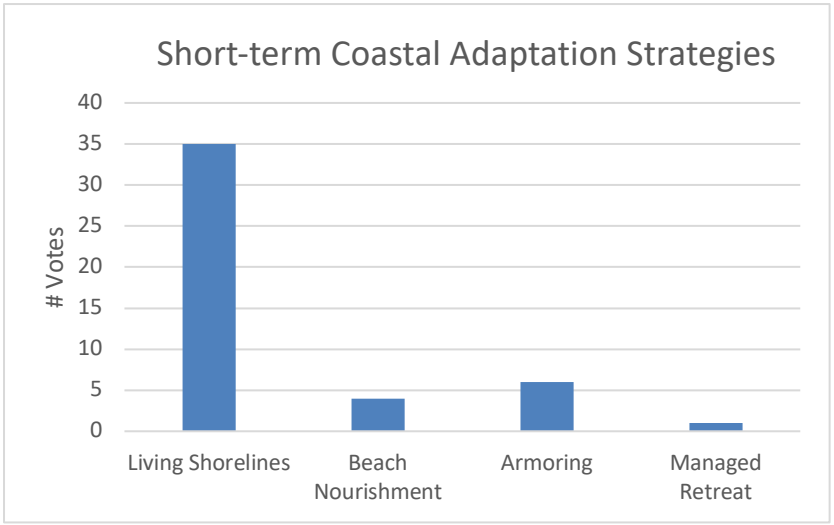


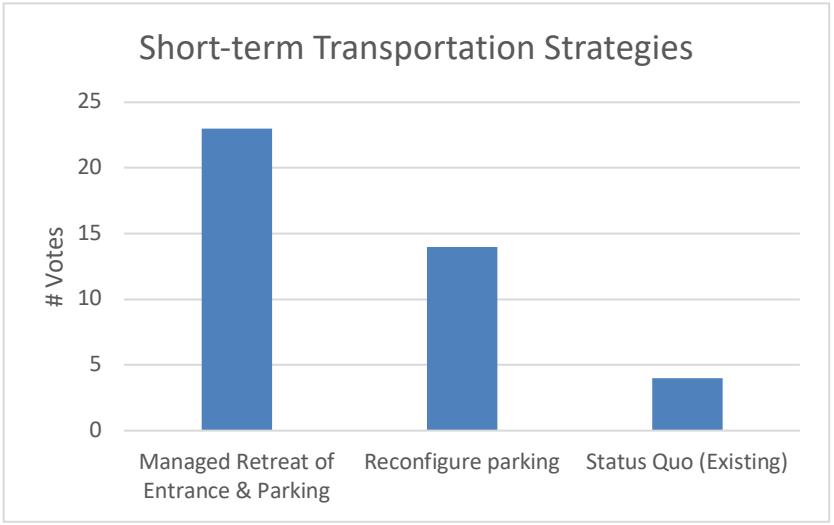
Natural Bridges State Beach Feasible Adaptation Strategies

