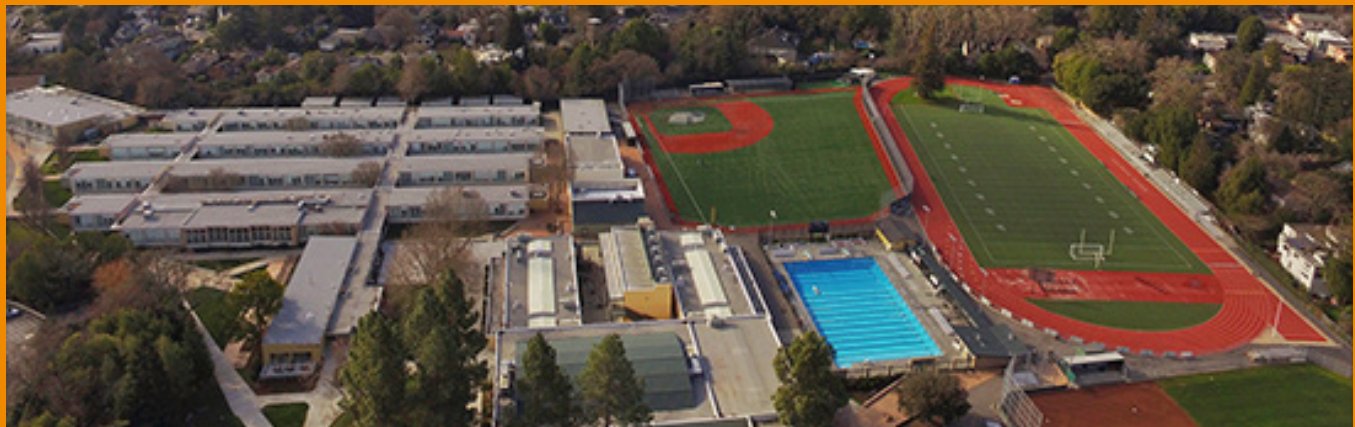

TAMALPAIS UNION HIGH SCHOOL DISTRICT

IRRIGATION SYSTEM ASSESSMENT

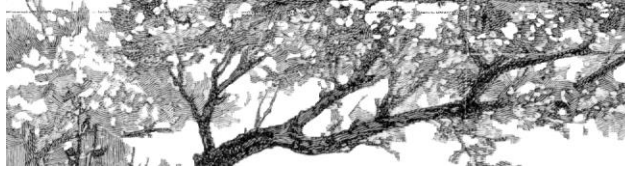
EXISTING CONDITIONS REPORT

JUNE 21, 2021



Prepared by
VALLIER DESIGN ASSOCIATES, INC.

In Association with:
Russell Mitchell Associates



June 21, 2021

Mr. Corbett Elsen, Chief Financial Officer
Mr. David O'Connor, Director of Maintenance and Operations
Tamalpais Union High School District
395 Doherty Drive
Larkspur, CA 94939

RE: TAMALPAIS UNION HIGH SCHOOL DISTRICT (TUHSD)
IRRIGATION SYSTEM ASSESSMENT EXISTING CONDITIONS REPORT

Dear Corbett and David:

Vallier Design Associates, Inc. (VDA) is pleased to present an assessment of the Tamalpais Union High School District's existing irrigation systems in order to determine replacement costs for a future system renovation/infrastructure bond measure.

We are attaching our updated existing conditions report wherein we summarize the findings of our site inventory, review of system repair history and make recommendations for campus-wide irrigation system replacement with associated costs.

We propose an overall 'green' approach to the campuses and site landscape including water use reduction through system replacement with state of the art equipment and reduction of ornamental turf areas. The proposed approach will reduce water use and be good for the education, the environment and the pocket book.

Please call me if you have any questions.

Sincerely,
VALLIER DESIGN ASSOCIATES, INC.

Marcia D. Vallier, ASLA, APA, LEED AP
President, Landscape Architect, L#3293

VALLIER DESIGN ASSOCIATES, INC.

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TAMALPAIS UNION HIGH SCHOOL DISTRICT (TUHSD)
IRRIGATION SYSTEM ASSESSMENT
EXISTING CONDITIONS REPORT

June 21, 2021

INTRODUCTION

Tamalpais Union High School District (TUHSD) is exploring the possibility of an infrastructure bond measure. As evidenced by the passage of several infrastructure bonds, California voters are keenly aware of the need to invest in facilities to support education.

The team of Vallier Design Associates, Inc. and Russell Mitchell Associates conducted an assessment of the existing irrigation systems at the District campuses in order to determine replacement costs for the potential bond measure. Our team has carefully analyzed the existing irrigation systems and offers proposed modifications that are cost effective and forward-thinking in order to win support from the community for irrigation renovation at the following sites:

- Redwood Campus including
 - Redwood High School
 - San Andreas High School
 - Tamiscal High School
 - Tamalpais Adult School
 - TUHSD District Offices
- Archie Williams High School
- Tamalpais High School
- Red Hill Sports Complex

As California's climate continues to change and drought conditions worsen and increase in frequency, water conservation is of paramount importance. The District recognizes this and is working to do their part to conserve water and in doing so will realize the public benefits of such an effort as well as large savings on water bills.

