Demonstration Project for

Orleans Community Services District

Technical Assistance for Economically Disadvantaged Water and Wastewater Providers

North Coast Resource Partnership

California Department of Water Resources

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Orleans Community Services District

November 2014

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Table of contents

Table index

Figure index

Appendices

1. Introduction

1.1 Background

Orleans Community Services District (OCSD or District) operates in the unincorporated community of Orleans in Humboldt County, California. The capacity of the District's source water is unknown at this time, and the District is interested in determining if current and future water demands can be met. Additionally, the District is interested in determining the adequacy of the current storage capacity, and what measures should be taken if more is necessary. Major concerns for the Orleans community water supply are the capability to fight fires, meet municipal demand, and to develop a better understanding of the water source to help mitigate the effects of drought and climate change.

This water system evaluation includes assessing the diversion and storage capabilities of OCSD's system to ensure that fire protection and municipal demand requirements can be met. This analysis will focus on evaluating the system under the current demand requirements.

1.2 Project Location

Orleans is located in Humboldt County, California on US Highway 96. The community is built around the Klamath River, and is located within the territory of the Karuk Tribe of Northern California. The location and boundary of OCSD is shown in Figure 1 The community is located at an elevation of approximately 400 feet, and supports a population of 605 as reported by the 2010 census. Using the Drinking Water Watch website (Toolbox Element 1.1) it was determined the CSD serves a population of 430 residents (DWW, 2014).

1.3 Purpose of this report

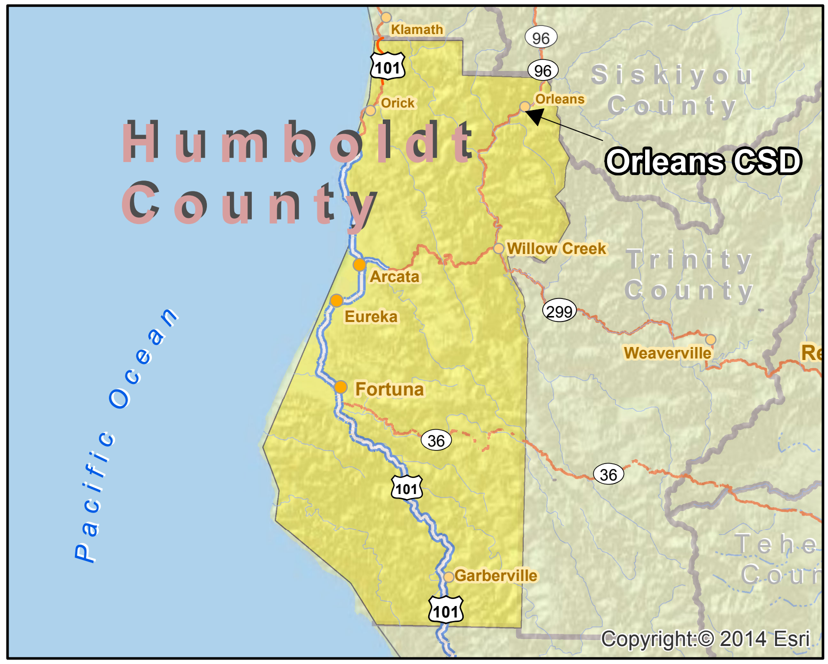
The purpose of this report is to identify the needs of Orleans Community Services District in regards to their water demand, water storage, water rights, water shortage plan, and develop strategies for addressing those needs. These needs will be identified in coordination with District staff and using elements from the Small Community Toolbox, which is a source of compiled information designed to assist small utility providers in all aspects of the Utility Management Cycle. Demonstration of these toolbox methodologies will serve as further guidance for small utilities that face similar issues. This report will result in a series of next steps, which will be chosen to further address and understand the issues of Orleans Community Services District.

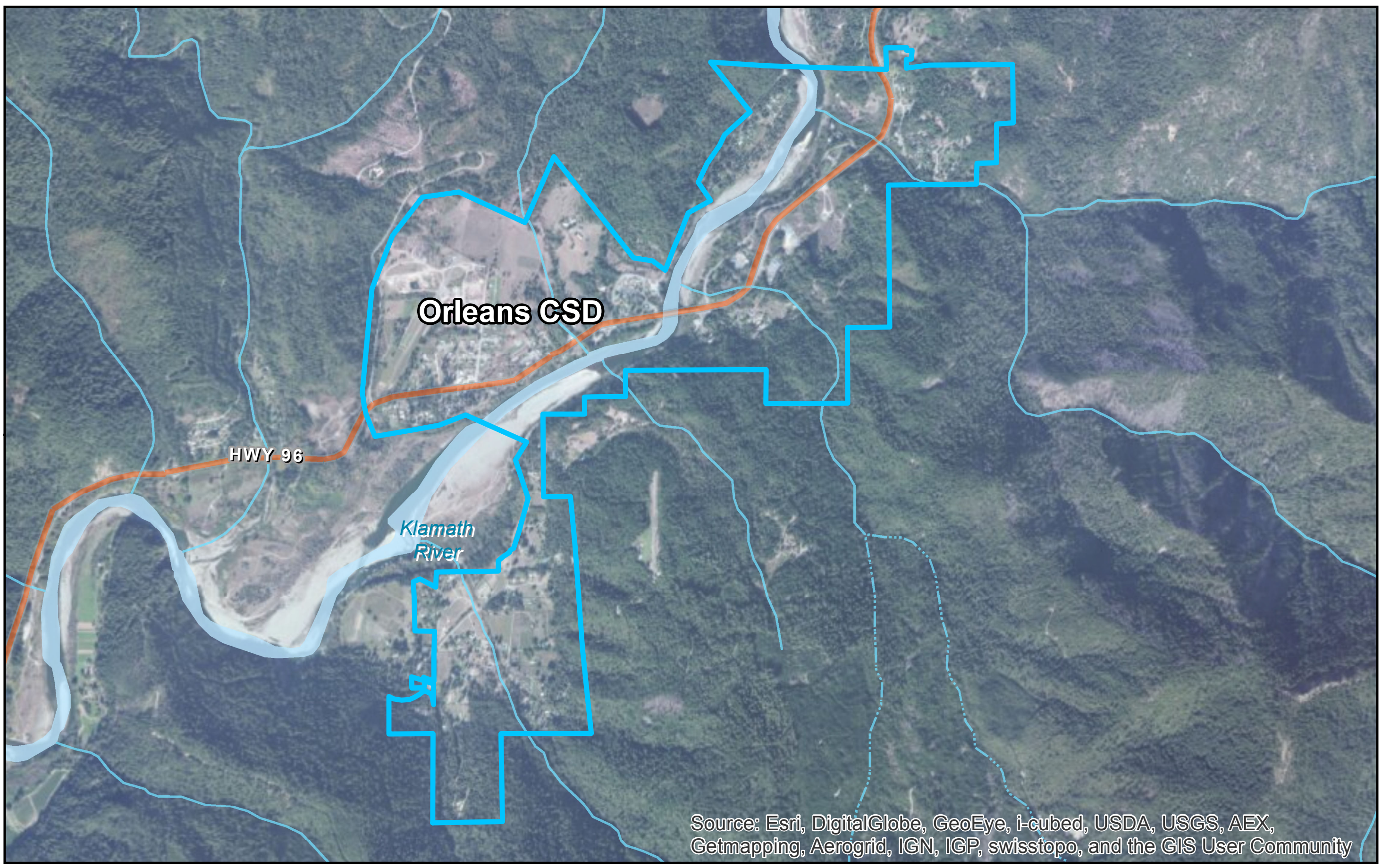
1.4 Scope and limitations

This report has been prepared by GHD for the North Coast Resource Partnership. The Orleans Community Services District has signed a participation agreement relating to the demonstration project that is the subject of this report. It should be emphasized that report is to be used as an example of how tools and processes can be used to help further infrastructure improvement projects for a variety of communities throughout the North Coast region. Further planning, analysis, engineering, and permitting will be required.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. This report has been prepared based on information provided by others, which has not been independently verified or checked.

