2020

CAWD WWTP Coastal Hazards Monitoring Plan

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Carmel Area Wastewater District

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Abbreviations

CAWD – Carmel Area Wastewater District

CCC – California Coastal Commission

CDP – Coastal Development Permit

CEQA – California Environmental Quality Act

EIR – Enviromental Impact Report

MPWMD – Monterey Peninsula Water Management District

NAVD – North American Vertical Datum

NOAA – National Oceanic ant Atmospheric Administration

OPC – Ocean Protection Council

USGS – United States Geological Survey

WWTP – Wastewater Treatment Plant

Section 1: Introduction

This report presents the plan for local monitoring of key indicators of coastal hazards related to sea level rise and climate change at the CAWD WWTP. Furthermore, the framework and parameters to analyze thresholds, define triggers, monitor regional projects, and respond to coastal hazards are discussed in this report.

A robust data monitoring program is proposed that will track key metrics that represent the potential for coastal hazards issues and identify trends. This monitoring plan is presented in Section 2.

Response to potential increases in coastal hazards will be an ongoing effort that will require a multi-pronged approach and will be largely dependent on the rate of change of key metrics compiled in the monitoring data and subsequent hydraulic modeling updates. Threshold analysis will inform the response to coastal hazards. In general, the response to coastal hazards would choose an appropriate adaptation principle (protect, accommodate, retreat and avoid) in a way that is protective of coastal resources (including water supply needs). Coastal hazards response is discussed in Section 3.

Threshold analysis will be a major tool in defining trigger points. A trigger point is a call for action to address hazards that are foreseeable in the relatively near term. The CAWD WWTP must continue to operate reliability. The threshold analysis in CAWD's 2018 Sea Level Rise Study provided a good starting point in identifying where adaptations may be needed. Further refinement of the threshold analysis is planned as hydraulic models are updated. A framework for triggers is provided in Section 4.

There are several significant flood control projects currently being pursued by Monterey County in the lower Carmel River floodplain. These projects are directed at mitigating impacts of floods on residential neighborhoods, commercial properties, and the Highway 1 corridor. These projects could impact CAWD, and the long-term planning associated with the WWTP in its current location. A perspective on these regional activities is provided in Section 5.

Development of long-term planning related to sea level rise will need to collectively consider timing of coastal hazards and appropriate adaptation measures. CAWD provides a valuable service to the local coastal community by collecting and treating wastewater and turning it into a water source.

Section 2: Monitoring Coastal Hazards Conditions

The monitoring plan includes tracking of key metrics that represent the major hazards of coastal flooding and sea level rise at the WWTP. The monitoring plan includes the following elements:

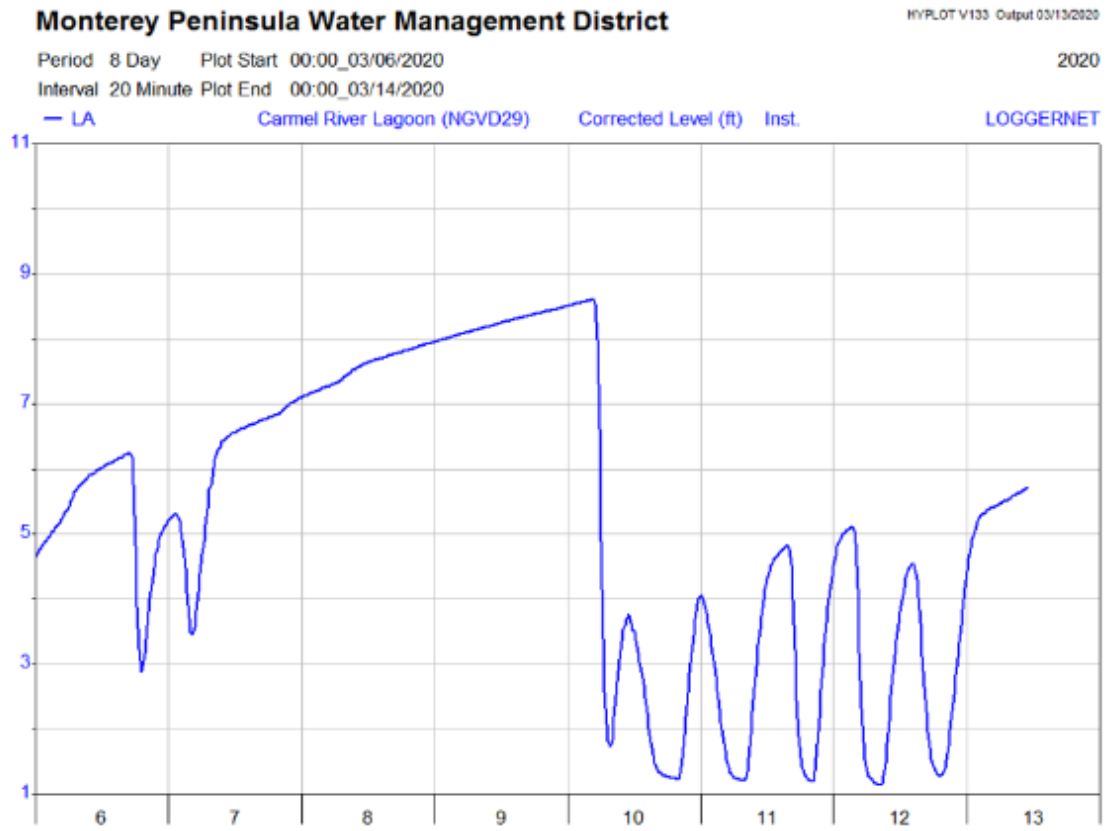
1. Real Time Monitoring of Lagoon Levels
2. CAWD WWTP Monitoring Well Online Instrumentation
3. Real Time Monitoring of River Flows at Via Mallorca (2.5 Miles Upstream)
4. Real Time Ocean Water Levels
5. Sandbar Topographic Surveys
6. Flood Modeling Updates

2.1 Real Time Monitoring of Lagoon Levels

Monterey Peninsula Water Management District (MPWMD) has been measuring lagoon levels via automatic recorder since 1991. Currently real time lagoon levels are available on the MPWMD website, in addition to all historical data. The level recorder is mounted on CAWD's pipeline infrastructure crossing the lagoon. During backwatered lagoon conditions the lagoon level is a close approximation of groundwater levels at the CAWD WWTP.

