MONTARA WATER AND SANITARY DISTRICT AGENDA

For Meeting Of: **August 18, 2022**

TO: BOARD OF DIRECTORS

FROM: Clemens Heldmaier, General Manager

SUBJECT: **Update on Application for Grant Funding for FEMA HAZARD MITIGATION.**

In December and January 2022, MWSD was inundated with two major rainstorms of much higher then normal rainfall intensity. These events once thought to be 20 year or 100 year storm events seem to be happening with more frequency. This compelled MWSD staff to refer to emergency preparedness and potential Hazard Mitigation projects to protect against not just heavy storms, but also seismic, tsunami and other natural phenomenon that can jeopardize water and sewer utilities. FEMA has available Hazard Mitigation funding opportunities to help protect local infrastructure.

In collaboration with San Mateo Resource Conservation District (RCD), MWSD staff have submitted an application to FEMA and have selected a project area between Deans Creek (at Nevada, Ellendale and Arbor Lane area) north to 16th Street, along the west side of Cabrillo Hwy (HWY 1) and including HWY 1 Utility crossings. There are several areas along this narrow corridor particularly along Vallemar St where water and sewer facilities are pinched between the ocean cliffs and homes and/or HWY 1, and in several locations are placed in paper street that are simply at risk falling into the ocean. While it is not possible to predict which natural disaster may come next, looking at all the possible risks which may impact this area, there are four critically situated sewer mains and three water mains which either need relocating or hardening to help protect against catastrophic failure to cliff failure and seismic events which could leave hundreds or even thousands of MWSD customers without water or sewer services and could even cause wastewater treatment upsets at SAM and could result in major fines from the State.

The Proposed Project: Montara Water and Sanitary District (MWSD) and San Mateo Resource Conservation District (RCD) multi-hazard mitigation project will prevent catastrophic loss of sanitary sewer infrastructure directly serving 25+ houses near the Fitzgerald Marine Reserve and manage the flow for approximately 800+ connections or ~40% of the sewer District and address three other venerable areas. MWSD sends sewage south to a regional treatment plant via a pipeline that runs through El Granada Community Services District to the Sewer Authority Mid-Coastside treatment plant serving ~25,000 people, and these facilities are also used by SAM to manage flow and keep treatment running smoothly. Additionally relocating, replacing, hardening and extending the water main (built in ~1940-1947) will provide improved water reliability, fire protection, and make room in the street to relocate the existing sewer and district pump stations away from the cliff west of the homes, to the paved area of Vallemar east of the homes.

This project will also ensure MWSD and SAM access to sewer flow and storage tools should hazard events cause disruption downstream. Planning activities include general

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feasibility and design of relocated water and sewer mains, sewer ejectors for homes, utility pipe and pump relocations, sewer spill prevention by improving an existing not used pipeline connection between Vallemar and the Montara District located Sewer Authority Mid Coastside wet weather storage tank, abandonment of existing sewers and Niagara Pump Station, and improvements to Vallemar pump station.

Movement of the existing pipe away from the coastal cliffs and project elements required to accomplish this, has been part of the long range plan for MWSD for over 15 years, will directly mitigate against risks from earthquake, flooding, landslide, scarp soil movement, severe weather, tsunami, and sea level rise (as outlined in the action MWS-1 in 2021 Multijurisdictional Local Hazard Mitigation Plan Volume 2) by providing adequate setback on sanitary sewer infrastructure from eroding costal cliffs, and provide flexibility, toughness and resilience to the new sewer and water pipelines with by using newer more resilient materials. Attached in a Risk Assessment and Costs technical memorandum from Nute Engineering reviewing the types of hazards which may affect Montara and Moss Beach, HWY 1 and the community.

Pippin Cavagnaro, P.E., from Nute Engineering, will be available to present the Project and answer any questions the Board might have.

RECOMMENDATION:

This is an information item only and if the FEMA grant application progresses, District Staff will bring future updates to the Board.

Attachments will be available at the Board meeting.

NUTE ENGINEERING
Civil and Sanitary Consultants

Memorandum

To: Noah Katz

From: Nute Engineering

Date: August 12, 2022

Re: Risk Assessment Categories for Vallemar Water and Sewer Utility Failures

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AGENCY OVERVIEW

The Montara Water and Sewer District (MWSD) serves water and wastewater utility service to approximately 6000 customers in the Montara and Moss Beach area. Additionally, the wastewater is collected in Montara and Moss Beach by a centralized Intertie Pipeline System (IPS) owned and manages by Sewer Authority Mid-Coastside (SAM), then treated in a more central location on the north edge of Half Moon Bay (HMB). SAM is joint powers agency (JPA) of which MWSD is 20% owner. SAM collects, manages and treats the sewage for MWSD, HMB and Granada Community Services District (GCSD) totaling about 25,000 people. The treatment plant capacity is up to 15 million gallons per day, and the treated sewage is discharged into the Pacific Ocean just south of the Fitzgerald Marine Reserve and the Pillar Point Conservation Area. In addition to providing utility services as described, MWSD and SAM also are charged with preventing environmental damage to the State Marine Reserve and Conservation areas adjacent to these communities by preventing sewer and chlorinated water spills and hazard mitigation planning to protect critical infrastructure and health and safety.

The purpose of this Memorandum is to give an overview of the Environmental risks which threaten MWSD (and SAM) Water and Waste Water underground utilities, estimate costs of failure based on impacted customers, and make some estimates for restoration of services. Subjects discussed herein are as follows:

Additionally, Reference Materials (RM 1 through 8 are reports) attached.

WATER AND SEWER RISK LOCATIONS IN THIS PROJECT

The coastal community plan was historically zoned for development right up to, and in many locations even into the Pacific Ocean (back when filling the natural wetlands was standard practice.) Many utilities were put in roadways right on the edges of the cliffs which now 80+ years later are weathering and failing and not save to walk on, and utilities run in these streets are in danger of failing and/or falling into the ocean. Pipes along Vallemar Street (and the parallel Strand, now a failing paper street), Niagara Avenue, Wienke Way, Reef Point Road, Arbor Lane to Nevada Street (crossing Deans Creek), South Laguna Street (and again the Strand) are targeted high risk areas for this project. Pictures 1 and 2 show the examples of streets like the Strand and S. Laguna which have utilities but are obviously not passible any longer and at high risk of catastrophic failure from environmental impacts. Picture 3 is the overall project area for Montara Water and Sanitary District.