Any cost estimates presented in this report or through related Toolbox elements are for conceptual purposes only. Actual prices, costs and other variables may be different at the time of an actual project and so are those used to prepare the Cost Estimate and may change. Actual costs will depend on final project configuration and requirements. There is no warranty or guarantee that the project as currently conceived can or will be undertaken at a cost which is the same or less than costs that may be inferred from this report.





U.S. Highway
Major Road
Local Roads
Stream
River
Orleans CSD

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Map Projection: Mercator Auxiliary Sphere
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Orleans Community Services District
Technical Assistance

Job Number	8410996
Revision	A
Date	21 Nov 2014

Vicinity Map

Figure 1

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Data source: ESRI Street Map; NAIP aerial 1m. Created by:emgutierrez

2. Use of the Small Community Toolbox

This Small Community Toolbox provides resources and references that allow small communities to approach the management of local water and wastewater infrastructure in a systematic fashion. The Toolbox is not a substitute for professional assistance with operations, management, engineering and legal issues. Rather it is intended to help small utilities develop a “first order” understanding of what their options are, how they should begin to budget, and how to get help.

The Small Community Toolbox is organized around the concept of the Utility Management Cycle illustrated in Figure 2

Figure 2. Utility Management Cycle

The Utility Management Cycle represents the continuous process of utility operation. Each stage in the process is subdivided into relevant tools which aid users in organizing the issues involved in utility operation and the order in which they are performed. The Individual tools have been prepared for each of the elements of the Utility Management Cycle which are summarized in Table 1. This demonstration project will highlight several elements from the Small Community Toolbox, which are shown with asterisks in Table 1. Throughout this report, references will be made that demonstrate where methodologies from the toolbox are used. Further information on the Utility Management Cycle and the associated Toolbox Elements can be found in the Toolbox Summary Document.

Table 1. Small Community Toolbox Elements.

Utility Management Cycle Element	Toolbox Element	What it is and How it can be Used
Utility Management Cycle Element 1: ***Organize and Plan for Success***	***1.1:** Community Networking Directory:	A contacts database of willing participants interested in collaboration for advice and assistance.
	***1.2:** Governance Summaries:	An overview of options, benefits, and steps required to form various types of service entities.
	***1.3:** GIS Layers:	Census, legislative, and other public data to help agencies access information needed for applications.
Utility Management Cycle Element 2: ***Match Needs to Economical Technologies***	**2.1:** Technology Overviews:	Overviews of common issues, technologies, and evaluation factors to help select alternatives.
	***2.2:** General Cost Estimating Charts:	Cost estimating charts to help develop order of magnitude estimates for various types and sizes of infrastructure to begin scoping overall funding strategies.
Utility Management Cycle Element 3: ***Create Viable Financing Strategies***	***3.1:** Funding Program Summaries:	A one-stop information shop about funding programs suited to small community infrastructure projects.
	***3.2:** Capital Recovery Tables:	Lookup tables to translate the portion of total project costs not paid by grant into annual debt service requirements met through a revenue mechanism.
	3.3: Financing District Summaries:	Summary of strategy options for generating revenue to pay the annual debt service.
	***3.4:** Cash Flow Considerations:	Assists entities in understanding the funds needed to move a project through planning, design, and construction
Utility Management Cycle Element 4: ***Prepare Preliminary Design, Studies, and Applications***	***4.1:** Consolidated Preliminary Engineering Report Template:	Consolidated report outline, with model tables that will meet the needs commonly used funding programs.
	***4.2:** CEQA/NEPA Exemptions and Checklists:	Summary of CEQA/NEPA exemptions and checklists to aid in meeting State and Federal environmental requirements and funding program requirements.
	***4.3:** Common Permit Triggers:	Summary chart of typical project components that often trigger different types of permits.
Utility Management Cycle Element 5: ***Complete Final Design and Construction***	***5.1:** Guidance for Hiring Professionals:	As a project moves from initial planning towards implementation, detailed, community-specific designs are required and communities will need to retain professional support.
	5.2: Public Bidding Process Overview:	Understanding how the public bidding process works, how to set up a successful project bid, and how the low bid contractor is selected
Utility Management Cycle Element 6: ***Operate and Manage System***	***6.1:** Technical, Managerial and Financial (TMF) Resources:	Tools to help agencies be organized and managed to improve overall operations and funding competitiveness.
	***6.2**: Regulatory Resources:	Sources to provide information to the utility operator on various federal and state regulations.
	6.3: Rate Setting Guidance:	Linking the costs of projects to the need to rate increases and methods to set and change rates
	6.4: Capital Improvement Planning Resources:	Part of the on-going Utility Management Cycle of planning for future system improvements

3. Model Project: Orleans Community Services District

3.1 OCSD Water Distribution System

The existing water distribution system for Orleans was constructed in 1979. The source of water for the system comes from Perch Creek, which is a small year round creek that enters the Klamath River approximately 0.9 miles north east of the Highway 96 Bridge. The water right permit issued by the State Water Resources Control Board (SWRCB) is for direct diversion, which is collected through an infiltration gallery. A system schematic is shown in Figure 3 below.

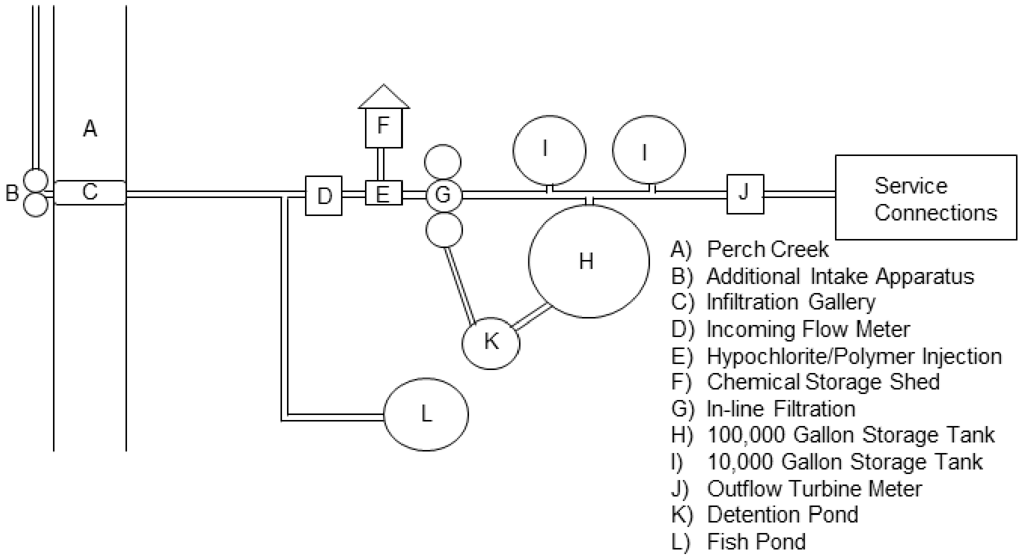

Figure 3. OCSD water system schematic.