To that end, we propose an overall 'green' approach to the campuses and site landscape including water use reduction through system replacement with state of the art equipment and reduction of ornamental turf areas.

Schools have large footprints and the ultimate goal is to reduce that footprint while making the environment healthier for students and staff. The operation and maintenance of school facilities significantly impacts the community and environment and plays an important role in protecting the environment.

The greening process could be integrated into the curriculum and get students, staff and the community thinking about solutions to the environmental problems we face. This can be achieved by conserving water, reducing ornamental turf areas, enlarging stormwater treatment areas and planting trees to create shaded hardscape and open space resulting in reducing heat island impact. The benefits of a tree canopy versus ornamental turf areas are substantially less water use, reduced air temperatures, improved air quality, increased carbon sequestration, improved watershed function/reduction in flooding, decreased energy costs as well as the social benefits of reduced noise and stress.

PROJECT START UP

The team met with David O'Connor, Maintenance and Operations Director on May 11 and May 12, 2021 to review available irrigation as-built plans and repair data and to establish goals for the irrigation assessment inventory. The team conducted a field evaluation tour of each campus within the Tamalpais Union High School District (TUHSD) on May 18, 2021 with the District's lead grounds person, Pablo Correa to review and document the existing irrigation systems and determine current condition. During the site tour, the team questioned staff to help identify overall and site specific issues with the systems and impediments to maintenance and site use.

Below are the recommended actions for the District's irrigation systems based on the inventory of each site.

- Separate irrigation water supply from domestic and fire water meters to comply with the State of California's Water Efficient Landscape Ordinance (WELO)
- Install isolation valves to separate irrigated areas to ease maintenance and reduce water leaks and usage
- Install flow sensor and master valve at each meter to monitor water use and detect leaks
- Install central irrigation control systems with smart controllers to regulate water use based on daily weather data and detect and shut down leaks to comply with WELO
- Install a two-wire control system in conduit to operate remote control and isolation valves
- Install HDPE 'flexible' main line to eliminate breakage due to ground settlement issues, lateral lines to remain PVC for ease of maintenance
- Install water efficient irrigation equipment to target irrigation where it is needed and reduce water use
- Install remote control valves, heads and irrigation equipment adaptable to reclaimed/recycled water usage including purple pipe and identifiable lids and labels
- Reduce the areas of non-sports turf landscape areas and convert to low-maintenance shaded spaces with trees, woody ground covers in mulched beds to sequester carbon and cool nearby structures and gathering areas
- Work with Marin Municipal Water District to identify and control leaks and reduce water consumption within all water systems including domestic, fire and irrigation

SITE ASSESSMENT

The team conducted a field evaluation tour of each campus within the Tamalpais Union High School District (TUHSD) with the District's maintenance staff to review and document the existing irrigation systems and determine current condition. During the site tour, the team questioned staff to help identify overall and site specific issues with the systems and impediments to maintenance and site use. The irrigation system is currently only watering turf and all shrub beds and landscape areas have been turned off to save water. Below is an inventory of each site's irrigation system.

REDWOOD CAMPUS, 395 Doherty Drive, Larkspur, CA 94939

Redwood High School

WATER METERS AND BACKFLOW PREVENTERS

- Two dedicated irrigation meters service most of the irrigation on the campus; one 2" and one 3".
- Endriss Field and track are not serviced from dedicated irrigation meter and are connected to the campus domestic meter. A 4" backflow protects the domestic water from this irrigation system.
- A small section of irrigation near building 300 is fed from a ¾" backflow off the building.

FLOW SENSOR AND MASTER VALVE

- Only one flow sensor and master valve is installed (meter near the entrance) but they are not operational from the controller.

ISOLATION VALVES

- Very few isolation valves exist on the system which creates issues when repairs are required.

CONTROLLERS

- There are 6 existing Rain Master DX2 controllers that operate the campus. All are stand alone with no communication to a central computer.

STATIONS

- There are roughly 170 remote control valves that service all the irrigation on campus.
- Six valves in Endris field have lost communication to the controller due to wiring issue and have battery operated valves.

OPERATION AND RUN TIMES

- Irrigation operates roughly 8-9 hours during the night in the summer months on the fields.
- Most turf rotor valves run 3 days a week for 25-30 minutes per day.

