

DEPARTMENT OF TRANSPORTATION

NORTH REGION ENVIRONMENTAL
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EUREKA, CA 95501
(707) 572-7039
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TTY 711



Making Conservation
a California Way of Life.

May 10, 2023

California Coastal Commission
1385 Eighth Street, Ste. 130
Arcata, CA 95521

File: Eureka-Arcata U.S. Highway 101 Corridor Improvement Project
HUM 101 / PMs 79.9 / 86.3
01-36600 / 0100000127

SUBJECT: CDP 1-18-1078 Special Condition 1, 2023 Annual Report

Special Condition 1. Sea Level Rise and Flooding Impact Monitoring and Reporting

The California Coastal Commission issued to the California Department of Transportation (Caltrans) a Coastal Development Permit (CDP) 1-18-1078 on September 12, 2019. The permit covers the Eureka-Arcata U.S. Highway 101 Corridor Improvement Project (aka the Corridor), which consists of five component projects within a six-mile segment of U.S. Highway 101 along the east side of Humboldt Bay. In accordance with CDP 1-18-1078, Special Condition 1, the California Department of Transportation (Caltrans) is submitting the Sea Level Rise and Flooding Impact Monitoring Report. This 2023 Annual Report references the Baseline Report, which was submitted to California Coastal Commission staff on May 1, 2020, the 2021 Annual Report submitted on May 1, 2021, and the 2022 Annual Report submitted on May 10, 2022.

The Baseline Report, the 2021 Annual Report, and the 2022 Annual Report identify existing water elevation conditions in Humboldt Bay from the North Spit Tide Gauge, which provides data applicable to the Corridor Project. The Baseline Report and Annual Reports are referenced in the 2023 Annual Report to identify changes in water elevation conditions over time.

"Provide a safe and reliable transportation network that serves all people and respects the environment"

California Department of Transportation — North Region Environmental

District 1
1656 Union Street, Eureka, CA 95501

District 2
1657 Riverside Drive, Redding, CA 96001 (DO)
1031 Butte Street, Redding, CA 96001 (W. Venture)

District 3
703 B Street, Marysville, CA 95901

The Baseline Report established locations from which to take reference photographs to annually document King Tides and other extreme tidal events along the Corridor. The reference photographs and photographs of King Tide events from winter 2019/2020, winter 2020/2021, winter 2021/2022, and winter 2022/2023 are included in Appendix C of the 2023 Annual Report.

Annual Reports also document any closures due to flooding and include a brief discussion of any coastal hazards impacts to highway infrastructure along the Corridor during the reporting period. No flooding or coastal hazards impacted the highway during the 2023 reporting period. The 2023 Annual Report also provides an update on progress made in developing the Comprehensive Adaptation and Implementation Plan (CAIP) required by CDP 1-18-1078, Special Condition 2.

If you have questions or need additional information, please contact Felicia Zimmerman at Felicia.Zimmerman@dot.ca.gov or (707) 815-5994.

Sincerely,



Jason Meyer
Senior Environmental Scientist
Branch Chief E3

Attachment: Sea Level Rise and Flooding Impact Monitoring Report 2023

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A. Baseline Report

A.1. Water Elevation

The Baseline Report was provided to the California Coastal Commission on May 1, 2020. Water elevation baseline data for the Baseline Report was accessed for the North Spit Tide Gauge from the National Oceanic and Atmospheric Administration (NOAA) website and referenced to NAVD88 (Appendix A). The reporting period for the Baseline Report is April 1, 2019, to March 31, 2020. Monthly maximum water elevations ranged from 7.67 feet to 8.86 feet. The mean monthly maximum water elevation for the baseline reporting period was 8.07 feet (Figure 1). Monthly mean sea level for the baseline reporting period ranged from 3.44 feet to 4.33 feet with a mean of 3.80 feet for the reporting period (Figure 2).

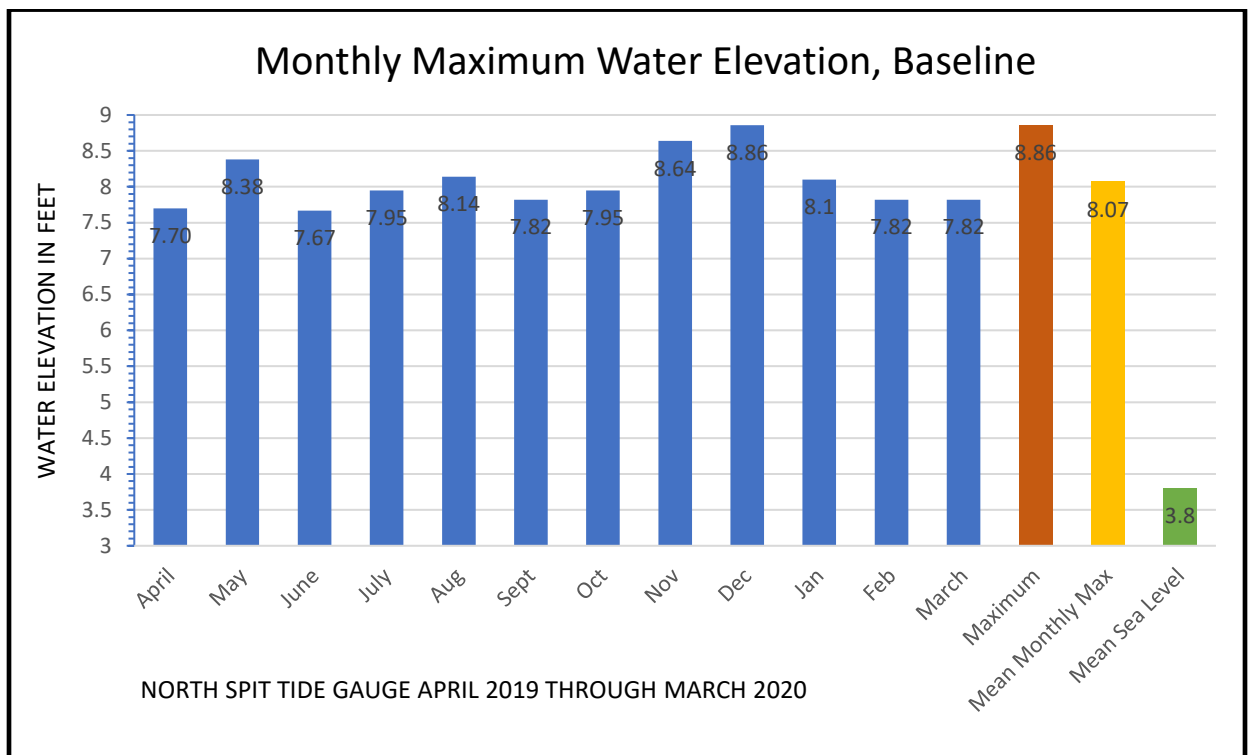


Figure 1. Monthly Maximum Water Elevation, Baseline shows the maximum water elevation by month at the North Spit Tide Gauge from April 1, 2019, to March 31, 2020. Monthly maximum and monthly mean sea level data were accessed from the NOAA Tides and Currents webpage. Mean Monthly Maximum and Mean Sea Level were calculated using the NOAA data.