From the gallery (C), water travels gravity fed through 8” pipes to the treatment and storage facility, approximately 70 feet down gradient. The maximum system intake rate is 453 gallons per minute (gpm), which is based on the filtration system flow rate that keeps the treatment system within State compliance (Jarvis, 2014).During low-flow months, an additional intake apparatus (B) is constructed along the creek that supplements the intake rate in the infiltration gallery. This apparatus consists of two PVC pipes that collect water upstream and discharge into two standup pipes. When the storage system is operating water moves through the inflow meter (D), is treated with polymer and hypochlorite (E), passes through three dual media inline filters (anthracite and sand), then is stored in one of three storage tanks (H,I). The 100,000 gallon redwood tank is from original construction in 1979 and the two 10,000 gallon HDPE tanks were added later. Before delivery to the service connections the water passes through a high flow turbine meter (J). The water system is gravity fed from the tanks, which are situated at an elevation of 700 feet. The elevation difference in the water system results in approximate maximum static pressures of 130 psi. Water is conveyed through a system of 4”, 6”, and 8” asbestos cement and ductile iron pipes. Suspended cables are used to convey the waterlines over both Perch Creek and the Klamath River to the distribution system. When the treatment system is not operating the intake valve is shut off and a 2” valve is opened to a fish pond (L) approximately 200” down gradient. The intake to the fish pond is part of a deal with the downhill property owner that provided the land to the CSD. A detention pond (K) exists between the filters and the storage tanks that collects filter backwash water and leakage from the 100,000 gallon tank (H).

OCSD currently uses inline filtration, which is no longer an accepted filtration technology in the state of California. As a result, the District has recently applied for funding a project which includes a fourth filter, turbidity meters, a second 100,000 gallon storage tank, and a new exit flow meter to replace the high flow turbine meter. Additionally, it has been proposed by the district to move the polymer and chlorine injection point further uphill from the current treatment point, which could provide the necessary flocculation time to change the system from inline to direct filtration. Another option to moving the polymer injection point is the consideration of two-stage filtration. In either case another item to be evaluated is providing adequate chlorine contact time between the injection point and the exit of the tanks.

Another water system operates within the Orleans area, the Orleans Mutual Water Company. The water right for this system comes from Crawford Creek, and services the southwest portion of Orleans. Specifics regarding the service and infrastructure of this system are unknown, and are not considered within the scope of this analysis.

The CSD serves members of the Karuk Tribe. Indian Health Services also monitors the OCSD system and has indicated it is at high risk due to recent drought conditions (IHS, 2014). Many hydrologic model studies conducted for Northwestern California suggest that earlier snowmelt and less snowmelt equivalent will occur going forward (Butz and Safford, 2010). For a community such as Orleans, this means less sustained stream flow throughout the later parts of the year, which could impact the ability of Perch Creek to meet municipal demand. These circumstances further impress the importance of appropriate water system understanding and management through analysis of the current water use.


Figure 4. Supplementary intake structure.

3.2 Existing Conditions

GHD undertook a site visit on October 2nd, 2014 to determine the existing conditions of the intake, treatment and storage system. Additional information regarding the treatment system was obtained from Indian Health Services and the conditions of the conveyance system were assumed to be those present in the original design drawings, which can be found in Appendix D. It should be noted that the actual alignment of the system may not be those presented in the design drawings.

The infiltration gallery currently has issues with sediment, which is a result of a backhoe damaging the filter fabric during cleaning. Currently, the infiltration gallery is backwashed using compressed air injected though two stand pipes. The additional intake apparatus mentioned above was incorporated to increase intake capacity during the low flow months (Figure 4). There is wire mesh covering the standpipe openings that prevents debris from blocking the intake pipes.

Figure 5. Severed pipe casing (left) and cable pipe bridge at slide (right).

The access road between the intake site and the treatment facility has a consistent source of water flowing over the road. The source was originally assumed to be a seep or spring; however, chlorine tracer tests determined that the water originates from a leak in the conveyance line. It is unknown at this time how much water is being lost through this leak. The pipe crosses the creek further downhill from the suspected leak. At this crossing, the protective casing around the pipe is broken and is supported by a vertical 4” x 4” (Figure 5). If the casing were to completely severe, a complete breakage of the conveyance line could result. A land slide on a hillside adjacent to the access road resulted in the exposure of the pipe, which is now supported by a cable system (Figure 5). Although it is believed that the condition of the pipe and cable system is adequate at this time, the road at this point is continually sliding downhill. This section of the road becomes difficult to pass during or after rain events.

Figure 6. Leak in the redwood tank.

The former operator believed that the cumulative capacity for the three tanks is 108,000 gallons due to air gaps. The redwood tank currently has a leak of approximately 2-3 gallons per minute (gpm), which increases with lower temperatures (IHS, 2014). As noted above the leakage is routed into the detention basin between the tank and the filters through a small diameter PVC pipe. It is unknown at this time if the metal straps around the redwood tank have ever been tightened. The flow meter at the exit of the system is a high flow turbine meter, which is believed to be contributing to inaccuracies in the meter data during low flows. As noted above, OCSD is currently planning improvements to the system which would replace this device with an electromagnetic meter that should improve the measurement accuracy.

4. Water Demand

Water demand is the volume of water used on a daily basis by a utility district or community. Understanding the demands placed on a water system is one of the first steps in evaluating a water system's ability to serve the community. This section discusses the methodology used to determine the water demands, the current water demands, and the projected future water demands for OCSD.

4.1 Methodology

Using Toolbox Element 6.2, Regulatory Resources, the method chosen for determining the user demand is that outlined by the California Code of Regulations Title 22 Chapter 16 (Appendix A). The data used in this analysis is based upon the water meter data provided by OCSD. The water meter data provided was for 157 connections (gallons/month) during the year 2013. The metered sites were mostly residential, however, also included a vineyard and plant, a United State Forest Service (USFS) district office, and a restaurant and motel. During the month of August 2013, a series of fires occurred in the District. These fires resulted in irregularities in the data as water usages during this time were above normal due to fire suppression efforts. As a result, the demand value used for August is the average of the two surrounding months (July and September). The average daily, peak daily, and peak hourly water demands were computed using the estimated August demand.