Tamalpais Adult School

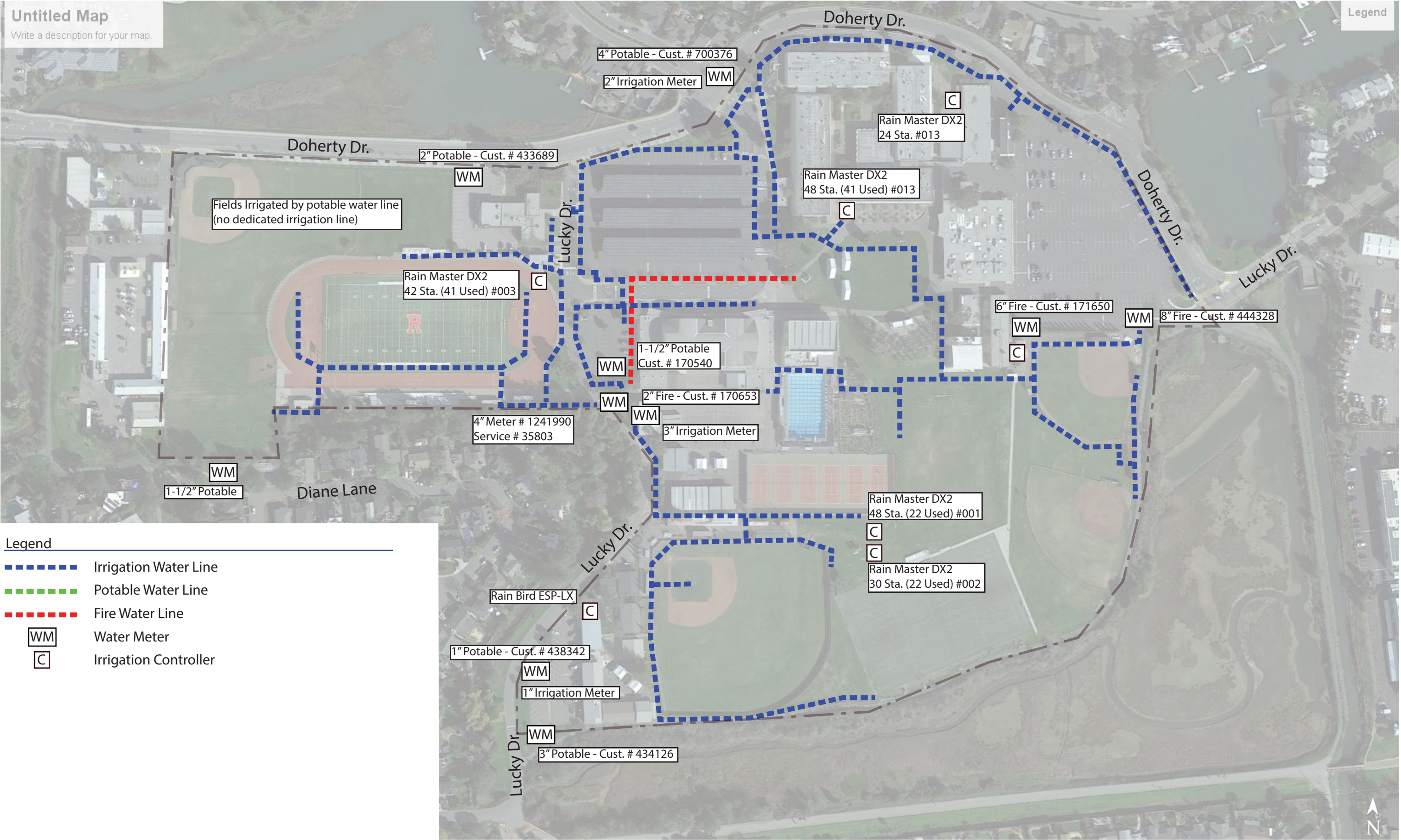
- The irrigation around this campus is serviced off the Redwood HS irrigation main line and controller.
- There is minimal planting and some turf around this school.
- Most valves are operational from controller #003 but some of the turf area in front has a battery controller at the valve because the wire from the controller is broken.

Tamiscal High School

- The irrigation around this campus is serviced off the building through a double check valve off the domestic service.
- There is one Rain Dial controller that has 3 stations.
- There is minimal planting around this school.

San Andreas High School

- The irrigation around this campus has a dedicated irrigation meter (1") and 1" backflow.
- One Rain Bird ESP-LX 12 station controller operates all the valves around this site.



Redwood High School Overall Site Water Plan

June 21, 2021

SHEET NO.
1 of 1

ARCHIE WILLIAMS HIGH SCHOOL, 1327 Sir Francis Drake Boulevard, San Anselmo, CA 94960

WATER METERS AND BACKFLOW PREVENTERS

- There are a total of eight meters on site, two 3" dedicated irrigation meters service most of the irrigation on the campus with four additional domestic meters, one 2" and one 3" with irrigation tapped into them. Two meters are for fire water
- There are two main areas of irrigation (softball field and the turf areas between the buildings).
- The source of water for the turf irrigation between the buildings is not known. Further investigation is required, and an additional backflow may be required.