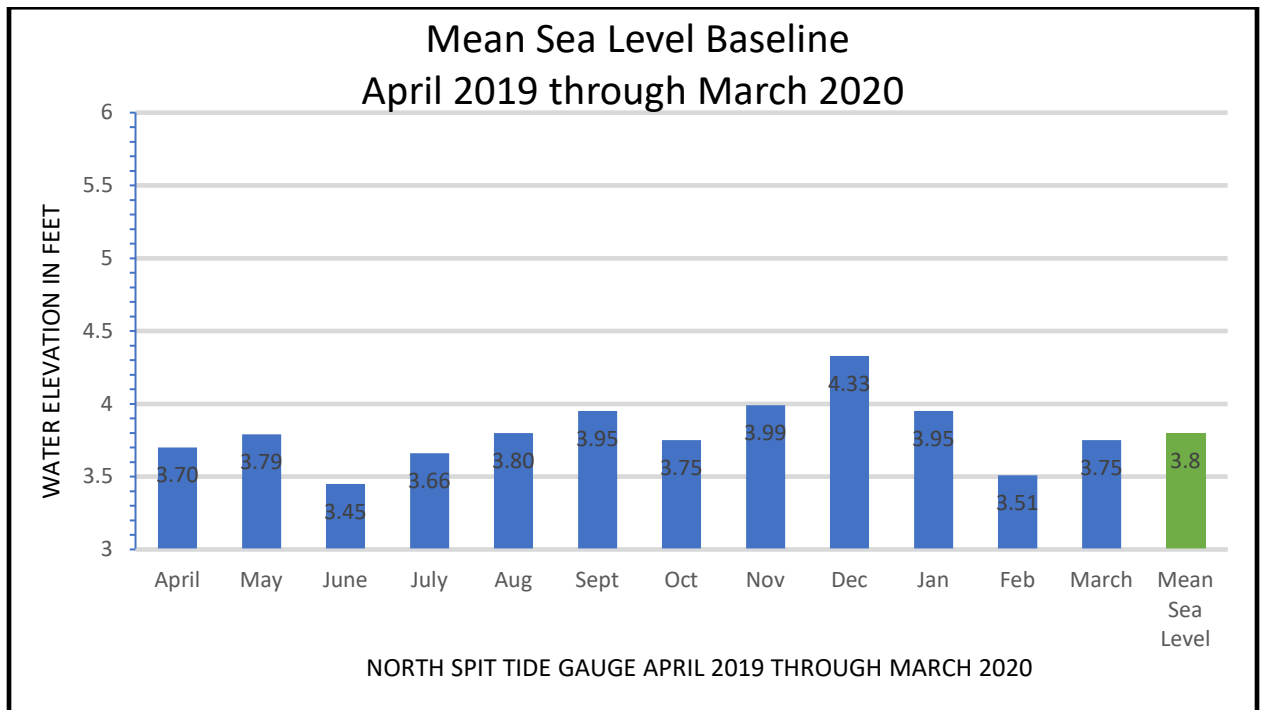


Figure 2. Mean Sea Level, Baseline at the North Spit Tide Gauge for April 1, 2019, through March 31, 2020, was calculated from available monthly mean sea levels from the NOAA Tides and Currents webpage.

A.2. Reference Photograph Locations

Reference locations for photographing annual King Tide and extreme tidal events along the Eureka-Arcata Corridor (Corridor) were established for the Baseline Report and were organized to easily facilitate replicating photos for the Annual Reports (Appendix B). Photograph location selection criteria included accessibility and safety, vulnerability to flooding (Caltrans Eureka-Arcata Corridor: Sea Level Rise Vulnerabilities and Adaptation Solutions 2019), and locations representing various shoreline cover and land use.

Two to four specific photo sites were established at each of the ten selected reference locations: Gannon Slough, Fay Slough, Jacoby Creek, North Bracut, South Bracut, Indianola, California Redwood Company, Jacobs Tide Gate, Eureka Slough, and Cole Avenue.

Site reference photos for Gannon Slough, Jacoby Creek, North Bracut, South Bracut, Indianola, California Redwood Company, Jacobs Tide Gate, Eureka Slough, and Cole Avenue were taken close to high tide on December 23, 2019. The National Weather Service (NWS) Daily Climate Report reported December 23, 2019, weather conditions as clear with an average wind speed of 2.8 miles per hour and no precipitation. The previous day saw 1.23 inches of precipitation. Site reference photos for Fay Slough were taken during the King Tide event on January 10, 2020. NWS reported cloudy weather conditions with an average wind speed of 4.6 miles per hour and minimal precipitation of 0.12 inch. Light precipitation of 0.28 inch was recorded for the previous day.

B. Annual Report 2023

B.1. Water Elevation

Water elevation data for the 2023 Annual Report for the North Spit Tide Gauge was accessed from the NOAA Tides and Currents website (NOAA, April 2023) and referenced to NAVD88 (Appendix A). The reporting period for the 2023 Annual Report was April 1, 2022, through March 31, 2023. Monthly maximum water elevations ranged from 7.67 feet to 8.96 feet (Figure 3). The highest reported water elevation of 8.96 feet was observed on December 23, 2022. This monthly maximum elevation is 0.42 feet lower than the highest monthly maximum elevation from the 2022 Annual Report, 0.31 feet higher than the 2021 Annual Report, and 0.10 feet higher than the monthly maximum elevation from the Baseline Report. The mean monthly maximum water elevation for the 2023 reporting period was 8.29 feet (Figure 3). This is 0.13 feet higher than the mean monthly maximum from the 2022 Annual Report, 0.19 feet higher than the 2021 Annual Report, and 0.22 feet higher than the mean monthly maximum from the Baseline Report (Figure 4).

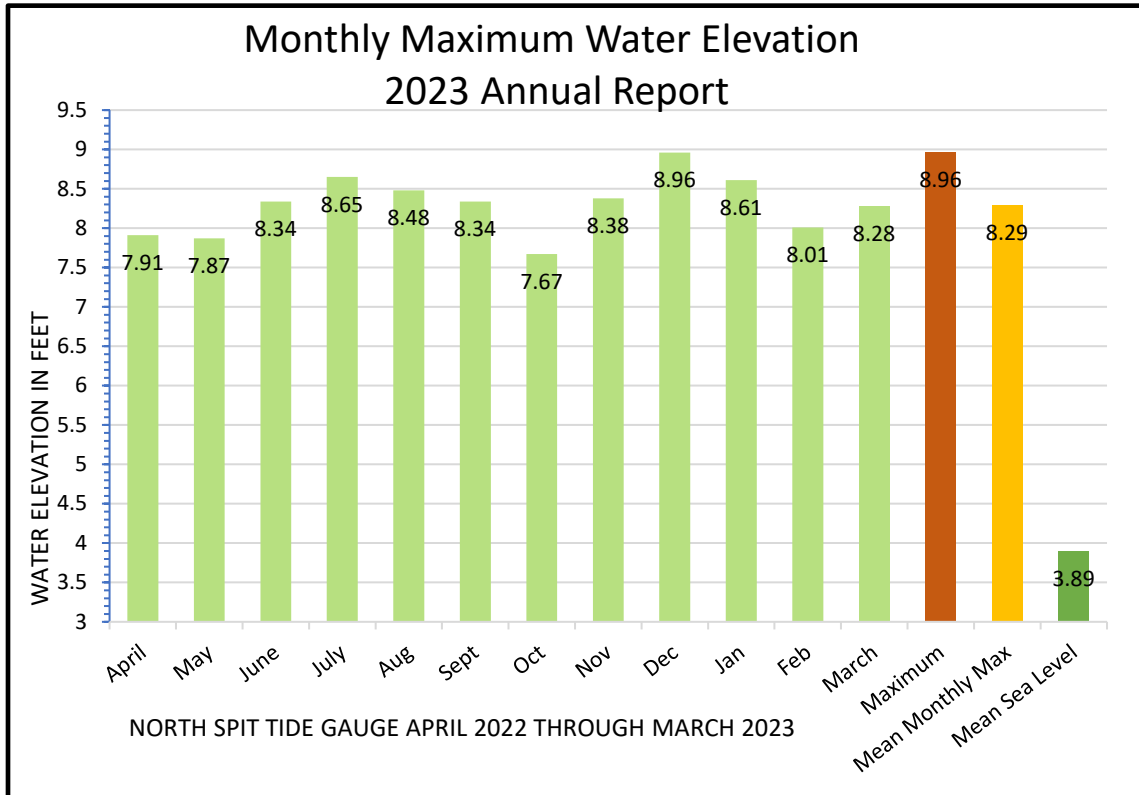


Figure 3. Monthly Maximum Water Elevation, 2023 Annual Report shows the maximum water elevation by month at the North Spit Tide Gauge from April 1, 2022, to March 31, 2023. Monthly maximum and monthly mean sea level data were accessed from the NOAA Tides and Currents webpage. Mean Monthly Maximum and Mean Sea Level were calculated using the NOAA data.

