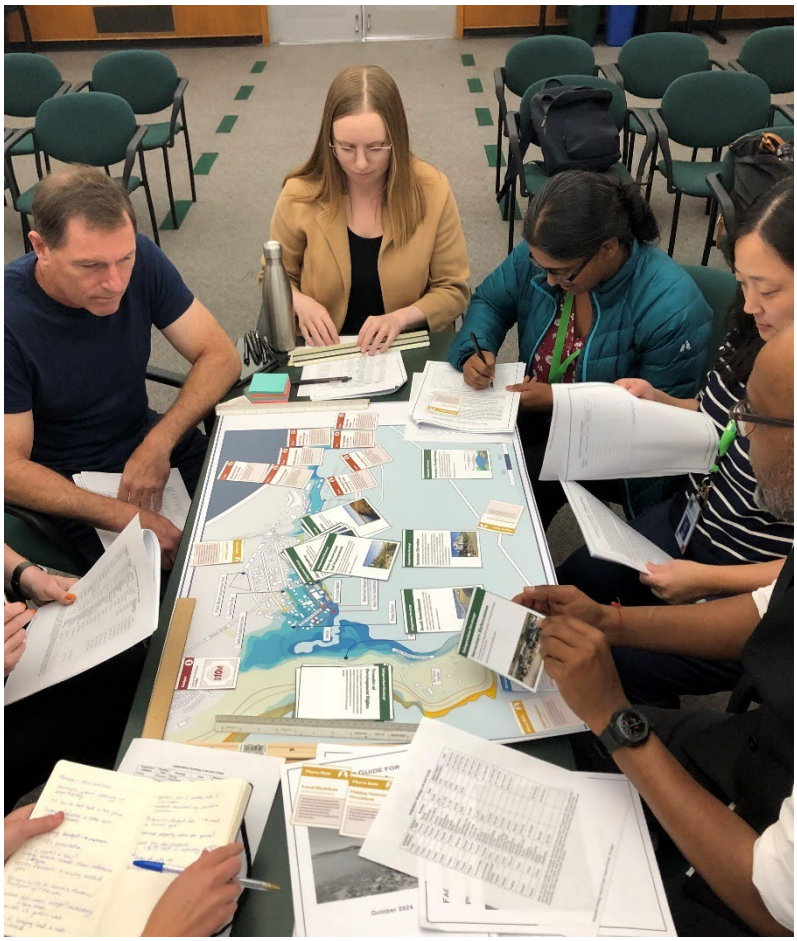
Workshop Summary for Game of Floods, Princeton, San Mateo County



December 2024

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pathways
CLIMATE INSTITUTE

Pathways Climate Institute supported San Mateo County in this effort.

1. Press Release Language

As part of the re-start of Plan Princeton, on Friday, November 1, 2024, the County of San Mateo Planning and Building Department hosted a Sea Level Rise Community Workshop at the Shoppes at Harbor Village in Half Moon Bay. The event gathered local residents and stakeholders to learn about the sea level rise risks facing Princeton and to engage in a collaborative activity aimed at envisioning the future of Princeton.

Plan Princeton is part of a comprehensive effort to update land use plans, development policies, and zoning regulations for Princeton which is to be completed in Spring 2025.

Participants played the Game of Floods, an interactive game-based exercise tailored specifically for Princeton, to assess sea level rise vulnerability of the community and to identify potential adaptation strategies to reduce the risk of future flooding, some of which may be incorporated into Plan Princeton. The aim of the game was to help participants develop better understanding of how sea level rise and coastal erosion will impact life in Princeton; gain better understanding of policies and physical strategies that may help Princeton adapt to sea level rise and understand the complexities and trade-offs of adaptation planning. Participants had the opportunity to voice their ideas and concerns in order to contribute to shaping the resilience of the community.

Example strategies that participants considered included resilient development standards and update of land use regulations; structure flood proofing and structure relocation; and dune restoration and management.

A total of twenty-five people attended the workshop. Participants ranged from residents, property and business owners, and local agency staff. Organizations and agencies included the San Mateo Resource Conservation District, Harbor District, Green Foothills, Romeo Packing, Half Moon Bay Yacht Club, County Planning Commissioner, Montara Water and Sanitary District, and the Sewer Authority Midcoast.

The County invites community members to stay involved and informed about future updates by visiting Plan Princeton. In addition, sets of the Game of Floods – Princeton are available for any groups or organizations who wish to use the game to continue discussions regarding sea level rise adaptation for Princeton from Supervisor Ray Mueller's Coastside office.

2. Game Play and Strategy Development

What is the Game of Floods?

The Game of Floods – Princeton was developed building on versions of a similar game developed originally by Marin County and evolved by the Urban Sustainability Directors Network that has been played in multiple locations around the US. The aim of the Game of Floods is to help participants (typically city and county staff and community members) develop better understanding of how sea level rise will impact their local community and what adaptation solutions are available.

San Mateo County is in the process of completing 'Plan Princeton' - a comprehensive effort to update land use plans, development policies, and zoning regulations for Princeton. The County wanted to make sure up to date sea level rise projections were taken into account within the planning process, and that the community understood this important context. The specific objectives for the Game of Floods – Princeton were to help participants:

- Develop better understanding of how sea level rise and coastal erosion will impact life in Princeton.
- Gain better understanding of policies and physical strategies that may help Princeton adapt to sea level rise.
- Understand the complexities and trade-offs of adaptation planning.

The Game of Floods – Princeton follows the typical adaptation planning process and uses a Princeton specific map-based gameboard and a role play format to help participants understand the issues from different perspectives. The gameboard illustrates Princeton infrastructure and sea level rise and storm surge inundation extents. A subset of Princeton assets (buildings, facilities, roads, natural resources) and stakeholders (such as a resident, business owner, harbormaster, surfer, elected official) were selected by the County for the purposes of game play. The participants are intentionally assigned a role that differs from their real live function.

Figure 1. Asset and Role Cards.

