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Stakeholder Analysis Related to Sea Level Rise Adaptation and Planning for the Eureka-Arcata 101 Corridor

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ESM 475 Senior Planning Practicum

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LIST OF ACRONYMS/TERMS

Abbreviation	Explanation
CAIP	Comprehensive Adaptation and Implementation Plan
CA CC	California Coastal Commission
CDP	Coastal Development Permit
CONS	Planning Consultants
Highway 101 Corridor	Eureka- Arcata US Highway 101 Corridor
ESA	Endangered Species Act
IRB	Institutional Review Board
LGOV	Local Government
MSA	Magnuson- Stevens Fishery Management and Conservation Act
NEC	Northcoast Environmental Center
NGO	Non-Governmental Organization
SIP	Shelter-in-Place
SLR	Sea Level Rise

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1. Introduction & Report Purpose

The Eureka – Arcata US Highway 101 Corridor (hereafter: 101 Corridor) is a six-mile stretch of highway within the coastal zone that runs along the east side of Humboldt Bay from the Eureka Slough Bridge in Eureka to the Samoa Boulevard overpass in Arcata. This is a critical piece of transportation infrastructure for residents of Humboldt County, CA as it is the only major highway that connects the southern portion of the county with the northern portion – and connects major economic hubs in the county in the McKinleyville-Arcata area with other hubs in Eureka and Fortuna. Recent research reveals that this low-lying stretch of highway is also at risk from future sea level rise (SLR). Projections show that three meters of SLR – anticipated by 2050 – could cause regular overtopping and flooding of the highway section (Aldaron Laird, personal communication, 2020). There is a growing consensus that the Humboldt County community needs to begin a dialogue how to plan for and adapt to these potential future impacts to the 101 Corridor.

Caltrans has been working for many years on a safety improvement project on the 101 Corridor portion of the highway. Since the highway lies within the coastal zone, Caltrans was required to get a Coastal Development Permit (CDP) from the California Coastal Commission (CA CC) before they could implement the improvement project. On August 7th 2019, The California Department of Transportation (Caltrans) was granted a CDP for the Eureka - Arcata Route 101 Corridor Improvement project. This CDP was issued with a Standard of Special Conditions.

Figure 1: The US Highway 101 Corridor and the surrounding Humboldt Bay Region.

Condition 2 of the Coastal Development Permit's Standard of Special Conditions required Caltrans to prepare a Long-Term Sea Level Rise Comprehensive Adaptation and Implementation Plan (CAIP) to address sea level rise in this area of the 101 Corridor. The CA CC outlined the required contents of this CAIP in the CDP, which includes the provision that:

> The CAIP shall **identify a suite of strategies necessary for protecting, relocating, or otherwise adapting the development** authorized by CDP 1-18-1078 [the 101 Corridor Improvement Project] as necessary to maintain safety from flooding and other coastal hazards in order to minimize risk and assure stability and structural integrity in the long-term (at least through 2100). The CAIP shall reflect the **outreach, education, and coordination with the ongoing long- term planning efforts** of Humboldt County and the cities of Eureka and Arcata and shall also reflect coordination with the Humboldt County Association of Governments, relevant public interest groups, and other relevant entities (CA CC, 2019, emphasis added).

The purpose of this project is to conduct a stakeholder analysis related to SLR adaptation in the 101 Corridor in order to provide Caltrans with information relevant to fulfilling the conditions of their CDP – namely the requirement to develop a CAIP that reflects "outreach, education, and coordination" with stakeholders and other relevant entities and planning processes in the region.

This stakeholder analysis had three components:

(1) First we worked to identify and map relevant stakeholder groups connected to the 101 Corridor that may need to be engaged in an outreach, education, and coordination effort.

(2) We conducted semi-structured interviews with members of key stakeholder groups. These interviews served as a way to better understand stakeholder concerns and what they would like to see in an outreach strategy, as well as what is already being done for SLR planning and education in Humboldt Bay.

(3) We conducted a review of SLR adaptation planning engagement processes used by other planners and entities facing the issue SLR. The selected cases are summarized and used to draw potential insights or lessons for a potential outreach strategy related to the 101 Corridor.

In the end, we used findings from all three of these activities to form recommendations for Caltrans in beginning SLR adaptation planning and stakeholder outreach for the CAIP. This report aims to serve as a guide to assist Caltrans in preparing their CAIP, acting as one of the first steps in organizing planning efforts for SLR adaptation for the 101 Corridor. Although the main focus of the report is on the 101 Corridor, these findings are also relevant for regional sea level rise coordination around Humboldt Bay. Through working with the stakeholders identified

in the report, and building planning and outreach efforts based around the feedback collected from interviews, Caltrans can play a major role in sea level rise adaptation planning for the 101 Corridor and the areas surrounding Humboldt Bay.

2. Background

2.1. Sea Level Rise Globally and Regionally

Global sea level rise is a consequence of climate change caused by anthropogenic drivers that has increased since the pre-industrial era largely by exponential economic and population growth (IPCC, 2018). Thermal expansion of the ocean and the melting of glaciers and ice caps has caused sea level rise to be a distinguishable influence of climate change. According to (NOAA, 2019) 40% of the population lives in coastal areas where rising sea levels can cause flooding, shoreline erosion and hazards from storms. These highly populated coastal areas are at risk of destructive storm surges that damage infrastructure that is extremely expensive to repair. In addition, rising sea levels cause stress on natural ecosystems that provide protection and habitat for fish and wildlife.

Sea levels have risen higher than the annual average per year. According to (NOAA, 2019) between 2006- 2014 the global mean sea level rose by 0.14 inches (3.6 millimeters) per year, which was 2.5 times the average rate of 0.06 inches (1.4 millimeters) per year throughout most of the twentieth century. Projections have shown that sea levels will likely accelerate faster depending on the rate of ice melting and the contribution of greenhouse gas emissions. According to (NOAA, 2019) a 2017 research study was conducted on global sea levels rise projections. The report concluded that the most extreme scenario would result in global sea

levels rising to at least 12 inches (0.3 meters) above 2000 levels by 2100 if greenhouse emissions are kept at a low rate or could be as high as 8.2 feet if emissions continue to rise. Based on these projections sea level rise is likely to be higher than the global average sea level rise pathway. Rising sea level will result in increasing coastal flood risk in coastal communities that is expected to get much worse.

2.2. Humboldt Bay Sea Level Rise Vulnerability

Regional sea levels can differ in impacts due to ocean dynamics, climate-variability and human activity. On the entire U.S west coast, "researchers have documented interseismic tectonic land-level rates from plate locking that are an order of magnitude greater than the global GIA rate" (Anderson, 2018). This means that these tectonic plates are dramatically affecting regional and local sea level changes. Because of this variability in SLR, communities that live on the coast are faced with threats to coastal resources that are both economically and environmentally significant.

In California, SLR threatens "110-mile open coastline and many additional miles of estuarine shoreline, as well as high concentration of people and development along the coast" (Rising Seas in California, 2019). The potential impacts of SLR will disrupt economic assets that are significantly important to people's safety, daily movements and security. Local governments have determined that it is important to analyze and evaluate all opportunities of shoreline protection, retreat and adaptation towards SLR and coastal hazards. Understanding future projections of SLR will ensure that approaches addressing these concerns will use the best available science and increase the focus on incorporating SLR projections into planning, permitting and investment decisions.

Local research teams have described "Humboldt Bay as having the highest local sea level rise rate in California, approximately two or three times higher than the long-term global rate" (Anderson, 2018, p 2-1). Sea level rise is greater in Humboldt Bay because of the tectonic subsidence of the land and the compaction of former tidelands. [LR3] According to (Laird, 2013, p. 7) In Humboldt Bay the average rate of sea level rise is subsiding 4.72 mm/yr. (18.6 inches per century), is greater than anywhere else in California. The original U.S. Surveyor General Township Plats of 1854 showed that the tidal channels, inter-tidal mudflats and wetlands, and salt marshes in Humboldt Bay covered a total of 25,800 acres (Laird, 2013, p. 3). Since then Humboldt Bay has experienced tidal inundation from diked or drained areas for agricultural uses and development that has resulted in compaction and subsidence of tidelands that is lower elevation than the bay.

Development located in these vulnerable areas is at risk of being flooded or inundated and vulnerable assets such as land uses, transportation and utility infrastructure. To prepare for SLR vulnerability in the Bay, local agencies, NGOs and local government are assessing areas of exposure [LR4] and to "provide opportunities for coordinating adaptation strategies, policies, and measures across jurisdictional boundaries" (Trinity Associates, 2018). Local adaptation policies and strategies for SLR projections are recommended to minimize coastal hazards and protect existing development. Humboldt Bay is surrounded by critical regional assets that are coastal dependent such as port/harbor, infrastructure, U.S 101 Highway and the Humboldt Power Plant, municipal treatment plant and various utility infrastructures in addition to several residential communities that are at risk of inundation.

3. Methods

We conducted three activities: stakeholder mapping, stakeholder interviews, and a review of similar engagement efforts conducted in other regions. We used qualitative research methods to execute these activities in order to provide Caltrans with visual, categorical, and qualitative data relevant to the engagement and outreach plan.

3.1. Stakeholder Mapping

The first step in our process was to develop a list of the different types of stakeholders who are connected to the 101 Corridor and potentially could be included in outreach, education, and coordination efforts related to SLR adaptation planning (Appendix F). We developed the stakeholder map by talking with staff members at Caltrans about who to include and by conducting online research about local organizations, governments, and Tribes. Finally, we developed a list of the business and residential entities located adjacent to the 101 Corridor, for example the Jacobs Avenue area. We divided the map into seven broad stakeholder categories to develop a concise final map or visualization of the primary interest groups that hold an important stake in the 101 Corridor (Appendix A). Connected to the map we developed an assessment of the number and percentage of entities contained within each larger stakeholder category.

3.2. Stakeholder Interviews

We conducted stakeholder interviews under the approval the Institutional Review Board (IRB-19-123). In addition, we collected contact information for potential interviewees through internet sources like city county databases, and through communication with Caltrans who

provided us with direct emails and phone number contacts. Then, we split the stakeholders list evenly between our team members so that each person had a designated list of interviewees to contact. Our goal was to interview 10 people or more in the span of a week and a half. Over the course of that time we recruited our interviewees by emailing them an introductory email explaining the purpose of our project and our interest in conducting an interview with them as well as sending them the consent form. Alternatively, some interviewees were contacted via phone call. Participation was selected based on interviewees that replied to our request for an interview, agreed with the consent form, and that were available to interview no later than the expected deadline. Next, team members worked on contacting the stakeholders that replied to our request for an interview and we scheduled them either to be conducted over the phone or video call via Zoom. Before we conducted the interview we sent the interviewee the list of questions that we put together with Caltrans and the projections map for them to review (Appendix B). There were two separate lists of questions one for agencies and NGO staff and the other for residents and local businesses (Appendix C).

At the moment of the interview we grouped teams of two in which one member was the note taker and the other member facilitated the interview. The questions included what their title was and the organization they work with, what their initial reaction or familiarization they had with SLR on the 101 Corridor, and what planning efforts they have made so far to address this issue (Appendix C). Next, the noted responses from the questions were emailed to the participant to confirm that everything was noted correctly. Overall, a total of nine interviews were conducted across four broad stakeholder categories (Table 1).

Table 1: Total list of interviews conducted represented by the organization the interviewees were affiliated with. In the analysis section, interviews will be cited by listing abbreviations of the category of the interviewee and their number. For confidentiality purposes, the names of study participants will not be used. Agency (AGEN) refers to state and federal government entities. Planning consultants (CONS) refers to a professional local business. Local government (LGOV) refers to Humboldt County entities. Non-governmental Organization (NGO) refers to local organizations which are independent of government.

