

**NORTH COAST COUNTY WATER DISTRICT
FASSLER TANK**

PRELIMINARY DESIGN REPORT

SEPTEMBER 2024



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Abbreviations

AC	Asphalt Concrete
ANSI	American National Standards Institute
APN	Assessor Parcel Number
AT&T	American Telephone and Telegraph Company
CEQA	California Environmental Quality Act
CY	Cubic yards
DDW	Division of Drinking Water
DIP	Ductile Iron Pipe
District	North Coast County Water District
FF	Finished floor
ft	Feet
ft/s	Feet per second
GPM	Gallons per Minute
HDPE	High Density Polyethylene
HM	Hydromodification measures
HWL	High Water Level
ISA	International Society of Arboriculture
ISMND	Initial Study Mitigated Negative Declaration
MG	Million Gallon
MRP	Municipal Regional Stormwater Permit
NSF	National Science Foundation
OSHA	Occupational Safety and Health Administration
OSPAC	Open Space and Parkland Advisory Committee
PGE	Pacific Gas and Electric Company
PLC	Programmable Logic Controller
PVC	polyvinyl chloride
RTU	Remote Terminal Unit
RWQCB	San Francisco Bay Regional Water Quality Control Board
SCADA	Supervisory Control and Data Acquisition
SMCWPPP	San Mateo Countywide Water Pollution Prevention Program
TMS	Tideflex Mixing System

1. Background and Purpose

The North Coast County Water District (District) is an independent special district serving the City of Pacifica. The Fassler Tank is a 0.5 million gallon (MG) welded steel tank that serves the southern portion of the District's service area in Pressure Zone 24. The District has determined that this tank has reached the end of its useful life and has been prioritized to be upsized and replaced with a new 1.2 MG tank. An analysis of tank alternatives was performed in the *Fassler Tank Siting Study* (Brown and Caldwell, 2023), which recommended a 1.2 MG prestressed concrete tank. This Preliminary Design Report shall serve as the guide for the final design of the Fassler Tank and aims to fulfill the following criteria:

1. Present the primary design criteria and constraints for the prestressed concrete tank;
2. Present the improvements that would be necessary to replace the existing 0.5 MG steel tank with a 1.2 MG prestressed concrete tank;
3. Outline selected ancillary tank accessories and improvements to be incorporated into the design; and
4. Provide a cost opinion for the required improvements.

1.1. Project Location

The project is located at 1186 Fassler Avenue in Pacifica, California as shown in Figure 1. The APN of the parcel is 022-330-070.



Figure 1: Project Vicinity

1.2. Project Boundaries

The project site is surrounded by the Golden Gate National Reserve Area. Tank access is from a driveway that begins at Fassler Avenue and ends at the tank site. The tank access driveway runs parallel to the Baquiano Hiking Trail and passes a small parking lot intended for trail users. There is a vehicle gate at the parking lot preventing unintended use of the access driveway. The project work area and access driveway are shown in Figure 2.



Figure 2. Tank Project Boundaries and Access

2. Design Criteria and Constraints

The primary design criteria and constraints are presented in this section.

2.1. Survey

The District provided a topographical survey completed in February 2023 by LCC Engineering & Surveying Inc for the existing fenced tank area and access driveway.

2.2. Easements

There are three easements in the project vicinity as shown in Figure 3. These easements and alignments were provided in the survey completed by LCC Engineering & Surveying Inc. The tank sits within the District's easement surrounding the tank parcel. There is a joint utility easement along the site access road which is shared between AT&T, PGE, and the District. There is also a 15' wide waterline easement along the Northwest side of the tank site which contains a San Bruno transmission main no longer in service. The District has stated that new infrastructure may be in the San Bruno transmission main easement as it is currently not in use.



Figure 3. Project Site Existing Easements

2.3. Existing Utilities

The USA-North Design Research service was utilized to identify existing facilities within the project boundary. Through this service request agencies were identified to have facilities that could conflict with the project construction. Each identified agency was emailed an A-Letter with a general project description and a request for immediate mapping information of utilities in the area. Three agencies were contacted including AT&T, City of Pacifica, and PG&E. Of the agencies contacted, all three responded with mapping of relevant utilities. The utility information received is included in Appendix A.



As mentioned in Section 2.2 Easements, the original tank as-builts show a 12-inch San Bruno transmission line on the Northwest side of the existing tank. Based on District correspondence, it is our understanding that this line is inactive, and can be demolished and abandoned in place, in accordance with standard abandonment procedures.

2.4. Geotechnical Investigation

The District provided an existing geotechnical report, *Geotechnical Investigation Fassler Tank Replacement Project* (Miller Pacific Engineering Group, 2023) for the preliminary tank design. As part of this project, Water Work's geotechnical subconsultant, Bajada Geosciences Inc., conducted a geotechnical investigation in August of 2024. Complete details of the geotechnical field investigation, analysis and recommendations will be in the Draft Geotechnical Report that will be available during final design.

2.5. Operational Flows and Elevations

2.5.1. Water Levels

Based on the *Fassler Tank Siting Study*, the proposed Fassler Tank can operate with a high water level (HWL) between 723 feet and 737 feet. The HWL in the new tank will be 737 feet. This increase in water elevation compared to the existing tank will increase water pressure for the zone.

2.5.2. Floor Elevation and Inlet/Outlet Pipe

The existing tank finished floor is at 709 feet elevation. The new finished floor elevation at 706 feet elevation minimizes the amount of grading necessary, while conforming to the District's desired tank height presented in the *Fassler Tank Siting Study*. The inlet/outlet pipe will be located approximately 8 feet from the tank sidewall towards the tank center to avoid penetrating the wall footing. The outlet will extend 6 inches above the finished floor to prevent debris from entering the distribution system.

2.5.3. Overflow Elevation

The District stated there is a maximum inflow rate of 700 to 750 gpm. The proposed overflow elevation is at 738 feet, which is 1 foot above the new tank's HWL. The existing tank has overflowed 4 to 5 times in the last 5 years, and the District has expressed the desired for a minimum of 30 minutes to address a potential overflow for the new tank. At a 750 gpm inflow, tank overflow will occur in approximately 55 minutes, which gives sufficient time for operators to respond to a high-level alarm in the tank and address the problem. The overflow design is described more in the Section 4.4. Tank Overflow.

2.5.4. Water Storage and Supply During Construction

The District has stated that for the duration of construction, the tank may be isolated and bypassed without hindering the existing water supply distribution system in the area. The District will confirm the closest isolation valve that will be used to isolate the tank and piping to be replaced. No temporary water storage will be needed.

2.6. Minimum Useable Total Storage Volume

The useable tank storage volume is defined as the volume of water between HWL and the top of the inlet/outlet piping, minus the unusable volume associated with the sloped tank bottom and roof support columns. The minimum useable total storage volume for the new tank will be 1.2 MG.

3. Tank Layout

The dimensions and elevations for the tank are listed below in Table 1.

Table 1. Tank Dimensions and Elevations

Tank Parameters	
Tank Base Elevation at Sidewalls, ft	706.00
Inside Tank Diameter, ft	83.5
Roof and Floor Slope, %	1.5
Inlet/Outlet Piping Height Above Tank Floor, ft	0.5
Useable Volume, MG (HWL- Inlet/Outlet-unusable volume)	1.20
Maximum Operating Water Surface (HWL), ft	737.00
Overflow Height Above Finished Floor (FF), ft	32.00
Freeboard Above Overflow, ft	2.83
Sidewall Height (Roof to Floor at Wall), ft	34.83
Approximate Total Tank Height at center of roof, ft	36.29
Max Height from Tank Roof Center to Grade, ft	33.79

4. Tank Features

4.1. Tank Roof and Floor Design

The tank's roof and floor will both be designed with the standard 1.5% slope from the tank center to the edges. An equal roof and floor slope results in tank columns of the same length, simplifying costs and construction.

4.1.1. Tank Roof Details

The tank roof type will be a column supported flat slab that is 3.83 feet above the high water level. There are currently no plans for ancillary roof loads which would need to be accounted for, such as solar panels or large equipment storage. If any extraordinary loads are necessary, these could be incorporated into the design.

The slosh wave from a seismic event is expected to be approximately 5.5 feet, which is greater than the available freeboard of 3.83 feet. The freeboard cannot be increased and still meet the height constraint of the tank. Therefore, the tank will require one of the following to accommodate the uplift load: a) wall to roof cables or b) roof edge span reinforcing.

4.1.2. Tank Floor Details

The tank floor will be constructed as a 6-inch thick structural membrane slab with one reinforcing matt. A structural membrane floor has a differential settlement requirement of less than or equal to 0.25-inch over 50 feet. For this application, a thicker structural slab is not recommended. As thickness increases the slab becomes more rigid, thus decreasing the flexibility. The flexibility of the slab is important for accommodating the differential settlement that will occur.

Microcracks which form in the tank floor during construction are a common occurrence, however they do not typically affect the water tightness of the floor. The floor is thick enough for autogenous healing of the concrete. Autogenous healing occurs when the water in the tank reacts with the concrete to form crystals that fill in the microcracks over time. Before the disinfection and hydrostatic testing of the tank, any cracks discovered in the tank floor that exceed the width typically expected to autogenously heal will be corrected with protective measures such as crack injection.

4.2. Tank Wall to Floor Connection

The tank walls will be tied into the floor utilizing seismic base restraint cables, which allow for controlled movement in the event of seismic activity. All construction joints in the tank will include a PVC center bulb waterstop system, which minimizes leak potential at the joints after construction and during future wall movement events.

An optional feature which can be incorporated to control leakage is an injectable hose system, which is installed adjacent to the waterstops at the construction joints. The hose system has a spiral cut to allow for the epoxy to seal any void spaces at the connection without having to drill holes into the base of the tank. The hose system is a precautionary measure and would only be used to inject epoxy if significant leaks are found during hydrostatic leak testing.

4.3. Tank Foundation

There are dense earth materials within 2 feet of the ground surface reported from the existing drill holes at the site. The upper foot of soil will be replaced with aggregate base for the tank foundation. This assumption is being confirmed by the in-progress geotechnical work to make sure that the soils in the upper 2 feet are not plastic and are non-expansive. Constructing on 1 foot of aggregate base fill, will also assist in reducing the potential for differential settlement across the tank floor because the tank will be founded entirely on engineered fill instead of native soil.

4.4. Tank Overflow

The overflow pipe will be 10-inches, which results in a pipe velocity of 3 feet per second at the maximum overflow of 750 gpm. During an overflow event, the water will discharge into a catch basin west of the new tank and convey the water to the existing drain/overflow discharge outfall via a new 10" pipeline. The drainage flows towards Rockaway Beach through the San Pedro Creek drainage¹. The overflow pipe will have a duckbill check valve which will be separated from the top of the catch basin by a minimum 20-inch air gap to prevent backflow of non-potable water into the tank per the Division of Drinking Water (DDW) requirements. An example of the proposed orientation of the overflow piping is shown in Figure 4.

The existing tank's overflow water is not dechlorinated prior to discharge to the outfall. Therefore, it is assumed that dechlorination of the overflow water in the proposed design will not be required. The discharged water would not add turbidity or chlorine when entering the waters of the United States and therefore meets the requirements of the Statewide NPDES permit for Drinking Water Systems.



Figure 4. Proposed Tank Overflow Orientation

4.5. Tank Drain

If the tank needs to be emptied, most of the water may be used with system usage through the tank inlet/outlet pipe into the distribution system; however, the water below the inlet/outlet flange will need a separate drain to completely empty the tank. A separate tank drain is also a requirement of the DDW. There is sufficient grade to daylight a drain line at the existing drain outfall just west of the tank outside the fence line. The drain line will be 6-

¹ Accessed 8/29/20224 <https://www.epa.gov/waterdata/waters-geoviewer>
September 2024

inch diameter. At the point of discharge the drain will have a sufficient air gap of 12-inch to meet the DDW requirements.

4.6. Tank Roof Downspouts

Downspouts will be installed on the edge of the tank roof. Each downspout consists of a galvanized steel drain box that collects stormwater on the sloped tank roof and a vertical galvanized steel pipe that feeds into rain leaders that convey the collected runoff to a stormwater biotreatment basin. Downspouts are spaced evenly so each receives an equal runoff flowrate. The vertical steel pipes are attached to the tank sidewall.

4.7. Tank Hatches

Roof hatches will be spring operated and be equipped with a hold open arm which automatically locks the cover in the open position. The hatches will be raised from the roof to eliminate rainwater intrusion.

4.7.1. Personnel Hatch

The tank will have a 3.5 foot square personnel hatch near the top of the exterior ladder. The personnel hatch leads to an interior stainless-steel ladder with an internal platform.

4.7.2. Equipment Hatch

The tank will have an equipment hatch with an interior clear opening of 4 foot by 8 foot. The hatch will have safety grating segmented into spans which limit the lifting weight below 50 pounds. The grating will have a 6-inch by 6-inch grating pattern and meet OSHA fall protection standards. Four stainless steel D-ring anchor points rated at 5,000 pounds will be provided on the top of each hatch's curb for operator tie off. The equipment hatches are large enough to facilitate lowering a small scissor lift into the tank for future maintenance.

4.7.3. Watertight Access Portal

A side wall 36" diameter watertight access portal will be provided for District personnel access into the tank. The access portal and all associated appurtenances will be fabricated of stainless steel. The access portal will be supplied with a security cover to prevent unauthorized operation of the portal.

4.8. Tank Roof Davit Cranes

It is currently presumed that no davit cranes are desired to be included with the tank construction. If desired, a portable davit crane with lifting capacity of up to 500 pounds could be incorporated into the design for lifting equipment up to the tank from the ground surface and lifting in and out of the tank through the equipment hatch. Two davit crane bases would be installed, one at the edge of the tank and the second adjacent to the equipment hatch.

4.9. Tank Water Quality Sampling

A sampling station will be provided which will consist of three separate penetrations into the tank with each sample tap at different elevations. The sample elevations would be spread out evenly distributed from the floor elevation to the maximum water surface elevation to ensure sampling can happen regardless of the tank operational level. This will also allow operators to assess the tank's overall water quality by comparing samples at multiple elevations. All sample piping and the sample cabinet will be stainless steel.

4.10. Tank Roof Guardrail

The tank will have aluminum guard rails extending 6-feet on each side of the exterior access ladder to facilitate safely dismounting from the ladder. All tank roof appurtenances will be safely located away from the edge such that operators can access them without being at risk of falling, therefore guardrail around the rest of the perimeter is not required. A safety access corridor can be painted onto the tank to ensure that operators stay within a safe distance from the tank edge without needing the appropriate fall protection equipment.

4.11. Tank Vent

The tank vent allows air into the tank to prevent collapsing the tank in the event of a catastrophic inlet/outlet pipe failure. The tank vent shall be sized for a conservative 10-inch outlet pipe flow rate of 5,840 gpm, which is the maximum free-flow discharge rate assuming the tank was at the HWL when the failure occurred. The vent will have a 4 wire per inch mesh bird screen and a 24 wire per inch mesh stainless steel bug screen to meet DDW requirements. The tank will have one vent to minimize the number of items on the roof that need to be maintained. The vent will be a 16-inch diameter corrosion resistant spun aluminum gravity intake style vent. Multiple models meeting the pressure drop requirements will be considered, such as Greenheck's GRSI or Loren Cook's PR.

4.12. Tank Security Features

The security features at the tank site include a site security fence, a locked cover on the exterior ladder to prevent unauthorized roof access, and locked tank hatches. Intrusion alarms on the ladder cover and roof hatches will be provided. The tank's watertight access portal will also be provided with a security cover and an intrusion switch.

4.13. Tideflex Mixing System

The Tideflex Mixing System (TMS) is a passive mixing system that uses the pressure of the incoming water to mix the tank. Water enters the tank from a horizontal pipe manifold supported from the tank floor, and duckbill check valves are used to direct flow away from the tank inlet/outlet to distribute mixing energy throughout the tank, minimize short-circuiting, and promote circulation within the tank. The TMS design is based on manufacturer provided computer modeling to ensure tank mixing throughout the entire tank. Per the manufacturer, a TMS for the Fassler Tank would require a minimum of 2.1 feet of drawdown for each fill/draw cycle to achieve complete mixing. There is minimal maintenance for the TMS due to limited moving parts and no power source required. A 4-foot by 8-foot hatch would be provided on the tank roof to facilitate being able to replace valves. The valves are ANSI/NSF 61 certified. No minimum water level is required for the TMS, which allows the full volume of the tank to always be effectively mixed.