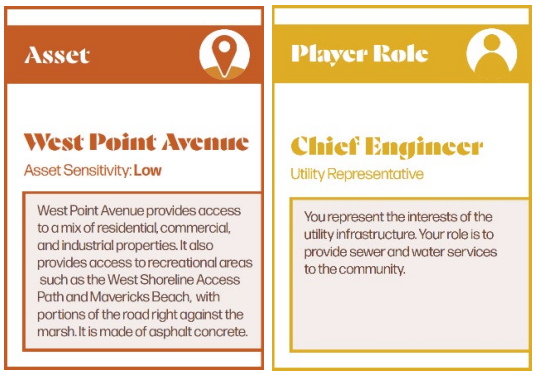
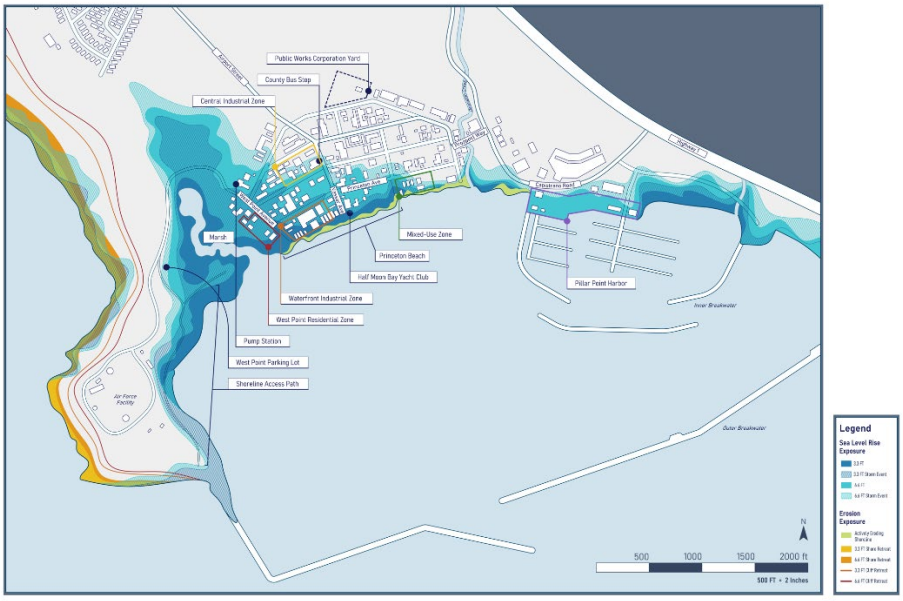


Figure 2. Gameboard



The gameboard shows two sea level rise exposure zones, each with storm surge from a 1% annual chance storm. The sea level rise amounts shown on the game board are for 3.3 and 6.6 feet, taken from USGS's Coastal Storm Modeling System data. These amounts were used for the game because they align with San Mateo County's Sea Level Rise Policy for County-Owned Assets and the County's 2018 Sea Level Rise Vulnerability Assessment. The data aligns with (but is not identical to) the projections from the State of California Sea Level Rise Guidance released in 2024 by the Ocean Protection Council. Teams were assigned one of two scenarios, relating to the projected timing of different amounts of sea level rise:

- Intermediate Scenario: sea levels may rise 3.3 feet by 2100, and 6.6 feet by 2150.
- High Scenario: sea levels may rise 3.3 feet by 2070, and 6.6 feet by 2100.

Teams were also allocated one of three budgets to mimic the restraints that may influence how adaptation planning will move forward in Princeton.

The steps for the Game of Floods are as follows:

1. Asset Inventory: The team selects assets that they consider to be important for the community to function.
2. Vulnerability Assessment: The team assigns exposure and sensitivity scores for the selected assets, looking at the time horizons for each sea level rise amount to understand which assets are most vulnerable. For the purposes of the game exposure + sensitivity = vulnerability.
3. Consequences Assessment: The team discusses and documents the potential social, economic and environmental consequences of temporary sea level rise for the selected assets in Princeton to understand if this alters their list of most vulnerable assets.
4. Adaptation Strategy Selection: The team selects a suite of adaptation strategies to protect and adapt the community to future sea level rise expected for 2100 while constrained to a set budget.

Outcomes from the Game of Floods

There were some intentional variations in how teams played the game, determined by different sea level rise scenarios and budgets. Three teams of approximately 8 participants played the game with the following variables:

- High sea level rise scenario and $50 million budget.
- High sea level rise scenario and $25 million budget.
- Intermediate sea level rise scenario and $5 million budget.

Asset Selection, Vulnerability and Consequence

A total of 19 assets were provided to the teams and illustrated on the game board and teams were asked to select 10 during the asset inventory. The full set of assets, descriptions, and sensitivity scores can be found in Appendix B: Asset Description and Sensitivity Scores. All teams commented initially on how hard it was to select assets as they considered all parts of the community infrastructure, including homes, to be important.

The following assets shown in Table 1 were selected by the three teams. Four assets were not selected by any team: the Airport Street Bus Stop, Public Works Corporation Yard, Prospect Way and the Central Industrial Zone. These assets were most likely not selected because of their location and lower risk of exposure to sea level rise hazards when compared to the rest of the assets. Princeton Avenue, West Point Avenue, the Princeton Pump Station, West Point Avenue Residential Zone, and the Waterfront Industrial Zone were selected by all three teams, and they are all at risk of flood exposure with 3.3 feet of sea level rise.

Table 1. Selected Assets.

Asset	No. of times selected
Princeton Avenue	3
West Point Avenue	3
Princeton Pump Station	3
West Point Avenue Residential Zone	3
Waterfront Industrial Zone	3
Marsh	2
Princeton Beach	2
Pillar Point Harbor	2
Princeton Columbia Mixed-Use Zone	2
Airport St/Vassar Ave	1
Capistrano Road	1
Highway 1	1
Half Moon Bay Yacht Club	1
West Point Parking Lot	1
West Shoreline Access Path	1
Groundwater (New Asset)	1

Some participants were business owners and advocated for businesses in the Princeton/Columbia Mixed-Use Zone and the Waterfront Industrial Zone to be included, while others stressed the importance of selecting roadways for mobility and emergency access. Multiple teams noted that the Yacht Club was an important community asset, however it could be easily moved out of the exposure zone, so it was not of great concern. Other important community assets discussed were Princeton Beach and the Marsh, both providing waterfront access and recreational benefits. Groundwater was proposed as a new asset to include. The team proposing this emphasized the importance of groundwater in providing water to the Princeton community, as well as the associated consequences of saltwater intrusion.

ADAPTATION STRATEGY SELECTION

Participants were asked to think about what adaptation strategies they might need for the 2100 sea level rise timeframe which meant 3.3 feet for the 'Intermediate' scenario team, and 6.6 feet for the 'High' scenario team. This changed what assets would be vulnerable for each team. The assigned budget was the other main constraint for teams in selecting adaptation strategies.

The full suite of adaptations strategies offered to the teams are shown in Table 1 and strategy cards were provided with more information about each one including pros, cons and costs.

