2018 Supplemental West Point Water System Master Plan

Calaveras County Water District

Calaveras County, California

Prepared for:

Calaveras County Water District
120 Toma Ct.
San Andreas, CA 95249

Prepared by:

KASL Engineering, Western Hydrologics, and ECORP Consulting, Inc.

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1.0 INTRODUCTION, PURPOSE, AND SCOPE

1.1 Water System Master Plan Background

The Calaveras County Water District (CCWD or District) owns and operates the West Point Water system which provides potable water service to approximately 600 residential and commercial customers located in the Calaveras County communities of West Point, Wilseyville, Bummerville and Railroad Flat. Raw water is supplied to the system with existing diversions from Bear Creek and the Middle Fork of the Mokelumne River. Bear Creek supplies originate from a smaller watershed that is tributary to the Middle Fork of the Mokelumne River. During anything less than above average water years the year-round water supply from Bear Creek has been unreliable. Raw water from the Bear Creek diversion flows, by gravity, to the District's Regulating Reservoir located near the West Point Water Treatment Plant (WTP). CCWD supplements the Bear Creek supply with Middle Fork Mokelumne River water purchased through an agreement with the Calaveras Public Utility District (CPUD). Middle Fork Mokelumne River is pumped to the West Point WTP but can also be temporarily stored in the District's Regulating Reservoir. There is a small dam, Wilson Dam, located upstream of CCWD's Bear Creek Diversion which is non-functioning and does not store any water. Upstream of the District's Middle Fork Mokelumne River Pump Station intake is Schaads Reservoir, owned and operated by the CPUD.

The West Point WTP was improved and expanded in the early 2000s and provides treated water capacity up to one million gallons per day (MGD). This capacity is adequate to serve existing West Point area customers, with additional capacity available to serve existing plus new customers projected through the year 2100. Similarly, treated water storage has been recently expanded at the West Point WTP which adequately meets existing and projected Maximum Day Plus Fire Flows and Peak Hour Demands.

In 2004, the District received a Water System Improvements Final Feasibility Report (HDR, November 2004) which included recommended water supply, storage and distribution improvements for the West Point service area. These elements were also incorporated into the 2005 West Point Water System Master Plan (HDR, May 2005), which is also the last time the Water System Master Plan was updated. Many of the improvements recommended in the 2004 Feasibility Study and 2005 West Point Water System Master Plan have been implemented including water system distribution improvements within West Point and Wilseyville, the Bummerville Water Storage Tank replacement and a new 16-inch diameter HDPE raw water pipeline from the Bear Creek diversion. Water Master Plan elements included in the 2004 Feasibility Report which have not yet been implemented include:

- Improvements to increase the capacity and stability of Wilson Dam
- Improvements to increase the capacity of the West Point Regulating Reservoir
- Possible modifications to the Bear Creek Diversion
- New intake facilities at the Middle Fork Mokelumne River (MFMR) Pump Station
- Improvements to increase the capacity of the MFMR Pump Station
- Replacement of the MFMR pipeline from the new MFMR pump station to the West Point WTP

- Improvements to the Bummerville Distribution System

In addition, the District has identified the construction of additional West Point Water Treatment Facilities for redundancy as a critical Master Plan need.

The above-listed West Point area storage, diversion, piping and pumping improvements to meet existing and future demands in the West Point water service area are the principal subjects of this Master Plan Report.

Recently, ECORP Consulting, Inc. (ECORP) prepared a report which identified Calaveras County's long- term demands for Mokelumne River water (Calaveras County Mokelumne River Long-Term Water Needs Study, ECORP, October 2017). Although that study was a county-wide evaluation, updated long-term demands were specifically determined for the West Point service area and are included in this Study.

Storage improvements for Wilson Dam and the West Point Regulating Reservoir, and capacity improvements to the MFMR pump station and pipeline were recommended for further consideration in the conclusions of the Long-Term Needs Study. Also included in this Study are findings and recommendations in the Long-Term Needs Study regarding CPUD's Schaads Reservoir and improvements to the Middle Fork Mokelumne River water supply. This study is meant to be supplemental to the 2005 West Point Water System Master Plan, in that it is focused on infrastructure necessary for water supply reliability and resiliency.

1.2 Existing Location / Existing Facilities

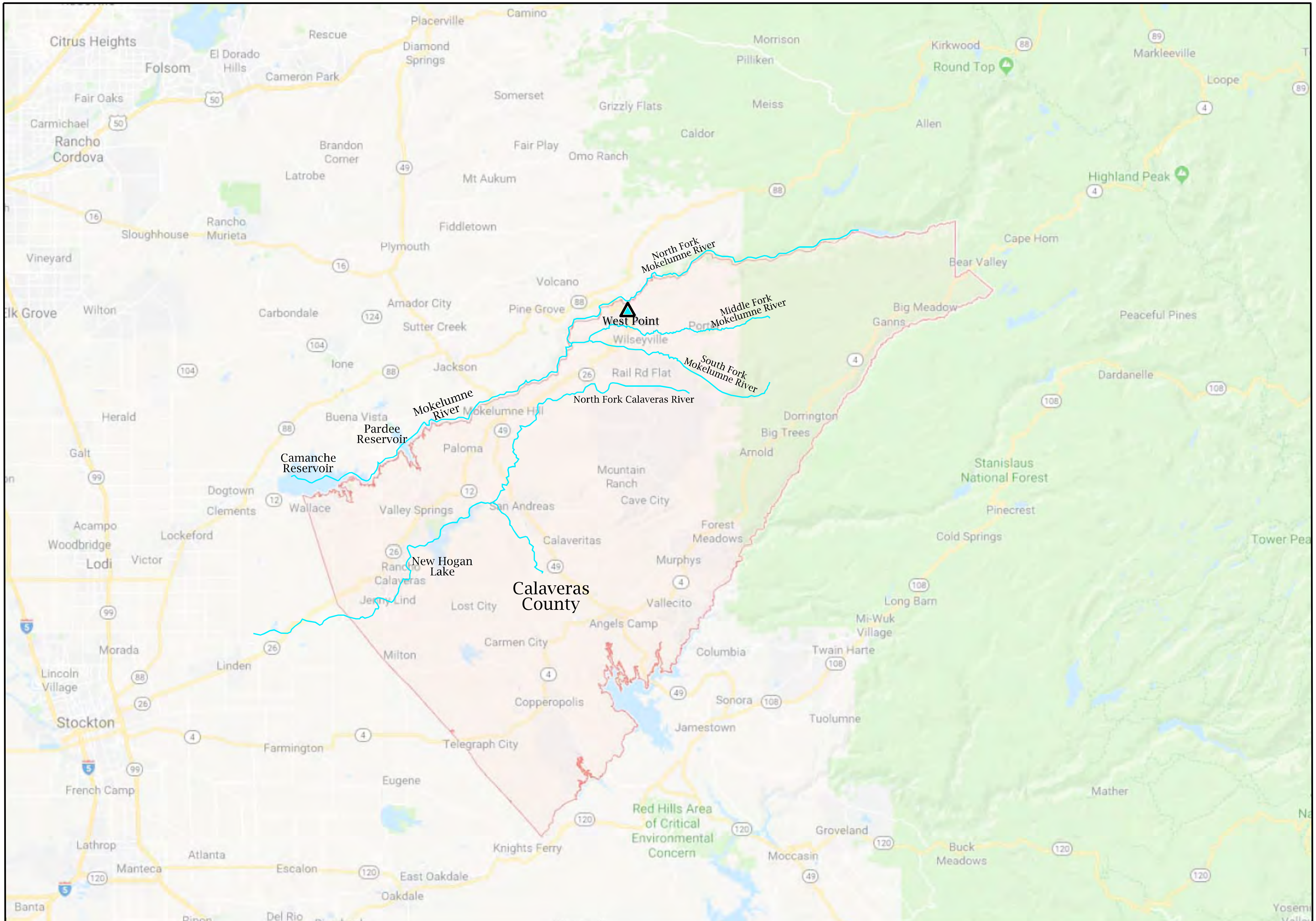
1.2.1 Location

West Point, and surrounding communities served by the West Point Water System, are located in the north central section of Calaveras County and the CCWD boundaries. A location map is presented in **Figure 1.**

The principal facilities discussed in this Supplemental West Point Water System Master Plan; Wilson Dam, the Bear Creek Diversion and Pipeline, the West Point Regulating Reservoir, the Middle Fork Mokelumne River Pump Station and the Middle Fork Mokelumne River raw water supply pipeline are shown with respect to the West Point WTP in **Figure 2**. Existing Schaads Reservoir and a possible Forest Creek - Middle Fork Reservoir site are located upstream of the MFMR diversion.

1.2.2 Wilson Dam

Wilson Dam is located upstream of the District's Bear Creek Diversion. According to available records, Wilson Dam was originally constructed about 1937 by the predecessor to Sierra Pacific Industries, which has landholdings surrounding the small reservoir. The existing embankment is approximately 25 feet high and approximately 150 feet long. The current operating capacity is approximately 25 acre-feet (AF), the facility has no usable outlet control and doesn't allow for the District to actively store and manage water supplies. Due to stability concerns, CCWD lowered the maximum operating levels below 25 feet in the 1990's. With year-round releases and losses due to seepage and lack of functioning outlet controls, there is currently no reliable storage in Wilson Dam when needed during summer-fall months. If Wilson Dam were improved, operated at its available capacity and the original spillway elevation, the size would then subject the facility to Division of Safety of Dams (DSOD) regulations.



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West Point Location Map

FIGURE 1

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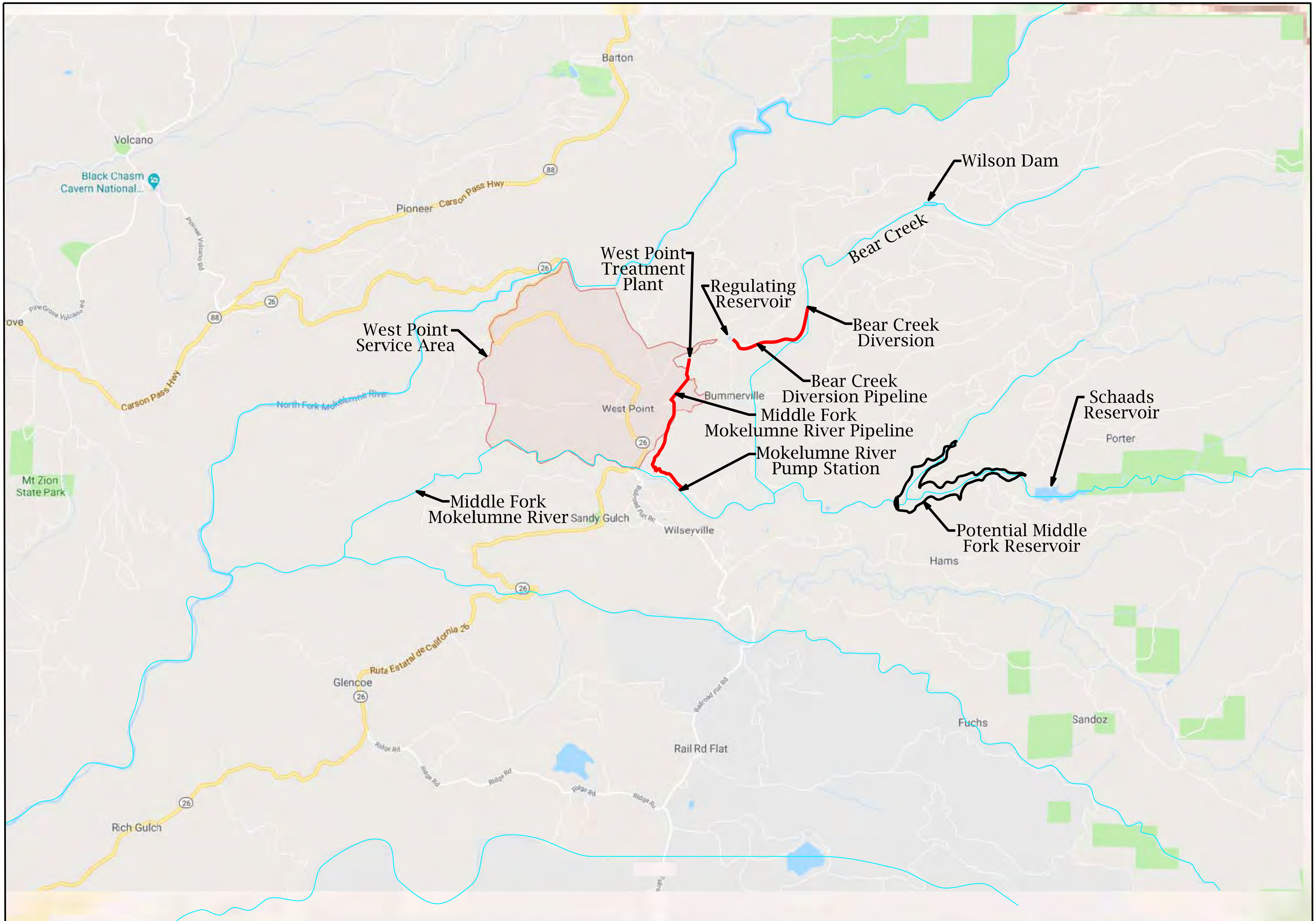

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Location of West Point Facilities

FIGURE 2

Exploratory dam safety investigations conducted by Woodward Clyde-Sherard in 1963, revealed that the original construction of the dam embankment did not make provision for under seepage cutoff. Consequently, the reservoir seeps through the underlying material and along the drain pipe and a sinkhole has developed along the upstream embankment slope. The sinkhole was repaired in late 2017 but does not address the underlying design issues with seepage. Investigations during summer months also confirm that the outlet drain pipe is damaged.

Existing conditions at Wilson Dam are shown in **Figure 3.**

CCWD requested the evaluation of Wilson Dam modifications including consideration of the following alternatives:

1. Repair the existing embankment, correct underlying seepage, replace the damaged outlet works and restore or expand the storage capacity of Wilson Reservoir consistent with the recommendations of the Long-Term Mokelumne River Water Needs Study.

2. Repair the existing embankment, correct underlying seepage, replace the damaged discharge pipe but reduce the height of the embankment and the spillway so that a reduced volume of water is retained but recreational and aesthetic values of the impoundment are kept.

3. Remove the embankment and damaged pipe and pursue a meadow restoration project in the existing upstream impoundment area, and immediately adjacent upstream reaches.

In the Mokelumne River Long-Term Water Needs Study, ECORP determined that restoration of Wilson Dam and expansion to provide up to 50 AF of available storage may be beneficial to the West Point service area and should, therefore, be considered and evaluated further. The benefits and costs of Alternatives 1, 2 and 3 described above will be considered in this Supplement to the Master Plan.

1.2.3 Bear Creek Diversion Structure and Pipeline

Water from Bear Creek is diverted via a permanent concrete check dam to the Bear Creek Diversion structure and pipeline. A culvert pipe equipped with a slide gate is used to regulate the rate of diversion. The check dam frequently fills with sediment. Diverted water is passed to a small concrete stilling basin and then through a Parshall type flume to the Bear Creek Raw Water Supply Pipeline. The flow measuring equipment that was initially installed at the Parshall Flume has been removed. The diversion structure is located in a relatively remote area along the Creek which makes it difficult to secure equipment installed at this location. In addition, where the diversion is located, the depth of the canyon makes it impractical to provide radio transmission of flow conditions to the West Point Water Treatment Plant. Existing conditions at the Bear Creek Diversion Structure are shown in **Figure 4**.

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Wilson Dam

FIGURE 3

Bear Creek Diversion

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FIGURE 4

Currently, there is no consistent flow measurement of water entering the Bear Creek Diversion. The District is permitted to divert up to 4 cfs from the Bear Creek and up to 150 acre-feet annum, by storage. The District does measure and record the flow from the Regulating Reservoir to the West Point WTP. This flow can be a mix of Bear Creek and Middle Fork Mokelumne River water. A reliable flow measuring device is needed at the discharge of the Bear Creek pipeline into the Regulating Reservoir. Bear Creek flow metering alternatives are discussed in this Supplement to the Master Plan.

After the 2004 West Point Feasibility Study was completed, CCWD authorized the construction of a replacement of the Bear Creek Diversion Pipeline. The reconstructed pipeline followed the alignment of the pre-existing pipeline which was built by logging corporations and the West Point Ditch Company prior to CCWD ownership of the system beginning in 1954. The existing pipeline is constructed with a 16-inch High Density Polyethylene (HDPE) pipe. No additional improvements to the Bear Creek Pipeline are proposed at this time.

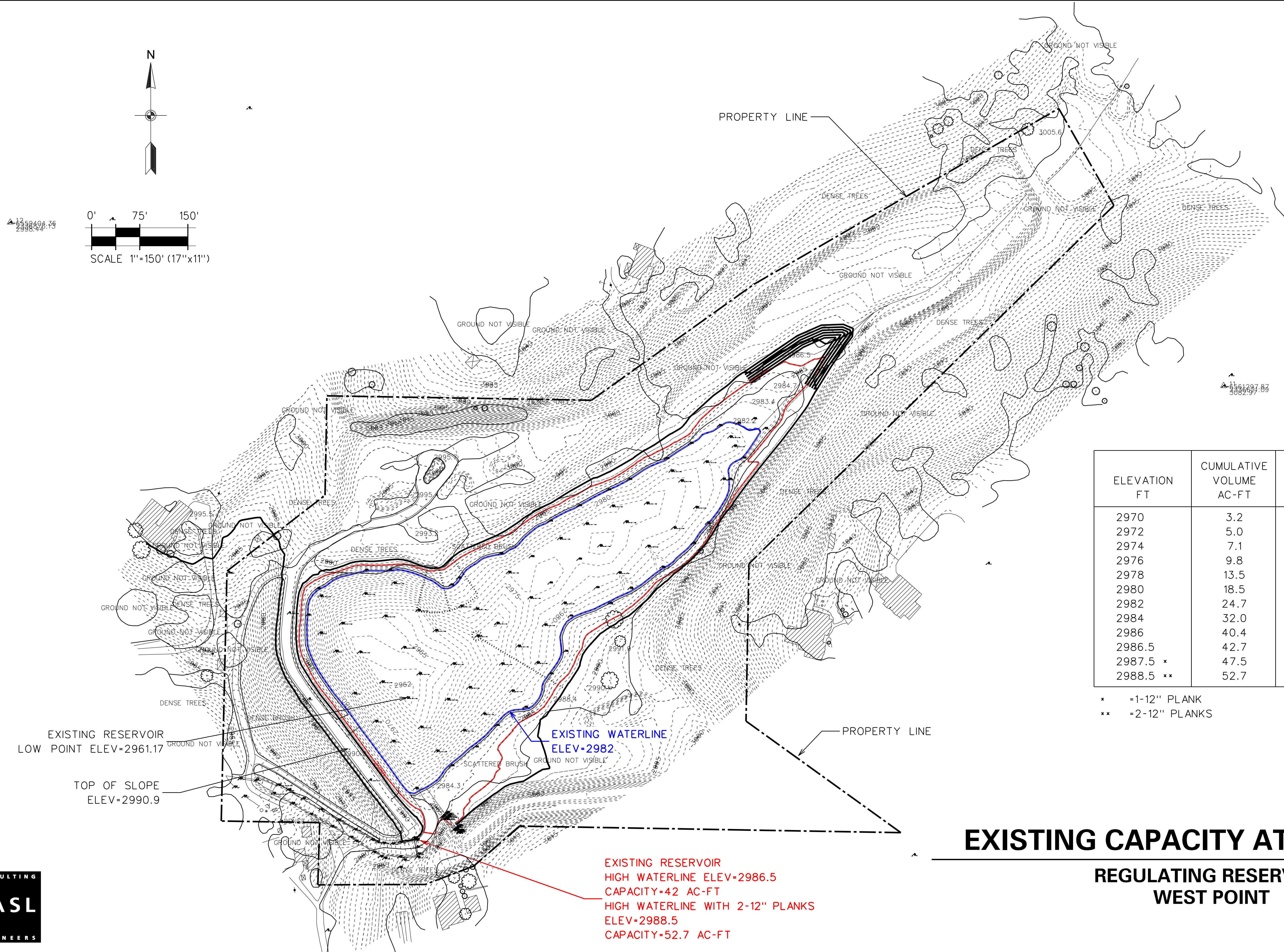
1.2.4 West Point Regulating Reservoir

The West Point Regulating Reservoir was constructed in 1964. The dam is approximately 35 feet high and 500 feet long. Existing conditions are shown in **Figure 5**. Bear Creek water enters the Regulating Reservoir on the south side near the spillway. The reservoir outlet includes a slanted sluice gate connected to a bottom outlet pipe and further, a series of valves which regulate gravity flows to the West Point WTP. Middle Fork Mokelumne River water can also enter the Regulating Reservoir through the reverse direction of the dam's outlet pipe when water from the MFMR Pump Station bypasses the West Point WTP and flows back into the Regulating Reservoir.

Aerial, topographic, and bathymetric surveys of the Regulating Reservoir were conducted in 2017. The top of the existing reservoir embankment is constructed at elevation 2,990.9' (NAVD 88 Datum). The existing reservoir high water line is elevation 2,986.5'. At this high water mark, the existing capacity of the Regulating Reservoir was determined to be 42 AF. DSOD permits the District to increase the storage capacity seasonally through the temporary installation of spillway "stop logs." When two, 12-inch wide stop logs are placed across the spillway, the high water elevation is increased to 2,988.5' and the Regulating Reservoir capacity is increased to 52.7 AF. These are typically installed by CCWD staff in May and removed in late October.

In the *Mokelumne River Long-Term Water Needs Study*, ECORP suggested that the capacity of the Regulating Reservoir be increased to 150 AF. Preliminary Plans and the estimated cost to increase the Regulating Reservoir to this capacity are presented in this Supplemental Master Plan Report.

With no screening of the discharge from the Regulating Reservoir, sediment and other debris have the potential to freely enter the West Point WTP through the existing bottom outlet structure. Water quality and treatability issues also occur with the outlet located near the bottom. As shown in **Figure 6**, the District has placed a floating mechanical aerator near the reservoir outlet to improve dissolved oxygen levels in the water delivered to the WTP when needed. This is in addition to three other existing aerators in the middle of the reservoir that always operate. A floating screened outlet would prevent sediment and debris from entering the West Point WTP from the Regulating Reservoir. With the floating inlet located near the surface outlet rather than near the bottom, the best water quality available in the Reservoir would be delivered to the West Point WTP. Reservoir outlet improvements are presented in this Master Plan Report.



ELEVATION FT	CUMULATIVE VOLUME AC-FT	SURFACE AREA SF
2970	3.2	33,800
2972	5.0	44,700
2974	7.1	52,000
2976	9.8	64,500
2978	13.5	96,700
2980	18.5	121,700
2982	24.7	146,800
2984	32.0	169,200
2986	40.4	197,000
2986.5	42.7	203,000
2987.5 *	47.5	217,500
2988.5 **	52.7	233,600

* =1-12" PLANK
** =2-12" PLANKS

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EXISTING CAPACITY AT RESERVOIR

REGULATING RESERVOIR WEST POINT

FIGURE 5

West Point Regulating Reservoir

FIGURE 6

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FILE: S:\2517-01 West Point Mokelumne River\Study A - West Point Water System\Master Plan\Figure\FIG_6.dgn
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1.2.5 Middle Fork Mokelumne River (MFMR) Pump Station Intake Facilities

A topographic survey of existing conditions and facilities at the MFMR Pump Station and Pump Station intake facilities is presented in **Figure 7**. A concrete diversion structure has been constructed across the Middle Fork at this location. As shown in the photo, **Figure 8,** the existing structure permits stop logs to be placed along the top of the diversion to raise the water level upstream of the pump station intake.

According to plans available for the MFMR Pump Station there are 12-inch diameter collectors located in the gravel stream bed upstream of the diversion. Prior to the high runoff which occurred in late 2016 and early 2017, there was also a sub-surface perforated collector pipe along the upstream face of the diversion structure. As shown in **Figure 9**, this perforated pipe was damaged during high flows and removed. Restoration of this facility occurred in early summer 2018, utilizing a partial grant from Federal Emergency Management Agency under their disaster recovery grant programs. **Figure 10** shows the repaired intake.

1.2.6 Middle Fork Mokelumne River (MFMR) Pump Station

The existing MFMR Pump Station has an existing capacity of 200 gpm. During recent drought periods when the Bear Creek supplies were severely depleted, increasing the capacity of the MFMR Pump Station was identified by CCWD as a priority to meet existing and projected West Point Maximum Day Demands. The existing capacity of the MFMR pump station falls well below the ±700 gpm (1 MGD) capacity of the West Point WTP and is less than Master Plan maximum day demands of 500 gpm estimated for the West Point WTP service area.

The existing low ground elevation at the MFMR Pump Station site is approximately 2,484.5. This elevation is well below historic high water elevation marks measured at approximately elevation 2,486 in the vicinity of the MFMR Pump Station. FEMA Flood Level Maps were reviewed for the MFMR Pump Station area but the existing 100-year flood level for this location was not able to be determined more precisely from the FEMA maps. Improvements to increase the capacity of the MFMR Pump Station to ±500 gpm and to raise the pump station floor elevation above the high water elevation of approximately 2,486 are presented in this Master Plan Report. Additional site improvements are also proposed to improve existing pump station access from Charles Avenue. The existing MFMR Pump Station site includes a storage building and an abandoned filter, remnants of previously abandoned water treatment facilities. These would also be removed with the new pump station improvements. The existing site includes an old water storage tank which has been converted to a standby generator building. While this is a unique structure, the existing standby generator capacity (8kW) will be too small to serve proposed MFMR Pump Station improvements.

Currently, there is no direct system control or communication between the West Point WTP and the MFMR Pump Station. Proposed pump station improvements evaluated in this Master Report include radio or fiber optics telemetry to/from the West Point WTP so that the CCWD Operator at the West Point WTP can remotely start, stop and monitor the MFMR pumps, view the MFMR Pump Station Programmable Logic Controller (PLC) and respond to pump station alarm conditions.

FIGURE 7

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Middle Fork Mokelumne River
Pump Station Intake Diversion Structure

FIGURE 8

Remnant Pump Station Intake Pipe

Pump Station Intake Pipe Manifold Removed From Service

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DATE: 3/29/2018

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Middle Fork Mokelumne River Pump Station Intake

FIGURE 9

Middle Fork Mokelumne River Pump Station Intake
Repaired Summer 2018

FIGURE 10

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FILE: S:\2517-01 West Point, Mokelumne River\Study A - West Point Water System\Master Plan\Figure\FIG_10.dgn
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CCWD has discussed the possibility that a small "satellite" water treatment facility with capacity of approximately 200 gpm could be constructed, in the future, to serve the Wilseyville area. The Wilseyville WTP would be served by the future construction of the Middle Fork Ditch Pipeline. If a separate Wilseyville WTP was constructed, the capacity of the proposed MFMR Pump Station could be reduced but would still exceed the current capacity of 200 gpm.

MFMR Pump Station improvements will be designed and constructed consistent with the new MFMR pipeline proposed for delivery of MFMR water to the West Point WTP. MFMR Pump Station and pipeline improvements are described in this Supplemental Master Plan Report.