The TMS header could be manufactured out of various piping materials. Stainless steel piping could be considered due to its robustness and longevity. PVC piping can serve as a cost saving alternative to stainless steel, reducing the total cost of the TMS system by around \$20,000. However, PVC is much more susceptible to fatigue cracking and failure during seismic events. HDPE piping for the TMS is another alternative that is a middle ground between longevity and cost. An example HDPE TMS is shown in Figure 5. The TMS documentation is shown Appendix B. The BODM recommended piping material for the TMS is HDPE.



Figure 5. Example of Tideflex Mixing

The TMS header is bi-directional with outlet check valves which allow for water to enter the header and flow out of the tank when the system demands water.

4.14. Exterior Tank Coating

The exterior of the tank will be coated to match the District's preferred dark green color. The coating will be a modified waterborne acrylic designed for use on porous surfaces.

The tank roof will not be coated due to maintenance issues as discussed with the District.

5. Tank Piping and Mechanical

5.1. Tank Inlet/Outlet Piping

Because the TMS is bidirectional and allows for the outlet water to feed through a common pipe, a common inlet/outlet pipe is proposed for this tank. The inlet/outlet pipe will have a buried EBAA Force Balanced Flextend joint for seismic protection. A manual isolation valve will be installed on the inlet/outlet pipe to allow for staff to isolate the tank as needed for maintenance.

The inlet/outlet pipe beneath the tank will be fully encased in concrete to ensure no joint leakage under the footprint of the tank. As the piping enters the tank it will transition to stainless steel pipe, to provide a robust corrosion resistant penetration. An example of the under slab piping of the inlet/outlet for a prestressed concrete tank is shown in Figure 6. Note that the Tideflex Mixing System is not shown for clarity.

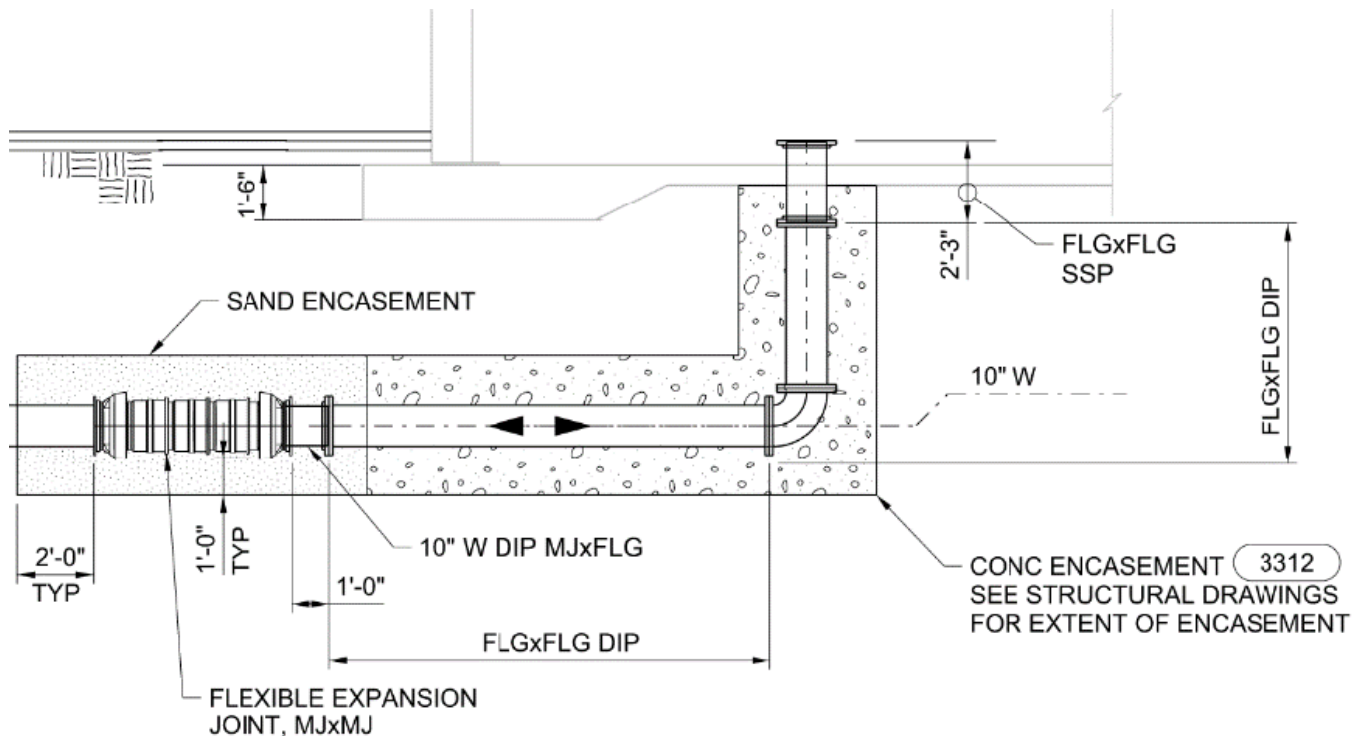


Figure 6. Inlet/Outlet Piping Detail

5.2. Tank Foundation Drain

Per the *Geotechnical Investigation Fassler Tank Replacement Project*, no groundwater was encountered in the bore holes. Being on a hillside also limits the expectation of groundwater. Therefore, a foundation drain is not required for this project

5.3. Tank Wall Drain

A tank wall drain will surround the tank and convey water that collects in the ground near the tank walls away from the tank walls to the drainage outfall, as this water does not need to be treated. This perforated pipe is encased in granular fill that is held together by filter fabric and positioned above the tank foundation.

5.4. Tank Leak Detection Piping

Because the tank is partially buried, at the District's discretion, a leak detection system may be added to ensure that the tank is not leaking. This system includes a 30 mil liner which encapsulates the tank footing and traps any leakage. The leakage is then collected by perforated HDPE drainage piping and conveyed to a manhole where operators can perform a visual inspection to identify if any leakage is present. To minimize project costs, it is assumed that leak detection will not be provided for this tank.

5.5. Potable Water Piping

The District stated they would like to replace as much of the existing cast iron pipe as possible. The new piping will be installed from the tank inlet/outlet, down the site access road and to the existing tee as shown in Figure 7. The District has identified this tee as the tie in point for the new tank and piping to the existing system. It is assumed there is a functioning isolation valve at this tee that can tied into and be used to bypass the tank during construction. The tank will have a new 10-inch ductile iron pipe (DIP) connecting to the distribution system which matches the size of the existing pipe. Buried joints will be restrained mechanical joint or TR FLEX, and all exposed joints will be flanged.



Figure 7: Tank Yard Piping and Existing Tee.

6. Existing RTU Equipment Shed

If feasible, the existing shed may be reused per the District. The shed would be temporarily removed during construction and be reinstalled on a new foundation in a similar location. Stormwater will be diverted around the shed. If the enclosure cannot be reused, then a pre-engineered FRP enclosure will be installed. A new enclosure would not include any lighting or environmental controls.

7. Site Layout

7.1. Demolition

The District will provide constraints on when the existing tank may be taken out of service and be demolished. If the old San Bruno transmission line is encountered, then it will need to be demolished and capped. The existing telecommunication tower and surrounding equipment will be protected in place. The existing bollards will remain to protect the equipment during tank demolition and construction. The existing RTU storage shed will be demolished.

7.2. Construction Access

The site will be accessed from a steep gravel driveway beginning from the Baquiano Trail Head parking lot and leading to the tank site. There is a vehicle gate separating the parking lot from the driveway. The existing gravel tank access driveway at the trail parking lot will be maintained by the contractor during the construction duration to maintain access.

7.3. Trail Modifications

The Baquiano Trail runs parallel to the driveway and will be maintained and separated from the driveway with concrete jersey barriers. A portion of the trail will be regraded to provide adequate room for a construction vehicle, temporary construction partition, and 3' lane for trail users. Barriers were used instead of a chain-link fence to provide more robust protection for trail users. Only native materials will be used for the trial modification, so that the stormwater runoff from the modified trail would not need to be treated per C.3 stormwater requirements. The trail modifications are shown in Figure 8. The trail will need to be temporarily closed for a week to build the new pipeline.



Figure 8. Tank Access and Trail Modifications

7.4. Site Driveway

To avoid triggering C.3 stormwater requirements, the driveway will remain as a gravel driveway that is replaced in kind with gravel in the same footprint as part of a maintenance activity. Cross ditches also known as water bars or interceptor dips will be placed between 30 to 100 feet depending on the slope on the driveway on the gravel driveway to direct water off the driveway to the ditch on the northwest side of the driveway. Directing the water off the driveway will prevent water from building up and increasing in velocity in volume and therefore, prevent the formation of rills and gullies. The existing ditch conveys the water down the hill, which will remain the same. Since the driveway is being replaced in kind to avoid triggering C.3 requirements, it will not be modified to meet City of Pacifica driveway requirements.

7.5. Site Stormwater Conveyance

Stormwater from the impervious areas will be treated and infiltrated in two biotreatment basins. Stormwater from pervious areas including stormwater running onto the project site will be diverted around the project site and surface flow away from the tank.

7.6. Site Layout during Construction

The site layout during construction is shown in Figure 9. The tank footing will be excavated using 1:1 construction slope. Adjacent to the tank footing excavation, on the east side, a temporary construction pad will be created to be utilized during tank construction to allow for crane and pump truck staging. Upon completion of the tank roof construction, the pad will be removed during final site grading.

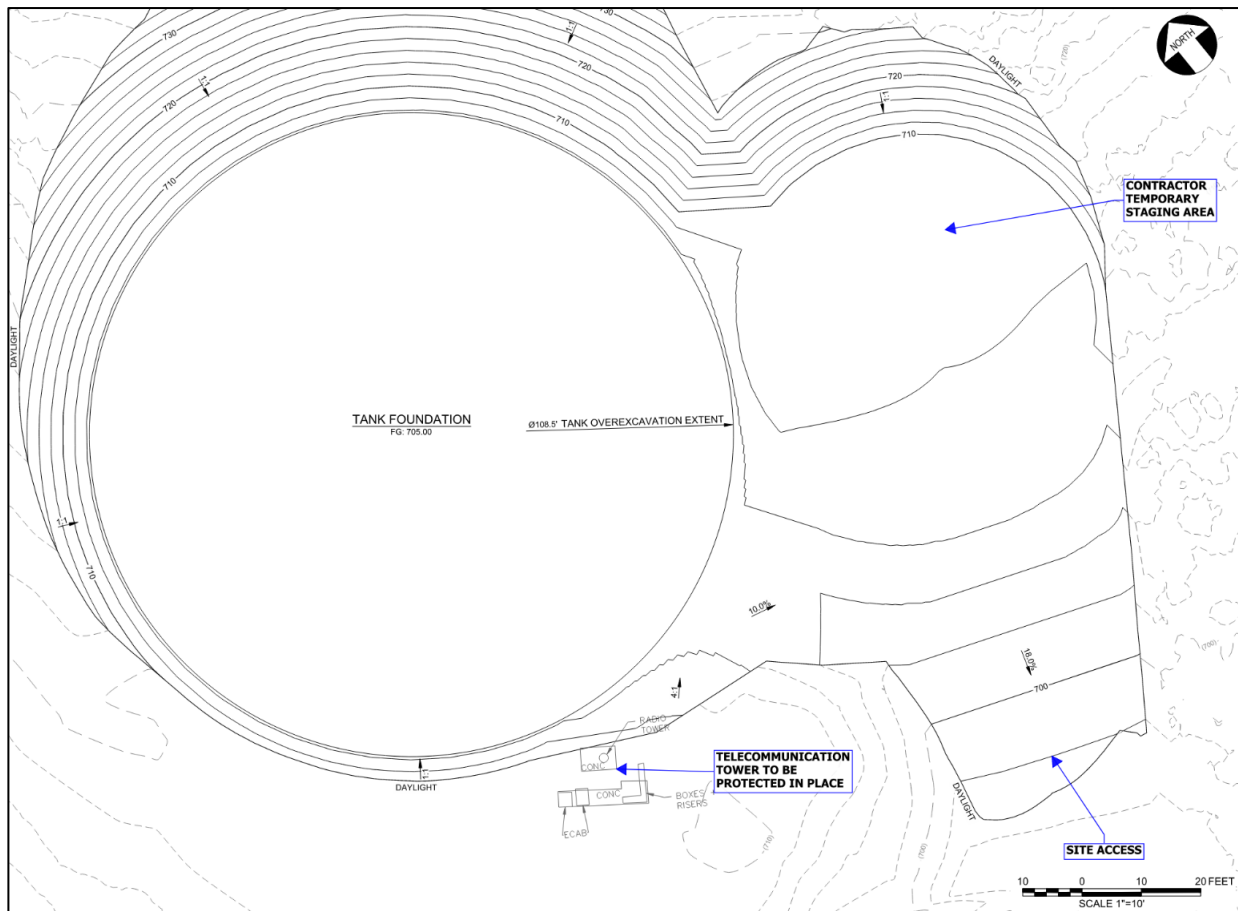


Figure 9. Site Layout During Construction

7.7. Final Site Layout

Model renderings of proposed tank elevation and site paving are shown in Figure 10 and Figure 11. The final tank layout is shown in Figure 12. The telecommunication equipment and RTU shed are not shown. The telecommunication equipment will remain as is.