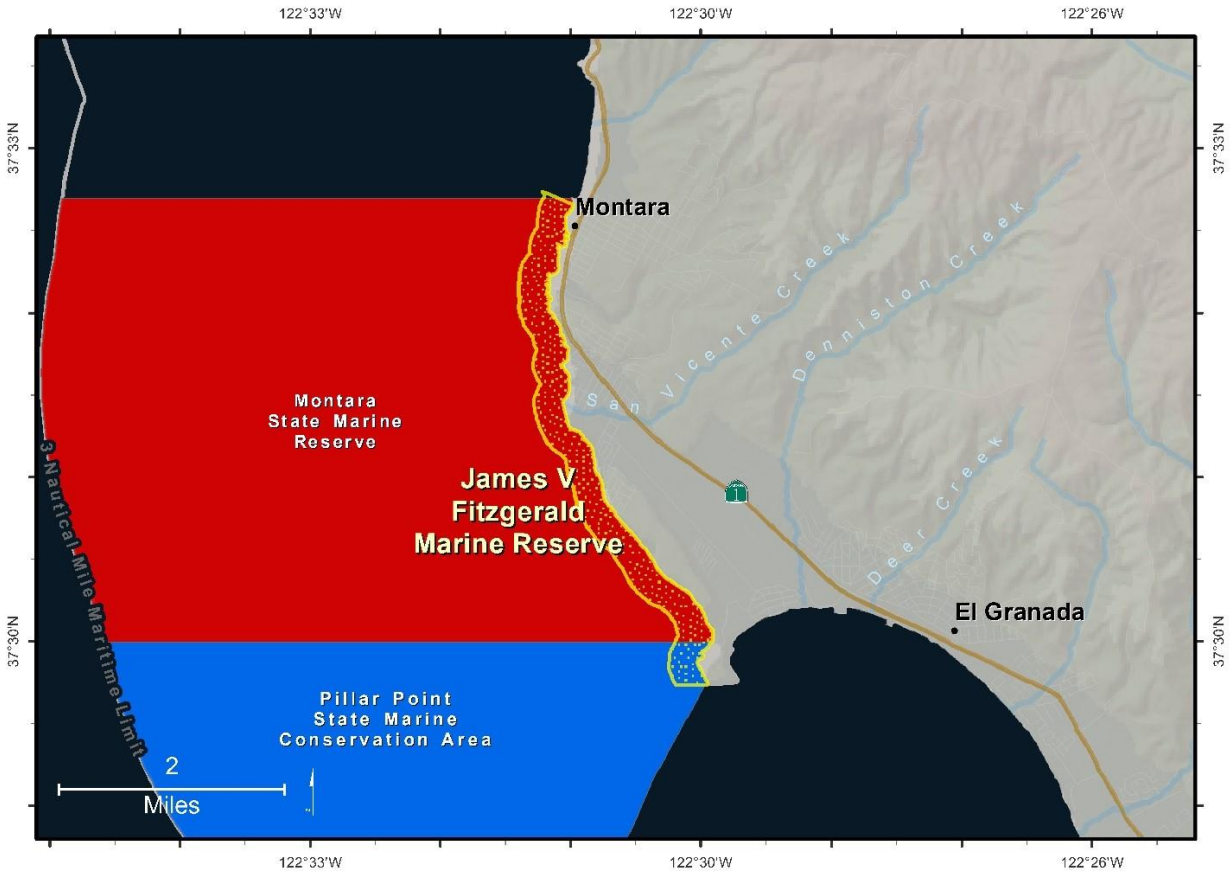
Picture 1: Looking South on S. Laguna St at west end of Ellendale Rd. containing utilities including sewer pipes.

Picture 2: Map of S. Laguna St at west end of Ellendale Rd (called Ellendate St on the next map)

Picture 3: Map Project coastal areas where MWSD utilities are at risk due to environmental hazards.

REGIONAL ASBS AND FITZGERALD MARINE RESERVE AND PILLAR POINT

The region immediately west of MWSD is a very sensitive environmental preserve for the endangered sea otters. Providing utility services to the existing customers in the are is an increasingly challenging job with increased environmental RISKS and an ever increasing awareness of protection for the environmental life and habitat of birds and sea creatures and the high standards of Zero Spills as a sewer and water management goal to protect the environment. Picture 4 shows the Fitzgerald Marine Reserve and Pillar Point Conservation area. MWSD and SAM have potential impact to former, and SAM has a larger potential impact on the latter.

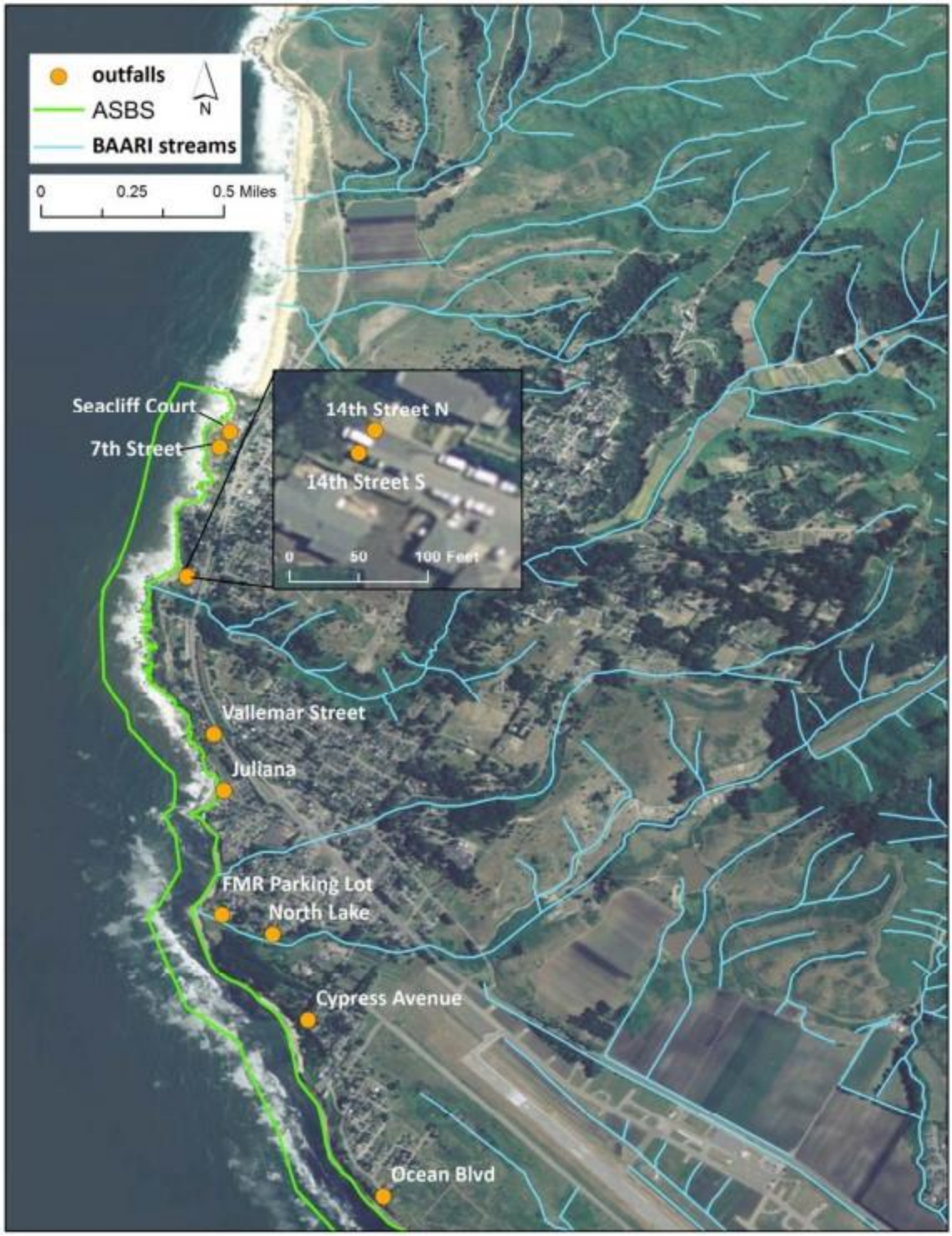


Picture 4: Fitzgerald State Marine Reserve Area and Pillar Point State Marine Conservation Area.

The State Water Boards and the Count of San Mateo and related agencies like the San Mateo Conservation District (RCD) and Parks Departments work to monitor and oversee the health and wellbeing of the marine environment, and check up on the Utility agencies like MWSD and SAM to see how their performance is. In order to monitor this, and improve the coastal health, the County Storm Drainage system has been mapped and categorized into and Area of Special Biological Significance (ASBS) which can be seen in Picture 5 as the costal zone. The Vallemar, Strand, and South Laguna pipes are all in this ASBS area and need hardening or relocation. Picture 6 is showing outflow points (Deans creek did not appear as an outfall on the print but is present and is an active drainage outfall relevant to this project.) Vallemar, Juliana, Deans Creek and FMR Parking area are all relevant areas where sewer or water failures in this area will impact, and where cleanup

activities would have to be focused, among other possible localized areas. Outfall storm drain risk can be found in RM02 reference material.

Picture 5: Area of Special Biological Significance ASBS, County of San Mateo Drainage Special monitoring area.