It was recommended that participants considered the strategy types in the following order:

1) Realign / Policy Strategies:
    a. Help ensure that over time assets can move out of harm's way
    b. Need to get in place early

    c. Lower cost and big impact
2) Accommodate / Asset-Specific Strategies:
    a. Help protect existing structures against periodic storm surge in the short-term before the onset of permanent inundation
    b. Lower cost
3) Protect / Constructed Strategies:
    a. Take time to consult, design, permit and fund
    b. Feasibility depends on existing shoreline type
    c. May require extensive ongoing maintenance
    d. May negatively impact habitat or other parts of the shoreline
    e. More expensive

Table 2. Adaptation Strategies provided in the Game of Floods

Strategy Type	**Adaptation Strategy**
Policy	Update Land Use Regulations
Policy	Resilient Development Standards
Policy	Acquisition and Buyout Programs
Policy	Transfer of Development Rights
Asset-Specific	Structure Elevation
Asset-Specific	Structure Floodproofing
Asset-Specific	Structure Relocation
Protect	Riprap Revetment
Protect	Seawall
Protect	Raising Inner Breakwaters
Protect	Raising Outer Breakwaters
Protect	New Breakwater
Protect	Elevated Roadway
Protect	Beach Nourishment
Protect	Dune Restoration and Management
Protect	Traditional Levee

Information on which strategies participants selected are briefly noted below, with the full set of strategies selected by team provided in Appendix A. Further discussion on the strategies is provided in section 3.

Policy Strategies
All teams discussed the need for adjusting and relocating development in the areas at risk of future permanent sea level rise inundation. All three teams selected resilient development standards and two selected land use regulations, showing support for policy implementation as a strategy for regional resilience to sea level rise hazards. One team also chose to include transfer of development rights and acquisition and buyout programs. Two teams did not choose transfer of development rights or acquisition and buyout programs partly because of uncertainty on how the policies would work out and also because of the high potential associated costs for the owner. There were robust discussions within the teams about new policies due to their experience of existing regulations slowing development and raising costs for property owners, although all teams ultimately agreed to include at least one policy strategy in their plan. Some participants were not supportive of buyouts because of previous experiences they had heard about where promised benefits never materialized.

Accommodate Strategies
Two teams chose to relocate the pump station out of the sea level rise exposure zone, with one bumping up the cost to $10,000,000 because they knew it would cost more than the estimated cost provided. Two teams focused on floodproofing structures in the Princeton/Columbia Mixed-Use Zone partly because they had personal connections to the zone and because it is in a highly exposed area on the waterfront. One team opted to create a grant fund from their overall budget to support owners in floodproofing their buildings.

Infrastructure Strategies
All teams included strategies to protect the waterfront which would reduce flooding further inland while maintaining recreational benefits. The strategies selected were dune restoration and management, a levee with the coastal trail, beach nourishment, a new perpendicular breakwater, and dredging program. Other selected strategies to protect the shoreline were raising the outer breakwater and enhancing the marsh. It is important to note that these two strategies mainly protect against temporary flooding, not permanent sea level rise. A few participants advocated to plan for retreat around the marsh so they could allow it to migrate naturally with permanent sea level rise. Participants felt that preserving access to the waterfront and the marsh would attract visitors and benefit local businesses.

Table 3. Selected Strategies in Community Workshop

Strategy Type	Strategy	No. of times used	Repeated protected assets
Policy	Resilient Development Standards	3	
Policy	Update Land Use Regulations	2	
Policy	Transfer of Development Rights	1	
Policy	Acquisition and Buyout Program	1	
Asset-Specific	Structure Relocation	2	Pump Station
Asset-Specific	Structure Floodproofing	2	Princeton/Columbia Mixed-Use Zone
Protect	Dune Restoration and Management	3	
Protect	Levee with Coastal Trail	1	
Protect	Beach Nourishment	1	
Protect	New Perpendicular Breakwater* (Swirl Stopper Wall, 500 ft. long)	1	
Protect	New Dredging Program and Dock*	1	
Protect	Raising Outer Breakwater	1	
Protect	Marsh Enhancement	1	

Structure elevation, riprap revetment, seawall, raising inner breakwaters, and elevated roadway were not selected by any of the teams. Participants considered elevating roadways, however decided against selecting it due to potential utility impacts and associated high costs. Overall, participants selected policies, asset-specific strategies, and more hybrid/nature-based solutions than traditional gray infrastructure strategies in the context of this game. They noted the long-term benefits of updating regulations and development standards, and that costs and regular maintenance had a large role in what physical strategies were selected.

***Additional Strategy Options**

New adaptation strategies were developed during the game by participants; one team created a dredging program with a dock and a perpendicular inner breakwater called the “swirl stopper”. These strategies were developed in part because of the technical knowledge of certain stakeholders on the team. The new dredging program was considered a “win-win” because it is already a need for current boat navigation and could be used to nourish Princeton beach. The new inner breakwater was proposed to address erosion and help provide protection to the western segment of the shoreline.

3. Additional Community Feedback on Adaptation Planning for Princeton

Many participants have already experienced impacts from past tsunamis and storms and are aware of the vulnerability in the area. They recalled previous renovations or new builds that contained more resilient design features, including structure elevation and the placement of more riprap. While the area is prone to these vulnerabilities, all teams expressed a commitment to protecting and reinforcing the waterfront to safeguard the inland areas of Princeton outside of the game. There were many comments on the local conditions in the community. For example, a participant stated that the pump station is currently being updated and will have greater protection against flooding but that may not matter because it is connected to the sewer force main system which still needs to be updated. Other vulnerabilities were mentioned in relation to the waterfront structures, where many have aging foundations and rebar and will require updating in the near future. Participants also noted that local sediment supply can be harnessed as it builds within the breakwaters, and there is a constant supply from the bluffs eroding.

Some participants questioned the feasibility of strategies relating to costs, permitting issues, potential development areas, and airport overlay restrictions. Given the uncertain and increasing nature of sea level rise, some participants felt current permitting and regulations will need to change over time and should be considered when the County is developing adaptation strategies. One team felt like there were already enough permitting and building requirements that slowed down development in the area and wanted to focus on fixing those issues now rather than future ones. During this conversation, some participants highlighted that more regulations to require floodproofing would increase costs for residents when existing regulations already make it expensive to complete improvements. These participants want the ability to decide their own flood risk level for their properties because they would prefer to take on more risk in exchange for less regulations. However, some felt that floodproofing or resilient design will increase the property value in the future which may encourage homeowners to do it.

Participants discussed the need to secure political and social buy-in for certain strategies and to connect with the local community for their input, in addition to the game-play workshop. Participants want their input to shape Plan Princeton efforts and would like more engagement before the final plan is set. Some felt like the workshop did not capture their real opinion because they were playing their given role in the game.

One vulnerability of potentially high consequence highlighted in the game was saltwater intrusion in the underground springs and water wells serving some parts of the Princeton community. This should be considered, along with the aging underground sewer and stormwater utilities as part of adaptation planning for Princeton.

Although managed retreat was not listed as a strategy, multiple groups discussed and supported retreating from the inundated areas on the gameboard. Many participants said that protecting the shoreline was paramount to the community and could also offer protection to inland areas

from flooding. Some participants concluded the game with the notion that they would have to retreat or “give up” certain areas because of the costs and regular maintenance required for protecting the areas with greatest vulnerability to sea level rise. These are very valuable discussions because they contrast with previous community feedback from Plan Princeton conducted in 2013 where members said they did not want any change.