Stakeholder Group	Number of Interviewees
Non-governmental Organization (NGO)	3
Local Government (LGOV)	3
Agency (AGEN)	2
Planning Consultants (CONS)	1

It is important to note that this project period coincided with the arrival of the COVID-19 pandemic to California and the subsequent issuing of a stay at home order. As a result, we were not able to conduct the number of interviews that we would have liked and all interviews need to be conducted remotely (over the phone or zoom). We were not able to interview residents or businesses in the 101 Corridor area because we were not able to travel to those sites to recruit interview participants. Although those interviews were not conducted we still provided a list of questions geared to residents and local businesses. More interviews across a broader range of categories may need to be conducted to fill in the complete picture.

3.2.1. Analysis

To analyze our qualitative data from the interviews conducted we looked back at the notes of all nine interviews and highlighted key themes and common responses. Then, we used Google Forms to compose a survey to query each interview on the selected questions we thought best represented valuable information for our client (Table 2). In the survey we answered each

question based on the individual responses per interview. This allowed us to determine how many interviewees gave certain responses to the questions. For example, for the first question in the survey "Who are you?" we answered it by marking "Agency" based on the response of interviewee #1. Following up with interviewee #2 we redid the same survey but this time marked "Other" for that question. We proceeded to individually complete one single survey per interviewee based off of their responses associated with the interview. The Google Form program formulated the data results into bar graphs displaying the nine different responses per question. This was then transferred into Microsoft Excel to organize the graphs into pie charts and/or bar graphs with improved format.

Table 2: List of selected questions to query in Google Form survey for interview analysis

Interview Questions Selected for Analysis
Who are you?
Which agencies have you been coordinating with in activities related to SLR adaptation and planning?
How do you think adaptation related to SLR impacts on the 101 corridor should be paid for?
What do you think are some top concerns or considerations of your agency when thinking about planning and adapting to SLR impacts to the 101 corridor?
What activity is/are your agency involved in related to planning and adaptation to SLR in the 101 corridor specifically?
What would you like to see in an outreach strategy/plan related to the 101 corridor?

3.3. Review of Similar Engagement Efforts

In the report we also included a summary of lessons learned from SLR outreach and engagement processes that took place in other areas and that can be used for SLR planning for the 101 Corridor. We researched plans that were relevant to adaptive efforts to this environmental issue and choose them based on coastal regions. After researching several cases

through the city government websites and the library database, we proposed that the three locations composed appropriate plans that had feasible outcomes and expectations (Table 3). Then, we dissected the information by reading through the plans looking for the overall recommendations and results. Similarly, we tried to highlight the positive and negatives associated with the plan as well as identify what priorities the plans had set for the region in which it occurred. Also, as we read the plans we looked for the barriers they may have had to overcome and the constraints of planning for SLR. Lastly, we synthesized all this information from all three case studies and developed a Lessons Learned section.

Table 3: List of reviewed case studies relevant to SLR.

Case Studies Researched
The City of San Diego's SLR Vulnerability Assessment
Florida's Adaptive Response Planning to Sea Level Rise
Vancouver City's Coastal Adaptation Plan

4. Stakeholder Map

The intent of the stakeholder map was to help our client have a visual representation of the list of interest groups related to 101 Corridor (Appendix A). In summary, we identified a total of 101 stakeholder entities. We broke the stakeholder map into seven broad stakeholder categories. The definition, number of entities and percentage of entities in each category is contained in Table 4.

Table 4: Stakeholder categories connected to the 101 Corridor.

Stakeholder Category/Abbreviation	Definition	# of Entities	% of Entities
Non-governmental Organization (NGO)	A nonprofit organization that operates independently of any government, typically one whose purpose is to address a social or political issue.	34	34%
Local Businesses (CONS) & Residents	Any company that provides goods or services to a local population. & The land adjacent to the 101 Corridor which is used for housing.	22	22%
State Government (AGEN)	A state government or agency which shares political power with the federal or national government.	16	16%
Federal Government (AGEN)	Special government organizations or federal agency that set up for a specific purpose such as the management of resources, financial oversight of industries, or national security issues	10	10%
Tribes	A social division in a traditional society consisting of families or communities linked by social, economic, and religious ties.	9	9%
Local Government (LGOV)	The administration of Humboldt County entities.	6	6%
Utility Providers	An organization that maintains the infrastructure for a public service.	4	4%

These findings indicate that Caltrans should prioritize and gear its efforts for collaboration with NGOs, state government entities, and local businesses and residents because they represent a large number of stakeholders on the 101 Corridor. In addition, by building partnerships with these groups they can accomplish an effective engagement with the community that will be profoundly impacted by the consequences of SLR. The secondary stakeholder groups that also

hold importance were the federal government, tribal consultation, and local government. These groups also play a vital role because they are composed of fewer entities which need to be represented and advocated for the most. The data displayed on the map suggest that Caltrans needs to reassure that all voices will be heard throughout the development of their SLR project because it is made up of a variety of stakeholders that have varying interests and concerns.

In addition, just because a stakeholder category has only a few entities connected to it, does not mean that the category is less important. For example, outreach with regional Tribes will be an essential part of the process. This stakeholder map should be considered as a starting effort to develop an assessment of the key groups and entities connected to the issue. Further interviews and outreach efforts may identify more stakeholders to be incorporated into the process. As such, this should not be considered a comprehensive map. Finally, the map does not include a key (and much more larger and amorphous) stakeholder group: the general public. Since the 101 Corridor is such a crucial piece of infrastructure, nearly every resident of the county uses the 101 Corridor as a part of daily life. As a result, the general public has a large stake in the planning process and would likely need to be thoughtfully incorporated into an outreach effort.

5. Interview Results

5.1 Demographics

We interviewed nine participants to get a better understanding of what stakeholders connected the 101 Corridor are doing to prepare/adapt SLR. Figure 2 shows the demographics of the interviewees. We were able to speak with representatives from federal and state agencies, local governments, non-governmental organizations (NGOs), and a private consultant. Each

interviewee provided unique perspectives and responses on what they would like to see from Caltrans as the Eureka- Arcata Route 101 Corridor Improvement Project continues.

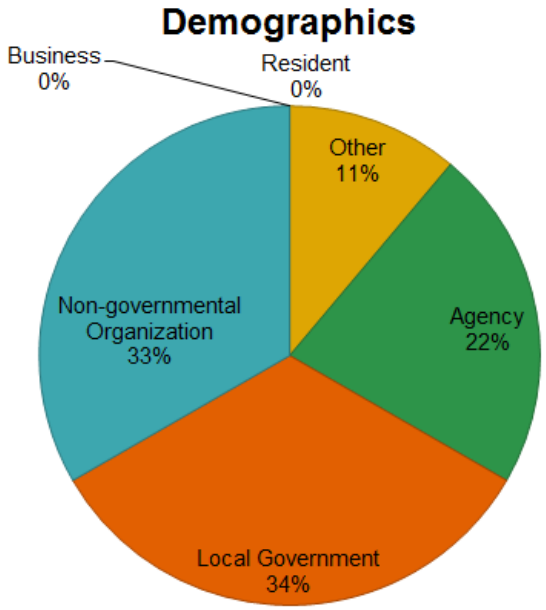

Figure 2: Pie graph representing the demographics of the interviewees.

5.2 Concerns

We asked the interviewees to tell us about their concerns when it comes to planning and adapting to SLR impacts on the 101 Corridor, and we used Google Forms to identify repeating concerns for our analysis. We identified 14 main concerns expressed by stakeholders in the interviews. We found that the top four concerns were: (1) property and infrastructure being underwater, (2) time constraints, (3) habitat destruction, and (4) cost of project (Fig. 3).

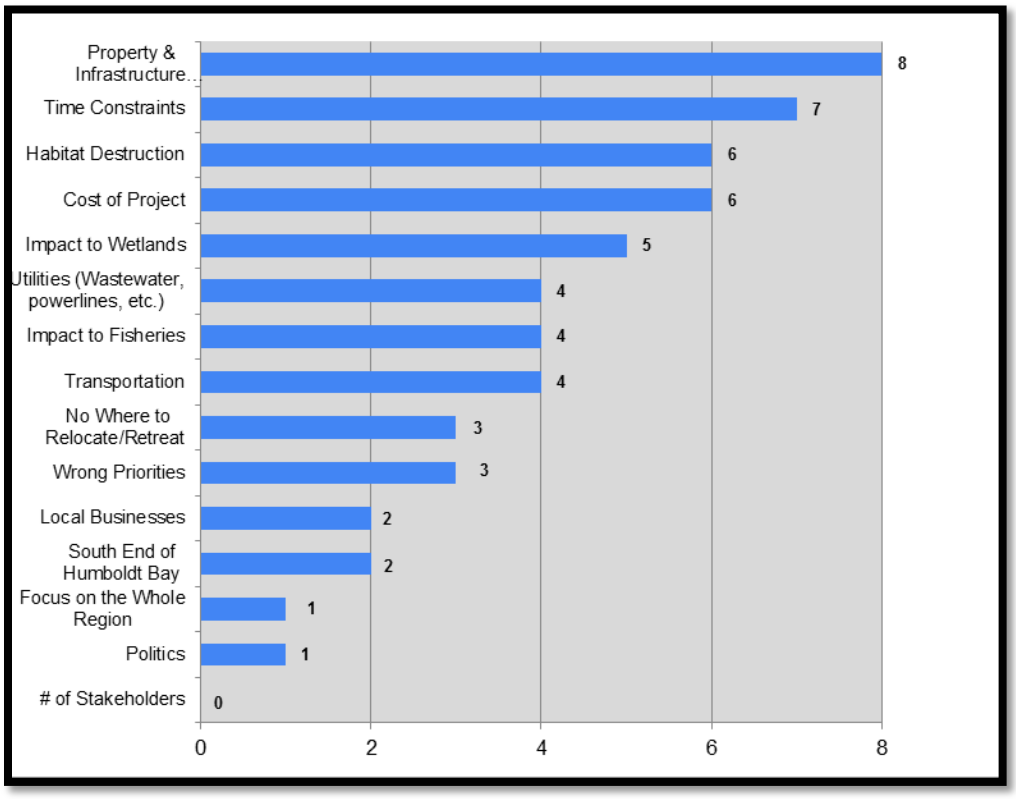

Figure 3: Bar graph showing number of responses to the following questions, "What do you think are some top concerns or considerations of your agency when thinking about planning and adapting to SLR impacts to the 101 corridor?" Legend: Property & Infrastructure Underwater (Property & Infrastructure); Bay SLR at the South End of Humboldt Bay Occurring at a Quicker Rate (South End of Humboldt); Need to Focus on the Whole Region Not Just the Corridor (Focus on the Whole Region)

Nearly all of the interviewees expressed concern about the potential for SLR to inundate and irrevocably damage the 101 Corridor and its crucial structures. Five of the nine participants said that the community surrounding the bay would need to retreat out of the areas which are projected to be inundated, including the 101 Corridor. We asked them where the property owners and the highway structures should retreat from SLR, and we got various answers. Some suggested retreating and relocating the highway along Myrtle Avenue, while others did not have any input on where to retreat specifically. The Private consultant said they would like to see Caltrans use creative relocation strategies to move the 101 Corridor along Myrtle Avenue until

Bracut, and from there build a causeway to Arcata (Interview CONS, 2020). They also suggested that Caltrans needs to determine if a causeway could withstand 20 feet of SLR in the next 100 years (Interview CONS, 2020). An agency representative suggested multiple alternatives for the 101 Corridor upgrade, "Look at the possibility of moving the highway, raising it to a causeway, retreating agricultural lands, raising elevation in critical areas by using dredged material, and adding more shoreline protection," (Interview AGEN-1, 2020).