The lagoon water levels trending over time will show clearly how the lagoon responds to long term sea level rise. In shorter duration trends the lagoon water levels show sandbar and river flow dynamics. Figure 1 shows lagoon level plots in March of 2020 obtained from the MPWMD website.

Figure 1 – Lagoon Level Data from MPWMD



2.2 CAWD WWTP Monitoring Well

There is a groundwater well at the WWTP which is being used by MPWMD to conduct periodic monitoring of groundwater levels at the WWTP. Currently there is no online instrumentation at this location, but CAWD proposes to add an online level sensor to be able to capture real time groundwater level data. During most of the year the levels should correspond very closely with the lagoon level gauge located at our pipelines crossing the lagoon. However, during high river flows there may be a more discernable gradient between the WWTP groundwater levels and the lagoon. An online gauge in this location would help measure the gradient.

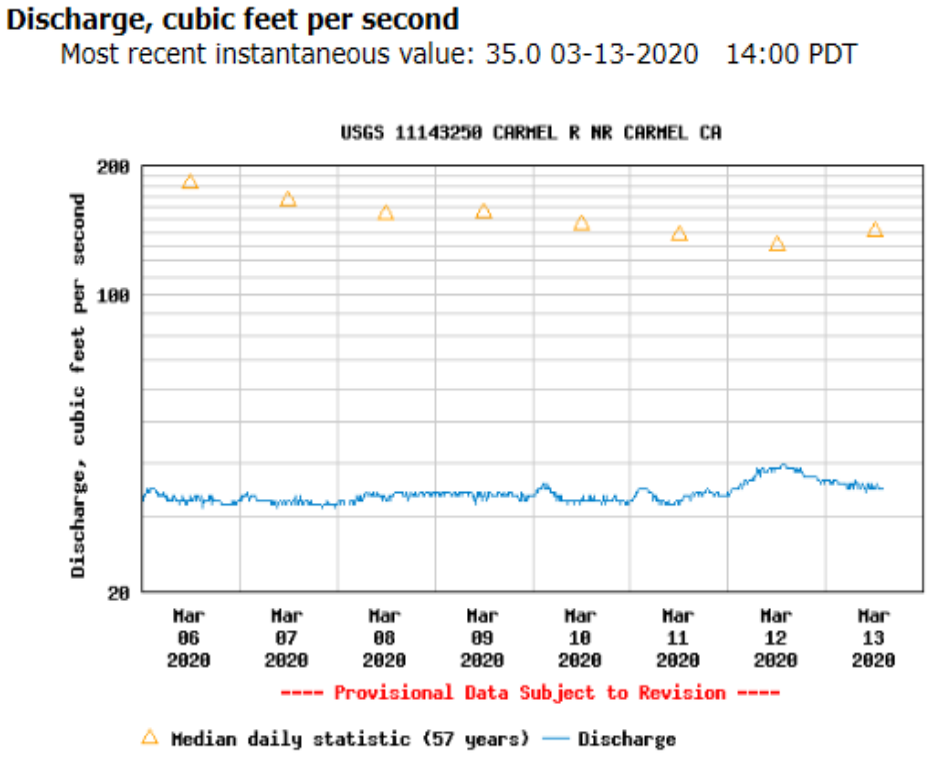
CAWD would complete installation of an online gauge by the end of 2022 for inclusion in regular monitoring.

2.3 Real Time Monitoring of River Flows

USGS maintains a river gauge about 2.5 miles upstream of the CAWD WWTP. This gauge has real time and historical data that is used for flood monitoring and flood models in the lower floodplain. Historic flood events have been recorded at this gauge and therefore future events

can be compared to historic to determine river storm flows that may increase as a result of climate change. It is widely assumed that higher intensity storms will occur in the future. This river flow data will be used to evaluate this assumption into the future. The gauge is "USGS 11143250 CARMEL R NR CARMEL CA". Figure 2 shows Carmel River flow data.

Figure 2 – River Flow Data from USGS



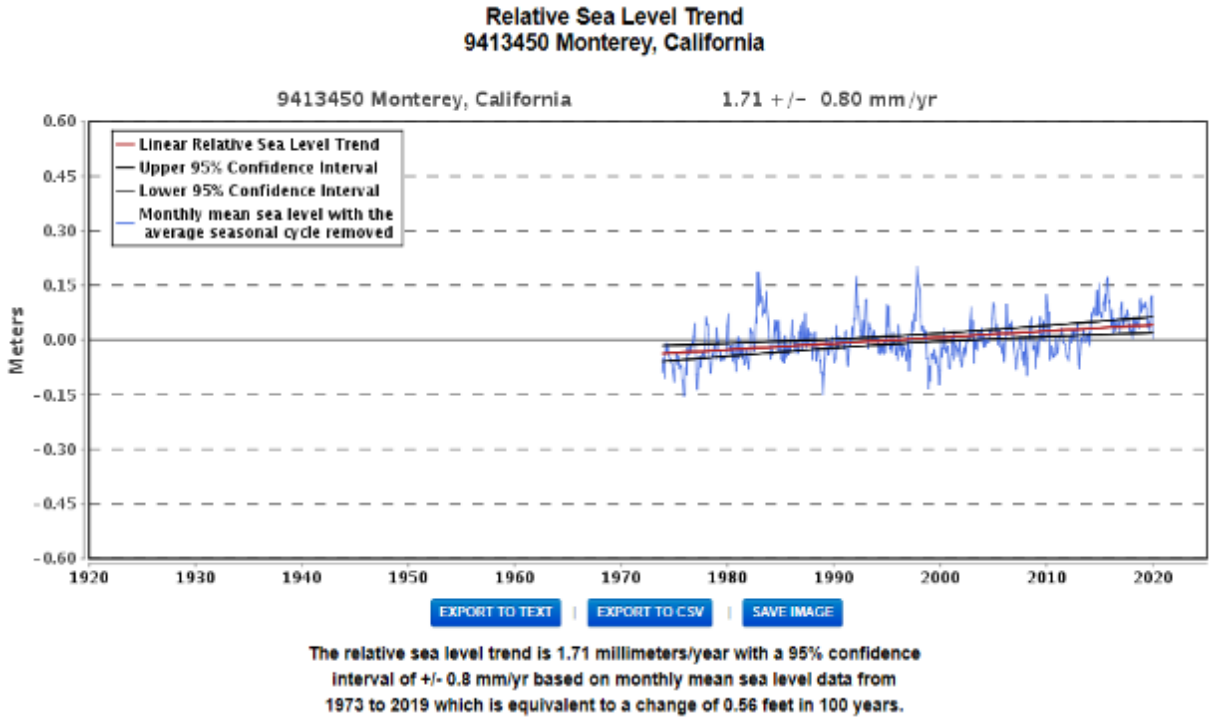
2.4 Real Time Ocean Water Levels

NOAA maintains an ocean tide station in the region at the Municipal Wharf in Monterey, CA. The station number is 9413450 and has been used by other entities monitoring sea level rise, including the Ocean Protection Council (OPC). The station is currently being used by various entities to trend sea level rise in the Monterey area. The station has water level measurements going back to 1973.