1.2.7 Middle Fork Mokelumne River (MFMR) Supply Pipeline

The existing alignment of the 6-inch diameter MFMR supply pipeline to the West Point WTP is shown in **Figure 11**. The existing raw water pipeline crosses the Middle Fork of the Mokelumne River along the face of the existing MFMR pump station intake diversion structure and then continues west along Barney Way, north along an existing CCWD pipeline easement to Acorn Way, north along Acorn Way, then north along an existing CCWD easement beginning at the intersection of Acorn Way and Bald Mountain Road and ending at Smitty Lane, then west along Smitty Lane to the West Point WTP; a distance of some 10,300 feet (±1.94 miles). To meet the future MFMR design demand of 500 gpm replacement of the existing 6-inch pipeline with an 8-inch diameter main is proposed.

Currently the delivery of Middle Fork Mokelumne River water to the West Point WTP is accomplished in two stages. The existing MFMR pumps lift the raw water to an intermediate pump station located on Acorn Way. Second stage pumping to the West Point WTP is then provided by the Acorn Way Pump Station. While this scheme reduces the pipeline design pressures along Barney Way the MFMR replacement pipeline is proposed with a single lift and the elimination of the Acorn Way Pump Station. The Acorn Way Pump Station is difficult to access, operate and maintain. Replacement of the existing pipeline with transmission facilities that can safely operate at higher pressures is preferred to the continued operation and maintenance of the Acorn Way booster pump station.

1.2.8 West Point Water Treatment Plant

The existing West Point Water Treatment Plant is a relatively new (circa early 2000s) One (1) MGD capacity, microfloc type, plant with upflow clarification, downflow multimedia filtration and disinfection. The design of the plant is similar to other existing CCWD facilities located at Jenny Lind and at Copper Cove. The 1 MGD capacity is provided in a single treatment plant train. Operational flexibility would be provided if a second, 1 MGD, microfloc type, water treatment plant was constructed allowing either plant to be removed from service without reduction in capacity. The existing 1 MGD plant will meet treated water demands projected for the West Point service area through the year 2100.

EXISTING WATERLINE ALIGNMENT MIDDLE FORK PUMP STATION TO WEST POINT WATER TREATMENT PLANT

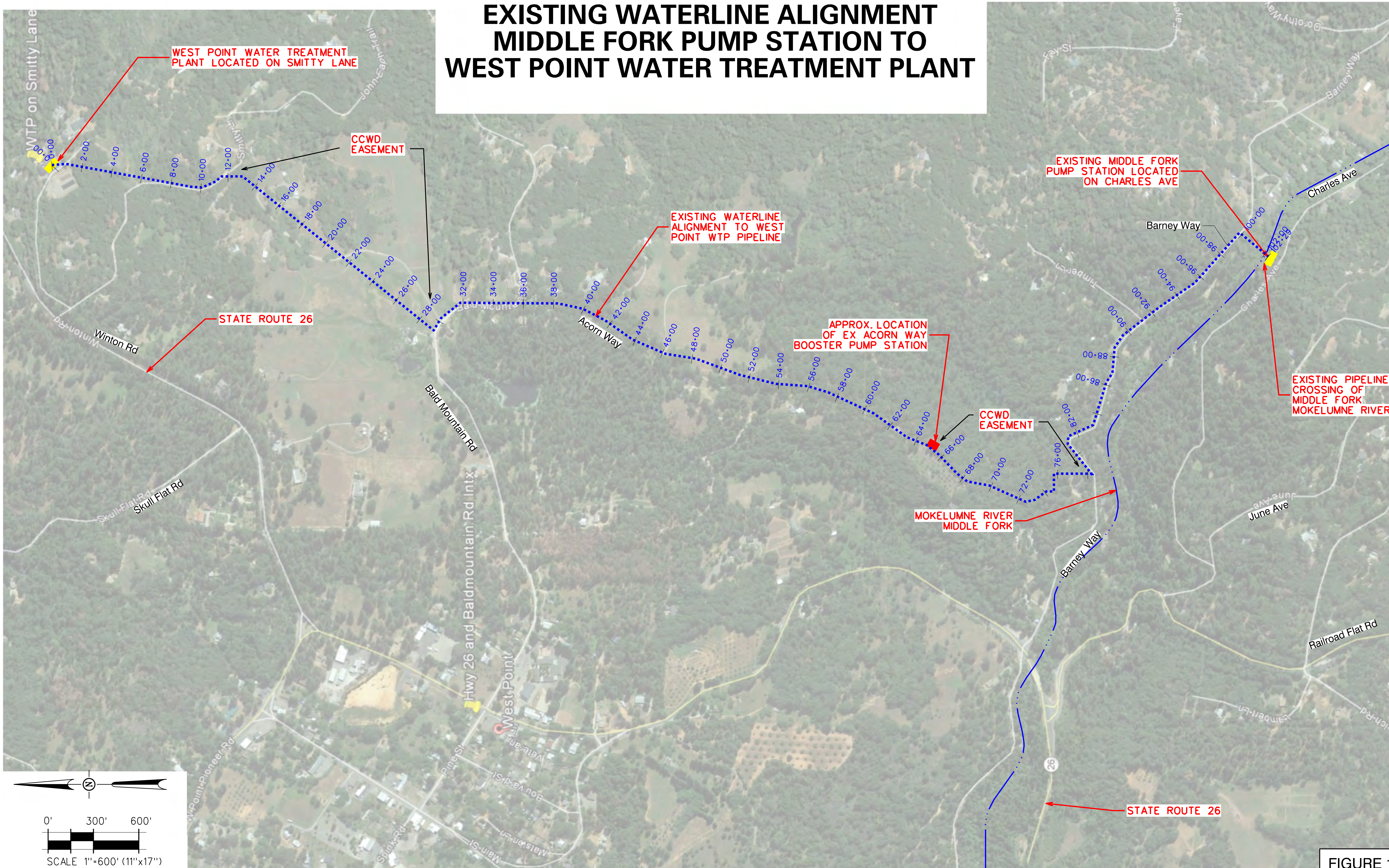

FIGURE 11

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1.2.9 Treated Water Storage

Since completion of the 2004 Feasibility Study, two approximately 350,000-gallon treated water storage tanks were constructed at the West Point WTP for a total of ±700,000-gallon storage at the plant. Separately, a new ±150,000-gallon water storage tank was also constructed to provide the Bummerville area with adequate fire flows and peak hour flows. No additional treated water storage improvements are proposed in this Water Master Plan

1.2.10 West Point / Wilseyville and Bummerville Distribution System

Based on the findings and recommendations included in the 2004 Feasibility Study, small diameter pipelines located in the West Point and Wilseyville distribution systems were replaced with minimum 6-inch diameter mains adequate to supply maximum day plus fire flows and adequate to meet peak hour demands. Additional water distribution improvements are proposed in this Supplemental Water Master Plan to serve the Bummerville service area.

2.0 BEAR CREEK STORAGE, SUPPLY AND CONTROL IMPROVEMENTS

In this section of the 2018 Supplemental Water System Master Plan, alternative and recommended modifications and reservoir expansions to improve the capacity and reliability of the Bear Creek supply are discussed. These include improvements to the Wilson Dam, metering of Bear Creek flows delivered through the Bear Creek Diversion Pipeline and capacity and water quality improvements at the West Point Regulating Reservoir.

2.1 Wilson Dam

An aerial photo of Wilson Dam is shown in **Figure 12**. The top of the Wilson Dam Embankment is constructed at approximately elevation 3,615'. The toe of slope on the downstream side of the reservoir embankment is approximately elevation 3,583'. **Figure 13** presents approximate cross sections of ground elevations in the Wilson Reservoir area. Based on these cross sections the existing capacity of the Wilson Reservoir is approximately 25 AF when the water surface is allowed to reach approximately elevation 3,613'. As previously discussed in Section 1.0 of this Supplemental Master Plan Report, the District has lowered the operating level of the Reservoir due to concerns regarding seepage and stability.

A subsurface investigation of the Wilson Dam embankment was conducted by Woodward-Clyde-Sherard Associates (WCSA) in 1963. Based on these subsurface tests the WCSA Engineering Geologist concluded that the embankment was constructed over native material and not constructed using engineered fill material. WCSA concluded that the dam was constructed using decomposed granite and placed over the native material without removing (or conditioning) the natural topsoil. Highly weathered rock and soil and other "unsuitable and potentially permeable materials" were used to construct the dam. WCSA determined that seepage was not, however, occurring through the reservoir embankment but rather through a zone composed of open joints and fractures in the granite bedrock beneath the dam embankment. WCSA further concluded that the seepage which was occurring through the underlying zones could be controlled by chemical grouting to seal the fractured zones.

For the purpose of this Supplement to the Master Plan, KASL obtained a proposal for updating the 1963 geotechnical explorations conducted at Wilson Dam. Given the proposed cost of this updated investigation the District decided not to pursue additional geotechnical testing or findings at this time.

The Wilson Dam outlet works are in disrepair and water flows through the impoundment to the creek below. In addition, a sinkhole developed near the upstream slope crest indicated possible "piping' of the embankment soil in the past. The District "patched" the sinkhole area on the upstream face in early 2018 as part of routine maintenance activities; the sinkhole perimeter was excavated to remove unstable material and wood debris and then backfilled with Class 2 aggregate base to the original grade along the face of the dam. The sinkhole may be related to the damaged pipeline and indicative of a long-term issue that needs to be resolved.

ELEVATION FT	CUMULATIVE VOLUME AC-FT	SURFACE AREA SF
3602	1.5	66,430
3603	3.0	70,800
3604	4.7	75,300
3605	6.5	79,900
3606	8.4	84,700
3607	10.4	89,500
3608	12.5	94,500
3609	14.9	106,800
3610	17.4	112,100
3611	20.0	117,350
3612	22.8	122,700
3613	25.7	129,000

ELEVATIONS ARE APPROXIMATE

N

0' 50' 100'

SCALE 1"=100' (17"x11")

EXISTING RESERVOIR CAPACITY AT WILSON DAM
25 AC-FT

WEST POINT

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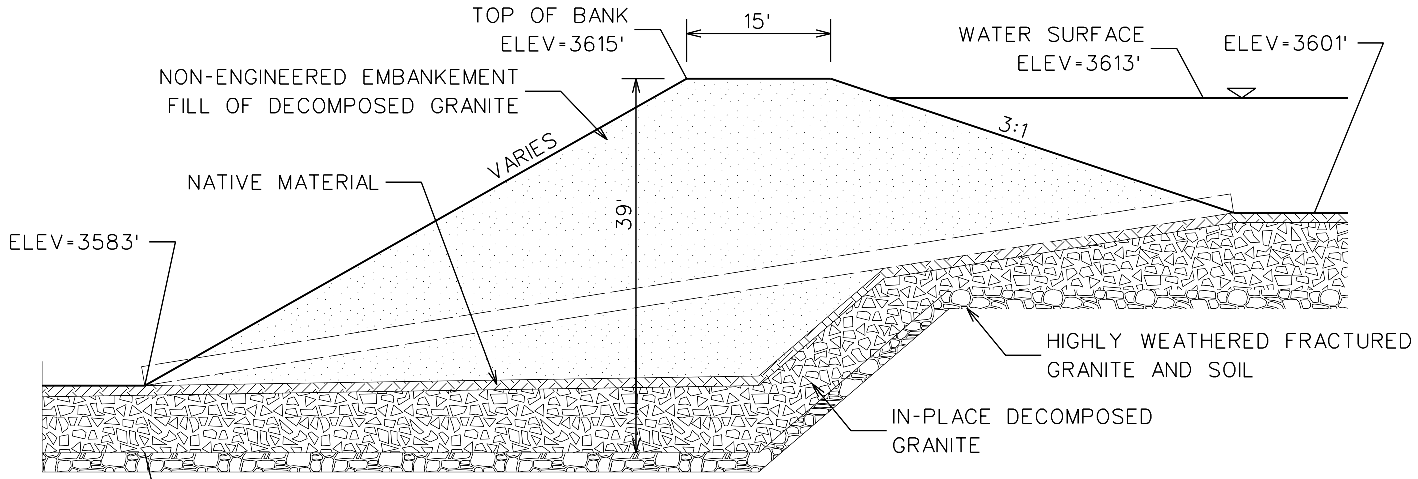
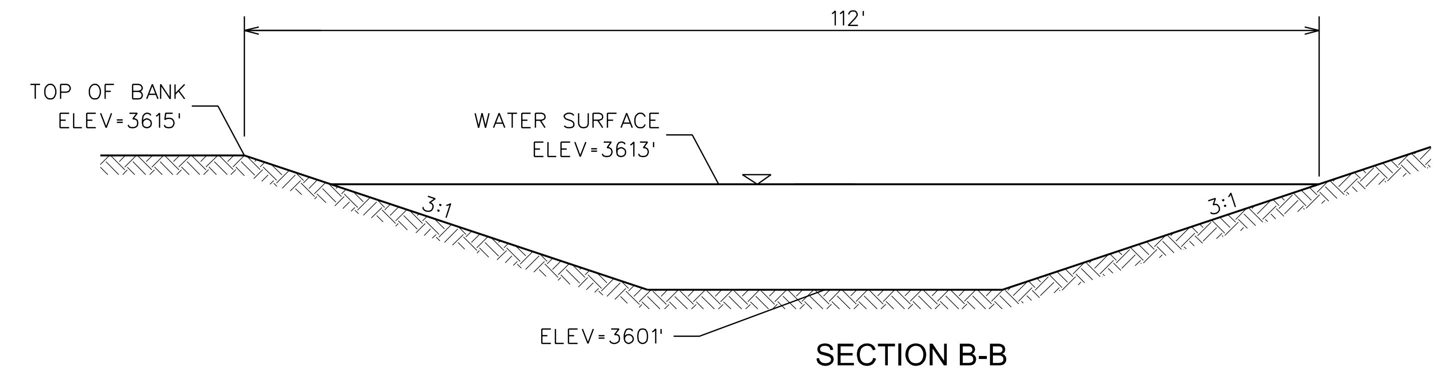
FIGURE 12



SECTION A-A



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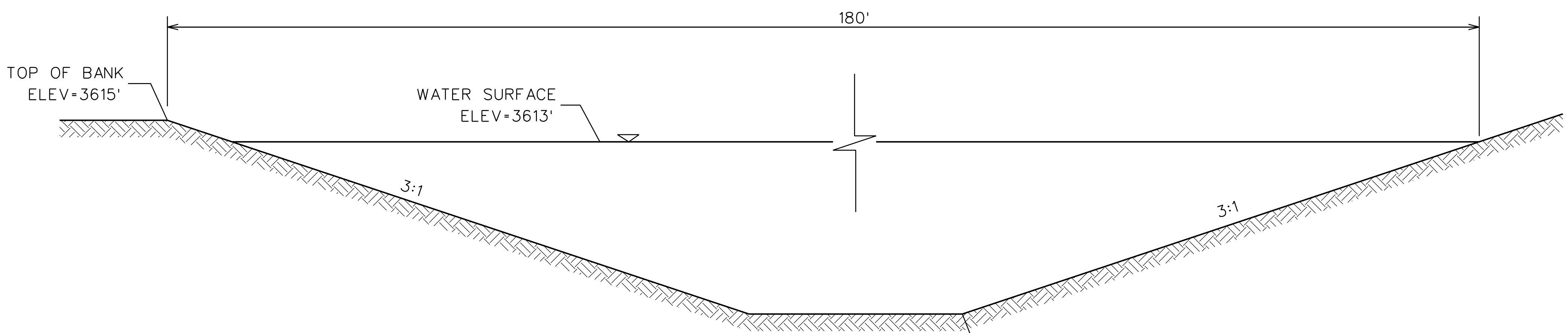

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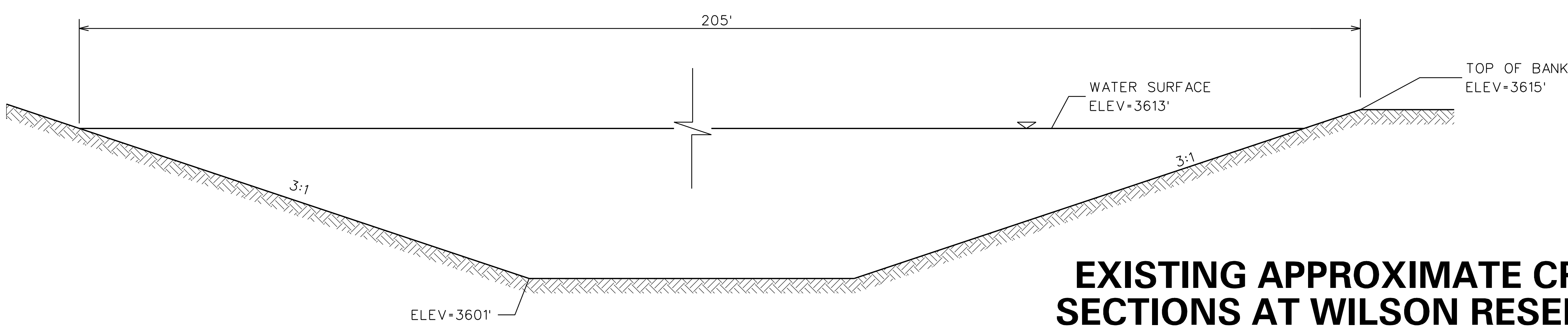

SECTION D-D

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EXISTING APPROXIMATE CROSS SECTIONS AT WILSON RESERVOIR

WEST POINT

2 OF 2

FIGURE 13

2.1.1 Reconstruct Wilson Dam to Restore 25 AF Capacity

To address the seepage through the material beneath the embankment, correct the existing damaged outlet pipe and reconstruct the embankment with engineered fill, it is recommended that the existing embankment material, spillway, outlet pipe and outlet pipe controls be removed and replaced. The embankment area must be cleared, scarified and compacted. During reconstruction, a temporary (piped) diversion of Bear Creek will be required. To correct the seepage though the underlying fractured granite consistent with recommendations included in the WCSA report, an impervious grout "curtain," 150 feet long, 6 feet deep and approximately 3 feet wide is proposed. Updated geotechnical investigations may determine other methods that are more suitable and more acceptable to the Regional Water Quality Control Board or to the Department of Fish and Wildlife. Estimated costs to restore Wilson Reservoir to 25 AF capacity are presented in **Table 1.**

2.1.2 Expand Wilson Reservoir Capacity

In the Mokelumne River Long-Term Water Needs Study the benefits of increasing the capacity of Wilson Reservoir to 50 AF to meet the future water supply needs of the West Point community are discussed. Based on preliminary analysis of surface area and the estimated cross-sectional geometry of the existing reservoir, increasing the capacity to 50 AF would require raising the dam embankment and emergency spillway elevations by approximately 7 feet. As shown in **Figure 14**, raising the embankment and maximum operating level by 7 feet will likely encroach onto Winton Road.

Expansion of the Reservoir "footprint" would require a revised operating agreement with Sierra Pacific Industries as it would encroach on their adjacent properties. Increasing the capacity of the Reservoir would also require an updated permit from the Division of Safety of Dams and permitting from the California Department of Fish and Wildlife, Regional Water Quality Control Board and U.S. Corps of Engineers.

As previously discussed for the 25 AF capacity alternative, increasing the capacity of Wilson Reservoir to 40 AF or 50 AF would require removal of the existing embankment, drain pipe and spillway, clearing, scarification, and compaction of the expanded dam embankment area, temporary rerouting of Bear Creek during construction, construction of a grouted curtain to control seepage through the underlying fractured rock, construction of the new embankment with engineered fill, replacement of the reservoir outlet pipe together with new gate controls and trash rack and construction of a new concrete spillway. Increasing the capacity to 50 AF would require reconstruction (raising) a portion of Winton Road along the north side of the expanded reservoir. Estimated costs for the 50 AF reservoir alternative are presented in **Table 2**. After discovering that a 50 AF expansion requires raising Winton Road, a second evaluation was done to determine the maximum capacity achievable without the need for raising Winton Road. The evaluation resulted in a maximum capacity of 40 AF. Expansion of Wilson Reservoir capacity to 40 AF is shown in **Figure 14A**. Estimated costs for the 40 AF reservoir expansion alternative are presented in **Table 3**. These costs do not include purchase of the expanded reservoir site or the cost of an expanded operating agreement with SPI. These costs are unknown at this time.

Table 1. Estimated Costs to Restore Wilson Reservoir to 25 AF Capacity

ITEM NO.	DESCRIPTION	ESTIMATED UNIT COST	UNIT	ESTIMATED QUANTITY	ESTIMATED COST
1	Mobilization,[(1)] Clearing and Grubbing	$ 75,000.00	LS	1	$ 75,000
2	Remove Existing 24" Drain	$ 50.00	LF	125	$ 6,250
3	Excavate Existing Embankment Material	$ 6.50	CY	11000	$ 71,500
4	Scarify and Compact Embankment Site	$ 40,000.00	LS	1	$ 40,000
5	Place and Compact Engineered Fill Material[(2)]	$ 10.00	CY	14300	$ 143,000
6	Install 24" Concrete Encased Drain Pipe	$ 250.00	LF	125	$ 31,250
7	Install 24" Diameter Drain Gate, Controls and Trash Rack	$ 40,000.00	LS	1	$ 40,000
8	Install Grout Barrier (150' x 6' x 3')	$ 3,000.00	CY	100	$ 300,000
9	Construct Concrete Lined Spillway	$ 75,000.00	LS	1	$ 75,000
10	Provide Temporary Diversion of Bear Creek During Construction	$ 25,000.00	LS	1	$ 25,000
			Estimated Construction Cost		$ 807,000
	20% Construction Cost Contingencies				$ 161,400
			Planning & Engineering Design (10% of Construction)		$ 80,700
	Environmental Mitigation and Permitting (10% of Construction)				$ 80,700
			Construction Administration (8% of Construction)		$ 64,600
			Administrative and Legal Costs (5% of Construction)		$ 40,350
			Total Estimated Costs		$ 1,234,750

(1) Mobilization Estimated at ±5% of Estimated Construction Cost.

(2) Assumes ±30% Shrinkage and that Suitable Onsite Sources of Fill Material are Available.

ELEVATION FT	CUMULATIVE VOLUME AC-FT	SURFACE AREA SF
3602	1.5	66,430
3603	3.0	70,800
3604	4.7	75,300
3605	6.5	79,900
3606	8.4	84,700
3607	10.4	89,500
3608	12.5	94,500
3609	14.9	106,800
3610	17.4	112,100
3611	20.0	117,350
3612	22.8	122,700
3613	25.7	129,000
3615	31.8	140,400
3616	35.1	146,100
3618	42.1	157,800
3620	50.0	169,700

ELEVATIONS ARE APPROXIMATE

N

0' 50' 100'

SCALE 1"=100' (17"x11")

EXPAND WILSON RESERVOIR CAPACITY TO 50 AC-FT (RAISE BY 7 FT)

WEST POINT

CONSULTING KASL ENGINEERS

FIGURE 14

Table 2. Estimated Costs for Wilson Reservoir Expansion Alternative

ITEM NO.	DESCRIPTION	ESTIMATED UNIT COST	UNIT	ESTIMATED QUANTITY	ESTIMATED COST
1	Mobilization,[1] Clearing and Grubbing	$ 85,000.00	LS	1	$ 85,000
2	Remove Existing 24" Drain	$ 50.00	LF	125	$ 6,250
3	Remove Trees	$ 1,000.00	EA	35	$ 35,000
4	Excavate Existing Embankment Material	$ 6.50	CY	11000	$ 71,500
5	Additional Project Area Excavation	$ 10.00	CY	4000	$ 40,000
6	Scarify and Compact Embankment Site	$ 50,000.00	LS	1	$ 50,000
7	Place and Compact Engineered Fill Material [2]	$ 10.00	CY	20000	$ 200,000
8	Install 24" Concrete Encased Drain Pipe	$ 250.00	LF	175	$ 43,750
9	Install 24" Diameter Drain Gate, Controls and Trash Rack	$ 50,000.00	LS	1	$ 50,000
10	Install Grout Barrier (200' x 6' x 3') During Construction	$ 3,000.00	CY	135	$ 405,000
11	Construct Concrete Lined Spillway	$ 90,000.00	LS	1	$ 90,000
12	Provide Temporary Diversion of Bear Creek During Construction	$ 25,000.00	LS	1	$ 25,000
13	Reconstruct Winton Road	$ 325.00	FT	880	$ 286,000
			Estimated Construction Cost		$ 1,387,500
		20% Construction Cost Contingencies			$ 277,500
			Planning & Engineering Design (10% of Construction)		$ 138,750
		Environmental Mitigation and Permitting	(10% of Construction)		$ 138,750
			Construction Administration (8% of Construction)		$ 111,000
			Administrative and Legal Costs (6% of Construction)		$ 83,250
			Total Estimated Costs		$ 2,136,750.00

(1) Mobilization Estimated at 5% of Estimated Construction Cost.

(2) Assumes ±30% Shrinkage and that Suitable Onsite Sources of Fill Material are Available.

Table 3. Engineer's Estimate of Quantities and Costs - Study A West Point Water System Master Plan Wilson Dam Reconstruct to 40 AF Capacity

ITEM NO.	DESCRIPTION	ESTIMATED UNIT COST	UNIT	ESTIMATED QUANTITY	ESTIMATED COST
1	Mobilization,[1] Clearing and Grubbing	$ 85,000.00	LS	1	$ 85,000
2	Remove Existing 24" Drain	$ 50.00	LF	125	$ 6,250
3	Remove Trees	$ 1,000.00	EA	30	$ 30,000
4	Excavate Existing Embankment Material	$ 6.50	CY	850	$ 5,525
5	Additional Project Area Excavation	$ 10.00	CY	3200	$ 32,000
6	Scarify and Compact Embankment Site	$ 50,000.00	LS	1	$ 50,000
7	Place and Compact Engineered Fill Material [2]	$ 10.00	CY	16000	$ 160,000
8	Install 24" Concrete Encased Drain Pipe	$ 250.00	LF	175	$ 43,750
9	Install 24" Diameter Drain Gate, Controls and Trash Rack	$ 50,000.00	LS	1	$ 50,000
10	Install Grout Barrier (200' x 6' x 3') During Construction	$ 3,000.00	CY	135	$ 405,000
11	Construct Concrete Lined Spillway	$ 90,000.00	LS	1	$ 90,000
12	Provide Temporary Diversion of Bear Creek During Construction	$ 25,000.00	LS	1	$ 25,000
		Estimated Construction Cost			$ 982,525
	20% Construction Cost Contingencies				$ 196,505
		Planning & Engineering Design (10% of Construction)			$ 98,253
	Environmental Mitigation and Permitting (10% of Construction)				$ 98,253
		Construction Administration (8% of Construction)			$ 111,000
		Administrative and Legal Costs (6% of Construction)			$ 58,952
		Total Estimated Costs			$ 1,545,486.50

(1) Mobilization Estimated at 5% of Estimated Construction Cost.

(2) Assumes ±30% Shrinkage and that Suitable Onsite Sources of Fill Material are Available.