FLOW SENSOR AND MASTER VALVE

- Only one flow sensor and master valve is installed (for the softball field) but they are not operational from the controller.

ISOLATION VALVES

- No isolation valves exist on the system which creates issues when repairs are required.

CONTROLLERS

- There are 4 existing Rain Master DX2 controllers and 1 Rain Master Eagle that operate the campus. All are stand alone with no communication to a central computer or to a cloud-based server

STATIONS

- There are roughly 107 remote control valves that service all the irrigation on campus.

OPERATION AND RUN TIMES

- Most turf rotor valves run 3 days a week for 25-30 minutes per day.

TAMALPAIS HIGH SCHOOL, 700 Miller Avenue, Mill Valley, CA 94941

WATER METERS AND BACKFLOW PREVENTERS

- There are ten meters on site. Two are dedicated irrigation meters, one 3" and one 2" service most of the irrigation on the campus. There are two 4" and a 1" meter that provide potable water. Five are fire water meters.
- The 3" meter on the southeast side of the campus also feeds one of the buildings. A separate backflow is needed to protect the domestic water from the irrigation system.
- There are two (2) 2" backflow preventers on the southwest side of the campus that appear to be serviced off the domestic water meter. What they backflow service is unknown.
- The 3" meter has two (2) 2" backflows downstream that service the fields.

BOOSTER PUMP

- A booster pump is installed downstream of the backflow but it has not been used in many years and the water just passes through the pump to the fields. The static water pressure is high in this area and no booster is needed.

FLOW SENSOR AND MASTER VALVE

- Only one flow sensor and master valve is installed (for the field) but they are not operational from the controller.

ISOLATION VALVES

- No isolation valves were located on the system which creates issues when repairs are required.

CONTROLLERS

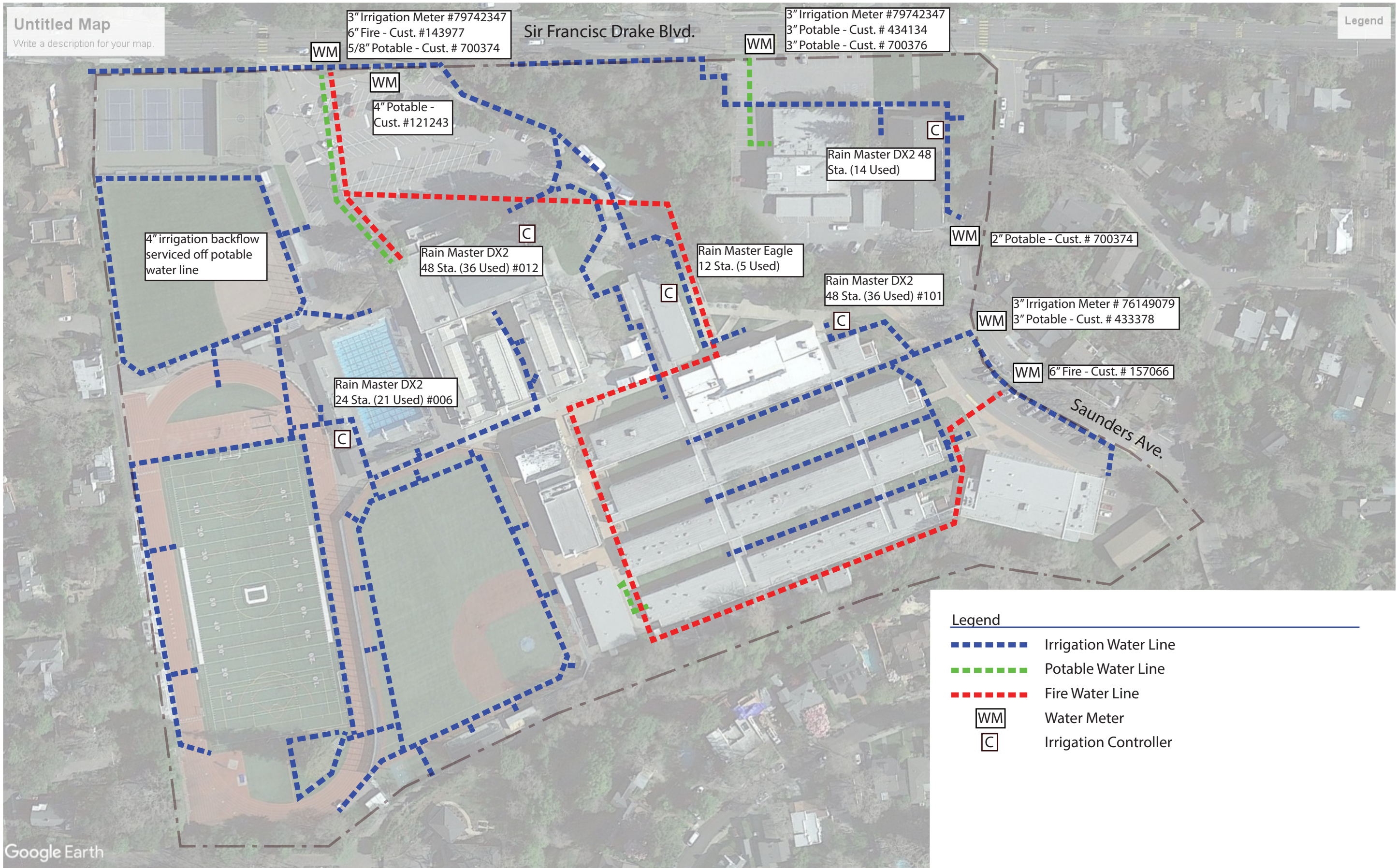
- There are six (6) total controllers that operate the campus; five (5) existing Rain Master DX2 controllers and one (1) Rain Master Sentar controller. All are stand alone with no communication to a central computer.