4.2 Current Demand

Based on the water meter data provided by OCSD, the average daily demand of the system was 133,574 gallons per day (gpd) during 2013. This value is inclusive of all water use measured by the OCSD at the user meters, and does not differentiate between residential, municipal, irrigation and commercial use. The maximum daily, peak hourly, and average summer month demand values are shown in Table 2.

Table 2. Current water demands for OCSD using meter data.

Description	Average Daily Demand (gpd)	Maximum Daily Demand (gpd)	Peak Hourly Demand gallons/hour (gph)	Summer Average Daily Demand (gpd)
End User Meter Data	133,574	315,828	19,739	202,873
Engineering Estimation	55,900	83,850	5,241	N/A

[D]etermined using per capita usage of 130 gallons/capita/day for a population of 430.

It should be noted that an alternate method for determining average daily demand would be to do so during only the summer months when demand is increased. During the summer months (June, July, and September) the average daily demand is approximately 202,873 gpd. August is omitted from this calculation as there was the fire which introduced abnormality into the data. All subsequent calculations in this report are based on the annual average water demand; to correct these values during design for the summer demand and additional 70,000 gallons would be required.

Table 2 also shows the water demands that would be estimated assuming all connections are residential and using a relatively high per capita water usage rate (Lindeburg, 2001). The population assumed for this analysis is based on the number reported by the Drinking Water Watch Website (DWW, 2014). The engineering estimation is determined using the upper limit estimation value for per capita water usage, 130 gallons/person/day (Lindeburg, 2001). When the two demands are compared, the meter data shows that there is above average water usage taking place.

Master meter data for the water system was provided by the District in order to verify these above normal usages; however, there is a large amount of unaccounted for losses. Differences between the inlet and outlet meter readings on the tanks range in value between 431,600 and 4,132,300 gallons/month. The three main sources of error currently identified include the leak in the redwood tank, filter backwashing, and the flow meter (turbine meter) at the tank exit (IHS, 2014). Assuming a 3 gpm leak over a 31 day month, the total amount lost through leakage would be 133,920 gallons, which constitutes between 3.2 and 31% of the total range of losses, depending on the month. It is unknown at this time how much of the losses are due to filter backwashing and the tank exit flow meter. Due to these uncertainties, use of the end user meter data was determined to be more appropriate for this analysis. The master meter data can be found in Appendix B.

It should be noted that the values in Table 2 do not account for any potential losses in either the conveyance or treatment system. Because use of the master meter data to characterize treatment facility losses was determined to be subject to uncertainty, losses where assumed to be a percentage of the system demand. Table 3 shows the average per capita demands placed on the treatment facility using assumed system losses of 10%, which is a low end typical loss value.

Table 3. Per capita water treatment demand comparison.

Description	Average Daily Treatment Demand (gallons/capita/day)
End User Meter Data	341.7[1]
Engineering Estimation	85 – 150[2]

[1]Based on a population of 430.

[2]Includes assumed waste and loss of 10-20 gpd (Lindeburg, 2001).

The per capita water demand is approximately 2.3 times greater than highest value estimated using standard engineering methodologies. It should be noted that the engineering estimation assumed all residential use, and as noted earlier are designed to be conservative, which makes the reported usages in OCSD even more alarming. Clearly, there is an issue with how much water is being used in this system.

4.3 Future Water Demand

As reported by the District, water service connections have been growing at a rate of one meter per year over the past 14 years. Additionally, there has been a proposed housing development project which could add another 35 homes to the CSD's system. To project the demands for the treatment system going forward at this rate, the average daily demand (ADD) per connection is determined. This is done by dividing the ADD (Table 2) including assumed losses by the number of service connections (157). The demand projections for 10, 20, and 30 years is presented in the subsequent section (Table 4).

4.4 Demand Summary

The average daily water demand for OCSD is much larger than standard engineering estimations. The average daily, maximum daily, and peak hourly water demands assuming 10% losses are 146,931 gpd, 347,411 gpd, and 21,713 gph, respectively. Table 4 below summarizes the current and projected water demands.

Table 4. Current and projected daily water demands.

Years in the Future	Present	10	20	30
Projected Average Daily Water Demand[1] (gpd)	146,931	156,290	165,649	175,007
Maximum Daily Water Demand[2] (gpd)	347,411	369,539	391,667	413,795
Number of Total Connections	157	167	177	187

[1]If 35 home development occurs, add 32,755 gallons to all demands.

[2]If 35 home development occurs, add 77,488 gallons to all demands.

When system losses are assumed, the per capita daily water demand at the treatment plant is approximately 2.3 times larger than the maximum expected value. Given the magnitude of these demands, measures need to be taken to reduce daily water consumption and mitigate leaks in the conveyance system. This could include repairing the leak in the line connecting the intake to the treatment facility and continuing to identify and repair leaks in the conveyance system to the service connections. In addition, efforts should be made to improve the understanding of the tank master meter data. This would include characterizing the losses in the storage system and addressing any infrastructure deficiencies which are causing the losses at the treatment site. The new exit flow meter which is part of the current funding application should be one component that will help address this problem. Lastly, it is recommended that a minimum of five years of user demand data be gathered to be used in future evaluations of the water system.

5. Water Storage

Orleans CSD currently operates three storage tanks, one 100,000 gallon redwood tank and two 10,000 gallon HDPE tanks. The water system operator believes that with all three tanks the cumulative storage capacity is 108,000 gallons. These tanks are located on the northeast end of Orleans at approximately 700 feet elevation.

5.1 Storage Volume Requirements

There are three components that compose the necessary storage volume: working, fire, and emergency storage. The working storage needs are based on the adjusted meter data for the year 2013, the emergency storage is based on health standards, and the fire storage is based on an assumed fire flow of 1500 gpm.

5.1.1 Working Storage

Working storage is the volume of water necessary to accommodate for daily variations in water usage. Due to the large demands determined from the meter data, the average daily demand was chosen over the maximum daily or peak hourly demands to calculate working storage volume. For one day of ADD, the necessary working storage volume is approximately 147,000 gallons. It should be noted that the working storage does not include considerations for future population growth. If the growth of the system were to be included for a 20 year planning horizon, the resulting working storage would be 166,000 gallons.

5.1.2 Fire Storage

Available water storage for fire suppression is a key design element for any community. In August of 2013, Orleans experienced two fires, requiring some homes to use municipal water to fight encroaching fires. Given the inherent risk associated with wildfires in this area, ensuring necessary fire storage is of paramount concern to the community of Orleans and the OCSD.

The needed fire flow (NFF) for Orleans is based on a one structure fire for the largest inhabited structure, as recommended by the ISO fire standards (ISO, 2008). For Orleans, the largest inhabited structure is assumed to be the elementary school. However, because there is no available information as to the composition of the structure, the necessary fire flow is assumed to be 1500 gpm. Over a 2-hour fire event, this results in a fire storage volume of 180,000 gallons. This storage requirement can be reduced by combining the contribution of the available production capacity, which in this case is the diversion from Perch Creek (Mays, 2000). Assuming the maximum diversion rate of 453 gpm, the necessary fire storage over a two hour fire event is reduced to 126,000. It should be noted that the increased flow experienced during a fire event could affect the chlorine contact time, which could compromise system water quality. Future work should be done to investigate how fire flows effect the contact time in the system.