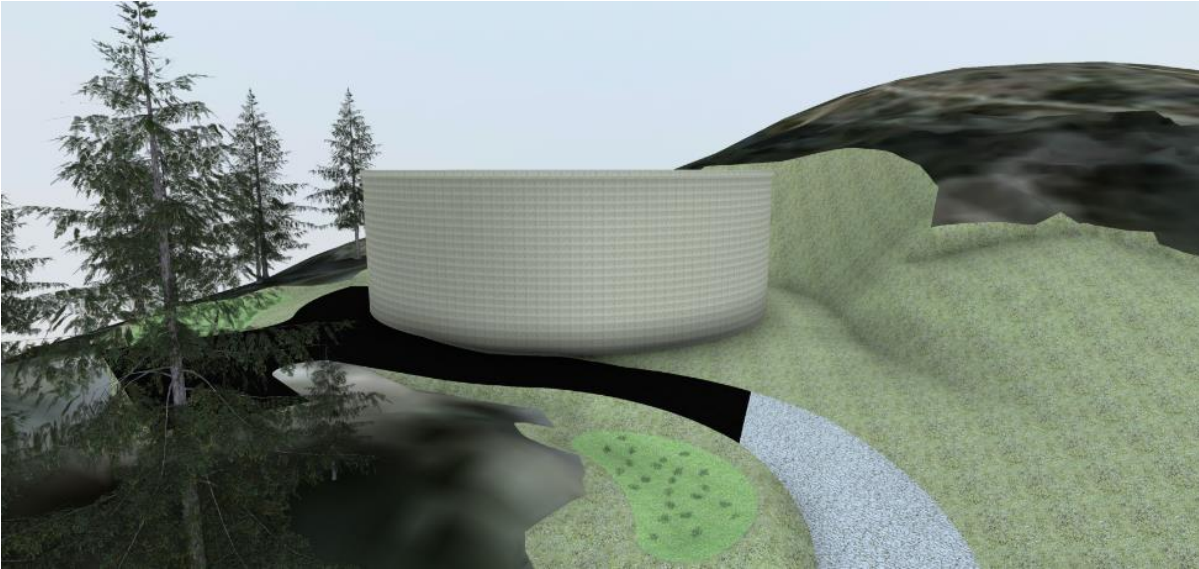


Figure 10. Proposed Tank Elevation Looking North

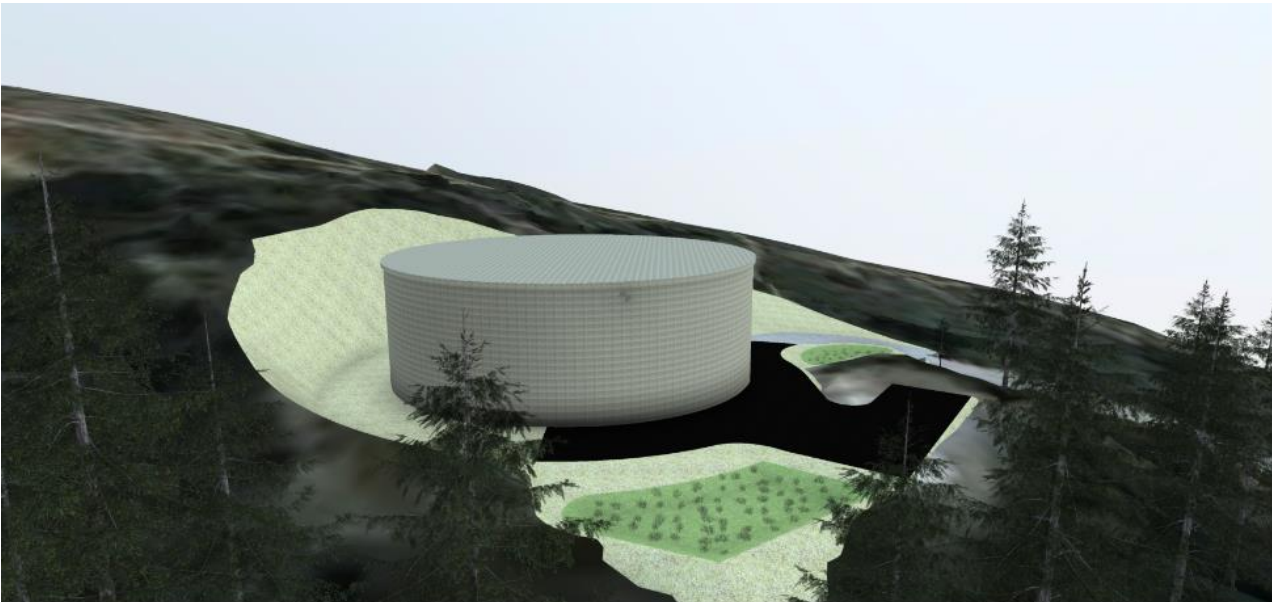
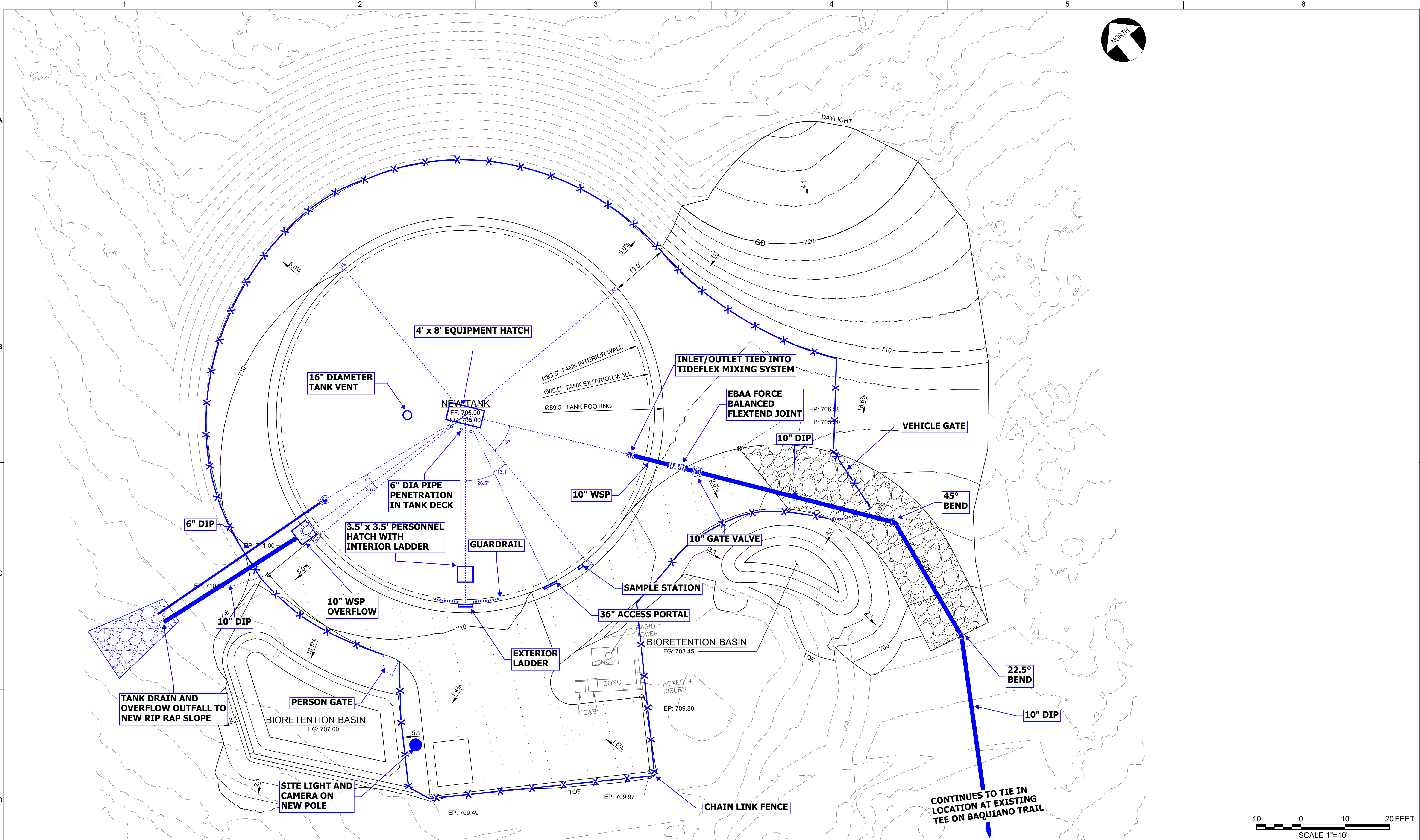


Figure 11. Proposed Tank Elevation Looking South-East



VERIFY SCALE			PRELIMINARY NOT FOR CONSTRUCTION			DESIGN P. WEBSTER			 WATERWORKS ENGINEERS			NORTH COAST COUNTY WATER DISTRICT			CIVIL			DATE SEPTEMBER 2024					
BAR IS ONE INCH ON ORIGINAL DRAWING						DRAWN M. TRUITT															PROJECT NO. 24-033		
0 ██████ 1"						CHECKED C. BERTSCH															DRAWING NO. PH.2		
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY						APPROVED C. BERTSCH															SHEET NO.		
NO	DATE	REVISION				BY	APVD	#													REDDING, CALIFORNIA		

FILENAME: L:\CAD\PROJECTS\24-033 NCCWD FASSLER TANK REPLACEMENT\07 DRAWINGS\EXHIBITS\2433 FINAL PHASE.DWG

PLOT DATE: September 10, 2024

PLOT TIME: 12:01 PM



7.7.1. Site Grade

The tank will be backfilled with imported soil. The tank will have varying grade around the circumference from 2.5 feet to 5 feet. The differential loading on the tank between the max and min grade elevations around the tank will be less than 8 feet so passive soil resistance is used to keep the tank from sliding. The tank footing also will have at least 2 feet of fill on the lower filled side to provide passive soil resistance.

The grading will facilitate storm water drainage as outlined in Section 7.5 – Stormwater Conveyance.

7.7.2. Paving

Paving will be added along the driveway from the property boundary to the RTU shed and tank access points. The existing paving around the RTU shed will be replaced in kind with minor grading revisions.

7.7.3. Landscaping and Irrigation

The disturbed areas will be hydroseeded. During final design, the quantity of planted mitigation trees will be determined and compared to the alternative of paying a mitigation fee for removed trees. Mitigation trees may potentially be planted downhill from the tank to provide additional screening.

An irrigation system may be needed for the bioretention basins. The available pressure from the distribution system will not be enough to irrigate the plants after the pressure loss through a backflow preventer. Utilizing native plants in the bioretention areas should result in the plants needing minimal to no irrigation water after becoming established.

At the District's discretion, the bioretention areas could be permanently irrigated utilizing a small booster pump, or manual watering until the plants are appropriately established. The current design assumes that the Contractor or District will be responsible for temporarily irrigating the plants until they are established and then allowing the system to self-sustain.

7.8. Preliminary Earthwork Balance

The District's preference on tank height, combined with the available property area for stockpiling, influences the amount of soil export. There is no area on site to store the excavated soil, so it will be off hauled and then brought back on site. The District may have an adjacent property near the Royce Tank, which can be utilized as a soil staging area. This will allow for the Contractor to store 1,500 cubic yards (CY) of soil required for backfilling the site after completion of the tank construction, which will help minimize import costs.

The tank excavation is anticipated to generate 6,400 CY of soil export. Overall, the project will require approximately 7,900 CY of soil hauling which will be 1,050 truck trips assuming 7.5 CY per truck.

7.9. Tree Removal

Construction of the tank will require the removal of several trees. All remaining trees will be protected. The existing trees on the downhill slope of the parcel are being protected to provide mature landscaping to screen the new tank.

7.10. Groundwater Monitoring Wells

Since the tank is partially buried, groundwater monitoring wells will be required to meet DDW requirements even without the expectation of high groundwater at the site. A 20-foot-deep ground monitoring well will be constructed up gradient and down gradient of the tank.

7.11. Site Fencing

The site fencing will be replaced with an 8 foot tall chain-link fence with three strand barbed wire. The fencing will be provided with black PVC coating. A manual double swing gate with three strand barbed wire will be added for site access.

8. Tank Electrical and Instrumentation

The proposed tank will include intrusion switches on each roof hatch and the exterior access ladder which will alarm at the local RTU. Similar to the District's Sheila Tank, the tank will have an ultrasonic level transmitter to measure the tank level. Additional level float switches could be provided to provide level measurement redundancy to have back up devices to alarm when the tank is at a low or high setpoint. The new instrumentation will be connected to the existing supervisory control and data acquisition (SCADA) system via the reutilization of the existing relocated RTU panel.

The existing electrical service at the site powers the site lighting and existing tank's instrumentation. It is assumed that the existing power feed will have sufficient capacity for the power needs of the new tank. The tank electrical needs are as listed below.

- Water level transducer
- Site lighting
- Exterior tank lighting
- Intrusion alarm (tank hatches and ladder)
- Remote camera(s) pointed at gate and exterior ladder

9. Permitting Requirements

9.1. City of Pacifica

The potential permits required by the City of Pacifica (City) was reviewed. Per the District, a conditional use permit and building permit are not required for this project.

9.1.1. Tree Removal Permit

A tree removal permit is required for any trees that have a trunk with a diameter of 12-inch or greater. Trees that are determined to be an invasive species by the California Invasive Species Council do not require a tree removal permit. The permit may be obtained by applying through Pacifica's permitting web portal. The permit application requires a Tree Permit Application Form, arborist report, site plan indicating the exact location of the trees, and an ISA (International Society of Arboriculture) basic tree risk assessment form. There is a \$250 application fee for the permit. There may be the need for more than one tree removal permit, because one permit can only cover a 50-foot radius. After the application is submitted, it takes 14 days for the City Arborist to review. After the City Arborist has reviewed the permit, there is a 10-day public notice period. Applicants will be notified regarding the status of their permit after the public notice period ends.

9.2. Municipal Regional Stormwater Permit (MRP) Provision C.3

Development and redevelopment projects in Pacifica are required to implement post-construction stormwater controls per Provision C.3 of the Bay Area Municipal Regional Stormwater Permit (MRP). This permit is a National Pollutant Discharge Elimination System permit issued by the San Francisco Bay Regional Water Quality Control Board (RWQCB), allowing municipal stormwater systems to discharge stormwater to local creeks. General requirements of the MRP are described in the C.3 Stormwater Handbook prepared for the San Mateo Countywide Water Pollution

Prevention Program (SMCWPPP). During the permit process, work will be completed with the City to ensure all requirements for this project are satisfied per the City of Pacifica's website².

Requirements of Provision C.3 will apply to this project because there is more than 5,000 square feet of impervious surface being added. Additionally, projects that replace 50% or more of the existing impervious area are required to treat runoff from the entire site. This project will replace more than 50% of impervious the areas, therefore, runoff from all impervious area will need to be treated. There is approximately 8,500 square feet of impervious area to be added for the tank and pavement. The stormwater from the impervious area will be treated in two biotreatment basins.

9.2.1. Site Design Measures

Site design measures are included in the site layout to reduce the amount of runoff generated from the project. The following are examples of site design measures used in the design:

- Minimize land disturbance;
- Minimize impervious surfaces;
- Minimize impervious surfaces directly connected to the storm drain system by routing runoff to landscaped areas;
- Use landscaping as a drainage feature.

9.2.2. Source Control Measures

Source control measures for this design will be operational methods because there are no known sources of pollutants on site. The following are examples of operational methods:

- Marking storm drain inlets with a "No Dumping" message;
- Regular inspection and cleaning of storm drain inlets.

9.2.3. Stormwater Treatment Measures

9.2.3.1. Bioretention Basin

The impervious area runoff will be treated in two unlined bioretention basin. Two basins are needed because of the grade break on site. The basins are more than 18 feet away from the tank foundation to avoid infiltration affecting the tank foundation. The size of the bioretention areas are approximately 4% of the impervious area added. Irrigated landscaping will be added in the basin per C.3 requirements. The treated water will be infiltrated. Bioretention basin overflow water will be discharged down the hill.

9.2.4. Hydromodification Measures

Hydromodification measures (HM) are required if a project will be increasing the amount of impervious surface compared to the pre-project condition and is in the drainage area to a creek that is susceptible to erosion. A project can be exempt from HM controls if one of the following exemptions applies:

- **The project creates or replaces less than 1 acre of impervious surface.**
- The project does not increase the amount of impervious area on the site (compared to pre-project condition).

² [SMCWPPP/NPDES | City of Pacifica](#) Accessed August 27, 2024.

- The project can show via a hydrologic analysis that even though the impervious surface has increased, actual runoff will be less because permeability of the remaining area will be enhanced by the project and there is less directly connected impervious surface.
- The project proponent conducts stream-specific field and modeling studies consistent with the method used in the hydromodification plan to estimate the impacts of a project and demonstrates there will be no increase in potential for erosion or other adverse impact to beneficial uses.

HM do not apply to this project because the design replaces less than 1 acre of impervious surface.

9.3. Stormwater Pollution Prevention Plan

This project disturbs less than an acre of soil, and therefore will not be required to obtain coverage under the General Permit for Discharges to Storm Water Associated with Construction Activity Construction General Permit Order 2022-057-DWQ.

9.4. Pacifica Open Space & Parkland Advisory Committee

The Pacifica Open Space and Parkland Advisory Committee (OSPAC) is an important stakeholder that should remain informed about this project throughout the process. It is important to alert OSPAC of this project prior to any other public hearing. OSPAC meets on the third Wednesday of each month.

9.5. North County Fire Authority

The District has stated that no provisions for North County Fire Authority are necessary for this project.

9.6. Water Supply Permit from Division of Drinking Water

The District will amend the water supply permit to include the new tank. The submittals necessary to demonstrate ANSI/NSF 61 compliance will be available after construction starts at which time the contractor material selections are known, reviewed for ANSI/NSF 61 compliance, and presented in a permit amendment package.

9.7. California Environmental Quality Act (CEQA)

The District will be the lead for the CEQA documentation. It is anticipated that an Initial Study Mitigated Negative Declaration (ISMND) will be enough to present mitigation measures for the project. Mitigation for tree protection, tree removal, noise, and dust may be necessary.

9.8. Hazardous Materials

The District provided a report (Harlan Associates, Inc., 2004) regarding the existing lead-based paint that is on the site that will be provided to the contractor. The oiled soil under the tank will be tested during construction because it is not possible to obtain soil samples while the tank is still in use.

10. Construction Constraints

10.1. Working Hours

The District prefers working hours be 8 AM to 5 PM even though the City allows 7 AM to 7 PM.



10.2. Public Outreach

The District will be responsible for public outreach. During standard construction activities, the trail will remain open with signage and barriers added where the trail intersects with the driveway to ensure hikers stay clear of construction traffic. At critical key phases during the construction process, the parking lot may have to be temporarily shut down to minimize public safety concerns.

10.3. Construction Parking

Due to limited space on the tank site, construction crews will have to park on Fassler Ave and either walk or shuttle up the driveway.