Coastal hazard projections in the 2018 CAWD Sea Level Rise Study are based on OPC H++ scenario. The timing of this scenario is a key element in determining the triggers associated with sea level rise.

Figure 3 shows sea level data for the Monterey tide station.

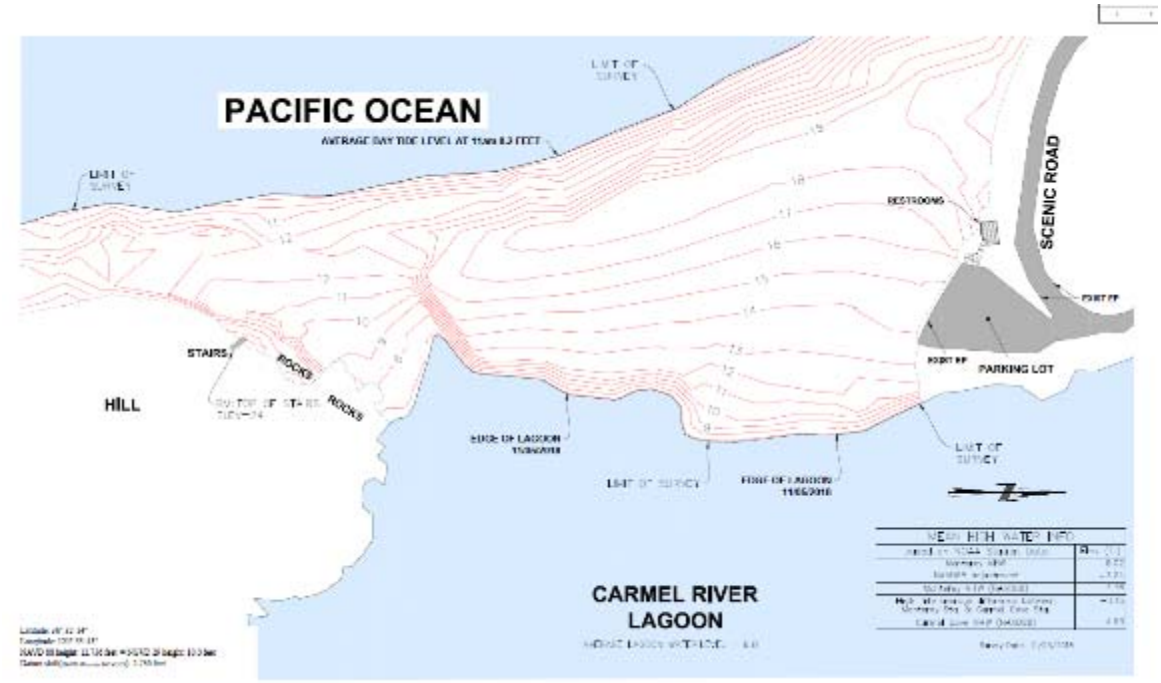
Figure 3 – Ocean Water Levels in Monterey, CA from NOAA



2.5 Sandbar Topographic Surveys

The 2018 CAWD Sea Level Rise report identified sandbar sedimentation patterns as a fundamental element to the flood modelling. The dynamics of sandbar sedimentation have a major impact on water levels in the floodplain, because the sandbar acts as the downstream weir for the open channel hydraulic modeling of the river and backwatered lagoon water levels. It is currently unknown whether the sandbar elevations will rise at the same rate as sea levels or not. As part of the 2018 CAWD Sea Level Rise Study Environmental Science Associates (ESA) indicated that it was likely that sandbar levels would not increase linearly with sea level rise which would slow the impact of sea level rise on riverine flood levels. Periodic topographic surveys of the sandbar would develop a data set and trending of sandbar elevations to determine whether sedimentation is increasing or not. Monterey County currently conducts sandbar surveys to allow sandbar breaching activities and these surveys can be collected to create a record of sandbar elevations over time. Figure 4 shows the sandbar survey conducted by Monterey County in 2018.

Figure 4 – Sandbar Survey by Monterey County in 2018



2.6 Flood Modeling Updates

CAWD will update and improve the existing flood model as needed as part of the five-year interval progress reporting. The existing model was developed by Environmental Science Associates and was the basis for the 2018 CAWD Sea Level Rise study.

2.7 Monitor Effects of Regional Flood Control Projects

CAWD is aware of several projects being put forth by the County of Monterey to address coastal flooding of homes and businesses in the lower Carmel River floodplain. In some cases these projects have the potential to improve flood conditions and in some cases they may also result in significant negative impact to CAWD infrastructure. CAWD has been and will continue to monitor these projects and take action as appropriate under the California Environmental Quality Act to protect CAWD interests. See Section 5 for a detailed discussion of the regional projects CAWD is currently aware of.

2.8 Summary of Coastal Hazards Monitoring Plan

Table 1 contains a summary of the various monitoring elements included in the Coastal Hazards Monitoring Plan, frequency of monitoring, and source of data.

Table 1 – Coastal Hazards Monitoring Plan Matrix

Monitoring Parameter	Frequency	Source	Notes
1. Real Time Monitoring of Lagoon Levels	• Real Time • Historical to 1991	MPWMD	
2. CAWD WWTP Monitoring Well	• Currently spot checked by MPWMD	MPWMD	CAWD to install a real time level monitor by 2022
3. Real Time Monitoring of River Flows	• Real Time • Historical to 1988	USGS	
4. Real Time Ocean Water Levels	• Real Time • Historical to 1973	NOAA	
5. Sandbar Topographic Surveys	• Periodic before controlled sandbar breaching	Monterey County	
6. Flood Modeling Updates	• Every five years	CAWD	
7. Monitor Effects of Regional Flood Control Projects (See Section 5)	• Continuous	CAWD	

Section 3: Coastal Hazards Response

3.1 Threshold Analysis

CAWD proposes to utilize threshold analysis to identify timing of coastal hazard impacts. The threshold analysis will build on the same analysis that was developed as part of the 2018 CAWD Sea Level Rise Study.