ELEVATION FT	CUMULATIVE VOLUME AC-FT	SURFACE AREA SF
3602	1.5	66,430
3603	3.0	70,800
3604	4.7	75,300
3605	6.5	79,900
3606	8.4	84,700
3607	10.4	89,500
3608	12.5	94,500
3609	14.9	106,800
3610	17.4	112,100
3611	20.0	117,350
3612	22.8	122,700
3613	25.7	129,000
3615	31.8	140,400
3616	35.1	146,100
3618	40.0	155,000

ELEVATIONS ARE APPROXIMATE

N

0' 50' 100'
SCALE 1"=100' (17"x11")

EXPAND WILSON RESERVOIR CAPACITY TO 40 AC-FT (RAISE BY 5 FT)

WEST POINT

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FIGURE 14A

2.2 The Bear River Diversion Pipeline

As noted in Section 1.0 of this Supplemental Master Plan Report, the Bear River Diversion Pipeline has been recently replaced with a 16-inch diameter HDPE pipe. The new pipeline is adequate to deliver the 4 cfs allowed by the District's current water rights permit. No additional improvements to the pipeline are proposed. The reinforced concrete Bear River Diversion Facilities adequately provide diversion of up to 4 cfs of Bear River flow. The diversion structure inlet seasonally fills with sand and sediment and needs to be maintained. No improvements to the diversion structure inlet are proposed at this time except for the reinstallation of stream flow gaging equipment at the existing Parshall Flume. Ongoing cleaning of the diversion structure inlet is proposed. It is recommended that at, a minimum, the existing diversion structure inlet be cleaned of sediment and debris each Spring. After flow monitoring facilities are installed, it is recommended that reduced flow through the Bear River Diversion structure could indicate blockage of the diversion structure inlet pipe and, therefore, warrant maintenance. The District previously installed a Parshall type flow metering flume as part of the Bear Creek Diversion. After vandalism and theft occurred, the District has not replaced the critical flow measurement and flow recording equipment. During a site visit to the Bear Creek Diversion, CCWD suggested re-establishing the existing flow gaging equipment to comply with the requirements of S.B. 88 and to support operating staff to coordinate the Bear Creek Diversions, Regulator Reservoir Operations and Middle Fork Pump Stations operations.

The District has already entered in to a contract to install a float tape with WaterLOG H-3301/11/42 shaft encoder, WaterLOG Storm 3 data logger, a new enamel staff gage and a satellite radio. This equipment will be housed in a powder coated steel gage house at the original Parshall Flume gaging station. Data will ultimately be transmitted through the satellite system to a password protected website so that operators can log in to the website to check the status of the diversion.

2.3 West Point Regulating Reservoir

The Calaveras County Mokelumne River Long-Term Water Needs Study includes recommendations to increase the capacity of the West Point Regulating Reservoir to 150 AF. The current capacity with the placement of two, 12-inch-high stop logs at the spillway, is approximately 52.7 AF.

The existing top of the Regulating Reservoir embankment is constructed with maximum water surface elevation (with two stop logs) of 2,987.5. The top of embankment elevation is 2,990.9.

The initial evaluation for increasing the capacity of the Regulating Reservoir to ±150 AF is shown in **Figure 15.** A top of berm embankment elevation of 3,005.0 is suggested together with a maximum water surface elevation of 3,001.5. As noted in Figure 15, this plan results in the top of the reservoir aligned too close to the existing CCWD property limits at the northwest and southwest limits of the expanded reservoir.

To more reasonably increase the capacity, the footprint of the reservoir needs to be expanded with additional excavation while maintaining the limits of the reservoir within the CCWD property lines.

The first revised plan for expanding the capacity of the Regulating Reservoir is shown in **Figure 16**. With this plan, the bottom of the reservoir is excavated and expanded to the northeast. The open channel outfall structure is retained with a new spillway constructed at a high water elevation of 2,999. A top of embankment elevation of 3,003 is proposed. This alternative would include construction of retaining walls up to 12 feet high to maintain the toe of the embankment within the CCWD pipeline limits. Typical sections along the spillway and at critical embankment locations are presented in **Figure 17**. The expanded reservoir plan and sections presented in Figures 16 and 17 include maintaining a 15-foot-wide top embankment width, a 14-foot-wide spillway outfall with open channel section, similar to existing, and a minimum 12-foot-wide access roadway constructed around the outside of the embankment toe, again, similar to existing conditions.

The initial revised plan was reviewed with CCWD Engineering Department staff. Based on their recommendations, the spillway open channel outfall section was replaced with a 3-foot-deep by 10-foot-wide box culvert. The footprint of the reservoir was further expanded to the southeast while keeping the facility within the limits of the CCWD property. The second, revised plan also results in an increased Regulating Reservoir capacity of 150 AF. This option is shown in **Figure 18**. As before, the embankment elevation is proposed at 3003 with a maximum water surface elevation of 2,999. This revised plan, which significantly reduces the need for retaining walls, was found to be more acceptable to CCWD Engineering Department staff. A cost estimate for the second revised plan for increasing the capacity at the West Point Regulating Reservoir to 150 AF is presented in **Table 4.**

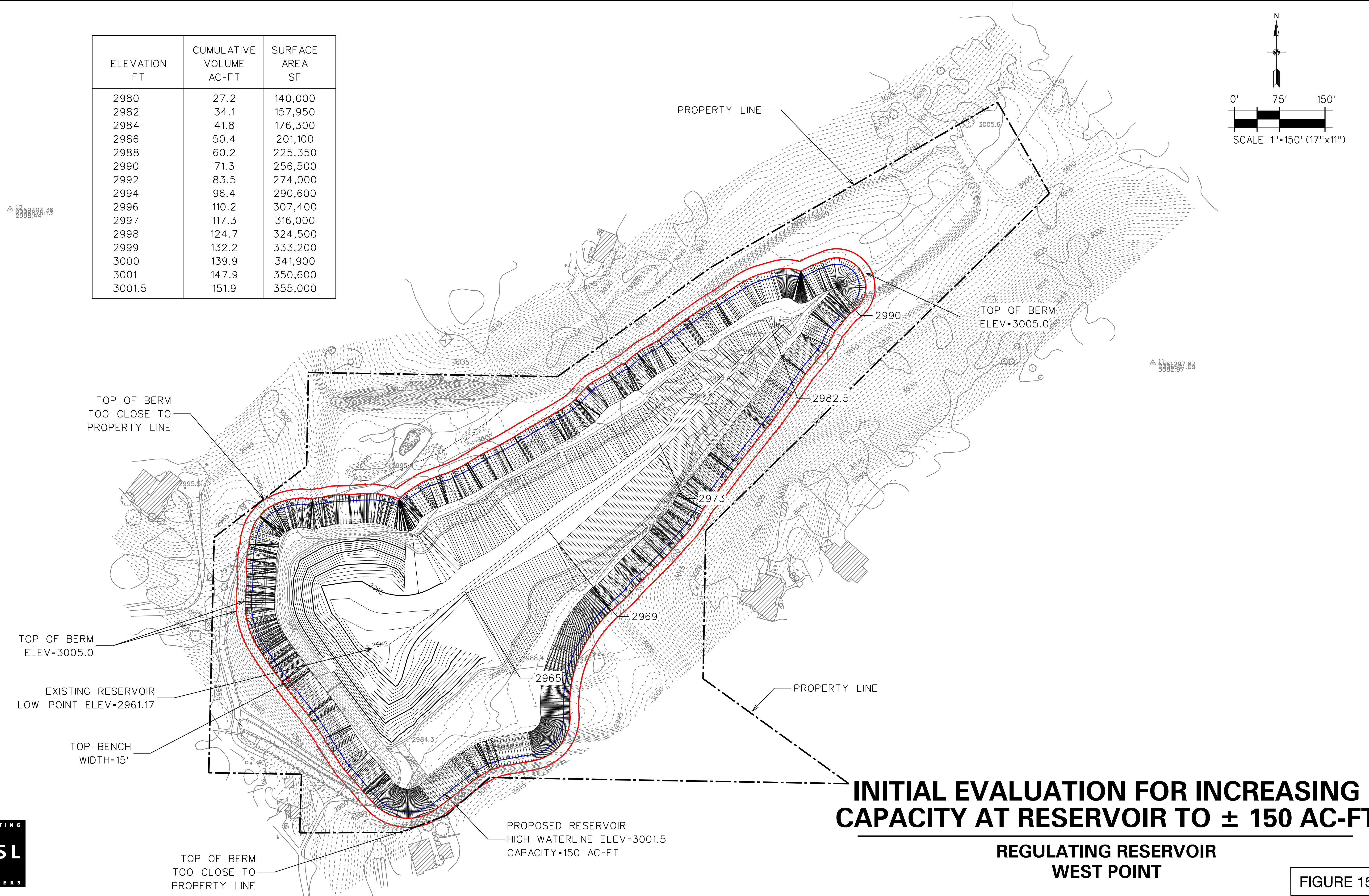
The Hydraulic Grade Line developed with the Bear Creek Raw Water Pipeline Replacement Project was evaluated with respect to the increased Regulating Reservoir capacity of 150 AF and increased maximum water surface elevation of 2999. After verifying that the Bear Creek Pipeline Plans prepared for the District in 2004 and the topographic surveys conducted for this Supplemental Master Plan use on the same vertical datum, it was determined that even with the increase in the maximum operating level of the Reservoir to elevation 2999, the Bear Creek Pipeline would still deliver water from the Bear Creek Diversion to the West Point Regulating Reservoir by gravity flow.

2.3.1 Regulating Reservoir Outlet Pipe Modifications

The existing Regulating Reservoir outlet pipe is located at or near the reservoir low point. The District has placed a surface aerator near the outlet pipe location to improve dissolved oxygen levels. There is currently no screening of the outlet, which presents ongoing concerns with the potential for sediment and debris to enter the Regulating Reservoir outlet pipe and ultimately to the headworks of the West Point WTP.

Operational flexibility for treatability of source water would be improved with modification of the existing outlet with a floating screen. This would also reduce risk associated with large sediment and debris entering the headworks of the West Point WTP. A sample design (City of Plymouth Treated Effluent Reservoir) is presented in **Figure 19** and **Figure 20.** With the screened floating outlet, the existing bottom outlet piping is retained and remains functional if the reservoir needs to be drawn down to minimum elevations quickly in an emergency. By floating the reservoir outlet pipe near the surface, water with higher levels of dissolved oxygen and lower levels of total solids would enter the West Point WTP. The estimated cost of modifying the existing outlet with a floating screened outlet is approximately $100,000 based on the actual cost experience at Plymouth. The Plymouth installation was approved by DSOD. An itemized cost estimate of the suggested floating, screened, reservoir outlet improvements is presented in **Table 5.**

ELEVATION FT	CUMULATIVE VOLUME AC-FT	SURFACE AREA SF
2980	27.2	140,000
2982	34.1	157,950
2984	41.8	176,300
2986	50.4	201,100
2988	60.2	225,350
2990	71.3	256,500
2992	83.5	274,000
2994	96.4	290,600
2996	110.2	307,400
2997	117.3	316,000
2998	124.7	324,500
2999	132.2	333,200
3000	139.9	341,900
3001	147.9	350,600
3001.5	151.9	355,000



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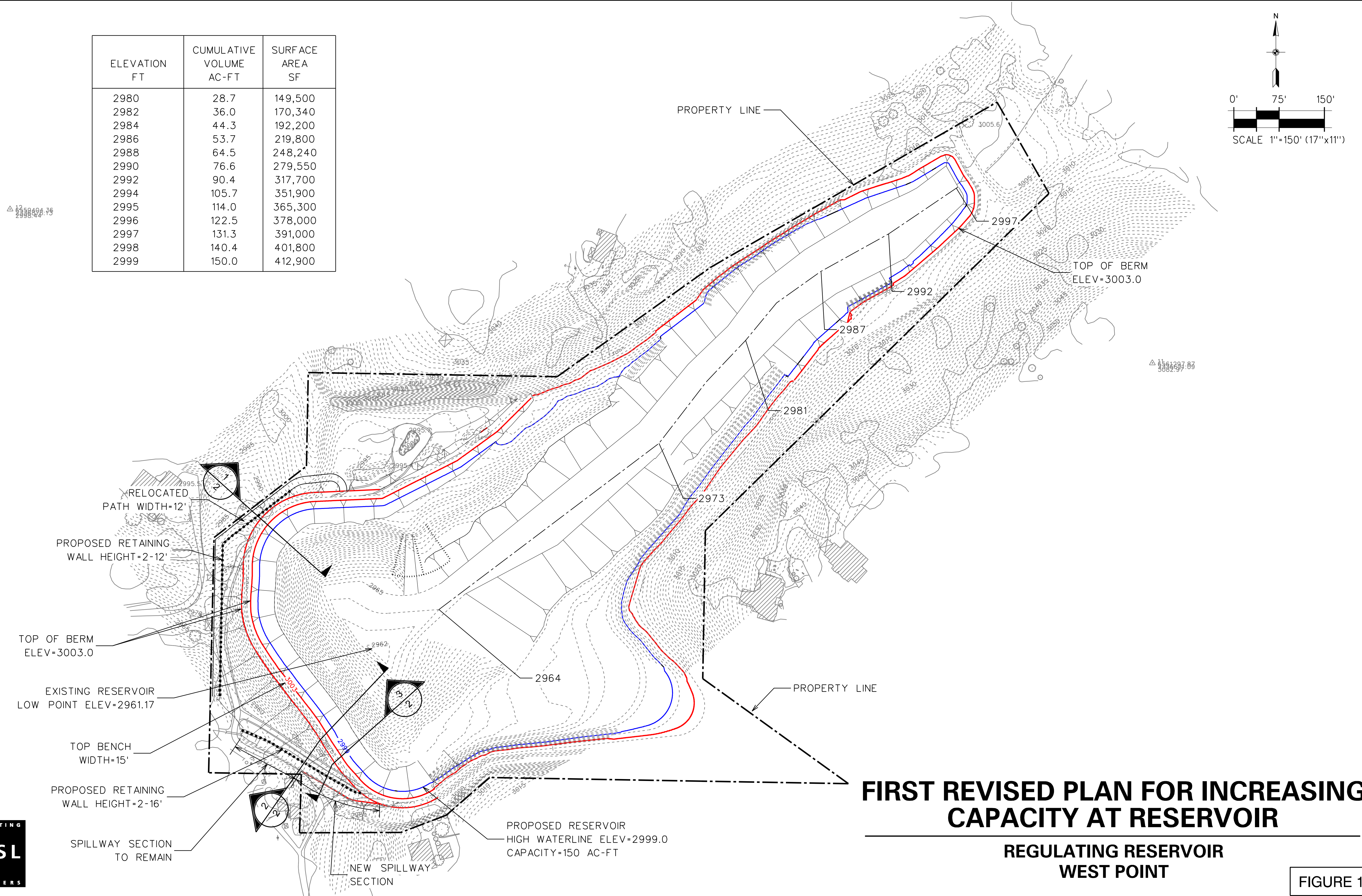
INITIAL EVALUATION FOR INCREASING CAPACITY AT RESERVOIR TO ± 150 AC-FT

REGULATING RESERVOIR WEST POINT

FIGURE 15

ELEVATION FT	CUMULATIVE VOLUME AC-FT	SURFACE AREA SF
2980	28.7	149,500
2982	36.0	170,340
2984	44.3	192,200
2986	53.7	219,800
2988	64.5	248,240
2990	76.6	279,550
2992	90.4	317,700
2994	105.7	351,900
2995	114.0	365,300
2996	122.5	378,000
2997	131.3	391,000
2998	140.4	401,800
2999	150.0	412,900



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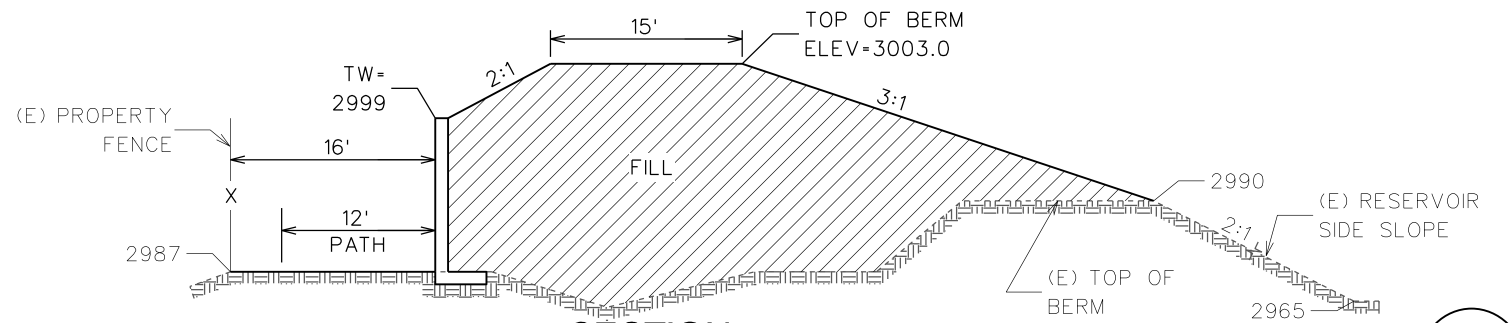
FIRST REVISED PLAN FOR INCREASING CAPACITY AT RESERVOIR

REGULATING RESERVOIR
WEST POINT

FIGURE 16



SECTION 1

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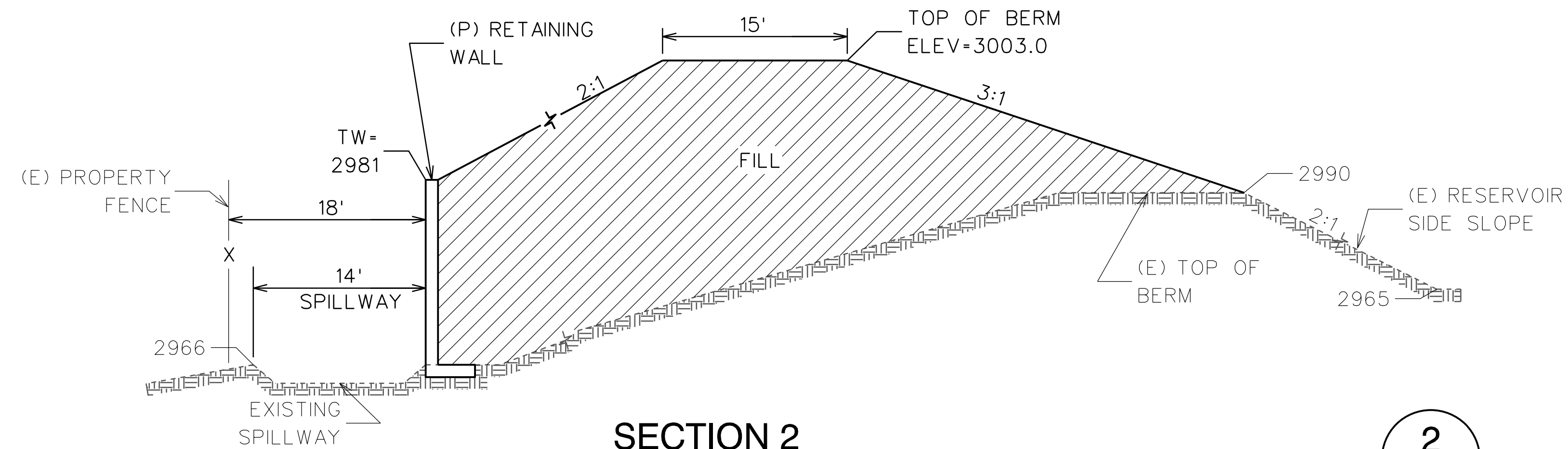
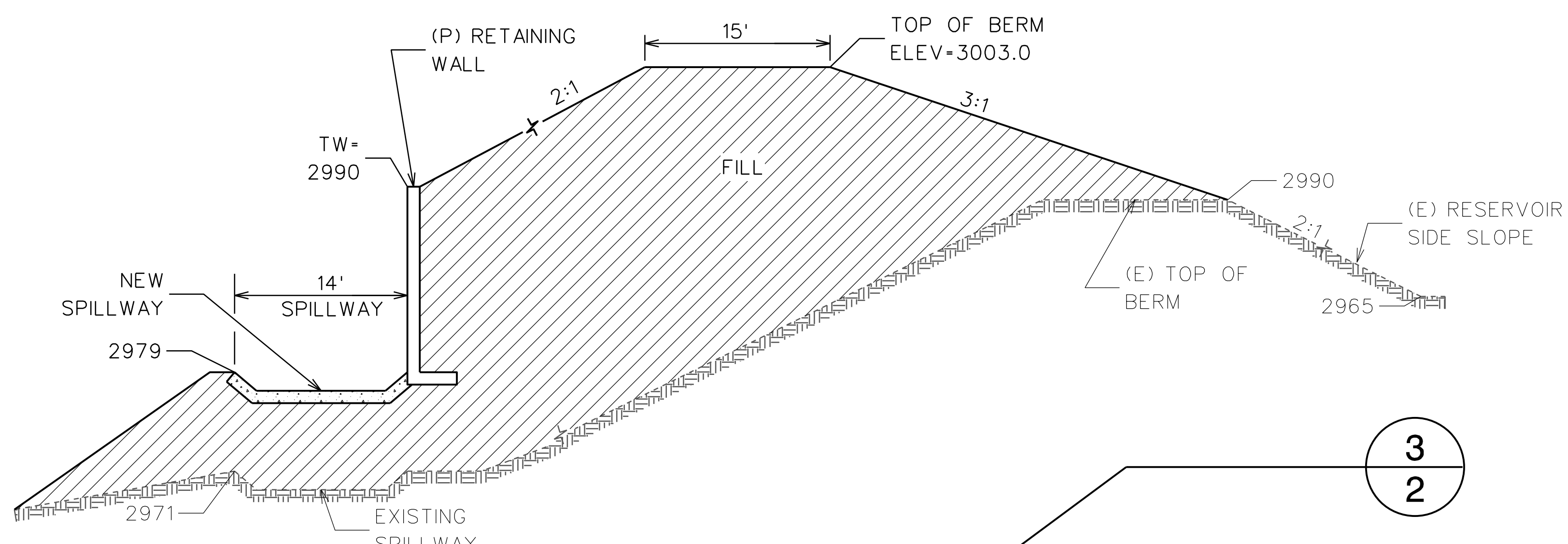
1
2



SECTION 2

SCALE: N.T.S.

2
2



3
2

SECTION 3

SCALE: N.T.S.

FIRST REVISED PLAN FOR INCREASING CAPACITY AT RESERVOIR CRITICAL SECTIONS

REGULATING RESERVOIR
WEST POINT

FIGURE 17

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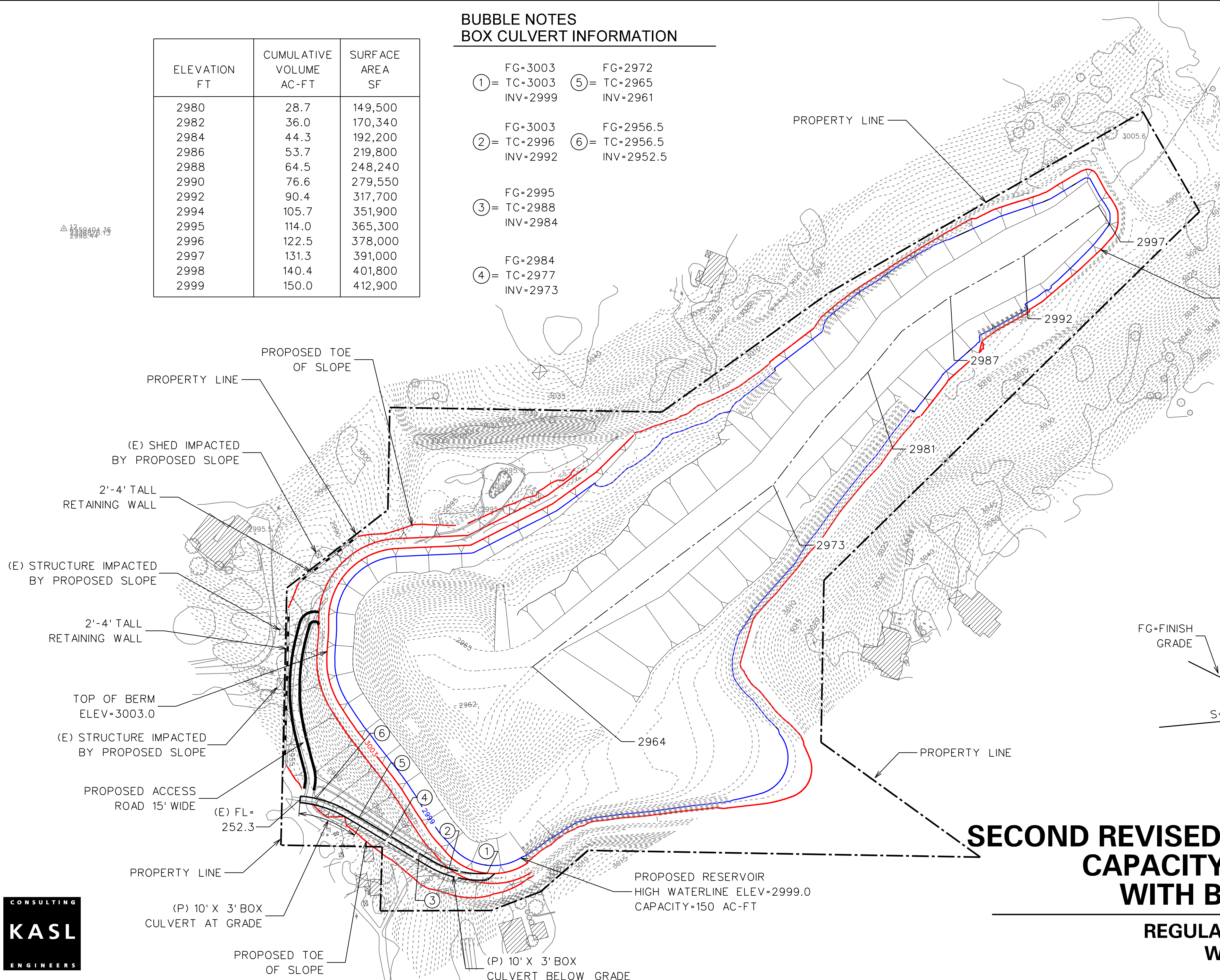
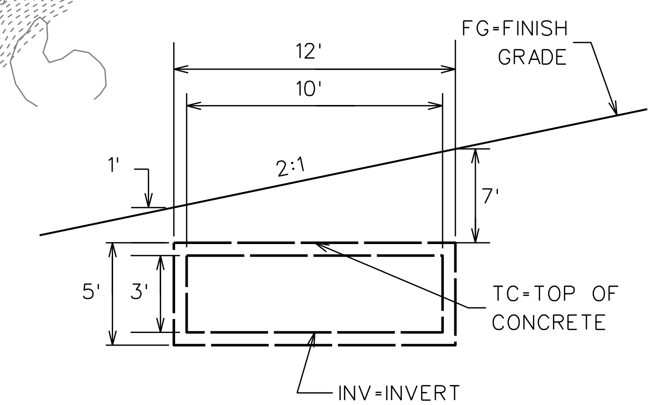
ELEVATION FT	CUMULATIVE VOLUME AC-FT	SURFACE AREA SF
2980	28.7	149,500
2982	36.0	170,340
2984	44.3	192,200
2986	53.7	219,800
2988	64.5	248,240
2990	76.6	279,550
2992	90.4	317,700
2994	105.7	351,900
2995	114.0	365,300
2996	122.5	378,000
2997	131.3	391,000
2998	140.4	401,800
2999	150.0	412,900

