



Beach Boulevard

INFRASTRUCTURE RESILIENCY PROJECT

Summary

City of Pacifica Beach Boulevard Infrastructure Resiliency Project

Public Workshop #4

Thursday, April 29th, 2021

6:00 – 8:30 p.m.

Welcome, Introductions and Agenda Review

Mary Bier, Mayor Pro Tem of Pacifica, opened the meeting by welcoming attendees and thanking the Beach Boulevard Infrastructure Resiliency Project (BBIRP) team for their continued efforts on the project.

Kelsey Rugani, facilitator, welcomed attendees and reviewed the meeting objectives, agenda, and ground rules. The workshop objectives included:

- Providing a project overview and updates since the February Community Workshop.
- Discussing the Multi-Criteria Analysis (MCA) and how it was used to score each alternative.
- Presenting the MCA high-scoring alternative and discuss possible hybrid refinements.
- Building understanding of BBIRP Phase 2.

Overview of Beach Boulevard Infrastructure Resiliency Project

Ryan Marquez provided an overview of the project by introducing the project area. The BBIRP is located in northern Pacifica, on the western edge of the historic West Sharp Park neighborhood. The project area is comprised of four different reaches with unique characteristics; the Pier Wall System built in 1973 rehabilitated in 1993, the North Wall built in 1984, the South Wall built in 1987, and the South Gap. Due to multiple major failures to the North Wall between 1984 and 2020 (including foundational and full wall failures), localized flooding and property damage from wave overtopping, and sea level rise projections, Marquez emphasized the need to update these structures in order to protect public infrastructure along and adjacent to Beach Boulevard.

Marquez continued by explaining the project goals of the BBIRP, which include:

- Replacing the current seawall and outdated infrastructure.
- Building climate resilience into one of the most vulnerable segments of the City's shoreline.
- Improving public access and use of the Beach Boulevard Promenade.
- Creating a multi-benefit solution to protect public infrastructure, recreational activities, homes, businesses, and the community at large, from further coastal erosion impacts.



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The project is broken into three phases. The current phase, Phase 1, focuses on preliminary planning and feasibility and includes reviewing Existing Conditions and conducting a Multi-Hazard Risk Assessment (MHRA) which will inform the development and analysis of the project alternatives. Once a preferred alternative has been identified, Phase 2 will focus on design and permitting. Phase 3 is the construction phase.

Marquez indicated that this workshop is the fourth and final community workshop for Phase 1 of the project. The first and second workshops focused on the Existing Conditions of the project area and MHRA, respectively. The third workshop focused on providing an overview of potential alternatives for the BBIRP as well as public space opportunities for the project. Marquez noted that the project will enter Phase 2 once a preferred alternative (PA) has been identified. This phase will focus on the design and permitting of the PA.

Marquez then summarized discussion topics that have come up during and after previous workshops, which include:

- Project funding and cost to Pacificans.
- Alignment between City's planning efforts (e.g., Local Coastal Plan and the Sharp Park Specific Plan) and the requirements of regulatory agencies.
- The potential for the BBIRP to serve as a catalyst for commercial development and private investments in Pacifica.
- BBIRP construction timeline (e.g., phasing to address priority areas).
- How recreation is being evaluated as project alternatives are analyzed.
- Requests for additional details on economic impact, costs and amenities associated with each project alternative, long-term and large scenario planning, and real-world examples of the project alternatives.
- Direct outreach to residents within the project area.
- The extent to which the BBIRP's preferred alternative impacts surrounding beaches.
- Parallel planning efforts to address short-term needs and develop long-term solutions.
- Balancing tradeoffs between protecting businesses, residents, homes, and infrastructure with recreation, accessibility, and natural aesthetics.

Question and Answer

Following the presentation, participants were given the opportunity to ask questions to the Project Team. A summary of the questions is included in Appendix A.



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Overview of BBIRP Alternative Analysis

Multi Hazard Risk Assessment Review

Paul Henderson, GHD, provided a recap of the [Multi Hazard Risk Assessment](#) (MHRA) which identifies the hazards and risks the project area faces if no action is taken to update existing infrastructure (e.g., the no project alternative). These include:

- Hazards
 - **Coastal Flooding** is caused mostly by wave overtopping. During a 60-year event, total water levels are significantly higher than the seawall crest creating a flood hazard zone that could extend up to 200 feet landward on the North Wall and 75 feet landward on the South Wall.
 - Pacifica's bluffs are susceptible to **coastal erosion** as they are made of loosely consolidated materials that are highly erodible. To predict how the beach and bluff could erode without sea level rise, the project team used a background erosion rate of 1.6 feet per year.
 - **Scour** is another form of erosion that occurs during flooding events. Rock revetments in front of the existing seawall serve as protection against scour.
 - **Earthquake risks** exist given the City's proximity to the San Andreas and San Gregorio faults. In addition to strong ground shaking and ground surface rupture, additional risks include liquefaction and slope failure of the coastal bluff. Liquefaction occurs when water saturation and pore pressure increase reduce the strength of subsurface soils. Slope failure risks exist as ground shaking can erode coastal bluffs to the extent that they collapse.
 - **Sea-Level Rise** increases the severity of the hazards listed above. The project team utilized 2ft, 3.5ft and 7ft sea level rise scenarios to determine risk aversion scenarios for the project's design life.

Henderson continued by providing an overview of the Economic Risk Assessment stating that findings suggest that the cost of inaction may lead to the loss of Beach Boulevard by 2030, the loss of 50 buildings in the project area by 2050, and the loss of more than 160 buildings by 2100. Infrastructure, critical utilities, and other amenities will also need to be relocated. Specific risks include:

- Non-Monetized Impacts
 - **Anxiety and discomfort** occur due to road closures and the uncertainty of the future of property access.
 - **Recreation** risks occur due to loss of access to the Beach, Pier, and Promenade.
 - **Environmental** risks including adverse impacts to the Laguna Salada Wetland.



