

**TECHNICAL MEMORANDUM**

**DATE:** September 2, 2016 **FILE:** 4.1198.00  
**TO:** Bill Hansell, Muir Beach Community Facilities District  
**FROM:** Wayne Leach, RCE 54309  
**RE:** *Muir Beach Sunset Way and Cove Lane Water Main, Street and Drainage Improvement Project*

The intent of this memorandum is to provide a summary of our review of the Sunset Way and Cove Lane Improvement Project and evaluate the need to move the project forward.

Several areas were considered with the evaluation and assessment of the project. Below is a list and following is a summary of findings and engineering opinion within each area.

The analysis included a review of the information listed below:

1. Muir Beach Sunset Way and Cove Lane Water Main, Street and Drainage Improvements Project prepared by ILS Associates dated February 27, 2015 (Job Number 8874)
2. Geotechnical Investigation, Sunset Way and Cove Lane Improvements prepared by Herzog Geotechnical dated October 21, 2014 (Project Number 3184-01-14)
3. Cost Proposal prepared by Ghilotti Construction Company dated May 6, 2016.
4. Muir Beach Community Services District, Twenty Year Plan for Water System Capital Improvements 1997-2016 prepared by Henry Hyde & Associates and Associated Business & Community Consultants, Inc. dated April 1995-March 1996.
5. Water System Schematic, Muir Beach Community Services District, California Public Water System #2100508, revision 8/5/2016
6. Muir Beach Community Services District, Account Quick Report, All Transactions dated 08/18/16.
7. Muir Beach Community Services District, Capital Asset Detail Listing undated
8. Muir Beach Community Services District Capital Assets, Year Ended June 30 2005
9. Muir Beach Community Services District, Fixed Assets undated
10. Muir Beach Community Services District Board Meeting Audio recording from August 3, 2016
11. Field Observation of Sunset Way on August 30, 2016. Attendees: Wayne Leach and Don Curry from CSW|Stuber-Stroeh Engineering Group, Inc. (CSW|ST2), Bill Hansell District Manager and Harvey Pearlman Water Manager from Muir Beach Community Services District (MBCSD), and Chief Steve Wynn from Muir Beach Volunteer Fire Department.

The project was initiated as a result of the intent to repave a portion of Sunset Way as a result of a recent construction project. The project increased in scope following consideration to improve paving and drainage conditions along the entire length of Sunset Way. In addition, it was decided that it was prudent to also improve the existing water system in Sunset Way considering existing conditions and recommendation contained in the Water System Capital Improvements Plan.

Following discussions with the District Manager and those from the August Board Meeting it was decided that each of the following areas should be included in the needs assessment.

a. Review project plans to identify immediate needs and opportunities for phasing improvements;

The review of the plans was not intended to serve as a plan check review, but a review of the extent of proposed improvements to meet the intent to improve the existing pavement surface, drainage conditions, and water system. The review of the plans also considered opportunities to phase improvements in order to achieve all or part of the intent of the improvements.

The proposed improvement plans have been found to meet the intent of the project. They address improving pavement conditions, drainage and the water system.

The pavement improvements include removal of the existing worn pavement surface, grading a cross slope to the uphill side of Sunset Way, and creating a minimum 11-foot wide paved section.

The drainage improvements are proposed along the entire length of the project through a combination of lined ditches and underground storm drains. Drainage is directed to the uphill side of the road and discharge into existing storm drain crossings at various locations. The proposed improvements are expected to minimize sheet flow to properties on the downhill side of Sunset Way.

Improvements to the water system upgrade the existing main system by upsizing the main providing additional fire flow capacity, increased protection within the trench section, additional new standard fire hydrants, and improved domestic water services. Upgrades to water systems typically improve water quality, reduce the risk to public health from contamination in drinking water, and will reduce the need for repairs overtime by replacement of facilities.

b. Review Water Master Plan document for consistency with proposed project;

The Sunset Way system is located within the Low Zone Distribution System. The original system was installed in the 1920's and was replaced with a PVC plastic pipe system by District personnel in the early 1970's.

The plan discusses the 4" PVC pipe installed in the early 1970's was not installed in accordance with standard engineering practices. It notes the pipe has minimal or no protective surface cover in many sections versus the normally required 30 inches. It also makes reference to loosening of couplings when stressed over time and this has resulted in several leaks requiring repairs. The plan continues and recognizes improvements that have led to improved operational reliability and noted the system functions adequately despite the construction deficiencies. It goes on to say in order to remain in proper operating condition "at risk" shallow or exposed distribution mains should be replaced.