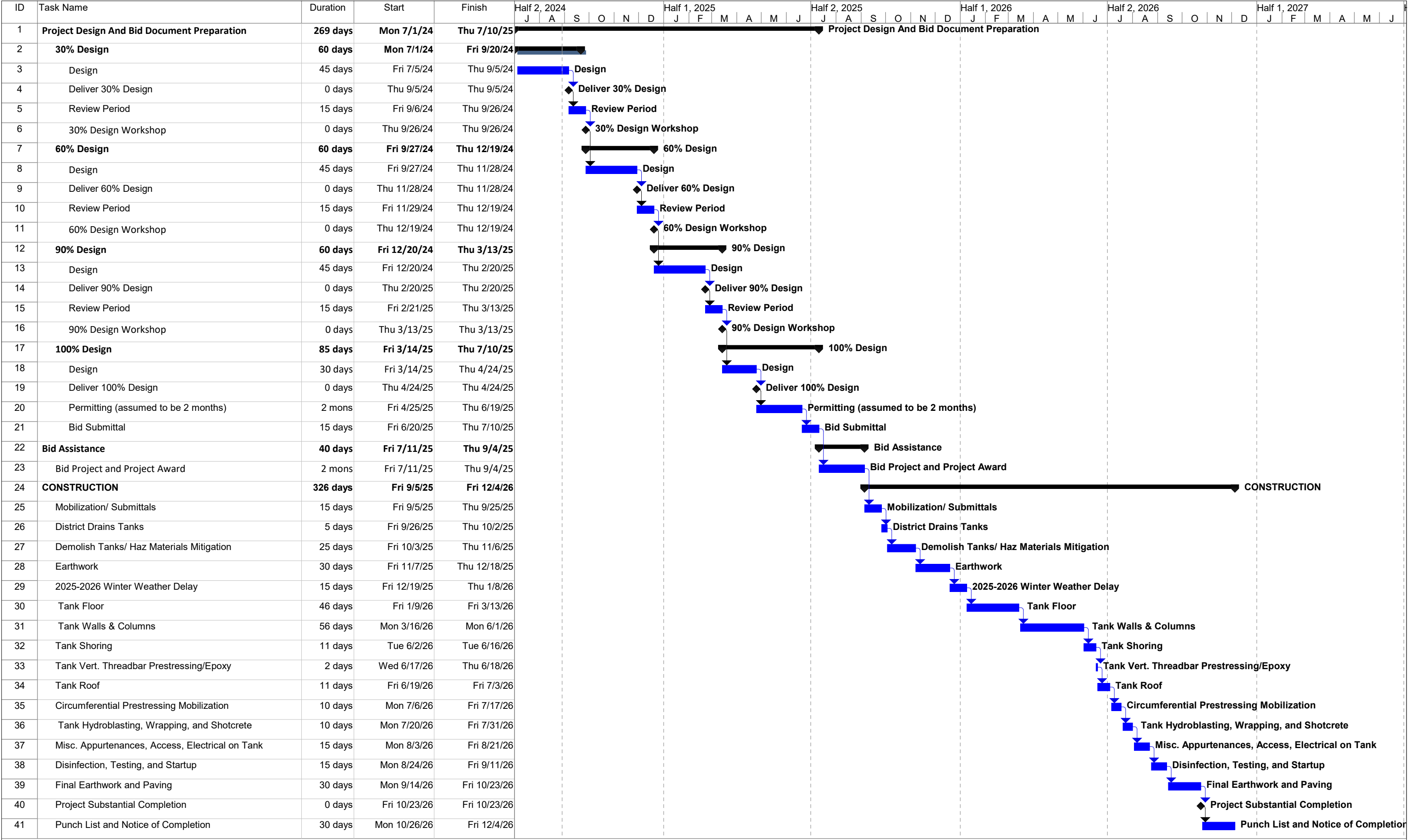
11. Opinion of Probable Cost

The probable capital construction cost is \$6.7 million assuming a 2026 tank construction start date. The detailed cost is presented in Appendix C. The tank site location adjacent to the trail will increase the difficulty of access and therefore, increase the project cost compared to if construction access was easier.

Minimal operation and maintenance costs are expected. The prestressed concrete tank will need periodic inspection and cleaning that may be done with a diver while the tank is full of water.

12. Schedule

The estimated schedule is displayed on the next page. Permitting is assumed to take two months after the 100 percent design is complete. The project construction will occur over a timespan of a little over a year.





13. References

Bajada Geosciences, Inc. (2024) *Geotechnical Report*, In progress.

Brown and Caldwell (2023) *Fassler Tank Siting Study*, September 28, 2023.

Bown and Caldwell (2022) *Sheila Tank Replacement Project Bid Documents Volume 4*, March 15, 2022.

Dyett & Bhatia (2022) *City of Pacifica General Plan 2040*, July 2022

Miller Pacific Engineering Group (2023) *Geotechnical Investigation Fassler Tank Replacement Project*, August 1, 2023

Charles S. McCandless & Co (1960) *Fassler Tank As-Builts*, November 1960

Harlan Associates, Inc. (2004) *Lead Paint Samples*, August 19, 2004

LCC Engineering and Surveying, Inc. (2023) *NCCWD Fassler Tank Topographic Boundary Tank Site*, April 18, 2023



14. Appendices

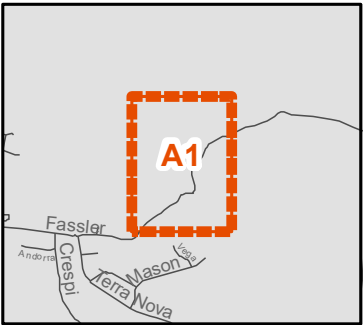
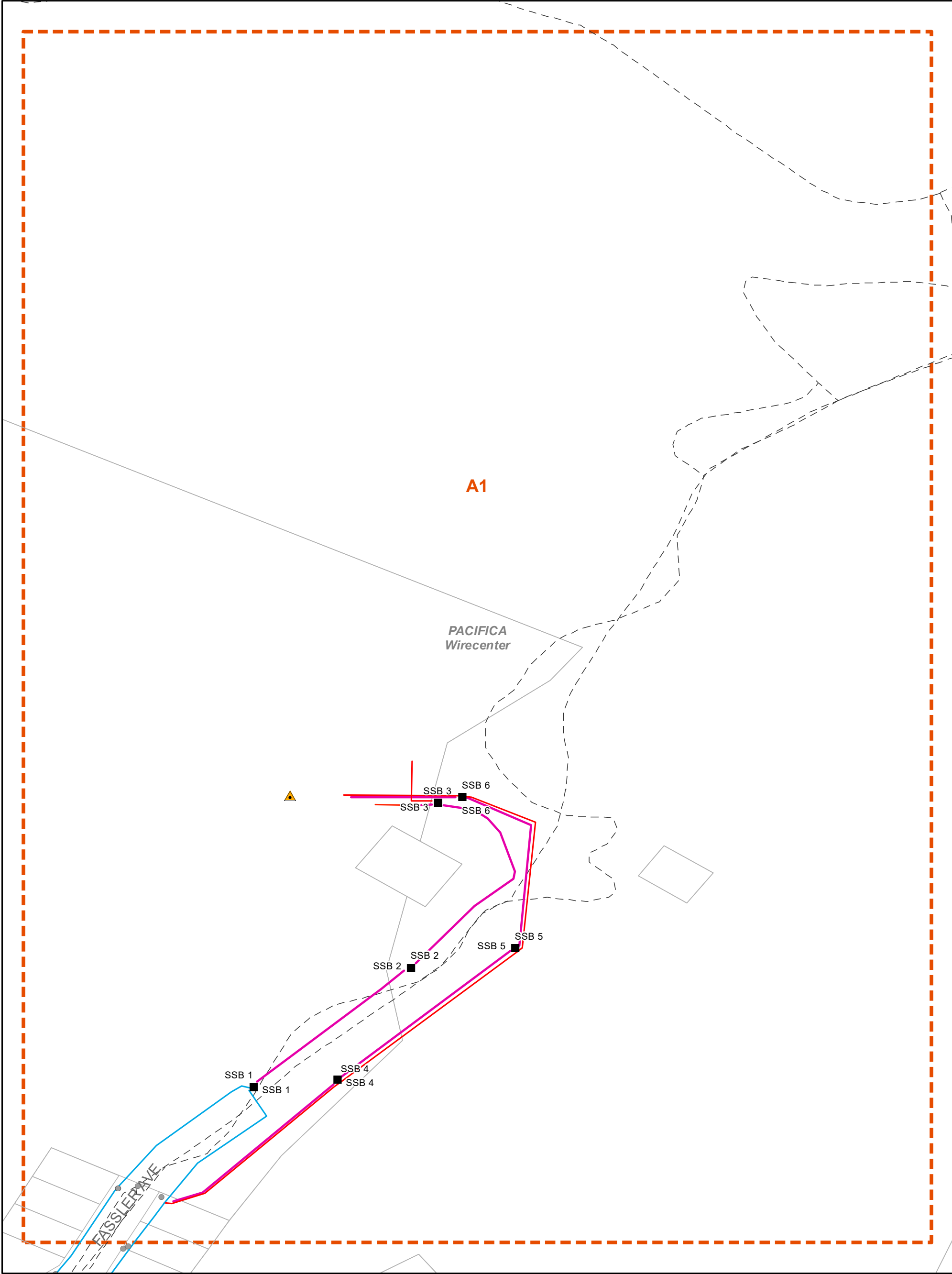


North Coast County Water District
Fassler Tank
Preliminary Design Report



Appendix A – Project Utility Mapping

AT&T Utility Mapping



1:1,820



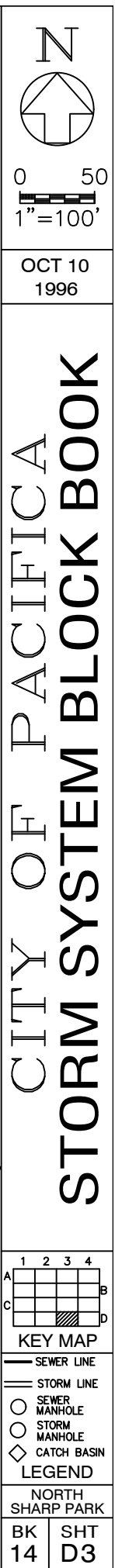
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- ▲ Remote Terminals
- Manholes
- Aerial
- Building
- Buried
- Underground
- Floating
- Submarine
- Other
- Conduit
- Street Centerlines
- Mapping Index
- Wirecenter Boundary
- Parcels

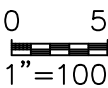
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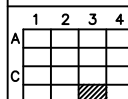
City of Pacifica Utility Mapping





OCT 10
1996

CITY OF PACIFICA SEWER SYSTEM BLOCK BOOK



KEY MAP

— SEWER LINE
 STORM LINE
 ○ SEWER
 MANHOLE
 STORM
 MANHOLE
 CATCH BAS

LEGEND

NORTH
SHARP PAR

BK 14	SHT D3
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Pacific Gas and Electric Company Utility Mapping

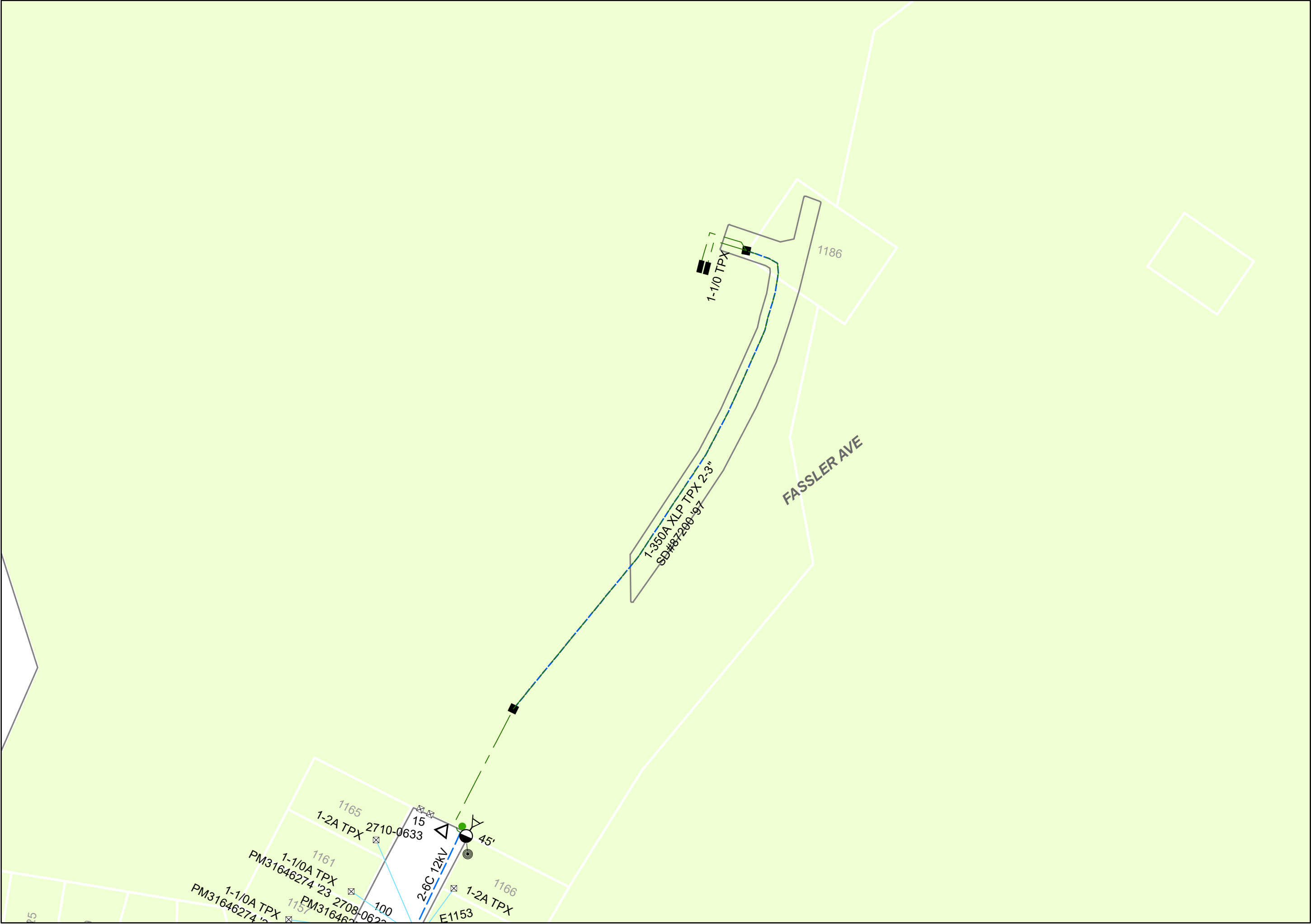
PLEASE CALL U.S.A. AT
LEAST 48 HOURS PRIOR TO
EXCAVATING IN THIS AREA
Dial 811

"WARNING: Confidential, Proprietary Information.
This document contains confidential, proprietary
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APPROXIMATE LOCATIONS
VERIFY BY HAND TOOLS
PACIFIC GAS AND ELECTRIC CO.



1 inch = 80 feet





BASIC LEGEND FOR PG&E DISTRIBUTION MAPS

SYMBOL	DEFINITION	
Note: Line Segments - GREEN = UNDERGROUND / BLUE = OVERHEAD (* exceptions noted below)		
	Primary Voltage Overhead Conductor	
	Secondary Voltage Overhead Conductor	
	Primary Voltage Underground Conductor	APPROXIMATE LOCATIONS VERIFY BY HAND TOOLS PACIFIC GAS AND ELECTRIC CO. PLEASE CALL U.S.A. AT LEAST 48 HOURS PRIOR TO EXCAVATING IN THIS AREA Dial 811
	Secondary Voltage Underground Conductor	
	* Deactivated Underground Conductor (Not Energized)	
	* Empty Underground Conduit	
	Structures that Support Overhead Facilities (e.g. Poles, Towers, etc.)	
 	Although they share the same symbol - Customer Service Locations are differentiated from Transmission Towers by symbol size	
Note: Symbols attached to Overhead Conductor Line Segments are Overhead devices		
	Examples of some more common Overhead equipment	
Note: Symbols attached to Underground Conductor Line Segments are either Padmounted or Subsurface facilities		
 	Examples of some more common Underground/Padmounted Enclosures	
 	Examples of some more common Subsurface/Padmounted Equipment (Note: Padmounted Equipment is typically enclosed in a rectangle. Subsurface Equipment is typically enclosed in a circle.)	