Picture 6: Map Project overlays areas with drainage outfalls to ASBS into Fitzgerald Marin Reserve, including Deans Creek, Juliana St, Vallemar St and FMR Parking Lot.

INCRAMENTAL COSTS FOR UTILITY FAILURE AND EMERGENY REINSTATEMENT

The cost risk for the District are significantly higher than then were even 10 or 15 years ago. Sewer fines are the immediate and largest financial risk to a large infrastructure failure with an possible $5.6M fine possible in the worst case scenario if a reginal disruption takes our the project area pipes and SAM cannot collect or treat the sewage per their charge. Direct construction for emergency repairs and emergency water or sewer bypasses could be in excess of $1.5M for a water or sewer emergency. Incremental utility restoration could lead to ongoing cost for 6 month or a year in some cases before corrections could be permitted and installed may costs up to half of a million dollars.

Major events like seismic events of an estimated 7 or greater may lead to these failures. Also a Tsunami, major tropical storm waves, heavy coastal rains and scarp/soil slides could all cause these events. These frequency of events once thought to be 1/100 year events are all much more possible in the near future based on observations and understanding of geologic event frequency.

Worst Cast Economic Losses for Vallemar Water/Sewer Utility Failure						
	Wastewater service Failure		Water Service Failure		Incremental restoration	
	Days	%	Days	%	# customers	value
Regional*	5	47	5	0	24,658	$ 5,600,510
MWSD 1+2	5	3	5	3	2,928	$ 1,690,298
MWSD 1+2	30	0.5	30	2	2,896	$ 208,422
MWSD 2	90	0.1	90	0.5	724	$ 114,161
MWSD 2	180	0.03	180	0.02	75	$ 228,321
MWSD 2	365	0.03	365	0.02	75	$ 228,321
Direct Damage						$ 1,500,000
GRAND TOTAL LOSS RISK, 2022 Dollars.						**$ 9,570,032**

Table 1: Costs Expected Future Costs for losses dues to environmental impacts.

Examples of recent environmental impact costs have caused the District to have to spend over $150,000 for extra construction and soft costs on one road repairs caused by damage due to excessive rain runoff eroding the coastal bluff away. In winter 2019, spring 2020 the district had rain intensities of 3 to 5 inches per hour which undermined the plan access road for MWSD and the SAM pump station. This project required construction costs. See Reference Materials RM01.

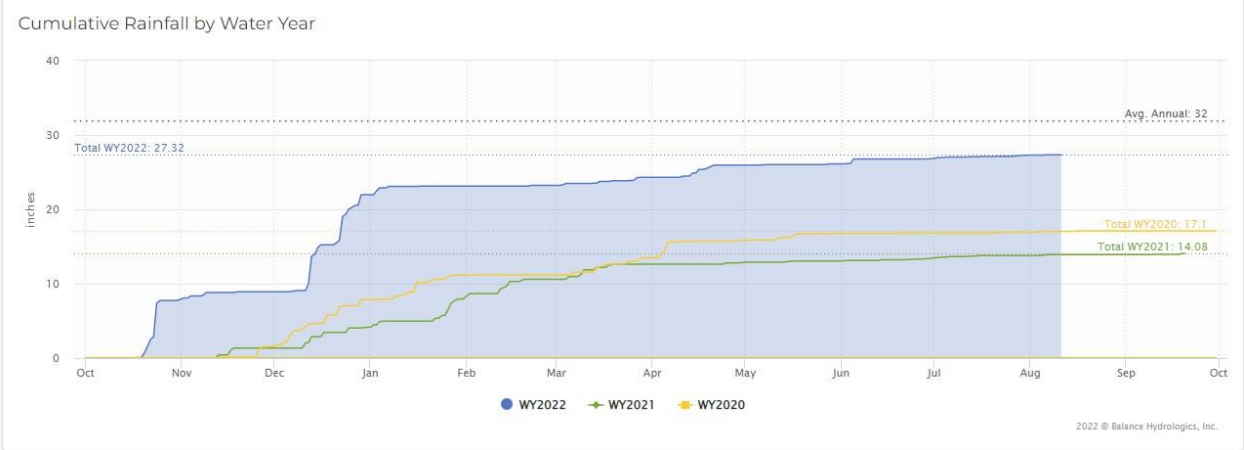
Historic Project Costs

Project	Reason	~Date	Cost
Abandonment of MWSD Plant	Cliff Risks/Marine protect.	1982	$2,000,000
Vallemar Pump Station	Cliff Risks/Marine protect.	1985	$180,000
Conversion of the Walker Tank	Coastal Cliff Risks	1987	$400,000
Vallemar Relief Sewer	Active Scarp/Fault	1988	$ 50,000
Niagara Pump Station	Waves Cliff Failed	1990	$200,000
Montara Trunk Sewer	Active Scarp	1999	$ 90,000
Niagara Force Main	Coastal Cliff Failed	2005	$225,000
Deans Creek Crossing Fix	Fault Slip	2010	$125,000
Total Historic Costs (not inflation adjusted)			$3,270,000