CAWD assets elevations will be compared with the hydraulic modelling exposure analysis to determine threshold timeframes of impact. Vulnerability thresholds in Appendix A have been developed with the following procedure:

- Tabulation of asset elevations.
- Hydraulic modeling used to compute flood levels at the WWTP under future conditions with a set of sea-level rise values.
- Fitted curves developed using sea level rise projections between 2000 and 2100.
- Asset elevations were compared to the fitted curves to give an expected timeline for impacts.

3.1.1 Threshold Analysis - Vulnerable Assets

Flooding impacts in Appendix A (Table A-1) are assessed for any assets that were found to be vulnerable within the modeling timeframe for the potential flooding scenarios identified. These are:

- 100-yr River Flooding (RCP 8.5) – Limited duration flooding due to heavy rainfall and fluvial flooding.
- Moderate Storm with Closed Lagoon Inundation – Temporary increase in lagoon levels due to collection of moderate storm river flows behind closed sandbar.
- Backwatered Lagoon Inundation – Long term water levels at the WWTP created from sea level rise impact on normal lagoon levels. Groundwater elevations are likely to equilibrate with this surface water level.

Appendix A (Table A-1) also contains information on the assets as to whether it is critical to the WWTP process and the potential adaptation strategy to deal with sea level rise projections. If the asset is not critical then there is a greater range of adaptations available including removing the asset or taking it out of service during a flood.

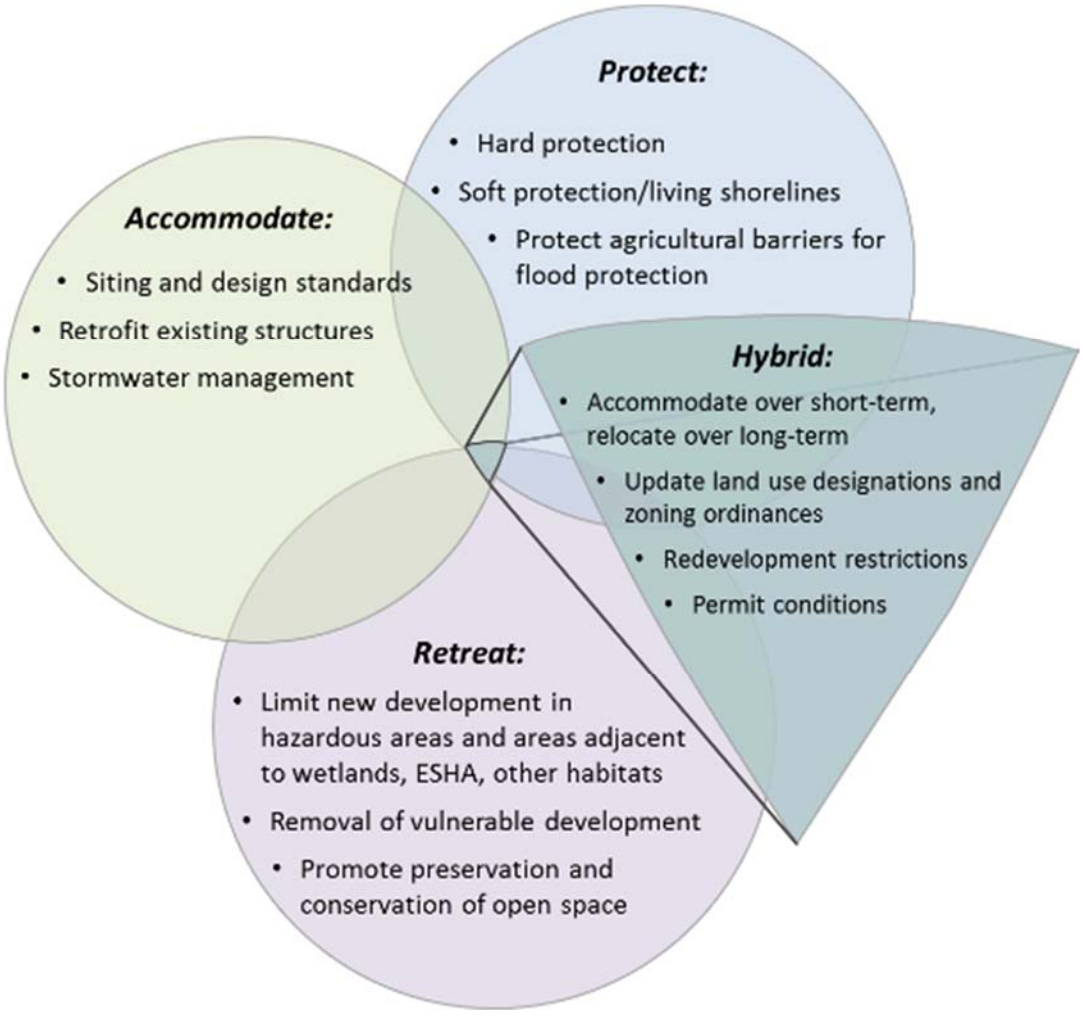
3.1.2 Threshold Analysis – Critical Assets

A limited number of assets shown in Appendix A (Table A-1) are critical to the operation of the CAWD WWTP. These assets should be the most important focus for adaptation. A full list of the critical assets to the operation of the CAWD WWTP are summarized in Appendix A (Table A-2).

3.2 Adaptation: Protect, Accommodate, Retreat, Hybrid

The general principles CAWD will utilize in Coastal Hazard Response are drawn from adaptation guidance from the California Coastal Commission. Figure 5 shows the general guidance for sea level rise adaptation from the Coastal Commission. How these principles will specifically look for CAWD is described in the following.

Figure 5 – General Adaptation Strategies



3.2.1 Protect

Protection work would not include a sea wall or similar land barriers as this is specifically prohibited in the Coastal Development Permit (CDP) for the WWTP. However, it is too early to rule out possible projects that would involve living shorelines, horizontal levees, or other natural protection that is compatible with sea level rise. At this early stage it may seem that these types of endeavors will be costly and may detract from alternatives involving retreat. Nonetheless, natural protection could be an alternative worth keeping an eye on.