Typically small water systems serving a permanent (non-vacation) population operate at or near full capacity. In this case, the water system should never be operated with less than 126,000 gallons in storage, which is the amount necessary for firefighting. Further analysis of this system would be necessary to determine if required residual pressures and velocities would be maintained in the system under this minimum storage amount.

5.1.3 Emergency Storage

Emergency storage is the volume of stored water the system needs if the water treatment plant goes offline due to maintenance or emergency. For small rural water systems a typical volume of emergency storage would be two to three days of ADD, as the time to order parts or hire technicians can be several days longer than in developed areas. For Orleans, two to three days of additional ADD storage would be between 267,000 and 400,750 gallons. Because this is such a large quantity for a small community with limited resources, emergency storage will be estimated using 50 gallons/person/day, which is the minimum requirement for health and safety. At this usage rate, three days of emergency storage for the general population of 430 would be approximately 65,000 gallons. In addition, storage is considered for the Orleans Karuk Tribal Wellness clinic. Assuming a five bed clinic with 10 employees, the resulting additional emergency storage is 2000 gallons (Metcalf and Eddy, 2003). The resulting final emergency storage volume is 67,000 gallons.

5.2 Storage Summary

The required storage capacity for the system is determined by adding the fire storage, working storage, and emergency storage. Table 5 below summarizes the results.

Table 5. Storage summary table.

Storage Type	Volume (gallons)
Working	147,000
Fire	126,000
Emergency	67,000
Total	**340,000**

The current storage capacity needed to satisfy all storage demands is 340,000 gallons. Given an estimated current storage capacity of 108,000 gallons, an additional 232,000 gallons of storage would be necessary to meet this requirement. It should be noted that if the air gaps which are currently reducing the available storage capacity could be addressed, an additional 12,000 gallons of storage could be made available. This would reduce the additional recommended storage to approximately 220,000 gallons. As noted previously the District is seeking funding for system upgrades including an additional 100,000 gallons storage tank. If this upgrade were to occur the system would still require an additional 120,000 gallons.

6. Water Rights

A water right is a permit obtained from the State Water Resources Control Board which outlines the permissible beneficial use amounts of a water source, and the terms which must be followed as part of that usage. Understanding the terms of a district's water right is important in engaging in responsible and legal usage of water resources. This section discusses OCSD's permitted diversion amounts and the required bypass flows in Perch Creek. Further resources on water rights can be found in Toolbox Element 6.1.

6.1 Permitted Diversion Amounts

Water diversion for OCSD is permitted for two uses, domestic and irrigation. The following table summarizes OCSD's permitted diversion amounts and the times which they are applicable. A full listing of the water right permit can be found in Appendix B.

Table 6. Beneficial usage amounts for Orleans CSD.

Parameter	Value	Date Applicable
Maximum Instantaneous Domestic/Recreational Diversion	0.321 cfs	1/1-12/31
Maximum Instantaneous Irrigation Diversion	1.74 cfs	4/1-9/1
Maximum Annual Diversion	751 acre-feet	1/1-12/31

As shown above, there are no set diversion limits for irrigation during the wet months (September-April). Currently, the District does not differentiate between irrigation diversion and domestic diversion. Domestic diversion is defined in the California Code of Regulations as:

"..water use in homes, resorts, motels, organizations, camps, camp grounds, ect., including the incidental watering of domestic stock for family sustenance or enjoyment and the irrigation of not to exceed one-half acre in lawn, ornamental shrubbery, or gardens at any single establishment."

Watering or irrigating any lawns or gardens over ½ acre in size qualifies as irrigation usage. Orleans is a rural community with many homes on land greater than ½ acre; therefore, there could be homes that are operating under the definition of irrigation. Without differentiation of usage type it is difficult to accurately determine whether OCSD is meeting the permit requirements by diversion type. OCSD should undertake a user survey to determine which water service connections qualify under irrigation diversion

6.2 Bypass Flow

In addition to the permissible diversion amount, necessary bypass flows are prescribed to maintain in stream flows for aquatic species in Perch Creek. Bypass flows are minimum flow amounts which must be maintained in the creek after diversion has occurred. The bypass flow requirements for the OCSD's water right can be found in the attached permit (Appendix B).

Stream flow data for Perch Creek was provided by the District. The data provided is over a twelve year period (July 2002 - August 2014), with measurements performed by two different agencies at several different measurement sites. Table 7 below shows the average dry-month flows for Perch Creek at a gaging site below the water system intake, labeled in the data as "Trail to pool at gate in Perch Creek Campground". The full listing of flow data can be found in Appendix B.

Table 7. Average annual, maximum, and minimum flows (cfs) at "Trail to pool at gate in Perch Creek CG" gaging station.

Parameter	June	July	August	September
Avg. Flow (cfs)	12.7	7.3	3.9	1.9
Max. Flow (cfs)	17.8	11	7.2	2.1
Min. Flow (cfs)	5.3	2.6	1.9	1

During the summer months the required bypass flow is 1.5 cfs. Over the period of record shown in Table 7, only one measurement was recorded that was less than the bypass flow, dated September 5, 2002 (1 cfs). Under current drought conditions, the District has reported summer 2014 stream flows below the municipal intake of 1.55 (7/16/2014), 1.51 (7/30/2014), and 1.36 (9/3/2014) cfs. As the exact gaging location for these readings is unknown, they are not included in the averages presented in Table 7. These values are just above the legal diversion limit from the creek or lower, and further impress the importance of reducing water usage, which as previously noted have been found to be far above average. In order to perform a more in-depth source assessment for Perch Creek, it is recommended that daily flow data at a consistent gage location be gathered. This data could lead to a more accurate source assessment, and a greater overall understanding of the capacity of Perch Creek to meet OCSD demands going forward. Methodologies for this type of assessment can be found in Toolbox Element 6.1, Technical, Managerial and Financial Resources Module 4: Source Capacity.

6.3 Water Rights Summary

Operating within the terms of the District's water right is important in maintaining a legal and sustainable utility going forward. The District's water right includes both domestic/recreational and irrigation diversion amounts. The District does not track customer water use by type. It is recommended that OCSD conduct a customer survey to determine which water connections may qualify as Irrigation usage.

The District's water right includes a requirement to bypass 1.5 cfs past the diversion point during the dry months. It is recommended that the District set up a calibrated flow monitoring station to accurately track daily flow for compliance with the water right.

7. Water Conservation

California declared a state of emergency in January 2014 due to the drought which has persisted the past several years. Under these drought conditions, utility providers statewide are being asked to implement drought contingency plans if available, or begin to draft measures if they are not yet in place. The following items are common components which should be addressed in a drought contingency plan.

7.1 Water Shortage Strategy Stages

A common way to implement drought contingency measures is through a staged approach. During each stage, different levels of demand reduction and water supply augmentation are enacted to help mitigate the effects of drought conditions. A typical water shortage contingency plan will have four stages. One common method for triggering the various stages is using a percentage of total supply or usage reduction (USBR, 2003). The following table is an example of the stage methodology adapted from the United States Bureau of Reclamation.