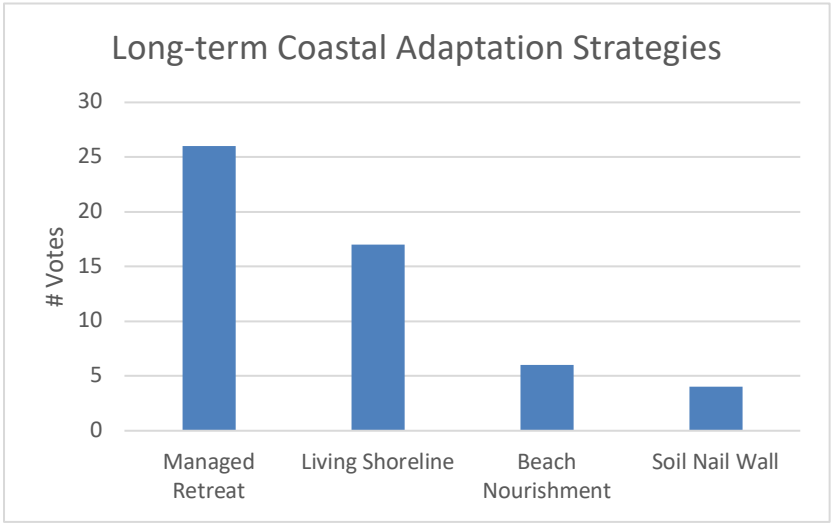
Natural Bridges State Beach Strategies	Cost		Certainty of Success	Secondary Impacts			Lifespan
	Upfront	*Maintenance*		*Beach & Coastal*	*Access*	*Parking & Road*	
Short term adaptation							
Living shoreline	$	$	Medium	+	=	NA	Medium
Beach nourishment	$$	$	Medium	+	=	NA	Short
Short term transportation							
Status quo (maintain all vehicle access)				-	-	=	
Reconfigure parking				+	+	-	
Managed retreat of entrance & parking				+	+	-	
Long term adaptation							
Managed retreat	$	$	High	+	=	=	Long
Living shorelines	$	$	Medium	+	=	=	Medium
Beach nourishment	$$	$	Medium	+	=	=	Short
Long term transportation							
Status quo (maintain all vehicle access)				-	-	=	
Reconfigure parking				+	+	-	
Managed retreat of entrance & parking				+	+	-	

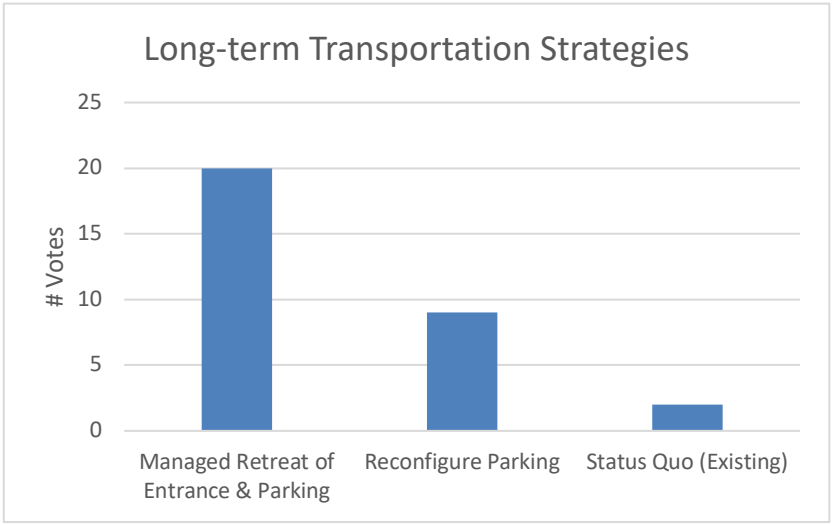
Upfront Cost: relative construction cost ($$$ = High, $$ = Medium, $=Low)
Maintenance Cost: relative cost associated with the lifespan of the project ($$$ = High, $$ = Medium, $=Low)
Certainty of Success: certainty that measure will function as intended for its projected lifespan (High, Medium, Low)
Secondary Impacts: consequences associated with the adaptation that could affect the beach or coastal resources, coastal access, or parking and roads. Plus (+) refers to an improvement from existing conditions, Minus (-) refers to a deterioration from existing conditions, Equal (=) refers to a similar to existing condition
Lifespan: the relative length of time the adaptation strategy functions (Short is <10 years, Medium is up to 30 years, and Long is 30+ years)