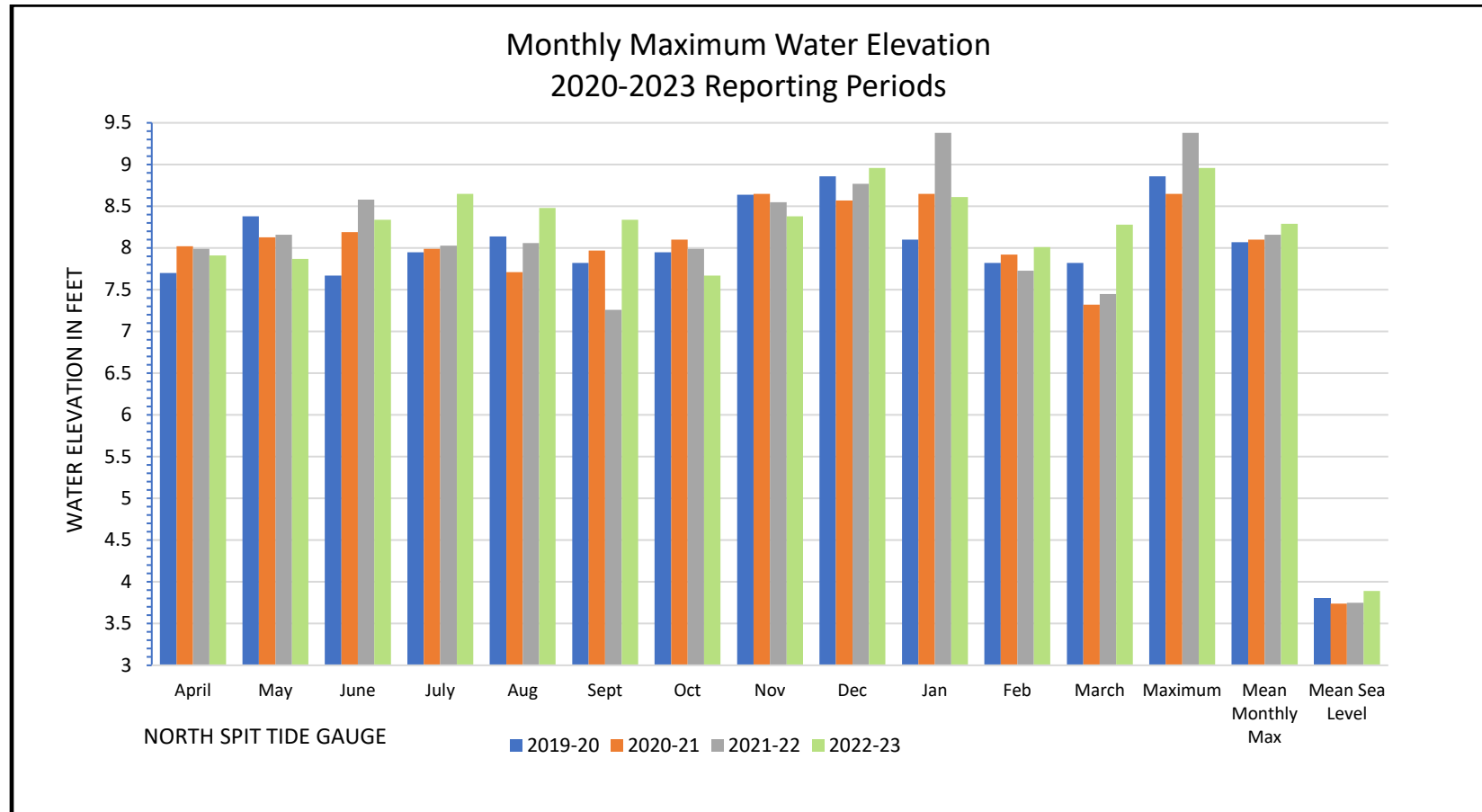


Figure 4. Monthly Maximum Water Elevation 2020-2023 reports the maximum water elevation by month at the North Spit Tide Gauge for the Baseline Report (April 1, 2019, to March 31, 2020), the 2021 Annual Report (April 1, 2020, through March 31, 2021), the 2022 Annual Report (April 1, 2021, through March 31, 2022) and the 2023 Annual Report (April 1, 2022, through March 31, 2023). The maximum water elevation, mean monthly maximum, and mean sea level for the four reporting periods is also represented in the figure.

B. Annual Report 2023 (continued)

B.1. Water Elevation (continued)

Monthly mean sea level for the 2023 reporting period ranged from 3.40 feet to 4.43 feet. Mean sea level for the 2023 Annual Report is 3.89 feet (Figure 5). The mean sea level for the 2022 and 2021 reporting periods was 3.75 feet and 3.74 feet respectively. The Baseline Report mean sea level was 3.80 feet; 0.09 feet lower than the 2023 Annual Report (Figure 6).

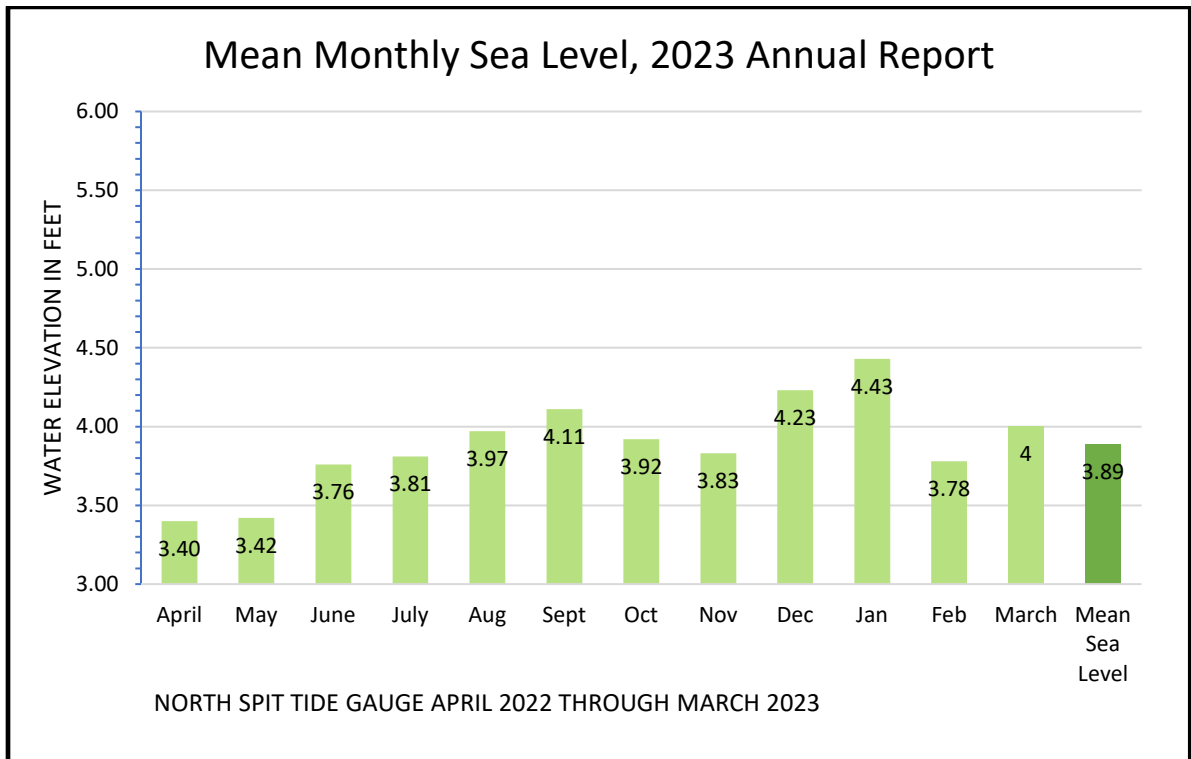


Figure 5. Mean Sea Level at the North Spit Tide Gauge for April 1, 2022, through March 31, 2023, was calculated from available monthly mean sea levels from the NOAA Tides and Currents webpage.