Table 2: Costs

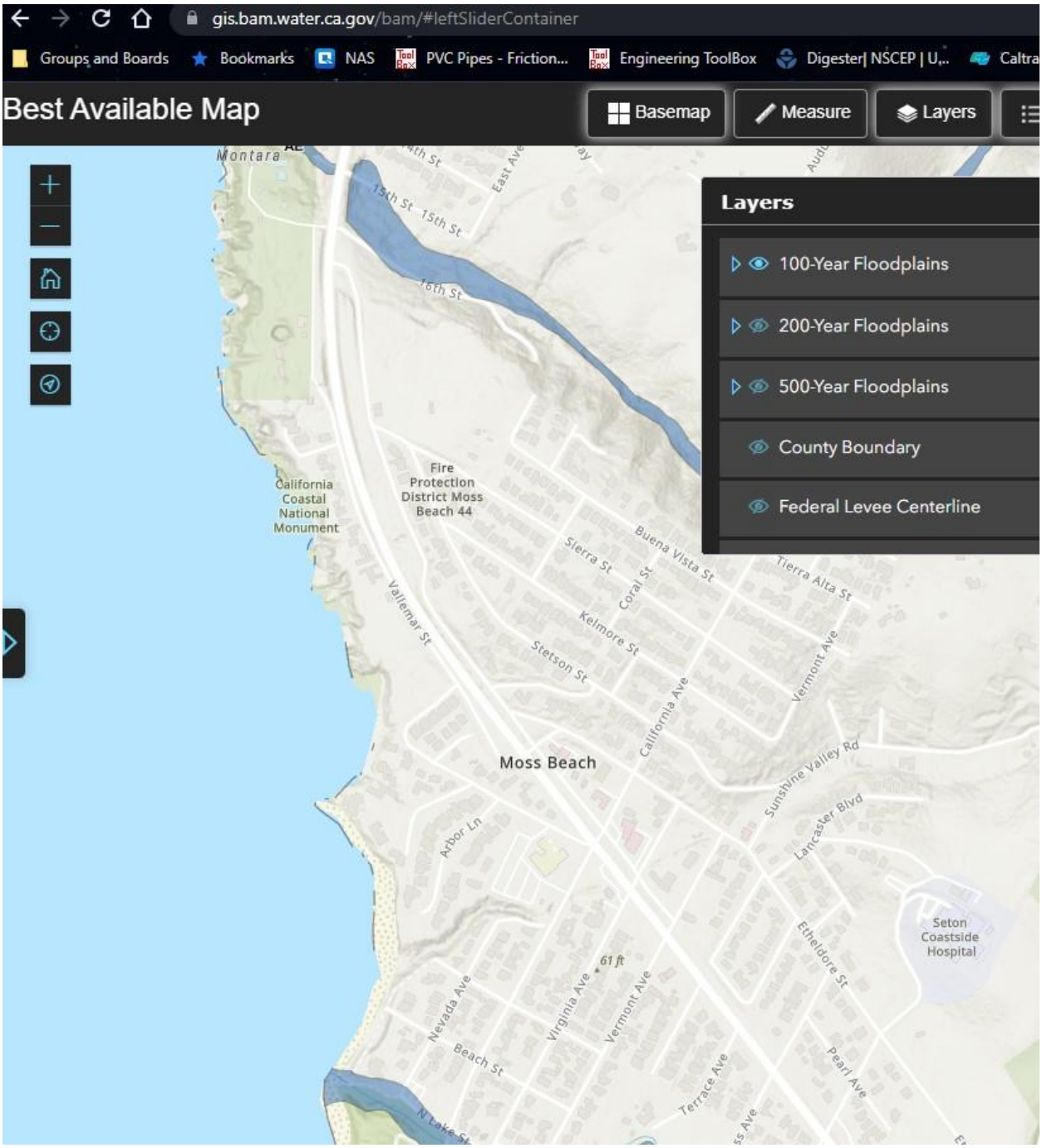
RAINS AND FLOODING RISK

The Montara and Moss Beach area is a rain basin where storm water is captured by Montara Mountain. These area have significantly higher focused runoff because of the hill and valley topography then is found in more flat urban areas. The historical rains in Montara range from 27 to 35 inches of rain per year. In the recent years the rain events are coming fewer and further between, but much greater intensity. This last year for example intensities of 8 to 12 inches per hour happened with storm events of 5 to 8 inches in a day (see Picture 7).



Picture 7: Cumulative rain events. Notice 2022 storms were 3, 5 and even 8 inches per event with 12 inches per hour intensity, far higher than the last two years shown which are more incremental storms of 1 or 2 inches (as was the case historically).

These high intensity rain events used to be considered 20 year or even 100 year events, but have happened 5 times in with in the last approximately five years, with three significant events this year alone. Below Picture 8 is a map of the what the state considers 100 year flooding events (impacts are Deans Creek are not mapped completely, but are noted with a lake forming just up Sunshine Valley road not visible in this map as the collection area is just south of the map image. District observations are very high water pressure in these events with inflow and infiltration with 10 to 15' head pressures. Because the observed intensity of rains has been increasing, what was once considered 100 year storms, should be estimated to be on a 20 year even. And 20 year events to happen on 10 or even 5 year frequencies in terms of intensity rainfall and erosion risk when planning protection of critical infrastructure.



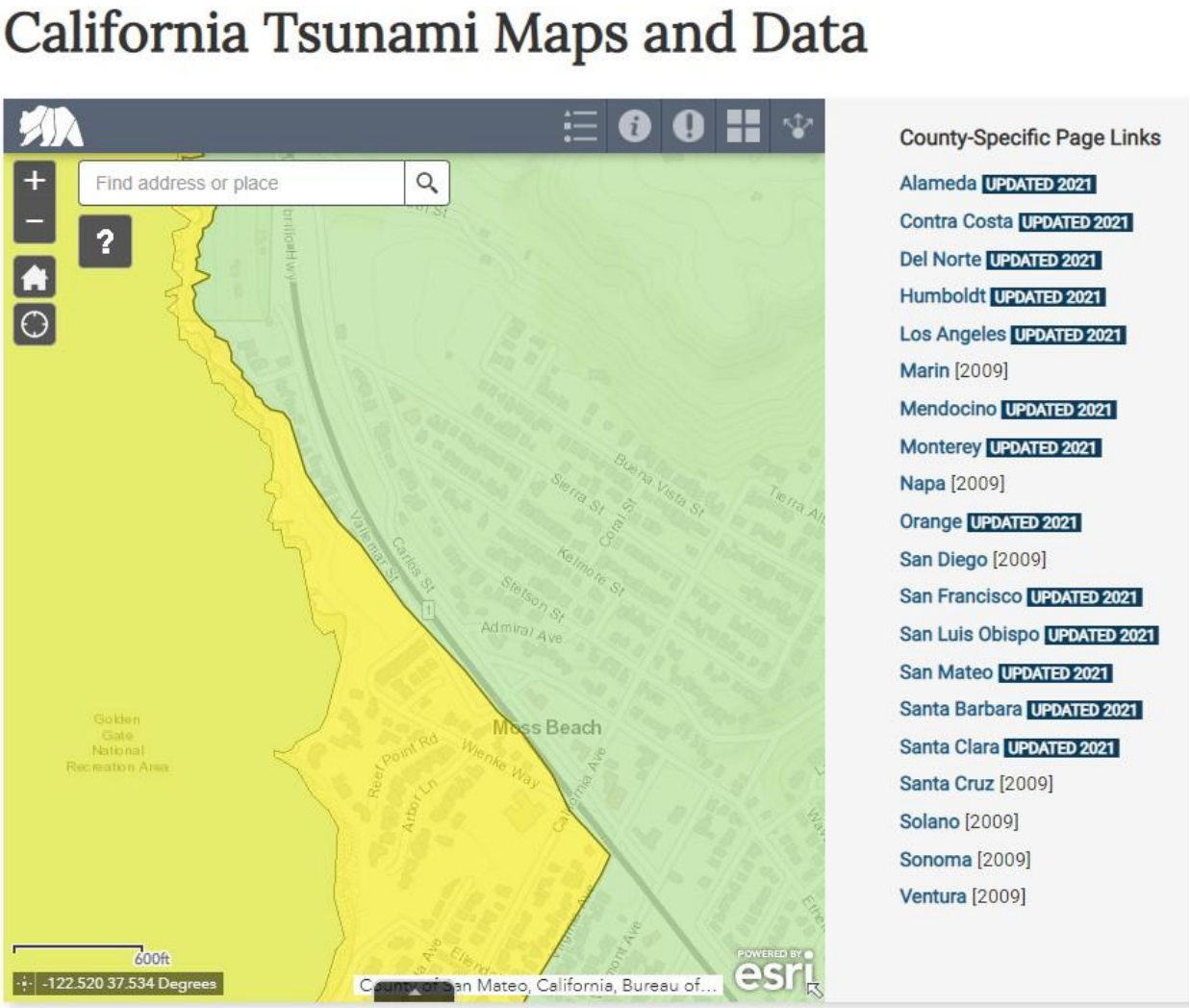
Picture 8: 100 Year Flood Plan areas, with coastal impact areas marked with a this blue line has impacts along Vallemar and costal areas near MWSD utilities which can increase coastline failure. The events in recent years seem to be on closer intervals then the previously predicted 100 years.

WAVE ACTION FROM OCEANIC STORMS

The increase in frequency and size of coastal storms, particularly oceanic warm pacific storms bring with them high wave action risk. These areas of concern for this project are just a few miles north of Pillar Point where the famous Mavericks Surf contest is every year where waves are often 25 to 60 feet tall (this translates to the wave front face can be 50 to 120 feet high!) and are frequent. This event is usually held in April and the potential for environmental impact to damage the coastal cliffs, improvements and utilities is real every spring. Existing soft and granular coastal alluvial deposits are easily undercut by waves.

TSUNAMI RISK

The exposure of tsunami risk is another threat this coastline has to deal with. The off shore plateau is such that tsunami's created in the south pacific like from Japan or possibly a major quake in Alaska can lead to coastal inundation and damage if the angle and shape of the wave form is such that it impacts the coast head on. Picture 9 is the State of California Tsunami map, showing typical risk areas for damage in yellow. The entire project area for the Vallemar Water and Sewer pipe relocation and hardening is in the tsunami risk area. Frequency is unknown, but seems to be every 20 to 40 years for a potential seismic event/quake that could cause a significant tsunami event.



Picture 9: California Tsunami risk map for typical risk areas. Yellow is the area where MWSD sewers and water mains are at risk of damage due to Tsunami form the south pacific, or even Alaska.