Representatives from local governments in the region expressed concerns about the effects that SLR will have on public infrastructure and utilities. They mentioned that utilities such as water, electric, phone, and sewer lines run under the highway are extremely susceptible to being damaged from SLR. A local government official expressed concern that their City's critical infrastructure which is parallel to the 101 Corridor will be inundated by SLR, "The sewer runs downhill and we have larger systems that will compromise it. However, how do we adapt to it [SLR] and be ready before we get there?" (Interview LGOV-2, 2020). NGO-1 had similar concerns and said, "The Corridor is one of the critical linkages in this area for transportation and utilities [...] I don't think that the community or Caltrans has made appropriate decisions to address the problem [SLR]," (Interview NGO-1, 2020).

Time was the second concern among the stakeholders we interviewed. The participants explained that the process of upgrading the 101 Corridor will take years, because of the permitting processes, unexpected issues, coordination with various agencies, and funding. There is concern that Humboldt Bay is experiencing an accelerated rate of SLR from tectonic plates causing the bay to subside, and that SLR will occur faster than Caltrans can complete the 101 Corridor upgrades. An NGO representative expressed their worry, "Caltrans takes so long to plan things; they should have been working on this a long time ago," (Interview NGO-2, 2020). The

concern that the project will take a long time to complete, directly corresponds with the stakeholder's concerns that the project will be expensive. Some interviewees expressed worry that permitting processes with multiple agencies will take a long time, which will require more funding. An agency representative emphasized, "Permits could take years to pass," (Interview AGEN-1, 2020).

The majority of the participants said the cost of the project is a concern for many reasons. The community is already speculating the proposed project from Caltrans will cost a vast amount of money, because the 101 Corridor is highly susceptible to being flooded by SLR and there is critical habitat in need of protection. The interviewees are concerned that the overall process of upgrading, or relocating the highway will cost an amount that federal and state funding may not be able to cover. They mentioned that projects such as the proposed 101 Corridor upgrade take several years to complete, because the agencies in charge of the project sometimes do not gather enough funding to fulfill permitting requirements. NGO-1 explains:

> [SLR planning] is very expensive and takes a long time. Look at the Last Chance Grade Project, when you have a big project in a remote area there are going to be geotechnical and environmental issues, which is going to take a long time to deal with (Interview NGO-1, 2020)..

The interviewees said they are concerned that Caltrans will not consider input from the community, which could cause backlash and create a costly setback for Caltrans, "Part of a longer battle the environmental community is having with Caltrans, is that they do what they want, and ignore scientific and public input, which is costing taxpayers money," (Interview NGO-3, 2020). Participants also expressed concerns that Caltrans is not prioritizing their spending on the most vulnerable parts of the 101 Corridor. One participant commented, "The

biggest concern is that Caltrans will not plan appropriately, build a seawall, waste money, and then everything will have to be redone in 10-20 years," (Interview NGO-2, 2020).

Another key concern among the interviews is that the crucial habitats and vulnerable species found around Humboldt Bay will be impacted negatively as a result of upgrading the safety corridor. An agency representative said that 90% of the salt marsh along the bay is gone, and that the remaining 10% is extremely vulnerable to experiencing negative effects from habitat changes caused by the 101 Corridor upgrades (Interview AGEN-2, 2020). Multiple respondents made it clear in their interviews that they are concerned how the upgrades to the highway will affect critical habitats. One respondent explained, "Salt marsh is important for fish habitats and an important filter for water quality," (Interview NGO-2, 2020). Another participant said they are apprehensive that, "Marsh ecosystems, bird habitats and trails will be underwater," (Interview LGOV-1, 2020). Local Agencies have been working on restoration projects in Humboldt Bay for many years, and they expressed that the 101 Corridor upgrades would reverse the existing restoration efforts. One agency representative said they are concerned that upgrades to the 101 Corridor will impact critical fish habitat, "We don't want to see full levees, because it will block anadromous fish species. [...] Be mindful of the Endangered Species Act (ESA) and the Magnuson-Stevens Act (MSA) habitat along the corridor," (Interview AGEN-2, 2020).

A few of the interviewees expressed that they are worried that Caltrans is not prioritizing their focus on sections of Highway 101 that are the most vulnerable to SLR. We interviewed a private consultant who has worked on various projects around Humboldt Bay, and they said Caltrans is only focused on the current construction projects along the 101 Corridor, and they are not prioritizing the most vulnerable sections (Interview CONS, 2020). This is not ideal since there are sections of highway in Southern Humboldt Bay which are more susceptible to flooding

from SLR than the proposed highway upgrade project. Trinity Associates developed a SLR vulnerability assessment document for Humboldt County, which contains maps showing different SLR inundation projections for Southern Humboldt Bay (Appendix D) and (Appendix E). The maps from the vulnerability assessment display the potential flooding to segments of the 101 Corridor in Southern Humboldt Bay for the years 2050 and 2100, along with a projection showing 13.1 feet of inundation. An NGO representative explained that the southern end of the bay is affected by SLR more than the northern end, because the ground is sinking which is causing the sea level to raise faster (Interview NGO-2, 2020). The Consultant also expressed that Caltrans needs to look at the entire region, not just the Eureka-Arcata corridor when they are considering upgrades to the highway:

> All it takes is one breach of the 101, whether it's in Arcata Bay or South Bay and then we can't use it [101 Corridor] anymore. They need to look at the whole region, and not just focus on the commuter corridor (Interview CONS, 2020).

5.3 Coordination

On average each interviewee reported that they have been coordinating with three to four other entities on projects related to SLR. The most common entities that respondents indicated they had coordinated with included: City of Eureka, the City of Arcata, Humboldt County, the Humboldt Baykeeper, and the CA CC (Fig. 4).

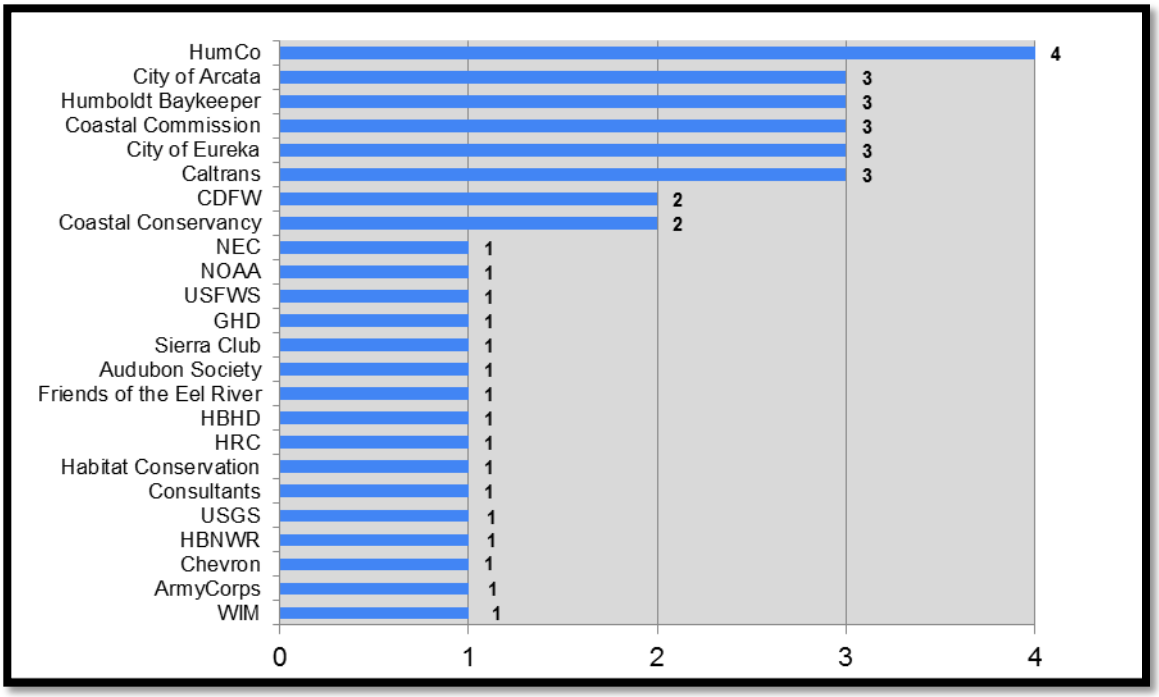

Figure 4: This graph shows the number of respondents who mentioned that they are coordinating with specific entities. Answering the question "What would you like to see in an outreach strategy/plan related to the 101 corridor?" Legend: Humboldt County (HumCo); California Department of Fish & Wildlife (CDFW); Northcoast Environmental Center (NEC); National Oceanic & Atmospheric Administration (NOAA); U.S Fish & Wildlife Services (USFWS);Engineering Consultant (GHD); Humboldt Bay Harbor District (HBHD); Humboldt Redwood Company (HRC);United States Geological Survey (USGS);Humboldt Bay National Wildlife Refuge (HBNWR); Army Corps of Engineers (ArmyCorps);Woodley Island Marina (WIM)

Local governments within the community have been coordinating with each other on SLR projects. The Cities, the County, and NGOs discussed how the most recent coordination amongst the entities occurred during the Humboldt Bay Trail. The Bay Trail project involved multiple stakeholders who are going to be affected by the proposed highway upgrade. The participants said that the previous relationships from the Bay Trail project between Caltrans, the CA CC, and stakeholders will have major influence on completion of the 101 Corridor. We gather that both the City of Eureka and the City of Arcata are essential municipalities to be

consulted on the project considering the 101 Corridor runs through and connects both the cities to each other.

There are several local agencies and NGOs working together to identify and create adaptation strategies for SLR. Though many of the participants said they were not planning for SLR in the 101 Corridor specifically, a lot of them are aware of the issue and think that it is important to address it sooner rather than later. Some of the interviewees made the comment that it's not up to the local entities to plan for SLR on the 101 Corridor, but they would like to see Caltrans making a genuine effort to coordinate with the stakeholders affected by the project. A local government representative suggested an effective strategy for Caltrans to coordinate with stakeholders:

> Ongoing coordination - meeting, discussing, and understanding the feedback loops that are required to address SLR as well as understanding where communities and agencies could get resources to react to these things [impacts from SLR] before they become critical situations (Interview LGOV-3, 2020)..

Several respondents mentioned the important role that Humboldt Baykeeper is playing in SLR outreach and planning on Humboldt Bay. The Humboldt Baykeeper is an environmental watchdog for Humboldt Bay. They are an NGO who protects and advocates for the wellbeing of the bay and the community around it. They have started initiatives to spread awareness about the increasing rate of SLR and the hazards that the local coastal community are facing. Many of the people we interviewed have interacted with Humboldt Baykeeper on previous projects and plans regarding SLR. After completing our interviews, we found that a lot of people trust and work with the Baykeeper. The organization has gathered a lot of knowledge on local SLR issues, and they have connections with the community and the local agencies.

5.4 Involvement in SLR Planning

We asked the interview subjects if they were, or have been involved in any planning efforts for SLR along the 101 Corridor, and all of nine of them responded yes (Fig. 5). Most of the participants have attended meetings hosted by the CA CC to discuss SLR, and the impacts it will have on the 101 Corridor. Many interviewees said they are always in contact with the CA CC, because they are representatives from local municipalities, federal and state agencies, and NGOs who work on projects within the coastal zone.