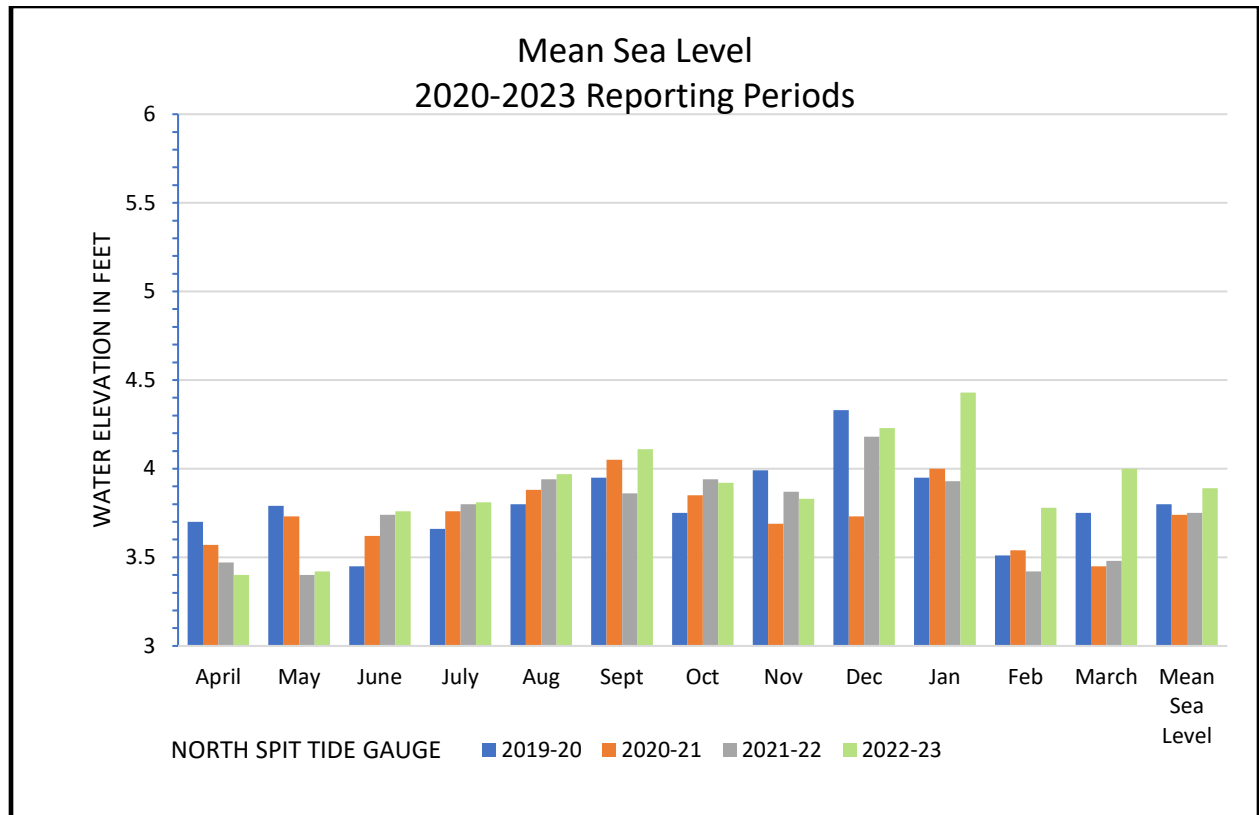


Figure 6. Mean Sea Level for the Baseline Report (2020) through 2023 Annual Report at the North Spit Tide Gauge. The Baseline Report shows monthly mean sea levels from April 1, 2019, through March 31, 2020. The 2021 and 2022 Annual Reports show mean sea levels for April 1, 2020, to March 31, 2021, and April 1, 2021, to March 31, 2022, respectively. The 2023 Annual Report shows monthly mean sea levels from April 1, 2022 through March 31, 2023. Mean sea level was calculated from available monthly sea level data from the NOAA Tides and Currents webpage.

B.2. Coastal Hazard Impacts

No impacts to highway infrastructure within the U.S. Highway 101 Corridor occurred during the 2023 reporting period. No temporary or ongoing flooding was observed and no weather-related incidents (such as erosion, overtopping of dikes, or tide gate failures) impacted the Corridor.

King Tides for winter 2022/2023 took place December 23 and 24, 2022, and January 21 and 22, 2023. Caltrans staff photographed King Tide conditions from established reference locations along the Corridor on December 23, 2022, and January 21, 2023 (Appendix C). Using the daily tide prediction tables published on the NOAA website, three-hour work windows were identified for when to best document King Tide conditions to capture the highest water elevations for each day.

Weather on December 23, 2022, included fog and mostly cloudy conditions with an average wind speed of 4.3 miles per hour and no precipitation for the day. Previous day precipitation was measured at 0.04 inch (Appendix A—National Weather Service Climate Data). Maximum December 23, 2022, high tide at the North Spit Tide Gauge was 8.96 feet (NOAA). Weather conditions on January 21, 2023, were mostly clear with an average wind speed of 2.3 miles per hour and no precipitation for the day. No precipitation was recorded the previous day (NWS). Maximum high tide on January 21, 2023, was 8.61 feet.

B.3. Adaption and Hazards Response

During the reporting period, Caltrans did not implement any weather- or flooding-related closures within the Corridor.

Additionally, no repair or maintenance was performed by Caltrans or other entities on dikes or berms that protect the highway. No impacts have been identified that would require a planned response, an amendment to CDP 1-18-1078, or a separate CDP application before the next monitoring cycle.

B.4. Adaptation Plan Progress

Coastal Development Permit 1-18-1078, Special Condition 2, directs Caltrans to develop the Comprehensive Adaptation and Implementation Plan (CAIP) to address long-term sea level rise within the Corridor by identifying strategies for protecting, relocating, or adapting the development authorized by CDP 1-18-1078.

Since the last Caltrans update on the CAIP, progress has been made in several CAIP areas, including, but not limited to, internal working groups, the 01-0M70 (Eureka Arcata SLR Resilience Project) kick off, Cal Poly Humboldt partnership, and potential partnering and regulatory meetings.

There are two internal working groups that were established in 2021: D1 Climate Change Working Group (CCWG) and the Sea Level Rise Technical Working Group (SLR TWG). The CCWG's mission is to develop a collaborative strategy for addressing climate change utilizing adaptive framework encompassing resources from long-range planning through maintenance. The goals and values of the CCWG are to lead on climate action planning through partnership, collaboration, and innovation on climate action. Specifically, the CCWG will engage stakeholders and the public, and will prioritize equity in planning and decision-making. Responsibilities and tasks include the following: (1) coordinate climate change activities across all functional units; (2) identify and provide support for implementation and updates of climate change adaptation policy and strategies; (3) provide review and assistance; (4) develop and implement outreach and education activities; and (5) provide and/or participate in training needs related to climate change.

The SLR TWG is specifically focused on addressing all needs related to the Special Condition 2 of CDP 1-18-1078, also known as the Comprehensive Adaptation and Implementation Plan (CAIP) for the Eureka-Arcata Corridor. The SLR Technical Group is currently developing the CAIP to include: (1) SLR analysis based on updated, best available science and monitoring reports; (2) evaluation of adaptation alternatives (accommodation, protection, and relocation) and their consistency with Coastal Act policies; (3) a timetable for implementation; and (4) coordination with local governments, stakeholders, and public interest groups.

As previously reported, due to the initial CAIP SLR projection analysis, the district requested funding of a Project Initiation Document (PID) for a project to address the immediate need to keep U.S. Highway 101 operable under 2030 inundation projections. The project is intended to function as an interim project (01-0M270) and is considered a temporary fix until the long-term strategy developed by the CAIP can be permitted and built. Caltrans Planning provided

funding for this short-term strategy PID in FY 2023 and 2024 with a PID target completion date of April 2024. The 01-0M270 (Eureka Arcata SLR Resilience) PID was funded with non-SHOPP funds but does not yet have a funding source for future environmental, design, and construction phases. If this project is funded through construction, the potential project benefits could include, but are not limited to: (1) delivery of a short-term project that can be adapted to the CAIP long-term strategy; (2) preservation of U.S. Highway 101 service along this vital North Coast corridor that many communities rely on; (3) reduction in risk of overtopping events, inundation and interrupted service along the corridor; and (5) allows CAIP stakeholders and partners to continue to collaborate with Caltrans to determine the comprehensive long-term solution.

Work on the PID started in February 2023. The project study proposes to raise the minimum elevation of the corridor to prevent inundation in year 2030. Finally, this project study will allow Caltrans to continue collaborating with our partners to find a long term SLR solution, while reducing the risks of having to intermittently close down U.S. Highway 101 during storm surge and flooding events.

We know that it is likely that the CAIP long-term comprehensive strategy will change over time as more information is gathered and analyzed. The options of retreat and accommodating sea level rise still need to be evaluated as part of the CAIP. The PID project short-term fix will not conflict with the comprehensive long-term strategy and, if the CAIP strategy is to preserve the existing U.S. Highway 101 alignment, living shorelines and other hybrid approaches could be constructed as part of a future long-term project.

Additionally, and concurrently with the PID development process, D1 staff are working diligently on the CAIP. District 1 has also applied for PROTECT Program 2% Planning Set-Aside for Climate Adaptation and Resilience Planning Studies for fiscal year 23/24 to provide support resources for the CAIP. The resources from the PROTECT program will provide the needed support resources for the remainder of the CAIP process, and we are awaiting the evaluation and award process that is being run by Caltrans HQ Office of Air Quality and Climate Change.

Furthermore, we are in the process of finalizing a California Model Agreement (CMA) between D1 Caltrans and Cal Poly Humboldt (formerly known as HSU) for Subject Matter Expert and technical study needs of the CAIP. The CMA between Cal Poly Humboldt will involve two major CAIP-related tasks:

- (1) Task 1 - Evaluate Existing and Anticipated Conditions and
- (2) Task 2 - Review of Conceptual Adaptation Strategies and Develop Strategies for Analysis and Assessment.

Task 1 tasks will include Cal Poly Humboldt's evaluation of existing and determination of anticipated conditions including:

- Compiling and summarizing existing long-term planning and assessment efforts by Caltrans and other experts.
- Defining existing and projected hydrological hazards including groundwater assessment, Humboldt Bay stillwater levels, local wind setup and wave runup, shoreline/coastal geomorphology, and riverine flood impacts.
- Defining existing geologic hazards such as subsidence, seismic hazards related to earthquakes, liquefaction and tsunami hazards.
- Identification of potential land use and infrastructure impacts.

Task 2 work consists of Cal Poly Humboldt's review of conceptual adaptation strategies, development of analysis and assessment strategies, and provision of design guidance for natural armoring systems.

D1 and Cal Poly Humboldt anticipate having the CMA in effect for a May 2023 Kick Off. The CMA with Cal Poly Humboldt will run through February 2025. D1 staff will work with Cal Poly through our SLR TWG. The contract manager is Clancy De Smet.