SOILS SLIDE AND ACTIVE SCARP SLIDE RISK

Soil slippage and active scarps are a theme in this area, and heavy rain, seismic events, wave action or shifting of earth crust fault lines can all cause accelerated movement of soils especially on scarps where cracks can take up water from rains or waves and lead to rapid movement of soils. Picture 10 is a visible soil slide bisected by a fault line (in the swale). These movements can be slow over years, or catastrophic. Last winter a slide on Ocean Blvd just south of this proposed project area caused ~200 yards of soil to fail and caused a water main brake. Historically these events have been part of the failure of the Vallemar Street sewer long the Strand and Niagara Steet.

Picture 10: Slip on active scarp visible as slip line cracks in the road, as is a fault line settlement as the large dip in the road.

Below is picture 11 of the sewer alignment of the Vallemar sewer along the historic Strand (now a paper street. The pipe has been damages several times over the years due to cliff erosion, scarp failures and wave undermining. The section of the pipe about 500 to 1200 feet south of this location had to be abandoned in the 1980's and the building of the Vallemar pump station to redirect sewage was a solution. The current remainder of the once 60 foot right of way is not only 5 feet wide. Picture 12 is a close of the same area showing slippage. See CALTRANS and Devils Slide discussion below.

Reference Materials RM03 is a report my Michelucci and Associates which reviews soil conditions, costal creep inland and instability. The cliff could last another 20 years with only standard creep of about 3 inches per year, but risks of failing in the next 5 years in much more significant due to the scarp cutting into the sewer area. If rain, waves or seismic events cause catastrophic failure, repairs would require an

expensive and hard to permit elevated bridge structure to span to more stable soil areas. This fix would damage the environment more quickly and be very expensive for a short-term fix. These above ground options are not recommended.

Picture 11: Slip on active scarp visible as cut in edge of cliff. Notice the sewer Caution markers. This sewer was re-aligned about 10 feet inland after this slip several years ago which caused a pipe failure.

Picture 12: Larger view of the active slip of the scarp visible as curve in cliff line where soil sluffed down. Notice someone placed erosion protection fabric to try to reduce the failure rate in the soft soil area.

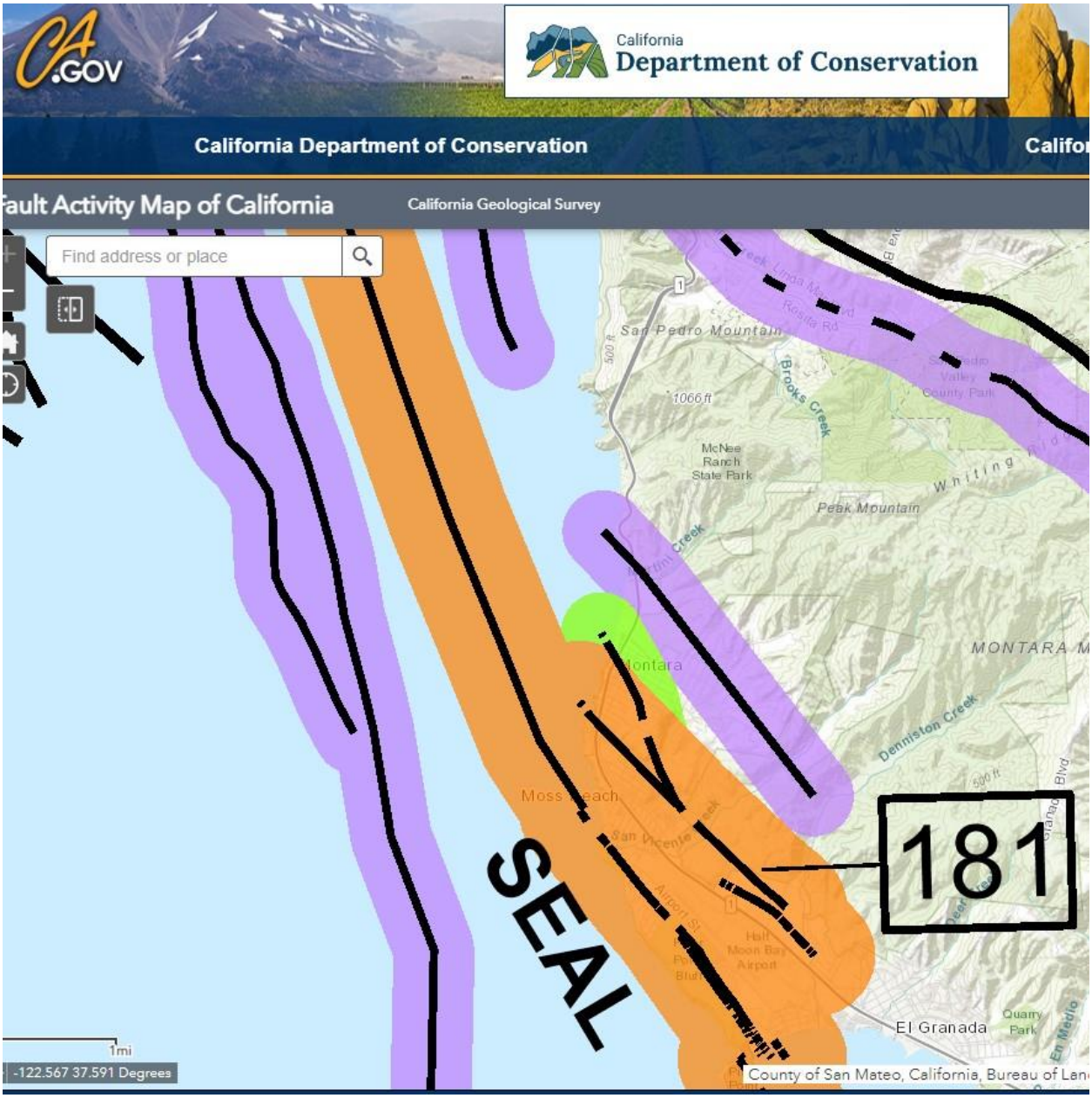
SIESMIC EVENTS RISK

Likely the most significant events for catastrophic failure due to soil movement would come from strike slip faults which dominate this area. Secondarily heavy shaking, especially if in wet winter or spring winter months would likely cause slides of loose soil, undercuts and scarps. Reference Materials RM04 Is a geological analysis from 1980 which shows significant faulting and risk areas which may (and in several cases already have) cause to damage the underground utilities.