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- Monetized Impacts
 - **Primary Impacts**
 - Relocation of sewer
 - Property loss
 - **Secondary impacts**
 - Business interruptions
 - Debris cleanup

A no project alternative would result in severe economic implications, including over \$305 Million by 2100. These costs include the relocation of infrastructure, namely the sewer system, and property loss and damage. Further information on the economic risks is detailed in the MHRA on the City's website.

Alternatives

Aaron Holloway, GHD, provided a recap of the alternatives currently being analyzed. Holloway began by describing the criteria the project team is utilizing for design of each alternative (except the no project alternative). These criteria include:

- Design life of 50 years out to roughly 2070.
- Ability to withstand a design event (similar to the 1983 El Nino Storm)
- Protection against 2ft of Sea Level Rise in combination with the design event.

Holloway explained that the design criteria above over a 60-year return period has a low joint probability of exceedance within the design life of the project. Holloway shared a graph with the projected sea level rise over the next 50 years and showed how these design criteria would factor against future conditions. The low probability of exceedance was determined based on the design criteria withstanding the projected Sea Level Rise of the next 50 years. Holloway explained that having each alternative with the same criteria means they would have the same level of protection.

Holloway continued by summarizing the features of each of the project alternatives under consideration as well as tradeoffs associated with them.

- **Alternative #1 – No Project:** This alternative would entail not taking any action to improve or replace existing infrastructure within the project area, subsequently leaving the area susceptible to all the risks and hazards discussed above. A no project alternative is required as means to establish baseline conditions for analyzing other project alternatives.
- **Alternative #2 – Beach Nourishment:** This alternative involves maintaining the existing beach through the importation of sand. This alternative requires a 100ft wide beach to provide storm protection with initial nourishment needed to create a 200ft wide beach. While this alternative maintains beach access and recreation, there are some tradeoffs, including:



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- Large volumes of sand will be needed indefinitely to maintain the 100ft wide beach. The source of this sand is uncertain and there is no guaranteed availability of the volume needed in the future.
- Potential for maintenance cost escalation over the design life.
- Repairs to the existing seawall will still be required to maintain functionality and flood protection.
- **Alternative #3 – Replace Seawall:** This alternative provides a new seawall to uphold Beach Boulevard and is comparably low maintenance to nourishment. It includes a 5ft diameter of reinforced concrete pile wall with no scour protection.
- **Alternative #4 – Rock Revetment:** This alternative is adaptable to projected increases in sea level rise and has the lowest maintenance needs of all alternatives being considered. Tradeoffs with this alternative include a mandatory, impermeable wall behind the rock revetment to alleviate flooding and restriction of public access to the beach. This structure is much higher and wider than what exists today with a crest elevation of 25.5ft and overall footprint of 85ft
- **Alternative #5 – Sand Retention Structure:** This alternative allows for the slowing of loss of beach materials and reduces the force of wave climate. This includes two offshore parallel rock structures with low-crested breakwater or a multi-purpose reef. This alternative still requires Beach Nourishment, however, lengthens the time needed between nourishments by double.

Holloway provided an overview of alternatives considered but are not presently evaluated. These include:

- **Living Shoreline**
 - **Oyster reefs, marsh restoration, and a horizontal levee** are not applicable in an open coast environment like Pacifica.
 - **Sandy beach and restored dune** is applicable and are a possible solution with the Beach Nourishment and Beach Nourishment & Sand Retention alternatives.
- **Managed Retreat** is not included as a City adaptation policy.
- **Infrastructure Relocation** does not address a variety of risks described in the MHRA (including public safety, access, and property).

Holloway described the Alternatives Monetary Cost Comparison which analyzes the differences in costs associated with each alternative. The project alternative with the greatest lifecycle costs includes the no project alternative and sand retention, at \$244M and \$235M, respectively. The project alternative with the lowest lifecycle costs includes rock revetment and a new seawall, at \$102M and \$120M, respectively.

Holloway provided an overview of the Multi-Criteria Analysis used to score the project alternatives. These include 13 criteria organized into 3 categories that reflected public feedback from the Public



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Workshop #2. The alternatives were weighed and scored by a 13-member MCA workshop panel including representatives from the Planning, Coastal engineering, Environmental Science, Construction management, Civil & structural engineering, Coastal science, and Geotechnical engineering sectors. This workshop panel included members from the City, including Public Works, Planning, and the consulting team ranging from a wide variety of disciplines. The panel weighed the project alternatives by category out of a total available score of 100%. These alternatives were then divided out into the three categories, and then scored on a scale of 1-5 between the 13 criteria.

The 3 categories include:

- Technical Performance (40%)
- Financial (30%)
- Environmental (30%)

The 13 criteria (under each category) include:

- Technical Performance
 - Flood protection (20%)
 - Erosion protection (20%)
 - Reliability 20%
 - Operability 10%
 - Constructability (10%)
 - Sea Level Rise Adaptability (20%)
- Financial
 - Lifecycle costs (70%)
 - Grant Funding Potential (30%)
- Environmental
 - Marine Bio Resources (20%)
 - Terrestrial Bio Resources (20%)
 - Visual Resources (20%)
 - General Recreation (20%)
 - Coastal Access (20%)

Holloway continued providing an overview of the MCA of each project alternative based on the categories outlined above. The MCA of each project alternative includes:

Technical Performance (40% of total)

- **Seawall and Rock Revetment** scored the highest at 35% and 33% respectively. These structural alternatives scored highest because they offered more reliable and adaptable coastal protection.



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- **No Project** scored lowest at 10%.

Financial (30% of total)

- **Rock Revetment and Seawall** scored the highest at 26% and 23% respectively. These two alternatives had the lowest O&M costs and are eligible for federal funding programs including FEMA and USACE programs.
- **No Project and Sand Retention** scored lowest at 12% and 13% respectively due to high O&M and capital costs.