North Coast County Water District
Fassler Tank
Preliminary Design Report



Appendix B – Tideflex Information

TIDEFLEX MIXING SYSTEM (TMS)

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PRELIMINARY DESIGN REPORT

Tank Name: Fassler 1.2MG Reservoir

Water Utility/Owner: North Coast County Water District, CA

Consultant: Water Works Engineers

CONTENTS

TMS - GENERAL ARRANGEMENT DRAWING

CFD MODELING

TMS - MIXING ANALYSIS

WATER AGE ANALYSIS

MANIFOLD HYDRAULICS / SYSTEM HEAD CURVE- FILLING CYCLE

MANIFOLD HYDRAULICS / SYSTEM HEAD CURVE- DRAW CYCLE

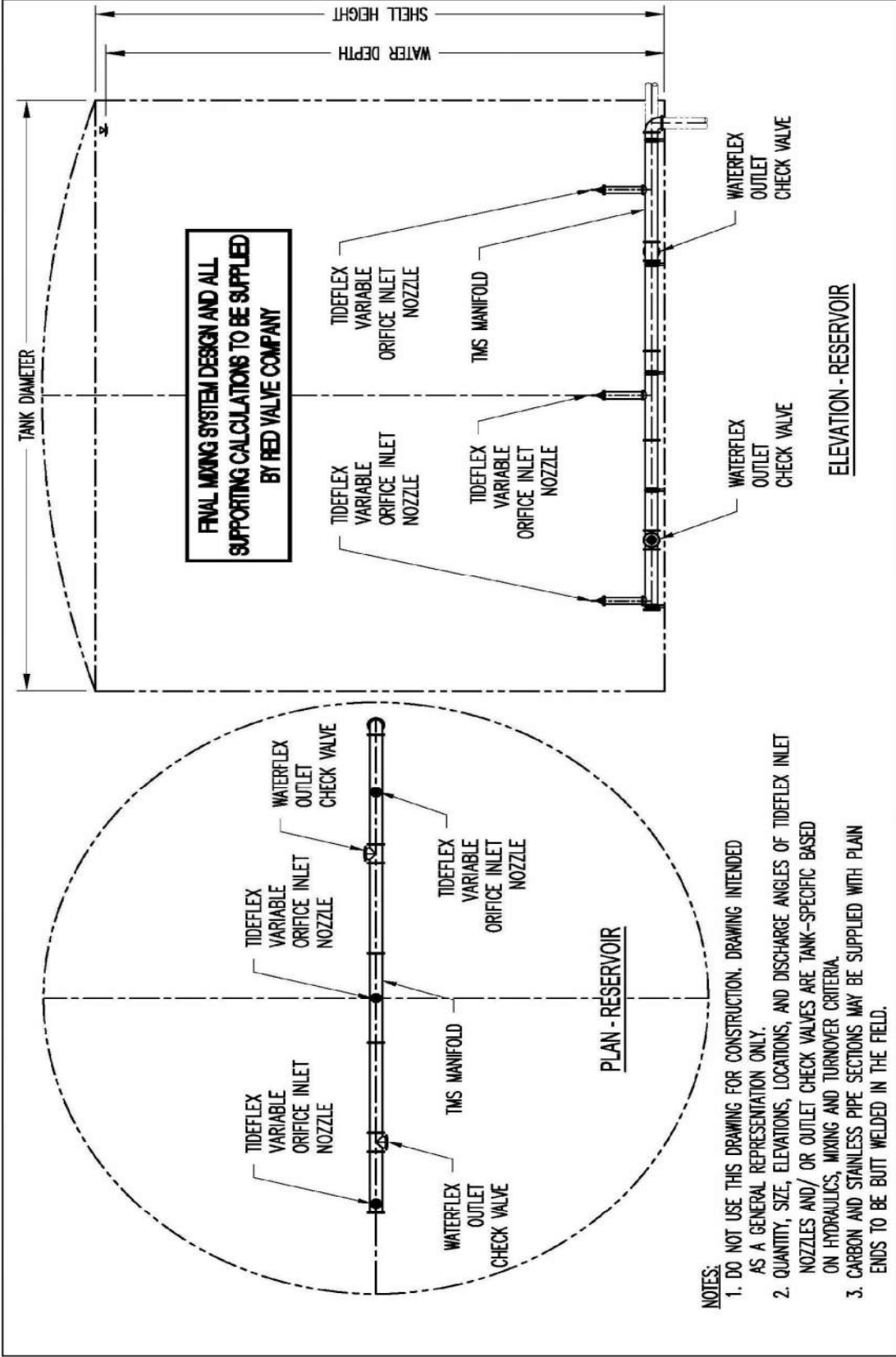


Analysis by:
Ron Koch



August 14, 2024





Red Valve

Red Valve Company, Inc.
750 Holiday Drive, Suite 400
Pittsburgh, PA 15220 USA
Phone: 412-278-0044
Fax: 412-278-3410
Email: INFO@REDVALVE.COM

Tideflex

NOT FOR CONSTRUCTION

**TMS GENERAL ARRANGEMENT FOR
GROUND LEVEL CIRCULAR RESERVOIRS
AND BOLTED COMPOSITE ELEVATED TANKS**

REV	BY	APVD	DATE	ECO#	DESCRIPTION

PART NO.	OPP NO.	ORDER NO.	REVISION NO.
			E

APPLICATION: (TMS) TIDEFLEX MIXING SYSTEM
DWG. BY: GJG
DATE: 12-13-02

TMS-CIR7

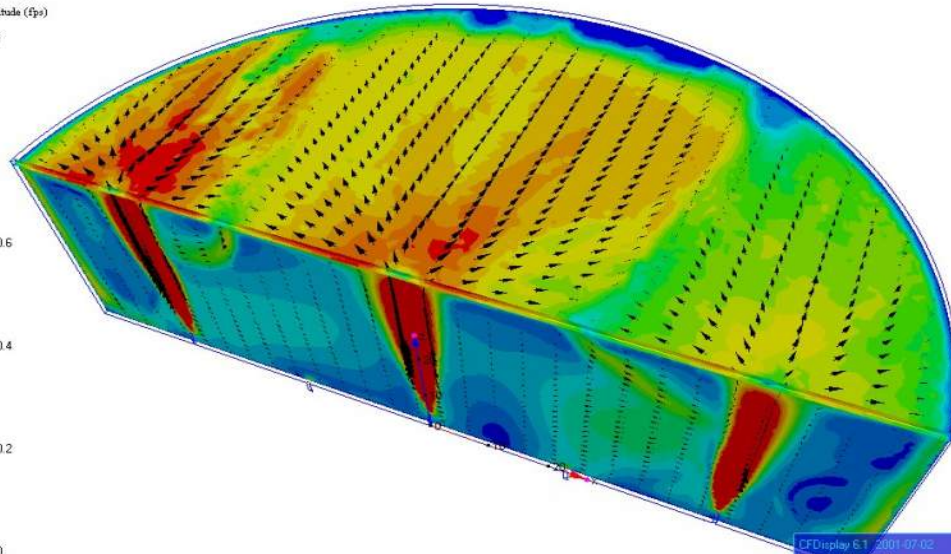
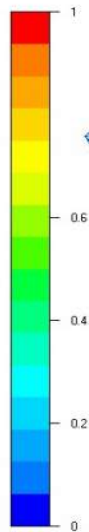
SHEET NO. 1 OF 1

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Computational Fluid Dynamics (CFD) Modeling

Below are CFD images showing representative velocity magnitude contour and vector images of this TMS configuration in a circular reservoir.

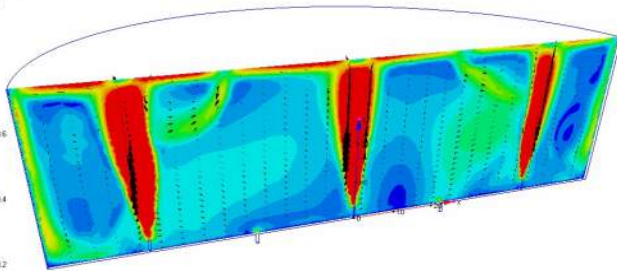
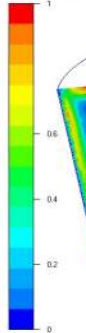
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Velocity Magnitude (fps)



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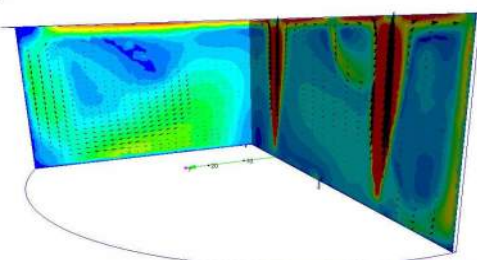
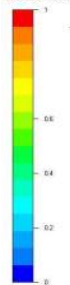
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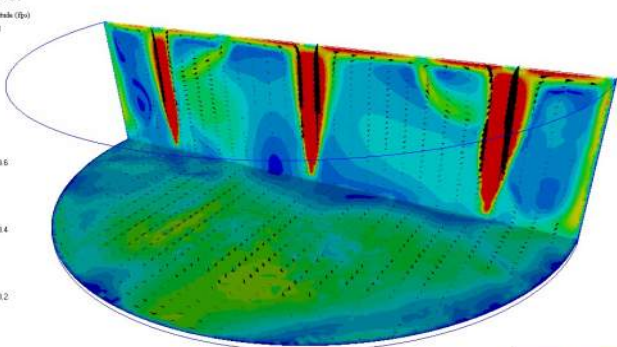
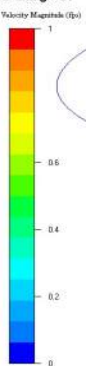
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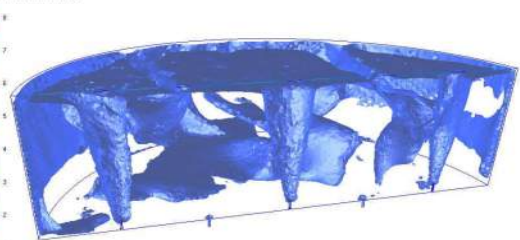
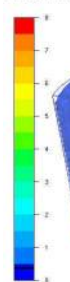
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CFDesign for Windows 5.0



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Iteration 200

Tideflex®

TIDEFLEX RESERVOIR MIXING ANALYSIS

Fassler 1.2MG Reservoir North Coast County Water District, CA

The Reservoir Mixing Analysis (RMA) is to be supplied to the water utility/owner as it provides guidance on the tank turnover/fluctuation required to ensure complete mixing with the TMS installed. Maintaining water quality in tanks and reservoirs is a combination of achieving complete mixing AND tank turnover to minimize water age. It is critical to achieve complete mixing to prevent a localized increase in water age (and associated water quality problems) due to short-circuiting and dead zones.

The RMA calculates the dependent variables and uses the mixing time formula to calculate the "Theoretical Mixing Time" (MT) at various filling flow rates. The MT is the fill time required to achieve complete mixing. The required drawdown (in feet), % turnover, and the required volume exchange (in gallons) are calculated based on these mixing times. These values are shown in the "Guide to Tank Fluctuation and Turnover" section of the RMA. A slightly greater drawdown/turnover is typically recommended to be conservative.

Within the "Guide to Tank Fluctuation and Turnover" is a "Minimum Tank Fluctuation Target". This is applicable for tanks that operate in fill-then-draw. This is the minimum amount the tank should be drawn down on the draw cycles to ensure complete mixing on the fill cycles. This data is intended to be used by operators in conjunction with SCADA and strip charts (where applicable) to verify adequate tank turnover and to determine "pump on" and "pump off" set points (where applicable). For tanks that operate in simultaneous fill and draw, the "Theoretical Mixing Time" (fill time required to achieve complete mixing) should be used to ensure the minimum fill time required is achieved.

The RMA also provides data on the time required to draw down the tank, at various draw rates, to the required level as determined by the mixing time calculations.

Note, the data provided on the required drawdown, % turnover and volume exchange are to ensure complete mixing of the tank volume to prevent water quality problems associated with short-circuiting, incomplete mixing, and increased water age. A water age evaluation of the entire distribution system may dictate greater tank turnover than provided with the RMA. As long as the actual tank turnover/fluctuation is equal to or greater than that provided with the RMA, the tank will be completely mixed.

Ice Formation Disclaimer:

The Mixing Times and Turnover required to achieve complete mixing as presented in this report are solely with respect to water quality - to ensure consistent temperature and disinfectant residuals thru the water volume. In colder climates, the turnover required to mitigate or eliminate ice formation in winter may be greater than the required turnover to mix the tank for water quality. It is the responsibility of the consulting engineer and/or owner to determine the amount of turnover required to mitigate ice formation or to implement additional preventative measures such as a recirculation pump and/or submersible heater.

The logo for Tideflex, featuring the word "Tideflex" in a stylized font. The "Tide" is in black and the "flex" is in red, with a registered trademark symbol (®) to the right.

RESERVOIR / TANK NAME:
Fassler 1.2MG Reservoir
CONSULTANT: Water Works Engineers

Contact: Erik Ma, P.E.

Address:

phone
fax
email

UTILITY / OWNER: North Coast County Water District, CA

Contact: Adrianna Carr

Address:

phone
fax
email

RED VALVE REP.:

Frank Olsen Company

Contact:

James Giles

ANALYSIS BY: Ron Koch


RESERVOIR / TANK DATA			INLET / OUTLET PIPES		FILL / DRAW RATES	
Tank Diameter	85	ft	Outlet Dia. =	10 in	Fill Rates (gpm)	Draw Rates (gpm)
Tank Depth (SWD) to HWL	29.15	ft	* Effective Diameter of TMS (See Note 1) Effec. Dia (in) = AT → Effec. Dia (in) = AT → Effec. Dia (in) = AT → Effec. Dia (in) = AT →			
Depth to LWL	2	ft				
Tank Volume	1,237,366	Gallons				
Tank Volume	165,412	ft³				
Gallons Per Foot =	42,448					
					100	250
					350	750
					700	1000
					750	1500

FILL	Time to Fill Tank from Empty to H.W.L.		Time to Fill to 1' Depth		Input Fill Time (Hours)	Resulting Increase in Water level (ft)	Volume Change (gallons)
	(Hours)	(Days)	(Minutes)	(Hours)			
INLET FLOW RATES (gpm)							
100.0	206.23	8.59	424.48	7.07	9.0 →	1.3 →	54,099.36
350.0	58.92	2.46	121.28	2.02	3.5 →	1.7 →	73,593.07
700.0	29.46	1.23	60.64	1.01	2.1 →	2.0 →	86,868.07
750.0	27.50	1.15	56.60	0.94	2.0 →	2.1 →	88,287.00

PROPRIETARY NOTICE

This document contains proprietary information owned by Red Valve Company. It is loaned by Red Valve Company subject to these conditions: that it and the information embedded therein shall be used only for record and reference purposes. It shall not be used or caused to be used in any way prejudicial to the interests of Red Valve Company. It shall not be reproduced or copied in whole or in part or disclosed to anyone without the direct written permission of Red Valve Company. And shall be returned upon request.

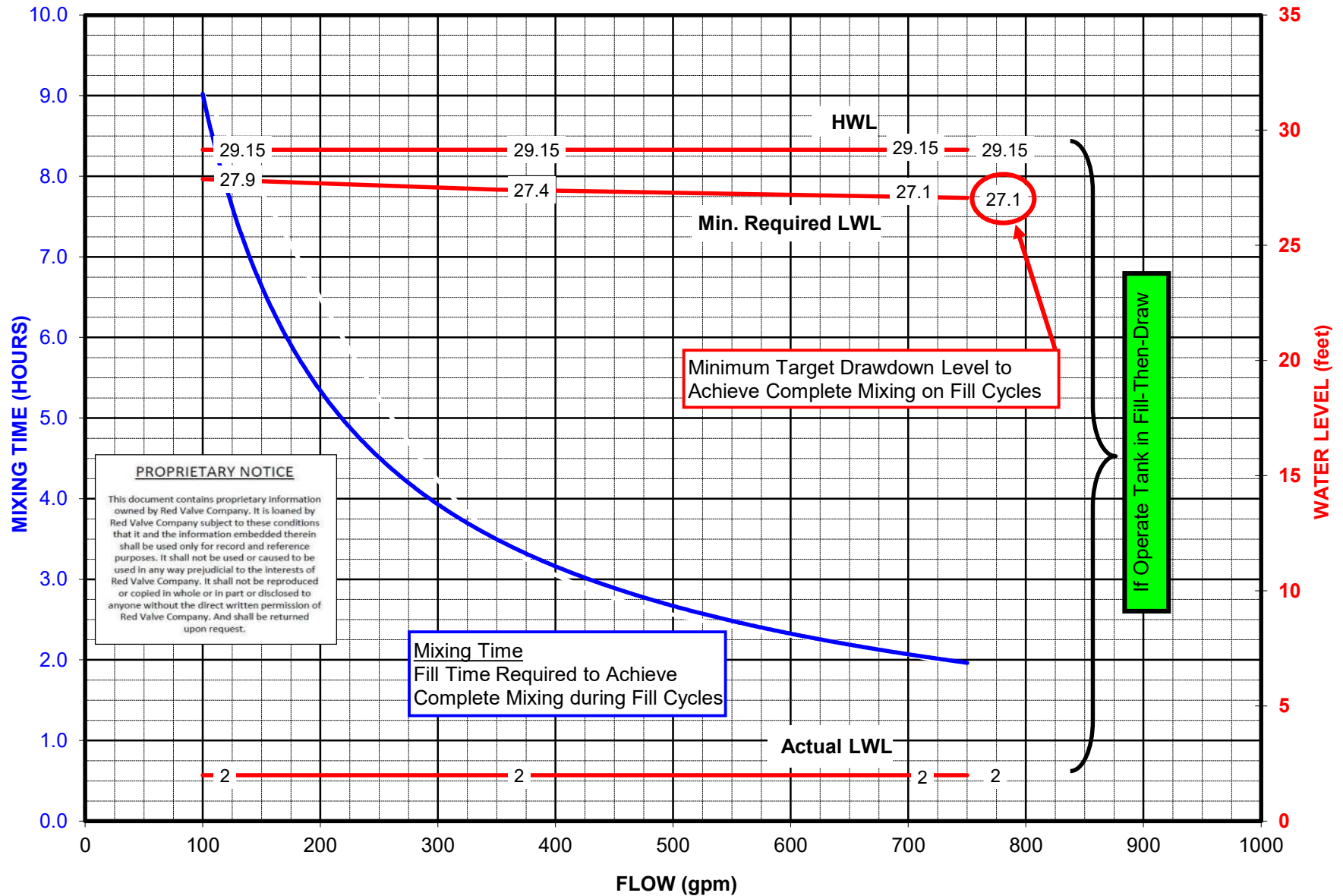
						GUIDE TO TANK FLUCTUATION AND TURNOVER				
FILL	Jet Velocity (fps)	JV^2 / 2g (feet)	Reynold's Number	Inlet Momentum (ft^4 / min^2)	Velocity Gradient, G (1/sec)	Theoretical Mixing Time (Fill Time Req'd for Complete Mixing) MT = K * V^(2/3) / M^(1/2)		Req'd Drawdown on Previous Draw to Mix on Next Fill (feet)	% Turnover Required (%)	Volume Exchange Required (gallons)
						(Minutes)	(Hours)			
INLET FLOW RATES (gpm)								(SEE NOTE 2)	(SEE NOTE 2)	(SEE NOTE 2)
100.0	4.02	0.25	132,136	3,223	0.95	541.0	9.0	1.3	4.4	54,444
350.0	7.60	0.90	339,973	21,333	3.34	210.3	3.5	1.7	5.9	73,005
700.0	10.91	1.85	576,039	61,245	6.79	124.1	2.1	2.0	7.0	86,616
750.0	11.31	1.99	607,265	68,065	7.29	117.7	2.0	2.1	7.1	87,853
						MINIMUM TANK FLUCTUATION TARGET				