4. Lessons Learned about Game Play

Place-based Game Board and Role Cards

A key concept for the success of the Game of Floods is the ability for participants to adopt a different persona, to enable them to understand the perspectives of different parts of the community. This is difficult when the game board is designed for a place that you know intimately, and you have strong opinions about specific assets and functions. This issue is enhanced for a place the size of Princeton where individual building footprints can be seen on the map. If one of the objectives of the game is to collect community input on potential strategies, participants want to provide information from their own perspective not that of their assigned role.

If the game is to be used for capacity building, it is suggested that building footprints are not shown, but more generalized areas are symbolized instead. A location-specific board may work better for a larger geographic area than Princeton, where it isn't possible to be so fine-grained.

If the game is to be used for collecting specific community feedback about strategies, then the role-playing aspect of the game may need to be removed or there needs to be a way for participants to express their personal views as well as those of the character they are assuming and for both of those viewpoints to be recorded. (It is likely to be challenging for anyone to do both at the same time.)

Other concerns were raised regarding the game play as being exclusionary, as it involves removing specific assets rather than considering a comprehensive review and plan for the whole area. Groundwater rise could be illustrated as an additional sea level rise hazard on the game board; however, game play and materials (including researching new adaptation strategies) will need to be revised and this would considerably add to the complexity of gameplay. It is advised, however, that it is more clearly stated to participants upfront where factors have been removed to simplify the game.

Asset Cards

Some participants struggled with the 'Zones' that were created for the purposes of the game, because they were overgeneralized (e.g., one of the asset 'industrial zones' contains residential properties). This is a challenge when creating generalized game pieces for a real place. They also felt like the cost or value of certain assets should be considered when selecting assets in the asset inventory exercise. It was clear that language was important for participants when selecting assets and assessing their vulnerability and consequences. When selecting assets, it wasn't clear whether they should default choose what asset was listed on their role card or what they (as individuals) deemed as priority assets. When running the game, participants wanted clear and concise language from the facilitators during the asset inventory, vulnerability, and consequence assessments. Terms such as priority, risk, vulnerability were used interchangeably, making the game challenging for one participant.

Budgets

The team given $5 million dollars as their budget felt too constrained in the activity and quickly allocated their budget to a couple of the policy and asset specific strategies. To keep them engaged in the game, they were given a 'surprise' $40 million dollar grant that the County had just successfully received. This was a successful technique as it reengaged the team and enabled them to think about some of the 'protect' strategies, while reenforcing how important lower cost policy strategies are to consider in the first instance. The game could be played with all teams having larger budgets or 'surprise' grants being allocated to the team with the lowest budget.

Strategy Development

Some teams felt that it was difficult to plan for 2100 and wanted to build adaptation pathways. One team selected protection strategies for the next 30 years then planned to re-evaluate them later when more information was available. Providing strategy costs for protection to 3.3 feet and 6.6 feet of sea level rise helped aid this conversation and pushed participants to consider these adaptation pathways. Certain assets such as the County Bus Stop and Half Moon Bay Yacht Club were called out as assets easy to relocate but did not make it on the strategy selection list. When developing strategies, teams were inclined towards designing strategies that protected the waterfront or focused on assets with the highest exposure or with the most critical functions. One team felt short on time with strategy selection because they wanted to focus on discussing the existing issues they had as property owners.

Scribe Role

During the game play, it became evident that the role of the scribe was demanding, with some scribes attempting to complete the forms individually. Encouraging more participants to engage in this writing exercise could enhance involvement, with the facilitator guiding the team's attention to the task. Some responses were incomplete or incorrect, highlighting the need for the entire team to collaboratively fill out and review the scores and board. Specifically, most teams did not explicitly connect strategies back to the assets previously selected as part of their inventory.

5. RECOMMENDATIONS

We recommend that more engagement is conducted with the community before the finalization of the next Plan Princeton update. Many attendees wanted to provide more feedback both on sea level rise strategies as themselves (rather than their assigned game role) and on other Plan Princeton items such as transportation.

The lessons learned on game play should be reviewed and implemented as deemed appropriate if repeated for other areas in San Mateo County.

Other hazards like extreme heat could also be included in future iterations of the game for a more comprehensive review of climate impacts (see the Urban Sustainability Directors Network Game of Extremes as a guide. More information about it can be found here: https://www.usdn.org/projects/climate-trainings.html).

APPENDICES

APPENDIX A: GAME WORKSHEET RESULTS

Table 4. Team 1 Asset Tracking.

	Asset Inventory			Vulnerability Assessment				Consequences Assessment	
	Asset	**Sea Level Rise Exposure**	**Exposure Time Horizon**	**Sea Level Rise Exposure Score**	**Sensitivity Score**	**Total Score (E+S)**	**Ranking (1 to 10)**	**Potential Consequences**	**Ranking (1 to 10)**
1	Princeton Pump Station	6.6	2100	3	5	8	2	Environmental, economic, social, health, tourism	
2	Princeton Beach	3.3	2070	5	3	8	2	Public access, boat access	
3	Capistrano Road	6.6	2100	2	1	3	5	Access, traffic	
4	West Point Avenue	3.3	2070	5	1	6	3	Beach access, housing access	
5	HMB Yacht Club	3.3	2070	5	3	8	2	Beach access, boat access, gathering area	
6	Marsh	3.3	2070	5	1	6	3	Environmental habitat	
7	Harbor	6.6	2100	3	3	6	3	Pier facilities, boat access	
8	Princeton Avenue	3.3	2070	4	1	5	4	Business access, coastal trail, economic	
9	West Point Avenue Residential	3.3	2070	5	5	10	1	Residential impacts	
10	Waterfront Industrial Zone	3.3	2070	5	3	8	2	Environmental, employment, residential	

Table 5. Team 1 Adaptation Strategy Selection.

	Strategy Type	Adaptation Strategy	Asset(s) Protected	Quantity	Cost/Quantify (from card)	Cost
1	Policy	Transfer of Development Rights				$100,000.00
2	Policy	Resilient Building Standards				$250,000.00
3	Asset-Specific	Structure Relocation	Pump Station			$200,000.00
4	Asset-Specific	Structure Floodproofing	Residential Zone		20,000/house	
5	Protect	Dune Restoration	Waterfront Industrial Zone, HMB Yacht Club, Mixed Use Zone	2000	6000/ft	$12,000,000.00
6	Protect	Levee with Coastal Trail	on Keith's Corner Lot			$5,000,000.00
Total Cost						$17,550,000.00

Table 6. Team 2 Asset Tracking.