The plan discusses the impacts to leaks on a small water system and the need to detect and repair leaks as soon as they occur. It recognizes the most susceptible to leakage are the PVC pipe couplings like those in the Low Zone System in Sunset Way.

The plan notes the main deficiency in the system is the shallow 4" PVC mains located in the low zone and concrete encasement or replacement in heavily traveled areas with stronger pipe and minimum 30 inches of cover will correct the deficiency.

The plan identifies the service life used by water utilities in California for similar facilities is 50-years. The system replaced along Sunset Way in the early 70's would be about 45 years old. It is close to the end of its useful life and an increase in repairs should be anticipated.

The proposed project is found to be substantially consistent with the plan outline for water system upgrades. The improvements to the Low Zone System includes upsizing the main from 4" to 6", installing the main to a minimum depth of 30-inches, replacement of valves and upgraded fire hydrants to standard 4 inch dual outlet type.

c. Site Observations to assess existing condition of drainage, pavement, and water facilities:

We met onsite with District Staff including Bill Hansell and Harvey Pearlman, and Chief Steve Wynn. We toured the entire length of the project on Sunset Way from Highway 1 to the dead end. The Cove Lane segment was eliminated from the observation and assessment. Along the project route we observed the existing condition of the drainage system, roadway pavement, and water system. We did not include any operational observations of the water system. We did observe traffic and circulation. We did not observe any surface water runoff during the visit. A number of conditions were brought to our attention along the way that helped characterize in general why improvements were being brought forward. The following summarizes some of these observations.

The drainage condition was difficult to determine how inadequate the system is functioning. However, it is clear the system has been patched together in an effort to affect surface water runoff and concentrated flow. We observed a variety of means that included: graded roadside ditches, rock slope protection, failed and repaired pipe culverts, at grade pipes placed in roadside channels affected by sluffing, private yard downspouts discharging onto the roadway, asphalt speed bumps/water diverters, asphalt and concrete berms and other creative measures. All of these signal challenges to controlling the flow of water that has been reported to be an ongoing issue. The system was in need of maintenance and debris

and vegetation removal in order to improve conveyance. Beyond that, a unified approach with specific standard measures (i.e. culverts, inlets, etc.) will be affective in helping resolve any drainage issue.

The pavement surface is in poor condition and a candidate for resurfacing and repair. Pavement sections with significant amounts of cracks and potholing allow surface water to enter into the pavement section and cause failures. Once water gets into the pavement section it affects the integrity of the pavement section and with vehicle loading can cause sections to fail. These failures can be limited to small areas but can also grow and lead to larger failures with the potential to introduce greater amounts of water into the underlying soil. This has the potential to lead to other geotechnical issues.

The water facilities were found to be in fair condition. Along the length of the main system we observed various leaks at main valve locations and on laterals beyond the water meter on the private side. In addition to these we observed some locations where the main and service laterals on the public side were exposed. These exposed portions present vulnerability to the integrity and reliability of the system and are subject to the elements, damage, and vandalism. Each of these items should be resolved accordingly.

d. Review of opportunities for available funding and grants;

Our review did not include a detailed assessment of funding sources and programs the project would be eligible for, but intends to bring to light the fact that there are opportunities for funding and or grants for this type of improvement project. Additional work and research would need to be investigated to actually determine what is required to be eligible for programs. Below is a list of some programs for consideration.

The USDA Rural Development has Water & Waste Disposal Loan & Grant Programs. The programs provide funding for clean and reliable drinking water systems, sanitary sewage disposal, sanitary solid waste disposal, and storm water drainage to households and businesses in eligible rural areas.

The California Environmental Protection Agency State Water Resources Control Board's Division of Financial Assistance implements a number of programs that provide funding opportunities to public water systems. Programs include the following:

Drinking Water State Revolving Fund: The DWSRF provides funding to correct public water system deficiencies that pose public health risks and systems with needs for funding to comply with requirements of the Safe Drinking Water Act.

Proposition 50: Proposition 50 is the Water Security, Clean Drinking Water, Coastal and Beach Protection Act of 2002. It deals with water security, safe drinking water, and treatment technology.

Proposition 84: Proposition 84 is the Safe Drinking Water, Water Quality and Supply, Flood Control, River and Coastal Protection Act of 2006. It deals with safe drinking water supplies, including emergency and urgent funding, infrastructure improvements, and groundwater quality.