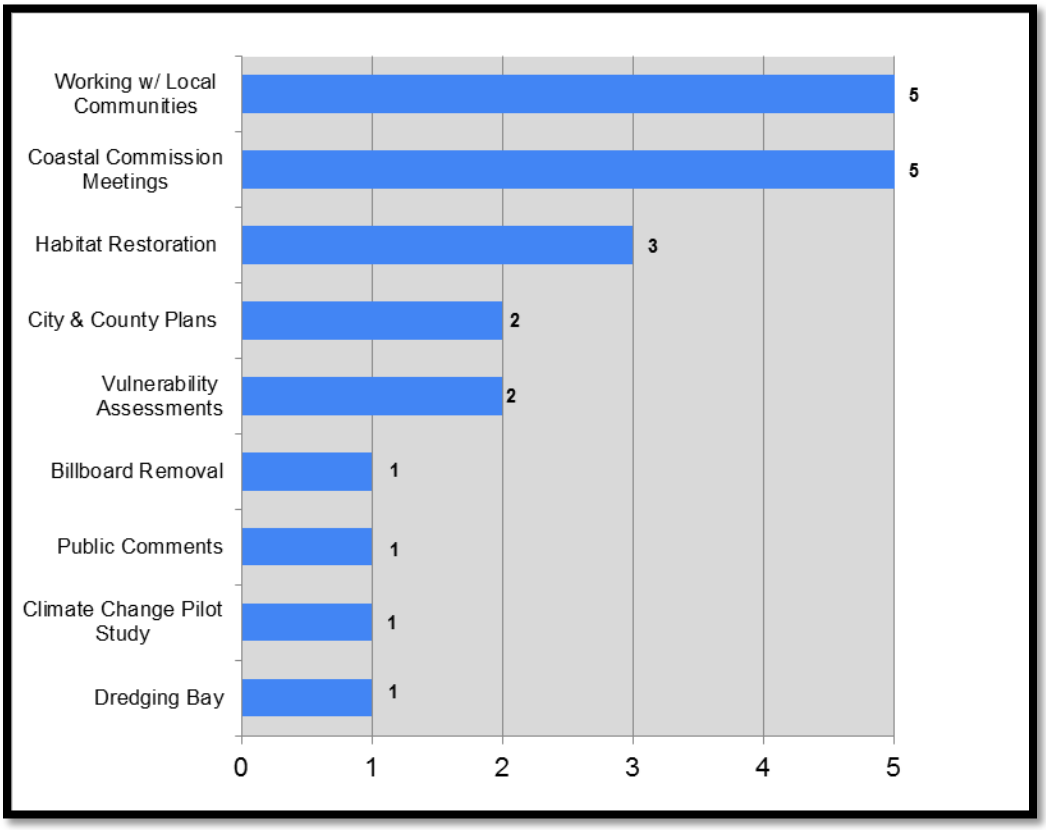

Figure 5: This graph shows the number of respondents who answered to the question "What activities is/are your agency involved in related to planning and adaptation to SLR in the 101 corridor specifically?" Legend: Dredging Bay & using dredge material for protection (Dredging Bay); District 1 climate change pilot study (Climate Change); City and county plans which briefly mention the 101 Corridor (City & County Plans); Working with local communities to start SLR planning in response to the SLR projections on the 101 corridor (Working w/ Local Communities)

A few of the participants said that they have been, or are currently involved in habitat restoration projects along the 101 Corridor. One agency respondent said that they have done restoration projects to assist in preserving and protecting sensitive anadromous fish habitats which are found along the 101 Corridor (Interview, AGEN-2, 2020). They use the Magnuson-Stevens Fishery Management and Conservation Act (MSA) to help acquire permits for restoring vulnerable fish and wildlife habitat, and they say that it is an important tool for protecting sensitive species (Interview AGEN-2, 2020). The interviewees expressed their concerns that the proposed project would destroy the habitat around the 101 Corridor, which would then affect the local fish and wildlife populations.

The majority of stakeholders that were interviewed said that they are working with local communities to begin SLR planning in response to the flooding projections on the 101 Corridor. Interview responses showed that stakeholders and local agencies have been forming alliances and groups with one another to address the implications of SLR for many years. A respondent said the Northcoast Environmental Center (NEC) acts as a hub to bring groups together, and they have monthly meetings to discuss issues such as SLR on the 101 Corridor (Interview NGO-3, 2020). In interviews we heard that the NEC is a supporter of public outreach, and they contact the public when there is new or concerning information regarding the well-being of the environment on California's Northcoast (Interview NGO-3, 2020).

5.5 How/Who Should Pay?

We asked participants who should pay for the adaptation related SLR impacts, and the majority said the federal and state government should pay for the upgrades (Fig. 6). The reasoning being that roads are managed under the federal government so they should be covered

by federal and state funding. Many people responded that taxpayers should pay for the Highway 101Corridor upgrade, which is redundant considering the money from taxpayers is used by the federal and state governments for projects that affect the public's assets.

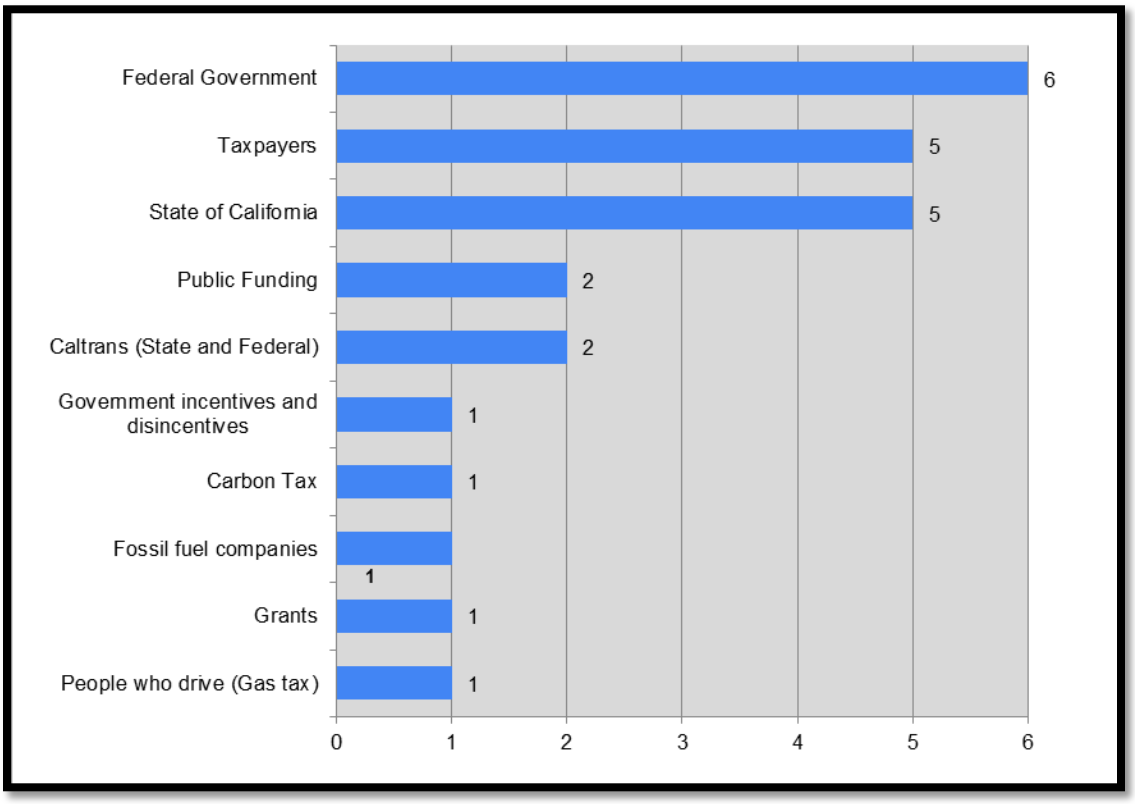

Figure 6: This graph shows the number of respondents who answered to the question "How do you think adaptation related to SLR impacts on the 101 corridor should be paid for?"

A couple participants responded that the project could receive money by applying for grants and other types of public funding. There was also a suggestion that the fossil fuel companies pay for the project since they are the underlying cause of SLR and climate change. One NGO representative made a point that SLR is happening because our human activities are causing an increase in global temperatures, "Think about SLR, and don't forget about what is causing the underlying problem," (Interview NGO-1, 2020). They believed that the people who drive, and the companies who produce fuel should be the ones paying for the 101 Corridor

upgrades, “The people who caused the problem should contribute in solving the problem,” (Interview NGO-1, 2020).

5.6 Outreach Recommendations

All of the respondents stated that they would like to see Caltrans arrange public meetings so that everyone within the community can hear the proposed alternatives and have the chance to offer comments (Fig. 7). A few mentioned that the conventional public meeting may not be appropriate for circumstances such as Shelter-In-Place (SIP) order for COVID-19, if meetings plan to be held when restrictions are still in place, they recommended that Caltrans host Zoom meetings or other types of online web forums. Hosting public meetings online could make it easier for people to attend, which could result in more public involvement. Several of the participants recommended that Caltrans create a website that anyone can easily access, which would provide updated and consistent information on the 101 Corridor progress. The website could be a good platform for public outreach, and could make the public feel that they are consistently involved in the project.

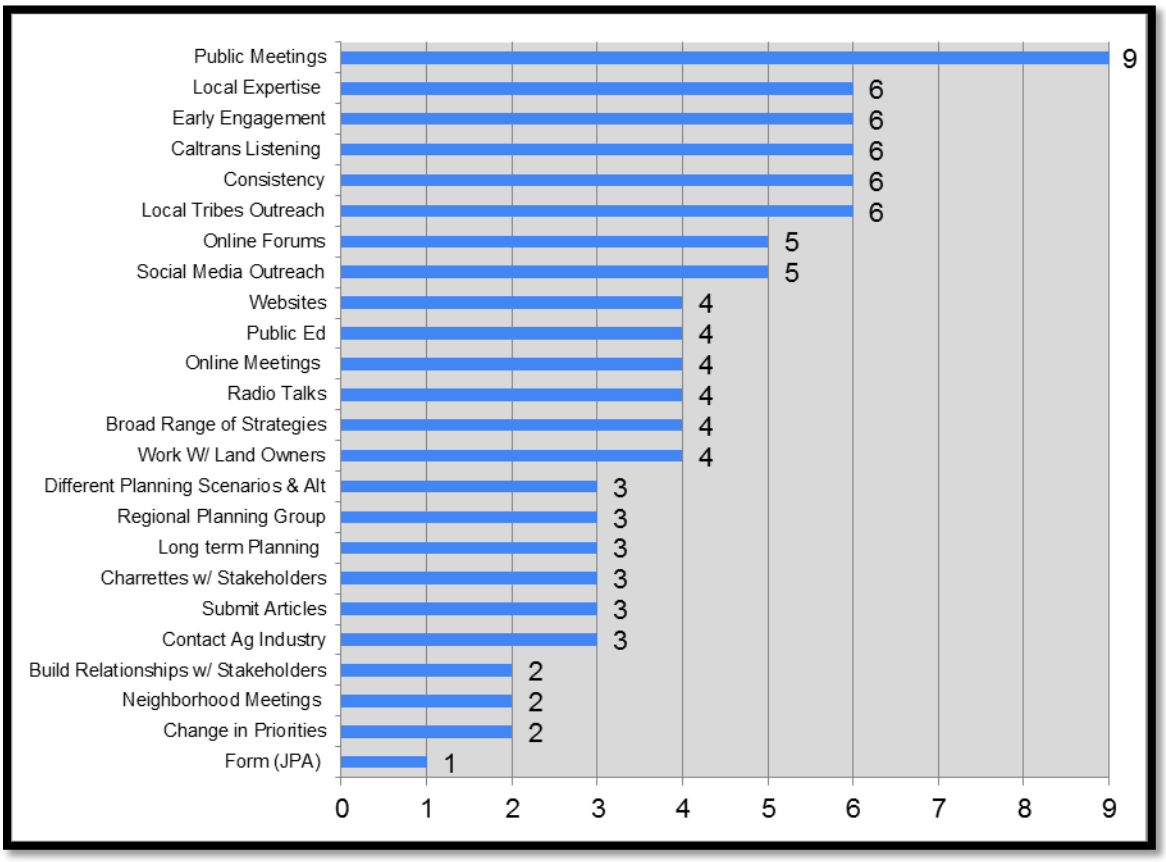

Figure 7: This graph shows the number of respondents who answered to the question "What would you like to see in an outreach strategy/plan related to the 101 corridor?" Legend: Form Joint Power Authority (JPA) of locally elected officials (Form JPA); Neighborhood meetings instead of City hall meetings (Neighborhood Meetings); Reach out to agricultural industry (Contact Ag Industry); Submit articles to local news outlets (Submit Articles); Want to see different planning scenario's and alternatives (Different Planning Scenarios & Alt); Host online meetings (Online Meetings); Public education on SLR in Humboldt (Public Ed); Have a website with project details for public (Websites); Reports and updates on their SLR planning progress (Consistency); Let people know Caltrans is listening (Caltrans Listening); Bring stakeholders in EARLY on the project (Early Engagement); Seek local expert and advocate advice (Local Expertise).