Environmental (30% of total)

- **Beach Nourishment and Sand Retention** scored the highest at 26% and 24% respectively due to marine resources, access, and recreation benefits.
- **Rock Revetment and No Project** scored lowest at 12% and 13% respectively due to the large footprint impacting visual, access and bio resources.

Overall Score (out of 100%)

- **Seawall** received the highest score at 75% due to a high technical performance score and medium scores in the financial and environmental categories.
- **Rock Revetment, Beach Nourishment, and Sand Retention** followed at 71%, 66%, and 63% respectively.
- **No Project** scored lowest at 36%.

Holloway continued comparing the project alternative scores while adjusting for category sensitivity. The category weighting sensitivity analysis showed that the Seawall is consistently the highest performing alternative. Beach Nourishment is the top environmental performer and Rock Revetment is the top financial performer. No Project consistently ranked lowest among the different category weighting sensitivities.

Hybrid

Holloway introduced a hybrid alternative refinement which includes components of a seawall, rock scour protection, and Beach Nourishment. The hybrid alternative has been developed to perform to meet the design criteria without the sand in place. When sand is in place it will provide a level of protection that is higher than the design criteria minimum.

Because the wall of the hybrid solution has rock scour protection in front of the wall the structural components of the wall are generally smaller than the standalone seawall alternative, for example the secant piles are smaller in diameter (3ft vs. 5ft) and the piles are shorter (60ft vs. 70ft). While the sand



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does provide redundancy for scour protection it is not required for the hybrid solution to perform as required.

The lifecycle cost of this alternative refinement is approximately \$114 Million. Cost savings when compared to the standalone seawall alternative are primarily provided by a significant reduction in materials, for example the volume of reinforced concrete is around half in the hybrid when compared with the standalone seawall. These savings can be utilized to help fund the beach nourishment. The beach nourishment included in the hybrid would provide added recreation and access benefits, while also increasing protection. While not formally run through the multi-criteria analysis at the time of this workshop, we anticipate that the hybrid project will score well considering the lifecycle cost and increased environmental and recreation benefits. Further analysis will be conducted, and results presented at a special City Council meeting in June.

Question and Answer and Virtual Polling Exercise

Following the presentation, participants were given the opportunity to ask questions to the Project Team. A summary of the questions is included in Appendix A.

Rugani introduced a virtual polling exercise to collect attendees' feedback on the initial preference of the project alternatives. Poll results are listed below:

Based on your current understanding of the alternatives, which alternative would you say you initially prefer?

- No project: 7% (4 out of 55 votes)
- Beach Nourishment: 5.5% (3 out of 55 votes)
- Seawall: 25.5% (14 out of 55 votes)
- Rock Revetment: 11% (6 out of 55 votes)
- Beach Nourishment with Sand Retention: 11% (6 out of 55 votes)
- Hybrid: 40% (22 out of 55 votes)

Public Comment

Rugani invited members of the public to provide comments to the project team. A summary of the public comments made is included below.

- It concerns me that this is the last workshop, and the next public forum is the presentation to city council. I think the pier is iconic and that its end of life might be 2030. I would like reassurances it will not go away.
- The robust seawall is the best alternative but needs more work. Bottom-line, all of these can be rectified with a seawall. A no project alternative will bankrupt taxpayers.
- I am pleased we are taking a positive "let's-do-something" approach and not giving up. Everything that was said regarding cost and damage is agreed on 100%. I am for the seawall.



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- I am glad we are looking at other alternatives like the hybrid. Based on the answers to the questions, it needs more study and should include keeping existing seawall and rock revetments. Even though more sand costs a lot, it is offset by cost savings the hybrid provides. Any funding we can get from the Biden Administration for infrastructure should be used for a seawall. The City can also consider fees in the parking lot and fees from tourists to cover the costs of the project.
- With the no-action alternative, the challenge is that we are not including housing lost and displaced residents. We need a seawall to ensure the economic development and sustainability of the Beach Boulevard Promenade. I am glad that we are homing in on the benefits of the seawall and the hybrid option; those two clearly seem to be the best alternatives.
- There needs to be a fix to the seawall to discuss rationally moving sewage from the north of town to the quarry. As the Local Coastal Plan (LCP) developed in 2018 has not been approved by the Coastal Commission, we still must work within the guidelines of that which was approved in 1980. That LCP prohibits seawalls as a mitigation measure for any new development. Will any regulatory agency accept the limitations this city has proposed? When do we start the real work? Any short-term measures taken now will buy us time until a new infrastructure is constructed.
- The city has proposed certain trigger points for taking action on resiliency infrastructure. Is it reasonable to assume that the sewage system can survive projected sea level rise before the BBIRP is completed? We need to make a decision that can protect the sewer system before it becomes inundated.
- I voted for the seawall because a 50-year protection would be best for protecting the core of the city. I agree that a seawall is best, but I would hope it would incorporate natural features and be visually appealing. I would be happy to give up 4-5 feet of ocean view to save the core of Pacifica and this neighborhood. You need to live out here to get the meaning of that. If you raise the wall 4-5 feet, people will still come. I do not understand the issue with the sewer line since it was said that the lines will hold until 2090.
- My home is not threatened by sea level rise but I fully support the need to protect Sharp Park residents. I would point out that those who favored a living shoreline, the real living shoreline is what's behind that seawall: the people, the business and the taxpayers. We should be doing a loss-benefits analysis. What is the total cost of homes in Sharp Park right now and the cost of compensating property owners at market value? I am opposed to any interim solutions. I like the aesthetics of the hybrid, but I am unsure it's the strongest. We need to protect Sharp Park and hopefully longer than 50 years.
- The 50-year lifespan is short sighted and myopic. Most homes in Pacifica are already older than 50 years. Pacifica has miles of other coastline that will also need protection. We are spending all our money right now on Beach Boulevard. The sea had removed 6ft of sand in 2014 but if the sea wants to take the sand away, it will.
- I would like to see a short-term fix to buy us time to make a good long-term plan. If there will be a bond measure to pay for this, we would like to know more about what it will entail.