DRAW	TIME TO DRAW TANK FROM FULL TO EMPTY		Time to Draw Down 1' Depth		Pipe Velocity (fps)	Volume Exchange Required (gallons)	Draw Time Required (Hours)	
	(Hours)	(Days)	(Minutes)	(Hours)			(Hours)	
OUTLET FLOW RATES (gpm)								
250	82.49	3.44	169.79	2.83	1.02	87,853	5.9 @	250 gpm Draw Rate
750	27.50	1.15	56.60	0.94	3.06	87,853	2.0 @	750 gpm Draw Rate
1000	20.62	0.86	42.45	0.71	4.08	87,853	1.5 @	1000 gpm Draw Rate
1500	13.75	0.57	28.30	0.47	6.12	87,853	1.0 @	1500 gpm Draw Rate

- * NOTE: 1. TIDEFLEX VALVES ARE INHERENTLY A VARIABLE ORIFICE SO THE TMS EFFECTIVE DIAMETER VARIES WITH FLOW RATE
 2. MIXING TIME EQUATIONS DO NOT ACCOUNT FOR DIFFERENCES IN TEMPERATURE BETWEEN INLET WATER AND TANK (BUOYANT JETS)
 THESE CALCULATIONS MAY UNDERESTIMATE THE FILL TIME REQUIRED FOR MIXING.

TMS - Mixing Time and Minimum Required Drawdown

Fassler 1.2MG Reservoir





WATER AGE ANALYSIS

For Tanks That Operate in
FILL - THEN - DRAW
(Not simultaneous fill and draw)

Actual/Predicted Daily Turnover and Water Age

High Water Level (HWL) = 29.15 ft	Turnover = 27.2 feet	Ave. Water Age = 1.1 days
Low Water Level (LWL) = 2 ft	93.1 %	(Assumes tank is mixed. CAUTION: A single inlet pipe often does not mix. Water age could be much higher)
	1,152,433 gal	

Turnover Required for TMS to Achieve Complete Mixing

(GOAL: For Required Turnover for Complete Mixing to be Less Than Actual/Predicted Turnover)

The TMS will mix the tank with Turnover = 2.1 feet	Ave. Water Age = 14.0 days
(see Mixing Analysis) 7.1 %	(Water age if tank turnover was the minimum required to achieve complete mixing)
88,284 gal	

RESULT

Is Actual Turnover Greater than Required Turnover to Mix with TMS? **YES**

If Yes, the TMS will Completely Mix the Tank. Applicable Water Age is from Actual/Predicted Turnover
If No, Tank May not be Completely Mixed but Will Not Short-Circuit. The TMS Separates the "Inlet" and "Outlet" and will Draw the Oldest Water from the Tank First

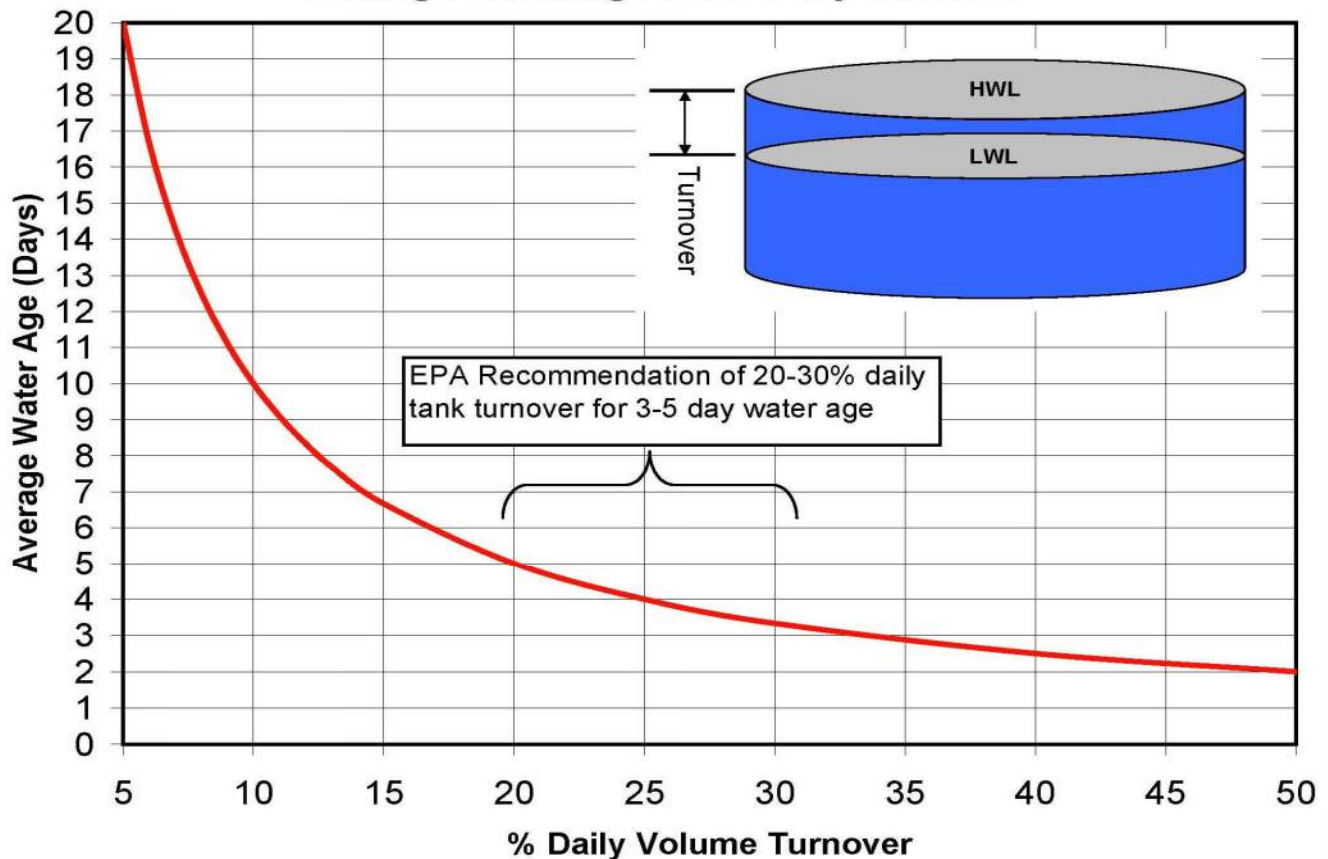
WATER QUALITY:

* Maintaining storage tank water quality is a function of:

- 1) Maximizing volume turnover to minimize water age. See Water Age vs. Turnover Guideline below.
- 2) Achieving complete mixing to avoid a localized increase in water age due to incomplete mixing and short-circuiting

* The TMS design addresses #2. Consultant and/or Owner to address #1 by looking at the "operation" of the distribution system and tank in order to maximize turnover. See Water Age vs. Turnover Guideline below.

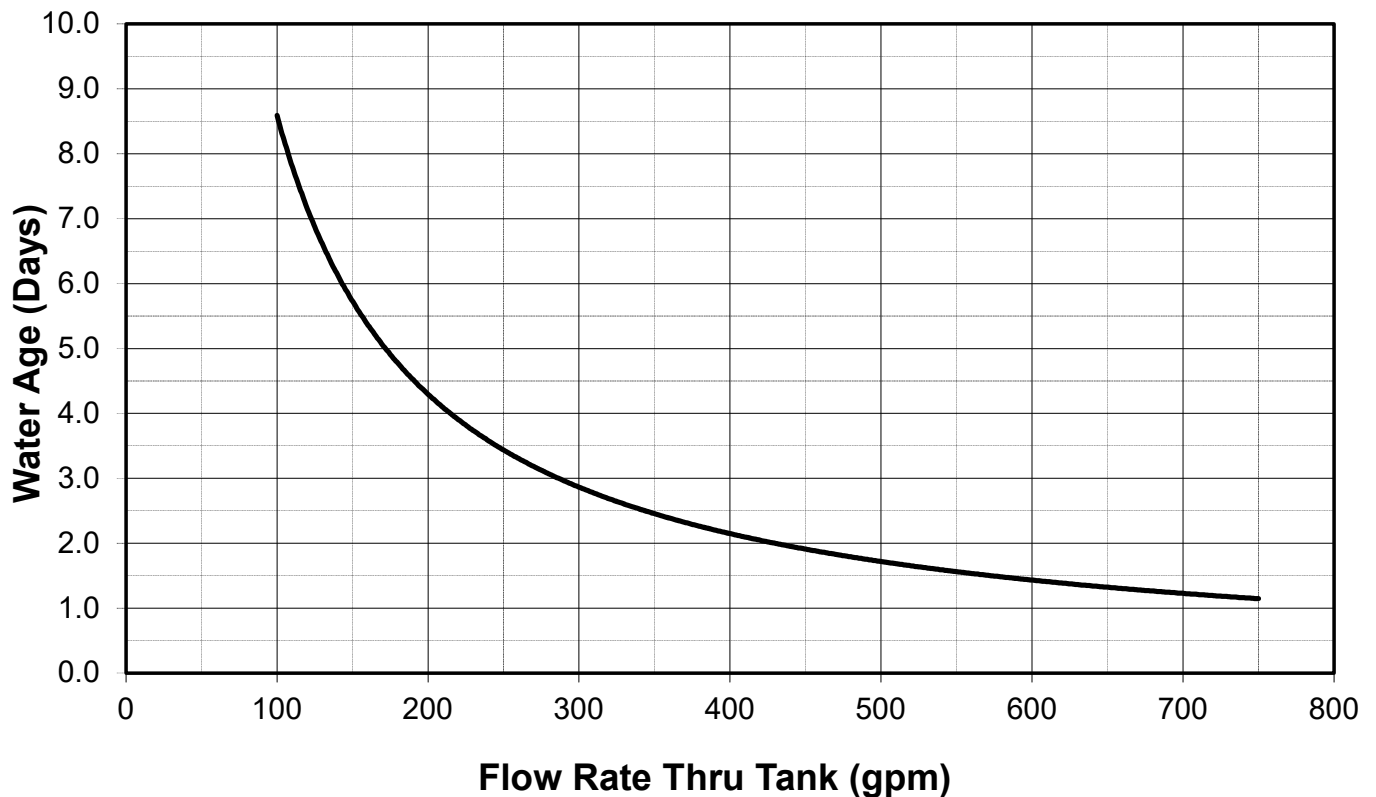
Average Water Age vs. % Daily Turnover



Tank Volume (Gallons)	Flow Rate (gpm)	WATER AGE (Assumes fill/drawing 24 hours per day)			Mixing Time from Mixing Analysis (Hours)
		(Minutes)	(Hours)	(Days)	
1,237,366	100.0	12,374	206.2	8.59	9.0
	350.0	3,535	58.9	2.46	3.5
	700.0	1,768	29.5	1.23	2.1
	750.0	1,650	27.5	1.15	2.0

These Water Age Calculations are valid if the tank is completely mixed.
 (TMS will completely mix tank if the actual fill time is greater than the theoretical mixing time as shown here and on Mixing Analysis)

Water Age vs. Flow Rate Thru Tank



WATER QUALITY:

* Maintaining storage tank water quality is a function of:

- 1) Maximizing volume turnover to minimize water age. The greater the flow rate thru the tank, the lower the water age.
- 2) Achieving complete mixing to avoid a localized increase in water age due to incomplete mixing and short-circuiting
 Ensure that tank is filling for longer than what is shown on the theoretical mixing time in the mixing analysis



TMS Manifold Hydraulics (FILL CYCLE)

Reservoir Name: Fassler 1.2MG Reservoir

Reservoir Size: 85' Dia. X 30.15'

Reservoir Capacity: 1.2 MG

End User: North Coast County Water District, CA

Consultant: Water Works Engineers

Ambient Density = 62.4 lbm/ft³

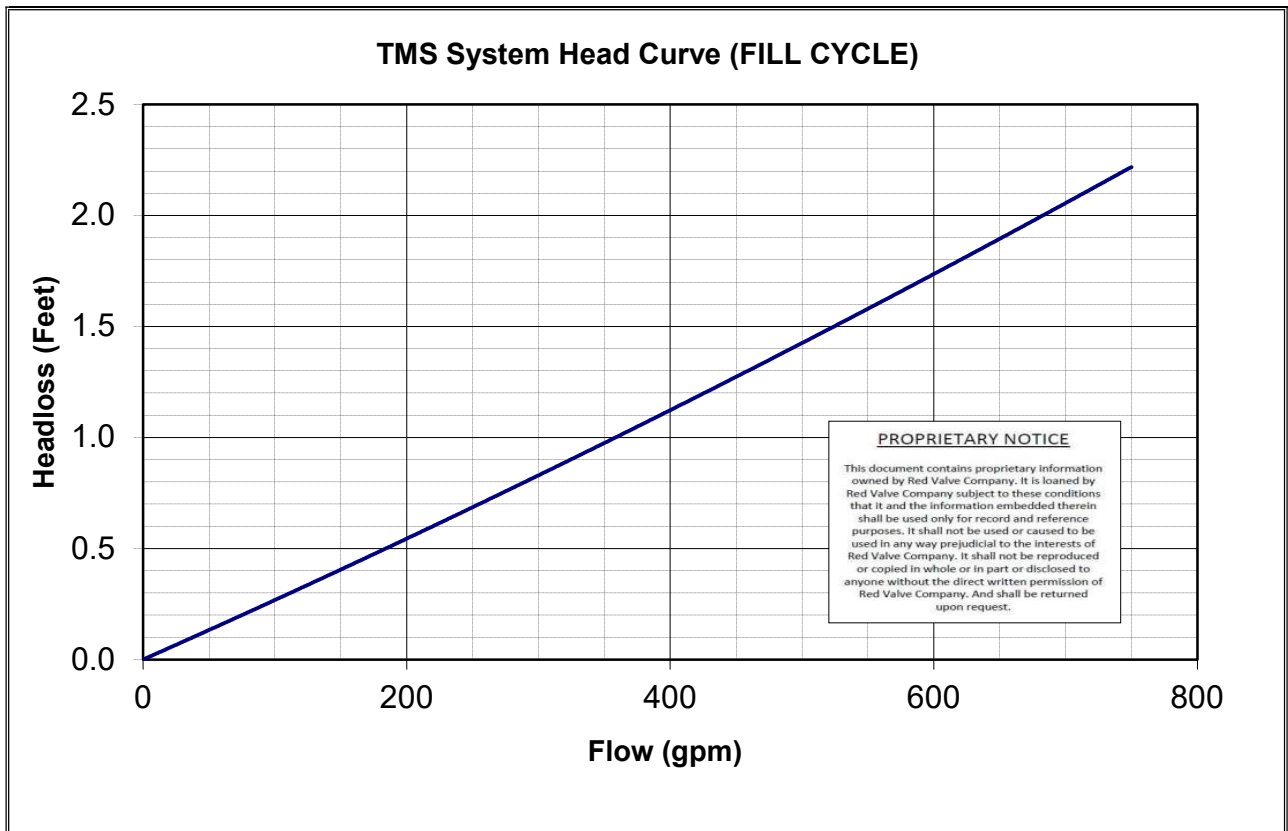
Effluent Density = 62.4 lbm/ft³

dS/S = 0

C = 100 Hazen Williams Coeff.