Table 8. Common trigger intervals for various stages of water shortage plans (USBR, 2003).

Implementation Triggers for Water Shortage Plans	
Stage 1 - Minimal	10-15% Supply Reduction
Stage 2 - Moderate	15-25% Supply Reduction
Stage 3 - Severe	25-35% Supply Reduction
Stage 4 - Critical	35-50% Supply Reduction

In many water conservation plans, the initial stage is voluntary and the subsequent stages are mandatory. OCSD has currently drafted a water shortage plan with three stages of supply reductions, 20%, 50% and 75%. These reductions constitute a percentage reduction in water usage. While it is important to note that water shortage plan stages, actions, and triggering levels are very subjective, there are advantages to implementing the above four stage approach. With a greater number of stages, the utility has more time over which to implement demand reduction and supply augmentation measures. Additionally, customers have more time to adjust to water conservation measures as they can be enacted in a more gradual manner.

Presented below (Table 9) is an example four-stage water shortage plan with two contrasting Perch Creek flow trigger levels. The flow trigger levels in the third column (Flow Trigger 1) are based on the permitted diversion rates in the OCSD water right. In this method, Stage 1 conservation occurs when the flow in Perch Creek is equal to the bypass flow (1.5 cfs) plus the maximum permissible diversion rate (2.061 cfs). Stage 3 occurs when the creek flow is equal to the bypass flow plus the maximum treatment system diversion rate (1.01 cfs) and Stage 4 occurs when the flow is equal to the bypass flow plus the maximum permissible domestic diversion rate (0.321 cfs). The flow trigger for Stage 2 conservation is linearly interpolated between Stages 1 and 3.

Table 9. Example Perch Creek trigger flows for stages of a water shortage plan.

Water Shortage Plan Stage	Usage Reduction Level	Flow Trigger 1 (cfs)	Flow Trigger 2 (cfs)
Stage 1 - Minimal	10% Reduction	3.561	2.038
Stage 2 - Moderate	20% Reduction	3.035	1.984
Stage 3 - Severe	30% Reduction	2.510	1.930
Stage 4 - Critical	50% Reduction	1.821	1.876

The flow trigger levels in the fourth column (Flow Trigger 2) are based on the maximum daily demand and the water conservation enacted from the previous stage. State 1 conservation would occur when the flow in the creek is equal to the bypass flow plus the maximum daily flow (0.538 cfs). Stages 2-4 conservation occurs when the creek flow is equal to the bypass flow plus the net previous reduction percentage of the maximum daily demand. For example, the flow trigger levels in Stage 3 and 4 is the bypass flow plus 80% and 70% of the maximum daily flow, respectively. It should be noted again that flow trigger levels are subjective; the two methods above are developed to show the utility and differences that can result from how triggers are chosen.

Because diversion rates must change through the implementation of a water conservation plan, it is useful to estimate how long the treatment system must operate in order to meet demand over the possible levels of diversion rates.Table 10 below shows the number of hours the system must operate to meet daily demands.

Table 10. Diversion time required to meet system daily demands.

Demand Type	Volume (gal)	Hours at Maximum System Intake (1.01 cfs)	Hours at Maximum Domestic Permitted Diversion Rate (0.321 cfs)
Average Daily Demand	146,931	5.4	17
Maximum Daily Demand	347,411	12.8	n/a

It should be noted that flow triggers based on Perch Creek stream flows could be developed; however, this would require the collection of a larger amount of stream flow data from a calibrated gaging location.

7.2 Demand Reduction Strategies

Demand reduction strategies are methods by which utilities can encourage or require users to reduce water usage. These measures vary from small voluntary changes in water use habits to large mandatory changes, and are generally tailored to meet the needs of the community involved. Example demand reduction strategies for each stage in a water shortage plan are presented below.

Table 11. Example demand reduction strategies for various stages of a water shortage plan.

Water Shortage Plan Stage	Example Water Use Reduction Measures
Stage 1 - Minimal	Encourage morning/evening watering, reduce showering times
Stage 2 - Moderate	Require shut off nozzles on hoses, restrict water use on impervious surfaces
Stage 3 - Severe	Enact excessive use charges, restrict vehicle washing
Stage 4 - Critical	Restrict household per capita usage (gallons/person/day)

Properly selecting demand reduction measures depends upon the typical use of water within a service district. Utilities should rank their water usage priorities in descending order, and enact demand reduction methods that reduce use in the low priority areas. More information regarding demand reduction strategies can be found in Appendix F.

7.3 Water Supply Augmentation

Supply augmentation is a way to mitigate the effects of water shortage by increasing the storage capacity or by providing temporary alternatives when water shortages occur. The U.S. Bureau of Reclamation categorizes supply augmentation techniques into the following five categories:

1. Methods to increase existing supplies or develop new supplies
   a. Increase use of recycles water
   b. Add additional tank storage capacity
2. Drawing from reserve supplies
   a. Add new sources
3. Methods to increase efficiency (demand reductions)
   a. Address leaks in the system
   b. Conduct distribution system audits
4. Modifications to operations
   a. Re-circulate backwash water
   b. Change water storage and release operations
5. Cooperative efforts with other agencies
   a. Water transfers or interconnections
   b. Mutual aid agreements

Specific to OCSD, some supply augmentation strategies could include re-circulating the filter backwash water, adding additional storage, and addressing leaks within the transmission, storage, and distribution systems. In general, many supply augmentation techniques are beneficial when implemented prior to a water shortage because they take time to implement. More examples of how to address the issue of supply augmentation can be found in Appendix F.

8. Project Funding Sources

Securing funding for infrastructure projects is an important step for most utilities. First, eligible funding programs need to be identified based on factors such as governance structure and project type. Orleans operates as a Community Services District, which is public, independent type of governance structure. Using the Available Funding Summary Table from Toolbox Element 1.2 (Governance Summaries), the following agencies are identified as potential project funders:

- California Department of Public Health
- Department of Water Resources
- California Infrastructure and Economic Development Bank (I-Bank)
- United States Department of Agriculture
- North Coast Resource Partnership
- Rural Community Assistance Corporation
- Indian Health Services

OCSD would need to define a project to be undertaken, and complete any pre-application steps necessary in order to be considered for funding. For example, for funding through Safe Drinking Water State Revolving Fund (CDPH), a universal pre-application sheet is available for submission through their website. In addition to pre-applications, most projects will require a preliminary engineering report (PER). A PER is a planning document that is required by most funding agencies in order to obtain funding. Further information about PER's can be found in Toolbox Element 4.1.

9. Summary

Using the meter data provided by the District the average daily, maximum daily, and peak hourly water demands are 146,931 gpd, 347,411 gpd, and 21,713 gpd, respectively. Determining losses through the use of the master meter data was determined to be unreliable so these values include assumed 10% system losses. These usages are 2.3 times greater than conservative engineering estimates for residential use, and further impress the need for water use reduction. Repairing deficiencies in the conveyance system would also help reduce the demand placed on the treatment plant.