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- Our LCP and Coastal Act require buildings to have a 100-year life; Seawall will only last for 50 years. I do not see how a developer can build here and overlook these issues; we need protection from sea level rise to bring in investment. Regarding the sewer infrastructure, there has already been \$1 million spent on repairs and will need to be moved eventually. The value beaches bring are often lost with tall seawalls. The value of beaches is often lost. Beaches are vital to California's economy, generating \$14 billion from tourism per year. From a purely economic viewpoint, California's beaches are more important to the overall economy than the property that shoreline armoring is designed to protect. Shoreline armoring only benefits the small minorities of people who own property directly on the coast while it decreases access to millions who come to access the beach every year. I am not opposed to some armoring, but we need to maintain views and access to the beach and not lose our sand to the design solutions.
- I am heartened to see these options. I appreciate seeing the move to preserve the community of Sharp Park. There is more to this neighborhood than just those of us who have homes here. There is a whole life and community and attraction on Beach Boulevard. I liked the hybrid alternative as it allows for more beach recreation opportunities.
- I want to move forward with a seawall or hybrid option. We need to do all we can to preserve the beauty, recreation, business, and way of life here in Pacifica. The alternative selected also entails an equity issue as people who could lose their homes may not be able to afford a new home in Pacifica.
- Regardless of the alternative selected, what do we do if we cannot get the required funding? It seems misleading to say that funding will come from a variety of sources when this is uncertain. Are we looking at short-term options to reinforce the existing wall while we build large-scale projects?
- I find it interesting hearing people say they do not want to spend money on a seawall when the cost of doing nothing is greater. We need to protect our town.
- I attended a conference called Implementing and Scaling Resilience in Coastal California in which the Federal Emergency Management Agency (FEMA) was a panelist. FEMA indicated there are lots of neighborhoods looking for funding for shoreline armoring and it is unclear whether they would fund short-term solutions. Without clear local funding, I am unsure where we go from here. It is helpful if we are realistic and balancing addressing the near-term realities of sea-level rise by looking for a longer-term plan.
- I submitted letters to the City, substantiated by a leading appraiser, which indicates the value of real property at the Sharp Park golf course to be \$70 million by 2050. These costs and the value of the wetlands adjacent to the golf course are not being represented by the cost estimate.
- Our city needs vision and needs to accept science that projects in other locations may be prioritized for funding. We need to consider what the backup plan is. I was encouraged by the hybrid option but would like to see more studies on it. The amenities offered do not offset the loss of view of the ocean.
- Our downtown area is being developed and revitalized as a central attraction for residents and visitors. We need to protect our downtown, so the projected economic growth comes to fruition. Most people selected the hybrid during the virtual polling exercise. Are there other



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hybrids out there that are not being considered? Can two different hybrid approaches be analyzed at the same time?

- I appreciate all the studies and process, but we need to take the next step forward. I support protecting the existing seawall while a new seawall is built.
- I am hearing comments raising the concern that there is no backup plan. I am all for moving forward, but what if we never get funding? What is the solution then? What if a bond measure fails? Not having a backup plan concerns me. Doing nothing is also not an option.
- The promenade is a main street with lots of activities. Palmetto Avenue is our designated historic main street, and it should be protected. I think the costs for no-action are grossly underestimated due to loss of property. I am looking forward to getting the seawall or hybrid approach built.
- This is a huge and important undertaking for the City. I hope that with such a huge price tag, some of which potentially coming from residents, the alternative selected provides opportunities for entertainment and instills confidence in private developers. I want to see more elements of how the seawall can be more than what it already is. Can we fix it and make it bigger and better for the next generation to enjoy?
- I am fully in support of the seawall proposal or a hybrid solution that includes the seawall. Not crazy about the rock revetment alone based on the aesthetics. I think we are moving in the right direction.
- This is a complicated and emotional issue. There is a property aspect to this that will catch up to homeowners eventually. The market will catch up to communities that better plan for sea level rise. More damaging solutions of the seawall and revetment will lead to more damage in the future and will be more difficult to recover from. If we sacrifice beaches, Pacifica will not be the same place.

Next Steps

Marquez reviewed the following next steps before opening into the public comment period.

- Participants were encouraged to visit the project website (CityofPacifica.org/beachresiliency) to:
 - Find the summary and recordings from past Workshops.
 - Complete the post-meeting survey.
 - **Note:** Responses to questions asked in the post-meeting survey are captured in Appendix B.
 - Sign-up for the project email list.
- Next Steps
 - Bring the preferred alternative to City Council at a special City Council meeting in June (meeting date to be announced). This meeting includes another opportunity for public comment.
 - Once a preferred alternative is approved, a scope and budget for Phase 2 will be put together and brought again to the City Council for approval.



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- External City Funds will likely be needed.
- Phase 2 includes
 - Design of the preferred alternative.
 - Permitting (environmental studies & coordination with agencies)
 - Community engagement around the amenities considered.

Closing Remarks from Mayor Sue Beckmeyer

Sue Beckmeyer, Mayor of Pacifica, shared her appreciation of the attendees' time, open-mindedness, and thoughtful comments. Beckmeyer reiterated the June City Council meeting will provide an additional opportunity for the public to provide comments on the alternatives. She thanked attendees for their widespread interest and support in moving the BBIRP process forward.