Some interviewees expressed concerns that Caltrans won't involve the entire community of stakeholders who have property along the 101 Corridor. These interviewees expressed the importance of involving the public, local tribes, agricultural land owners, and business owners in the 101 Corridor upgrade project early in the planning process. They criticized previous local projects where the lead agency did not invite the tribes and other key stakeholders into the process early enough. The tribes and stakeholders who were not initially asked to participate in

that project felt that their interests and concerns were being ignored, so they eventually sued the lead agency.

Several of the respondents expressed concerns about how Caltrans has handled public and stakeholder engagement in the past. Many of the participants said that they did not believe Caltrans had listened to their concerns in the past, so they want to see Caltrans make more of an effort to consider the public's input going forward. One of the NGO representatives made the following comment in their interview:

> The best way to coordinate is to change their [Caltrans] attitude about input of agencies and the public [...] As planners, we have to get input from agencies and the public, Caltrans does not take it seriously. They did not have a public hearing; they had a meeting the Coastal Commission forced them to have, Q and A section which was put down, it was a joke and it reflected the attitude that they don't care about public input (Interview NGO-2, 2020)..

These comments along with others indicated that based on past experiences, trust in Caltrans may be low among key stakeholders, particularly when it comes to public outreach and engagement. In a project of this scale, Caltrans may want to consider avenues to rebuild this trust possibly through processes of transparency and inclusive outreach and engagement.

Another outreach recommendation that was frequently mentioned in our interviews is that Caltrans should focus on long-term planning solutions and should not consider any short-term planning solutions for this project. The participants explained that fixing the 101 Corridor with temporary solutions will only lead to more complex and expensive issues further into the future. An NGO representative made a point about what they perceived as society's general thought process when it comes to resolving issues caused by climate change, "We often think about

adaptation and forget about mitigation," (Interview NGO-1, 2020). This quote is key in understanding how important it is to create long-term planning solutions for the 101 Corridor which will mitigate the main problem. Although greenhouse gas emissions are not Caltrans' planning focus, the stakeholders don't want Caltrans to lose sight of the underlying reason why the 101 Corridor project is being proposed; sea level rise caused by increasing greenhouse gas emissions.

6. Lessons from Similar Outreach Projects

While planning for SLR, including stakeholder engagement early and often can be crucial to ensure equity, prevent delays, and limit resistance to the planning process. Because communities have different priorities, opportunities, and constraints when considering SLR planning adaptation methods, including stakeholders early and often can limit conflict. SLR planning is a complex issue and often affects multiple parties with diverse cultures, different identities, values, and goals. Stakeholder engagement throughout the planning process can allow stakeholders to express concerns and make suggestions. Failing to include stakeholder engagement throughout the planning process can create a long term division between groups. Limiting stakeholder inclusion is not considered best practice, and can harm the faith stakeholders have in an outreach process. Engaging stakeholders throughout the entirety of a planning process can facilitate collaborative learning, which could include learning from local and traditional ecological knowledge. Gaining stakeholder trust throughout the full planning processes can mitigate conflicts significantly. This can be done by having effective meetings that include honesty about planning goals and being transparent with stakeholders about all aspects of the planning process (ESM 305, 2019).

SLR is expected to threaten infrastructure on the 101 Corridor in the near future. “According to the latest projections, sea level in the Humboldt Bay area will rise one foot by 2030, two feet by 2050, and three feet by 2060” (Humboldt BayKeeper, 2020). Because our local community is going to be majorly impacted by SLR, we have chosen to assess the advantages and disadvantages of several other communities' SLR adaptation plans. We chose these plans because of their diversity in terms of region and scale. Researching a diverse selection of various communities' SLR plans might allow local stakeholders to address similar concerns in their adaptation and planning for the 101 Corridor.

We chose to assess The City of San Diego’s “State Lands Sea Level Rise Vulnerability” to compare our local communities SLR Plan to another California city. We also chose to assess Florida’s Department of Urban and Regional Planning in conjunction with Florida State University’s “Adaptive Response Planning to Sea Level Rise” to compare similarities and differences in California’s planning to that of Florida’s. Finally, we looked at the City of Vancouver’s Coastal Adaptation Plan for the Fraser River Foreshore area and assessed the strengths of its stakeholder outreach and education strategy. These plans can enhance Caltrans’ insight of effective strategies to implement when planning for SLR on the 101 Corridor.

6.1 City of San Diego

San Diego’s SLR Vulnerability Assessment addresses the impact of SLR on specific areas around the city's jurisdiction. According to San Diego’s SLR Vulnerability Assessment, “The plan covers granted public trust lands including more than 4,000 acres of land water, 27 miles of shoreline, and eight official swimming areas” (The City of San Diego, 2019). The city

found SLR and storm surge pose an increasing risk of flooding to the city's boundaries and SLR exposure has significantly increased within the last century.

The City's climate models explain, "SLR in the San Diego region is forecasted to rise faster over the course of this century than it did during the previous 100 years" (The City of San Diego, 2019). One advantageous aspect of the city's plan was identifying vulnerability rankings to city assets and public trust resources. This allows the city to determine what areas and infrastructure are most susceptible to SLR so appropriate mitigation measures can be planned. San Diego is also collaborating with many key stakeholders in an advisory group for the City's climate change vulnerability assessment. The Stakeholder Advisory Group identified 30 potential mitigation and adaptation measures to reduce projected vulnerabilities of SLR to these specific areas in the city's jurisdiction. This shows an advisory group of stakeholders can prove to be effective in terms of collaborative learning and also accounts for complexity, controversy, and uncertainty when planning for SLR.A stakeholder advisory body like the one in this San Diego case could be an effective way to include stakeholder engagement throughout all aspects of a SLR planning process.

The City of San Diego SLR Vulnerability Assessment could be improved upon because the report only addresses impacts of SLR on granted public trust lands; these lands represent a small subset of the city's jurisdiction (The City of San Diego, 2019). One thing to remember however, is that SLR has no boundaries. Another critique of the San Diego SLR Vulnerability Assessment is although the city has included and identified many regional partnerships there is no mention of local public education or outreach. Educating the public about the danger of SLR is crucial to all coastal cities as you need to generate public support and buy in for these types of expensive and potentially disruptive adaptation projects.

6.2 Florida Department of Urban and Regional Planning and Florida State University

Lessons on plans for SLR on the state scale could provide Caltrans insight on a unique way to plan for a wide range of California coastal communities and could potentially increase funding Caltrans could obtain for SLR adaptation. A study done by scholars of planning from Florida State University are planning for sea level rise even under uncertainty about the magnitude of sea level rise-projected for the area. The Adaptive Response Plan explains, "The earth is clearly committed to millennia of sea level rise because of the lag in achieving temperature equilibrium between the atmosphere and the oceans. (Bailey et. al. 2007). This document may inform Caltrans and California coastal communities on how the east coast planners are responding to sea level rise.

According to Florida's SLR plan, "Large areas of Florida are vulnerable to increasing sea level rise. Many of these areas are already developed. Thus, there are likely to be substantial components of public infrastructure that already are vulnerable to sea level rise and will remain so because of their long design lives" (Bailey et. al., 2007). This is true for the 101 Corridor as major infrastructure is threatened by SLR. This plan is similar to the research conducted in this report as the scholars conducted interviews with planners from agency staff around the state.

This SLR assessment was based on findings from 20 interviews with planners embedded within Florida cities and counties that are most vulnerable to sea level rise that were expected to have one meter of SLR. Twelve water supply planners, and nine wastewater facility planning officials who serve these regions were also interviewed. "Inquiries concerning transportation infrastructure were focused on State Department of Transportation officials because of the major

role played by the state in financing and overseeing both construction of new infrastructure and major repair and reconstruction efforts" (Bailey et. al., 2007). Results from the Florida State University study show Florida communities have high uncertainty of where significant SLR will happen and when. SLR community education is crucial so that all community members are certain of the SLR risk in their region. Results from interviews conducted for this study showed all of nine respondents would like to see Caltrans arrange public meetings so that members of the community can hear the proposed alternatives and have the opportunity to offer comments. The authors of the Florida Study found similar results. They made the following comment in highlighting their interview results:

> When asked what resources might be made available from the state that would enhance their ability to account for the potential impacts of sea level rise in their long-range planning, the planners we interviewed listed the following: (1) credible predictions of sea level rise scenarios for which planning would be appropriate coupled with information about likely impacts and best practices for adaptation ; (2) public education that can serve to raise public awareness of the importance of dealing with potential sea level rise impacts now ; (3) policy direction as to how local governments should address sea level rise in comprehensive plans; and (4) funding to help defray the costs of conducting local vulnerability studies and assessments of practical adaptation options (Bailey et. al., 2007).

SLR is inevitable for many coastal cities, and with increasingly precise SLR projections, the public and local governments should be prepared to adapt to infrastructure loss. Because SLR planning is a relatively new phenomenon it is understandable that many communities planning and adaptation plans will change significantly over time. King tides and other natural disasters can increase the possibility of infrastructure being taken over from SLR. These king tides and natural disasters can often add a foot or more of SLR in one day and can threaten unprepared communities.

One advantageous aspect of the Adaptive Response Plan was coordinating with a long-range of planners. This plan also serves as a great platform for Florida agencies, organizations, and community members to start talking about the complexity of SLR. Some of the preliminary recommendations included, "Requiring assessment of sea level rise-induced shifts in flooding and erosion hazards in assessing corridors for new state highways and local highways funded with state monies and in major amendments to the Future Land Use Element and Future Land Use Map in local comp plans" (Bailey et. al., 2007). Funding will be one of the toughest challenges for the 101 corridor and public engagement and outreach could aid Caltrans in successfully completing this project.

6.3 City of Vancouver

The city of Vancouver's Coastal Adaptation Plan for the Fraser River Foreshore, a component of the first phase of the cities' Coastal Adaptation Plan (CAP), includes an extensive stakeholder outreach and education process focused around assessing the risks of sea level rise and flooding, and identifying vulnerabilities and adaptation opportunities. Composing a large part of the southern coastal boundary of the city, the Fraser River foreshore floodplain is the most vulnerable flooding area in the city and includes a number of neighborhoods, businesses, industrial areas, and critical habitats (City of Vancouver, 2019). This mix of uses prompted the need for a through outreach and engagement process that involved all possible stakeholders in sea level rise adaptation planning.