Natural Bridges State Beach Community Workshop Preferences

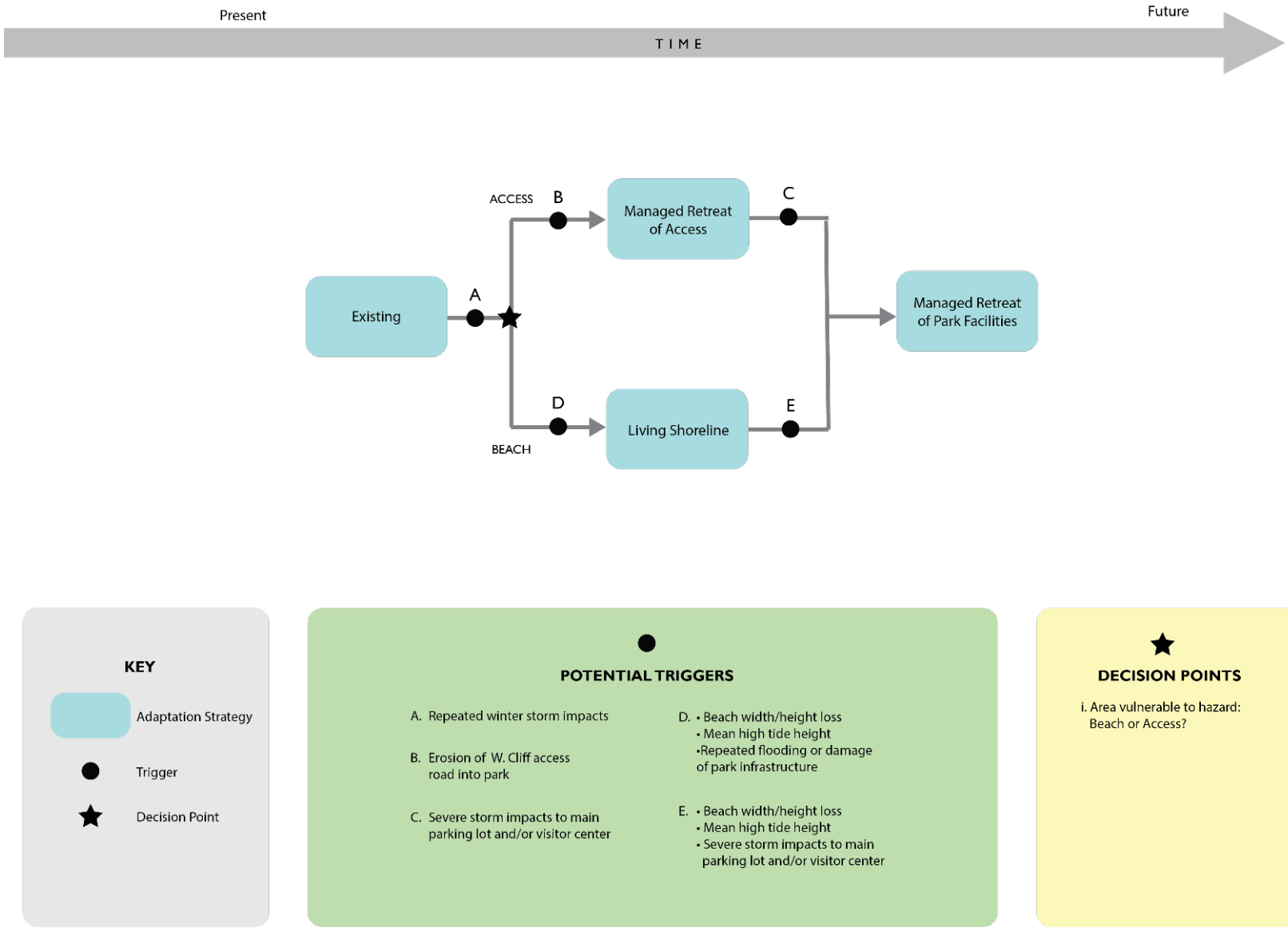








Natural Bridges State Beach Adaptation Strategy Decision Tree

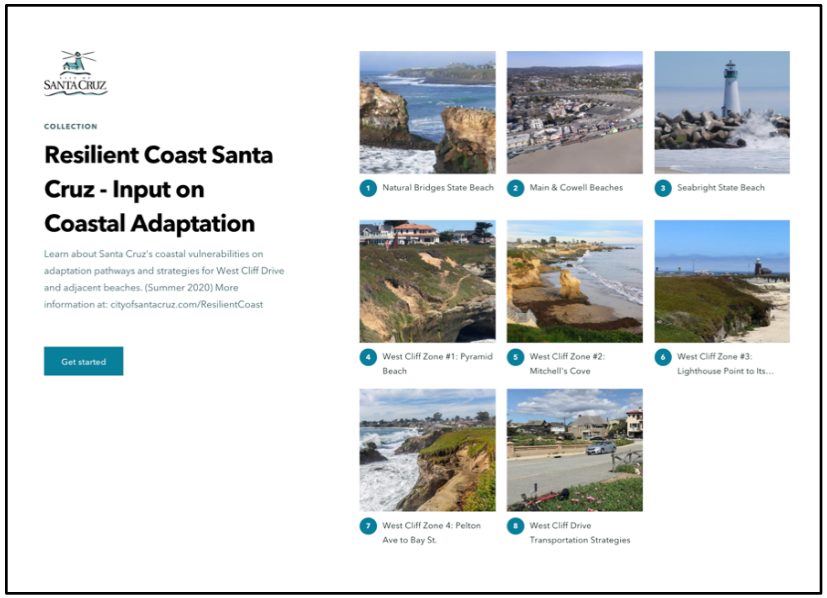


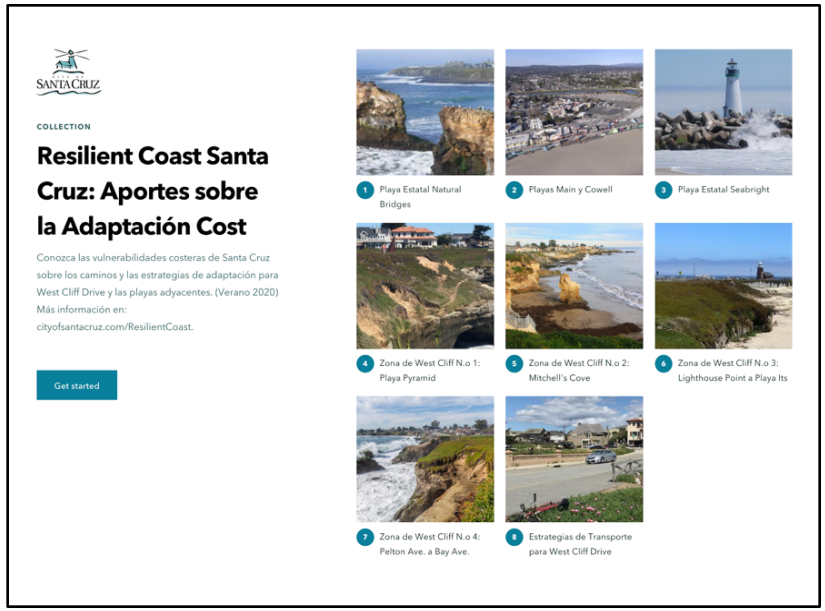
Adaptation Pathway Preferences

The Team identified adaptation pathway preferences from prior engagement, an in-depth feasibility analysis and, and meetings and workshops with Department Heads, the TAC and key stakeholders. At this stage of the initiative, the community was engaged through Online Storymaps and Community Surveys as well as with a virtual reality application available at the City's library, online and via mobile devices.

Summer 2020 Online Storymaps & Community Surveys

In late summer 2020, the City developed a series of eight informational ArcGIS "storymaps" based on four shoreline zones. The storymaps were intended to inform the community on the coastal vulnerabilities and gain further feedback on feasible adaptation pathways and strategies for West Cliff Drive and four adjacent beaches, including Natural Bridges State Beach, Main & Cowell Beaches, and Seabright State Beach. There was an additional storymap on West Cliff Drive Transportation strategies. Each storymap included an integrated survey for community members to express their views on the adaptation pathways and provide additional input. The storymaps and surveys were developed in English and Spanish, and advertised through the City's social media accounts, website, newsletters, and flyers. There were over 1,000 ArcGIS views of the storymaps and approximately 395 survey responses.





Each "storymap" is an overview of the coastal vulnerabilities and feedback mechanism for the feasible adaptation pathways for seven coastal locations in Santa Cruz and one is on the Transportation strategies for West Cliff Drive. Community members were asked to read through each storymap that provided details of the existing conditions, a glossary of terms, an overview of the feasible adaptation pathways. Adaptation pathways are strategies that will help alleviate degradation issues associated with Santa Cruz's coast. Adaptation pathways were developed, for short-term, midterm, and long-term action that, if implemented, will build coastal resilience.