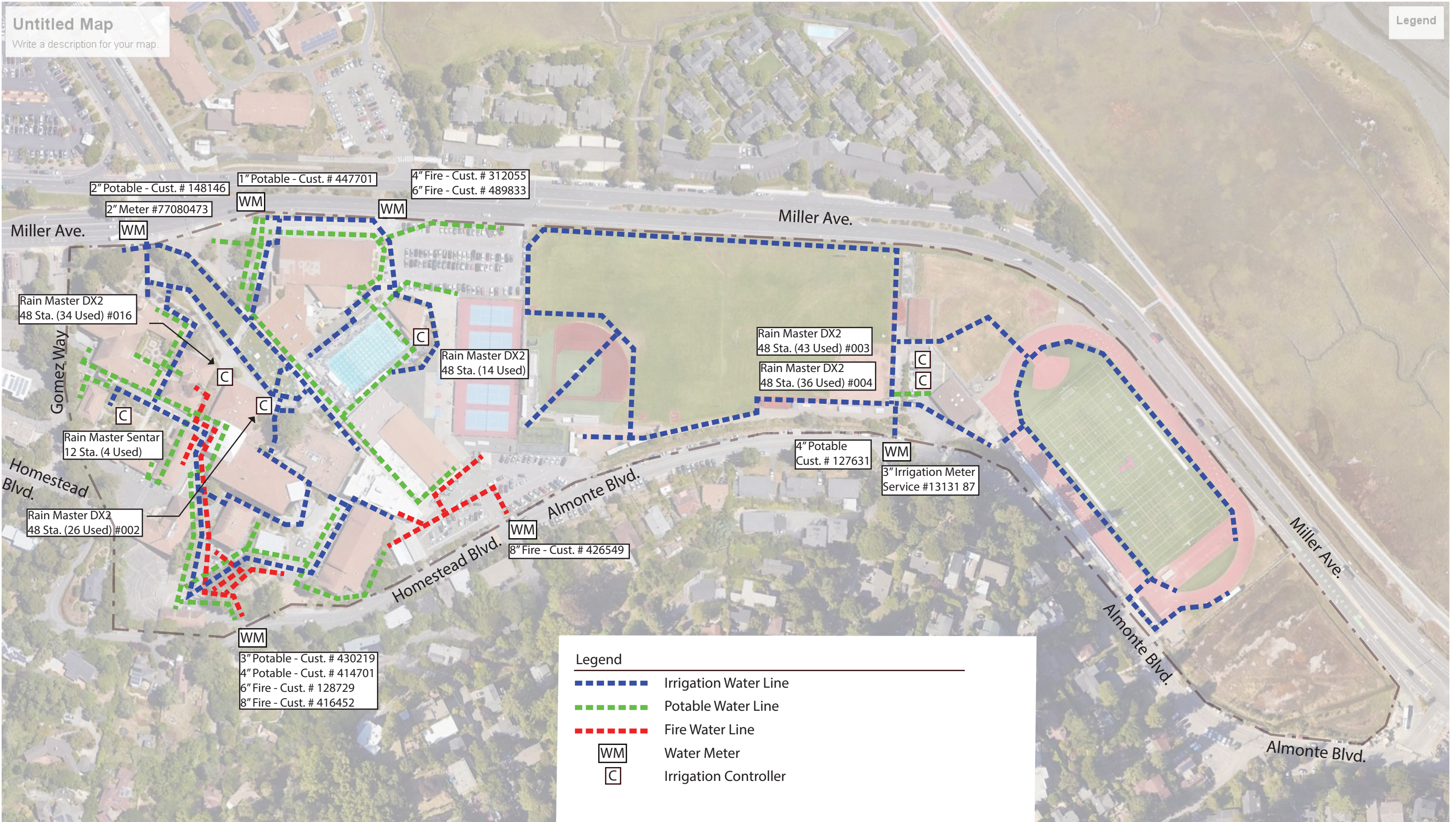
STATIONS

- There are roughly 157 remote control valves that service all the irrigation on campus.