The current storage capacity for the three existing water tanks is estimated to be 108,000 gallons. To meet working, emergency, and fire storage capacity OCSD would need an available storage volume of 340,000 gallons. Under these conditions OCSD would require approximately 232,000 gallons of additional storage. If an additional 100,000 gallon storage tank is installed as part of the current proposed improvement project and the 12,000 gallons is recovered from the current storage system (air gaps) the system would still require an additional 120,000 gallons of storage capacity.

OCSD does not currently differentiate between irrigation and domestic diversion purposes. As Orleans is a rural community with many parcels above ½ acre in size, many household may be using water under the definition of irrigation use. The CSD should conduct a user survey to determine which connections are using water for irrigational purposes. A greater understanding of these two diversion types would lead to a better understanding if the CSD was meeting the water right allotted for domestic usage.

The current stream flow data indicates Perch Creek is near or below bypass flow at times. However the accuracy of the data collected is not known, which is why a calibrated gaging station is recommended. The addition of new connections to the system is not recommended until a calibrated gaging station is installed and a drought contingency plan is in place so that usage can be reduced during low stream flow periods.

OCSD is currently drafting a water conservation plan to further address the issues of drought and water use efficiency. An example four stage water shortage implementation plan was developed following methodology presented in the 2003 U.S. Bureau of Reclamation report *Water Shortage Contingency/Drought Planning Handbook*. Two separate methods were used to determine flow trigger levels in Perch Creek, one based on the water right and the other on maximum daily diversion. Water supply augmentation strategies such as increasing storage capacity, system leak repair, and re-circulation of filter backwash water could significantly help water conservation efforts.

10. Implementation Strategy and Next Steps

Using Toolbox Elements from the Small Community Toolbox, deficiencies in the OCSD municipal water infrastructure have been identified. To address some of these issues, a recommended project is proposed. Additionally, operational improvements are presented to help improve system operation. Similar to this analysis, components of this project would involve using resources available in the Small Community Toolbox.

10.1 Recommended Project

The following system components are recommended as part of the improvement project:

- Construct a permanent calibrated Perch Creek gaging station and gather daily readings.
- If not currently possible, improve intake system to allow for reduction of intake flows.
- Add 100,000 gallons of additional storage. This recommendation assumes that the current project proposal including a new 100,000 gallon storage tank proceeds. This would result in a total storage volume of 300,000 gallons.
- Repair the transmission line in between the infiltration gallery and the treatment plant.

Funding for this project could come from a variety of sources, which have been summarized in section 8. The next step in securing funding from one of these sources is the completion of a preliminary engineering report and any applications for funding that are required by specific agencies. Further information on completing these tasks is presented in Toolbox Element 4.1: Consolidated Preliminary Engineering Report.

10.2 Operational Improvements

The following improvements are presented to address operational deficiencies in the water system:

- Complete the water shortage contingency plan and inform customers about the need for continued water conservation.
- Review user meter data on a regular basis to identify leaks in the conveyance system.
- Coordinate with users to identify connections that qualify under the irrigational water use.
- Continue to identify and repair leaks in the storage and treatment system.
- Gather a minimum of five years of user demand data.

10.3 Future Investigations

This analysis focused on the issue of water supply and demand for Orleans CSD. A parallel issue that the CSD faces is the adequacy of the treatment system given the large demands and storage requirements. During high flows, which could be a result of peak demand or fire occurrences, the current water system may not be achieving the chlorine contact times required for the removal of viruses and Giardia. Moving forward, the CSD should investigate the relationship between chlorine contact time and peak demand to ensure that during such events water quality is not compromised. Additionally, the design and implementation of any new storage tanks in the future should be selected and operated to ensure sufficient contact time.

11. References

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Appendices

Appendix A California Code of Regulations Title 22 Chapter 16

This appendix contains the methodology used to determine the design flows of the system.

(7) The running annual average for both TTHM and HAA5 for systems meeting the criterion in section 64536(a)(3) or (4).

(8) The running annual average of the amount of magnesium hardness removal (as $CaCO_3$, in mg/L) for systems meeting the criterion in section 64536(b)(2).

(9) Whether the system is in compliance with the particular alternative compliance criterion in section 64536(a) or (b).

CHAPTER 16. CALIFORNIA WATERWORKS STANDARDS

Article 1. Definitions

§64551.10. Distribution Reservoir.
"Distribution reservoir" means any tank or other structure located within or connected to the distribution system and used to store treated/finished drinking water.

§64551.20. Distribution System.
"Distribution system" means all physical parts of the water system, including, but not limited to: Pipes, valves, pumping stations, storage tanks or reservoirs, and user service lines, that are located between the water treatment plant, or the source if there is no treatment, and the consumer's service connection.

§64551.30. Maximum Day Demand (MDD).
"Maximum day demand (MDD)" means the amount of water utilized by consumers during the highest day of use (midnight to midnight), excluding fire flow, as determined pursuant to Section 64554.

§64551.35. Peak Hour Demand (PHD).
"Peak hour demand (PHD)" means the amount of water utilized by consumers during the highest hour of use during the maximum day, excluding fire flow, as determined pursuant to Section 64554.

§64551.40. Source Capacity.
"Source capacity" means the total amount of water supply available, expressed as a flow, from all active sources permitted for use by the water system, including approved surface water, groundwater, and purchased water.

§64551.60. User Service Line.
"User service line" means the pipe, tubing, and fittings connecting a water main to an individual water meter or service connection.

§64551.70. Water Main.
"Water main" means any pipeline, except for user service lines, within the distribution system.

Article 1.5. Waivers and Alternatives

§64551.100. Waivers and Alternatives.

(a) A water system that proposes to use an alternative to a requirement in this chapter shall:

(1) Demonstrate to the Department that the proposed alternative would provide at least the same level of protection to public health; and

(2) Obtain written approval from the Department prior to implementation of the alternative.

Article 2. Permit Requirements

§64552. Initial Permit for Public Water System.

(a) Each public water system applying for an initial domestic public water system permit shall submit an application that includes:

(1) A map and description of the entire existing and proposed service area, showing:

(A) The location of each water source, as well as wells that are abandoned, out-of-service, destroyed, standby, or inactive (not physically connected to the water system), together with:

1. Any valid water rights owned by the system for surface water sources, including information on any limitations or restrictions of those rights;

2. For a groundwater aquifer, the groundwater levels and drawdown patterns;

3. Permits or approvals for groundwater extraction if pumping from an adjudicated groundwater basin;

4. Existing and planned source pumping capability and distribution storage capacity for the system as a whole and for each pressure zone;

5. The calculated sustained well yields of existing wells if groundwater sources are used;

6. Permits for any waters proposed for use to offset potable water demand; and

(B) Treatment facilities and pumping plants;

(C) Distribution system piping, pressure zones, hydropneumatic tanks, and reservoirs;

(D) Valves, sample taps, and other system appurtenances;

(E) Recycled water and sewage systems;

(F) Conveyance facilities;

(G) Any flood plains in the projected service area; and

(H) The 100 year flood or highest recorded flood level, whichever is higher.