Surveys

Each storymap included a brief survey to gather community input about the adaptation pathways for each coastal section. The survey asked respondents to identify where they lived in the community, to rank their top considerations for adaptation for each coastal section, and to indicate their preferred "adaptation pathways" (defined earlier in this document) through star rating on a 5-star scale (a higher number of stars indicated a greater level of agreement) or by picking between options if more than one adaptation option existed. Survey respondents could also share additional comments and feedback at the end of the survey.

Through these visualizations, respondents were able to obtain information about the timeline of the pathway, the triggers to initiate a strategy, the strategy itself, and the cost of the measures. Respondents were able to self select which locations for which they reviewed storymaps and completed surveys.

Survey Preferences by Coastal Location

The following is a brief summary of the survey results for each storymap. There were different numbers of respondents for each survey, and no responses on the Spanish language surveys despite extended and targeted promotion to Latinx and Beach Flats residents. Overall, community members from the West Side neighborhoods contributed a majority of the survey responses. While the overall number of views of the storymaps were high, the relatively low response rates for each location, and the lack of response from all neighborhoods, and on all questions means that these findings are more anecdotal than absolute. The City has reopened the storymaps and surveys and is putting focused effort on reaching Beach Flats residents into Fall 2020.

Seabright

There were 25 total responses for the Seabright survey. The top three considerations that are important to the survey respondents were:

1) Maximize habitat improvement
2) Longevity of strategy
3) Maintain access to beach and other amenities

Pathway 1 is preferred by half the community respondents followed by Pathway 3. Pathway 1, consisting of a Moratorium on Armoring, which means creating a living shoreline, implementing dune restoration, upgrades to stormwater infrastructure, and management of informal trails in the short term, raising the jetty and beach nourishment in the medium term, and relocating infrastructure and transportation facilities (managed retreat) in the longer term. The TAC preferred Pathway 2, which prioritized protecting both private and public property. Pathway 2 focuses on protecting property, which means creating a living shoreline, upgrading stormwater infrastructure and managing

informal access trails in the short
term, and upgrading or constructing new coastal armoring in the medium term. It includes raising the jetty with beach nourishment in the longer term. Pathway 3 focuses on incremental retreat over time, which means creating a living shoreline, upgrading stormwater infrastructure and managing informal access trails, and upgrading or constructing new coastal armoring in the short term as well as incremental relocation/realignment of public infrastructure. Pathway 3 includes managed retreat of private property in order to retain public access to the coast in the longer term. **It is important to note that the low number of survey responses is not a representative sample of the community.**

West Cliff Zone 1: Pyramid Beach

There were 28 total responses to the West Cliff Zone 1 survey. The top three considerations that were important to the survey respondents were:

1) Maximize habitat improvement
2) High certainty of success in minimizing erosion/flooding
3) Longevity of strategy

There is only one Pathway 1 at Pyramid Beach. Pathway 1 involves upgrading stormwater infrastructure, repairing existing armoring, and/or implementing a sand management strategy and beach nourishment strategy in the short term. In the medium term, it involved filling caves and upgrading armoring to a soil nail wall. In the long term, it includes removing revetment/armoring and implementing a managed retreat strategy.

Respondents rated Pathway 1 on average as 4.1 out of 5. The TAC was in consensus in recommending Pathway 1.

West Cliff Zone 2: Mitchell's Cove

There were 39 total responses for the Mitchell's Cove survey. The top three considerations that are important to the survey respondents were:

- Maintain access to beach and other amenities
- Maximize habitat improvement
- Maximize space for bike and pedestrian infrastructure

Respondents and the TAC agreed that the near-term pathway of implementing a sand management strategy and upgrading stormwater infrastructure was the preferred pathway. In mid and long-term, there was no clear preference by respondents and the TAC recommended to upgrade the revetment to soil nail wall and cave fill.