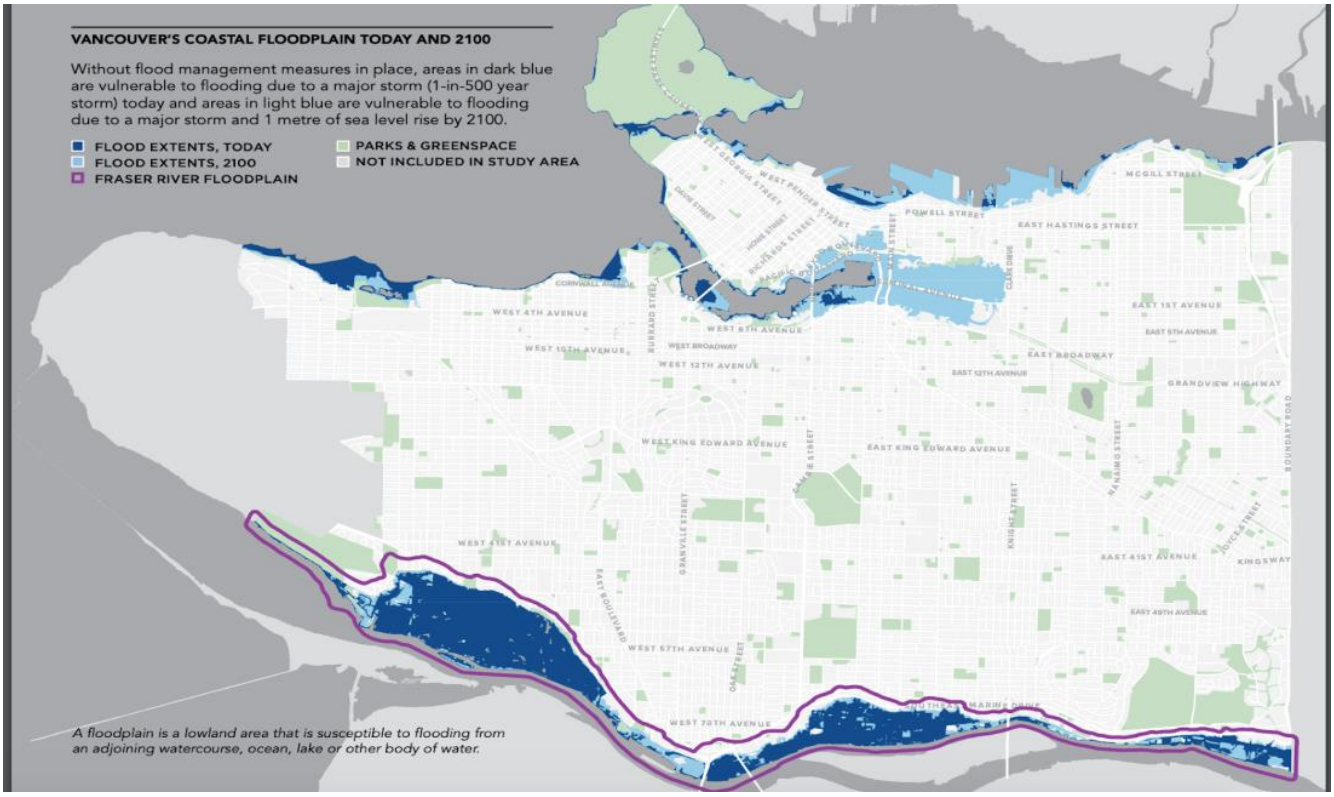

Figure 8: The Fraser River Foreshore in the city of Vancouver, where sea level rise adaptation planning efforts are focused (City of Vancouver, 2018).

The Fraser River Foreshore adaptation planning process was developed around the ideas of stakeholder education, value elicitation, the development of design principles, and strengthening community relationships. Stakeholders were contacted and invited to engage in value-based discussions that looked at flood management options, and possible infrastructure design and policy, to develop a set of guiding design principles to carry into future project phases.

The participatory, values-based approach included workshops where asset owners identified critical assets and infrastructure in the area, and assessed vulnerabilities and linkages to other assets (City of Vancouver, 2019). The city also conducted a series of three hour community workshops held in different areas at different times, inviting residents, business

owners, and community stakeholders. These workshops focused on value elicitation, where stakeholders were asked to identify their main values and concerns for sea level rise planning. These identified values included ideas like maintaining environmental quality and recreation.

Figure 9: Community members evaluating the set of identified planning values at a community open house (City of Vancouver, 2018).

During the workshops, proposed projects for shoreline adaptation with the pros and cons of each were introduced along with a summary of the risks and hazards flooding and sea level rise would bring. Stakeholders communicated their concerns and what they thought should be prioritized, as well as their feedback on proposed adaptation approaches using a set of interactive posters and break out groups. Additionally, planners hosted drop-in style community open house events, where they presented back and confirmed community concerns and continued to collect feedback. Tools including community surveys and a CAP project website that hosted materials such as reports, presentations, and workshop materials were also utilized (City of Vancouver, 2019).

Through this process, the planners working with the City of Vancouver identified community values and concerns including protecting the environment, minimizing property loss and displacement, protection health and safety, as well as maintaining transportation, economic,

recreational, and cultural elements in the area. These values and concerns were used to develop design principles that were then presented at open house events.

Figure 10: Community members selecting values at a community open house event. These values are considered by planners and guide their decision making for sea level rise adaptations (City of Vancouver, 2018). This photograph shows dot-voting, a useful exercise where workshop participants can put stickers or dots by their chosen priorities or in this case values to guide the planning process

These design principles were used to guide adaptation planning and include designing for adaptability with backup plans, and ensuring access to the shoreline (City of Vancouver, 2019). Recommendations from this public outreach process included continuing to refine and validate community concerns and values throughout future phases of the adaptation process while using a values based participatory approach, continuing public education, and engaging with asset owners and tribal leaders as key partners (City of Vancouver, 2019).

Figure 11: A timeline showing the stakeholder engagement process (City of Vancouver, 2018). Caltrans could consider adopting a similar process model for outreach and engagement related to the 101 corridor.

6.4 Adapt Lessons

With local SLR experts in our community, in conjunction with HSU, many believe Humboldt County is ahead of the game for SLR planning. However, one local planning consultant, has speculated current trends and projections indicate many sections of Northern California's Highway 101 will be under water within ten years if nothing is done about SLR in our community. The 101 Corridor is a major transportation highway, and this expert believes local communities are not ready to deal with SLR. They believe funding is going to be the hardest part about planning and adapting for SLR in the North Coast, including the 101 corridor. (Interview, CONS-1, 2020). The alarming SLR projections suggest that the Humboldt County community should be proactive in gathering stakeholder and public interest regularly to act on SLR planning and adaptation for the 101 Corridor and surrounding infrastructure.

Table 5: Lessons Learned from case studies

Lesson:	Case:	Why?
Potential Value of a Stakeholder/Community Advisory Committee	San Diego	Having an inclusive Advisory Committee can mitigate potential conflict within the project and facilitate collaborative learning. Collaborative learning is a methodology developed to address natural resources, environmental, community conflict, and decision-making situations.
Need to Consider Community Values and Knowledge – Possibly through interview-based research	Florida	Community education and outreach in planning processes promotes best practices in Fairness, Accountability, Access, Inclusion, Transparency, and Honesty.
Importance of presenting multiple options to be weighed and considered by the public	Vancouver	Collecting feedback from stakeholders can expand the pool of options considered for adaptation and ensure that the values priorities of stakeholders are included in the selected adaptation options
Engaging the public with multiple workshops and drop in open houses to ensure the involvement of all relevant stakeholders through all steps of the process	Vancouver	An open and accessible stakeholder outreach process can ensure that as many stakeholders and members of the public are included as possible. This can help the adaptation projects go smoothly and benefit as many stakeholders as possible

7. Conclusion and Recommendations

The purpose of the report was to conduct a stakeholder analysis to provide Caltrans with background information relevant to developing a Comprehensive Adaptation and Implementation Plan for the 101 Corridor that incorporates community engagement and outreach as was stipulated in their recent Coastal Development Permit for the 101 Corridor Improvement Project. Our goal was to provide analysis, insights, and information that can contribute to Caltrans developing a successful community outreach and engagement process related to adaptation of the 101 Corridor to future SLR.

For this report we interviewed nine different stakeholders varying from local government, non-governmental organizations, agencies, and other interest groups. However, due to the COVID-19 pandemic we were not able to fulfill our goal of interviewing participants with varying connections to the 101 Corridor. The Governor of California issued a shelter-in-place order from the COVID-19 pandemic, which requires non-essential businesses close to stop the spread of the virus. Several of the local businesses and residents whom we planned to contact for an interview, could not be reached due to circumstances caused by the pandemic. Nevertheless, we were able to get valuable feedback from local professionals about their concerns on SLR and how it will affect the 101 Corridor and the surrounding community.

After reviewing the results from our stakeholder interviews and findings from case study analyses of other SLR adaptation strategies, we identified several key findings for Caltrans to consider. First, the majority of the interviewees expressed that their top concerns for planning and adapting to SLR are that property, habitats, and structures will be inundated by water, and that there is a lack of sufficient time and funding to successfully address this issue. Secondly, most of the participants said they were coordinating with either the City of Eureka, the City of Arcata, Humboldt County, the Humboldt Baykeeper, or the CA CC. The third key finding was that all the interviewees were involved in planning efforts for SLR in the Humboldt Bay region at large and along the 101 Corridor specifically. In addition, the participants mentioned that funding for adaptation related SLR impacts should come from federal and state government and taxpayer money. Lastly, the analysis showed that many stakeholders would like to see Caltrans reach out to every possible stakeholder that may be affected by the 101 Corridor project as well as facilitate public meetings where these stakeholder communities can communicate their

concerns and ideas and offer commentary on proposed adaptation measures. They also recommend that the public meetings be convenient and accessible for the community members to attend. For example, offer video chat meetings to encourage more public involvement or post a website with easy to read information regarding the project and provide a platform for them to apply comments. Additionally, many of the participants expressed a concern in Caltrans generating a single solution proposal related to SLR adaptation on the 101 Corridor. Instead, they expressed an interest in Caltrans considering a range of options and alternatives with extensive public input in order to provide an inclusive solution for SLR adaptations.

We distilled a few key insights from successful SLR cases conducted in other areas with hopes that that may provide insights for Caltrans as they develop a CAIP related to the 101 Corridor. We highlighted The City of San Diego's "State Lands Sea Level Rise Vulnerability" in which their plan identified vulnerability rankings to city assets and public trust resources and collaborated with their key stakeholders through a stakeholder advisory group. In the Florida case, university researchers conducted interviews with key state, city and county planners to assess their awareness of, concerns about, and needs related to SLR in Florida. The research gave state planners key information about the knowledge, attitudes, values and needs of different localities in the state in order to inform comprehensive SLR planning. In the city of Vancouver's Coastal Adaptation Plan for the Fraser River Foreshore, they created a stakeholder outreach and education plan which aimed to involve all possible stakeholders in sea level rise adaptation planning and encouraged public engagement so that they can educate the community and design appropriate measures for their project. They hosted workshops that allowed members of the

public to assess the efficacy of different adaptation alternatives or projects. Their innovative outreach process design and workshop formats could provide inspiration to Caltrans.

Table 6 includes a list of recommendations for Caltrans based on the findings and insights that emerged from the analysis in this report. Background research along with commentary from interview respondents indicates that developing a genuine, transparent, and inclusive community engagement process will be a crucial step for successful SLR adaptation planning for the 101 Corridor. Caltrans should use this engagement and outreach plan to progressively improve on the way they reach out to the public relevant to their projects. Furthermore, they should take on more responsibility to spearhead the planning for these big projects such as allocating the funds, facilitating education, and recruiting collaborating from stakeholders.

Table 6: Summary of Recommendations for Caltrans' Outreach and Engagement Plan

1. Leadership: In Interviews, stakeholders expressed an interest in seeing Caltrans take on a leadership role for sea level rise adaptation planning along the 101 Corridor. Although adaptation may involve coordination with other entities and processes, there was a desire for Caltrans to take a leadership role on the 101 Corridor specifically.
2. Stakeholder Advisory Committee: Caltrans may want to consider the development of a stakeholder advisory committee for this project, made up of representatives from local government, consultants, NGO's and residents and business owners that could be developed at the beginning of the planning process and be involved throughout. This could serve as a way to involve relevant stakeholders and the public as early and as often as possible. Many stakeholders emphasized the importance of consultation with various groups before the development of adaptation alternatives.
3. Tribal Consultation: Tribal consultation should also start at the beginning of the planning process. Local tribes, particularly ones upon whose ancestral territory the 101 Corridor resides, should be involved often and early in the process of considering solutions. This includes the three tribes with Wiyot membership: the Wiyot Tribe, Blue Lake Rancheria, and Bear River Rancheria.