D1 staff worked with a consultant to develop a Public Engagement Plan (PEP). D1 staff is planning additional public participation workshops. Also, we used public engagement support services under the Planning Public Engagement Contract (PPEC) to develop a website. To enhance our efforts to add resiliency to the State Highway System we have launched a website [North Coast Climate Action](#). On the website, the public will find information about planning and

projects along the U.S. Highway 101 Corridor and in each of the four counties covered by District 1. We have also launched [Clancy's Climate Change Corner](#) (a video series) to provide the latest news and updates on projects and opportunities to get involved with the process. We are currently in the process of re-engaging with the PPEC support services to provide public engagement support for the CAIP process.

D1 staff continues to participate as a member in several groups related to climate change in the area, including: (1) [Cal Poly Humboldt's Sea Level Rise Initiative \(SLRI\)](#); (2) [Humboldt County's Natural Shoreline Infrastructure Technical Working Group](#); and (3) [Humboldt Bay Initiative](#). Also, D1 staff member, Clancy De Smet, is a contributing co-author along with members of the SLRI to the article *A Polytechnic to Address Climate and Community Resilience: Developing a Cal Poly Humboldt Focus in Transformative Sea-Level Rise Research and Planning*, [Humboldt Journal of Social Relations](#), to be published in Summer 2023.

Finally, the CAIP team members (i.e., PDT members) have been identified, and monthly meetings are being scheduled with the team. We are working towards setting up meetings with working groups. We will conduct partnering meetings with City of Eureka, County of Humboldt, City of Arcata, tribal groups, California Coastal Commission, CDFW, U.S. Army Corps of Engineers, NCRWQCB, and USFWS.

In summary, a lot has been done but there is much more work to do to complete the CAIP by the December 2025 deadline. We're working on partnering meetings, public engagement, and technical assistance with Cal Poly Humboldt. The heavy lifting will come in 2023 through the end of the process. Public and partner engagement will be the focus in the near term.

B.5. Flood Events

No flooding or road closure events occurred during the reporting period.

C. Frequent Flood Event Report

The roadway was not closed during the reporting period; therefore, no Frequent Flood Event Report is included with this Annual Report.

References

California Department of Transportation (Caltrans). 2019. *Caltrans Eureka-Arcata Corridor: Sea Level Rise Vulnerabilities and Adaptation Solutions*. May 2019.

California Department of Transportation (Caltrans). 2019 *CDP 1-18-1078 Special Condition 1, Baseline and Annual Report*. May 2020.

California Department of Transportation (Caltrans). 2019 *CDP 1-18-1078 Special Condition 1, 2021 Annual Report*. May 2021.

California Department of Transportation (Caltrans). 2019 *CDP 1-18-1078 Special Condition 1, 2022 Annual Report*. May 2022.

Observed Weather Reports (April 21, 2023). In *National Weather Service*. Retrieved from <https://forecast.weather.gov/product.php?site=EKA&product=CLI&issuedby=EKA>

Water Level Reports (April 21, 2023). In *NOAA Tides and Currents*. Retrieved from <https://tidesandcurrents.noaa.gov/reports.html?type=monthlyextremes&bdate=20220401&edate=20230331&units=standard&datum=NAVD&id=9418767&retrieve=Retrieve>

Appendix A

NOAA Tides and Current Data and NWS Climate Data

NOAA Tides and Currents Data

MAXIMUM, MINIMUM WATER LEVEL DATA
National Ocean Service (NOAA)

Station: 9418767 T.M.:
 0 W
 Name: North Spit, CA Units:
 Feet
 Type: Mixed Datum:
 NAVD
 Note: [] Inferred Water Level Value Quality:
 Verified

2019	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Annual												

Mean	4.25	4.26	4.03	3.70	3.79	3.58	3.66	3.80	3.95	3.75	3.99	4.33
Maximum	9.09	8.48	7.92	7.70	8.38	7.67	7.95	8.14	7.82	7.95	8.64	8.86
Max Day	20	3	25	20	19	16	31	1	30	29	27	25
Max Time	18:24	18:24	10:42	07:48	07:24	06:12	05:54	06:48	20:36	20:06	19:24	18:24
Minimum	-2.09	-1.97	-0.58	-1.32	-0.99	-1.75	-1.93	-1.76	-0.54	-1.31	-1.36	-1.24
Min Day	23	20	18	21	20	5	5	2	1	31	26	27
Min Time	02:48	01:48	23:54	15:00	14:48	15:00	15:30	14:30	14:54	03:24	01:00	02:18
2020	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Annual												

Mean	3.95	3.51	3.75	3.57	3.73	3.62	3.76	3.88	4.05	3.85	3.69	3.73
Maximum	8.10	7.82	7.82	8.02	8.13	8.19	7.99	7.71	7.97	8.10	8.65	8.57
Max Day	21	8	13	10	9	5	22	19	20	18	16	13
Max Time	16:36	18:30	10:12	08:54	08:18	06:24	07:54	07:06	21:36	20:18	19:36	17:54
Minimum	-1.83	-2.05	-1.11	-1.10	-1.66	-1.85	-1.72	-1.26	-0.32	-1.35	-1.88	-2.37
Min Day	12	10	10	10	8	7	5	3	16	20	16	16
Min Time	02:42	02:06	01:42	15:24	14:18	14:48	13:48	13:30	12:42	03:54	01:54	02:24
2021	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Annual												

Mean	4.00	3.54	3.45	3.47	3.40	3.74	3.80	3.94	3.86	3.94	3.87	4.18
Maximum	8.65	7.92	7.32	7.99	8.16	8.58	8.03	8.06	7.26	7.99	8.55	8.77
Max Day	12	11	4	28	27	25	24	22	7	24	5	4
Max Time	18:36	19:06	11:12	07:48	07:18	07:00	06:42	06:42	07:12	21:00	19:18	18:36
Minimum	-1.84	-1.70	-1.13	-1.98	-2.41	-2.00	-1.92	-0.92	-0.30	-1.05	-1.75	-2.48
Min Day	14	28	1	29	27	25	23	20	6	10	7	6
Min Time	02:18	02:00	02:36	15:18	14:12	14:06	13:00	12:06	13:06	04:00	03:00	02:36
2022	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Annual												

Mean	3.93	3.42	3.48	3.40	3.42	3.76	3.81	3.97	4.11	3.92	3.83	4.23
Maximum	9.38	7.73	7.45	7.91	7.87	8.34	8.65	8.48	8.34	7.67	8.38	8.96
Max Day	3	1	2	19	17	16	13	12	10	27	24	23
Max Time	19:30	19:06	19:18	08:36	07:30	08:06	06:06	06:48	06:48	20:12	19:06	18:42
Minimum	-2.03	-2.54	-1.50	-1.13	-2.42	-2.28	-2.20	-1.63	-0.72	-1.26	-2.03	-2.25
Min Day	2	2	2	19	18	15	14	12	8	29	26	25
Min Time	00:48	02:12	01:06	15:36	15:06	14:18	14:06	13:48	12:00	04:00	03:00	02:42

MAXIMUM, MINIMUM WATER LEVEL DATA
National Ocean Service (NOAA)

Station: 9418767
 0 W
 Name: North Spit, CA
 Feet
 Type: Mixed
 NAVD
 Note: [] Inferred Water Level Value
 Verified

T.M.:
 Units:
 Datum:
 Quality:

2023	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Annual												
Mean	4.43	3.78	4.00	3.68								
Maximum	8.61	8.01	8.28	7.47								
Max Day	4	19	21	10								
Max Time	17:30	18:30	19:24	09:36								
Minimum	-2.55	-1.99	-0.43	-1.20								
Min Day	23	20	25	21								
Min Time	02:24	01:24	16:30	14:30								

*The monthly max/min report information is based on high/low tides only.