West Cliff Zone 3: Lighthouse

There were 33 total respondents for the Lighthouse survey. The top three considerations for adaptation include:

- Minimize impacts to surfing quality
- Maintain access to beach and other amenities
- Maximize space for the bike and pedestrian infrastructure

In the Short Term: Sand Management from Pyramid Beach was rated on average by respondents as 4.4 out of 5. This adaptation pathway means implementing a sand management strategy in the short term by allowing sand deposited at Pyramid Beach to migrate down coast and deposit on its beach.

In the Mid to Long Term there was no consensus among respondents. However, the TAC came to consensus that upgrading armoring to a soil nail and cave fill on one side and removing

armoring and implementing a managed retreat strategy on the other side of Lighthouse point

The TAC consensus opinion favored the option to upgrade the armor in one high hazard area and in another high hazard area in this zone, remove the armor in the mid to long term for managed retreat.

West Cliff Zone 4: Pelton to Bay

There were 33 respondents to the survey. The top three considerations for adaptation include:

- Maximize habitat improvement
- Minimize impacts to surfing quality
- Maintain access to beach and other amenities

The Short Term approach includes: Sand Management. This pathway means implementing a sand management strategy by allowing sand deposited at Pyramid Beach to migrate down coast and deposit on downstream West Cliff beaches. Respondents rated the approach a 4.3 of 5.

The Mid to Long Term: Fill Caves was the favored pathway by both the community and the TAC. This pathway means filling caves once a minimum ceiling thickness is reached.

No long term approach had consensus with the respondents or the TAC. The options were to Upgrade existing armoring to a soil nail wall and to Remove Armoring and Implement Retreat.

These pathways provide two possible medium to longer-term adaptation solutions which would involve moving a bike/pedestrian path or going to one lane of traffic, and there was support from respondents and the TAC.

Natural Bridges

There were 72 total respondents for the Natural Bridges survey. The top three community considerations for adaptation include:

- Maximize habitat improvement
- Longevity of strategy
- Maintain access to the beach and other amenities

Only one pathway was presented for consideration

- Pathway 1, Short to Midterm: Creating a Living Shoreline, which would involve creating vegetated structures.
- Pathway 1, Long Term: Managed Retreat Strategy would implement a managed retreat strategy, which would realign parking access and facilities.

The TAC was in consensus agreement with Pathway 1 as well.

Main and Cowell Beaches

There were 38 total respondents for the Main and Cowell survey. The top three community considerations for adaptation include:

- Maintain access to the beach and other amenities
- Longevity of strategy
- Maximize habitat improvement

Respondents, through open responses, highly valued minimizing impacts to the bike and pedestrian infrastructure.

The respondents were split between Pathways 1 and 2. Pathway 1, Accommodate, then Retreat. Pathway 1 focuses on accommodation and then retreat over time, which means creating a living shoreline and increasing storm water pump capacity strategies in the shorter term and bolstering additional resiliency of infrastructure in the

medium term until beach width and loss of use and access becomes unacceptable. Additionally, Pathway 1 includes a longer-term adaptation strategy that will focus on moving infrastructure away from hazards (managed retreat). However, the TAC consensus agreement was supporting Pathway 2, to protect and then accommodate or retreat. Pathway focuses on retaining beach area and beach habitat through living shoreline restoration programs and increasing storm water pump capacity strategies in the short term and, raising the existing curb wall in the medium term, when wave overtopping becomes problematic. Pathway includes a longer term adaptation strategy of bolstering additional resiliency of infrastructure and then either increasing the resiliency of impacted infrastructure *OR* implementing a managed retreat strategy for impacted infrastructure.

West Cliff Transportation

There were 127 total respondents for the West Cliff Transportation survey. The top three considerations for adaptation include:

- Maintain and improve bike and pedestrian space
- Address stormwater runoff
- Maximize habitat improvement

The three suggested pathways that considered by the community include:

- Short Term Strategy: Current Configuration with Enhancements (respondents' average rating is 3.4 of 5).
- Mid-Term Strategy: One-way with Enhanced Bicycle Facility (respondents' average rating is 3.8 of 5).
- Long-term Strategy, Reconfiguration West Cliff Drive in the case of a disaster closing West Cliff Drive: The preferred pathway (37.5% of 127 respondents) was the Reconfiguration of Monterey Street to Liberty Street. However, it was found after the surveys that Monterey Street is not a viable connector due to many transportation corridor issues and should not have been offered as an option. One fifth of the respondents preferred rerouting from Pelton Avenue to Woodrow Avenue to Delaware.