	Asset Inventory			Vulnerability Assessment				Consequences Assessment	
	Asset	**Sea Level Rise Exposure**	**Exposure Time Horizon**	**Sea Level Rise Exposure Score**	**Sensitivity Score**	**Total Score (E+S)**	**Ranking (1 to 10)** *Low - High*	**Potential Consequences**	**Ranking (1 to 10)**
1	Princeton Avenue	3.3 ft	2070	5 (+)	1	6	1	Temporary closure of Princeton Avenue due to ponding on roadway; delayed emergency services; higher long-term maintenance costs	
2	West Point Ave	3.3	2070	5	1	6	1		
3	West Shoreline Access Path	3.3	2070	5	3	8	2		
4	West Point Residential Zone	3.3	2070	5	5	10	3		
5	Princeton Columbia Mixed Use Zone	3.3	2070	5	5	10	3		
6	West Point Parking Lot	6.6	2150	3	3	6	1		
7	Princeton Beach	3.3	2100	5	3	8	2		
8	Waterfront Industrial Zone	3.3	2100	5	3	8	2		
9	Pillar Point Harbor	6.6	2150	3	3	6	1		
10	Princeton Pump Station	6.6	2150	3	5	8	2		

Table 7. Team 2 Adaptation Strategy Selection.

	Strategy Type	Adaptation Strategy	Asset(s) Protected	Quantity	Cost/Quantify (from card)	Cost
1	Policy	Update Land Use Regulations				$250,000.00
2	Policy	Resilient Design Standards				$250,000.00
3	Policy	Property Acquisitions				
4	Protect	Engineered Dunes				$12,000,000.00
5	Protect	Beach Nourishment				$8,000,000.00
6	Protect	Swirl Stopper Wall (provides fish habitat)		500 ft		$3,000,000.00
7	Protect	Dredge and Dock				$21,000,000.00
Total Cost						$44,500,000.00

Table 8. Team 3 Asset Tracking.

	Asset Inventory			Vulnerability Assessment				Consequences Assessment	
	Asset	**Sea Level Rise Exposure**	**Exposure Time Horizon**	**Sea Level Rise Exposure Score**	**Sensitivity Score**	**Total Score (E+S)**	**Ranking (1 to 10)**	**Potential Consequences**	**Ranking (1 to 10)**
1	Princeton Avenue	3.3 ft	2070	4	1	5		Temporary closure of Princeton Avenue due to ponding on roadway; delayed emergency services; higher long-term maintenance costs	
2	Princeton Pump Station	3.3 ft	2070	5	5	10		Potential loss of sewage conveyance, risk of system overflow posing public health and drinking water impacts	
3	Marsh	3.3 ft	2070	5	3	8		habitat impacts, reduction of ecosystem services provided by the marsh (e.g. natural filtration), impacts to public access to recreation	
4	Mixed Use Zone	3.3 ft	2070	5	5	10		potential loss of use (mix of temporary and permanent)	
5	Airport St/Vassar Ave	6.6	2100	3	1	4		potential impacts to access/egress for community (1 of 2 egress routes)	
6	West Point Ave	3.3/6.6	2070	4	1	5		temporary closure during storms, loss of access to marsh and air force facility	
7	Groundwater (New Asset)	3.3	2070	5	5	10		potential permanent impacts to groundwater that services public and private utility wells, may result in need to expand public utility services ($$$)	
8	Waterfront Industrial Zone	3.3	2070	5	5	10			
9	Highway 1	3.3	2070	5	1	6			
10	West Point Residential Zone	3.3	2070	5	5	10			

Table 9. Team 3 Adaptation Strategy Selection.

	Strategy Type	Adaptation Strategy	Asset(s) Protected	Quantity	Cost/Quantify (from card)	Cost
1	Policy	Resilient Development Standards		1		$250,000.00
2	Policy	Land Use Regulations		1		$250,000.00
3	Policy					
4	Policy					
5	Asset-Specific	Structure Relocation	Pump Station	1	200,000	$10,000,000.00
6	Asset-Specific	Raising Outer Breakwater (w/ USACE)				$20,000,000.00
7	Protect	Marsh Enhancement		20 acres	20 ac	$1,000,000.00
8	Protect	Dune Restoration and Management	Princeton Beach, Mixed Use Zone, Yacht Club, Waterfront Industrial		3,000/lf 2,500/ lf	$7,500,000.00
9	Protect	Floodproofing	Mixed	50	50/structure	$1,000,000.00
Total Cost						$40,000,000.00