4. Inclusive, Extensive Community Engagement: For sea level rise adaptation planning of this scale, it is important to develop a multi-faceted outreach and engagement process to connect with the range of different stakeholders and community members who are connected to the issue. All of the interviewees agreed that extensive and include community engagement was important. Engagement should include residents and business owners in the 101 Corridor area, agencies and local governments involved with permitting and reviews, Tribes, local governments, NGOs, and members of the general public should all be contacted regarding adaptation planning efforts.

5. Transparency and Adaptation Planning Website: Background research and interviews highlighted the important of transparency in the development of an adaptation process at this scale and importance. One part of this effort could be the development of an SLR adaptation planning website or webpage that outlines the background, purpose and need, potential alternatives and considerations, and provides updates about activities, events, and project progress.

6. Creative, Interactive Community Workshops: Consider conduct workshops or public meetings that allow members of the public to engage and interact with various options and alternatives and provide their feedback in an interactive and meaningful way.

7. Evaluate Potential Adaptation Alternatives: Consider developing a set of alternatives for SLR adaptation in the 101 Corridor. Then consider conducting an analysis of the different implications (environmental, financial, logistical) of each (similar to the process for Last Chance Grade). These alternatives could be discussed and weighed in on by stakeholders at outreach planning events and would give the public and stakeholders something tangible to evaluate.

8. Public Education on SLR: Public outreach and education about the current projections of SLR and its potential impacts to the 101 Corridor could be an important element of the strategy as stakeholders and members of the public may be unaware of current projections and the need for possible solutions or adaptations.

9. Expand Stakeholder Interviews: Interview-based research should be continued and expanded. The information on stakeholder knowledge, opinions, and perceptions of SLR and the 101 Corridor, and recommendations for the adaptation process included in this report are by no means extensive as this was conducted as a short term study. Additionally, this report does not contain feedback from residents, business owners, and Tribes. These groups are important stakeholder groups and should be contacted.

10. Building Trust: Initial results from this subset of stakeholder interviews suggest that trust in Caltrans when it comes to public engagement and agency consultation may be fairly low. Designing and inclusive and transparent process that involves key stakeholders from the beginning could be important steps to help rebuild this trust and develop effective collaboration and coordination on this and other projects.

11. Timeliness: Many interviewees expressed a desire that Caltrans begin an SLR adaptation and community engagement process as soon as possible. The projections for SLR show that impacts could arrive very soon compared to the large amount of time it will take to develop solutions and get funding to implement solutions at this scale.

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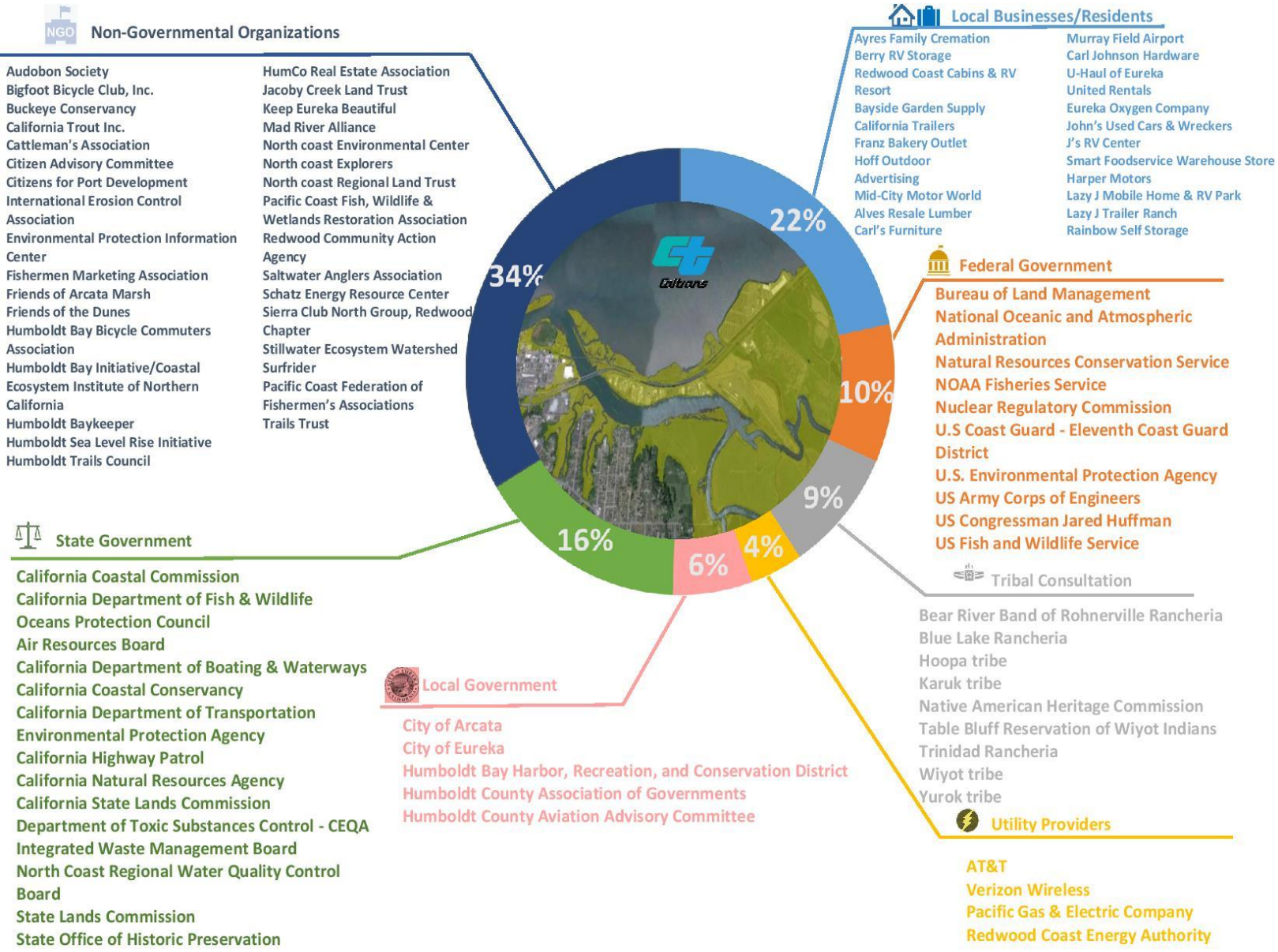
APPENDIX A:

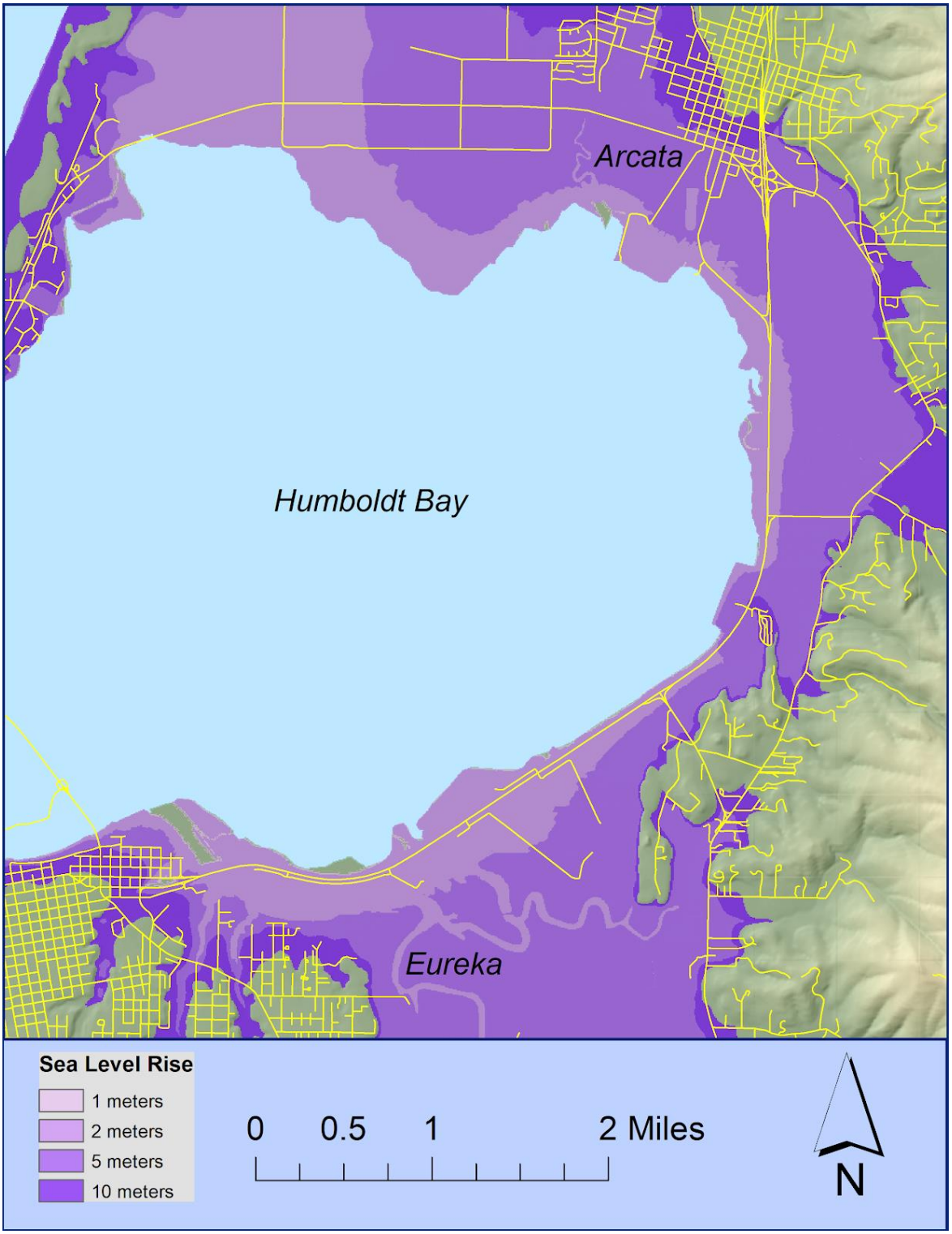
Stakeholder Map



Stakeholders on the Eureka-Arcata 101 Corridor

APPENDIX B:

Map of Eureka-Arcata 101 Corridor
Inundations from 1 meter to 10 meters



Source: Humboldt County GIS Data

APPENDIX C:

Interview Questions

Agency and NGO Staff

1. Who are you, what is your role, what agency do you work for?
2. Are staff members from your agency aware of projections for SLR impacts on Humboldt Bay?
    - Have you seen projections for the Eureka-Arcata US Hwy 101 corridor specifically? (show them the projections)
    - What is your reaction to these projections?
    - What do you think are some top concerns or considerations of your agency when thinking about planning and adapting to SLR impacts to the 101 corridor?
3. Is your agency doing anything related to sea level rise planning and adaptation on Humboldt Bay?
    - If so what?
    - Have you been coordinating with other agencies in activities related to SLR adaptation and planning?
        - Which ones? In what way?
        - What have you found most effective in terms of SLR coordination?
    - Does your agency have or are they developing a sea level rise or climate adaptation plan?
        - Follow-up to get details about the plan, focus, SLR projections, dates, etc.
    - Do you feel like your agency has sufficient support to engage in SLR planning?
        - What do you need?
4. Is your agency involved in any activities related to planning and adaptation to SLR in the 101 corridor specifically?
    - If so, what?
    - What role do you think your agency could or should play in planning and adaptation to SLR on the 101 corridor?
    - How do you think adaptation related to SLR impacts on the 101 corridor should be paid for?
    - What do you think would be the most effective ways for Caltrans to work/collaborate with other agencies/organizations on SLR planning for the 101 corridor?