Virtual Reality Online and Mobile Phone Application

The City, in collaboration with Dr. Juliano Calil of Virtual Planet Technologies LLC, adapted an existing Virtual Reality (VR) application proof of concept into the VR Sea Level Rise Explorer in the Oculus headsets for use in hyper realistic engagement for the project. (See sample images to the right illustrating current conditions, king tides, and a living shoreline solution concept.) For example many groups were able to experience the VR application at Santa Cruz Public Library branches, enabling broader reach and depth of engagement with the community. Library patrons dove into an immersive virtual world in which coastal changes were rendered before their eyes. Users were guided through the VR experience, learning about coastal issues and solutions to address sea level rise.

This technology was available for community members to view using Oculus goggles depicting projected shoreline change at the City of Santa Cruz's iconic beaches and West Cliff Drive. It also leveraged grant funding from the American Geophysicist's Union and California Coastal Commission to build adaptation solution designs into the beta VR application and embed a survey to assess user awareness of sea level rise impacts and preferences on adaptation options.

By adapting the Virtual Reality (VR) Sea Level Rise Explorer application for use at Santa Cruz Public Library branches, the project has enabled broader reach and depth of engagement with the community, supporting the Resilient Coast Santa Cruz Initiative. On exhibit at the Main Library branch from 11/17/19 through 2/18/20,

over 200 library patrons experienced an immersive virtual world in which coastal changes are rendered before their eyes and learn about coastal change issues and solutions to address sea level rise. Other successful VR demo events included the opening of the Felton library branch, Santa Cruz Museum of Natural History (10/4/19), Santa Cruz Emergency Preparedness Event (10/13/19), Alliance of Regional Climate Collaboratives for Adaptation meeting (12/13/2019), and Resilient Coast Community Open House (3/5/2020).

Additionally, the VR Sea Level Rise Explorer Santa Cruz was made available in both English and Spanish as a mobile phone and online application, available on both Apple and Android app stores (accessible from Resilient Coast website). The app was also available for download on Oculus Go. For these three platforms combined, more than 750 users downloaded the application between initial launch and 9/22/2020.

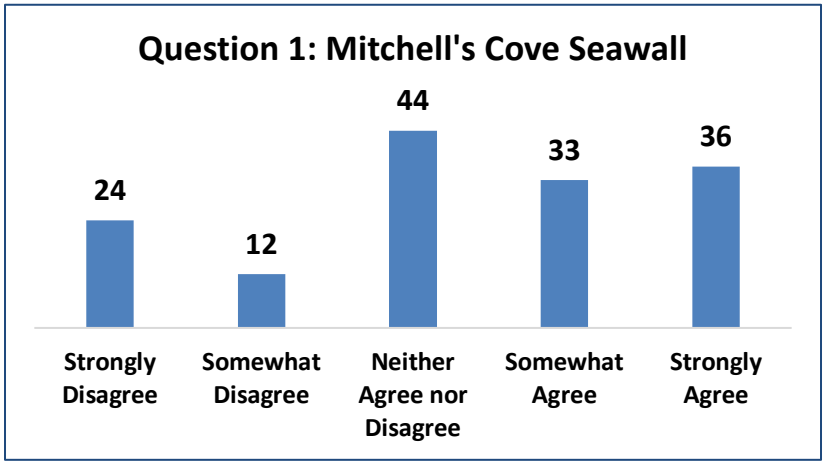
Mobile Phone and VR App User Survey Results

The mobile app had a 3-question survey to better understand user preferences and knowledge after viewing the app content. The questions and the user-responses are detailed below.

1. To what extent do you agree with the following statement related to coastal management for Mitchell's Cove?

"Adding a seawall as a near-term solution for Mitchell's Cove is the best approach for Santa Cruz and the community."