OPERATION AND RUN TIMES

- Most turf rotor valves run 3 days a week for 25-30 minutes per day.
- Irrigation operates roughly 12 hours per day to get all the valves in fields to operate





RED HILL COMMUNITY PARK, 198 Shaw Drive #114, San Anselmo, CA 94960

- The irrigation around this park has been turned off because the field is artificial turf.
 - The irrigation does not appear to have a dedicated irrigation meter and is connected downstream of the potable meter with a separate backflow.
 - There is a Tucor RKD two wire controller that operates the valves.
 - There is one (1) 2" backflow, master valve, and flow sensor that can manage the system when it is operational.
-

STAFF COMMENTS

The District is short staffed which is creating a great deal of pressure on the limited grounds staff. The irrigation controllers all have to be operated and adjusted manually, in person which is very time consuming. Irrigation to shrub beds and landscape areas have been turned off and only turf areas are being irrigated. Due to time and equipment limitations, small repairs are made by in-house staff while larger repairs utilize the services of an outside engineering company. A majority of the repairs are due to irrigation wiring failures or breaks, main line ruptures and physical damage to exposed equipment.

REPAIR RECORDS ASSESSMENT

Ten years of internal work orders were reviewed along with invoices and reports from outside resources to identify trouble spots and reoccurring issues with the systems. The primary issue has been main line breaks and leaks and water supply line failures due to age. Control valve, quick coupler and sprinkler head failures occur less frequently than line breaks and leaks. A majority of sprinkler head failure is typically due to physical damage or vandalism.

CODES AND REGULATIONS

The District's irrigation water use is regulated by two entities, the California Department of Water Resources (DWR) and Marin Municipal Water District. Many of the District's irrigation systems are not in compliance due to their age and our proposed plan will help bring systems into compliance through a phased process.

DWR monitors compliance with water use targets through the State's Water Efficient Landscape Ordinance (WELO) and provides the California Irrigation Management Information System (CIMIS) which collects and provides crucial weather data to the public for irrigation scheduling, weather forecasting, and scientific research. DWR also manages the Land and Water Use Program which develops water use estimates used in statewide water planning efforts to support its efficient use.

The Water Efficient Landscape Ordinance (WELO) is a statewide water conservation law for new and renovated landscapes. The ordinance applies to any public, institutional or commercial project site meets one of these size thresholds: new construction projects with a total landscape area greater than 500 square feet and rehabilitations of existing landscape with a total landscape area greater than 2,500 square feet. Irrigation systems are required to have:

- dedicated irrigation meters for landscape areas over 1,000 square feet,
- pressure regulation to ensure correct and efficient operation,
- water efficient equipment
- flow sensors that detect and report high flow conditions due to broken pipes and/or popped sprinkler heads, and
- master shut-off valves that prevent water waste in case of large failures of irrigation systems due to breakage or vandalism.

Marin Municipal Water District dictates the amount of water designated to the District at all its campuses through water entitlements and estimated water budgets which is the maximum amount of water MMWD is committed to provide non-residential customers on an annual basis.

The water budget is MMWD's determination of the actual consumption requirement based on square footage calculations. The District is billed at a certain rate for the allocated water and anything over is charged at a higher rate. The goal of our proposed plan is to reduce costs and bring irrigation water use into compliance with the water budgets through system renovation and replacement.

FINDINGS

Most of California's K-12 school facilities are in good condition thanks to Bond Programs that have funded upgrades to campuses including new or renovated structures, installation of new roofing systems, fire alarms, ADA access, electrical, HVAC and technology, etc. This includes the work from TUHSD's recent Bond Program. As Bond projects come on line, there is typically a lack of adequate funding for routine and major maintenance of the new and existing facilities, taxing already short staff and tight budgets.

The District campuses have a large amount of infrastructure that requires annual operation and maintenance spending. Most school districts underspend on operations and maintenance of their facilities due to decreasing budgets and higher operation costs. Historically operation and maintenance have been funded from district operating budgets and some State funds. However, due to low and sometimes fluctuating funding sources, maintenance projects are frequently deferred, leaving some elements of our school facilities in a weakened state.

Deferred maintenance and antiquated equipment are costly in wasted staff time and spending on short term repairs. This reactionary approach creates a lot of pressure on the grounds staff and generates negative feedback from school site staff and the community.

In general, the TUHSD irrigation systems are operational and the staff is doing a good job maintaining the sites with the resources they have available. Again, a great deal of time and money is spent on repairs and chasing irrigation leaks. Additionally, there are issues that require modification to comply with State and Local codes and to be water efficient. We suggest a coordinated approach to the on-site potable, fire and irrigation water systems and are working with Clark Civil Engineering to identify issues with the water systems on site.