Clean Water State Revolving Fund (CWSRF): This funding program offers low cost financing for a wide variety of water quality projects.

e. Review of service/repair records for integrity and reliability of existing system;

Assessment of service and repair records was limited but included discussions with the water manager about frequency of repairs and extent. The discussion revealed the repairs were ongoing but limited to only a couple times a year and were not considered major. Most seemed to be limited to services lateral repairs, possibly valve replacements, and localized main repairs. There were no reports of the system not operating. A review of District account reports did not reveal any significant expenditures related to unexpected repairs or replacement. Based on the above the system appears to be functioning at a reasonable level. There were ongoing leaks on the private side at the meter which the MBCFD has been addressing with the homeowners. These will need to be resolved in the near future to prevent water waste and damage to the roadway.

f. Analysis of annual construction cost increases;

Construction costs do vary from year to year but in general the trend in costs continue to increase regardless of the economy. The construction cost indices published by Engineering News Record reported increases in 13 out of the past 15 years. The year over year percentage change ranged from a 0.7% decrease reported at the end of 2001 to a 7.6% increase reported at the end of 2006. In the past 15 years the construction cost index increased 51% or on average 3.4% per year.

Several factors can affect the amount of change in construction cost, but it would be appropriate to consider an allowance for annual cost increases based on the trends reported.

There have been instances reported during the great recession where certain projects saw significant decrease in the cost of construction. This was evident in some of the reported indices. Some consideration could be made to wait out the next recession in the hopes of more favorable pricing, but reliance on cost decreases resulting from an economic downturn is speculative and questionable with respect to fiduciary responsibilities.

There was no engineering opinion of probable construction cost available for the project. However, the District was able to obtain a cost proposal from an engineering contractor familiar with the type of work being proposed. The proposal was broken down into several categories and included a description of the work, quantity, total cost for each category. Our review of the proposal was limited to establishing an approximate unit costs for each

category and comparing it to similar work. The following is a summary: demolition costs were about \$2 per square foot, earthwork costs were about \$3.50 per square foot, paving costs were about \$6.50 per square foot, storm drain costs were about \$300 per lineal foot, water main costs were about \$195 per lineal foot, and concrete and retaining wall work accounted for just over \$300,000. In reviewing the unit costs we found them to be reasonable considering the scope of the project, materials selected, and project location.

g. Review fire service needs with local fire;

As a part of the review Fire Chief Steve Wynn attended the field observation and responded to inquiries about fire service access and reliability of the existing water system. Access by emergency vehicles and water reliability are critical components to providing adequate emergency services to residents and guests along the roadway.

The width of Sunset Way varies and is proposed to be increased and improved to 11-foot minimum. This is a substandard existing condition. By comparison, the County of Marin minimum driveway width serving two to six dwelling units is 16 feet. Sunset Way would be classified as a residential road providing access to twenty or more dwelling units and typically has a minimum paved width of 36-feet. Regardless, an 11-foot roadway width is limited at the least to one way traffic and vehicles passing each other must leave the paved surface in order to pass. Recognizing the physical limitations to increasing the roadway width consideration should be made when and where feasible to increase roadway widths and improve access.

The length of Sunset Way is approximately 3100 feet and with the limited width of the roadway opportunities for adding turnouts should be considered. Typically, within the County of Marin Sunset Way would include turnouts at no more than 400 feet apart with a minimum width is 18 feet for a length of 60 feet. Recognizing the physical limitations to increasing the roadway width adequately consideration should be made when and where feasible to provide turnouts and improve access.

Sunset Way is a dead-end street and should include a turnaround at the end of the roadway. Without an adequate turnaround larger emergency vehicles need to back out to escape or leave a call. This is a life safety issue for residents, guests, and emergency personnel. The proposed project incorporates a turnaround and measures should be taken to ensure it is included with the project.

Fire protection from a municipal fire hydrant within Marin County typically has a minimum flow of 500 gallons per minute for a duration of two hours and available within 350' of all portions of the envelope of structure. Average spacing of hydrants is 500 feet and is typically reduced on dead end streets. It was reported that the existing system has adequate flow and pressure, but improving hydrants would be essential to the overall reliability and operation of the system.

h. Cost impacts resulting from emergency repairs;

Cost impacts from emergency repairs is expected to be manageable. Most of the costs associated with repairs have been limited. Repairs to the system have been limited to readily available resources. Small main systems consisting of PVC pipe with glued joints and shallow depth are more easily maintained and repaired. Limitations to emergency repairs within the MBCFD would include availability of contractors, equipment, and materials. It was reported that the number of repairs are less than a few each year and have been managed without significant cost impacts. As the system continues to age the frequency of emergency repairs would be expected to increase. To help mitigate potential cost impacts a ready supply of pipe materials, fittings and backfill material should be kept locally.

i. Hydraulic analysis demonstrating changes to pressure and flow.