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Appendix A

Public Workshop #4 Question and Answer

Overview of BBIRP: Question and Answer

- Question (Q): What examples of seawalls from other locations were looked at as part of your analysis?
 - Response (R): We referenced the Ocean Beach seawall in San Francisco as well as seawalls and bluff stabilization techniques in Santa Cruz.
- Q: Does the replacement of "outdated infrastructure" include replacement of underground sewer lines and utilities?
 - R: While relocating or replacing that infrastructure was analyzed in the MHRA, we are not putting forward an alternative that would do so. Relocating infrastructure like storm drains would be assessed once we select a preferred alternative.
- Q: What are the City's backup plans if they cannot get funding from state or federal agencies? And how much will be left over for other issues throughout the City? How much of this is planned to be paid for by bonds from Pacificans?
 - R: While we will be pursuing a variety of funding sources, total funding needs are still to be determined and identifying a PA will help to inform the extent to which public funds are needed. We are not sure exactly how that breakdown will occur yet. In the meantime, the City intends to continue to maintain the area.
- Q: If a seawall is the alternative selected, how will the pier abutments be addressed?
 - R: Addressing pier abutments will likely not be a difficult task regardless of the alternative pursued.
- Q: Are there alternatives that would allow for existing buildings and pedestrians access space to remain as is? What is missing in these reports is an understanding of critical infrastructure, like utilities, that is immediately threatened. How old are the sewer pipes? When is critical infrastructure updates needed for these pipes? Utilities need to be looked at hand in hand with other coastal infrastructure resiliency.
 - R: I am hearing questions about alignment. We are not making any decisions about alignment yet. We need to discover what preferred alternative there is then we can discuss alignment. As far as the conditions of the existing infrastructure, specifically wastewater, the City's Wastewater Division has indicated the Beach Boulevard sewer line may last into the 2090s.

BBIRP Alternatives Analysis: Question and Answer

- Q: Currently and historically, the project area has good public accessibility to the beach and existing infrastructure has maintained views. How will the alternatives presented change this?
 - R: Access will be maintained or improved regardless of the alternative selected. There are opportunities on the pedestrian promenade corridor for greater amenities and increased elevation so that the ocean views are not as impacted.



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- Q: Does the Multi-Criteria Analysis consider the resiliency of each alternative? How does each alternative respond to a catastrophic event? What costs more and which is more resilient? And which is easier to fix after an event?
 - R: Yes, we did look at resilience and it was taken into account in the analysis. The seawall and revetment are more resilient.
- Q: What impacts will the alternative selected have on surrounding shorelines? Is removal considered?
 - R: This will be addressed during Phase 2 of the project. Any of the options can be removed and are factored in the decommissioning costs. The policies developed here align with LCP's certified draft policies. Within that document, it provides policies for us to monitor our deadlines, schedule, and timelines to reassess our adaptation plan. This is what we will use at a planning level to reassess whether protection for this area and others is still factored into our decision.
- Q: Glad to hear that the sewer pipes will last until 2090. However, the real issue is not the strength of the pipes, but if the City has a plan for a potential sewage back up?
 - R: Capacity of the pipes are generally not related to wave overtopping. There could be infiltration issues, which is something we will continue to analyze. The City's Wastewater Division is also working on their master plan which will address any capacity of the pipes and look at sea level rise as well.
- Q: How will beach nourishment affect the north end of the pier?
 - R: The key challenge with north part of the pier is the alignment with Beach Boulevard and the pier. The boulevard sticks out further than where a natural beach would be. Sand retention would help adjust that natural shoreline orientation.
- Q: How much higher would the new seawall be than the existing seawall?
 - R: The height relative to the existing seawall will vary because the height of the existing wall varies. The concept North wall brings the section up to 30ft overall. I. Closer to pier where the wall is about 25ft today, there would be an increase of 4-5ft but some sections would remain the same height.
- Q: How does the hybrid model vary in its strength, longevity, and structural soundness compared to just a seawall?
 - R: Under the hybrid alternative, the seawall would be designed in a manner so it could provide protection from wave energy even in the absence of a beach (e.g., in between beach nourishment cycles). The seawall would be stable on its own and thus the differences are negligible.
- Q: Can we emulate resiliency strategies like those in Holland where the water is pumped outward from the beach?
 - R: The physical environment in Holland differs from that of California meaning strategies that work there do not translate well to Pacifica's environment. Additionally, sand for beach nourishment in Holland is paid for by the national government, which is not necessarily an option in California.
- Q: Why are we only looking at a 50-year period?



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- R: A 50-year design life this is a common standard for public shoreline protection infrastructure. There is a difference between 'design life' and 'useful life'. If an infrastructure asset is maintained correctly, it has the potential to have a useful life that extend well beyond the design life, we would not anticipate any structural solution to require demolition at 50 years.
- Q: Will a full analysis be completed for the hybrid alternative?
 - R: Yes, it will go through the same analyses as the other alternatives under consideration.
- Q: If we did not alter the existing seawall and rock revetment, would just pursuing beach nourishment provide adequate protection?
 - R: That would necessitate a substantially larger amount of sand than the beach nourishment strategy, and subsequently be even more expensive. The existing seawall would remain vulnerable to damage from wave impacts during extreme events, particularly at the end of each nourishment cycle. Since the wall is nearing the end of its useful its unlikely to provide adequate protection during these events throughout the design life.
- Q: Were the social and economic benefits of having a beach considered as the alternatives were analyzed? Have you considered feed to use the beach?
 - R: Yes, those were accounted for in the Economic Risk Assessment. No fees for beach use are being considered nor would they be allowed.
- Q: Is the City pursuing funding from the Biden Administration's infrastructure plan?
 - R: Yes, we will be pursuing all funding sources.
- Q: The seawall would go up 5ft higher than the current level of the Seawall near the pier. Does this mean 5ft higher than the existing road? This would block views to pedestrians and autos. Was this impact considered at all?
 - R: Yes, visual, and even more so recreational impacts were considered in the MCA. The seawall received a lower score based on that reason. But there could be added amenities on the other side of the seawall. There are opportunities on the pedestrian promenade corridor for greater amenities and increased elevation so that the ocean views are not as impacted.
- Q: Why was the hybrid not included in the alternatives analysis reports?
 - R: The alternatives analysis report was originally only focused on the four alternatives and the No Project. The hybrid was developed as a result of the original multi-criteria analysis as a way to combine benefits from multiple alternatives. At the time of the workshop, the Hybrid alternative had not been fully evaluated. Once analyses for the hybrid alternative are completed, they will be included in an updated alternatives report.
- Q: Based on what was presented, it sounds like the best alternative is a modern seawall while managed retreat in any form is not an option. The \$305 million for the No-Project Alternative is grossly underestimated, particularly as the non-monetized values are not included in this cost. I do not understand why these were not included in the costs for the No Project Alternative,