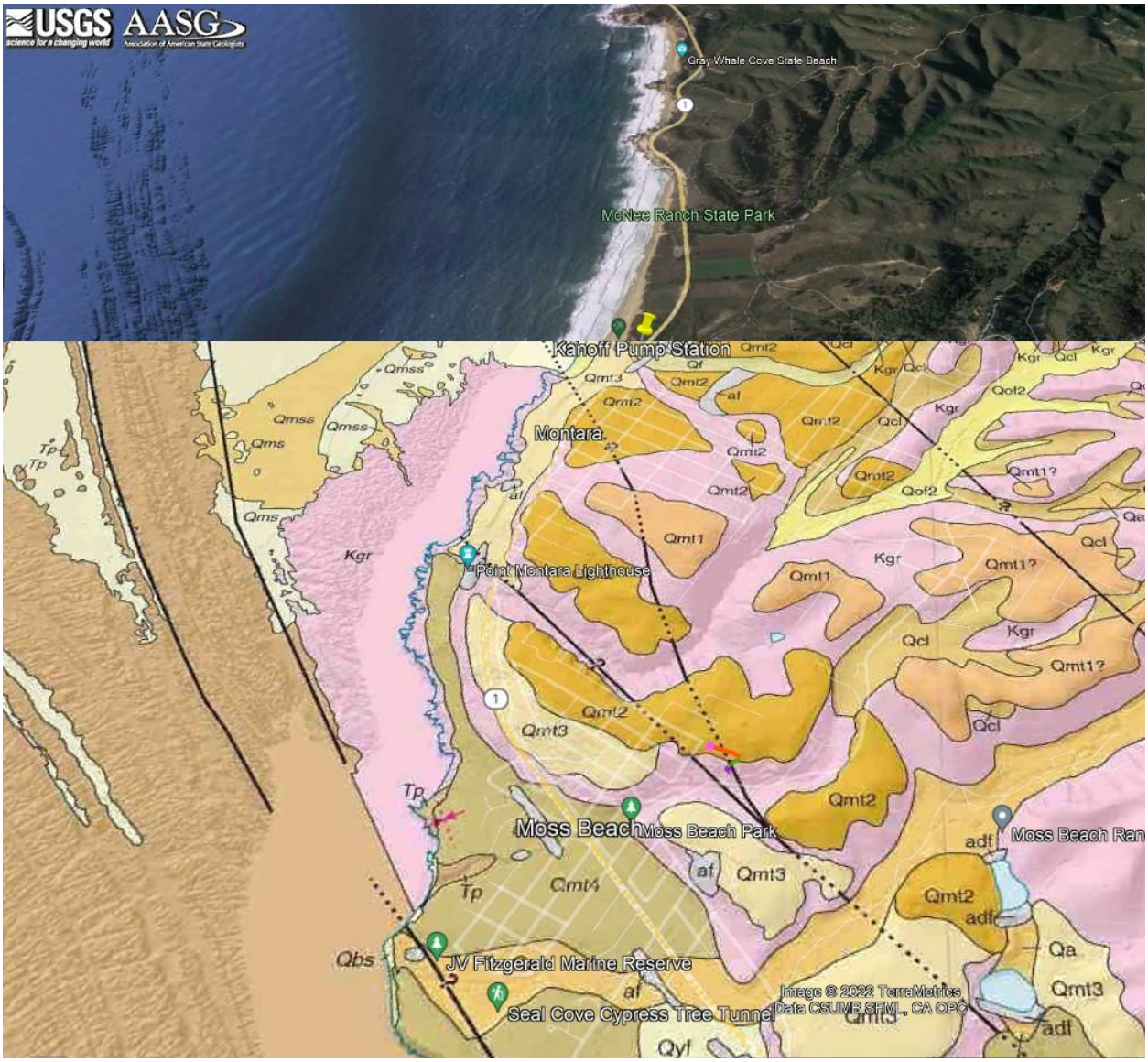
Pictures 13 and 14 show two faults (one branched) which cross the project utilities and could cause sheer stress or rupture. Additionally adjacent shallow faults are so close by they could easily disrupt the utilities or cause soil slides. The local faults are directly or indirectly related to the Seal Fault (or the Seal Cove Fault.) These are secondary faults to the San Andreas fault.

Seismic events are truly hard to predict, but these have been well documented since the 1900's after the 1906 earth quate in San Francisco. And of course there is strong speculation and measured stress and strain in the regional plates that the San Andreas is due for a major movement earthquake sometime in the next 20 to 150 years. A major quake there could either cause soil movement in this area, or cause secondary aftershocks, either of which could damage water and sewer mains in this area. Picture 15 and Key reference pictures 15a and 15b explain the soil types, but all are composed of granular materials

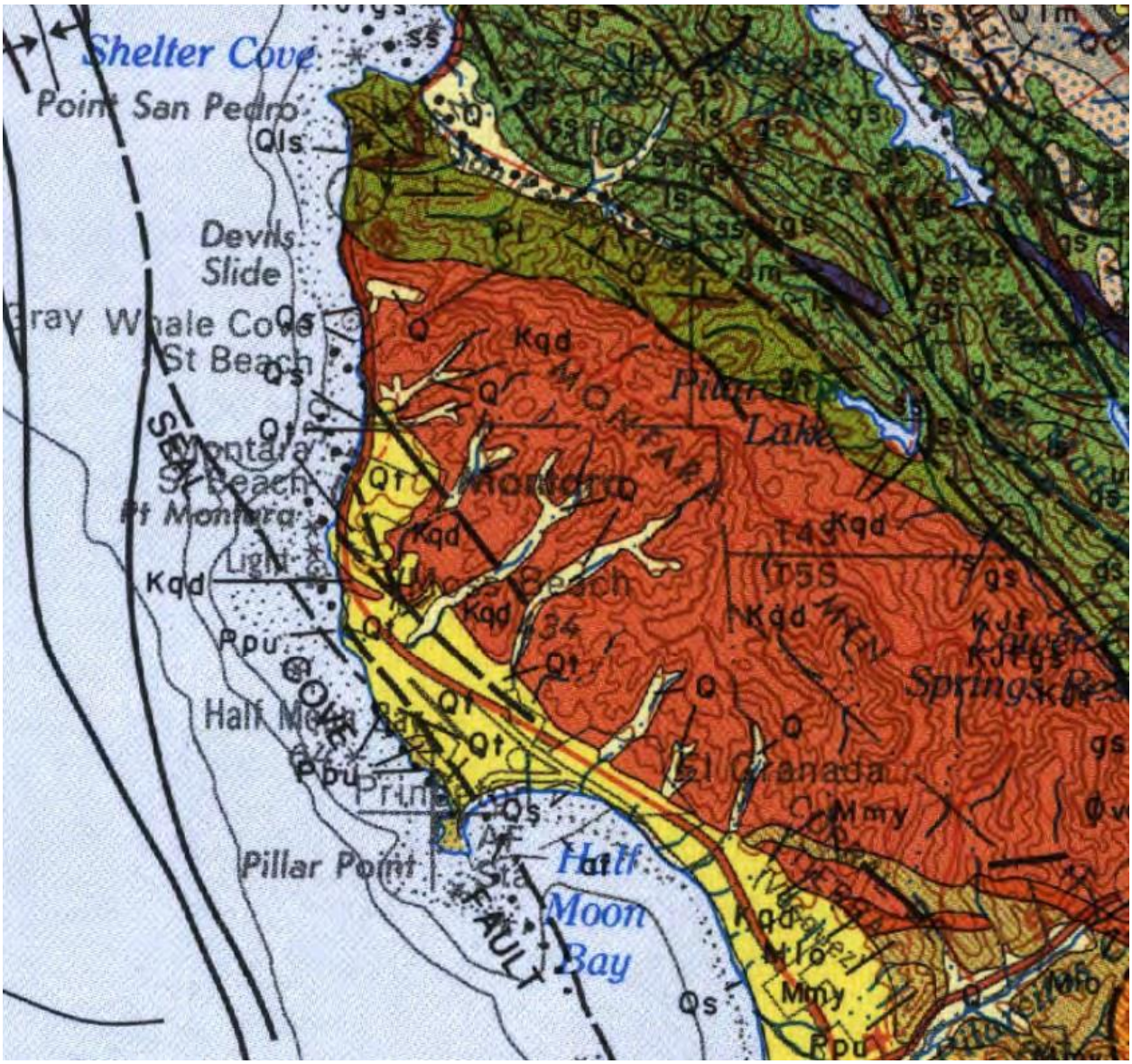
which are prone to movement, erosion, and slippage, especially when shaken or exposed to weather or wave action.



Picture 13: California GIS map of Montara and Moss Beach showing three faults in this area which the utilities must cross, and five additional faults which are all near by that could disrupt the local utilities. All of these faults are directly related to the San Andreas continental north-south fault which is only several miles east of Montara Mountain.