Figure 3. Pictures from Workshop

APPENDIX B: ASSET DESCRIPTION AND SENSITIVITY SCORES

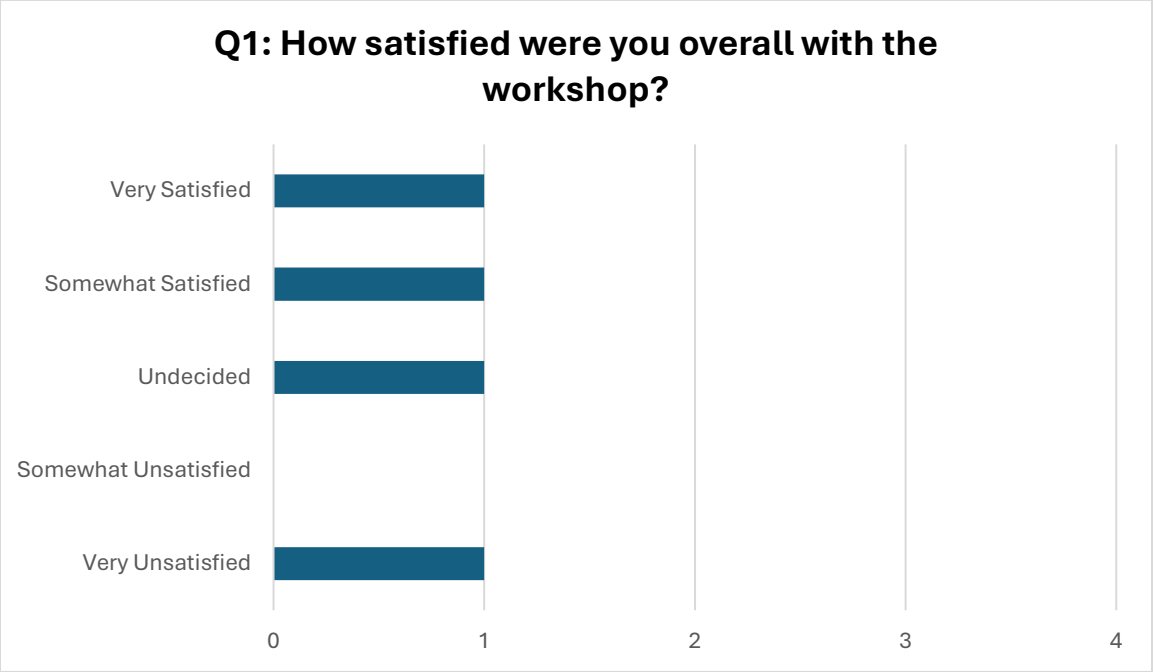
Asset	Asset Description	Sensitivity	Scoring Justification
Central Industrial Zone	This industrial zone is on Harvard Avenue. The buildings are typically a mix of masonry or steel. The businesses on the properties supply automobile services and wholesale fish. There may be a large amount of uncovered materials that could cause environmental impacts when flooded.	Medium (3)	Masonry and steel are more resistant to flooding, however substantial impacts would be felt. Function will be impacted as businesses cannot run and equipment potentially broken/ stock ruined due to flood exposure.
Waterfront Industrial Zone	This industrial zone is along Princeton Avenue by West Point Avenue, made up of various local businesses. The buildings are typically made of steel. The materials stored in some of these businesses may be ruined from flood exposure and cause environmental contamination.	Medium (3)	Steel is more resistant to flooding, however substantial impacts would be felt. Function will be impacted as businesses cannot run and equipment potentially broken and fertilizers ruined due to flood exposure.
West Point Avenue Residential Zone	The single-family homes on West Point Avenue are typically made of wood. One of the homes was built in 1908. They have crawl foundations which can trap floodwaters.	High (5)	Wood is less resistant to flooding and flooding could irreversibly damage the homes. Residences with older materials may have a permanent loss of function.
Princeton/ Columbia Mixed-Use Zone	The mixed-use zone is on Princeton Avenue from Columbia to Broadway, with a mix of homes and businesses. The buildings are typically made of wood, one of the homes was built in 1940 and an Inn was built in 1996. Some of the buildings appear to be raised.	High (5)	Wood is less resistant to flooding and flooding could irreversibly damage businesses and homes.
Pillar Point Harbor	The harbor is the home port to a vital commercial fishing industry, to sport fishermen, and to pleasure boaters. The Harbor has 369 berths and is currently protected by an inner and outer breakwater. The Pillar Point Harbormaster's office building was constructed in 1972 and is made of steel.	Medium (3)	The steel building material is more resistant to flooding but it could still cause substantial damage and limit the operations of the harbor. The boats and pier are more resistant to storms because of the breakwaters.
Highway 1	Highway 1 connects Princeton to the larger coastal region. It is made of asphalt concrete and is highly trafficked.	Low (1)	The highway, made of asphalt, is resistant to flood damage, however it disrupts the function when flooded. It does not usually require repairs after floodwaters recede.
Marsh	The marsh is a popular open space, providing critical habitat for local plants and animals. It contains multiple sensitive species including the California red-legged frog. It also provides flood and storm protection.	Not Sensitive (0)	Marshes are resistant to flooding and storms. There may be some ecological impact to the sediment in a storm but overall, the function is not impacted greatly.
Princeton Beach	Princeton Beach is a popular recreation area for residents and tourists. Unfortunately, it is	Medium (3)	The beach has a medium sensitivity because it is prone to changes and is already facing erosion. Function as a

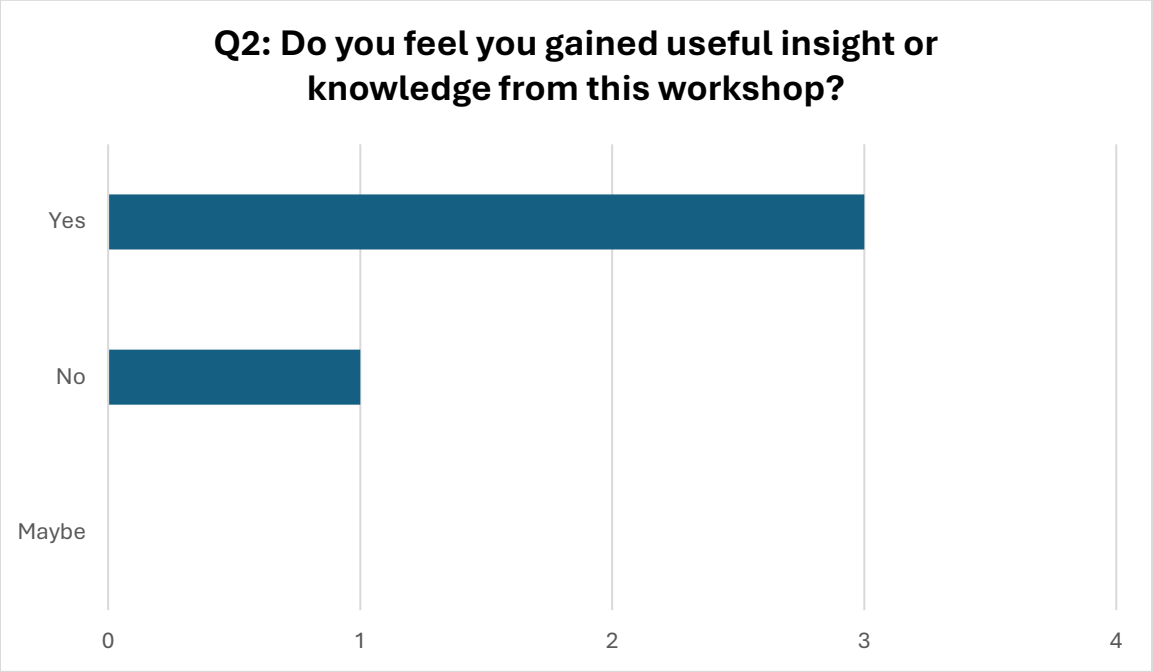
	currently eroding, and the width of the beach is reducing.		recreational area will be disrupted with floodwaters, and further erosion may cause permanent loss of function.
West Shoreline Access Path	The West Shoreline Access Path is a popular recreation area for residents and tourists. It is more prone to flood and erosion impacts because it is made of sand and gravel. A recent dune restoration project aims to provide flood and storm protection.	Medium (3)	The shoreline access path is made of gravel/sand which makes it more prone to substantial changes. Function as a recreational area will be disrupted with floodwaters, and erosion may cause permanent loss of function.
Airport Street / Vassar Avenue	Airport Street and Vassar Avenue connect Princeton to Highway 1 and serve as one of only two accessways into Princeton. It is made of asphalt concrete.	Low (1)	The roadway, made of asphalt, is resistant to flood damage, however it disrupts the function when flooded. It does not usually require repairs after floodwaters recede.
Capistrano Road	Capistrano Road connects Princeton to Highway 1. It is made of asphalt concrete.	Low (1)	The roadway, made of asphalt, is resistant to flood damage, however it disrupts the function when flooded. It does not usually require repairs after floodwaters recede.
Prospect Way	Prospect Way connects Princeton to Highway 1 and serves as one of only two accessways into Princeton. It crosses over Denniston Creek. It is made of asphalt concrete.	Low (1)	The roadway, made of asphalt, is resistant to flood damage, however it disrupts the function when flooded. It does not usually require repairs after floodwaters recede.
West Point Avenue	West Point Avenue provides access to a mix of residential, commercial, and industrial properties. It also provides access to recreational areas such as the West Shoreline Access Path and Mavericks Beach, with portions of the road right against the marsh. It is made of asphalt concrete.	Low (1)	The roadway, made of asphalt, is resistant to flood damage, however it disrupts the function when flooded. It does not usually require repairs after floodwaters recede.
Princeton Avenue	Princeton Avenue is the closest road to the shoreline. The road provides access to a mix of residential, office, vacant, and industrial properties, and to the crossing street ends that provide access to Princeton beach. It is made of asphalt concrete.	Low (1)	The roadway, made of asphalt, is resistant to flood damage, however it disrupts the function when flooded. It does not usually require repairs after floodwaters recede.
Princeton Pump Station	The Princeton Pump Station was originally built in the 1950s. The station pumps wastewater from the Princeton community to the wastewater treatment plant in Half Moon Bay. The station has not been upgraded in more than 40 years and has exceeded its useful life. It contains electrical components that need replacement.	High (5)	The pump station is old and has electrical components so flooding could cause permanent damage and loss of function.
West Point Parking Lot	The West Point Parking Lot provides access to the West Shoreline Access Path and Mavericks Beach. It is more prone to flood and erosion impacts because it is made of sand and gravel.	Medium (3)	The lot is made of gravel/sand which makes it more prone to substantial changes. Function as a parking lot for recreation will be disrupted with