3.2.2 Accommodate

There are instances at the CAWD WWTP where minor modifications to existing structures will provide a higher level of flood protection without conflicting with the need to protect coastal resources and without effecting long-term potential for coastal retreat. CAWD is extremely risk averse and would implement minor structural modifications to make sure critical assets will continue to operate reliably through a flood event.

Protection work could include:

- Installing watertight lids over any critical vaults and basins with low lying openings.
- Adding stem walls on top of existing structures to raise the level of flood protection.
- Elevating existing equipment.
- Anchoring temporary trailers and storage containers to the ground.

3.2.3 Retreat

CAWD will analyze options that involve retreating from the current WWTP location so CAWD would be prepared in the event that coastal hazards warrant retreat. Relocating a WWTP is not a simple endeavor. The cost to maintain existing services in a different location will be a burden on the local community, and so the decision to move must be well supported. Furthermore, there are a multitude of hurdles associated with a major public works project such as relocating a WWTP or constructing infrastructure to transport sewage to Monterey One Water. It will take considerable time to plan, develop, and implement such an endeavor.

CAWD staff are in agreement that studying of options for retreat needs to begin immediately, because the amount of time it will take to plan and implement a major public works project of this magnitude could take decades. The plan for these efforts will be provided as part of the "Long-Term Coastal Hazards Planning" work required per the latest CAWD WWTP CDP amendment.

3.2.4 Hybrid

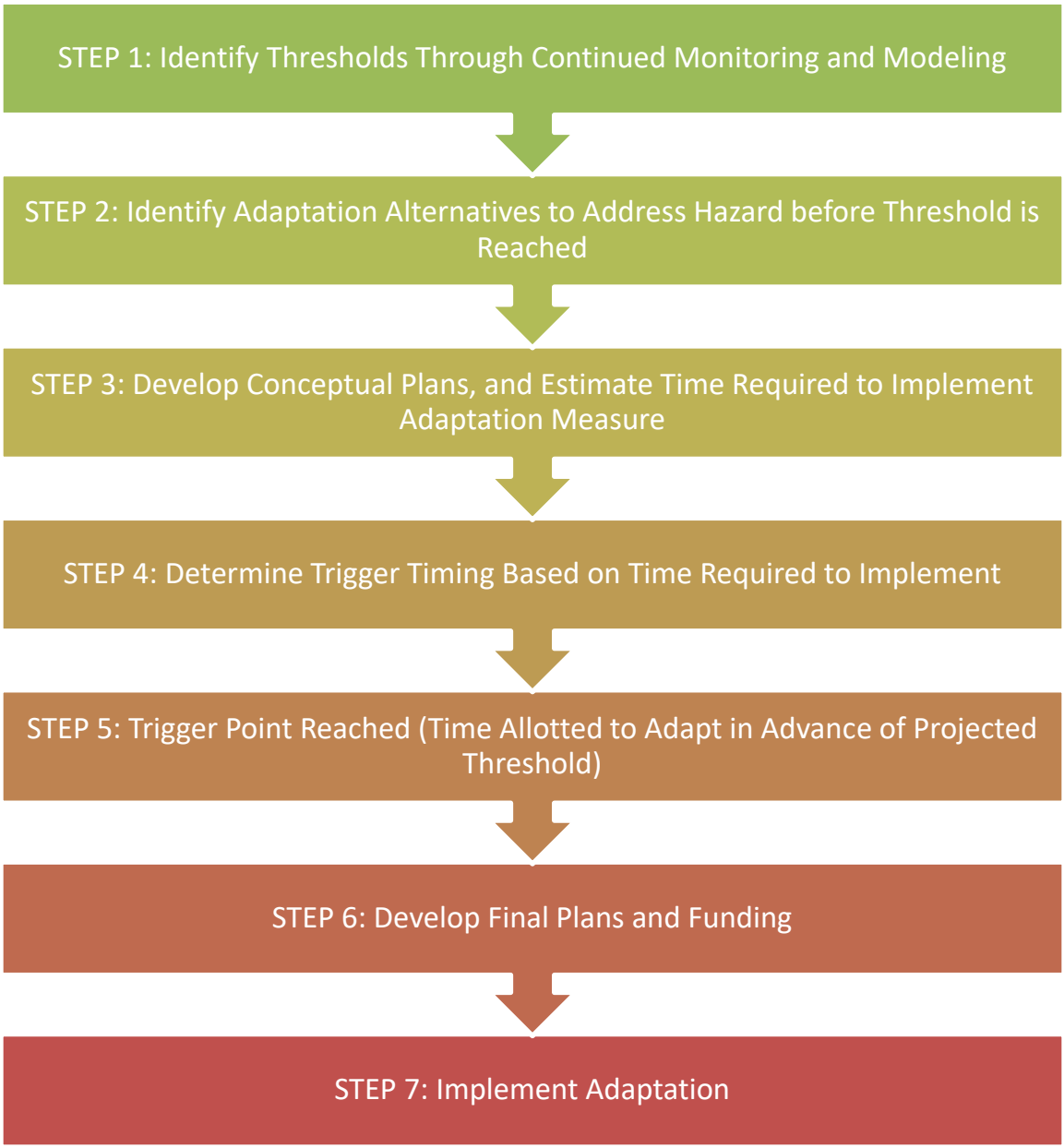
Inevitably a hybrid approach will be taken as there is no one solution that solves all potential issues when cost and schedule factors are taken into account. CAWD anticipates that there may be benefit in maximizing the existing site location as long as there are no adverse impacts to coastal resources. This will allow CAWD time to implement the best retreat plan and develop funding sources.

Section 4: Coastal Hazards Triggers

4.1 General Framework for Developing Adaptation Triggers

The general approach to developing triggers is outlined in this section. The process is based on the coastal hazard monitoring data, threshold analysis, development of adaptation measures, and estimated time it will take to implement adaptation.

Figure 6 – General Framework for Developing Adaptation Triggers



STEP 1: Identify Thresholds Through Continued Monitoring and Modeling

Identification of thresholds has begun as shown in Appendix A. Further refinements of the threshold analysis is planned as part of 5-year reporting to the Coastal Commission.

STEP 2: Identify Adaptation Alternatives to Address Hazard before Threshold is Reached

Identification of adaptation alternatives to address hazards has begun as shown in Appendix A. Further refinements of potential adaptations is planned as part of 5-year reporting to the Coastal Commission.