Cd = 0.95 Cd

Flow Rate (gpm)	Jet Velocity (fps)	Friction Headloss (ft)	Total Headloss (ft)
100.0	4.0	0.00	0.3
350.0	7.6	0.04	1.0
700.0	10.9	0.14	2.1
750.0	11.3	0.16	2.2





TMS Manifold Hydraulics (DRAW CYCLE)

Reservoir Name: Fassler 1.2MG Reservoir

Reservoir Size: 85' Dia. X 30.15'

Reservoir Capacity: 1.2 MG

End User: North Coast County Water District, CA

Consultant: Water Works Engineers

Ambient Density = 62.4 lbm/ft³

Effluent Density = 62.4 lbm/ft³

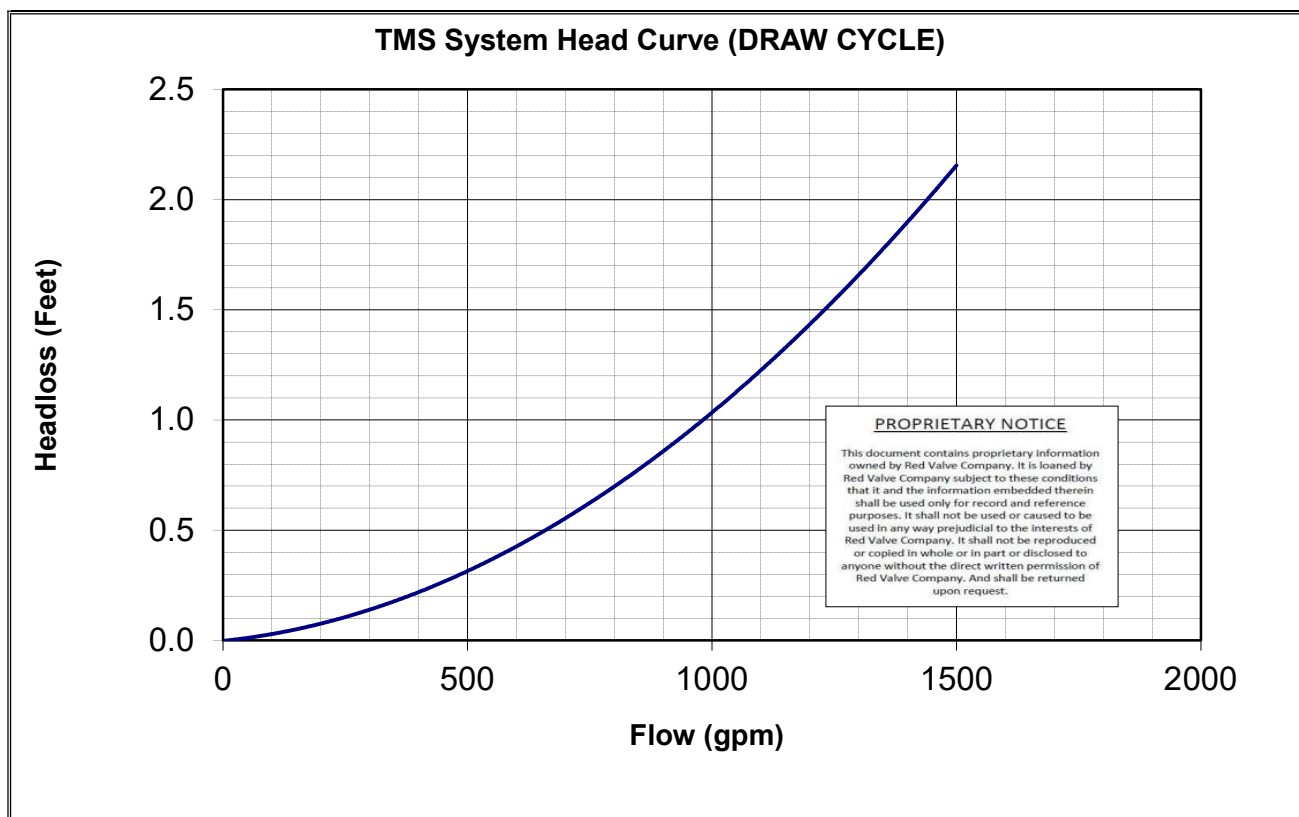
dS/S = 0

C = 100 Hazen Williams Coeff.

Cd = 0.95 Cd

Flow Rate (gpm)	WF-3 Headloss (ft)	Friction Headloss (ft)	Total Headloss (ft)
250.0	0.1	0.03	0.1
750.0	0.4	0.21	0.6
1000.0	0.7	0.36	1.0
1500.0	1.4	0.77	2.2

**TMS DRAW HYDRAULICS ONLY APPLIES IF WATER IS
DRAWN FROM TANK THRU TMS**



Red Valve
QUOTATION



To: United States
ALL BIDDERS

Invoice Terms: Net 30

Days Valid: 30 day(s)

Delivery Terms: PPD, Prepaid and Charge on Actuals

Date of Quote: 08/14/2024

Quote Number: QUO124251

Project Name: TMS - FASSLER 1.2MG RESERVOIR -
NORTH COAST COUNTY W.D., CA

I.D. (Rep. Use):

Line of Business: 4941 Water Treatment

Make Order To: Red Valve Company, Inc.
C/O Red Valve
750 HOLIDAY DRIVE
SUITE 400
Pittsburgh PA 15220
United States
Kevin Stoltz
Tel/Direct:
kstoltz@redvalve.com

Currency and Values expressed in USD (\$)

ANY PURCHASE ORDER ISSUED AS A RESULT OF THIS QUOTATION IS SUBJECT TO ALL OF THE MANUFACTURER'S CONDITIONS SET FORTH IN THIS DOCUMENT HEREOF, REASONABLE CONTRACT LANGUAGE NEGOTIATIONS AND FINAL ACCEPTANCE BY RED VALVE AT SARTELL, MN USA. UNLESS OTHERWISE NOTED, QUOTATIONS ARE VALID FOR 30 DAYS. UNTIL ACCEPTANCE OF ORDER, QUOTED PRICES AND DELIVERY ARE SUBJECT TO CHANGE. UNLESS OTHERWISE NOTED, PRICES ARE FIRM FOR SHIPMENT OF GOODS WITHIN 12 MONTHS FROM THE RELEVANT QUOTATION DATE. OUR PRICES ARE BASED ON CURRENT PRICES FOR MATERIAL. IF A SIGNIFICANT MATERIAL PRICE INCREASE OCCURS BETWEEN ORDER ACCEPTANCE AND SHIPMENT DATE, GOODS SCHEDULED TO SHIP BEYOND 12 MONTHS OF THE QUOTATION DATE ARE SUBJECT TO A PRICE ADJUSTMENT BY THE AMOUNT NECESSARY TO COVER SUCH AN INCREASE.

Line#	Cust. Line #	Qty	Order Code
1		3	TMS-INLET INCLUDED TIDEFLEX VARIABLE ORIFICE INLET NOZZLES NSF-61 Certified, EPDM Elastomer Complete with 316 Stainless Steel Retaining Rings for Inlet Valves Flange Drilling: ANSI 125/150#
2		2	TMS-OUTLET INCLUDED WATERFLEX WF-3 OUTLET CHECK VALVES NSF-61 Certified, EPDM Elastomer Complete with 304 Stainless Steel Disc, Rods and Fasteners Flange Drilling: ANSI 125/150#
3		1	TMS-PIPE INCLUDED MANIFOLD PIPING Approximately 68' of 10" PVC Schedule 80 Flanged and Socket Welded Manifold Pipe Carbon Steel Mating Flange PVC Schedule 80 – 90° Elbow PVC Schedule 80 Inlet Tees

Red Valve QUOTATION



Line#	Cust. Line #	Qty	Order Code
			PVC Schedule 80 Outlet Tees PVC Schedule 80 Reducers Various sizes and quantities of PVC Schedule 80 Van Stone Flanges Hardware- Flanged Mounting Kit- including 304 Stainless Steel Bolts, Nuts, Washers and NSF-61 Gaskets
4		1	TMS-SUPPORTS INCLUDED PIPE SUPPORTS Carbon Steel Pipe Supports with 304 Stainless Steel U-Bolts
5		1	TMS-MODELING & DOCUMENTATION INCLUDED - NSF-61 CERTIFICATION FOR ABOVE VALVES - MANIFOLD HYDRAULIC ANALYSIS, MIXING TIME AND WATER AGE ANALYSIS - COMPUTATIONAL FLUID DYNAMICS (CFD) – A "Representative" CFD Model Evaluation of the Proposed HMS System Configuration Applied within a Reservoir of Similar Geometry - COMPLETE SYSTEM INSTALLATION DRAWINGS FOR CONSTRUCTION - PRE-START UP INSPECTION-A Pre Start Inspection of the Installed TMS System to be Performed by a Red Valve Factory Representative or a Red Valve Approved Inspector. For Elevated Tanks, the Contractor Shall be Responsible for Taking Photographs of the Installed TMS and Submitting to the Factory Representative for Review and Approval. TMS WILL NOT BE WARRANTIED WITHOUT INSPECTION.
Total			\$49,147.00

*Estimated manufacturing lead times included in this quotation are defined as "after release of order to production" (ARO) and are subject to change based upon availability of parts and manufacturing capacity at the time the goods are released to production. Production orders are considered released to production upon receipt. Manufacturing lead times do not include transit lead times. Estimated lead times are based upon the items and quantities listed on the quotation. Any changes to order codes and/or quantities may result in changes to manufacturing lead times.

Quote Comments:

Special Conditions

- After the Purchase Order is received for a "Complete System", Red Valve will send a complete set of submittals that includes detailed installation plans, hydraulic calculations and charts, mixing analysis, water age analysis, and IOM's.
- Purchaser shall send the latest inspection report with digital photos (if available) and tank detail drawings showing the tank dimensions and inlet and outlet pipe details.
- Submittals shall be sent approximately 3-5 weeks after acceptance of purchase order. Submittal drawings and Installation Manuals for the review process will be provided in digital format. If hard copies are required an additional fee will be applied.
- Receipt of approved drawings is required for release to production.
- Equipment will be released to production approximately 3-5 weeks after receipt of approved submittals which is the time required to generate fabrication drawings and BOM's.
- **ORDER WILL BE SCHEDULED FOR SHIPMENT APPROXIMATELY 12-14 WEEKS AFTER RELEASED TO PRODUCTION**
- Piping, Pipe Supports, and Hardware may have shorter lead time and could be shipped in advance of the valves. Contact Red Valve to confirm lead times and coordinate.
- **WARRANTY: TMS WARRANTY WILL NOT BE INVOKED UNTIL AN AUTHORIZED TMS REPRESENTATIVE VISITS THE SITE TO INSPECT THE TMS INSTALLATION. IT IS THE CONTRACTOR'S RESPONSIBILITY TO CONTACT THE REPRESENTATIVE, WHO IS LISTED ON THE FRONT PAGE OF THIS QUOTATION, TO MAKE ARRANGEMENTS FOR THEIR SITE VISIT. Equipment Warranty period shall be effective for a period of two (2) years from the date of system installation certification. Final inspection of the installed system to be conducted by a factory trained representative. In the case of elevated tanks, digital photos to be provided by contractor for review and approval of installation.**

Notes (PVC)

- 1) Following installation of TMS, all carbon steel components (pipe supports, bolt kits, etc.) to be surface prepared and coated in accordance with the interior tank specification. Surface preparation and painting to be done by others.

General Notes

- 1) Installation by others.
- 2) Contractor responsible for verifying that all components of TMS can be inserted into tank without interference.
- 3) Contractor responsible for verifying that the TMS Piping System will not interfere with internal components of the tank.
- 4) Prices subject to escalation if the benchmark pricing of materials (per www.custeel.net or equivalent third party, specific benchmark to be identified with order acceptance), in US dollars (translated at then current rates published in the Wall Street Journal), increases by five (5%) percent or more from date of order acceptance or if import tariffs of five (5%) percent or more are levied after the date of P.O. acceptance.

* Best Available (Foreign and/or Domestic) Material.

Shipping Notice

- In the event that the delivery of a TMS System order is delayed by the customer, it is imperative that the customer notify Red Valve of the delay immediately. Red Valve will not be responsible to store the product or make arrangements to have it stored. It is the customer's responsibility to take immediate possession of the order, or make arrangements to have it stored.

Quote Prepared By: Kevin Stoltz

MANUFACTURER'S CONDITIONS

These conditions apply to all quotations, orders and contracts for Red Valve Company, Inc. ("we," "us" or "our")

1. CONSTRUCTION AND LEGAL EFFECT: Our sale to you (defined as the purchaser of goods from us), is limited to and expressly made conditional on your assent to these typed and printed terms and conditions of sale, the face and reverse side hereof ("These Terms"), all of which form a part of the agreement to sell and which supersede and reject all prior writings (including your order), representations, negotiations with respect hereto and any conflicting terms and conditions of yours, any statement therein to the contrary notwithstanding. The sending of the purchase order for the goods referred to herein, whether or not signed by you, or your acceptance of the goods or payment operates as acceptance by you of These Terms. In case of conflict between These Terms and the terms of your purchase order or acceptance, These Terms govern; any different or conflicting terms submitted by you in any purchase order or acceptance shall be deemed objected to by us and shall be of no effect unless specifically agreed to by us in writing. We will furnish only the quantities and goods specifically listed on the face hereof or the pages attached hereto., or any updates or modifications to the same purchase order. We assume no responsibility for other terms or conditions or for furnishing other equipment or material shown in any plans and/or specifications for a project to which the goods quoted or ordered herein pertain or refer. Our published or quoted terms and conditions are subject to change without notice prior to acceptance of order.

2. PRICES: Unless otherwise noted on the face hereof, quotations are valid for 30 days, prices are net, FCA Incoterms 2020 our factory. Stenographic, clerical, and mathematical errors are subject to correction. Until acceptance of order on These Terms, quoted prices and delivery are subject to change. Thereafter, unless otherwise noted, prices are firm for shipment of goods within 12 months from the relevant quotation date. Our prices are based on current prices for material. We will endeavor to obtain the lowest pricing on materials from our suppliers, but if a significant material price increase occurs between order acceptance and shipment date, goods scheduled to ship beyond 12 months of the quotation date are subject to a price adjustment by the amount necessary to cover such increase.

3. DELIVERY: Dates for the furnishing of services and/or delivery or shipment of goods are approximate only and are subject to change. Quoted lead times are figured from the later of date of acceptance of order on These Terms or from the date of receipt of complete technical data and approved drawings as such may be necessary. We shall not be liable, directly or indirectly, for any delay in or failure to perform caused by carriers or suppliers or delays from labor difficulties, shortages, strikes or stoppages of any sort, failure or delay in obtaining materials, customer requested order changes, fires, floods, storms, accidents, government restrictions, epidemics, pandemics, causes designated acts of God or force majeure by any statute or court of law or other causes beyond our reasonable control.

4. SHORTAGE, DAMAGE, ERRORS IN SHIPMENT: Our responsibility ceases upon delivery to carrier. Risk of loss, injury or destruction of property, shall be borne by you from and after our delivery to carrier, and such loss, injury or destruction shall not release you from the obligation to pay the purchase price. You shall note receipt for goods that are not in accordance with bill of lading or express receipt and you shall make claim against such carrier for any shortage, damage or discrepancy in the shipment per the ICC Code for Freight Claims promptly. You shall inspect and examine all items and goods covered by the order when unpacking crated or boxed goods, and if damage is discovered, leave as is until the carrier's agent makes examination and notation on freight or express bill of concealed damage. We will render reasonable assistance to help trace and recover lost goods and collect just claims as a business courtesy, but without obligation. We do not guarantee safedelivery.

5. TAXES: Our prices do not include sales, use, excise, occupation, processing, transportation or other similar taxes which we may be required to pay or collect with respect to any of the materials covered hereby under existing or future law. Consequently, in addition to the price specified herein, such taxes shall be paid by you, or you shall provide us with a tax exemption certificate acceptable to the appropriate taxing authorities. You shall also assume and pay any import or export duties and taxes, with respect to the materials covered by the order, and shall hold harmless and reimburse us therefrom.