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particularly when you consider things like loss of endangered species habitat, potential lawsuits being brought by property owners, and loss of access to the beach and promenade.

- R: The National Oceanic and Atmospheric Administration’s economic analysis framework was used to assess the BBIRP project alternatives. The project team did not want to assign dollar values to intangible components of the project area like recreational benefits of the promenade, pier, beaches and endangered species habitat.
- Q: What in your professional opinion is the “slam dunk” solution to provide protection for Sharp Park?
 - R: Our professional opinion is that the systematic multi-criteria analysis (MCA) should be used determine the best solution – and one of the reasons for the MCA is because it takes one person’s ‘opinion’ out of the equation and assesses both a quantitative and qualitative manner. Notwithstanding that professional opinion, we believe the hybrid alternative presented is the best solution for this project, and this conclusion is largely based on the scoring in the MCA.
- Q: Is it possible to include offshore structure that is parallel to the seawall to disperse the energy before it gets to shore? This seemingly would also lower costs for construction and maintenance of the seawall.
 - R: Yes, these type of structures were evaluated for the Sand Retention alternative. With the retention approach, we developed two models at a conceptual level: groins perpendicular to shore and offshore reefs. Offshore reefs/breakwaters would reduce the number of waves breaking closer to the shore contain the sand to limit the amount moved away from the project site. However, during large storms, these offshore structures will not completely stop wave transmission that comes over and through the breakwater, so you would still have lots of wave action hitting the shore. This alternative proved to be very expensive due to the large quantity of rock required to build the offshore structures and the beach nourishment needed to maintain a sufficient beach width for storm protection.
 - R: The cost of construction of offshore reefs would be significant. The high-level cost analysis completed as part of this feasibility study shows the offshore reef lifecycle cost is approximately double the cost of the new stand-alone seawall alternative and hybrid alternative, and the highest cost of all alternatives other than ‘No Project’. Permitting of offshore reef structures would be difficult.
- Q: You talked about ensuring the BBIRP comply with the Local Coastal Plan, however, I am unsure if any alternative for the BBIRP is in compliance with the City’s General Plan. Do the current designs for BBIRP alternatives meet the requirements of the City’s General Plan?
 - R: The BBIRP will be built in accordance with what is outlined in the Local Coastal Plan, which was adopted by City Council in 2020. The City’s General Plan is being updated now and will be adjusted based on comments to the Local Coastal Plan from the California Coastal Commission.



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Appendix B

Public Workshop #4 Post-Meeting Survey Question and Answer

General Project

- Question (Q) Can I get a recording of the meeting?
 - Response (R): Yes, the recording is Youtube here: <https://www.youtube.com/watch?v=4gmBVSPL5FO> . It is also posted in the project library on the project webpage. www.cityofpacifica.org/beachresiliency.
- Q: What if the California Coastal Commission (CCC) doesn't approve the selected and designed alternative?
 - R: The City is working with the CCC currently and will continue to do so in future to ensure this does not happen. Additionally, the City believes this area is afforded protection under the Coastal Act and as such does not believe the CCC can outright reject a project here. We are closely considering what would make this project permit-able and striving to ensure the alternative is the least impactful and provides a multi benefit solution.
- Q: What if the plan is never funded? What if a bond measure fails?
 - R: The City would continue to maintain the current seawall in place with the understanding that maintenance costs would increase with time.
- Q: Is the city setting aside money into a special fund each year for this project vs. trying to get all the money in one year for the portion not covered by federal funding i.e. are they doing that now?
 - R: No.
- Q: Pacificans need to know: how will any choice be funded? Will it include all Pacificans to pay? How? A bond? Or a Special District, or what?
 - R: That has not been decided yet.
- Q: Can the public see interim draft of the further hybrid alternative studies before city council meeting in June?
 - R: Yes, the City will release updated reports including the hybrid before the June meeting and will announce it to all on the emailing list.
- Q: Will the presentation to city council be just the first of several, as this is a very complicated project and process?
 - R: There is only one special council meeting planned in June to present and discuss the feasibility study phase. Additional public workshops and council meetings will be scheduled as the project progresses through Phase 2.
- Q: What is the projected time it will take to get to building -- through design, CCC approval, funding? How many years until there is a built project?



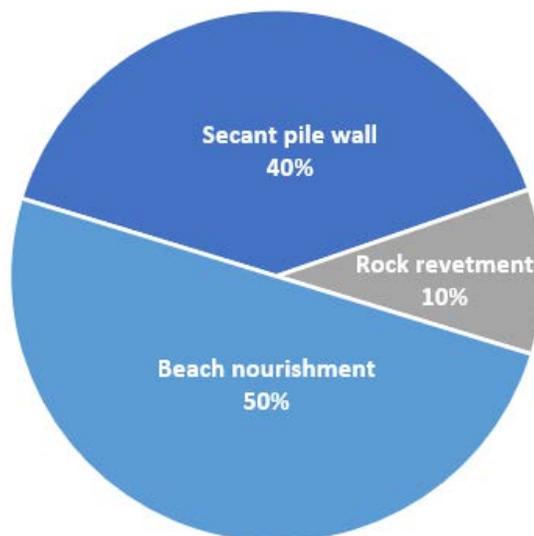
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- R: The timeline is variable, particularly with funding and permitting. At this time, it could be anywhere from 2-5 years for the project to be permitted, then 1-2 years to construct.
- Q: What will the City do if a catastrophic storm breached our protection in the next few years?
 - R: The City will continue to monitor the seawall and if there is breach it will be repaired.
- Q: Has Pacifica Public Works or anybody connected with the Project discussed this matter with anyone at City & County of San Francisco, and if so, w/ whom did you discuss it, and what was said in that discussion?
 - R: The City has discussed this project with San Francisco Parks and Rec and has been updating them periodically with the understanding that during phase 2, more coordination would be needed to align the Levee with a preferred alternative.