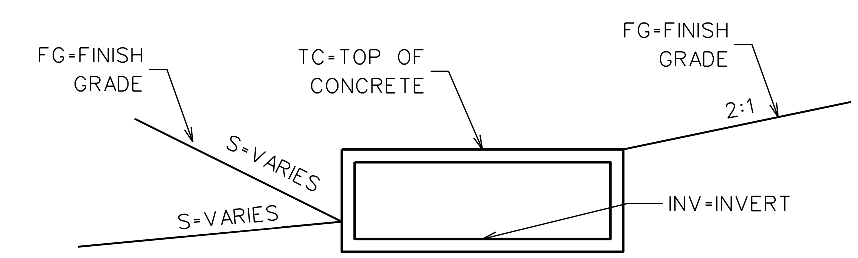
BUBBLE NOTES
BOX CULVERT INFORMATION

(1) = FG=3003, TC=3003, INV=2999
(2) = FG=3003, TC=2996, INV=2992
(3) = FG=2995, TC=2988, INV=2984
(4) = FG=2984, TC=2977, INV=2973
(5) = FG=2972, TC=2965, INV=2961
(6) = FG=2956.5, TC=2956.5, INV=2952.5





3' HIGH X 10' WIDE BOX CULVERT
(BELOW GRADE CONDITION)



3' HIGH X 10' WIDE BOX CULVERT
(AT GRADE CONDITION)

SECOND REVISED PLAN FOR INCREASING CAPACITY AT RESERVOIR WITH BOX CULVERT

REGULATING RESERVOIR WEST POINT

FIGURE 18

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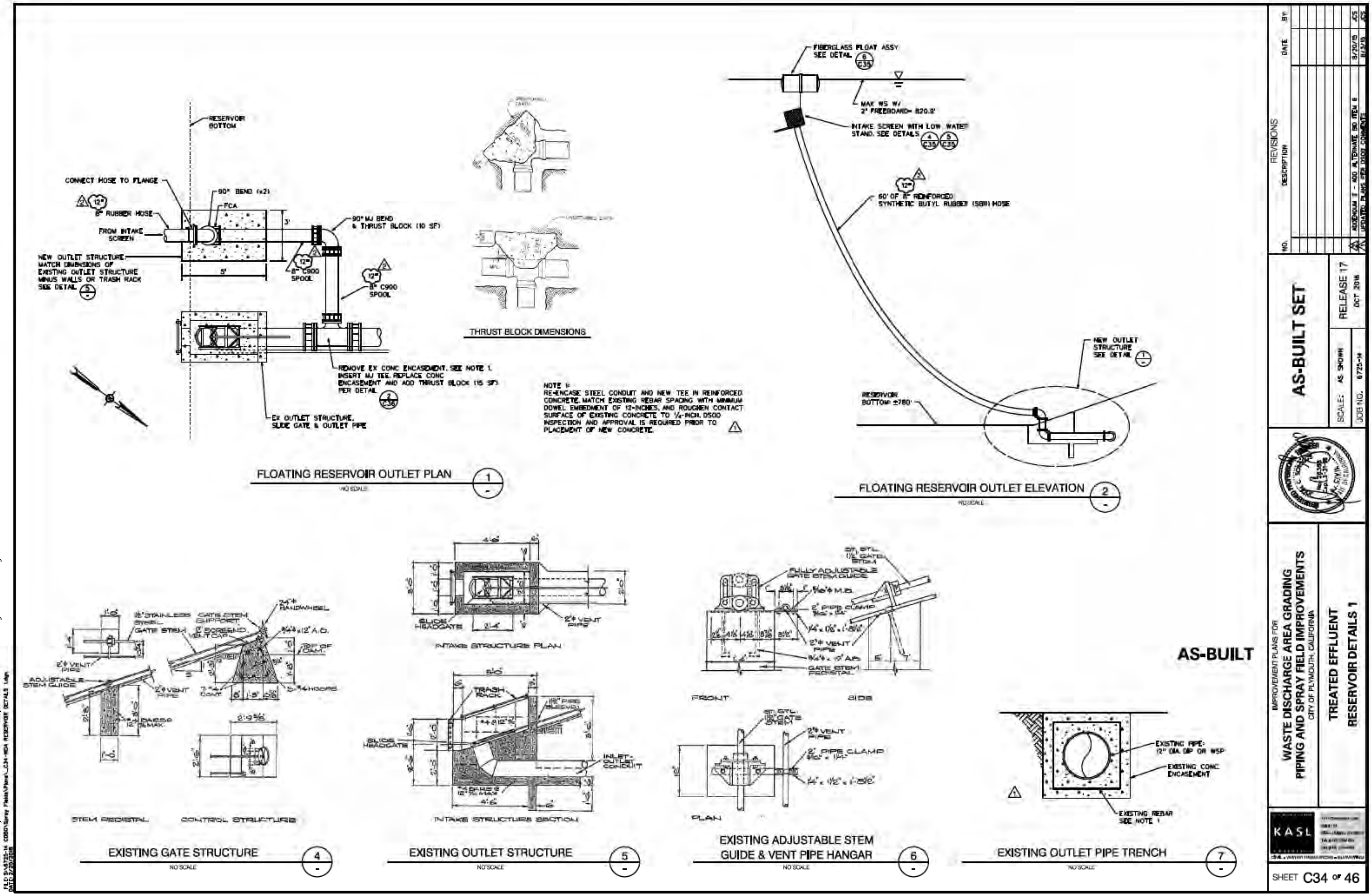
Table 4. Cost Estimate for the Second Revised Plan for Increasing the Capacity at the West Point Regulating Reservoir to 150 AF

ITEM NO.	DESCRIPTION	ESTIMATED UNIT COST	UNIT	ESTIMATED QUANTITY	ESTIMATED COST
1	Mobilization,[1] Clearing and Grubbing	$ 85,000.00	LS	1	$ 85,000
2	Remove Existing Structure	$ 2,000.00	EA	3	$ 6,000
3	Remove Existing Fence	$ 10.00	LF	350	$ 3,500
4	Remove Existing Concrete Spillway	$ 250.00	CY	80	$ 20,000
5	Remove Existing 24" CMP	$ 50.00	LF	200	$ 10,000
6	Reservoir and Reservoir Embankment Excavation	$ 6.50	CY	45000	$ 292,500
7	Place and Compact Reservoir Embankment [2]	$ 10.00	CY	60000	$ 600,000
8	Install Erosion Control Netting	$ 2.50	SY	5250	$ 13,125
9	Construct 15' Wide Access Road (Class 2 A.B)	$ 125.00	TONS	145	$ 18,125
10	Construct 10' x 3' Reinforced Concrete Box Culvert	$ 800.00	CY	400	$ 320,000
11	Install Chain Link Fence	$ 40.00	LF	350	$ 14,000
12	Rebuild Structures	$ 10,000.00	EA	3	$ 30,000
13	Construct Perimeter Retaining Walls	$ 100.00	LF	350	$ 35,000
14	Furnish and Install 24" CMP Drain	$ 250.00	LF	300	$ 75,000
15	Furnish and Install Drain Trash Rack and Gate Control	$ 65,000.00	LS	1	$ 65,000
			Estimated Construction Cost		$ 1,587,250
	20% Construction Cost Contingencies				$ 317,450
			Planning & Engineering Design (10% of Construction)		$ 158,725
	Permitting and Environmental Clearance (7% of Construction)				$ 111,100
			Construction Administration (8% of Construction)		$ 127,000
			Administrative and Legal Costs (4% of Construction)		$ 63,500
			Total Estimated Costs		$ 2,365,025

(1) Estimated at 5% of Construction Cost.

(2) Assumes 30% Shrinkage and that Suitable Onsite Sources of Fill Material are Available.



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DATE: 3/29/2018

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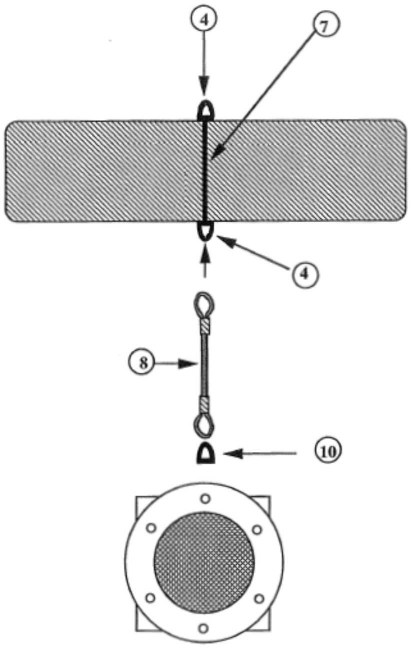
Sample Floating, Screened Reservoir Outlet Plan

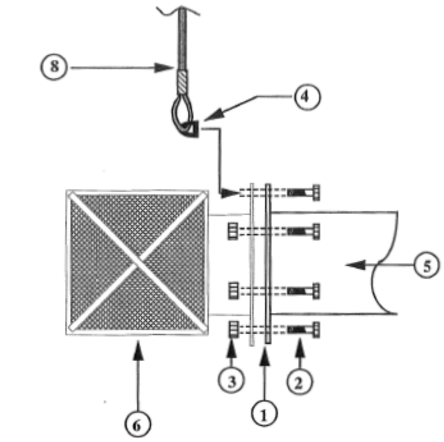
FIGURE 19



Item #	Description
4	Stainless Steel Eye Nut
7	Stainless Steel All Thread
8	Stainless Steel Cable
10	Stainless Steel Eye Nut

FLOAT / INTAKE SCREEN CONNECTION 4 -

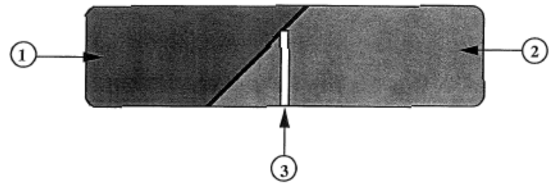
NO SCALE



Item #	Description
1	Flange
2	Stainless Steel Bolt
3	Stainless Steel Nut
4	Stainless Steel Eye Nut
5	SBR Hose
6	Stainless Steel Screen

INTAKE SCREEN DETAIL 5 -

NO SCALE



Item #	Description
1	Fiberglass Cover
2	Foam Insert
3	PVC Sleeve

FIBERGLASS FLOAT ASSEMBLY 6 -

NO SCALE

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DATE: 3/29/2018

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Floating Screened Reservoir Outlet Assembly Details

FIGURE 20

Table 5. Cost Estimate of the Suggested Floating, Screened, Reservoir Outlet Improvements to Regulating Reservoir

ITEM NO.	DESCRIPTION	ESTIMATED UNIT COST	UNIT	ESTIMATED QUANTITY	ESTIMATED COST
1	Modify Existing Outlet Structure; Piping, Fittings, Concrete Foundation(1)	$ 25,000.00	LS	1	$ 25,000
2	Furnish & Install HDPE Outlet Piping	$ 250.00	LF	60	$ 15,000
3	Screen & Float Attachment	$ 35,000.00	LS	1	$ 35,000
4	Install Bar Rack on Existing Bottom Outlet	$ 15,000.00	LS	1	$ 15,000
5	Furnish and Install Aluminum Staff Gauge in Concrete Footing	$ 3,500.00	LS	1	$ 3,500
6	Furnish and Install Pressure Sensor in Outlet Pipe; Provide Radio Transmittal of Data to West Point WTP	$ 12,500.00	LS	1	$ 12,500
		Estimated Construction Cost			$ 106,000
	20% Construction Cost Contingencies				$ 21,200
	Planning and Engineering Design (10% of Construction)				$ 10,600
	Construction Administration (8% of Construction)				$ 8,500
		Total Estimated Costs			$ 146,300

(1) Existing Gate Operator to Remain.

It is recommended that an aluminum staff gauge be installed in the reservoir near the reservoir bottom and visible from the embankment levee. The staff gauge will serve as a visual check of the reservoir operating level. With expansion of the Regulating Reservoir a water surface elevation (depth) to volume curve will be prepared for the West Point Operators.

To provide an electronic monitoring of the reservoir level, a pressure sensor is proposed on the outlet pipe. The pressure in the outlet pipe can be converted to provide the relative elevation difference between the reservoir outlet pipe and the water surface elevation. Regulating Reservoir water surface elevations can be electronically transmitted to the West Point WTP along with the Bear Creek flow meter data.

3.0 MIDDLE FORK MOKELUMNE RIVER SUPPLY, PUMP STATION AND PIPELINE IMPROVEMENTS

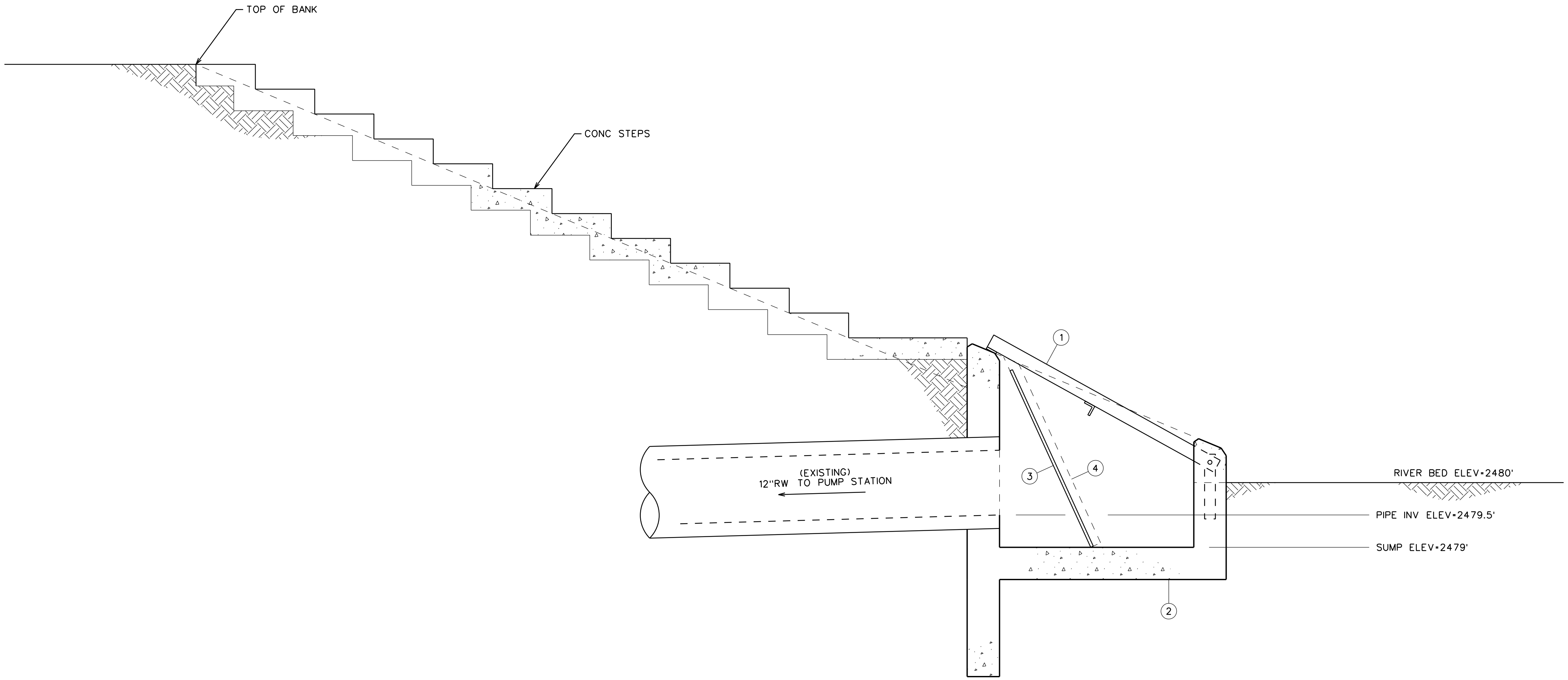
In this section of the West Point Water Master Plan improvements to the existing Middle Fork Mokelumne River (MFMR) supply system, including modifications to the Middle Fork Pump Station intake facilities, replacement of the existing MFMR Pump Station and the replacement of the pipeline that delivers MFMR water from the MFMR Pump Station to the West Point WTP, are discussed. In addition, the estimated cost of redundant West Point Water Treatment Plant capacity improvements, additional improvements to the Bummerville water distribution system and the estimated cost and benefits of either expanding Schaads Reservoir and/or constructing a new reservoir below the confluence of the Forest Creek-Middle Fork Mokelumne River (Forest Creek – Middle Fork Reservoir) are developed.

The District currently has an agreement to purchase up to 200 acre-ft. per year of MFMR water from CPUD.

3.1 Middle Fork Mokelumne River Pump Station Intake

As previously discussed in Section 1.0 of this Report, the MFMR Pump Station intake facilities consist of two, 12-inch diameter, perforated or slotted, pipelines placed in the gravel material upstream of the MFMR diversion structure and, a 12-inch diameter perforated pipe placed along the upstream face of the diversion structure. During the winter of 2016-2017, high flows in the Middle Fork damaged the near surface perforated pipe collector and the perforated pipeline sections were removed by District Staff. Reinstallation by CCWD staff was completed in July 2018.

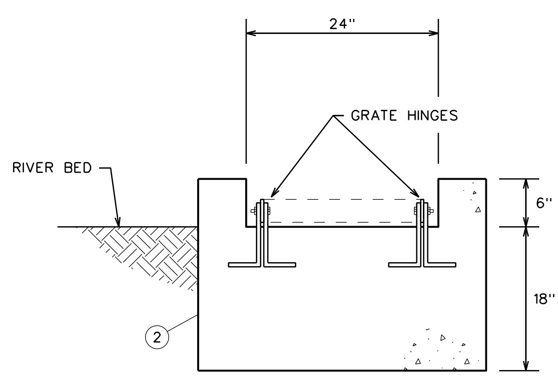
With the vulnerability of the exposed perforated pipe intake to damage from high water flows, alternative, longer term pump station intake solutions are considered here. The first option to improving the existing intake facilities includes replacing the near surface perforated pipe collector with a screen inlet placed in a concrete inlet structure. Water which is not collected by the pump station intake pipe would be allowed to flow through the inlet structure and return to the River. The existing diversion structure constructed across the River channel would remain with stop logs placed on the diversion structure except for that section closest to the new screened inlet. During low flows the river would be diverted toward the inlet screen and pump station intake. The inlet screen would be designed with access from above so that an operator standing on top of the concrete inlet structure could remove the screen through a hinged top grate, clean the interior screen and top grate of any debris and return the screen to a precast slot constructed in the inlet structure. With minimal disturbance to the river channel it is believed that a new screened inlet structure placed at the intake of the pump station intake pipe could be more easily permitted by the California Department of Fish and Wildlife than other alternatives that require excavation within the river channel. District Engineering Staff reviewed the preliminary plan presented in **Figure 21**. Staff directed modifications of this proposal with features similar to a "Ranney" type collector which would include excavation within the MFMR channel and include installation of perforated or screened collector pipes in the riverbed.



RIVER INTAKE PROFILE 1 -

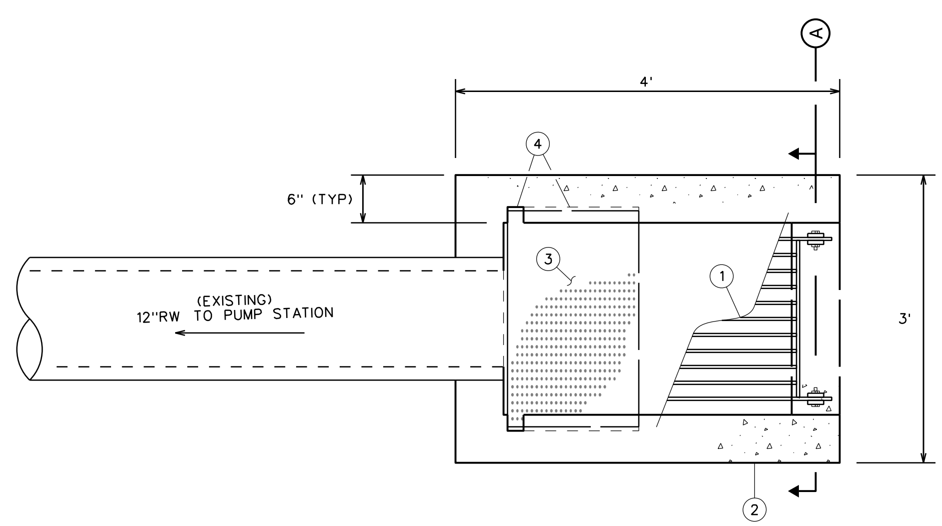
SCALE: 1"=1'

1. HINGED GRATE
2. CONC INTAKE STRUCTURE
3. PERF SS SCREEN (1/4" MESH) W/ HANDLE & SCRREN SUPPORTS
4. 2"x2" NOTCH IN CONC (TO ACCEPT PERF SCREEN)



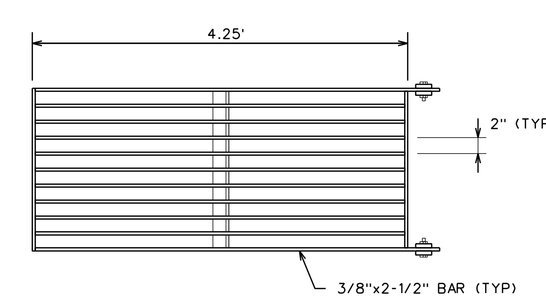
SECTION A -

SCALE: 1"=1'



RIVER INTAKE PLAN 2 -

SCALE: 1"=1'



HINGED GRATE DETAIL 3 -

SCALE: 1"=1'

REVISIONS

NO.	DESCRIPTION	DATE	BY

BENCHMARK
DESCRIPTION:
ELEV.
DATUM: NGVD 1929

30% PLANS
RELEASE 2
NOV 2017

SCALE: 1"=1'
JOB NO. 2517-01

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CALAVERAS COUNTY WATER DISTRICT
MIDDLE FORK RAW WATER PUMP STATION, WEST POINT
CALAVERAS COUNTY, CALIFORNIA

RIVER INTAKE STRUCTURE

CONSULTING KASL ENGINEERS
7777 Greenback Lane
Suite 104
Citrus Heights, CA 95610
Tel. (916) 722-1800
Fax (916) 722-4595
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FIGURE 21

IF THIS SHEET IS LESS THAN 22" X 34" IT IS A REDUCED PRINT, SCALE ACCORDINGLY

Figure 22 presents a modification to the initial pump station intake proposal that includes the installation of a series of 8-inch diameter perforated pipes placed within, and aligned parallel to, the river. A ± 100-foot-long intake collection gallery is proposed with six, 8-inch diameter, perforated collectors that would connect to a 12-inch diameter manifold which would, in turn, discharge to the MFMR pump station sump. With further design development, the length and number of perforated pipe collectors would be reviewed. Either C900 PVC or high strength HDPE pipe could be used for the collection gallery and manifold piping. The perforated pipe collectors would be set in 1- to 2-inch diameter drain rock bedding and initial backfill material. Final backfill would utilize larger diameter (2- to 6-inch diameter) cobble and existing riverbed material. The design presented in Figure 22 is similar to the river collection gallery installed in the Calaveras River for the Jenny Lind Water Treatment Plant. The Jenny Lind raw water collection system was placed into operation in the early 1990s and has been in continuous service since that time. For the Jenny Lind Project, the Contractor received approval from the California Department of Fish and Game (now Wildlife) to construct coffer dams to divert portions of the Calaveras River during construction.

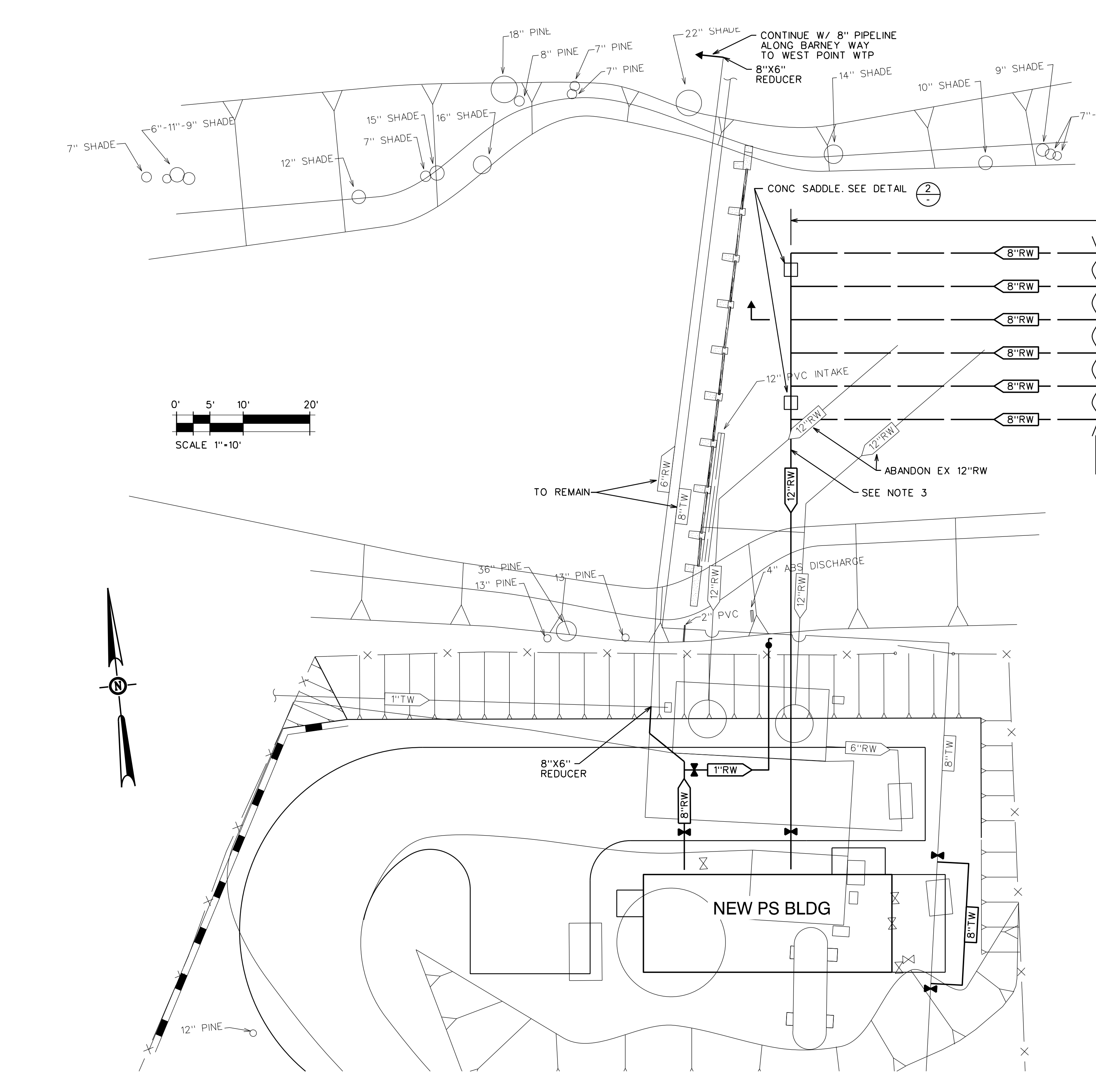
CCWD Engineering Staff also reviewed the MFMR pump station intake facilities shown in Figure 22 and suggested that further modifications may be warranted.