STEP 3: Develop Conceptual Plans, and Estimate Time Required to Implement Adaptation Measure

Some conceptual adaptation measures have been developed for assets already identified with potential shorter-term susceptibility to coastal flooding. These are included in the tables in Appendix A. Additional evaluation of these adaptation measures will be required along with estimating the time required to implement. Once a suitable adaptation measure is decided on, the time to implement can be established.

STEP 4: Determine Trigger Timing Based on Time Required to Implement

Minor projects such as installing water-tight lids on existing low-lying structure openings are expected to have a short timeframe for implementation and therefore shorter trigger timeframes. Major projects such as retreat from the current location will take much longer to implement and therefore the timing of the trigger point should be related to the extended time needed to implement.

For example, the trigger for minor adaptations (such as retrofits) could be less than 5-years before a vulnerability threshold is reached. On the other hand, the trigger for relocating the WWTP would most likely be greater than 10-years before a major vulnerability threshold is expected.

Another factor associated with vulnerability thresholds is risk of occurrence. The flood modeling being used is based on storm intensity that has a relatively low probability of occurring in any given year. Therefore, there would be some conservatism built-in as

the threshold analysis is a worst-case projection with a low probability of actually occurring any given year.

STEP 5: Trigger Point Reached (Time Allotted to Adapt in Advance of Projected Threshold)

If a specific adaptation will take 5-years to complete, the trigger would be 5-years before the projected threshold is projected to be reached. If a specific adaptation will take 10-years to complete, the trigger would be 10-years before the threshold is projected. The thresholds will be based on the Threshold Analyses described in Section 3.

STEP 6: Develop Final Plans and Funding

Once a trigger point is reached, CAWD would move forward with development of plans and establish funding to proceed with a specific adaptation.

STEP 7: Implement Adaptation

The final step is implementation of the adaptation.

4.2 Financial Trigger to Retreat

There may be a point in the life of the existing facility where the cost of improvements to the existing facility is projected to exceed the cost to retreat from the current site (i.e. relocate the WWTP, or pump to Monterey One Water). The evaluation of "Long-Term Coastal Hazards Planning" will provide insights into the costs associated with building new facilities away from the existing site. In general, the cost to build new facilities is expected to be in the hundreds of millions (plus financing costs over a 30-year period). The cost to accommodate flooding at the existing facility, whilst also maintaining the existing infrastructure, may at some point reach an inflection point with the cost to relocate. This situation will be considered over time as long-term planning is conducted.

Section 5: Regional Effects

There are several projects that are currently being pursued by the County of Monterey to address coastal flooding issues in the lower Carmel River floodplain. These projects are discussed below. Some projects would significantly alter the natural floodplain by construction of flood walls, and some would seek to restore natural processes in the flood plain. Some projects would potentially have a negative effect on CAWD, and some projects may have a positive effect on CAWD. These projects are being closely monitored by CAWD who is a major stakeholder in the lower Carmel River floodplain.

5.1 Carmel River FREE (Monterey County/Big Sur Land Trust)

The Carmel River Floodplain Restoration and Ecosystem Enhancement (FREE) Project involves creating a new river diversion channel in the Lower Carmel River Floodplain. The new diversion channel will convey a higher volume of flood flows to the South Overbank area of the floodplain thus reducing flood levels on the North Overbank area of the floodplain. The project involves reconstruction of Highway 1 to include an elevated causeway so the new river channel can cross under the highway.

The Carmel River FREE project was identified during the CEQA process as resulting in a significant impact to existing CAWD pipelines located downstream of the new proposed diversion channel. The impacts were correlated to the increased flow velocities and conveyance of debris resulting from creating a new defined flow channel in the South Overbank area. CAWD has cooperated with Monterey County efforts to move this project forward by developing an agreement with Monterey County for CAWD to engage in relocation of the existing pipelines that would be impacted by Carmel River FREE. It is anticipated that construction may begin on relocating the CAWD pipelines in 2022 with the Carmel River FREE construction work being conducted in a similar timeframe.

Project Effect on Coastal Hazards at CAWD WWTP:

Aside from the negative impacts to CAWD pipelines, which will be mitigated before completion of the project, the Carmel River FREE project is anticipated to reduce the flood levels at the CAWD WWTP by as much as 8-inches.

5.2 Ecosystem Protection Barrier (Monterey County)

Monterey County is pursuing a flood wall along the Northern border of the Carmel Lagoon to protect homes that were built along the border of the lagoon wetlands. The flood wall is proposed to be built to a top of wall elevation of 17.5 feet (NAVD). The project is currently in the EIR stage and CAWD is currently evaluating whether the flood wall would significantly change the base flood elevation at the CAWD WWTP.

Staff at CAWD are closely watching this project and are intently interested in whether a flood wall could ever be approved by the Coastal Commission along a coastal wetland given the current policy of favoring retreat over hard armoring and subsequent loss of habitat and beaches.

Project Effect on Coastal Hazards at CAWD WWTP:

Currently under review by CAWD.

5.3 Scenic Road Protection Structure (Monterey County)

Monterey County is planning a sea wall on Carmel River State Beach along Scenic Road. This project is intended to protect Scenic Road and the adjacent homes from erosion caused during natural breaching of the sandbar. The project is currently in the EIR stage and CAWD is watching this project as it is developed.

Project Effect on Coastal Hazards at CAWD WWTP:

Currently under review by CAWD.

5.4 Interim Sandbar Management (Monterey County)

Monterey County currently manages the sandbar at the mouth of the Carmel River in order to mitigate flooding of homes on the North side of the lagoon and to mitigate erosion along Scenic Road which is on the North side of the river mouth. Monterey County cuts a channel in the sandbar on the South side of the river mouth so that the sandbar breaches in that location, directing the river flow away from Scenic Road.

Breaching is typically controlled so that the backwatered lagoon water level does not exceed about 12-foot elevation, which is when homes start to be threatened by flooding. In December of 2019 the lagoon breaching did not go as anticipated and the water level reached 15-foot elevation which led to some short-term localized flooding of the homes along the North side of the lagoon.

No impacts were observed at the CAWD WWTP with the lagoon at that elevation, however it was only at that level for a few hours.

Project Effect on Coastal Hazards at CAWD WWTP:

Currently under review by CAWD. It is difficult to predict whether sandbar management is a true benefit to CAWD or not because it is not known at what level the sandbar would breach naturally any given year. The County has been mechanically breaching the lagoon for such a long time there is no experience to draw from in a scenario where the County is not doing controlled breaching.