Our research shows that there is a great deal of unexplained water usage and suspected leaks. We believe the leaks and repairs are due to the age of the existing infrastructure, with much remaining from the original construction. In addition, the campuses have undergone a great number of modernization projects that have tapped into these old, existing utility systems creating a fragmented and intermingled infrastructure system. Bond programs typically don't have the budgets to replace antiquated or existing systems and tie into the closest existing point. This has resulted in the water system being fragmented between old and new, with differing materials, strengths and standards and in some cases, intermingling of water uses on what should be separate systems.

We're seeing the results of aging infrastructure now. Of the 42 billion gallons we consume daily, nearly six billion is lost due to leaking or severed pipes. The U.S. is averaging water main breaks nearly once every two minutes across the country, or 240,000 per year. Take Some Time Today to Imagine a Day Without Water October 23, 2019 By: Kevin Longley

Our team recommends a two phase approach; first to address water leaks and separate irrigation water meter crossovers followed by irrigation system replacement funded by a future infrastructure bond program.

PHASE I – Irrigation System Isolation and Leak Detection

In Phase I, the team proposes to work with MMWD to identify and resolve the immediate water loss issues at all sites. We will work with maintenance staff and MMWD to identify the problem areas, then will provide budget estimates and timelines for first phase of leak resolution and irrigation system renovation. The work and the equipment to be installed will be reused in Phase II so there will be no waste.

The meters that supply irrigation water vary between those dedicated for irrigation only and those that are tapped off domestic meters or existing buildings. The State of California Water Efficient Landscape Ordinance (WELO) requires dedicated irrigation meters for projects over 5,000 square feet. Those systems that are not dedicated to irrigation only are charged at the higher potable water rate which includes sewer fees. An immediate and substantial savings would be realized by separating the irrigation water from domestic meters.

Additional sub-metering would be installed at key points on domestic, fire and irrigation to target problem areas and isolate leaks and use areas. The domestic and fire water sub-meters would be located and would stay in place to monitor future flow and detect unexpected water usage at the buildings which would help District Maintenance & Operations staff locate, identify and resolve issues more quickly.

New irrigation backflow preventers, flow sensors and master valves would be installed downstream of the dedicated irrigation meters. There are very few campus irrigation systems with flow sensors and master valves. Those that have the units are not integrated with an irrigation controller that can recognize leaks. It is recommended that 'Smart' controllers be installed in Phase I and connected to flow sensors and master valves to track water use and detect leaks. Existing irrigation controllers are antiquated and operated manually and have flow sensing, weather data and rain shut off capabilities. MMWD has the WaterSense Smart Irrigation Controller grant program that would offset some of the cost of new controllers.

Next, isolation valves would be placed at strategic locations along the irrigation main lines to separate landscape areas creating distinct zones and capturing the problem areas. For example, sports fields would be separated from adjacent landscape areas so each may be isolated when problems occur and/or watered when other areas are turned off. Existing isolation valves, when present are manual and not operated off a controller. These valves would also be positioned to divide the campus system in to project areas for phased renovation over time.

Installation of 'smart' controllers, which are required by WELO would bring the District into compliance. Smart controllers are automatically operated, use weather and evapotranspiration data and/or soil moisture and rain sensor data to determine the amount of water to be applied to the landscape. The controller memorizes how much water is used by each control valve or zone, by season. If the flow sensor shows that the water use of a particular zone is higher than expected or is running at an unscheduled time indicating a leak, the controller detects the change in flow and closes the master valve to stop the water flow and the leak. A flow sensor measures your irrigation water use and flow and can work with an irrigation controller to stop sprinkler geysers from a break or damage, alert you to broken pipes and leaks, and measure and monitor water use. Isolation valves would be connected to and

operated from these controllers. Smart controllers have battery back-up so programming data is not lost in the event the primary power source is interrupted.

An additional benefit of 'smart' controllers is that they, and the systems they control can be activated and monitored remotely on a smart phone or District desktop computer. This would save the grounds staff from having to go from site to site to manually adjust or operate controllers. Additionally, issues and leaks are detected and locations documented immediately. Again, the main lines are shut down stopping the leak and saving water and considerable staff time

Phase I work could be funded by state grants through MMWD or paid for with savings on District water bills.

PHASE II – Irrigation System Replacement

Phase II work would include full irrigation system replacement and would pick up after the master valves installed in Phase I. Elements not installed in Phase I would be installed in Phase II.

The work would include the installation of a cloud based system like WeatherTRAK or Rainmaster Eagle with smart controllers that regulate water use based on daily weather data and with capability to detect and shut down the system if leaks occur. The controllers would be connected to Phase I or new flow sensor and master valve systems at each dedicated irrigation meter to monitor water use and detect leaks. Installation of a two-wire remote control system in conduit would be installed to connect the controllers to each station. Remote control valves and irrigation equipment would be selected to be compatible with reclaimed/recycled water usage.