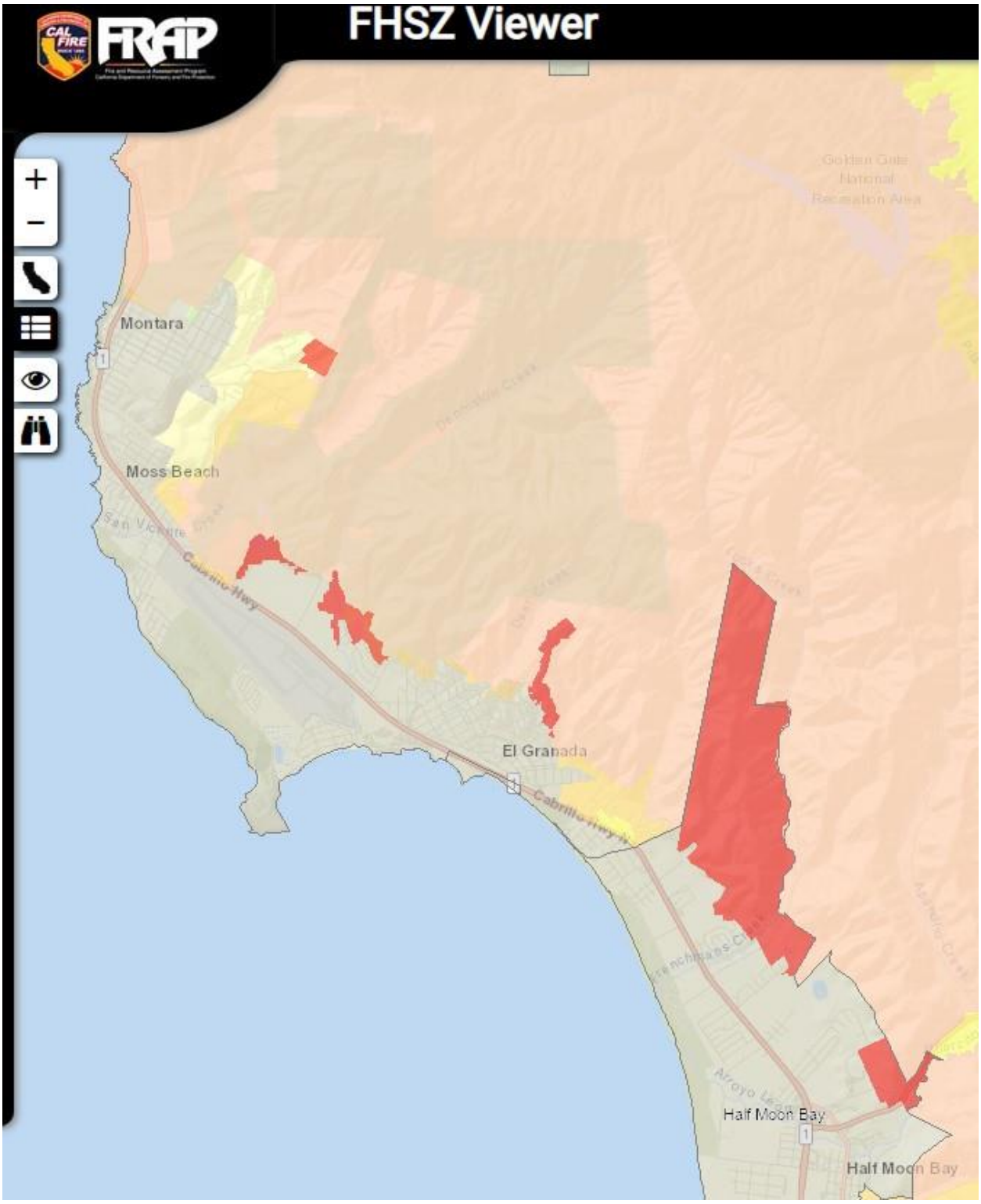
Picture 14: Google Earth isometric view of the more major faults in the area of the proposed project.



Picture 15: California historic fault map also showing rock types. The project area is largely Qt (yellow) which are alluvial terrace deposits and Qts (yellow with green speckles) which are alluvial fan deposits. There are some Kqd which is Cretaceous Quarts diorite or more commonly referred to as decomposed crushed granite, which can be stale when compacted, but one loosened, it can crumble apart and slide.

WILD LANDS FIRE RISK

Montara Water part of the MWSD agency is charged with urban fire protection by providing fire water flows Cal Fire has upgraded three areas adjacent to the project areas which are now Fire Hazards Zones for wild lands fires impacting residential neighborhoods. Loss of the water facility along Vallemar would loose pressure in the system which would depressurize the water system and prevent adequate fire water flow and reduce fire protection. Picture 16 shows the Fire Hazards Zones in Montara and Moss Beach. Seismic events are the most likely cause of this catastrophic loss, but a large truck crash in the right location could damage the water facilities as they cross under the roadway and run up the side bank. The pipeline is not as protected as modern codes require. Scarp movement and soil shifting could also cause a water line failure in this area.