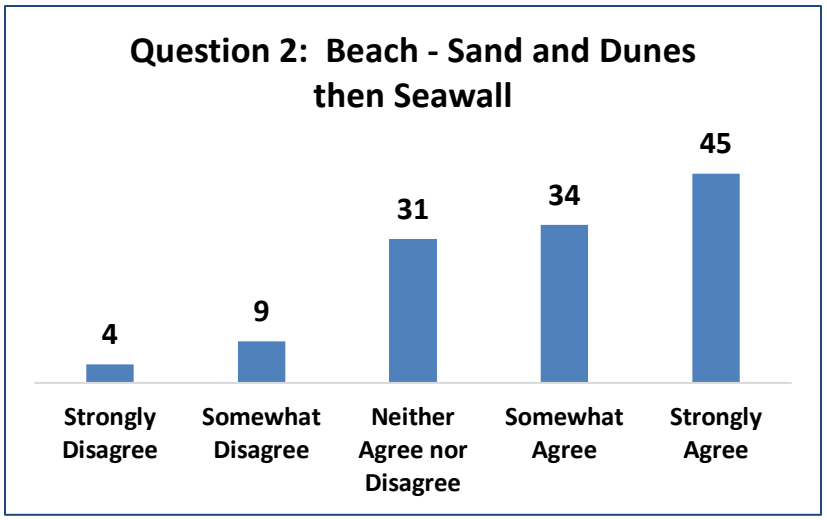
Strongly Disagree	24
Somewhat Disagree	12
Neither Agree nor Disagree	44
Somewhat Agree	33
Strongly Agree	36
Grand Total	**149**

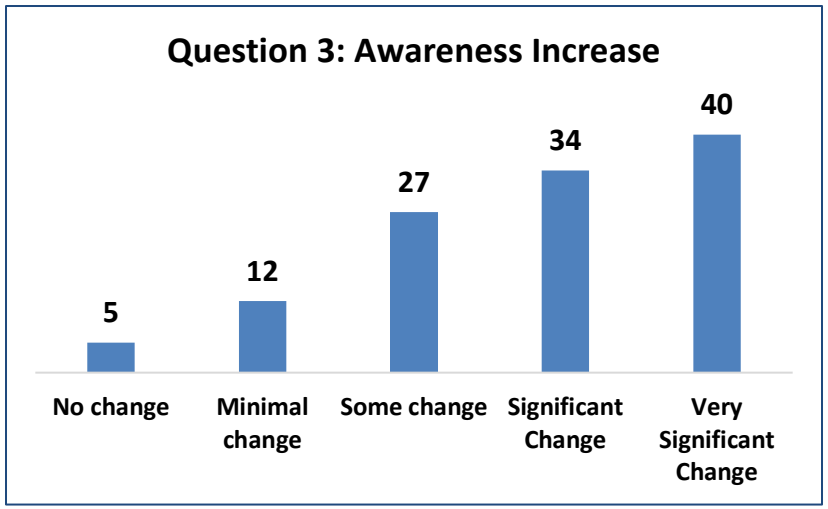


2. To what degree do you agree with the following statement regarding coastal management for Main Beach?

"Adding more sand and vegetated dunes in the near-term and adding a taller seawall in the long-term is the best plan for this area."

Strongly Disagree	4
Somewhat Disagree	9
Neither Agree nor Disagree	31
Somewhat Agree	34
Strongly Agree	45
Grand Total	**123**





3. Rate how your awareness of sea level rise has changed as a result of this experience.

No change	5
Minimal change	12
Some change	27
Significant Change	34
Very Significant Change	40
Grand Total	**118**

November 2020 Virtual Community Open House

These findings and preferences by stakeholder will be reflected back to the community and the recommended strategies will be presented for input at a November 17, 2020 Virtual Community Workshop. The workshop will be held in English and Spanish and will incorporate presentations, several breakout groups, and facilitated discussion.

This final workshop will inform the development of the draft LCP update and West Cliff Drive Adaptation and Management Plan due December 15, 2020. There will also be an opportunity for public comment at the Parks and Recreation Commission meeting on November 2, Transportation and Public Works Commission on November 11, and Planning Commission on November 19, 2020.