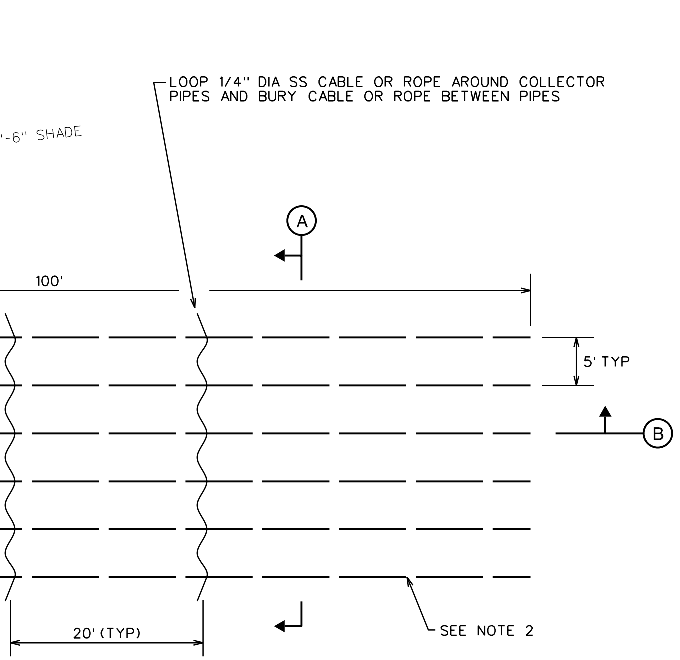
The estimated costs of the currently proposed MFMR pump station intake facilities are presented in **Table 6**.

3.2 Middle Fork Mokelumne River Pump Station

The existing MFMR Pump Station is constructed with a capacity of 200 gpm. As previously discussed in Section 1.0, the pump station capacity should be increased to provide 100% of the West Point service area water supply during periods when water from Bear River is not available or Bear River water quality is not acceptable. According to the Mokelumne River Long-Term Needs Water Study, a MFMR pump station capacity of 500 gpm would be expected to meet the demands of the West Point service area at least through the year 2100. The District has suggested that a smaller, satellite, water treatment plant with approximately 200 gpm capacity could be constructed in the future to serve the Wilseyville area. If this did occur the capacity of the MFMR pump station could be further reduced. A future Wilseyville WTP constructed in the vicinity of Blue Mountain Road would require approval, design and construction of a Middle Fork Ditch Pipeline and a new water appropriation agreement with CPUD. For the purpose of this Supplemental Master Plan Report, MFMR pump station improvements with 500 gpm capacity are proposed. The pumps could be driven by variable frequency drive (VFD) motors which would allow a range (reduction) of flows in the future.

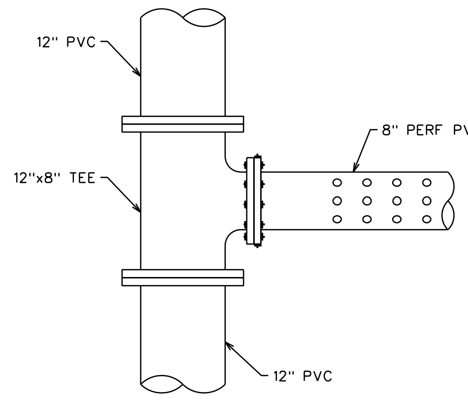
As further described in this Supplemental Master Plan Report, the design of the MFMR Pump Station is based on the replacement of the existing 6-inch diameter MFMR Pump Station to West Point WTP supply pipeline with an 8-inch diameter pipe. The new MFMR pump station pumps would lift the Middle Fork supply to the West Point WTP (static lift of ±450 feet) without the continued operation of the intermediate pump station on Acorn Way. This existing intermediate pumping facility would be removed from service.





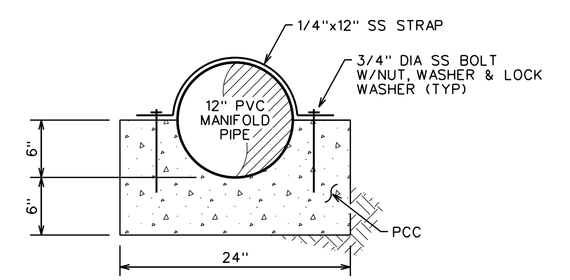
RIVER INTAKE PLAN

SCALE: 1"=10'



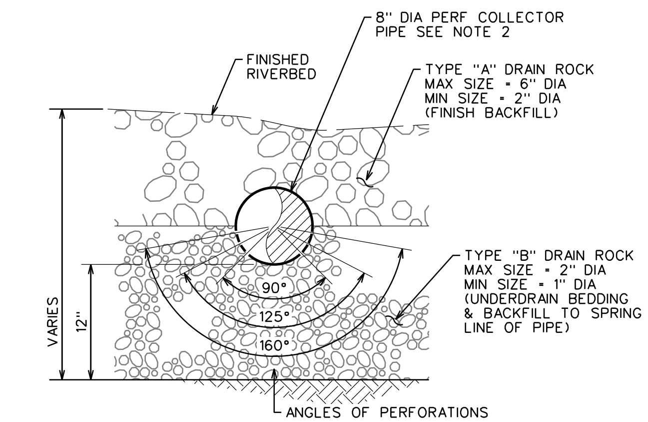
CONNECTION DETAIL (1)

NO SCALE



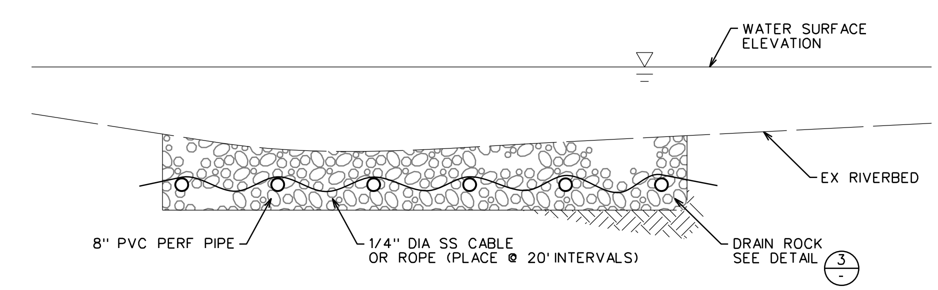
CONC SADDLE DETAIL (2)

NO SCALE



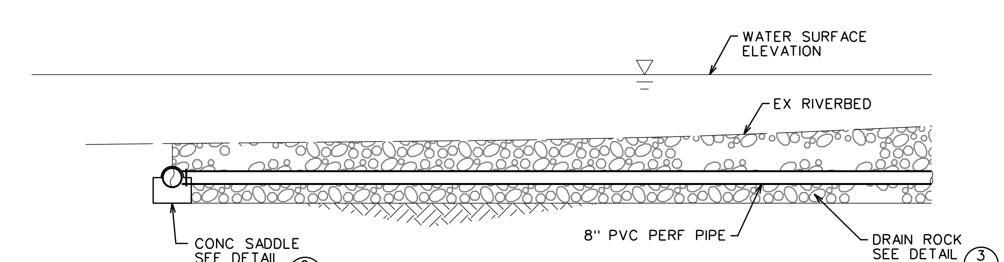
DRAIN ROCK DETAIL (3)

NO SCALE



SECTION (A)

NO SCALE



SECTION (B)

NO SCALE

NOTES:

1. WATER SURFACE ELEV. 2482' AS RECORDED ON MAY 4, 2017
2. 8" PERFORATED COLLECTOR PIPE SHALL BE SCHEDULE 40 PVC PERFORATED UNDERDRAIN PIPE WITH SOLVENT WELD JOINTS OR EQUAL. PERFORATION HOLE SIZE: 1/2", HOLE SPACING: 3-1/4".
3. 12" MANIFOLD PIPE TO PROPOSED INFLUENT PUMP STATION SHALL BE 12" CL 305 PVC.
4. RETURN RIVER BED TO EXISTING ELEVATIONS AFTER INTAKE MANIFOLD AND INTAKE COLLECTORS ARE PLACED.

FIGURE 22

NO.	REVISIONS DESCRIPTION	DATE	BY

BENCHMARK DESCRIPTION:
ELEV.
DATUM: NGVD 1929

SCALE: 1"=10'
JOB NO. 2517-01

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NOV 2017

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CALAVERAS COUNTY WATER DISTRICT
MIDDLE FORK RAW WATER PUMP STATION, WEST POINT
CALAVERAS COUNTY, CALIFORNIA

RAW WATER INTAKE

KASL CONSULTING ENGINEERS
7777 Greenback Lane
Suite 104
Citrus Heights, CA 95610
Tel. (916) 722-1800
Fax (916) 722-4595
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Table 6. Estimated Costs of the Currently Proposed MFMR Pump Station Intake Facilities

ITEM NO.	DESCRIPTION	ESTIMATED UNIT COST	UNIT	ESTIMATED QUANTITY	ESTIMATED COST
1	12" Diameter Intake Manifold	$ 150.00	LF	40	$ 6,000
2	8" Diameter Perforated Pipe Collectors	$ 100.00	LF	600	$ 60,000
3	Concrete Saddles and SS Straps	$ 750.00	EA	2	$ 1,500
4	1/4" Diameter Stainless Steel Cable	$ 15.00	LF	250	$ 3,750
5	Type A Drain Rock	$ 100.00	CY	220	$ 22,000
6	Type B Drain Rock	$ 120.00	CY	110	$ 13,200
7	12" Diameter Piping to MFMR PS Building	$ 150.00	LF	80	$ 12,000
	Estimated Construction Cost				$ 118,450
	20% Construction Cost Contingencies				$ 23,750
	Planning and Engineering Design (10% of Construction)				$ 12,000
	Permitting (est.)				$ 15,000
	Construction Administration (8% of Construction)				$ 9,500
	Administration and Legal Costs (5% of Construction)				$ 6,000
	TOTAL ESTIMATED COSTS				$ 184,700

The new MFMR pumps would also provide head for 20 psi of losses through the 1 MGD microfloc plant at the West Point WTP. A total design head (TDH) of approximately 550 feet is calculated with the new 8-inch supply pipe and a design flow at 500 gpm. To respond to the high static and dynamic pressures which must be carried by the new pipeline, high strength, Class 305, PVC C900 pipe is proposed. If the MFMR flow delivered by the new pump station exceeds the demands of the West Point WTP, excess flow would be diverted to the West Point Regulating Reservoir via the existing supply line placed between the Regulating Reservoir and the West Point WTP.

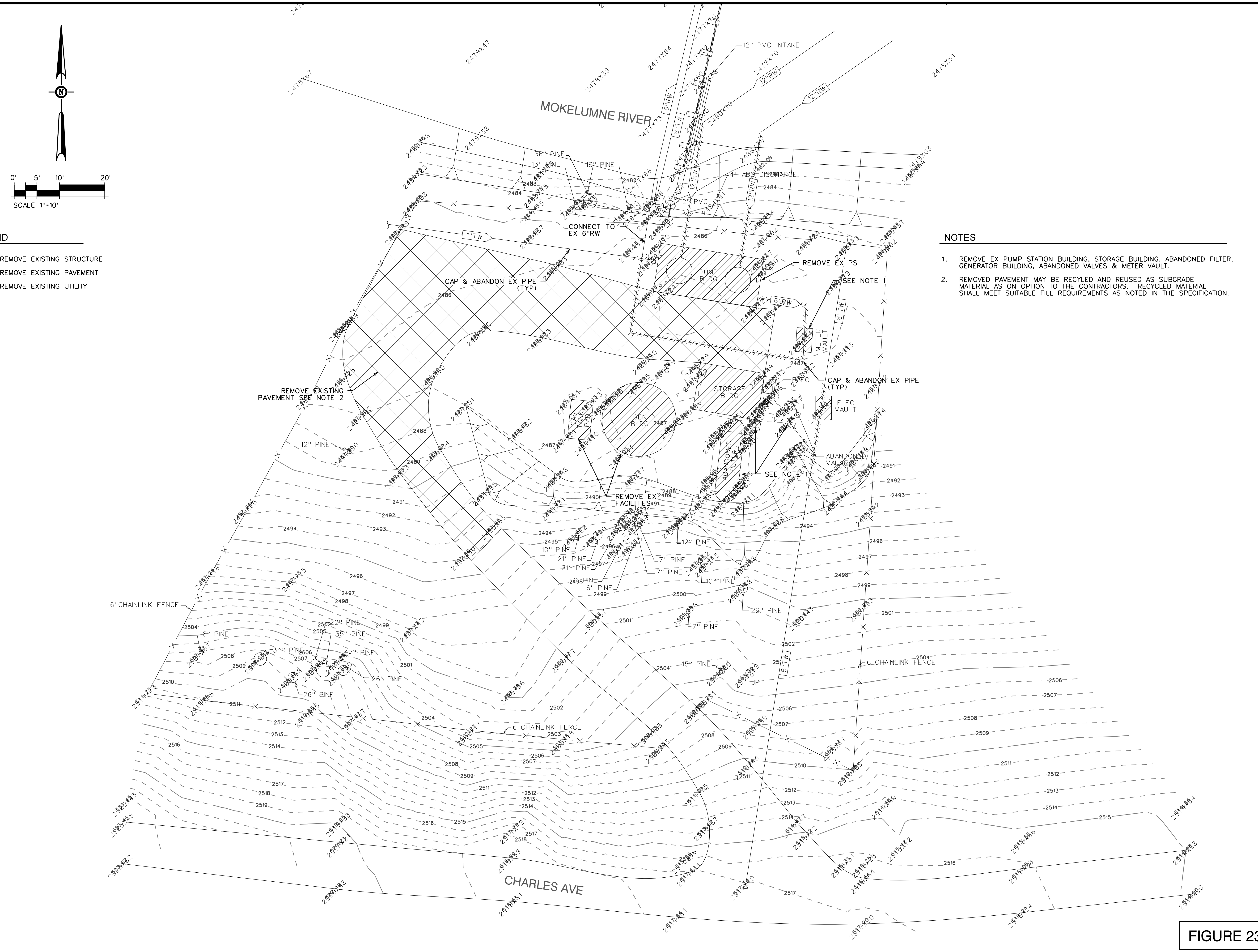
The finished floor elevation at the existing MFMR pump station is too low. High water levels in the MFMR at the pump station can exceed the existing MFMR pump station floor elevation (±2,487.2), as evidenced by flooding of the building housing the MFMR pumps in the winter of 2016-17.

Figure 23 presents the proposed MFMR Pump Station Demolition Plan. The existing pump station building, storage building, abandoned filter, standby generator building and fuel tank pad would be removed together with existing pavement. The pavement removed could be ground and reused as subgrade for the new pump station construction. Demolition of existing improvements will need to protect the 8-inch diameter treated water line which crosses through the pump station site and serves nearby Wilseyville residents. Similarly, the existing 6-inch diameter raw water supply line that crosses the Middle Fork within the MFMR pump station diversion structure must also remain. This short section of existing 6-inch raw water would remain and would connect, on both sides of the river crossing, with the new 8-inch diameter pipe improvements.

Figure 24 presents the proposed MFMR Pump Station Site Plan. The new pump station is proposed with a finished floor of 2490.15, approximately 3 feet higher than the finished floor elevation of the existing pump station. As shown in Figure 24, site grades are also raised 3 to 4 feet and the site surfaced with 3-inch-thick AC over 8-inch thick Class 2 AB pavement. Rock slope protection is proposed to transition the new site grades to existing grades at the top of bank. No fill is proposed within the Middle Fork Mokelumne River as part of these pump station improvements. A new standby generator is proposed on a separate concrete pad with cover attached to the east side of the new MFMR Pump Station building.

The new, 2 pump, pump station plan and section is presented in **Figure 25.** Two, multistage vertical turbine pumps (100% redundancy) are proposed. To deliver 500 gpm with a TDH of approximately 550 feet will require 100 horsepower variable frequency drive motors. The VFDs will provide a "soft start" to protect the supply pipeline from "pump on" surges. A surge anticipation and pressure relief valve is proposed to protect piping from reverse surges when a sudden power loss occurs. The pump station will be supplied with a flow meter. A pressure gauge would be installed at the discharge of the pumps to monitor pump performance and provide shut down alarms in the event of discharge pressures or surges outside of acceptable ranges. The Motor Control Center (MCC) installation will include a Human-Machine Interface (HMI) panel. The information available on this panel (flow rate, pump operating station discharge pressure, standby generator status, standby generator fuel level, generator oil pressure level, pump fail, building intrusion alarms and the like) will be relayed, via radio telemetry, to the West Point WTP. CCWD electrical and instrumentation staff have confirmed that radio transmission of MFMR pump station conditions and remote Supervisory Control and Data Acquisition (SCADA) is available between the West Point WTP and the MFMR Pump Station. Information displayed on the MFMR Pump Station Programmable Logic Controller (PLC) will also be available for display and response at the West Point WTP central computer.

Further refinement of new MFMR pump station facilities will occur at the design stage. The District may elect to install a 3 pump, pump station with any two pumps capable of delivering the Master Plan raw water demands to the West Point Water Treatment Plant. Under these conditions, each of the three multistage vertical turbine pumps could be driven by ± 75 hp variable frequency drive motors.



LEGEND

- REMOVE EXISTING STRUCTURE
- REMOVE EXISTING PAVEMENT
- REMOVE EXISTING UTILITY

NOTES

1. REMOVE EX PUMP STATION BUILDING, STORAGE BUILDING, ABANDONED FILTER, GENERATOR BUILDING, ABANDONED VALVES & METER VAULT.
2. REMOVED PAVEMENT MAY BE RECYCLED AND REUSED AS SUBGRADE MATERIAL AS ON OPTION TO THE CONTRACTORS. RECYCLED MATERIAL SHALL MEET SUITABLE FILL REQUIREMENTS AS NOTED IN THE SPECIFICATION.

REVISIONS			
NO.	DESCRIPTION	DATE	BY

BENCHMARK
DESCRIPTION:
ELEV.
DATUM: NGVD 1929

30% PLANS
RELEASE 2
NOV 2017

SCALE:
JOB NO. 2517-01

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CALAVERAS COUNTY WATER DISTRICT
MIDDLE FORK RAW WATER PUMP STATION, WEST POINT
CALAVERAS COUNTY, CALIFORNIA

MOKELUMNE RIVER PUMP STATION DEMOLITION PLAN

KASL CONSULTING ENGINEERS
7777 Greenback Lane
Suite 104
Citrus Heights, CA 95610
Tel. (916) 722-1800
Fax (916) 722-4595
CIVIL - WATER RESOURCES - SURVEYING

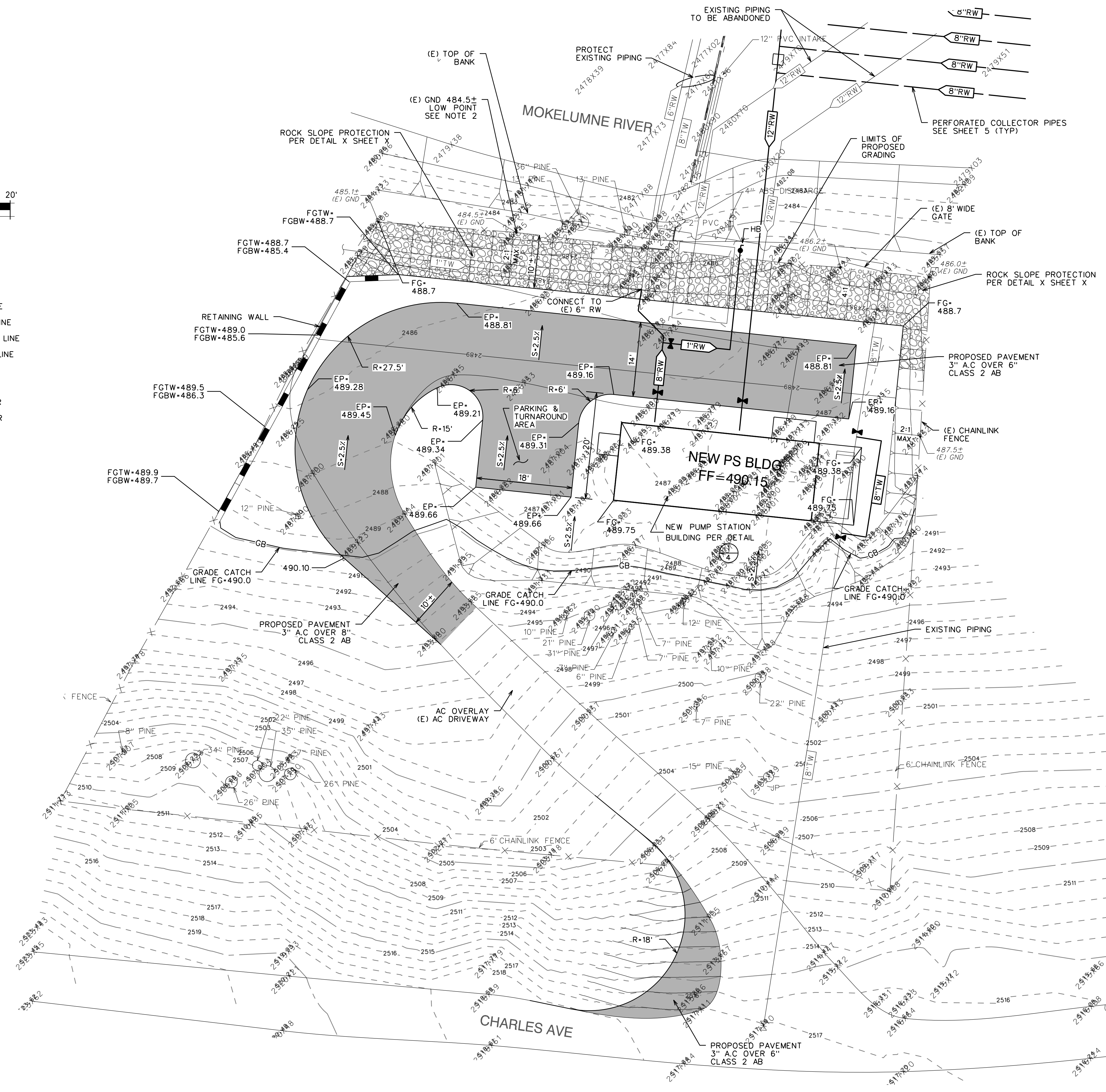
FIGURE 23

IF THIS SHEET IS LESS THAN 22" X 34" IT IS A REDUCED PRINT, SCALE ACCORDINGLY

0' 5' 10' 20'
SCALE 1"=10'

LEGEND

- EXISTING RAW WATER LINE (12"RW)
- PROPOSED RAW WATER LINE (12"RW)
- EXISTING TREATED WATER LINE (6"TW)
- PROPOSED TREATED WATER LINE (8"TW)
- PROPOSED SURGE RELIEF LINE (3"SR)
- EXISTING CONTOUR MINOR (2488)
- EXISTING CONTOUR MAJOR (2485)
- PROPOSED CONTOUR MINOR (2488)
- PROPOSED CONTOUR MAJOR (2490)
- PROPOSED AC PAVEMENT
- HB HOSE BIBB



NOTES

1. DATUM: ADD 2000' TO THE PROPOSED AND EXISTING SPOT ELEVATIONS SHOWN.
2. LOW POINT OF SITE ALONG FENCE ELEV=2484.5 APPARENT HIGH WATER MARK ELEVATION APPROXIMATELY 2485.

NO.	REVISIONS DESCRIPTION	DATE	BY

BENCHMARK DESCRIPTION:
ELEV. DATUM: NGVD 1929

30% PLANS
RELEASE 2
NOV 2017

SCALE: 1"=10'
JOB NO. 2517-01

REVIEW COPY

CALAVERAS COUNTY WATER DISTRICT MIDDLE FORK RAW WATER PUMP STATION, WEST POINT

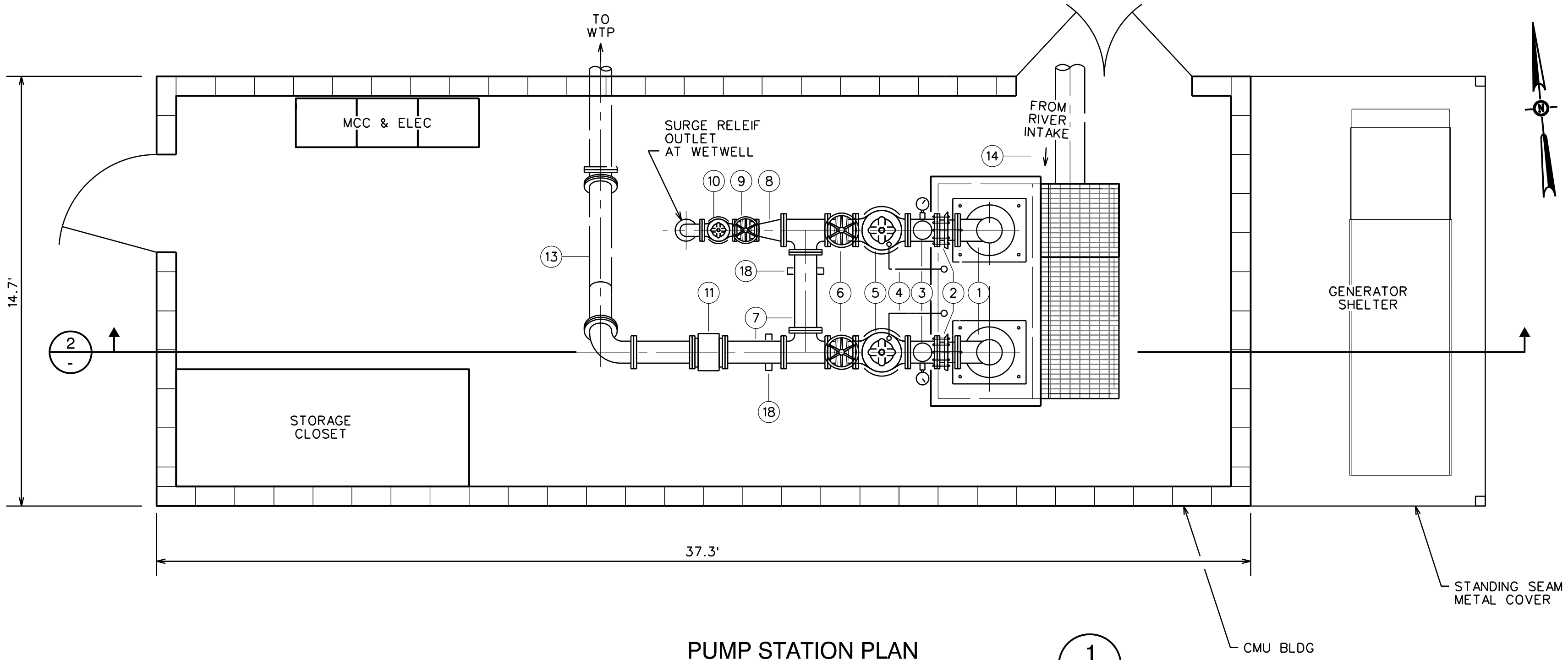
CALAVERAS COUNTY, CALIFORNIA

MOKELUMNE RIVER PUMP STATION SITE AND GRADING PLAN

KASL CONSULTING ENGINEERS
7777 Greenback Lane
Suite 104
Citrus Heights, CA 95610
Tel. (916) 722-1800
Fax (916) 722-4595
CIVIL - WATER RESOURCES - SURVEYING