5.5 County Service Area 50 Rioway Tract No. 2 Interior Drainage Stormwater Quality Improvement Project (Monterey County)

The project is in the 35% design stage and appears to involve building floodwalls and interior drainage improvements on the North side of the Carmel River directly adjacent to the CAWD WWTP. The actual proposed project is still unclear at this early stage.

Project Effect on Coastal Hazards at CAWD WWTP:

If the County intends to build a flood wall on the North Overbank of the lower Carmel River floodplain, it seems likely that the base flood elevations would at the WWTP. If that was the case CAWD would most likely have a negative opinion of this project. This project is still in the early stages and so information is limited.

Appendix A –
Threshold Analysis from 2018 CAWD Sea Level Rise Study

Table A-1: Vulnerable Assets And Approximate Time Thresholds Of Impact

Building #	Description	Operation Critical for Secondary Treatment	Asset Designed to Operate thru Flood Water Elevation (feet NAVD)	Timing of 100-yr River Flooding Impact (RCP 8.5)	Timing of Closed Lagoon Moderate Storm Impact	Timing of Backwatered Lagoon Inundation Impact	Notes	Adaptation Strategy
Treatment Plant Assets								
29	Grease Receiving Station	No	16.7	Existing	2060	beyond 2100	Receive fats-oils-grease and ground up food waste from grocery stores. Not required to accept the waste, can stop at anytime.	Demolish assets. Rebuilding to a higher elevation could be an option but would depend on payback analysis.
35	Storage Building	No	16.8	Existing	2066	beyond 2100	Not used in treatment plant process.	None required. Accommodate flooding or demolish building.
34	Maintenance Shop	No	16.84	Existing	2067	beyond 2100	Not used in treatment plant process.	None required. Accommodate flooding or build new elevated maintenance shop.
33	Vehicle Storage Building	No	16.87	Existing	2067	beyond 2100	Not used in treatment plant process.	None required. Relocate vehicles offsite during flood.
44	Conex Storage	No	17	Existing	2070	beyond 2100	Storage of materials and equipment. Can be removed from site.	Remove from site or place on an elevated concrete pad or anchor to protect structure from flooding.
28	Sludge Trailer	Yes	17.62	Existing	2078	beyond 2100	Not a structure. Dewatering can be offline for extended periods by using the standby digester for additional sludge storage. Therefore transport truck could be relocated offsite during a flood event without impacts to treatment.	Adapt treatment strategy during winter months by having second digester empty and available for storing digested sludge onsite for long periods (~30 days of storage).
13	Secondary Effluent Diversion Structure	Yes	17.95	2040	2080	beyond 2100	Pile supported below ground flow diversion structure (Approx 10 ft x 20 ft x 15 ft deep).	Accommodate by installing water tight access lids.
14A	Chlorine Contact Channels	Yes	17.98	2040	2080	beyond 2100	Pile supported structure for disinfection contact of treated effluent before discharge to the ocean.	Accommodate by installing water tight access lids.
30	Ops Building Restroom Sump	No	18	Existing	2081	beyond 2100	Small concrete sump that receives on site restroom drainage.	Accommodate by raising top of sumps to above flood level or installing water tight lid.
17	Microfiltration/Reverse Osmosis Facility	No	18.05	2025	2081	beyond 2100	Not designed to operate during flood event. MF/RO System is not required for NPDES permit.	Protect by building a three foot high flood wall on top of existing foundation slab.
44	Conex Storage	No	18.5	2045	2086	beyond 2100	Storage of materials. Can be removed from site.	Remove from site or place on an elevated concrete pad or install soil anchors to protect structure.

Building #	Description	Operation Critical for Secondary Treatment	Asset Designed to Operate thru Flood Water Elevation (feet NAVD)	Timing of 100-yr River Flooding Impact (RCP 8.5)	Timing of Closed Lagoon Moderate Storm Impact	Timing of Backwatered Lagoon Inundation Impact	Notes	Adaptation Strategy
38	Lunch Room Restroom Sump	No	18.6	Existing	2086	beyond 2100	Small concrete sump that receives on site restroom drainage.	Accommodate by raising top of sumps to above flood level or installing water tight lid.
16	Gypsum Silo	No	19	2040	2091	beyond 2100	For Recycled Water pH control. Not currently in use.	Abandon or replace with a calcium carbonate filter in Tertiary Building above flood level.
30	Operations Building First Floor and Basement	No	19.37	Existing	2094	beyond 2100	Basement was designed to flood. No equipment is in the basement. Office equipment is located on the first floor at elevation 19.04 ft. Main power Switchgear is located on second floor at elevation 24.75 ft.	None required. Accommodate flooding in future.
42	Ferric-Chloride Storage	No	19.38	Existing	2094	beyond 2100	Structure would not be damaged by flooding. Small pump is vulnerable, but can be offline for extended periods.	None required. Accommodate flooding in future. Could elevate pump to higher elevation in future. Or extend containment wall to higher elevation.
26	Waste Gas Burner	Yes	19.45	2040	2095	beyond 2100	Skid mounted unit. Floodable without damage for 72 hrs. Can be bypassed if required.	Accommodate flooding by raising the waste gas burner skid up on existing slab.
1	Manhole just upstream of influent pump station	Yes	19.6	Existing	2096	beyond 2100	Main WWTP Influent Manhole South of Carmel River on WWTP Property	Accommodate by installing water tight access lid or raising grade.
37	Office Trailer A	No	19.83	Existing	2098	beyond 2100	Not used in treatment plant process.	None required. Accommodate flooding in future or abandon trailers and relocate offices to existing buildings.
39	Office Trailer B	No	19.83	Existing	2098	beyond 2100	Not used in treatment plant process.	None required. Accommodate flooding in future or abandon trailers and relocate offices to existing buildings.
40	Office Trailer C	No	19.83	Existing	2098	beyond 2100	Not used in treatment plant process.	None required. Accommodate flooding in future or abandon trailers and relocate offices to existing buildings.
38	Employee Break Building	No	20.01	Existing	2100	beyond 2100	Not used in treatment plant process.	None required. Accommodate flooding in future or abandon trailers and relocate offices to existing buildings.
43	Storm water Pump Station	No	20.3	2030	beyond 2100	beyond 2100	Pumps station is designed to be flooded. Electrical controls could be vulnerable to extreme flooding.	Protect electrical panel by moving it to higher elevation in future.
31	Locker Room	No	20.47	2032	beyond 2100	beyond 2100	Not used in treatment plant process.	None required. Accommodate flooding in future.