Alternative Analysis

- Q: Is it a 5 foot high wall above the sidewalk? Won't it block views?
 - R: The seawall alternative does have certain areas where the wall would need to be raised around 5 feet. This may impact views some views, however as was discussed in workshop 3, there may be ways to deal with this elevation change to ensure the promenade still has similar views.
- Q: What is the estimated cost of the recommended hybrid – seawall/revetment/beach nourishment?
 - R: Approximately \$114 million. The approximate proportions of cost between the 3 basic elements of the hybrid alternative are displayed in the pie chart below, noting rock from the exiting rock revetment would be re-used:





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- Q: Has your team considered the odds of the proposed \$110 million dollar hybrid seawall we are considering tonight night actually reaching the end of its 50 year design life? If we need funding for additional repairs, where would that funding come from?
 - R: Probability of key variables such as design storm return period and sea level rise over the next 50 years were considered. The joint probability of the design criteria being exceeded during the 50-yr design life is very low (~0.2%) but not impossible.
 - R: With effective maintenance there is a very high probably the Hybrid alternative will reach its 50-years design life. This is one of the key reasons the Hybrid alternative scored highly in the 'Reliability' criteria in the MCA.
 - R: The design of the seawall and other elements of the hybrid will include materials that have proven durable in the marine environment and will remain functional over the design with regular inspection, maintenance, and repair typical for coastal structures.
 - R: Maintenance is required for all public infrastructure, this project is no different. Funding for repairs and maintenance would need to be planned for by the City, noting repairs can be minimized by regular maintenance.
- Q: Is there any data on combinations of the different strategies of three or more together? I am thinking, for instance, of hybrid structure seawall, plus beach nourishment plus sand retention from off-shore structures? It seems like there is probably a nexus of strategy and situation and luck which might allow superior results.
 - R: There are examples where beach nourishment and sand retention are used in combination with a seawall/revetment along the back beach. Unfortunately, most of these examples are located in milder wave climates and their data may not be directly applicable to Pacifica. Sand retention structures would improve benefits associated with beach nourishment in a hybrid alternative, but also come at a significant initial cost. Based on the feasibility analyses of potential costs, the initial cost of sand retention structures is higher than the cost savings from a reduced volume of beach nourishment.
- Q: Could the seawall be aligned westward to mitigate the height impact on sightlines?
 - R: Seawall alignment will be evaluated in more detail as part of the Phase 2 design and permitting process. A westward alignment of the seawall would likely increase the impact on sightlines. A seawall alignment shifted eastward could partially mitigate the impact on sightlines. This will involve a balance between the benefits of an eastward alignment on views with the desired recreation/access uses along the Promenade.
- Comment (C)/Q: The Report's assumption that perpendicular levees would be built at/near the north and south property lines of the San Francisco-owner Sharp Park Golf Course property, to protect (1) the golf course and (2) the West Fairway Park residents from coastal flooding in the event of "No Project". Questions: (1) Who does GHD think will pay for these perpendicular levees -- San Francisco, Pacifica, or someone else? (2) What are GHD's estimated hard and soft costs for construction of these levees, and what is the basis for the cost estimate?



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- R: The no project scenario does not make assumptions of who will pay for what, but only attempts to show a scenario along with costs to better understand what it may look like. The estimation for those costs can be found in Appendix C of the Multi Hazard Risk Assessment.
- Q/C: Were other sand retention structures considered such as groins to hold a beach fill? The offshore reef and or breakwater structures besides being very expensive will not fly past the Surfrider Foundation and Pacifica surfers. This area both up and down coast of the pier is arguably the best surfing wave in Pacifica for intermediate and expert surfers. I have been surfing there for almost 40 years. Even though the multi-purpose reef could make for a surfing wave, it's not worth the risk to lose it as a surfing site. If the surf was poor or non-existent in this area a surfing reef to create a new break would be sellable. A beach fill with some short retention structures could work.
 - R: Groins were considered as a sand retention structure. There was concern among the coastal engineers that groins (especially short ones) would not provide the retention benefits desired. The primary reason is that the significant wave energy and cross-shore sediment transport at the project site could render a shore-perpendicular structure ineffective at retaining a sufficient beach width to withstand the design event. For this reason the sand retention alternative includes a shore parallel component (low-crested breakwater or multi-purpose reef) to dissipate wave energy and facilitate deposition/accretion behind these structures.
- Q: Sand source for any beach nourishment project or hybrid project. Are you assuming an offshore site or trucking sand in from somewhere else?
 - R: Cost estimates for beach nourishment have assumed it would be sourced from an offshore sand deposit.
- Q: Do the current sea wall/hybrid proposals meet the requirements of the 1980 General Plan that "Seawalls shall not extend beyond the mean high tide line"? I asked the question, but it was not answered.
 - Yes. For purposes of the alternatives analysis the seawall was assumed to follow the existing alignment, which does not extend beyond the current mean high tide line.
- C: Regarding sewer landward pullback project needs to be considered on par with the sea wall, your response that the pipes may last 90 years and that the plan is make them bigger doesn't respond to the problem if they get inundated.
 - R: For clarification, the statement was the sewer pipe along Beach Boulevard may have a useful life into 2090.
 - R: Inundation of sewer lines is unlikely to be an issue since these are closed systems not directly influenced by ocean water levels. Sea level rise can increase groundwater levels, which present a low vulnerability to the sewer collection lines along Beach Boulevard but could potentially increase inflow & infiltration (I&I). This is unlikely to pose a major risk in the near future (20-30 years) but Public Works will continue to monitor sewer