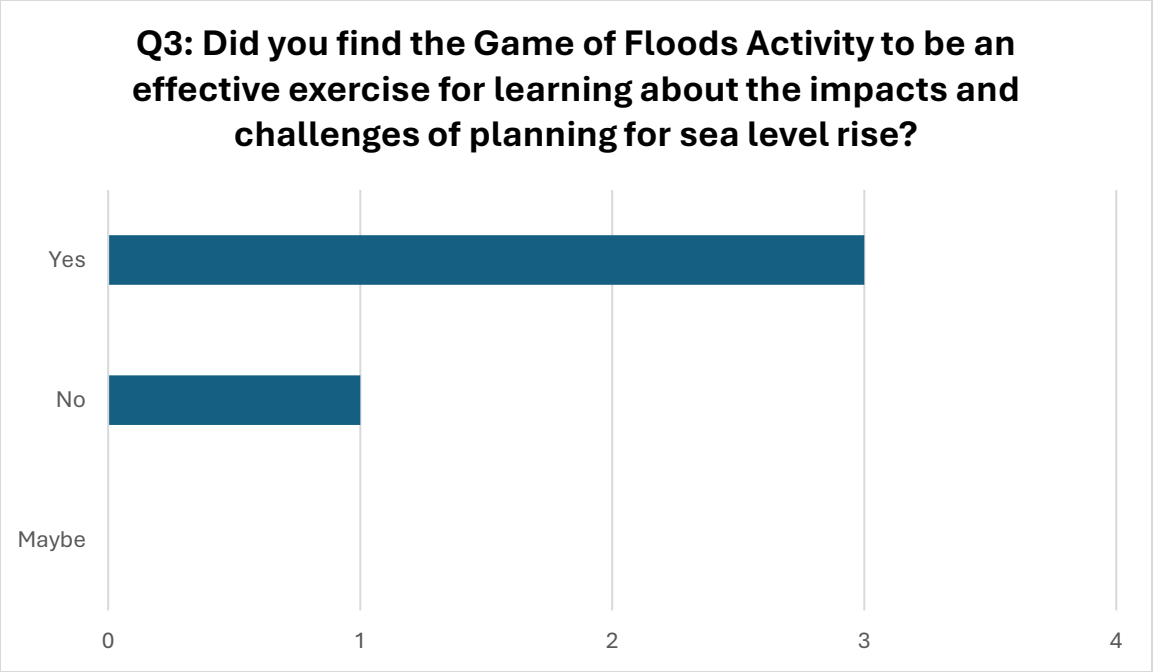
			floodwaters, and erosion may cause permanent loss of function.
Airport Street Bus Stop	The Airport Street Bus Stop is part of the regional bus service network. It does not have any infrastructure.	Low (1)	The bus stop function is somewhat limited when flooded, although there are no impacts to existing bus stop infrastructure since there is none. It would not require substantial repairs after floodwaters recede.
Public Works Corporation Yard	The Public Works Corporation Yard is a central county facility for storing equipment, vehicles, and other materials. It is important in maintaining county infrastructure and public spaces and serves as a County fuel station.	Medium (3)	The corporation yard may have substantial damage and disruption during floodwaters but not have lasting loss of function.
Half Moon Bay Yacht Club	The Half Moon Bay Yacht Club is a popular institution for the boating community. It is made of concrete. The Club's facility was expanded in 2009 with construction of the Event Center. It is right on the shoreline with an eroding, sandy beach.	Medium (3)	The yacht club is made of concrete which is more flood resistant than wood. Flooding may cause substantial damage and disrupt the function but has reversible changes.

APPENDIX C: WORKSHOP SURVEY FEEDBACK

Following the workshop, the County sent out a survey on November 5, 2024 to the email addresses from the workshop attendance sign-in log to solicit feedback on the workshop. The survey posed 6 questions and as of the publishing of this report has received 4 responses. The questions and feedback are provided below.







Survey responses to the following questions are summarized.

Q4: What could have been improved about the workshop?

The County received feedback that the presentations were fine, but some participants were under the impression that more information about Plan Princeton would be provided. Survey respondents noted that the game was a creative way to lay out potential solutions and that it was nice to have a group of knowledgeable specialists on the subject to answer questions. For participants that are familiar with Princeton, it was hard to let go of discrepancies between the game and reality (such as a "residential zone" in Princeton). It was also felt that there was too much information to learn at the workshop in order to participate in the game in a meaningful way. Suggested opportunities for game improvement include:

- Providing the materials in advance for participants to study and prepare.
- More venue room and table space so teams can communicate with team members in normal speaking voices, and for the recorder/scribe to take down notes (or smaller worksheets could make up for the lack of free table space).
- More visible and legible sizing of the game board and labels so all members can read, from any seated direction.
- Avoid having to scatter playing cards across the gameboard as it covers up the gameboard and makes it harder for some members to reach and read. A different table layout may help, such as a U-shaped table/seating layout with the group facing a screen.

Q5: What questions, concerns, and/or ideas do you have about addressing Sea Level Rise in Plan Princeton?