Building #	Description	Operation Critical for Secondary Treatment	Asset Designed to Operate thru Flood Water Elevation (feet NAVD)	Timing of 100-yr River Flooding Impact (RCP 8.5)	Timing of Closed Lagoon Moderate Storm Impact	Timing of Backwatered Lagoon Inundation Impact	Notes	Adaptation Strategy
15	Tertiary Building	No	20.59	2035	beyond 2100	beyond 2100	Pile supported tank structure holds disinfected secondary treated water. Tertiary system is not required for NPDES permit.	Protect by raising tank walls.
41	Vehicle Fuel Storage	No	22	2060	beyond 2100	beyond 2100	Diesel and Gasoline storage tanks for vehicles and equipment. Tanks are anchored and watertight and the air vent is elevated to elevation 22 ft.	Accommodate by raising air vent higher. Could also elevate the tanks on an elevated concrete structure.
Collection System Assets Near Carmel River								
	PBCSD Sewer Manholes on North Side of Carmel River Main Sewer Crossing (Two Manholes)	Yes	15.4	Existing	2030	2090	Manhole near River Bank	Accommodate by installing water tight lids.
	CAWD Sewer Manholes on North Side of Carmel River Main Sewer Crossing	Yes	17.9	Existing	2040	beyond 2100	Manhole near River Bank	Accommodate by installing water tight lids.

Table A-2: Critical Treatment Assets And Approximate Time Thresholds Of Impact of 100-yr Storm (RCP 8.5)

Building #	Treatment Process	Required Level of Service	Assets Designed for Flood at Elevation	Timing of Potential RCP 8.5 Flood Impact (Med-High Risk Aversion)	Timing of Potential RCP 8.5 Flood Impact (Extreme Risk Aversion)	Description of Impact	Adaptation Strategy
-	Conveyance Manholes Upstream of Influent Pump Station	Convey Wastewater into Influent Pump Station	15.4 to 19.6 ft	Existing	Existing	River inflow into WWTP Influent Pump Station could cause sewer overflows.	Install water tight lids.
1	Influent Pump Station	Pump Wastewater Into Influent Headbox	23.53 ft	2080	2062	Impact Outside 2050 Planning Horizon	Subject to future planning
2	Influent Headbox	Convey Wastewater to Headworks by Gravity	29.50 ft	Beyond 2100	Beyond 2100	Impact Outside 2050 Planning Horizon	Subject to future planning
3	Headworks	Removes Grit and Rags from Wastewater	29.46 ft	Existing	Existing	Potential for flooding in basement due to old flood door.	Need to replace old basement flood door.
4A and 4B	Primary Clarifiers	Removes Settleable Solids from Wastewater	23.59 ft	2080	2062	Impact Outside 2050 Planning Horizon	Subject to future planning
7A and 7B	Aeration Basins	Removes Nutrients from Wastewater	23.48 ft	2080	2062	Impact Outside 2050 Planning Horizon	Subject to future planning
8	Aeration Blowers	Provides Air for Aeration Basins	24.49 ft	2085	2065	Impact Outside 2050 Planning Horizon	Subject to future planning
12	RAS/WAS Pump Station	Supports Aeration Process	23.67 ft	2080	2062	Impact Outside 2050 Planning Horizon	Subject to future planning
11A and 11B	Secondary Clarifiers	Removes Suspended Solids	23.62 ft	2080	2062	Impact Outside 2050 Planning Horizon	Subject to future planning
13	Secondary Effluent Diversion Structure	Conveys Secondary Effluent to Chlorine Contact Channels	17.95 ft	2040	2035	Inflow into Chlorine Contact Channels could cause overflow of treated secondary effluent.	Install water tight lids.
14A	Chlorine Contact Channels	Provides Contact Time for Disinfection	17.98 ft	2040	2035	Inflow into Chlorine Contact Channels could cause overflow of treated secondary effluent.	Install water tight lids.
14B	Chlorination Building	Monitoring of Disinfection Process	23.62 ft	2080	2062	Impact Outside 2050 Planning Horizon	Subject to future planning
36	Hypo/SBS Facility	Feeds Disinfection and Dechlorination Chemicals before Final Effluent	23.75 ft	2080	2062	Impact Outside 2050 Planning Horizon	Subject to future planning

Building #	Treatment Process	Required Level of Service	Assets Designed for Flood at Elevation	Timing of Potential RCP 8.5 Flood Impact (Med-High Risk Aversion)	Timing of Potential RCP 8.5 Flood Impact (Extreme Risk Aversion)	Description of Impact	Adaptation Strategy
18	Effluent Pump Station	Pumps Final Effluent to Ocean	23.5 ft	2080	2062	Impact Outside 2050 Planning Horizon	Subject to future planning
20	Dissolved Air Flotation Thickener	Thickens Plant Waste and sends it to Digesters	23.75 ft	2080	2062	Impact Outside 2050 Planning Horizon	Subject to future planning
21 and 22	Digesters	Removes pathogens from Sludge	37 ft	Beyond 2100	Beyond 2100	Impact Outside 2050 Planning Horizon	Subject to future planning
23 and 25	Digester Control Buildings	Supports Digesters	23.57 ft	2080	2062	Impact Outside 2050 Planning Horizon	Subject to future planning
26	Waste Gas Burner	Burns Digester Gas not Used in Cogen or Boiler	19.45	2030	2030	Flaring could be impacted for about 1 day.	Raise or modify waste gas burner so that the burners are at a higher elevation. The controls can be submerged. Or burn all gas in digester heater.
27	Dewatering Building	Removes liquid from Sludge so Solids can be disposed of	23.60 ft	2080	2062	Impact Outside 2050 Planning Horizon	Subject to future planning
28	Sludge Trailer	Transports Solids off-site.	17.62 ft	Existing	Existing	May be difficult to drive sludge transport truck. If flooding duration is less than 1 week there may be no impact.	Use redundant Digester for emergency sludge storage.
30	Main Power Switchgear	Distribution Center for PG&E and Standby Power	25 ft	2100	2082	Impact Outside 2050 Planning Horizon	Subject to future planning
1	Standby Power Generator	Provides Power in Case of a PG&E Outage	23.53 ft	2080	2062	Impact Outside 2050 Planning Horizon	Subject to future planning
1	Standby Generator Fuel Tank	Provides Fuel for Standby Generators	24.2 ft	2080	2062	Impact Outside 2050 Planning Horizon	Subject to future planning