FIGURE 24

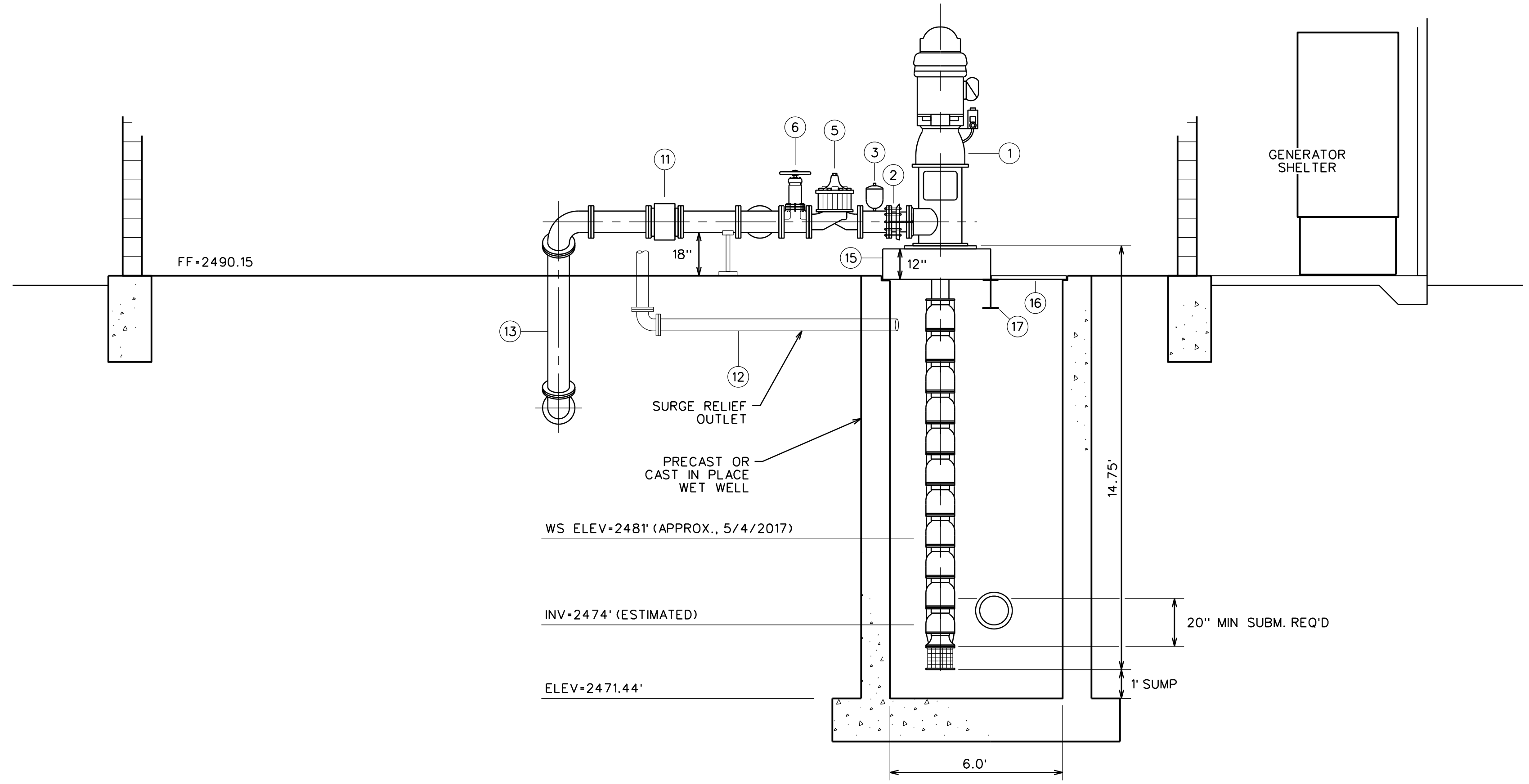
IF THIS SHEET IS LESS THAN 22" X 34" IT IS A REDUCED PRINT, SCALE ACCORDINGLY



PUMP STATION PLAN 1 -

SCALE: 1"=3'

1. VERTICAL TURBINE PUMP
2. 8" DISMANTLING JOINT
3. 1" AVRV, PRESSURE GAUGES & 8" DIP SPOOL
4. PUMP CONTROL VALVE DRAIN LINE
5. 8" PUMP CONTROL & CHECK VALVE
6. 8" GATE VALVE
7. 8" DIP SPOOL
8. 8"x3" REDUCER
9. 3" GATE VALVE
10. 3" SURGE ANTICIPATION & PRESSURE RELIEF VALVE
11. 8" MAGNETIC FLOW METER
12. 3" DIP
13. 8" DIP
14. 12" DIP
15. PUMP BASE
16. GALVANIZED BAR GRATING
17. I BEAM
18. PIPE SUPPORT



PUMP STATION SECTION 2 -

SCALE: 1"=3'

REVISIONS

NO.	DESCRIPTION	DATE	BY

BENCHMARK
DESCRIPTION:
ELEV.
DATUM: NGVD 1929

30% PLANS
RELEASE 2
NOV 2017

SCALE:
JOB NO. 2517-01

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CALAVERAS COUNTY WATER DISTRICT MIDDLE FORK RAW WATER PUMP STATION, WEST POINT

CALAVERAS COUNTY, CALIFORNIA

PUMP STATION PLAN AND SECTION

CONSULTING KASL ENGINEERS
7777 Greenback Lane
Suite 104
Citrus Heights, CA 95610
Tel. (916) 722-1800
Fax (916) 722-4595
CIVIL - WATER RESOURCES - SURVEYING

FIGURE 25

IF THIS SHEET IS LESS THAN 22" X 34" IT IS A REDUCED PRINT, SCALE ACCORDINGLY

As shown in Figure 25, a concrete masonry unit (CMU) block wall pump station building is proposed (dimensions approximately 15 feet (width) by 37 ½ feet (length)) with standing metal seam roof. The pump station roof will include skylights or hatches centered over the pumps to permit removal of the vertical turbine pumps through the skylights or the roof access hatches, if necessary, for pump repair or for pump replacement. A seven-foot-wide equipment access and 3'-6" wide personnel access doors are also proposed.

The MFMR pump station replacement plans shown in Figures 23, 24 and 25 were reviewed with the CCWD District Engineer. The preliminary pump station improvements were approved, in concept, for the purpose of this Master Plan. A cost estimate of the proposed MFMR pump station is presented in **Table 7**.

3.3 Middle Fork Pump Station to West Point WTP Pipeline

To deliver 500 gpm from the Middle Fork Pump Station to the West Point WTP will require replacement of the existing 6-inch diameter pipeline with a new 8-inch diameter pipeline. Three alternative alignments were considered and are shown in **Figure 26**.

3.3.1 Alternative Pipeline Alignment 1

This alternative would replace the existing MFMR supply pipeline with a new pipeline constructed along the same route as the existing. The disadvantage of this alignment include construction along an existing (15-foot-wde) CCWD pipeline easement located between Acorn Way and Barney Way and along an existing (15-foot-wide) CCWD pipeline easement located between Bald Mountain Road and Smitty Lane. This alternative alignment also requires crossing the Middle Fork within the existing MFMR diversion structure. The advantage of this alternative is that it is the shortest of the three alternative alignments considered (approximately 10,225 lineal feet).

3.3.2 Alternative Pipeline Alignment 2

With this option the new supply pipeline would not cross the MFMR between Charles Avenue and Barney Way at the existing MFMR pump station. Instead, the Alternative 2 pipeline alignment continues along Charles Way to State Route 26 and would cross the MFMR at the existing SR 26 Bridge. This is a relatively new bridge structure and includes a utility chase within the bridge structure. The West Point sewer outfall to the West Point WWTP is included in this structure. There is adequate space (in the utility chase) to also place an 8-inch diameter raw water line. Alignment 2 continues along State Route 26 through Central West Point to Winton Road and then along Winton Road and Smitty Lane and to the West Point WTP.

The advantage of this alignment is that the pipeline could be placed along and within public road rights of way from the MFMR Pump Station to the West Point WTP. The disadvantages of this alternative is that more than 1.5 miles of this route is within State Highway 26 and would require encroachment permits from Caltrans. Typically, Caltrans does not permit utilities placed longitudinally within the paved roadway section. With adequate cover (min. 42 inches) the new pipeline could be placed along the unpaved shoulder. There are, however, portions of State Route 26 within the Alternative 2 Alignment where there is little or no shoulder available. Alternative 2 is the longest of the three alternative routes considered (approximately 13,900 feet) and nearly 3700 feet longer than Alternative 1.

Table 7. Cost Estimate of the Proposed MFMR Pump Station

ITEM NO.	DESCRIPTION	ESTIMATED UNIT COST	UNIT	ESTIMATED QUANTITY	ESTIMATED COST
1	Mobilization, Site Clearing and Grubbing	$ 50,000.00	LS	1	$ 50,000
2	Remove Existing Structures	$ 5,000.00	EA	4	$ 20,000
3	Remove Existing Fence	$ 10.00	LF	50	$ 500
4	Remove Existing Pavement	$ 2.00	SF	2300	$ 4,600
5	Remove Existing Raw Water Piping	$ 25.00	LF	160	$ 4,000
6	Earthwork Embankment	$ 20.00	CY	600	$ 12,000
7	Rock Slope Protection	$ 200.00	CY	150	$ 30,000
8	Type A A.C.	$ 250.00	TONS	50	$ 12,500
9	Class 2 A.B.	$ 100.00	TONS	85	$ 8,500
10	Install 4' Tall CMU Retaining Wall	$ 150.00	LF	55	$ 8,250
11	Install 6' Tall Chain Link Fence & Gate	$ 50.00	LF	50	$ 2,500
12	1" Raw Water Pipe	$ 20.00	LF	30	$ 600
13	8" Raw Water Pipe	$ 100.00	LF	30	$ 3,000
14	12" Raw Water Pipe (included in MFMR)				
15	1" Gate Valve	$ 250.00	EA	1	$ 250
16	8" Gate Valve	$ 2,000.00	EA	1	$ 2,000
17	12" Gate Valve	$ 3,000.00	EA	1	$ 3,000
18	Pump Station Building	$ 350.00	SF	570	$ 199,500
19	Vertical Turbine Pumps	$ 75,000.00	EA	2	$ 150,000
20	Pump Station VFD Controls, MCC	$ 80,000.00	LS	1	$ 80,000
20	Pump Station Electrical Panel	$ 95,000.00	LS	1	$ 95,000
21	Pump Station Wet Well	$ 25.00	CY	2000	$ 50,000
22	Pump Station Piping & Valves	$ 20,000.00	LS	1	$ 20,000
22	Underslab Conduits & Piping	$ 5,000.00	LS	1	$ 5,000
23	Fans & Louvers, HVAC	$ 5,000.00	LS	1	$ 5,000
24	Standing Seam Metal Roof	$ 50.00	SF	900	$ 45,000
25	150 kw Standby Generator and ATS	$200,000.00	LS	1	$ 200,000
26	Surge Anticipation and Pressure Relief Valves	$ 10,000.00	LS	1	$ 10,000
27	6" Flow Meter and Misc. Instrumentation	$ 10,000.00	LS	1	$ 10,000
28	SCADA Antennae and Radio Telemetry Equipment	$ 85,000.00	LS	1	$ 85,000
	Estimated Construction Cost all items				$ 1,116,200.00
		20%		Contingency	$ 223,250.00
	Planning & Engineer Designs (10% of Construction Cost)				$ 112,000.00
	Construction Administration (5% of Construction Cost)				$ 56,000.00
	Administration and Legal Costs (2% of Construction Cost)				$ 22,325.00
			TOTAL ESTIMATED COSTS		$ 1,529,775.00

ALTERNATIVE PIPELINE ROUTES
MFMR WATER SUPPLY PIPELINE
MIDDLE FORK PUMP STATION TO
WEST POINT WATER TREATMENT PLANT

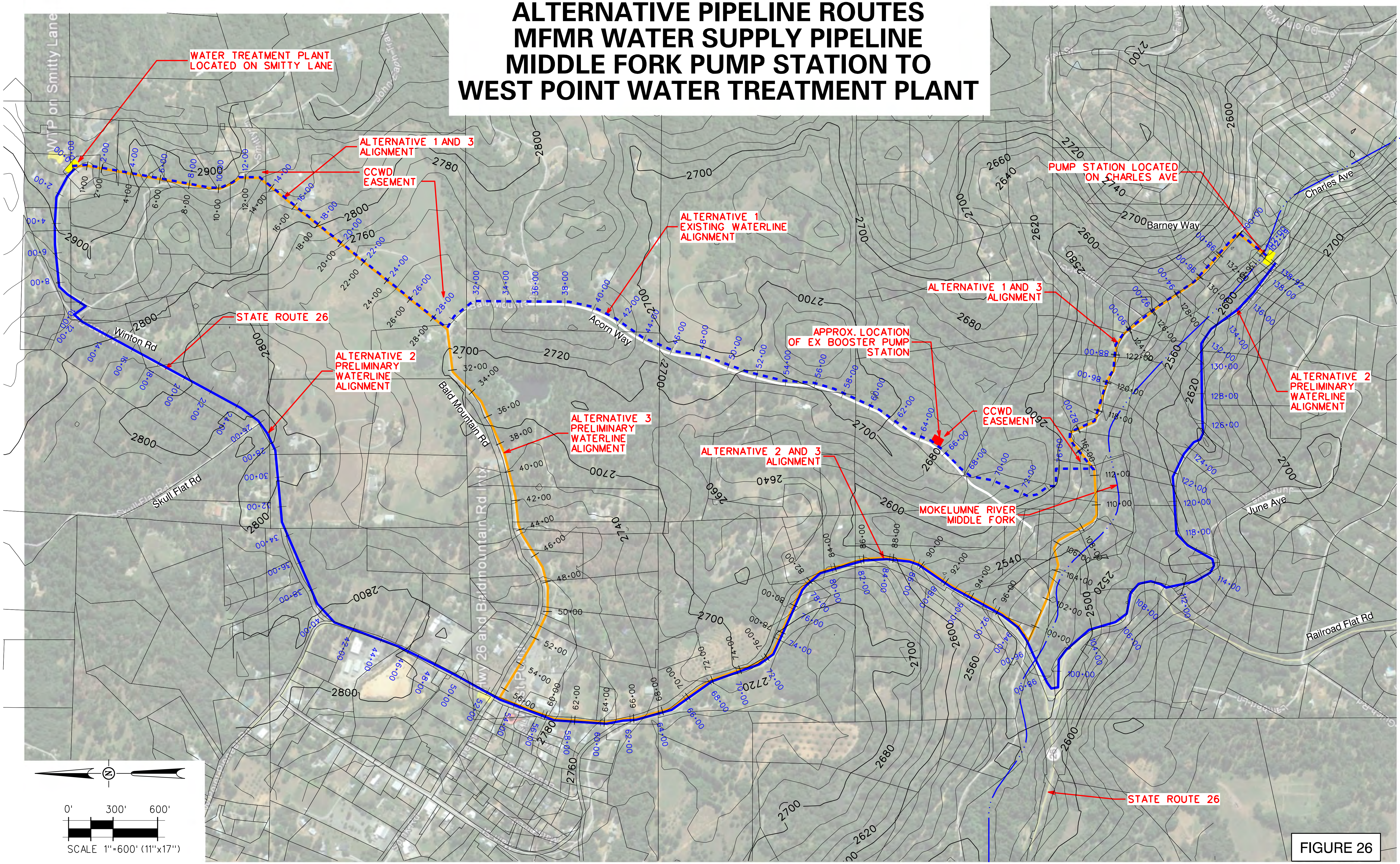


FIGURE 26

FILE: S:\2517-01 West Point, Mokelumne River\Study A - West Point Water System\Master Plan\Figure\FIG_26 11x17.dgn
DATE: 3/29/2018

3.3.3 Alternative Pipeline Alignment 3

Alternative 3 is a "hybrid" route combining portions of Alternative 1 and Alternative 2. Along this route the pipeline would utilize the existing MFMR crossing at the MFMR diversion structure and then continue west along Barney Way. Rather than follow the easement between Barney Way and Acorn Way, Alternative 3 would continue along Barney Way to State Route 26 and follow State Route 26 to Bald Mountain Road, continuing north and east along Bald Mountain Road to the existing CCWD easement and Alternative Pipeline Alignment 1 to Smitty Lane and the West Point WTP.

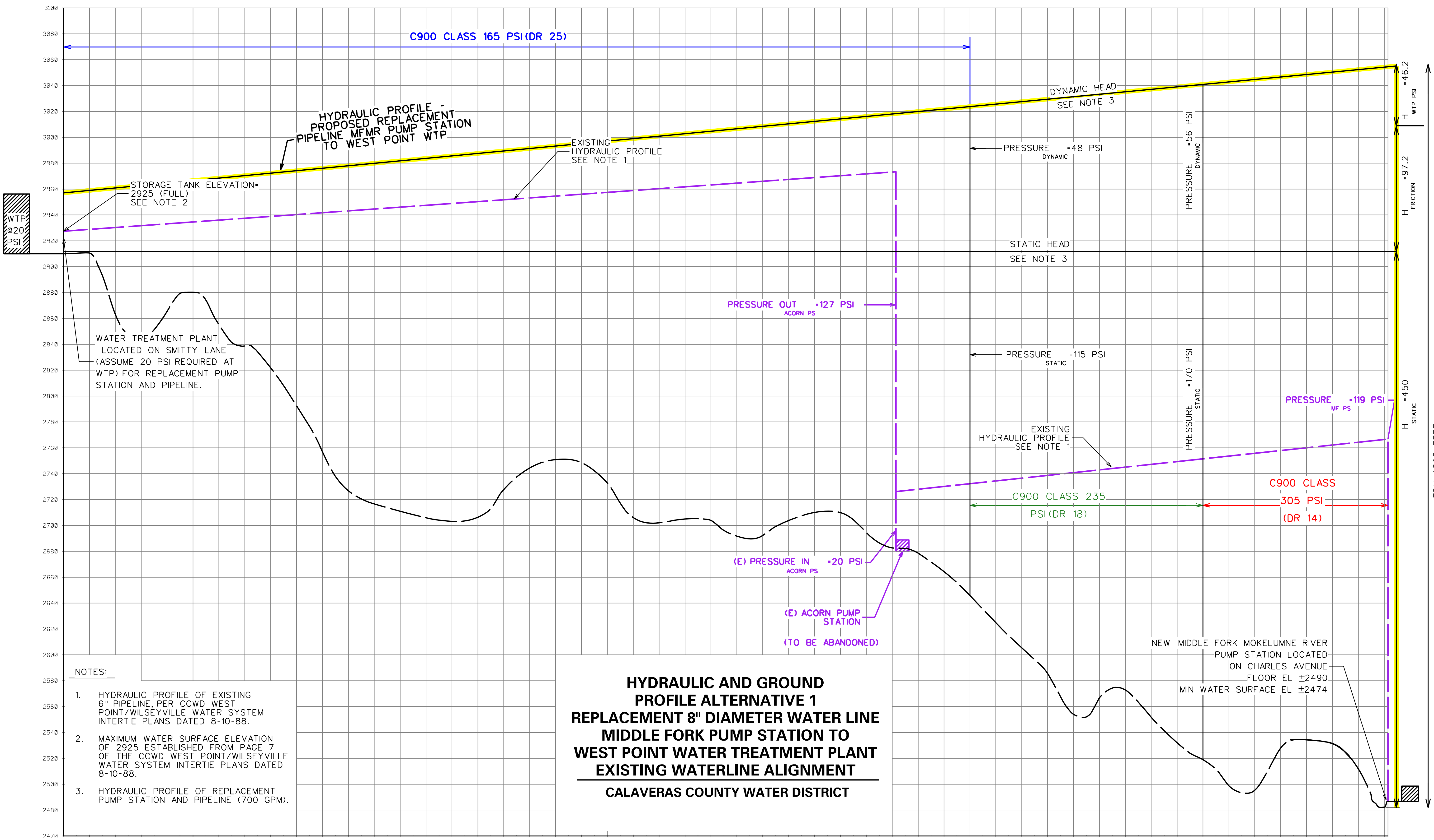
Alternative 3 is approximately 13,625 lineal feet and is, therefore, some 3400 feet longer than Alternative 1, but shorter than Alternative 2. Some of State Route 26 footage and the Acorn Way to Barney Way easement are avoided with this alignment, however, an encroachment permit from Caltrans would still be required and portions of SR 26 with little or no shoulder width are still included.

Based on this analysis and our field review of all three options, the existing alignment, Alternative 1, was selected. Selection of this alignment will require maintenance of the existing CCWD easements and improved easement access, especially during winter months. It is recommended that with the construction of the new pipeline along the Alternative 1 route a minimum 12-foot-wide section of the existing 15-foot-wide easement be surfaced with not less than 6-inch thick Class of Aggregate Base to help provide all weather access.

A profile of the selected, Alternative 1 alignment is presented in **Figure 27.** As noted, higher pressure (CL 305) pipe will be needed for the lower (Barney Way) portions of the pipeline replacement. Construction of the new MFMR water supply pipeline with higher strength pipe is considered a reasonable tradeoff to the continued operation of the Acorn Pump Station which is difficult to access and maintain, especially during winter months.

With the Alternative 1 Alignment and the use of PVC C900 pipe materials, a Hazen Williams C=130 coefficient was assumed consistent with CCWD Design Standards. At 500 gpm the delivery velocity would be 3.19 ft./sec. An automatic flow control regulating valve is proposed near the connection of the MFMR pipeline to the West Point WTP to permit bypass of excess flows to the Regulating Reservoir when the WWTP is in filter backwash or clarifier scour modes. The flow regulating valve would be programmed to divert MFMR flows to the Regulating Reservoir and then return the MFMR supply to the West Point WTP when the treatment plant is in normal filtration mode.

The estimated cost of the Middle Fork Mokelumne River Water Supply Pipeline, along the recommended Alternative 1 Alignment, is presented in **Table 8**.



HYDRAULIC AND GROUND PROFILE ALTERNATIVE 1
REPLACEMENT 8" DIAMETER WATER LINE MIDDLE FORK PUMP STATION TO WEST POINT WATER TREATMENT PLANT EXISTING WATERLINE ALIGNMENT

CALAVERAS COUNTY WATER DISTRICT

NOTES:

1. HYDRAULIC PROFILE OF EXISTING 6" PIPELINE, PER CCWD WEST POINT/WILSEYVILLE WATER SYSTEM INTERTIE PLANS DATED 8-10-88.
2. MAXIMUM WATER SURFACE ELEVATION OF 2925 ESTABLISHED FROM PAGE 7 OF THE CCWD WEST POINT/WILSEYVILLE WATER SYSTEM INTERTIE PLANS DATED 8-10-88.
3. HYDRAULIC PROFILE OF REPLACEMENT PUMP STATION AND PIPELINE (700 GPM).

FIGURE 27

FILE: S:\2517-01 West Point, Mokelumne River\Study A - West Point Water System\Master Plan\Figure\FIG_27 11x17.dgn
DATE: 3/29/2018

Table 8. Cost of the Middle Fork Mokelumne River Water Supply Pipeline Along the Recommended Alternative 1 Alignment

ITEM NO.	DESCRIPTION	ESTIMATED UNIT COST	UNIT	ESTIMATED QUANTITY	ESTIMATED COST
1	Mobilization [1]		LS	1	$ 82,000
2	8" PVC C900 CL 165 (DR 25)	$ 125.00	LF	7000	$ 875,000
3	8" PVC C900 CL 235 (DR 18)	$ 150.00	LF	1800	$ 270,000
4	8" PVC C900 CL 305 (DR 14)	$ 175.00	LF	1450	$ 253,750
5	Air Release Valve	$ 5,000.00	EA	9	$ 45,000
6	Automatic Flow Control Regulating Valve	$ 10,000.00	EA	1	$ 10,000
7	CCWD Easement Area All Weather Surfacing (6" Thick Class 2 A.B.)	$ 40.00	LF	2700	$ 108,000
			Estimated Construction Cost		$ 1,643,750
	20%		Construction Cost Contingencies		$ 328,750
			Planning & Engineering Design (10% of Construction)		$ 164,375
		Construction Administration (5% of Construction)			$ 82,200
		Administrative and Legal Costs (3% of Construction)			$ 49,300
			Total Estimated Costs		$ 2,268,375

(1) Estimated at 5% of Construction Cost.

3.4 Redundant Water Treatment Plant Capacity

The existing West Point Water Treatment Plant has adequate capacity (700 gpm) to meet the current and projected year 2100 treated water demands of the West Point service area. The plant is relatively new being placed into operation in the early 2000's. The existing facility consists of a single "train", 1 MGD, MicroFloc type plant. A second, parallel, 1 MGD Water Treatment Plant, similar to the existing is critical for system redundancy and reliability. With a second, parallel, water treatment plant either facility could be removed from service for repair, cleaning or improvements without loss of service to the West Point community. Concept level plans for the future installation of the second 1 MGD capacity plant were reviewed with CCWD Engineering staff. The existing West Point WTP building is not large enough to house a second WTP with capacity similar to the existing. To facilitate operation and maintenance, it would be preferred to modify / enlarge the existing WTP building to permit a second, parallel, WTP. There are older, abandoned, water filtration units adjacent to the existing WTP building. These could be removed and the existing building expanded to the east. Other alternatives include evaluation of smaller redundant WTP units that encompass a smaller footprint and may be more easily accommodated with less modifications and /or expansions of the existing building.

Design development of the redundant West Point filter will result in the selection of the best option. For the purpose of this Supplemental Master Plan Report the cost of the redundant WTP can be estimated from the year 2000 Construction Bids received for the existing 1 MGD plant. The average of the 10 Construction Bids received was approximately $1,630,000. Escalating these mid-2000 bid prices (Engineering News Record Construction Cost; ENRCC=6233) to current dollars would result in an estimated cost of $2,925,000 for the redundant West Point Water Treatment Plant (current ENRCC = 11,183).

3.5 Bummerville Water System Distribution Improvements

In the 2004 West Point / Wilseyville / Bummerville System Improvements, Final Feasibility Report (HDR, November 2004) Bummerville supply and distribution system improvements were recommended to improve system reliability and fire flows. These primarily included improvements to replace existing undersized mains with 6 inch and 8 inch diameter pipe. Since 2004, a booster pump was installed at the West Point WTP to better serve Bummerville. Approximately 1200 lineal feet of 8 inch diameter water transmission was constructed between the West Point WTP and the Bummerville Water Storage Tank. A new water tank was installed. Downstream of the new Bummerville tank distribution system improvements recommended in the 2004 Final Feasibility Report have not been constructed. Remaining improvements needed to serve the Bummerville community include:

- 5500 LF of 6 inch diameter water main
- 4550 LF of 8 inch diameter water main
- 18, each, 6 inch diameter gate valves and 17, each, 8 inch diameter gate valves
- Miscellaneous pavement repairs
- 43 water service connections

The estimated cost of these improvements including design, construction management and construction cost is $1,811,000.

3.6 Schaads Reservoir

Schaads Reservoir, owned and operated by the Calaveras Public Utility District, is located on the Middle Fork of the Mokelumne River approximately 5 miles upstream of the intake to the Middle Fork Mokelumne River Pump Station. At a maximum pool elevation of 2,907, Schaads Reservoir has a capacity of approximately 1,700 AF. Expansion of Schaads Reservoir by 250 AF to a capacity of 1,950 AF is included in one of the alternatives (Alternative 2) evaluated by ECORP in the Calaveras County Mokelumne River Long-Term Water Needs Study. Expansion of Schaads Reservoir by 250 AF, restoration of Wilson Dam and Reservoir to 50 AF capacity, increasing the capacity of the West Point Regulating Reservoir to 150 AF, increasing the capacity of the MFMR Pump Station construction of an 8,000-AF capacity Forest Creek-

Middle Fork Reservoir are all included in Alternative 2 of the Long-Term Needs Study to meet the projected year 2100 Calaveras County demands.