6. CREDIT AND PAYMENT: Unless otherwise noted on the face hereof, payment of goods shall be 100% thirty (30) days net in US dollars. Payment shall be made: (a) in full without set-off, counterclaim, or withholding of any kind; and (b) not contingent on payment from or approval of any third party. Prorated payments shall become due with partial shipments. We reserve the right at any time to suspend credit or to change credit terms provided herein, when, in our sole opinion, your willingness or ability to pay your obligations to us is in doubt. Failure to pay invoices at maturity date, at our election, makes all subsequent invoices immediately due and payable irrespective of terms, and we may withhold all subsequent deliveries until the full account is settled and we shall not, in such event, be liable for non-performance of contract in whole or in part. You agree to pay, without formal notice, 1.5% per month of the amount not paid when due, provided that, if such rate is in excess of applicable governing law, you agree to pay the maximum permitted rate.

7. CANCELLATIONS AND CHANGES: Orders which have been accepted by us are not subject to your cancellation or changes in specifications, except upon our written consent, and we may require, as a condition of such consent, appropriate modification charges and adjustments in price, delivery schedule and other relevant terms, and in the case of cancellation, cancellation charges. In the event we accept your cancellation, you shall be liable for a cancellation charge equal to the higher of (i) 25% of the purchase price of the item(s), or (ii) any loss or cost incurred by us, including, but not limited to, cost of materials, labor, engineering, reconditioning and reasonable overhead.

8. DEFERRED SHIPMENT: If shipment is deferred at your request, payment of the contract price shall become due when you are notified that the equipment is ready for shipment. If you fail to make payment and/or furnish shipping instructions, we may either extend time for so doing or cancel the contract. In case of deferred shipment at your request, storage and other reasonable expenses attributable to such delay shall be payable by you.

9. LIMITED WARRANTY: Products, auxiliaries and parts thereof that we manufacture for a period of twenty-four (24) months from the date of shipment from our factory, are warranted to the original purchaser only against defective workmanship and material, but only if properly stored, installed, operated, and serviced in accordance with our recommendations and instructions. For items proven to be defective within the warranty period, your exclusive remedy under this limited warranty is repair or replacement of the defective item, at our option, FCA Incoterms 2020 our facility with removal, transportation, and installation at your cost. Products or parts manufactured by others but furnished by us are not covered under this limited warranty. We may provide repair or replacement for other's products or parts only to the extent provided in and honored by the original manufacturers' warranty to us, in each case subject to the limitations contained in the original manufacturer's warranty. No claim for transportation, labor, or special or consequential damages or any other loss, cost or damage is being provided in this limited warranty. You shall be solely responsible for determining suitability for use and in no event shall we be liable in this respect. This limited warranty does not warrant that any product or part we manufacture is resistant to corrosion, erosion, abrasion or other sources of failure, nor do we warrant a minimum length of service. Your failure to give written notice to us of any alleged defect under this warranty within twenty (20) days of its discovery, or attempts by someone other than us or our authorized representatives to remedy the alleged defects therein, or failure to return product or parts for repair or replacement as herein provided, or failure to store, install, or operate said products and parts according to the recommendations and instructions furnished by us shall be a waiver by you of all rights under this limited warranty. This limited warranty is voided by any misuse, modification, abuse or alteration of our product or part, accident, fire, flood or other Act of God, or your failure to pay entire contract price when due. The foregoing limited warranty shall be null and void if, after shipment from our factory, the item is modified in any way or a component of another manufacturer, such as but not limited to; an actuator is attached to the item by anyone other than our factory authorized service personnel. All orders accepted shall be deemed accepted subject to this limited warranty, which shall be exclusive of any other or previous warranty, and this shall be the only effective guarantee or warranty binding on us, despite anything to the contrary contained in the purchase order or represented by any agent or employee of ours in writing or otherwise, notwithstanding, including but not limited to implied warranties.

THE FOREGOING REPAIR AND REPLACEMENT LIMITED WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES, OBLIGATIONS AND LIABILITIES, INCLUDING, BUT NOT LIMITED TO, ALL WARRANTIES OF FITNESS FOR A PARTICULAR PURPOSE OR OF MERCHANTABILITY OR OTHERWISE, EXPRESSED OR IMPLIED IN FACT OR BY LAW, AND STATE OUR ENTIRE AND EXCLUSIVE LIABILITY AND YOUR EXCLUSIVE REMEDY FOR ANY CLAIM IN CONNECTION WITH THE

SALE AND FURNISHING OF SERVICES, GOODS OR PARTS, THEIR DESIGN, SUITABILITY FOR USE, INSTALLATION OR OPERATIONS. NEITHER ANY PERFORMANCE OR OTHER CONDUCT, NOR ANY ORAL OR WRITTEN INFORMATION, STATEMENT OR ADVICE PROVIDED BY US OR ANY OF OUR EMPLOYEES OR AGENTS WILL CREATE A WARRANTY, OR IN ANY WAY INCREASE THE SCOPE OR DURATION OF THIS LIMITED WARRANTY.

10. INTELLECTUAL PROPERTY: We shall indemnify and hold you harmless from any amount that you are required to pay to a third-party pursuant to final, non-appealable court order as a result of such third-party's claim that a product sold hereunder infringes any United States patent or copyright of such third party; provided that our obligation of indemnification is contingent upon (a) your notifying us in writing of any such claim within 20 days of receipt thereof, (b) your providing us with exclusive control of the defense and/or settlement thereof, and (c) your cooperating with us in such defense and/or settlement. In the event of such a successful infringement claim by the third party, at our option, we shall either (i) modify the product sold hereunder so that it performs comparable functions without infringement, (ii) obtain a royalty-free license for you to continue using the infringing product or (iii) refund to you the then-depreciated fair market value of the infringing component. We shall have no obligation under this Section to the extent a claim is based upon (a) the combination, operation or use of the product with equipment, products, hardware, software, systems or data that was not provided by us, if such infringement would have been avoided in the absence of such combination, operation or use, or (b) your use of the product in any manner inconsistent with our written materials regarding the use of such product. This Section states our entire liability and your exclusive remedy with respect to any alleged infringement arising from the use of the products sold hereunder or any part thereof and is subject to the other limitations contained in These Terms.

11. LIMITATION OF LIABILITY: IN NO EVENT SHALL WE BE LIABLE FOR ANY DIRECT, INDIRECT, SPECIAL, PUNITIVE, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO, DAMAGE TO OR LOSS OF OTHER PROPERTY OR EQUIPMENT, BUSINESS INTERRUPTION, COST OF SUBSTITUTE PRODUCTS, LOSS OF TIME, LOSS OF PROFITS OR REVENUE, COST OF CAPITAL, LOSS OF USE, OR DIMINUTION IN VALUE) WHATSOEVER, AND OUR LIABILITY, UNDER NO CIRCUMSTANCES, WILL EXCEED THE CONTRACT PRICE FOR THE GOODS AND/OR SERVICES FOR WHICH LIABILITY IS CLAIMED. ANY ACTION FOR BREACH OF CONTRACT BY YOU, OTHER THAN RIGHTS RESPECTING OUR LIMITED WARRANTY DESCRIBED IN SECTION 9 ABOVE, MUST BE COMMENCED WITHIN 12 MONTHS AFTER THE DATE OF SALE.

12. EXPORT CONTROL COMPLIANCE: You agree and acknowledge that the products are sold in accordance with U.S. export control and sanctions laws, regulations and orders, as they may be amended from time to time. You agree to ascertain and comply with all applicable export and re-export obligations and restrictions, including without limitation, U.S. export and re-export controls under the Export Administration Regulations ("EAR"), International Traffic in Arms Regulations ("ITAR"), and all regulations and orders administered by the U.S. Department of Treasury, Office of Foreign Assets Control (collectively, "U.S. Export Control Laws"). If you are conducting the export from the United States or the re-export from a country outside the United States, you shall comply with such U.S. Export Control Laws and obtain any license or other authorization required to export or re-export the products and related technology. We shall reasonably cooperate and exercise reasonable efforts, at your expense, to support you in obtaining any necessary licenses or authorizations. You shall not export or re-export the products and/or related technology to any country or entity to which such export or re-export is prohibited, including, but not limited to any country or entity under sanction or embargoes administered by the United States. Any diversion contrary to the law of the United States is prohibited. You will not take, and will not solicit us to take, any action that would violate any anti-boycott or any export or import statutes or regulations of the United States or other governmental authorities, and shall defend and indemnify us for any loss or damage arising out of or related to such actions.

13. GENERAL COMPLIANCE WITH LAWS: In addition to your obligations under Section 12 above, you represent and warrant that, in performing your duties under this Agreement, you will comply with, at your sole expense, all applicable laws and regulations of any governmental authority, including, but not limited to your duties involving any required registrations, requirements as to product contents, packaging and labeling, restraint of trade, consumer laws, data privacy, export regulations, and environmental laws. You agree and acknowledge you have had an opportunity to obtain legal advice regarding, and currently comply with, all applicable legal requirements that prohibit unfair, fraudulent or corrupt business practices, including, but not limited to the U.S. Foreign Corrupt Practices Act (FCPA) as well as U.S. and other legal requirements that are designed to combat terrorism and terrorist activities. In addition, neither you nor any of your equity interest owners, officers or directors are named as a "specially designated national" or "blocked person" as designated by the United States Department of the Treasury's Office of Foreign Assets Control under the U.S. PATRIOT Act.

14. INDEMNIFICATION BY YOU: You will indemnify, defend and hold us and our corporate parents and other affiliates and their respective officers, directors, stockholders, members, insurers, attorneys, employees, agents, successors, predecessors, assigns, heirs and personal representatives harmless against any and all liability, claims, suits, actions, losses, liabilities, damages, costs and legal fees arising out of or related to: (i) any conduct of you or any related party as described in Sections 12 or 13 above; or (ii) your breach of any other provision herein.

15. PROPRIETARY INFORMATION: All specifications, drawings, data, manuals, designs, information, ideas, methods, patterns and inventions made, conceived, developed or generated by us incident to the procurement or performance of this order ("Work Product") will vest in, inure to and be the sole property of us. You will not copy, publish or otherwise disclose, in whole or in part, to others such Work Product without the express prior written permission of us. You will not use information furnished hereunder for any purpose other than for operation and maintenance of the goods and services or for any purpose other than as explicitly intended by us. The rights and obligations in this Section 15 will survive termination or expiration of this order. .

16. ARBITRATION: Any controversy or claim arising out of or relating to this Agreement or the breach thereof shall be settled by arbitration administered by the American Arbitration Association in accordance with its Commercial Arbitration Rules, and judgment on the award rendered by the arbitrator(s) may be entered in any court having jurisdiction thereof. The venue for such proceedings shall be St. Cloud, MN.

17. TEXAS WAIVER OF CONSUMER RIGHTS: If you are entitled to its protection, you hereby agree to waive your rights under the Deceptive Trade Practices-Consumer Protection Act, Section 17.41 et seq., Business & Commerce Code, a law that gives consumers special rights and protections. You warrant that, after consultation with an attorney of your own selection, you voluntarily consent to this waiver.

18. APPLICABLE LAW: The rights and duties of the parties shall be governed by the laws and exclusive jurisdiction of the State of Minnesota without regard to the conflict of law principles thereof. You agree the United Nations Convention on Contracts for the International Sale of Goods or any subsequently enacted treaty or convention shall not apply to These Terms.

19. NO OTHER CONTRACT PROVISIONS; OTHER: These Terms reflect the entire agreement with respect to the products. Terms and conditions of your order shall be without force and effect, except to the extent identical herewith. No dealer, broker, branch manager, agent, employee or representative of ours has any power of authority except to take orders for our products and to submit the same to us, at our factory, for our approval and acceptance on the terms herein or rejection. There are no representations, agreements, obligations, or conditions, expressed or implied, statutory or otherwise, relating to the subject matter hereof, other than herein contained. Red Valve Company, Inc. and related terms (we, us and our) shall refer to Red Valve Company, Inc. and its affiliates. If any provision hereof is invalid or not enforceable under applicable law, the remaining provisions shall remain in full force and effect. Any assignment of your rights hereunder without our consent (which shall not be unreasonably withheld) shall be void. These Terms shall be binding on your successors and assigns. Our failure to require your performance of any of These Terms shall not serve as a waiver of or diminish our rights to require strict performance of such provision or These Terms.



North Coast County Water District
Fassler Tank
Preliminary Design Report



Appendix C – Detailed Opinion of Probable Cost



WATERWORKS ENGINEERS

Project Number	24-033
Title:	NCCWD Fassler Tank Replacement 30% Cost Opinion
Date:	9/10/2024

Item	Quantity	Unit	Unit Cost	Installation Cost	Total Cost
Site Work					
Mobilization	1	lump sum	\$250,000	included	\$250,000
Stormwater Best Management Practices	1	lump sum	\$80,000	included	\$80,000
Banquiano Trail Safety Barrier	1	lump sum	\$25,000	\$8,400	\$33,400
Banquiano Trail Partial Expansion	300	square feet	\$20	\$8,400	\$14,400
Access Road Maintenance During Construction	1	lump sum	\$60,000	included	\$60,000
Demolition (Tank, Piping, Vaults, Pavement)	1	lump sum	\$200,000	included	\$200,000
Excavation (Cut and Fill)	7,900	cubic yards	\$15	included	\$118,500
Soil Disposal	4,900	cubic yards	\$50	included	\$245,000
Soil Storage and Import	1,500	cubic yards	\$20	included	\$30,000
12" Aggregate Base under Tank	220	cubic yards	\$15	included	\$3,300
3" AC Paving On-site	3,000	square feet	\$10	included	\$30,000
8" Aggregate Base (Under AC)	37	cubic yards	\$35	\$8,400	\$9,696
8" Aggregate Base Road On-Site	1,220	cubic yards	\$35	included	\$42,700
Catch Basin	1	each	\$3,500	included	\$3,500
Disinfection and Hydrotesting Tank	1	lump sum	\$50,000	included	\$50,000
Chain-Link Fence Removal and Replacement	1	lump sum	\$15,000	\$8,400	\$23,400
Bioretention Basin and Landscaping	1	lump sum	\$45,000	\$6,000	\$51,000
Riprap	1	lump sum	\$15,000	included	\$15,000
Hydroseeding	1	lump sum	\$20,000	included	\$20,000
Tree Removal	3	each	\$2,500	included	\$7,500
					\$1,287,396
Major Equipment					
Prestressed Concrete Tank	1	lump sum	\$3,150,000	included	\$3,150,000
Tank Appurtenances	1	lump sum	\$125,000	included	\$125,000
Tideflex Mixing System (HDPE)	1	lump sum	\$62,000	\$21,000	\$83,000
Groundwater Monitoring Wells	2	each	\$20,000	included	\$40,000
					\$3,398,000
Mechanical					
10" DIP	440	linear feet	\$200	\$50,400	\$138,400
10" 45 Deg Elbow Fitting	1	each	\$1,200	included	\$1,200
10" 22.5 Deg Elbow Fitting	2	each	\$1,200	included	\$2,400
10" Concrete Encased WSP Pipe Under Tank	1	each	\$5,000	included	\$5,000
6" Gate Valve	1	each	\$2,600	included	\$2,600
10" Gate Valve	1	each	\$3,100	included	\$3,100
10" Flextend	1	each	\$20,000	included	\$20,000
10" Duckbill Valve for Overflow	1	each	\$1,000	included	\$1,000
6" Duckbill Valve for Drain	1	each	\$500	included	\$500
6" Flex 900 Flexible Ball Joint for Drain Pipe	2	each	\$1,500	included	\$3,000
6" Concrete Encased WSP Pipe Under Tank	1	each	\$3,500	included	\$3,500
6" DIP	40	linear feet	\$120	\$6,300	\$11,100
					\$191,800



WATERWORKS ENGINEERS

Project Number	24-033
Title:	NCCWD Fassler Tank Replacement 30% Cost Opinion
Date:	9/10/2024

Item	Quantity	Unit	Unit Cost	Installation Cost	Total Cost
Major Electrical					
Site Electrical	1	lump sum	\$180,000	included	\$180,000
Site Instrumentation	1	lump sum	\$40,000	included	\$40,000
					\$220,000
Project Cost Summary					
Subtotal, Site Work					\$1,287,396
Subtotal, Major Equipment					\$3,398,000
Subtotal, Mechanical					\$191,800
Subtotal, Major Electrical					\$220,000
SUBTOTAL					\$5,100,000
Design Contingency (miscellaneous items)			20%		\$1,020,000
Insurance and Bonds			2%		\$110,000
Construction Contingency			10%		\$510,000
TOTAL CONSTRUCTION COST OPINION					\$6,700,000

Notes:

1. Assumes tank construction starts in early 2026.
2. Does not include tree replanting or tree mitigation costs.