Fire protection from a municipal fire hydrant within Marin County typically has a minimum flow of 500 gallons per minute for a duration of two hours and available within 350' of all portions of the envelope of structure.

By comparison 500 gallons per minute of flow through a 4" PVC pipe will result in a pressure loss of 5 PSI per 100 lineal feet and the flow velocity is 12.8 feet per second. Flow through a 6" PVC pipe will result in a pressure loss of 0.7 PSI per 100 lineal feet and a flow velocity of 5.7 feet per second. Increasing the size of the main facilities will improve flow velocity and pressure loss substantially. Generally accepted safe flow velocities are in the range of 8 feet per second.

Summary and conclusions:

The above assessment of the project conditions, improvements, and plans is intended to provide information to be considered in deciding what to advance with the project. Our recommendation would be as follows:

1. Continue to move forward with the project with a definitive schedule for construction.
2. It is reasonable to extend the schedule for construction of the water system considering the life of the water system and the history of repairs. However, the recommendation would be to have it replaced by the end of the 50 year life.
3. Economic climate should not be a determining factor for when to advance this project.
4. The system deficiencies resulting from shallow depth should be improved for safety and reliability.
5. Immediate needs should include repairing leaks and correcting portions of the public main and service laterals exposed to the elements and vulnerable to vandalism.
6. Improving the road surface to mitigate the potential of further deterioration and introducing water into the subsurface soil needs to be improved.
7. Water main construction should precede any pavement reconstruction or rehabilitation.
8. Total project cost is a significant allocation of resources available to the District. Consider opportunities for available funding and grants to help mitigate allocating such a significant portion of available financial resources.
9. Provide turnouts at the appropriate spacing and provide a hammerhead at the end of Sunset Way in order to improve emergency vehicle access.
10. Portions of the project could be phased, but would lead to additional costs. This phasing would allow MBCFD to repair the roadway in a priority listing and eventually take care of the entire roadway and water system issues.

**Sunset Way Road and Water Main Improvements - Construction Phasing Options**

Option	Phases	Description	Cost Impact	Benefits	Project Duration
1	One	Water main replacement, road reconstruction including drainage improvements.	Large single year cost	All improvements completed at one time	Allow 16 weeks
2	Two	<u>Phase 1:</u> Water main replacement only; <u>Phase 2:</u> Road reconstruction including drainage improvements.	Additional cost for pavement patch over new main; second mobilization cost; annual construction cost increases; additional design, permitting, and project management costs; continued repair costs.	Cost and schedule spread over longer period. Lower cost to install water main before pavement work.	Phase 1: Allow 12 weeks  Phase 2: allow 12 weeks
2	Two	<u>Phase 1:</u> Road reconstruction including drainage improvements; <u>Phase 2:</u> water main replacement.	Additional cost for pavement patch over new main in phase 2; second mobilization cost; annual construction cost increases; additional design, permitting, and project management costs; continued repair costs.	Cost and schedule spread over longer period.	Phase 1: Allow 12 weeks;  Phase 2: allow 12 weeks
4	Two	<u>Phase 1:</u> Water main replacement <u>Phase 2:</u> Road resurfacing only (no regrading or drainage improvements);	Lower overall construction cost due to reduced scope; additional cost for pavement patch over new main; second mobilization cost; annual construction cost increases; additional design, permitting, and project management costs; continued repair costs.	Reduced construction schedule; spread costs out over longer period; shorter disruption	Phase 1: allow 6 weeks  Phase 2: allow 12 weeks
5	Multiple	Water main replacement, road reconstruction and drainage improvements in multiple phases (up to 4 sections)	Multiple mobilization costs; annual construction cost increases; additional design, permitting, and project management costs; continued repair costs.	Reduced construction schedule, but multiple disruptions; spread costs out over longer period;	Multiple phases: allow 12 weeks each
6	None	No project improvements	Escalating repair costs	No large allocation of costs for project; no long schedule of construction.	Ongoing Unscheduled repairs

Bill Hansell, Muir Beach Community Facilities District  
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Submitted by:

CSW/STUBER-STROEH ENGINEERING GROUP, INC.



Wayne F. Leach  
R.C.E. # 54309