000
 CXUS56 KEKA 051230
 CF6EKA

PRELIMINARY LOCAL CLIMATOLOGICAL DATA (WS FORM: F-6)

STATION: EUREKA CA
 MONTH: JANUARY
 YEAR: 2023
 LATITUDE: 40 47 N
 LONGITUDE: 124 10 W

TEMPERATURE IN F:											:PCPN:		SNOW:		WIND		:SUNSHINE:			SKY		:PK WND	
1	2	3	4	5	6A	6B	7	8	9	10	11	12	13	14	15	16	17	18					
											12Z		AVG		MX		2MIN						
DY	MAX	MIN	AVG	DEP	HDD	CDD	WTR	SNW	DPHTH	SPD	SPD	DIR	MIN	PSBL	S-S	WX	SPD	DR					
1	53	36	45	-2	20	0	0.00	0.0	0	2.5	8	90	M	M	2		9	M					
2	52	38	45	-2	20	0	0.22	M	M	6.0	27	M	M	M	1		27	180					
3	55	39	47	0	18	0	T	0.0	0	7.4	17	180	M	M	10		28	M					
4	62	51	57	10	8	0	1.08	M	0	13.2	28	M	M	M	1		48	140					
5	56	46	51	3	14	0	0.72	0.0	0	9.1	14	180	M	M	10		30	M					
6	59	49	54	6	11	0	0.10	M	0	10.3	15	200	M	M	10	1	29	M					
7	56	46	51	3	14	0	0.91	0.0	0	11.6	20	160	M	M	10		40	150					
8	58	48	53	5	12	0	0.47	0.0	0	9.6	16	220	M	M	7	3	30	200					
9	60	41	51	3	14	0	0.08	0.0	0	8.8	29	160	M	M	5		35	M					
10	55	40	48	0	17	0	0.70	0.0	0	9.1	15	160	M	M	9		30	170					
11	58	47	53	5	12	0	0.07	M	0	11.9	22	170	M	M	M		40	170					
12	67	52	60	12	5	0	0.32	0.0	0	11.0	18	170	M	M	10		35	150					
13	59	51	55	7	10	0	0.93	0.0	0	8.8	12	160	M	M	10	1	22	190					
14	55	47	51	3	14	0	1.09	0.0	0	10.2	14	210	M	M	10	1	30	190					
15	55	41	48	0	17	0	0.24	0.0	0	4.1	8	180	M	M	7		12	M					
16	52	38	45	-3	20	0	0.00	0.0	0	3.2	12	20	M	M	6		12	M					
17	53	36	45	-3	20	0	0.00	0.0	0	0.9	6	320	M	M	6		6	M					
18	50	37	44	-4	21	0	0.83	0.0	0	4.2	12	190	M	M	9		21	300					
19	51	34	43	-5	22	0	T	0.0	0	3.1	13	350	M	M	4		18	10					
20	54	31	43	-5	22	0	0.00	0.0	0	1.7	6	290	M	M	0		8	M					
21	54	33	44	-4	21	0	0.00	0.0	0	2.3	6	120	M	M	6		7	M					
22	51	42	47	-1	18	0	0.00	0.0	0	10.9	17	360	M	M	5		25	360					
23	54	35	45	-3	20	0	0.00	0.0	0	4.1	12	360	M	M	2		18	M					
24	57	35	46	-2	19	0	0.00	0.0	M	2.1	5	340	M	M	0	18	7	M					
25	58	35	47	-1	18	0	0.00	0.0	0	1.3	10	360	M	M	0	8	10	M					
26	59	36	48	0	17	0	0.00	0.0	0	2.3	8	360	M	M	0	8	10	M					
27	51	40	46	-2	19	0	0.00	0.0	0	5.8	14	10	M	M	10	2	17	360					
28	51	42	47	-1	18	0	0.07	0.0	0	4.5	12	360	M	M	8		16	360					
29	51	35	43	-5	22	0	0.06	M	0	6.6	21	10	M	M	0		24	10					
30	56	27	42	-6	23	0	0.00	M	0	3.4	10	340	M	M	0		17	350					
31	55	30	43	-5	22	0	0.00	M	0	0.0	M	M	M	M	4		8	M					
SM	1717	1238			528	0	7.89	0.0		190.0			M		160								
AV	55.4	39.9								6.1	FASTST	M	M	6		MAX(MPH)							
								MISC	---->	29	160					48	140						

Note: An "M" in any column means the data are Missing for that element.

Column		
1	DY	The day of the month.
2	MAX	The highest temperature for the day in degrees Fahrenheit (F).
3	MIN	The lowest temperature for the day in degrees Fahrenheit (F).
4	AVG	The average temperature for the day, computed by finding the average of the values in columns 2 and 3, then rounding (if necessary). Example; 55.5 rounds up to 56, 55.4 rounds down to 55 degrees.
5	DEP	Departure from normal. The difference between column 4 and the 30 year normal temperature for this date. A minus (-) is number of degrees below normal. A zero (0) indicates that the average for that day was the Normal.
6a & 6b	HDD & CDD	Degree Day: A gauge of the amount of heating or cooling needed for a building using 65 degrees as a baseline. To compute heating/cooling degree-days, take the average temperature for a day and subtract the reference temperature of 65 degrees. If the difference is positive, it is called a " Cooling Degree Day ". If the difference is negative, it is called a " Heating Degree Day ". The magnitude of the difference is the number of days. For example, if your average temperature for a day is 50 degrees in September, the difference of the average temperature for that day and the reference temperature of 65 degrees would yield a minus 15. Therefore, you have 15 Heating Degree Days that day. If the average temperature is 77 degrees for a day, you would have 12 Cooling Degree Days (77-65). If the average temperature for the day is 65 degrees, there are no Heating or Cooling degree days. Electrical, natural gas, power, and heating, and air conditioning industries utilize heating and cooling degree information to calculate their energy needs. The Heating season runs from July 1st through June 30th. The Cooling season runs from Jan 1st through Dec 31st.
7	WTR	Total precipitation for the day to the nearest hundredth of an inch. This includes all forms of precipitation, both liquid and water equivalent of any snow or ice that occurred (T = Trace, some precipitation fell but not enough to measure).
8	SNW	Total snowfall for the day to the nearest tenth of an inch.
9	DPTH	Snow depth on the ground to the nearest inch at 1200UTC. 7am EST., 6am CST, 5am MST, 4am PST, 3am AST, etc.
10	AVG SPD	Average wind speed for the day in miles per hour (mph).
11	MX SPD	The highest wind speed in mph averaged over a 2 minute period.

12	2MIN DIR	The direction (in compass degrees divided by 10) from which the wind speed in column 11 came from. (N=36 S=18 W=27 E=09, etc.)
13	MIN	The number of minutes of sunshine received at the station. Not reported at all locations.
14	PSBL	The percentage of possible sunshine. Computed by dividing the minutes of sunshine in column 13 by the total possible minutes. Not reported at all locations.
15	S-S	The average sky cover between sunrise and sunset in tenths of sky covered. The minimum of "0" means no clouds observed, "10" means clouds covered the entire sky for that day.
16	WX	<p>A coded number representing certain types of weather observed during the day.</p> <ul style="list-style-type: none"> 1 = Fog 2 = Fog reducing visibility to 1/4 mile or less 3 = Thunder 4 = Ice pellets 5 = Hail 6 = Glaze or rime 7 = Blowing dust or sand: visibility 1/2 mile or less 8 = Smoke or haze 9 = Blowing snow X = Tornado <p>In the example above on the 12th, you see "138" coded for the day. That means Fog, Thunder and Smoke or Haze were observed at some time during that day.</p>
17	SPD	Peak wind speed for the day in mph. The highest wind speed observed at the station.
18	DR	The compass direction from which the peak wind speed came.