New HDPE main lines would be installed throughout each campus connected to Phase I isolation valves. Water supply lines and irrigation main lines fail at a high rate and the flexible pipe would eliminate breaks due to ground settlement. Lateral line pipe will remain as PVC for ease of maintenance. Lines would be purple reclaimed water pipe and valves and other equipment would have identifiable lids and labels to signal non-potable water. All sprinkler heads and bubblers would be selected to be the most water efficient, durable models that target irrigation where it is needed and reduce water use.

Another cost and water reduction measure would include changing non-sports turf landscape areas to low-maintenance shaded spaces with trees, woody ground covers in mulched beds to sequester carbon and cool nearby structures and gathering areas. The price to convert these areas from turf to shaded spaces will be factored in as an alternate cost.

COSTS:

We have generated a rough order of magnitude cost to replace the existing irrigation system and equipment using square footage pricing. The cost is separated by natural grass sports turf and ornamental turf areas, ornamental shrub bed landscape areas, artificial turf and naturalized, non-irrigated areas.

The square foot cost not only includes installation and irrigation equipment replacement of remote control valves and wiring, lateral line and sprinkler heads but also the cost repair to landscape and any construction impacts or damage to hardscape. We are assuming eventual conversion of most of the ornamental turf to shaded landscape areas but we offer in kind replacement costs that will cover wither ornamental turf irrigation or conversion away from turf at a later date.

	Quantity	Item Cost	Estimated Cost
REDWOOD CAMPUS			
Connect 4" backflow that services Endrsiss field to 3" irrigation meter located in the middle of campus	1	\$7,500.00	\$7,500.00
Backflow assemblies at each meter	3	\$7,500.00	\$0.00
Flow Sensor and Master Valve at each meter	2	\$7,500.00	\$15,000.00
Smart Controller(s)	6	\$15,000.00	\$90,000.00
Isolation valves (estimated # for Phase 1)	12	\$5,000.00	\$60,000.00
Main line (included in sq/ft cost)			
Sports turf (natural grass)	249,000	\$10.00	\$2,490,000.00
Ornamental Turf (natural grass)	53,100	\$12.00	\$637,200.00
Shrubs	11,200	\$8.00	\$89,600.00
Artificial Turf – (QCVs only)	157,000	\$3.00	\$471,000.00
Non-Irrigated natural grass (Non-irrigated)	214,000		\$0.00
		Total	\$3,860,300.00
ARCHIE WILLIAMS HIGH SCHOOL			
Connect 4" backflow that services fields to irrigation meter located at SFDB	1	\$20,000.00	\$20,000.00
Backflow assemblies at each meter	3	\$7,500.00	\$0.00
Flow Sensor and Master Valve at each meter	2	\$7,500.00	\$15,000.00
Smart Controller(s)	5	\$15,000.00	\$75,000.00
Isolation valves	12	\$5,000.00	\$60,000.00
Main line (included in sq/ft cost)			
Sports turf (natural grass)	37,000	\$10.00	\$370,000.00
Ornamental Turf (natural grass)	60,500	\$12.00	\$726,000.00
Shrubs	7,200	\$8.00	\$57,600.00
Artificial Turf – (QCVs only)	112,000	\$3.00	\$336,000.00
		Total	\$1,659,600.00

TAMALPAIS HIGH SCHOOL			
Meter conversion	0	Existing	\$0.00
Backflow assemblies at each meter	3	\$7,500.00	\$0.00
Flow Sensor and Master Valve at each meter	2	\$7,500.00	\$15,000.00
Smart Controller(s)	6	\$15,000.00	\$90,000.00
Isolation valves	12	\$5,000.00	\$60,000.00
Main line (included in sq/ft cost)			
Sports turf (natural grass)	170,000	\$10.00	\$1,700,000.00
Ornamental Turf (natural grass)	16,400	\$12.00	\$196,800.00
Shrubs	64,400	\$8.00	\$515,200.00
Artificial Turf – (QCVs only)	113,600	\$3.00	\$340,800.00
		Total	\$2,917,800.00
	Quantity	Item Cost	Estimated Cost
RED HILL COMMUNITY PARK			
(IRRIGATION IS TURNED OFF EXCEPT FOR COMMUNITY GARDEN)			
Meter conversion	1	Existing	\$0.00
Backflow assemblies at each meter	1	Existing	\$0.00
Flow Sensor and Master Valve at each meter	1	Existing	\$0.00
Smart Controller(s)	1	\$15,000.00	\$15,000.00
Isolation valves	Not required		\$0.00
Main line	Not required		\$0.00
		Total	\$15,000.00