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- flow rates and any potential increase will be factored into future infrastructure planning decisions.
- R: Geotechnical investigations show the groundwater is approximately elevation 7ft NAVD88, approximately 1ft higher than the mean higher high water (MHHW) elevation under Beach Boulevard. The lowest sewer line pipe invert elevation on Beach Boulevard (at intersection with Clarendon) is 11.14ft NAVD88. Projected sea level rise being used in this feasibility study is 2ft, which could raise the water table to 9ft NAVD88, still 2ft lower than the lowest sewer pipe invert.
 - C/Q: I find it hard to understand how Beach Nourishment can even be contemplated for the whole length Beach Blvd?! Most coastal geology opinions I am aware of consider this untenable for a shore with: NO existing beach (North of the Pier); No chance that the shoreline can retreat; and worst of all the open high energy coast and exposure. Your timeline predicts more sand needed every 12 years. Isn't it possible & increasingly likely that is could mostly disappear in 1-5yrs with "bad luck"? Can you give examples of any successful sand projects with: prior hard armor, no existing intertidal sand, along a coast of comparable exposure/energy to ours?
 - R: As indicated by the alternative analysis, it would take a very large quantity of sand placed along Beach Boulevard for beach nourishment to satisfy the design criteria. Reliability is a concern with beach nourishment and was reflected in the MCA scoring for this alternative. The performance of a specific beach nourishment project can't be accurately predicted because of the numbers of variables involved and the complexity of physical processes occurring in the littoral zone.

Given the high exposure and wave energy at Pacifica it's difficult to provide a directly relevant beach nourishment example. The USACE sand bypassing program at Channel Islands Harbor is one example where beach nourishment is performed regularly to maintain a beach in front of an armored shoreline along Port Hueneme and the City of Port Hueneme. In this case sand is dredged from the Channel Islands Harbor sand trap (behind breakwater) and placed south of the Port Hueneme entrance channel at an approximate rate of ~2 million cubic yards every 2 years. The photo comparison below shows beach conditions before and after a nourishment event at the City of Port Hueneme.



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- Q/C: Are the differences meaningful? Sensitivity Analysis (Fig. 6.1) is an important idea. But I note that it only considers different category weighting. You did not consider uncertainty, something like confidence intervals, on the actual scores. While such multi-step calculations are often improved by a quantitative error propagation analysis, I agree this is not justified here, since CIs on the scores are illusive. BUT, I wonder if you could gather the alternatives in groups by likely significance. It is common in such comparisons to draw “similarity bars” joining the ones that are not significantly different. I am pretty certain that it would show that not all differences are meaningful, given the real uncertainties involved in estimates, here subjective panel consensus. (? I assume the scores were not submitted blindly by panel members?) Can we escape the appearance that the choice of Seawall was predetermined? The change in scope, and slight difference in alternative score just tipping the decision appear to many in the public conspicuous. The addition of a hybrid option to the contrary notwithstanding. Might the final report include a clear statement whether Seawall & Rock Retment are meaningfully different? I really doubt they are. To those with less quantitative experience, isn't it misleading to cite such numbers without such caveats? Should this not rightfully affect the Final Alternative determination?
 - R: Yes, the sensitivity analysis performed indicates the differences between the alternatives are meaningful. Seawall was not a predetermined choice and was judged in the same manner as other alternatives in the MCA. Although seawall and revetment are relatively close in total score, these alternatives have similar strengths in the Technical Performance category. Therefore, if Technical Performance scores were adjusted up or down for one alternative, they would be adjusted in a similar manner for the other. Retment received a much lower score in Environmental due to multiple concerns associated with a very large footprint. The differences between these alternatives in the Environmental category are meaningful and were not sensitive to scoring changes. Financial scores were largely based on a quantitative estimate of lifecycle cost and



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therefore were less sensitive to subjective scoring than other criteria. This discussion will be added to the revised Alternatives Analysis Report.

- C: Comparing overtopping between Seawall and Revetment. High surf reaches the height of the Pier already. The proposed seawall design with the upper overhang lip will allow very powerful overtopping impacts when surf exceeds that height. The Rock Revetment (Fig, 4.3) builds a wide rock “ramp” sloping seaward into deep water that dissipates some wave energy, in addition to any reduction from the big waves feeling the natural bottom. The seawall (Fig 4.2) appears as a vertical wall, 70ft in extent, extending deep into the “hardpan” with max elevation 30ft above MLLW). I hope your final analysis evaluates whether big waves would hit a seawall with greater energy than a revetment with energy dissipation by armor sloping offshore? That is, the height of the shore-break on impact to a seawall alone may actually be greater and more likely to overtop, and with higher force than a Revetment. The hybrid seems to add this measure of protection, but then why do you need the seawall (the main reason was narrower footprint).
 - R: Yes, the final analysis will include a detailed assessment of wave run up and overtopping. Any structure (Seawall, Rock Revetment or Hybrid) would be subject to powerful waves during a storm event. It’s true that Rock Revetment dissipates more energy than a seawall, thus the need for a higher crest elevation for the Seawall alternative. The Hybrid structure seeks to balance the benefits of each alternative to develop a more economical solution, while reducing overall footprint on the beach. A seawall would be required with or without the rock revetment in order to provide an impermeable barrier behind the structure to prevent erosion of material from beneath the Promenade/Beach Boulevard.