Appendix B

Photo Documentation Locations

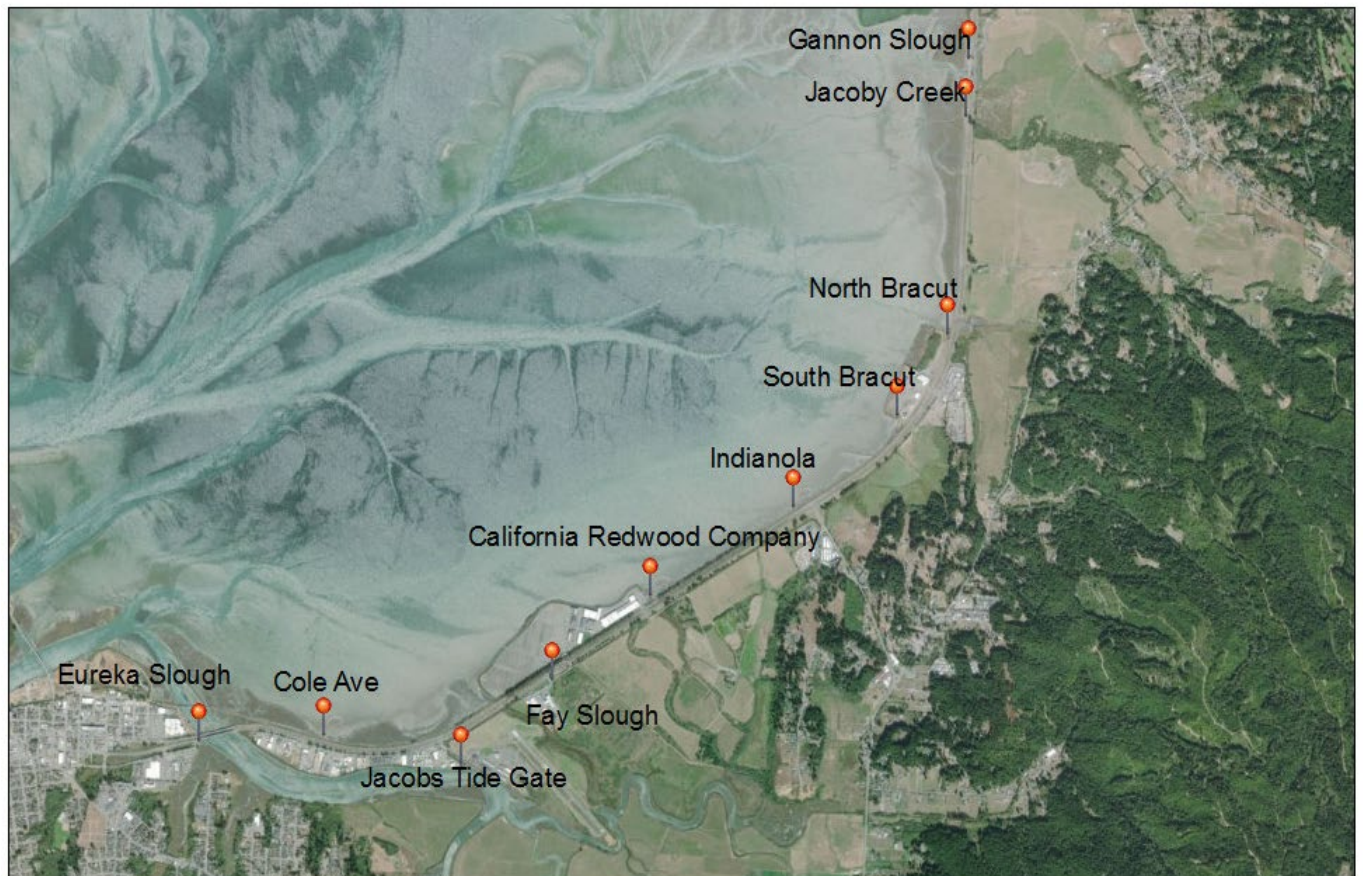


Figure 1 **Reference Photograph Locations** for documenting King Tides and extreme weather events along the Eureka-Arcata 101 Corridor.

Table 1 Location Selection Criteria

	Accessibility and Safety	Vulnerability to Flooding	Shoreline Cover	Adjacent Land Use / Zoning
Gannon Slough	Good, <i>Bay Trail</i>	moderate-high	Salt marsh, slough channel	Trail/Natural Resources (NR)
Jacoby Creek	Good, <i>Bay Trail</i>	moderate-high	Salt marsh, creek channel	Trail/NR
North Bracut	Fair, <i>behind Bayside Garden Supply</i>	moderate-high	Bracut dike, railroad grade, vegetation	Businesses/NR and Industrial General
South Bracut	Fair, <i>near California Trailers</i>	moderate	Bracut dike, railroad grade, salt marsh	Businesses/NR and Industrial General
Indianola	Caution, <i>shoulder</i>	moderate	Railroad grade, rock, exposed with areas of erosion	Future Trail/NR
California Redwood Company	Fair, <i>entrance to CRC</i>	moderate-high	Railroad grade, salt marsh, rock, CRC levee to the south	Future Trail/NR, Industrial General
Jacobs Tide Gate	Fair, <i>Airport Rd</i>	low-moderate	Jacobs Ave south side levee, rock protection	Businesses/Service Commercial
Eureka Slough	Good, <i>Eureka Waterfront Trail</i>	high	Bank of Eureka Slough, rock, vegetation	Trail/Service Commercial/NR
Cole Ave	Caution, <i>shoulder</i>	high	Railroad grade, rock, erosion bound by salt marsh to north and south	Future Trail/NR
Fay Slough	Fair, <i>CDFW parking lot, shoulder</i>	subject to inland flooding from Fay Slough	Roadside ditch paralleling Highway 101 north	Businesses/Service Commercial/Coastal Agricultural

Appendix C

Photo Documentation

King Tide and Extreme Tidal Event Photo Documentation

Reference Photos

December 23, 2019:

Gannon Slough, Jacoby Creek, North Bracut, South Bracut, Indianola, California Redwood Company, Jacobs Tide Gate, Eureka Slough, and Cole Ave

January 10, 2020:

Fay Slough

2020 Annual Report, Winter 2019/2020 King Tide Photos

January 10 and 11, 2020:

All locations

February 8, 2020:

All locations

2021 Annual Report, Winter 2020/21 King Tide Photos

December 14, 2020:

All locations

January 12, 2021:

All locations

2022 Annual Report, Winter 2021/22 King Tide Photos

December 4, 2021:

All locations

January 3, 2022:

All locations

2023 Annual Report, Winter 2022/23 King Tide Photos

December 23, 2022:

All locations

January 21, 2023:

All locations

Gannon Slough Photos

Gannon Slough South Reference



Gannon Slough South 2020 Annual Report



1/10/20

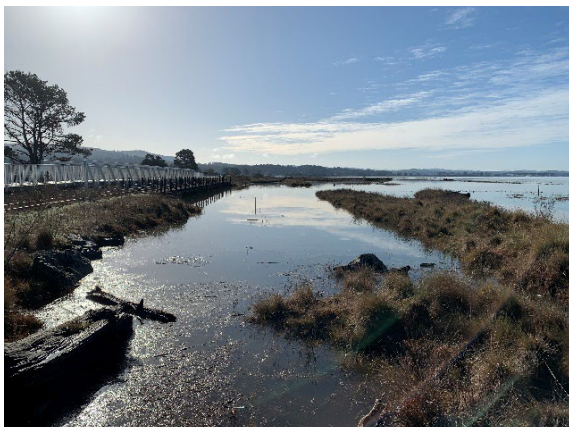


1/11/20



2/8/20

Gannon Slough South 2021 Annual Report



12/14/20



1/12/21

Gannon Slough South 2022 Annual Report



12/4/22



1/3/22

Gannon Slough North Reference



Gannon Slough North 2020 Annual Report



1/10/20

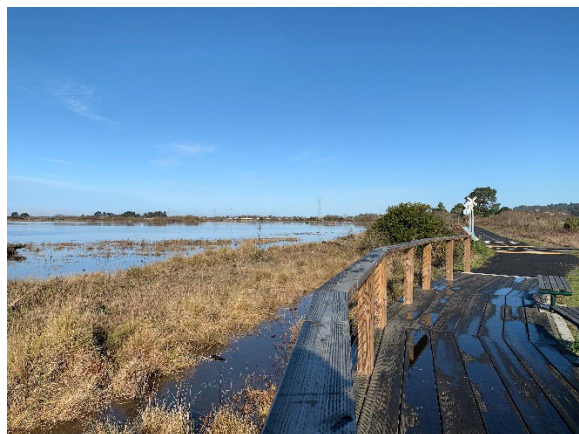


1/11/20



2/8/20

Gannon Slough North 2021 Annual Report



12/14/20



1/12/21

Gannon Slough North 2022 Annual Report

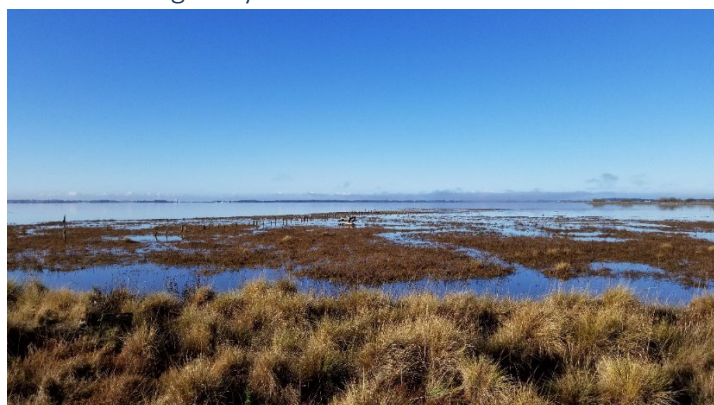


12/4/21



1/3/22

Gannon Slough Bay Reference



Gannon Slough Bay 2020 Annual Report



1/10/20



1/11/20



2/8/20

Gannon Slough Bay 2021 Annual Report



12/14/20



1/12/21

Gannon Slough Bay 2022 Annual Report



12/4/21



1/3/22

Jacoby Creek Photos

Jacoby Creek Left Reference



Jacoby Creek Left 2020 Annual Report



1/10/20



1/11/20



2/8/20

Jacoby Creek Left 2021 Annual Report



12/14/20



1/12/21

Jacoby Creek Left 2022 Annual Report



12/4/21



1/3/22

Jacoby Creek Right Reference



Jacoby Creek Right 2020 Annual Report



1/10/20



1/11/20



2/8/20

Jacoby Creek Right 2021 Annual Report



12/14/20



1/12/21

Jacoby Creek Right 2022 Annual Report



12/4/21



1/3/22

Jacoby Creek RR Reference



Jacoby Creek RR 2020 Annual Report



1/10/20



1/11/20



2/8/20

Jacoby Creek RR 2021 Annual Report



12/14/20



1/12/21

Jacoby Creek RR 2022 Annual Report



12/4/22



1/3/22

Jacoby Creek Bay Reference



Jacoby Creek Bay 2020 Annual Report



1/10/20



1/11/20



2/8/20

Jacoby Creek Bay 2021 Annual Report



12/14/20

Jacoby Creek Bay 2022 Annual report



12/4/21



1/3/22

Jacoby Creek Kayaker 2022 Annual Report



12/4/21

North Bracut Photos

North Bracut Full Reference



North Bracut Full 2020 Annual Report



1/10/20



1/11/20

2/8/20

North Bracut Full 2021 Annual Report



12/14/20

1/12/21

North Bracut Full 2022 Annual Report



12/4/21



1/3/22

North Bracut Zoom Reference



North Bracut Zoom 2020 Annual Report



1/10/20



1/11/20



2/8/20

North Bracut Zoom 2021 Annual Report



12/14/20



1/12/21

North Bracut Zoom 2022 Annual Report



12/4/21



1/3/22

North Bracut Railroad 2022 Annual Report



1/3/22

South Bracut Photos

South Bracut Full Reference



South Bracut Full 2020 Annual Report



1/10/20



1/11/20



2/8/20

South Bracut Full 2021 Annual Report



12/14/20



1/12/21

South Bracut Full 2022 Annual Report



12/4/21

1/3/22

South Bracut Zoom Reference



South Bracut Zoom 2020 Annual Report



1/10/20

1/11/20



2/8/20

South Bracut Zoom 2021 Annual Report



12/14/20



1/12/21

South Bracut Zoom 2022 Annual Report



12/4/21



1/3/22

Indianola Photos

Indianola North Reference



Indianola North 2020 Annual Report



1/10/20



1/11/20

Indianola Erosion 2020 Annual Report



2/8/20

Indianola North 2021 Annual Report



12/14/20



1/12/21

Indianola North 2022 Annual Report



12/4/21



1/3/22

California Redwood Company Photos

CRC Full Reference



CRC Full 2020 Annual Report

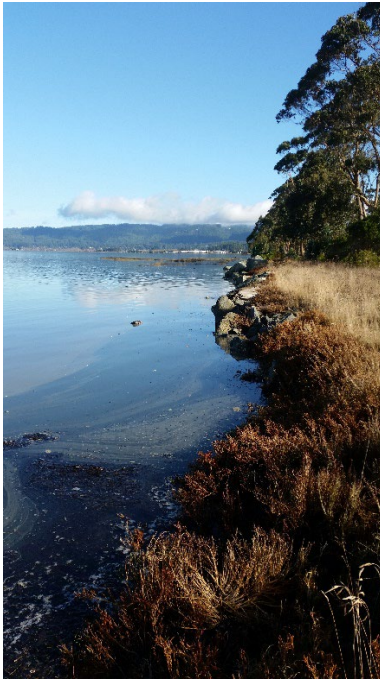


1/10/20



1/11/20

CRC Full 2021 Annual Report



12/14/20



1/12/21

CRC Full 2022 Annual Report



12/4/21



1/3/22

CRC Zoom Reference



CRC Zoom 2020 Annual Report



1/10/20

1/11/20

CRC Zoom 2021 Annual Report



12/14/20

1/12/21

CRC Zoom 2022 Annual Report



12/14/21



1/3/22

Eureka Slough Photos

Eureka Slough Zoom Reference



Eureka Slough Zoom 2020 Annual Report



1/10/20



1/11/20

2/8/20

Eureka Slough Zoom 2021 Annual Report



12/14/20

1/12/21

Eureka Slough Bridge Boat Ramp 2021 Annual Report



1/12/21

1/12/21

Eureka Slough Zoom 2022 Annual Report



12/4/21

Eureka Slough Bridge Boat Ramp 2022 Annual Report



12/4/21



1/3/22



1/3/22

Eureka Slough Boat Ramp Gauge 2022 Annual Report



12/4/21



1/3/22

Jacobs Tide Gate Photos

Jacobs Tide Gate East Zoom Reference



Jacobs Tide Gate East Zoom 2020 Annual Report



1/10/20



1/11/20



2/8/20

Jacobs Tide Gate East Zoom 2021 Annual Report



12/14/20



1/12/21

Jacobs Tide Gate East Zoom 2022 Annual Report



12/4/21



1/3/22

Jacobs Tide Gate East Reference



Jacobs Tide Gate East 2020 Annual Report



1/10/20



1/11/20



2/8/20

Jacobs Tide Gate East 2021 Annual Report



1/12/21

Jacobs Tide Gate East 2022 Annual Report



12/4/21

1/3/22

Jacobs Tide Gate West Reference



Jacobs Tide Gate West 2020 Annual Report



1/10/20



1/11/20



2/8/20

Jacobs Tide Gate West 2021 Annual Report



12/14/20

1/12/21

Jacobs Tide Gate West 2022 Annual Report



12/4/21



1/3/22

Cole Ave Photos

Cole Ave North Reference



Cole Ave North 2020 Annual Report



1/10/20



1/11/20

2/8/20

Cole Ave North 2021 Annual Report



12/14/20

1/12/21

Cole Ave North 2022 Annual Report



12/4/21

1/3/22

Cole Ave South Reference



Cole Ave South 2020 Annual Report



1/10/20



1/11/20



2/8/20

Cole Ave South 2021 Annual Report



12/14/20



1/12/21

Cole Ave South 2022 Annual Report



12/4/21



1/3/22

Fay Slough Photos

Fay Slough Mid City South Reference/2020 Annual Report



Fay Slough Mid City South Reference/2020 Annual Report



1/10/20



1/11/20



2/8/20

Fay Slough Mid City South 2021 Annual Report



12/14/20

Fay Slough Mid City South 2022 Annual Report



12/4/21

1/3/22

Fay Slough North Reference/2020 Annual Report



Fay Slough North Reference/2020 Annual Report



1/11/20



2/8/20

Fay Slough North 2021 Annual Report



12/14/20

Fay Slough North 2022 Annual Report



12/4/21



1/3/22



12/4/21



1/3/22

Railroad Levee Erosion Near PM 82.1, 2022 Annual Report (1/3/22)

Humboldt Bay

US Highway 101 roadside ditch





Gannon Slough Photos

Gannon Slough South 2023 Annual Report



12/23/22



1/21/23

Gannon Slough North 2023 Annual Report



12/23/22



1/21/23

Gannon Slough Bay 2023 Annual Report



12/23/22



1/21/23

Jacoby Creek Photos

Jacoby Creek Left 2023 Annual Report



12/23/22



1/21/23

Jacoby Creek Right 2023 Annual Report



12/23/22



1/21/23

Jacoby Creek RR 2023 Annual Report



12/23/22



1/21/23

Jacoby Creek Bay 2023 Annual Report



12/23/22



1/21/23

North Bracut Photos

North Bracut Full 2023 Annual Report



12/23/22



1/21/23

North Bracut Zoom 2023 Annual Report



12/23/22



1/21/23

North Bracut Railroad 2023 Annual Report



12/23/22



1/21/23

South Bracut Photos

Sough Bracut Full 2023 Annual Report



12/23/22



1/21/23

Indianola Photos

Indianola North 2023 Annual Report



12/23/22



1/21/23

Indianola Erosion 2023 Annual Report



12/23/22



1/21/23

California Redwood Company Photos

CRC Full 2023 Annual Report



12/23/22



1/21/23

CRC Zoom 2023 Annual Report



12/23/22



1/21/23

Eureka Slough Photos

Eureka Slough Zoom 2023 Annual Report



12/23/22



1/21/23

Eureka Slough Bridge Boat Ramp 2023 Annual Report



12/23/22



1/21/23

Eureka Slough Boat Ramp Gauge 2023 Annual Report



12/23/22



1/21/23

Jacobs Tide Gate Photos

Jacobs Tide Gate East Zoom 2023 Annual Report



12/23/22



1/21/23

Jacobs Tide Gate East 2023 Annual Report



12/23/22



1/21/23

Jacobs Tide Gate West 2023 Annual Report



12/23/22



1/21/23

Cole Ave Photos

Cole Ave North 2023 Annual Report



12/23/22



1/21/23

Cole Ave South 2023 Annual Report



12/23/22



1/21/23

Fay Slough Photos

Fay Slough Mid City South 2023 Annual Report



12/23/22



1/21/23

Fay Slough North 2023 Annual Report



12/23/22



1/21/23