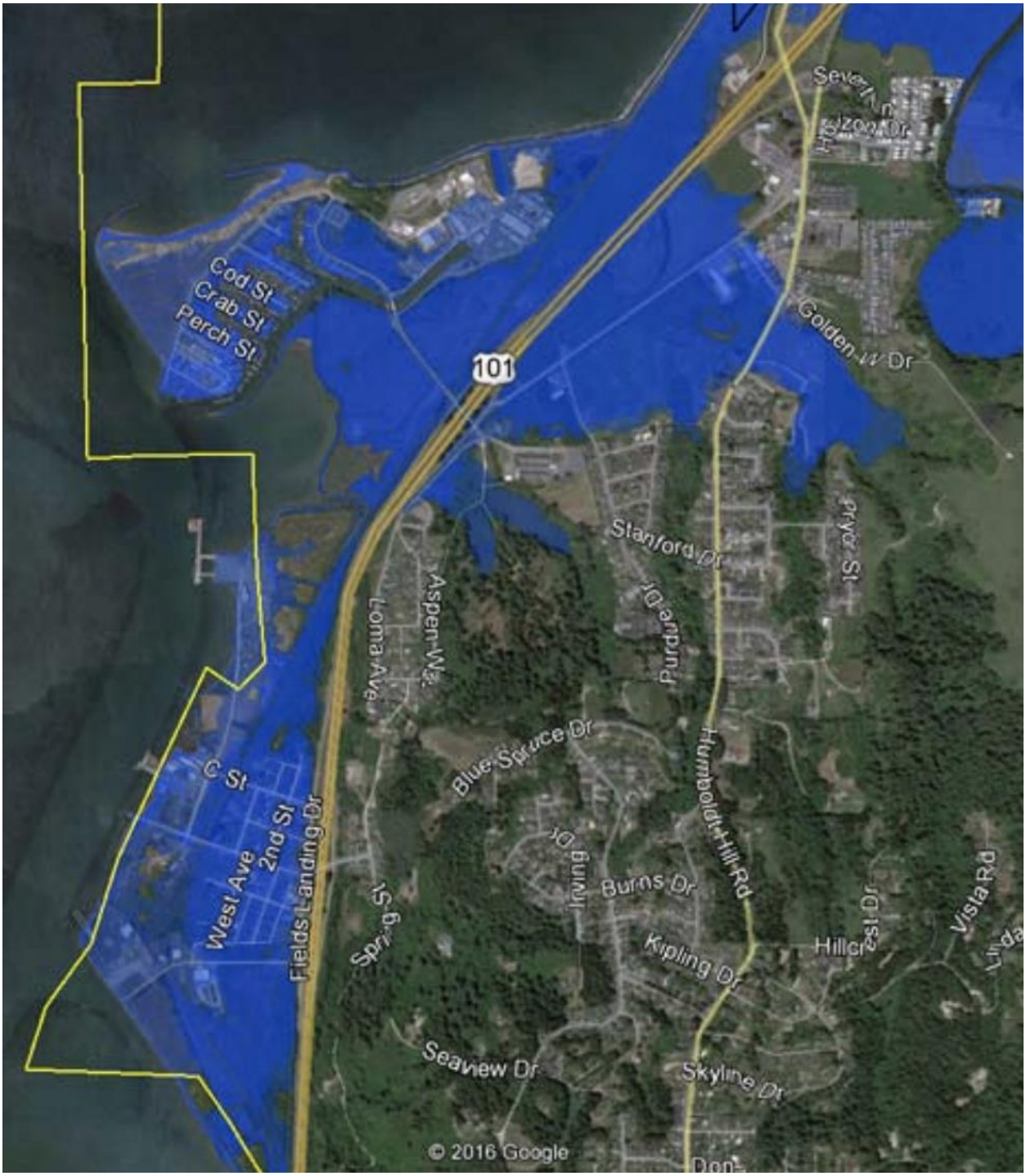
5. What would you like to see in an outreach strategy/plan related to the 101 corridor?
    - Who should lead the outreach effort?
    - Who should be involved?
    - What types of outreach tools should be used (public meetings/workshops, website, survey, etc.)?
    - Any input into how you would like to see the effort structured?
    - Are there particular options or strategies for adaptation for the 101 corridor that you would like to see assessed/reviewed/considered by Caltrans?
        - Or ones that you DON'T think should be considered
6. Anything else you would like to add?

Resident/Business Questions:

1. Tell me a bit about yourself. How long have you lived in or has your business operated in this area?
2. How are you connected to the Eureka-Arcata US Hwy 101 corridor?
    - Could you imagine living and/or operating your business anywhere else?
    - How often do you use the corridor?
3. Are you aware of SLR projections for Humboldt Bay and the Eureka-Arcata US Hwy Corridor specifically? - show the maps (Print out different time periods honed in on Corridor) -- when did you find out? From where?
    - What is your reaction to these maps? How do you think you might be affected?
    - What are your biggest concerns when thinking about SLR impacts to the 101 corridor?
    - How do you think that SLR might affect you or your business?
    - Are you currently doing anything to prepare for/adapt to flooding and SLR? What?
4. What would you like to see done to the 101 corridor area in response to SLR?
    - Elevate, Managed Retreat, Fortify
5. What do you feel should be Caltrans' role/responsibility in terms of planning for SLR impacts on the 101 corridor?
    - Who do you think should pay for adaptation?
6. What role do you think you could play in planning for and adapting to SLR on the corridor?
7. What would you like to see in an outreach strategy/plan related to the 101 corridor?
    - Who should lead the outreach effort?
    - Who should be involved?
    - What types of outreach tools should be used (public meetings/workshops, website, survey, etc.)?
    - Any input into how you would like to see the effort structured?
    - What do you think is the best way for Caltrans to connect with residents and business owners in the Jacobs Ave/101 Corridor Area?
    - Are there particular options or strategies for adaptation for the 101 corridor that you would like to see assessed/reviewed/considered by Caltrans?
        - Or ones that you DON'T think should be considered
8. Any last comments/thoughts?

APPENDIX D:

Potential tidal inundation areas in the King Salmon and Fields Landing community areas in the Southern Humboldt Bay region for the high relative sea level rise projections for 2050 (dark blue) and 2100 (light blue), and the PA boundary (yellow line (NHE 2014)).



Source: Laird, Aldaron. (2016).

APPENDIX E:

City of Eureka (black), its Planning Area (yellow) in the unincorporated area of Humboldt County, and area potentially vulnerable to tidal inundation (13.1 feet NAVD 88) by 2100 (blue).

Source: Laird, Aldaron. (2016).

APPENDIX F:

A table of all identified stakeholders for sea level rise adaptation planning in Humboldt Bay

Stakeholder / Organization
Local Government
101 Corridor Access Project (101 CAP)
Chamber of Commerce - Arcata
Chamber of Commerce - Eureka
City of Arcata
City of Eureka
City of Eureka Public Works and Building Department
County of Humboldt Board of Supervisors
FWS - Humboldt Bay National Wildlife Refuge
Humboldt Bay Harbor, Recreation, and Conservation District
Humboldt Community Services District
Humboldt County Association of Governments
Humboldt County Aviation Advisory Committee
Humboldt County Department of Public Works - Aviation Division
Humboldt County Farm Bureau
Humboldt County Planning Department
Humboldt County Public Works Dept.
Humboldt County Resource Conservation District
Manila Community Services District
McKinleyville Community Services District
Natural Resources Conservation Service
North Coast Unified Air Quality Management District
Northcoast Railroad Authority
State Government
Air Resources Board
California Department of Boating & Waterways
California Sea Grant
California Coastal Commission (North Coast Office)

California Coastal Conservancy
California Department of Fish and Wildlife
California Department of Transportation
California Environmental Protection Agency
California Highway Patrol
California Highway Patrol - Office of Special Projects
California Natural Resources Agency
California State Lands Commission
Department of Conservation
Department of Toxic Substances Control - CEQA Tracking Center
Integrated Waste Management Board
North Coast Regional Water Quality Control Board
Oceans Protection Council
State Lands Commission
State Office of Historic Preservation
Wildlife Conservation Board
Federal Government
Bureau of Land Management
National Oceanic and Atmospheric Administration
Natural Resources Conservation Service
NOAA Fisheries Service
Nuclear Regulatory Commission
U.S Coast Guard - Eleventh Coast Guard District
U.S. Environmental Protection Agency
U.S. Army Corps of Engineers
U.S. Congressman Jared Huffman
U.S. Fish and Wildlife Service
Non-Governmental Organizations
Aldaron Laird, Greenway Partners
Audubon Society

Bigfoot Bicycle Club, Inc.
Buckeye Conservancy
California Trout Inc.
Cattleman's Association
Citizen Advisory Committee
Citizens for Port Development
Coalition for Responsible Transportation Priorities
Craig Benson, International Erosion Control Association (IECA) director
Environmental Protection Information Center (EPIC)
Eureka Heritage 2007
Fishermen Marketing Association
Friends of Arcata Marsh
Friends of the Dunes
HSU Marine & Coastal Sciences Institute/ SLR Initiative
Humboldt Bay Bicycle Commuters Association
Humboldt Bay Initiative/Coastal Ecosystem Institute of Northern California
Humboldt Baykeeper
Humboldt State University Sea Level Rise Initiative
Humboldt Trails Council
Humboldt County Real Estate Association
Jacoby Creek Land Trust
Keep Eureka Beautiful
Keep Eureka Beautiful
Mad River Alliance
Northcoast Environmental Center
Northcoast Explorers
Northcoast Regional Land Trust
Pacific Coast Fish, Wildlife & Wetlands Restoration Association
Redwood Community Action Agency
Saltwater Anglers Association

Schatz Energy Resource Center
Sierra Club North Group, Redwood Chapter
Stillwater Ecosystem Watershed
Surfrider
The Pacific Coast Federation of Fishermen's Associations
Trails Trust
Utility Providers
AT&T
Verizon
Private Businesses
Alves Resale Lumber
Ayres Family Cremation
Bayside Garden Supplies
Bayside Garden Supply
Berry RV Storage
Bobcat of Eureka
California Trailers
Carl Johnson Hardware
Carl's furniture
Carlson Wireless Technologies
Coast Seafood
Coastline Foursquare Church
Don's Rent All
Eureka Freightliner
Eureka Oxygen Company
Franz Bakery Outlet
Gas Stoves with Style
GHD
Gordon Engineering
Greenway Partners

Happy Dog DayCare and Boarding
Harper Motors
Hoff Outdoor Advertising
Hog Island
HT Harvey and Associates Consulting
Humboldt River company
J's RV Center
John's Used Cars
Mid City Honda
Mid City Motor World
Mid City Toyota
Murray Airfield
Northern Hydrology & Engineering
Pacific Gas and Electric
Paper Material Handling
Pawlor
Point Blue Conservation Science
PWA/Cascadia Geosciences
Rainbow Self Storage
Rental Guys
Resale Lumber
Rogers Machinery Company
Smart Foodservice Warehouse Stores
Taylor Mari culture
Tea LAB
The Farm Store
U Haul
United Rentals
Residents
Lazy J Trailer Ranch

Tribal Consultation
Bear River Band of Rohnerville Rancheria
Blue Lake Rancheria
Hoopa tribe
Karuk tribe
Native American Heritage Commission
Table Bluff Reservation of Wiyot Indians
Trinidad Rancheria
Wiyot tribe
Yurok tribe

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