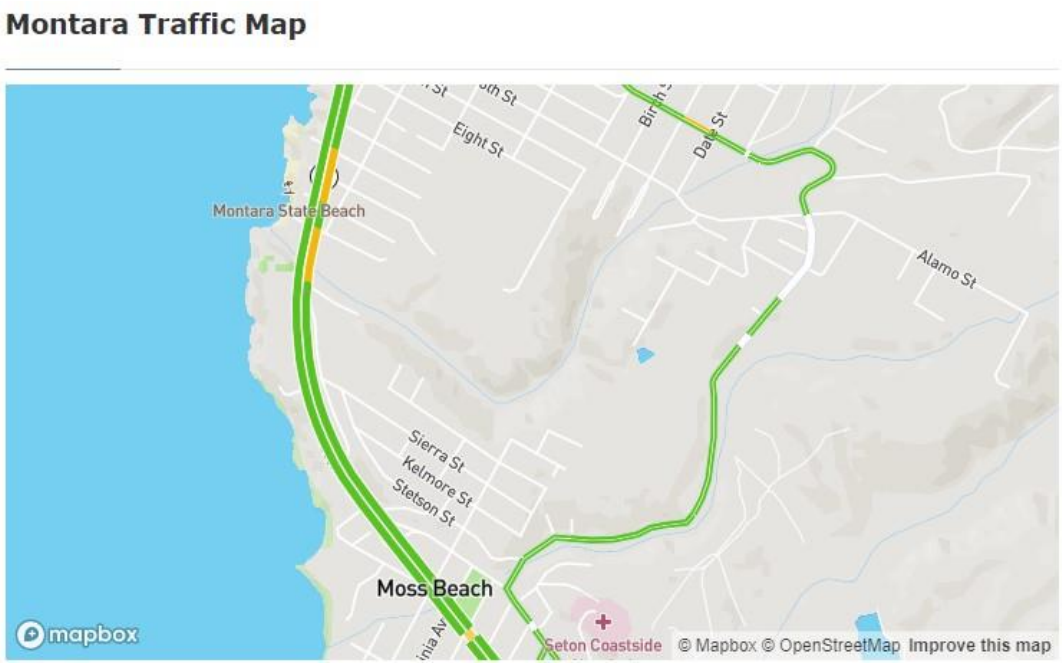
Picture 16: News article

CALTRANS TRAFFIC IMPACT AND DEVILS SLIDE

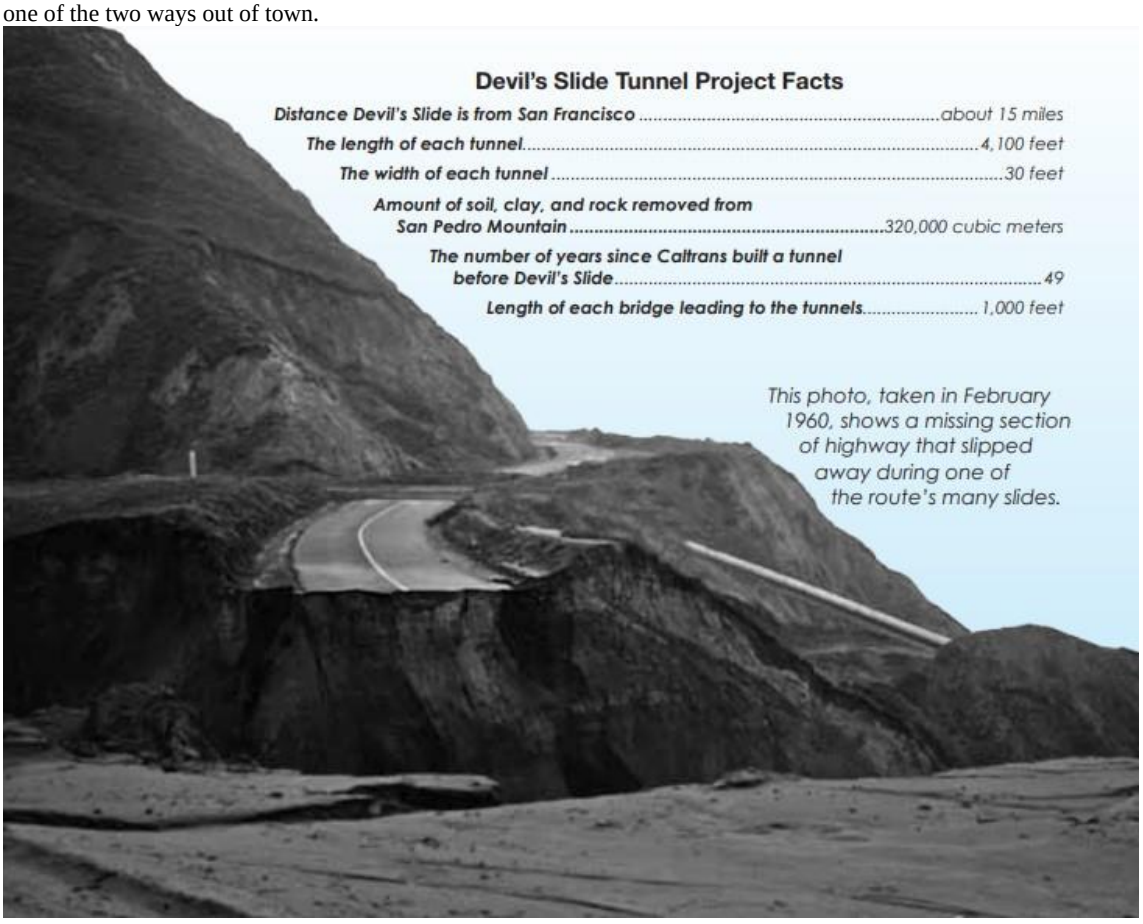
Between 2000 and 3000 people per day travel up and down HWY 1 (Cabrillo Hwy) through Montara and the Devil's Slide tunnel. Erosion has been a major problem affection HWY 1 since the 1950's, and even after the completion of the new Devils Slide Tunnel to keep cars away from the worst sections of the cliff, erosion and cliff loss is still a challenge for the CALTRANS agency.

Picture 17: News article in the Half Moon Bay Review discussing costal soil erosion and risk to roadway and utilities.

A water main failure in this area could easily undermine the CALTRANS roadway and block traffic. This has impacts because there are only two ways our of town, north and south, and a block in the highway would sever that access. Picture 18 shows the proximity of the Hwy to the project area. There is a water main crossing in this proposed project which needs to be improved that is between Sierra and Carlos St. Picture 19 shows an image from CALTRANS report that corroborates the likelihood of cliff and hill soil instability and failures in this area.



Picture 18: Montara Highway One (HWY 1, Cabrillo Hwy) is directly adjacent to the project area where the water main crosses directly under the roadway and runs parallel to it. A pipe failure due to seismic events could undermine the roadway blocking one of the two ways out of town.



Picture 19: Caltrans report on soil loss, erosion, cliff instability and the building of Devis Slide Tunnel. This location is only a few miles north of the project area and the soil types are the same as where the Vallemar project is located,

RECENT UTILTY AND ROAD ABANDONMENTS AND REPAIRS

The staff at MWSD has been dealing with various emergency pipe repairs and relocations over the years. A soil movement and pipe failure risk in 1998-1999 caused the pipe Montara truck sewer about 1000 feet north of the project area to need to be relocated which resulted in the soils research Reference Materials RM03. Again in 2012 MWSD performed a project that included hardening and relocating a portion of the truck sewer just north of this pipe and alto required road repairs in a project called the Cabrillo Hwy Crossing. Costs for that pipe relocation were in $50,000 range, and the extra driveway work was about $150,000 and this is noted in Reference Materials RM05. Additional soil boring were taken and a soils report is also included in RM05 which confirms the thickness of the Qt alluvial materials, which are in excess of 35 to 40 feet deep. This being along the coastline is entirely at risk of continual gradual and sudden catastrophic failure into the Pacific Ocean. As noted in the cost section above unforeseen environmental soil movement events have cost MWSD over $3.5 million in non-inflation adjusted dollars over the last 37 years.

San Mateo County has had to abandon roads along Ocean Boulevard, and at least three private homes have had to be red-tagged and torn down. Several dozen more are threatened. RM06 is the Closure of Ocean Blvd section from 2006. RM07 is an updated report on significant movements in the area. RM08 is a geologic report of risks and issues in the vicinity of Ocean Blvd. (south of the project area) that discusses the soil movement and the regional problems. All these mapping projects buy USGS and independent findings classify this area as medium to high risk for geologic phenomena that could lead to soil movement and thus underground utility failures.

INCRAMENTAL RESTORATION OF UTILITY PROCESS AND TIMELINE

Utility outages require immediate emergency response. Water and Wastewater facilities are continuously provide services which require no interruption in order to maintain public health and safety. Additionally, California State Water Recourse Control Boards requires 30 minute spill abatement response time by Staff to ensure sewage or chlorinated water is not spilling or directly impacting waters of the State. These types of responses can cost $5,000 to $10,000 per hour plus materials. The costs discussed in the INCRAMENTAL COSTS FOR UTILITY FAILURE AND EMERGENY REINSTATEMENT section above is based on various levels of outages and loss of service.

At the highest level is a major storm or seismic event that is affecting the entire region and causes damage to the Vallemar sewer system. If the this happens, the SAM infrastructure and sewer flow management will be compromised and could lead to improper treatment plant function downstream because of loss of sewer flow management. This would lead to releases in partially or untreated sewage to the Fitzgerald Marine Reserve and result in mandatory fines from the State Water Boards. Major seismic or tsunami events could cause this and may occur once every 20 to 200 years. But as experienced in this last December and several times over the last 5 years, significant tropical storms and oceanic events which used to happen every 100 years or so have happened at least three times and could also cause significant and similar SAM plant violations affecting the entire region's ~25,000 customers. These events usually would clear up after 3 to 5 days and could cost $3M to $6M dollars.

Next level of loss is a major sewer or water failure which impacts Montara MWSD water and/or sewer system and significaty impact the southern Moss Beach portion of the community including about 3,000 customers (~750 are low or ultra low income families). This would require above ground emergency installed temporary water and sewer pipes. This would cost on the order of $1.5M-2M per in implement. A five to 10 year events could cause this damage and cost risk.

Finally after the emergency implementation above, maintaining these emergency facilities could cost in excess of $20,000 per month for each water and sewer ran estimated $228,000 per six months or $560,000 per year in extra emergency response costs, not counting any construction costs to replace the damaged facilities with more permanent solutions. Most customers could be put back online, but 75 to 100 customers would remail with severely compromised service. Even a 5 year event could cause this level of impact and cost risk.

PROPOSED PROJECT SUMMARY

The proposed project to relocate a sewer pump station and about 1000 feet of sewer and 2000 feet of water main, upgrade a water crossing, requesting to spend about $5.4 million dollars is fiscally responsible because planned repairs are always less expensive than emergency repairs by at least two to one. Also, it is a requirement of the water and sewer agency to make all reasonable precautions to protect health and safety and the environment, and this project to relocate the MWSD Vallemar Water and Sewer facilities and harden related facilities improves both for the community good.