Figure 28 presents existing limits of Schaads Reservoir and limits of the Reservoir should it be expanded to meet the recommendations of the Long-Term Water Needs Study. While most of the Reservoir is located within property owned by the Calaveras Public Utility District (APN 010-021-028), upstream reservoir limits do extend into U.S. Forest Service land and onto land owned by Sierra Pacific Industries.

Schaads Reservoir is regulated by the California Division of Safety of Dams (DSOD) and is licensed by Federal Energy Regulating Commission (FERC). Expansion of Schaads Reservoir will require updated agreements / easements with the U.S. Forest Service and Sierra Pacific Industries, approval by DSOD and updated licensing by FERC.

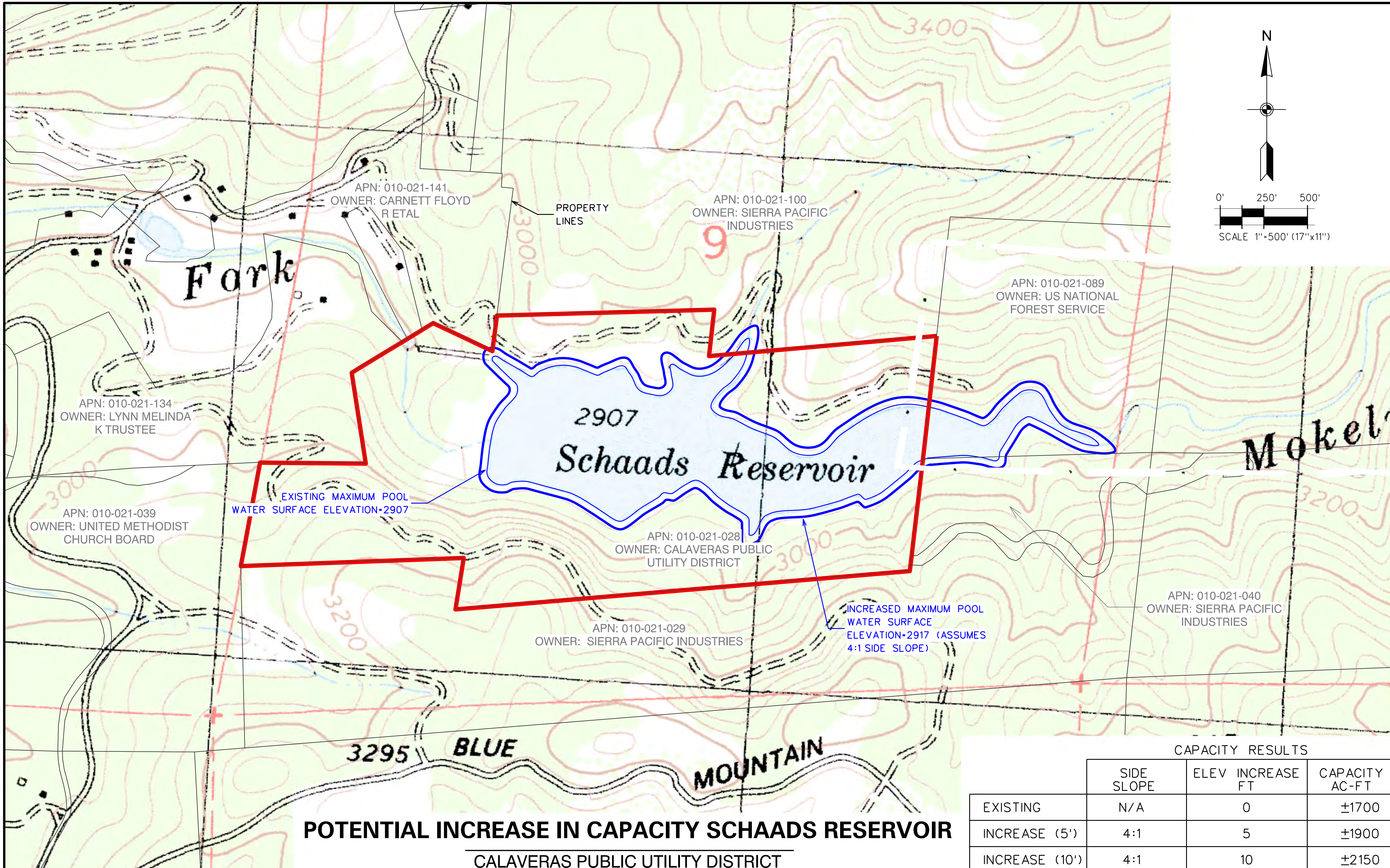
To increase the capacity of Schaads Reservoir by 250 AF will require increasing the maximum pool water surface elevation (and the heights of the dam spillway and reservoir embankment) by approximately 6 feet. The cost to increase the capacity of Schaads, not including updated easements, licensing agreements and permits, is estimated at $3.7 Million.

3.7 Forest Creek-Middle Fork Mokelumne River Reservoir

Evaluation of the region-wide Mokelumne River Long-Term Water Needs included consideration of construction of a new reservoir on the Middle Fork Mokelumne River downstream of Schaads Reservoir and downstream of the confluence with Forest Creek. This project was not ultimately evaluated as an alternative in this study. Alternative 3 of the Long-Term Needs Study suggested the construction of a 12,000-AF capacity Forest Creek-Middle Fork Reservoir without the restored / rehabilitated Wilson Dam, enlarged West Point Regulating Reservoir or expanded Schaads Reservoir. The main beneficiary as outlined in the Long-Term Water Needs Study would be CPUD to meet their forecasted demands in their service area.

The Forest Creek-Middle Fork Reservoir was first considered by CCWD in the late 1950s and has been reconfigured and reevaluated a number of times by both CCWD and CPUD. Forest Creek-Middle Fork Reservoir capacities ranging from 4300 to 18,000 AF in capacity have been considered. A reservoir with a capacity of approximately 12,000 AF and a maximum water surface elevation of 2,787 is shown in **Figure 29**. As shown, the center of the Forest Creek-Middle Fork embankment would be located approximately 350 feet downstream of the confluence of Forest Creek and the Middle Fork Mokelumne River. The reservoir pool would extend ±1.0 mile upstream along Forest Creek and approximately 1.5 miles upstream along the Middle Fork to a point approximately 600 feet downstream of Schaads Reservoir. At maximum pool, the Forest Creek-Middle Fork Reservoir would encompass approximately 180 acres. The construction cost of the 12,000-AF capacity reservoir is estimated at $19.3 million. This estimated cost does not include environmental permitting or agency approvals.

While the expansion of Schaads Reservoir and the construction of a new Forest Creek-Middle Fork Reservoir are long-term improvements that will not be considered in the shorter-term West Point Water System Master Plan, these future water storage improvements do provide solutions for meeting the long-term water needs of Calaveras County.



POTENTIAL INCREASE IN CAPACITY SCHAADS RESERVOIR

CALAVERAS PUBLIC UTILITY DISTRICT

CAPACITY RESULTS

	SIDE SLOPE	ELEV INCREASE FT	CAPACITY AC-FT
EXISTING	N/A	0	±1700
INCREASE (5')	4:1	5	±1900
INCREASE (10')	4:1	10	±2150

FIGURE 28

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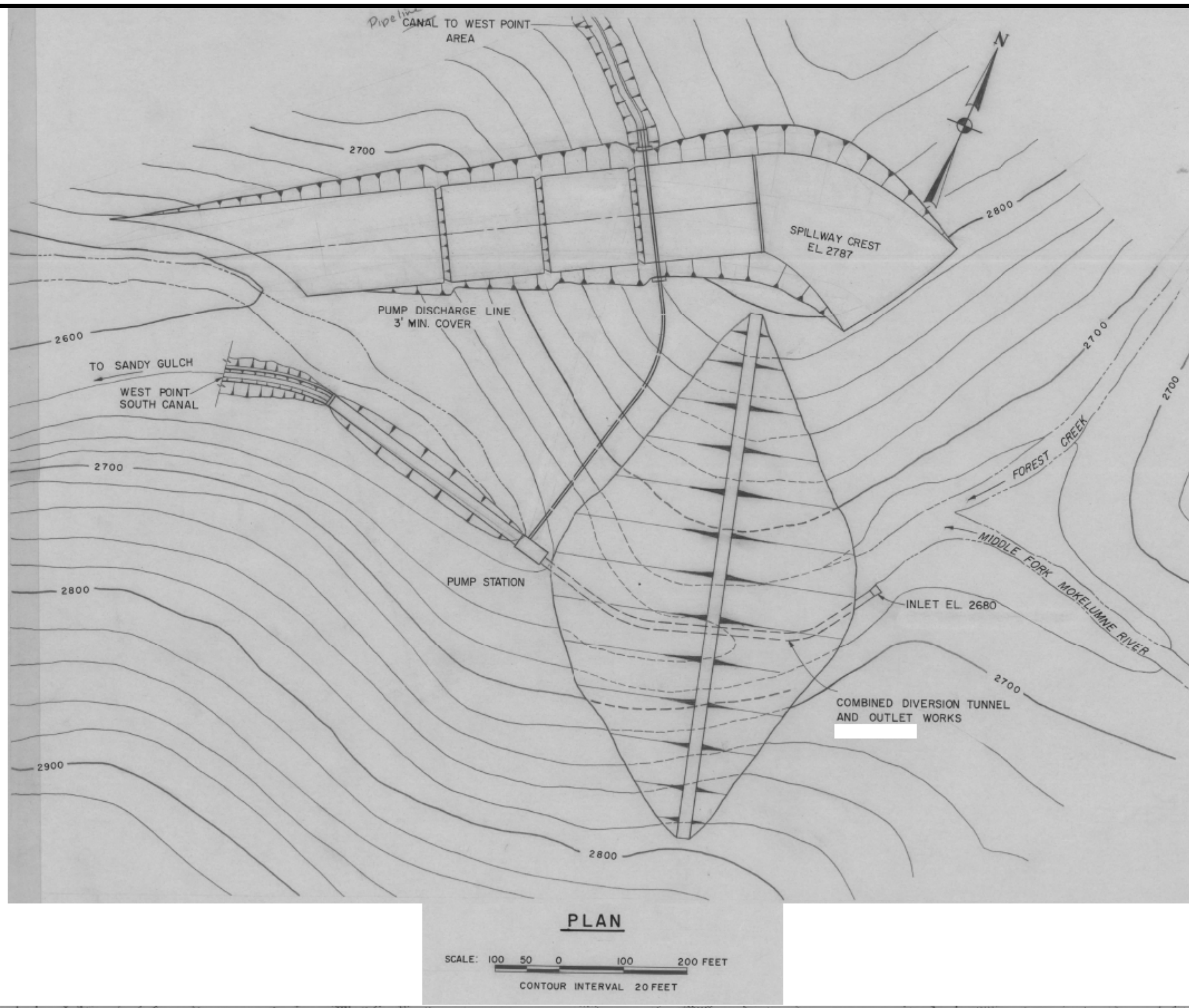
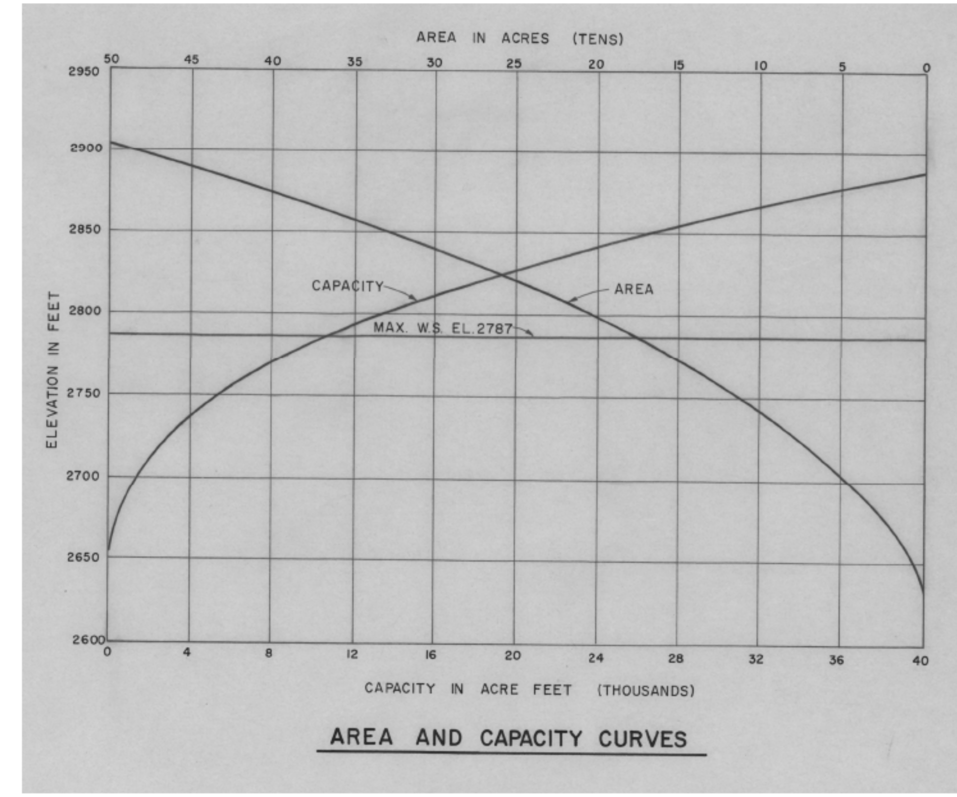
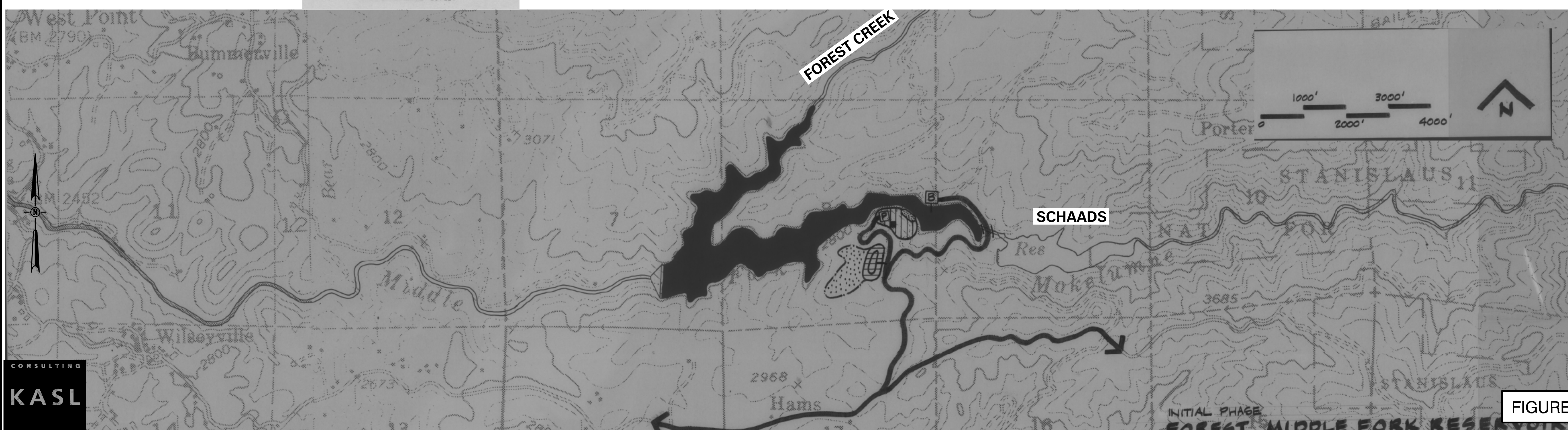




CONCEPT PLAN ±12,000 AC-FOOT CAPACITY
FOREST CREEK MIDDLE FORK RESERVOIR



CONSULTING KASL ENGINEERS

FIGURE 29

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DATE: 3/29/2018

4.0 EVALUATION OF WATER MASTER PLAN IMPROVEMENTS AND PRIORITIES

The purpose of this Supplemental Water System Master Plan is to recommend facilities that will improve water supply quantity and quality for the West Point Service Area. Previously prepared Master Plans and Feasibility Studies did not fully assess the limitations of the Bear Creek supply especially during seasonal dry periods and prolonged droughts. This document provides guidance to improve water supply reliability in the West Point Area.

The Calaveras County Water District has, in place, an agreement with the Calaveras Public Utility District for purchase of up to 200 AF annually of Middle Fork Mokelumne River water. This source supplements CCWD's West Point Service Area supplies provided by Bear Creek. The District's Agreement with CPUD has been in effect for a number of years and is subject to review and renewal every five years. The current contract will be up for renewal in 2021. The water supply developed by Schaads Reservoir is hydraulically disconnected from CPUD's service area. The historic Middle Fork Ditch is in disrepair and no longer used to transport water to CPUD's service areas. If constructed, the Proposed Middle Fork Ditch Pipeline could carry water supply developed by Schaads Reservoir to Jeff Davis Reservoir for treatment and delivery to CPUD customers. Until the pipeline is constructed, Schaads Reservoir can continue to reliably deliver at least 200 AF annually to the West Point Service Area.

In the Mokelumne River Long-Term Water Needs Study, ECORP projected the year 2100 annual surface water demand for the West Point Service Area at 327 AF/year. This demand is equivalent to 106.5 million gallons annually, or, on average, a daily annual average demand of approximately 292,000 gallons per day (.292 MGD). Assuming that maximum day demands could be as much as 2.5 times average annual daily demands, a projected year 2100 maximum day demand of approximately 730,000 gallons per day (.730 MGD) results. Current maximum day demands are estimated at 470,000 gpd (.470 MGD). CCWD's current agreement to purchase up to 200 AF annually of Middle Fork Mokelumne River water from CPUD would be equivalent to satisfying up to 90 days of projected year 2100 maximum day demands. Better utilization of the high quality raw water supply available from the Middle Fork Mokelumne River should be the highest priority of the West Point Water System improvements. Currently, the Middle Fork Mokelumne River intake, pump station and water supply pipeline improvements do not have the capacity to deliver existing or projected maximum day West Point Service Area demands.

Long-Term planning for the West Point water supply reliability includes consideration of the contract supply CCWD currently receives from CPUD. Results of the operations studies done in support of the Mokelumne River Long-Term Water Needs Study indicate that CPUD will need the Schaads Reservoir supplies to meet the buildout demands in their service areas. The buildout condition may require CCWD to develop a new water supply to replace the 200 AF currently supplied by CPUD from Schaads Reservoir. The water supply need could be partially mitigated by expanding Schaads reservoir to increase capacity by approximately 250 AF.

Each water supply improvement was evaluated to determine water supply benefits using the Mokelumne River operations model developed for the Mokelumne River Long Term Water Needs Study. Once the water supply benefits were determined, cost of each project was used to determine cost per acre foot of water produced. Some of the improvements were designed to maximize the use of the highest quality

Mokelumne River supply. Others were designed to improve the quality of the existing supply at Regulating Reservoir. The projects were then ranked by cost of supply, quality of supply, timing and need. The following sections discuss the priority ranking.

4.1 Cost of Supply

The intent of the improvements proposed for the West Point Water Supply system is to improve water supply, water quality or reliability. A series of operations studies were conducted using a simulation model to test the water supply benefits of each of the proposed improvements to identify the increase in yield. The simulation model mathematically runs historic unimpaired flow, sequentially from 1934 to 2016, through existing and proposed facilities on Bear Creek and the Middle Fork Mokelumne River. The historic flow provides a range of hydrologic conditions used to evaluate the performance of each facility. Yield is defined as the maximum quantity of water which can be delivered during a critically dry period. For the Mokelumne River System, the critically dry period is based upon the hydrology that occurred in 1976-1977. The 1976-1977 period is used throughout the Sierra Nevada by most operators for planning purposes because it is the driest period on record. In general, if the existing facilities with the addition of the proposed facilities can meet the anticipated demands during a period as dry as 1976-1977, there is a reasonable expectation that the water supply developed by these facilities will be sufficient to meet future anticipated demands under drought conditions. For this analysis, the proposed projects are layered on the Baseline study to determine water supply benefits. The Baseline study represents the existing facilities and existing operating criteria. Each improvement scenario is briefly described below.

1. Scenario 1: Evaluates benefits of the updated Middle Fork Pump Station. For the purposes of this evaluation, the Updated Middle Fork Pump Station includes the improved intake, pump station and pipeline to the West Point Water Treatment Plant.

2. Scenario 2: Evaluates benefits of the enlarged Regulating Reservoir.

3. Scenario 2A: Evaluates cumulative benefits of both the updated Middle Fork Pump Station (Scenario 1) and the enlarged Regulating Reservoir.

4. Scenario 3: Evaluates benefits of the enlarged Wilson Dam.

5. Scenario 3A: Evaluates cumulative benefits of the updated Middle Fork Pump Station (Scenario 1), the enlarged Regulating Reservoir (Scenario 2), and enlarged Wilson Dam.

6. Scenario 4: Evaluates Enlarged Schaads Reservoir assuming CPUD will need all of the existing Schaads Reservoir Supply to meet its own buildout demands.

7. Scenario 4A: Evaluates cumulative benefits of updated Middle Fork Pump Station (Scenario 1), the enlarged Regulating Reservoir (Scenario 2), enlarged Wilson Dam (Scenario3) and enlarged Schaads Reservoir.

Table 9, below, illustrates the projects included in each scenario.

Table 9. Scenario Descriptions for the Mokelumne River System

Facilities	Scenarios							
	Baseline	1	2	2A	3	3A	4	4A
Existing Wilson Dam	✓	✓	✓	✓			✓	
Existing Regulating Reservoir	✓	✓			✓		✓	
Existing Middle Fork Pumping Station	✓		✓		✓		✓	
Existing Schaads Reservoir	✓	✓	✓	✓	✓	✓		
Enlarged Wilson Dam					✓	✓		✓
Enlarged Regulating Reservoir			✓	✓		✓		✓
Updated Middle Fork Pumping Station		✓		✓		✓		✓
Enlarged Schaads Reservoir							✓	✓

Comparing the results of each scenario gives an indication of the water supply benefit of each project. Table 10, below, illustrates the water supply benefit by scenario. For example, comparing the Scenario 1 system yield of 316 AF to the Baseline yield of 305 AF results in an increase in system yield of 11 AF. This indicates that the proposed improvements to the Middle Fork Pump Station (Intakes, Pumps and Pipeline) would provide an 11 AF benefit to the system in a critically dry year like 1977.

Table 10. Water Supply Summary (With CPUD 200 AF Contract Supply)

Facilities	Scenarios					
	Baseline	1	2	2A	3	3A
Yield, AF	305	316	310	>327	305	>327
Years of Shortage	25	1	2	None	14	None
Average Shortage in Shortage Years, AF	6	7	8	None	6	None

Scenarios 4 and 4A assume that CPUD would need the contracted 200 AF currently reserved for CCWD for their own use and that CCWD would need the additional 250 AF of Schaads storage capacity to meet buildout demands. To evaluate the benefit of the additional Schaads reservoir storage, the No Contract Baseline was developed. The No Contract Baseline assumes that the 200 AF contracted water supply from Schaads reservoir would be used for CPUD purposes and not available to CCWD. The results of the studies are shown in Table 11, below.

Table 11. Water Supply Summary (No CPUD 200 AF Contract Supply)

Facilities	Scenarios		
	No Contract Baseline	4	4A
Yield, AF	128	247	288
Years of Shortage	66	24	1
Average Shortage in Shortage Years, AF	54	17	36

Table 12, below provides a summary of the water supply benefits by facility, both individually and cumulatively.

Table 12. Water Supply Benefits

Facilities	Water Supply Benefit, AF	Cumulative Water Supply Benefit, AF
Updated Middle Fork Pumping Station	11	11
Enlarged Regulating Reservoir	5	16
Enlarged Wilson Dam	0	16
Enlarged Schaads Reservoir	119	160

The analysis indicates that in the 1976-1977 critically dry period hydrology, Wilson, Regulating, and Schaads Reservoirs do not fill. In January of 1977, Wilson stores about 5 AF of water and releases the supply over the next few weeks. The Regulating Reservoir fills to 49 AF in Scenario 1. With scenarios 1 and 2 combined, Regulating Reservoir fills to 63 AF in part because the Middle Fork Pump Station was able to take more water earlier in the year filling the additional capacity at an enlarged Regulating Reservoir. This operation doesn't significantly increase yield; however, it allows for operational flexibility in the seasonal pattern of diversion. In a 1977 (critically dry) water year hydrology, Schaads reservoir fills to 908 AF by the end of March. This is far short of the existing storage capacity and would not make use of any additional storage. By April 1, the South Fork Pumping Plant demands are higher than Schaads inflow, resulting in an early drawdown of the reservoir. The benefits of Schaads reservoir is from the unused CCWD carryover supply from the previous year (1976) operations. This additional volume can be used to meet shortages as a result of the dry conditions of the 1977 hydrology. Table **13**, below, illustrates the construction costs of each project, water supply benefit, and the resulting Cost/Benefit ratio.

Table 13. Cost/Benefit Analysis

Project Description	Cost Estimate			Water Supply Benefit	Cost/Benefit Ratio
	Construction	Environmental	Total	(Yield - AF)	$/AF
New MFMR Pump Station	$1,529,775	$20,000	$1,549,775	11	$378,895
New intake facilities at the MFMR pump station	$184,700	$80,000	$264,700		
Replacement of MFMR pipeline from the MFMR pump station to the West Point WTP	$2,268,375	$85,000	$2,353,375		
Increase capacity of Regulating Reservoir	$2,365,025	$160,000	$2,525,025	5	$527,195
Floating Screened Outlet at Regulating Reservoir	$146,300	0	$146,300	0	N/A
Modifications to the Bear Creek Diversion	$82,950	$28.000	$110,950	0	N/A
Increase Capacity and Stability of Wilson Dam 50 AF	$2,136,750	$143,000	$2,279,750	0	N/A
Increase Capacity and Stability of Wilson Dam 40 AF	$1.234,750	$143,000	$1,377,750	0	N/A
Schaads Reservoir Expansion	$3,700,000	$1,000,000	$4,700,000	119	$39,495
Redundant West Point WTP	$2.925,000	$60,000	$2,985,000	0	N/A
Bummerville Water Distribution Improvements	$1,811,000	$80,000	$1,891,000	0	N/A

The analysis performed to support the development of this water supply plan indicates Wilson Dam provides no significant improvement in water supply in the 1976-77 critical dry period and therefore is not needed to meet consumptive demands. Based on the current condition of the dam, the District should consider one of three options:

- Option 1: Rehabilitation - 50 AF Wilson Dam
- Option 2: Rehabilitation – 40 AF Wilson Dam
- Option 3: Decommission Dam and restore the meadow

These options are discussion further in **Section 4.7 Medium Term Water Master Plan Improvements**

4.2 Quality of Supply

4.2.1 Middle Fork Pump Station Improvements

Although West Point's water has always been safe to drink, there are occurrences when taste and odor problems arise, usually in the summer, when CCWD's Bear Creek water supply diminishes due to natural runoff patterns. At that time, water levels are lower in Regulating Reservoir and algae blooms in the impoundment create taste and odor problems. The contract supply from CPUD's Schaads Reservoir provides a fresh supply of water at a time when Bear Creek flows don't provide enough supply to serve the increased summer demands. Improvements to the Middle Fork Pumping Station will increase the capacity of the pump station allowing for additional supplies to be pumped up to the West Point Water Treatment Plant.