Survey feedback confirmed the workshop provided a venue for constructive discussions and idea sharing. There was concern that the plan needs to balance the environment and vested property owners' needs. Interest was raised in the WRDA status that the Harbor District is working on related to partnering with the US Army Core to look at Princeton shoreline protection solutions. There is also interest in gathering business and property owners in Princeton to discuss sea level rise as the people that work and live in Princeton best know the area.

Q6: Do you have any additional feedback or comments on the workshop or workshop topics covered?

Survey responders found the workshop to be informative and the Game of Floods fun to play. It was suggested that there are some stakeholder groups that may be interested to play the game, such as the Half Moon Bay Yacht Club and the Midcoast Community Council. A few concerns raised were ensuring all voices and perspectives from the community are heard and considered, including Princeton property owners, and making sure priorities are clear and focused on protecting the shoreline.

APPENDIX D: FREQUENTLY ASKED QUESTIONS

This section states questions raised by participants during the Plan Princeton workshop. These should be taken into consideration during the planning process.

1. **How can the natural water springs and wells be protected?**
   Sea level rise will cause shallow groundwater to rise and could result in saltwater intrusion to the freshwater aquifer, which in turn can change natural water sources and infrastructure such as water wells in the area. Our Coast, Our Future offers an interactive online sea level rise mapping tool that includes a groundwater rise layer. The County is considering these impacts as we look at sea level rise planning for Plan Princeton and will look into any efforts underway, or opportunities to coordinate with, the local water purveyors to ensure safe drinking water sources are protected and maintained. Additionally, guidance and/or efforts for addressing these issues are provided in OneShoreline's Planning Policy Guidance and the County Sustainability Department's 2018 Sea Level Rise Vulnerability Assessment.

2. **How could a Transfer of Development Rights program work in Princeton? And how would it work with many property owners?**
   The specific details of a Transfer of Development Rights program in Princeton would have to be determined in a follow up planning process and would be shaped by public input and would have to be adapted to Princeton's local needs and considerations. More information about Transfer of Development Rights program in general are available from the Georgetown Climate Center.

3. **What and where are the development restrictions in Princeton?**
   The San Mateo County Zoning Ordinance is the main regulatory tool used to implement the policies established in the General Plan and Local Coastal Program that guide development in Princeton. A majority of the Plan Princeton Planning Area is comprised of two zoning districts, Waterfront (W) Zoning and Coastside Commercial Recreation (CCR) Zoning. Additionally, an Airport Overlay (A-O) district combines with a geographic portion of the W zone that aligns with the previous 1996 San Mateo County Comprehensive Airport Land Use Plan. Other zoning districts in the Princeton Planning Area include Light Industrial (M-1), Limited Highway Frontage (H-1), One-Family Residential (R-1), Planned Agricultural District (PAD), and Resource Management-Coastal Zone (RM-CZ). A Planning Area zoning map can be found here: Existing Planning Area Zoning Map or parcel specific zoning can be found using the online Planning GIS tool.

4. **How does the Half Moon Bay airport regulations and zones affect development restrictions?**
   The Half Moon Bay Airport Land Use Compatibility Plan (ALUCP) sets controls on land use and development standards limiting the intensity of use that ensure safe and efficient airport and flight operations and minimize the public's exposure to

excessive noise and safety hazards within the airport's vicinity. The entire Plan Princeton Planning Area is within the Airport Influence Area (AIA) of the Half Moon Bay Airport and portions of the Planning Area are within five of the six runway safety zones established under the ALUCP. The ALUCP sets limitations on maximum density, intensity, and prohibited land uses within each safety zone, and include requirements for the percentage of each safety zone that must be maintained as open land. While the ALUCP does not designate land uses, local land use policies and zoning regulations must maintain consistency with the ALUCP.

5. **How will land values change over time? How will that impact future development?**
   It is not within the scope of Plan Princeton to analyze or comment on how land values might change over time due to sea level rise. However, potential impacts to land values are one of the factors that will be considered as future sea level rise regulations are developed.

6. **Could you repurpose the agricultural land to retreat from the shoreline?**
   The County will consider locations within the Planning Area that could support the relocation of development (or intensification of development) away from the shoreline, including agricultural land. However, emphasis is likely to be on lands not designated for agriculture as a majority of the agricultural land within the Planning Area is designated as prime agricultural land which is a priority resource under the State Coastal Act and therefore could be challenging to convert to non-agricultural uses.

7. **Could permitting and regulations change over time with increasing flood risk?**
   Yes, this is a strategy the County will consider for Plan Princeton and other sea level rise planning efforts. This kind of strategy is often called phased adaptation or adaptation pathways, which are "sequences of adaptation actions that can be implemented progressively in response to the unfolding impacts of sea level rise over time…Adaptation pathways can include triggers, or thresholds of impacts, after which future phases of adaptation or adaptation planning will be implemented."[1] The development of adaptation pathways is a strategy that the Coastal Commission encourages local government to consider while planning for sea level rise.

8. **How realistic is dredging sand consistently?**
   The San Mateo County Harbor District periodically dredges sediment from the inner (Pillar Point) harbor to maintain navigable waterway for water vessels. Dredging efforts provide an opportunity for the beneficial reuse of sediment as beach nourishment. The feasibility for consistent dredging of the harbor would be determined by the Harbor District.

[1] https://documents.coastal.ca.gov/assets/slr/guidance/2024/2024AdoptedSLRPolicyGuidanceUpdate.pdf

9. **Would a tide gate work?**
   If a tide gate was installed between the outer breakwaters, it can cause water quality issues in the bay. It would require a pump to reduce the risk of poor water quality and would only protect against storm and wave impacts not permanent sea level rise.

10. **Is political support or social buy-in being considered in this game or in the Plan?**
    It is not currently part of the game play. The draft Plan will be presented to the community to garner feedback and support. It will be presented to the Planning Commission for recommendation to the Board of Supervisors and will ultimately have to be adopted by the Board of Supervisors and then certified by the California Coastal Commission to take effect. All of which is dependent on the support and buy-in of the community-at-large.

11. **How does this game relate to Plan Princeton?**
    This game is an interactive exercise that boosts the capacity and understanding of vulnerabilities to sea level rise in Princeton. Discussions during the game will help inform development policies that will be incorporated into Plan Princeton.

12. **What are the next steps in Plan Princeton?**
    County staff will use feedback from the workshop to update the Plan's development policies to address sea level rise. We anticipate being ready to share this work with the community towards the end of January/early February 2025. Following community feedback on these draft policies, we would expect to have a draft of Plan Princeton available in Spring 2025 in preparation for consideration and adoption by the Airport Land Use Commission, Planning Commission and Board of Supervisors, and subsequent certification by the California Coastal Commission.