4.2.2 Regulating Reservoir Floating Intake

A floating screened intake would prevent sediment and debris from entering the headworks of the West Point WTP from the Regulating Reservoir and allow for operational flexibility to select source water in the water column for optimal treatability. With the floating inlet located near the surface outlet rather than near the bottom, the best water quality available in the Reservoir would be delivered to the West Point WTP.

4.2.3 Regulating Reservoir Expansion

The expansion of Regulating Reservoir from 50 AF to 150 AF will mitigate some of the taste and odor and other aesthetic water quality issues. Shallow Reservoirs are more susceptible to a warming of the water column resulting in algal blooms. By adding an additional 100 AF of storage, deepening the reservoir, the magnitude of the summer algal blooms should be reduced.

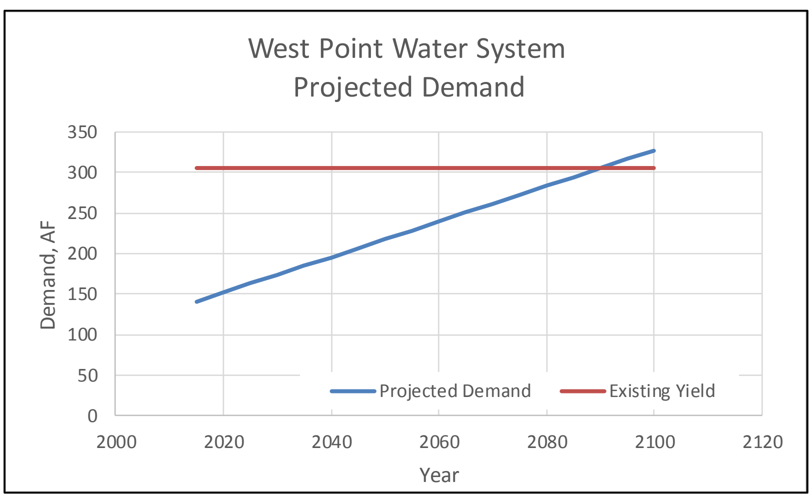
4.2.4 Schaads Reservoir Expansion

If future demands approach buildout, additional supplies from Schaads reservoir may be needed. This additional supply from Schaads would be high quality runoff from the Middle Fork Mokelumne River. Prior to diversion at the Middle Fork Pump Station, the water released from Schaads Reservoir will travel approximately 5.5 miles down the Middle Fork Mokelumne River undergoing natural aeration before being diverted at the Middle Fork Pump Station.

4.3 Need for Additional Supply

The scenarios performed for this study indicate that existing facilities and agreements will provide about 305 AF of water supply in the driest years. Demand projections for the West Point area indicate consumptive demand approaches project yield sometime around the year 2090, as shown in **Figure 30** below. CPUD future demands may change CCWD's water supply at buildout demand in the future. Until West Point demands exceed about 305 AF, CCWD has the water supply needed to deliver a full supply in every year. If CPUD demands increase to the point where the Middle Fork Ditch Pipeline is constructed, CCWD may need to consider construction of additional storage at Schaads Reservoir.

Figure 30. West Point Demand Projections



4.4 Regulatory Requirements

Although the measurement of the Bear Creek Diversion and the installation of the storage Gage at Regulating Reservoir do not provide improvement to water supply or quality, they are required by Senate Bill 88. These measurement devices will also support the annual water usage reporting required by the State Water Resources Control Board.

4.5 Project Priorities

Each of the projects have been evaluated for water supply improvements, water quality improvements, timing of need, and regulatory requirements. Table 14, below, illustrates the results of the evaluation and provides a ranking of the benefit and need of each project. A total score was calculated by adding the rankings. Project priorities were determined by ranking the scores from lowest to highest.

Table 14. Project Ranking

Project	Raw Cost Rank	Water Supply Cost/Benefit	Water Quality Benefit	Regulatory Requirement (If any)	Timing of Need	Total Score	Priority
New MFMR Pump Station New intake facilities at the MFMR pump station Replacement of MFMR pipeline from the MFMR pump station to the West Point WTP	8	2	1	N/A	3	14	5
Increase capacity of Regulating Reservoir	6	3	3	N/A	4	16	6
Floating Screened Outlet at Regulating Reservoir	2	N/A	2	N/A	2	6	3
Modifications to the Bear Creek Diversion (Gaging)	1	N/A	N/A	1	1	3	1
Increase Capacity and Stability of Wilson Dam 50 AF	5	4	5	N/A	6	20	9
Increase Capacity and Stability of Wilson Dam 40 AF	3	5	5	N/A	6	20	8
Schaads Reservoir Expansion	9	1	4	N/A	5	19	7
Redundant West Point WTP	7	N/A	N/A	N/A	1	8	4
Bummerville Water Distribution Improvements	4	N/A	N/A	N/A	1	5	2

4.6 Highest Priority Short-Term Master Plan Improvements

The highest priority, most immediately needed, West Point Water System Master Plan improvements include:

- Construction of new Middle Fork Mokelumne River (MFMR) Intake System
- Replacement of the existing MFMR Pump Station
- Replacement of the existing MFMR Pump Station to West Point Water Treatment Plant Water Supply Pipeline
- Construction of New West Point Regulating Reservoir Floating, Screened Outlet

- West Point Regulating Reservoir Staff Gauge and Bear Creek Discharge Meter
- Redundant West Point Water Treatment Plant Capacity
- Bummerville Water Distribution Improvements

It is recommended that these improvements be planned, designed, funded and constructed during the next 10 years (2019-2029). Administrative and permitting tasks, engineering design and capital improvement program elements proposed for each of the above listed, short-term, highest priority master plan improvements are discussed herein.

4.6.1 Middle Fork Mokelumne River (MFMR) Intake and Pump Station and Supply Pipeline Improvements

Construction of the MFMR intake, pump station and supply pipeline improvements could be phased but engineering planning, design and environmental documents should be prepared together for these Master Plan elements and initiated as soon as possible. The surface collection facilities which feed the existing pump station were damaged and partially removed during the winter of 2016-2017. These facilities were reinstalled with FEMA funds in July 2018. Alternative long-term surface collector and "in channel" collection facilities, as previously presented in this Master Plan, should be reviewed with CCWD Engineering Staff and then modified or expanded as appropriate.

The Preliminary Plans prepared for the new Middle Fork Pump Station and shown in Section 3.0 of this Master Plan were approved, in concept, by CCWD Engineering Department staff. There is sufficient information included in these preliminary plans to evaluate the potential environmental impacts of the MFMR Pump Station improvements. Similarly, alternative water supply alignments from the MFMR Pump Station to the West Point WTP were evaluated as part of this Master Plan Report. The alignment selected is the same as existing and no additional easements will be required to construct the new pipeline. The alignment selected follows existing road rights and way and CCWD easements. There is sufficient information provided in this Master Plan to evaluate the potential environmental impacts of the water supply pipeline improvements.

Construction of redundant water treatment plant improvements at West Point can be completed with little or no disturbance to surrounding CCWD property and could be permitted with the filing of a Notice of Exemption. It is intended that the redundant WTP facilities strictly serve as a backup and not provide additional capacity or expand the West Point treated water service area.

The Bummerville water distribution improvements discussed in this Supplemental Master Plan were previously described in the West Point / Wilseyville / Bummerville System Improvements Final Feasibility Report and in the 2005 Master Plan. Environmental documents were previously certified for these improvements and may only require updating to permit remaining distribution improvements to be constructed.

The suggested sequence of highest priority, short-term, MFMR Master Plan improvements follows. This suggested schedule is intended to provide ongoing operation of the existing MFMR supply during the most critical (hottest) summer months when supplies from Bear Creek are expected to be at their lowest levels.

Master Plan Year 1-2

- Obtain CCWD approval of West Point Supplemental Water System Master Plan.
- Complete preliminary design of permanent MFMR pump station intake facilities and obtain concept approval by CCWD.
- CCWD to request proposals from qualified environmental consultants to prepare an environmental document for MFMR Intake, Pump Station and Water Supply Pipeline to West Point WTP.
- CCWD selects environmental consultant; environmental field investigations are initiated.
- Preparation of MFMR Intake, Pump Station and Water Supply Pipeline Environmental Document. It is anticipated that an Initial Study/ Mitigated Negative Declaration would include sufficient impact mitigation and environmental safeguards to satisfy environmental regulations.
- CCWD receives proposals for engineering design of MFMR Pump Station to West Point WTP supply pipeline improvements.
- CCWD receives proposal for engineering design of redundant West Point WTP improvements.

Year 3-4

- Design of MFMR supply pipeline improvements is completed. Contract Documents are approved by CCWD and ready to bid.
- Design of redundant West Point WTP improvements is completed.
- CCWD applies to California Department of Fish and Wildlife for new MFMR intake facilities.
- MFMR Supply Pipeline Project Bid Period and Approval to Award to lowest responsive, responsible bidder.
- Redundant West point WTP Improvements are Bid and Approval to Award to lowest responsible bidder.

Year 5-6

- Notice to Proceed issued to Selected MFMR Contractor.
- Notice to Proceed issued to redundant West Point WTP Contractor.
- Pipeline and WTP Contractors submits shop drawings, receives approvals, orders materials.
- CCWD obtains permit to construct new, permanent, MFMR intake facilities.

- Pipeline improvements are constructed, existing pump station is connected to new pipeline during interim until new pump station improvements are designed and constructed.
- Redundant West Point WTP improvements are constructed.

- CCWD receives proposals for engineering design of MFMR intake and pump station improvements.
- CCWD receive proposals for engineering design of Bummerville Water Distribution System Improvements.

- Design of pump station intake and pump station improvements is completed. Contract Documents are approved by CCWD and ready to bid.

- MFMR intake and pump station construction bids received and Approval to Award to lowest responsive, responsible bidder.

Year 7-8

- Notice to Proceed issued to selected MFMR intake and pump station Contractor.
- Design of remaining Bummerville Water System Distribution improvements is completed.

- Pump Station Contractor submits shop drawings, receives shop drawing approvals and orders pump station equipment.

Year 9-10

- Pump Station intake and Pump Station improvements are constructed. Contractor is required to provide temporary pumping equipment to deliver MFMR flows to the West Point WTP while the MFMR pump station is under construction.
- Remaining Bummerville Water Distribution Improvements are completed.

With the above sequence, the new MFMR Pump Station Intake, Pump Station and Water Supply Pipeline facilities, the redundant West Point WTP and the remaining Bummerville water distribution system improvements are complete and on line by 2029. During the initial 10-year Master Plan period, MFMR supplies would continue to be supplied to the West Point WTP, as needed during low flow Bear Creek periods, using first, temporary, then, interim and then, completed, MFMR intake, pump station and pipeline improvements.

4.6.2 West Point Regulating Reservoir Outlet Pipe and Staff Gauge; Bear River Flow Meter

Coincident with improving Middle Fork Mokelumne River water supplies, improvements at the West Point Regulating Reservoir should be conducted in the short-term as a high priority to improve the quality of water delivered from the West Point Regulating Reservoir to the West Point WTP. Modification to the Regulating Reservoir outlet with placement of a floating screen would benefit the operations of the West Point WTP delivering the best water quality available in the Regulating Reservoir. The floating, screened, outlet would collect water in the reservoir with the highest available dissolved oxygen and the lowest levels of total suspended solids. While the West Point WTP is capable of treating raw water with a wide range of constituents, optimum plant performance will be achieved when the WTP is supplied the best raw water available. Outlet screen backflushing would be available from the connection to the Middle Fork Mokelumne River pumped supply.

Recommended West Point Water Master Plan improvements include expansion of the Regulating Reservoir. The Regulating Reservoir expansion is suggested as an intermediate term or “mid-level priority” improvement. While not the highest priority, planning and preliminary design of the Regulating Reservoir expansion must be conducted in the short-term to properly design and implement the floating, screened, outlet pipe modifications.

Other, relatively low cost but high priority master plan improvements include placement of a reservoir staff gauge to monitor the water surface levels and available volume in the Regulating Reservoir. A water surface elevation to volume curve would be developed to provide the WTP operators with a quick checkpoint of reservoir operating conditions. It is further recommended that a pressure sensor be placed on the Regulating Reservoir outlet pipe. Static pressures available in the outlet pipe could be converted to reservoir levels based on the relative difference in elevation between the outlet pipe and the Regulating Reservoir water surface. The outlet pipe pressures / Regulating Reservoir water surface elevation could then be transmitted, via radio signal, to the West Point WTP.

Monitoring of Bear Creek influent supplies to the Regulating Reservoir is proposed using a critical flow device. Raw water entering the West Point WTP is metered. Middle Fork Mokelumne River water pumped to the West Point WTP is metered. While, in large part, the net difference between the flow entering the WTP and the flow leaving the Middle Fork Mokelumne River pump station is water delivered from Bear Creek supplies, this approach does not take into account supplies that back flow into the Regulating Reservoir from the MFMR supply pipeline and do not account for “sidewater” that drains into the Regulating Reservoir. Per Senate Bill 88, the District is required to provide to the State Water Resources Control Board an accurate, annual accounting of Bear Creek water diverted to the Bear Creek pipeline and discharged to the West Point Regulating Reservoir. Replacement of flow monitoring and flow transmitting equipment at the existing Bear River diversion structure is proposed.

The sequence for completing the planning, environmental, design and construction of the highest priority Regulating Reservoir improvements is outlined herein. Preliminary design level plans for expansion of the Regulating Reservoir to 150 AF should be prepared sufficient to obtain concurrence from CCWD regarding the maximum water surface elevation, reservoir footprint, reservoir embankment design and appurtenances needed to increase capacity. The Regulating Reservoir operates under a DSOD permit. Preliminary expansion plans should be reviewed with DSOD before final plans are prepared. An environmental document will be required for the Regulating Reservoir expansion and new Regulating Reservoir outlet improvements. Modifications to the existing reservoir outlet is within the area of DSOD jurisdiction and are subject to review and approval by DSOD.

The suggested schedule to plan, permit, design and construct, short-term, highest priority Regulating Reservoir improvements follows:

Year 1-2

- Obtain approval of West Point Water Master Plan.
- Prepare preliminary design of West Point Regulating Reservoir expansion plans.
- CCWD requests proposals from qualified environmental consultants to prepare environmental document for West Point Regulating Reservoir Expansion, Regulating Reservoir Outlet and Gauge Facilities and Bear Creek Flow Meter.
- CCWD selects environmental consultant; environmental field investigations are initiated.
- Preparation of Regulating Reservoir Expansion, Outlet Structure, Gauge Facilities, Bear Creek Flow Meter environmental document.
  It is anticipated that an Initial Study / Mitigated Negative Declaration would provide sufficient impact mitigation and environmental safeguards to satisfy environmental regulations.

Year 3-4

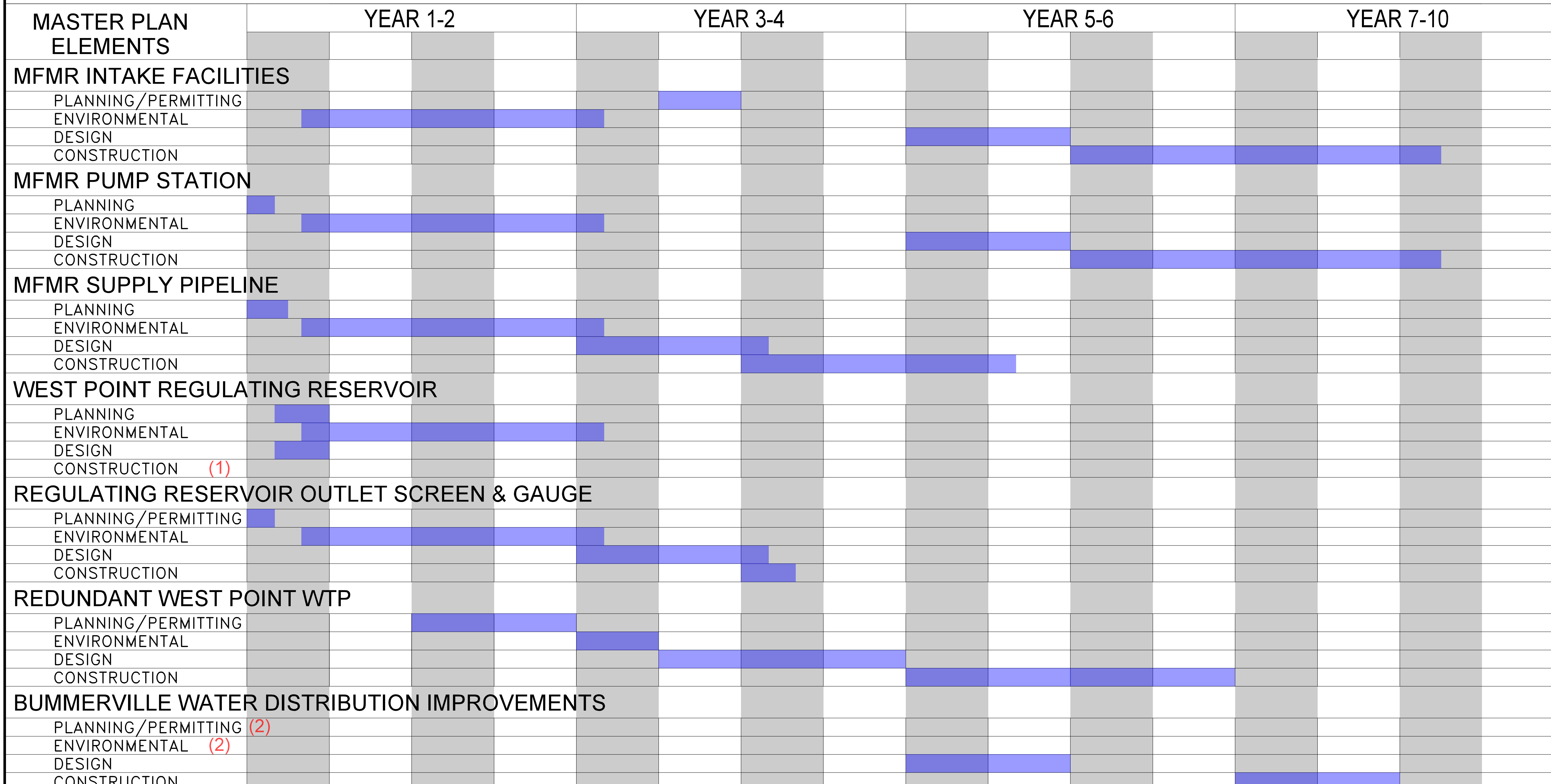
- CCWD receives proposals for engineering design of outlet, gauge and flow meter improvements.
- Outlet, gauge and flow meter improvement plans designed and approved by CCWD.
- Outlet modifications permitted by DSOD.
- Outlet, gauge and flow meter Project Bid period. Approval to Award to lowest, responsive, responsible bidder.
- Notice to Proceed: Construction begins mid-October during low Bear Creek flow periods and low Regulating Reservoir storage levels; Temporary Reservoir bypass improvements constructed as needed.
- Outlet, gauge, flow meter improvements are complete.

The above sequence does not include final design permitting or construction of the Regulating Reservoir expansion. It is proposed that these improvements be deferred to the recommended Medium Term Master Plan Improvements.

A summary schedule of the highest priority West Point Water Master Plan Improvements is presented in **Figure 31.**

CONSULTING KASL ENGINEERS

WEST POINT WATER MASTER PLAN
PROPOSED SCHEDULE OF HIGHEST PRIORITY MASTER PLAN IMPROVEMENTS
(2019-2029)



(1) CONSTRUCTION OF REGULATING RESERVOIR PLANNED FOR MEDIUM TERM,(10–20 YEAR PERIOD 2029–2039)
(2) COMPLETED WITH 2004/2005 REPORTS AND MASTER PLAN

FIGURE E3I

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DATE: 10/24/2018

4.7 Medium Term Water Master Plan Improvements

The focus of the proposed "medium term" West Point Water Master Plan improvements is expansion of storage for the Bear Creek supply. These facilities are described in Section 2.0 of this Master Plan and include increasing the capacity of the West Point Regulating Reservoir to 150 AF and decommissioning of Wilson Dam. As mentioned in **Section 4.1 Cost of Supply**, study results developed as part of this Supplemental West Point Water System Master Plan indicate that different configurations of Wilson Dam provide no additional water supply in dry years. Three options for Wilson Dam are provided later in this section for District consideration. Medium term improvements are those warranted for construction 10 to 20 years hence or for the period ranging from year 2029 to 2039. Typically, these improvements are costlier and will require more extensive environmental and permitting than the short-term highest priority improvements previously itemized.

In the Calaveras County Mokelumne River Long-Term Water Needs Study, ECORP projected that, during the next 20-year period, annual runoff volumes in the Project area should be expected to decrease with a shift in runoff patterns. Peak runoff is more likely to occur in February or March rather than in March or April. To adequately capture and store this reduced runoff for beneficial use within the West Point Service Area will require additional storage.

The expansion of the Regulating Reservoir will require an amended permit (license) from Division of Safety of Dams. Decommissioning Wilson Dam and meadow restoration will require cooperation with Sierra Pacific Industries. Updated or new permits from the Division of Safety of Dams, California Department of Fish and Wildlife, Regional Water Quality Control Board and U.S. Army Corp of Engineers will be required.

The estimated cost to expand the West Point Regulating Reservoir (in current dollars) is $2,365,025. This cost includes estimated Project construction, planning, design, permitting and environmental costs.

The analysis performed to support the development of this water supply plan indicates Wilson Dam provides no significant improvement in water supply in the 1976-77 critical dry period hydrology and therefore is not needed to meet consumptive demands. Based on the current condition of the dam, the District should consider the following options discussed below.

Option 1: Rehabilitation - 50 AF Wilson Dam

Historical information about Wilson Dam, indicated it had a capacity of 45–50 AF. As discussed in Section 4.1. *Cost of Supply*, Wilson Dam provides no significant increase in water supply. Rehabilitating the dam may provide recreational opportunities in some years. Preliminary design work completed by KASL Engineers indicates that restoring the dam to a 50 AF capacity would inundate Winton Road. Rehabilitation would include raising the road to provide the necessary freeboard for safe passage.

The estimated cost to deconstruct, remove, and replace the existing Wilson Dam with a facility that will provide 50 AF of capacity is estimated at $2,136,750. This cost includes estimated construction, planning, design, agency permitting and estimated administrative and legal costs but does not include the estimated cost to amend the operating permit with Sierra Pacific Industries or, alternatively, to purchase the site. These costs are unknown at this time.

Option 2: Rehabilitation - 40 AF Wilson Dam

After discovering that restoring Wilson Dam and reservoir to 50 AF would inundate Winton Road, KASL Engineers revised the design. A second preliminary design was created, resulting in the largest dam that would not inundate Winton Road. The second design resulted in a reservoir that could impound 40 AF. The design analysis indicates that a 40 AF Wilson Dam and reservoir was most likely the original size.

Option 3: Decommissioning Dam / Meadow Restoration

For several years, CCWD staff have considered various options for conservation of water from Bear Creek at Lili Gap. In 2015, Pat McGreevy, with contributions from Bob Dean and Steve Wilensky, conducted a detailed study exploring various options. The study considers a comprehensive restoration of the Bear Creek area including Lili Riparian and Bald Mountain Riparian Corridors. The project includes removal or thinning of invading conifers to maintain meadow area and reduce evapotranspiration, elevating creek bed so water spills onto floodplain, and removal of surface and ladder fuels to minimize risk of catastrophic fire.

Lili Gap Project - Planning, Design and Permitting

Plumas Corporation was contacted by Pat McGreevy to request a cost estimate to provide survey data collection, analysis and restoration design for the meadow and riparian corridors along the Bald Mountain and Bear Creek drainages. Additional budget amounts include botany, wildlife and archaeology surveys to satisfy CEQA and NEPA. The project will require a CDFW 1600 permit, Army Corps of Engineers 404 review under NWP 27 authority, Regional Water Board 401 certification. If USFS participates, they will also require a NEPA review decision process. Planning, permitting, design and implementation is estimated to cost approximately $207,600.

Table 15, below, summarizes the costs and water supply benefits of the proposed Wilson Dam and Reservoir treatment options.

Table 15. Wilson Dam and Reservoir Treatment

Project Description	Cost Estimate			Water Supply Benefit (Yield - AF)	Priority
	Construction	Environmental	Total		
Wilson Dam Rehabilitation 50 AF	$2,136,750	$143,000	$2,279,750	0	3
Wilson Dam Rehabilitation 40 AF	$1.234,750	$143,000	$1,377,750	0	2
Bear Creek Restoration	$170,000	$37,600	$207,600	0	1

Based on the analysis of the proposed options, decommissioning Wilson Dam and performing the Bear Creek meadow restoration is the recommended approach. Since none of the Wilson Dam rehabilitation options provide a water supply benefit, the most cost-effective approach is to decommission the dam and reservoir and restore the area to a meadow and flood plain. The resulting restoration could potentially improve water quality through natural processes.

4.8 Long-Term Master Plan Improvements

Long-term surface water needs for the West Point Service Area are estimated in the Long-Term Water Needs Study at 327 AF. The District's current agreement with CPUD to purchase up to 200 AF annually from the Middle Fork Mokelumne River (MFMR) combined with the District's right to divert up to 4 cfs and 150 AF or storage from Bear Creek would meet this requirement, except for the driest years. Future adjustments to the agreement to purchase MFMR water from CCWD may occur, especially if CCWD and CPUD can develop, jointly, MFMR storage improvements with the expansion of Schaads Reservoir or construction of the Forest Creek-Middle Fork Reservoir.

These relatively high cost improvements are long-term and will require extensive permitting but are reasonable solutions to meeting long-term water demands. The time line for long-term Master Plan improvements is estimated at 20 to 50 years (2038 to 2068) but long-term planning will be required to allow implementation.

The cost to expand Schaads Reservoir to provide an additional 250 AF of capacity is estimated (in current dollars) at $3.7 Million. This cost includes estimated Project construction, planning and design. Long-term permitting and environmental costs are estimated at $1,000,000. The Schaads expansion will affect U.S. Forest Service land. A combined CEQA / NEPA environmental document will be required.

Evaluation of the long-term demands projected from the West Point Water Service Area and the storage / supply provided by the Schaads Reservoir expansion was also completed (ECORP). As shown in Table 13 Project Priorities, the Schaads Reservoir Expansion would result in an additional yield of 119 AF.

The cost to construct a new Forest Creek-Middle Fork Reservoir that will provide 12,000 AF of storage capacity is estimated at (in current dollars) $19.3 Million. This cost includes estimated construction, planning and design costs. Future environmental and permitting costs that would address these improvements are unknown at this time. The Forest Creek-Middle Fork reservoir could provide additional supply to the West Point area; however, construction of this facility is only recommended as a regional supply alternative. In most years, the Schaads Reservoir and Regulator Reservoir expansions plus existing supplies would provide enough water supply to meet anticipated demands in most years. Our yield studies indicate that a shortage would only occur during the driest year on record. During the 1976-77 critical period hydrology a portion of the water supply at the expanded Schaads Reservoir would be used in 1976. A carryover storage supply at Schaads Reservoir along with the Bear Creek supply would provide about 288 AF. The 39 AF deficit is equivalent to about 12% of the total buildout demand. Development of a conservation policy during dry years could further ease the impacts of the shortage by spreading it over two years.