(2) The population, and number and type of residential, commercial, agricultural, and industrial service connections, in the system's projected service area;

(3) Design drawings of proposed facilities drawn to scale, showing location, size, and construction material;

(4) As-built drawings of existing facilities, drawn to scale, showing location, size, construction materials, and year of installation of any water main or other facility that has already been constructed;

(5) The estimated MDD and PHD with the methods, assumptions, and calculations used for the estimations;

(6) A source water assessment and description of each source of water proposed for use to meet the estimated MDD and information demonstrating that the sources are adequate to do so, such as, but not limited to, well pump tests, the capacities of all pumping facilities, and the hydraulic capacity of surface water treatment facilities,

(A) If the system plans to use surface water, the system shall demonstrate that it holds a valid water right to that amount of water including any allowable reductions or limitations on its availability, as stated in the water rights contract;

(B) If groundwater is to be used, the system shall demonstrate that the groundwater aquifer is sufficient, or in the case of adjudicated groundwater basins, that approval has been obtained to allow that amount of sustained withdrawal including any allowable reductions or limitations on its availability, as stated in the water rights contract;

(C) If purchased water is to be used, the system shall provide contracted amount and the hydraulic capacity at each turnout and any allowable reductions or limitations on its availability, as stated in the purchased water contract; and

(7) Information that demonstrates how the system proposes to reliably meet four hours of PHD using, but not limited to, available source capacity and distribution reservoirs.

(b) The information in subsection (a) shall be prepared by a professional civil engineer registered in the State of California with experience in water supply engineering.

§64554. New and Existing Source Capacity.

(a) At all times, a public water system's water source(s) shall have the capacity to meet the system's maximum day demand (MDD). MDD shall be determined pursuant to subsection (b).

(1) For systems with 1,000 or more service connections, the system shall be able to meet four hours of peak hourly demand (PHD) with source capacity, storage capacity, and/or emergency source connections.

(2) For systems with less than 1,000 service connections, the system shall have storage capacity equal to or greater than MDD, unless the system can demonstrate that it has an additional source of supply or has an emergency source connection that can meet the MDD requirement.

(3) Both the MDD and PHD requirements shall be met in the system as a whole and in each individual pressure zone.

(b) A system shall estimate MDD and PHD for the water system as a whole (total source capacity and number of service connections) and for each pressure zone within the system (total water supply available from the water sources and interzonal transfers directly supplying the zone and number of service connections within the zone), as follows:

(1) If daily water usage data are available, identify the day with the highest usage during the past ten years to obtain MDD; determine the average hourly flow during MDD and multiply by a peaking factor of at least 1.5 to obtain the PHD.

(2) If no daily water usage data are available and monthly water usage data are available:

(A) Identify the month with the highest water usage (maximum month) during at least the most recent ten years of operation or, if the system has been operating for less than ten years, during its period of operation;

(B) To calculate average daily usage during maximum month, divide the total water usage during the maximum month by the number of days in that month; and

(C) To calculate the MDD, multiply the average daily usage by a peaking factor that is a minimum of 1.5; and

(D) To calculate the PHD, determine the average hourly flow during MDD and multiply by a peaking factor that is a minimum of 1.5.

(3) If only annual water usage data are available:

(A) Identify the year with the highest water usage during at least the most recent ten years of operation or, if the system has been operating for less than ten years, during its years of operation;

(B) To calculate the average daily use, divide the total annual water usage for the year with the highest use by 365 days; and

(C) To calculate the MDD, multiply the average daily usage by a peaking factor of 2.25.

(D) To calculate the PHD, determine the average hourly flow during MDD and multiply by a peaking factor that is a minimum of 1.5.

(4) If no water usage data are available, utilize records from a system that is similar in size, elevation, climate, demography, residential property size, and metering to determine the average water usage per service connection. From the average water usage per service connection, calculate the average daily demand and follow the steps in paragraph (3) to calculate the MDD and PHD.

(c) Community water systems using only groundwater shall have a minimum of two approved sources before being granted an initial permit. The system shall be capable of meeting MDD with the highest-capacity source off line.

(d) A public water system shall determine the total capacity of its groundwater sources by summing the capacity of its individual active sources. If a source is influenced by concurrent operation of another source, the total capacity shall be reduced to account for such influence. Where the capacity of a source varies seasonally, it shall be determined at the time of MDD.

Appendix B Meter Data, Stream flow Data, Master Meter Data, and Water Rights

This Appendix contains data for the system provided by the District.

Orleans CSD End User Meter Data for the year 2013

Meter Number	Jan-13	Feb-13	Mar-13	Apr-13	May-13	Jun-13	Jul-13	Aug-13	Aug-13	Sep-13	Oct-13	Nov-13	Dec-13
	Gal/month	Gal/month	Gal/month	Gal/month	Gal/month	Gal/month	Gal/month	Gal/month	Gal/month	Gal/month	Gal/month	Gal/month	Gal/month
2015	0	0	0	0	0	0	0	0	0	0	0	0	0
3624	0	0	0	0	0	0	0	0	0	0	0	0	0
3725	-	-	-	-	-	-	-	-	0	-	-	-	-
4211	-	-	-	-	-	-	-	-	0	-	-	-	-
9592	-	-	-	-	-	-	-	-	0	-	-	-	-
6550	-	-	-	10	-	-	-	-	0	-	-	-	-
5794	480	420	580	850	770	800	1,160	2,680	920	680	500	480	340
3493	-	-	-	-	1,020	340	-	4,510	0	-	10	-	-
1131	-	20	930	30	-	130	150	90	440	730	640	710	1,600
9630	1,580	1,050	1,270	1,800	1,720	2,780	1,940	2,450	1055	170	110	270	240
9666	-	-	-	3,000	-	-	-	-	0	-	-	-	-
6795	-	-	-	-	-	3,030	750	32,640	1950	3,150	-	-	-
9625	-	-	-	-	-	1,040	1,180	1,050	1125	1,070	1,090	840	3,790
6793	4,760	3,390	2,160	3,730	7,070	5,700	3,410	4,350	3545	3,680	4,750	3,520	6,570
3093	-	250	60	-	220	2	-	10	1615	3,230	280	-	5,330
3892	100	190	160	70	2,300	2,350	980	9,580	3505	6,030	320	250	1,560
3671	4,240	3,950	3,750	4,180	5,450	9,470	6,200	22,140	7570	8,940	4,310	3,320	4,480
794	2,070	1,530	2,260	2,070	7,030	8,300	4,360	15,230	4890	5,420	7,500	5,110	3,410
217	9,790	7,720	7,730	8,390	10,700	10,140	13,550	38,980	13465	13,380	7,080	6,510	8,740
9602	520	6,090	4,400	1,170	880	2,080	4,050	6,620	5945	7,840	920	900	1,500
2774	8,100	900	600	2,400	2,100	5,100	1,100	51,400	1200	1,300	1,800	1,700	900
3040	1,750	2,100	1,880	1,750	2,350	4,530	4,790	12,430	6715	8,640	1,820	1,580	810
4556	2,800	3,800	3,400	2,500	5,100	5,200	9,400	77,300	10050	10,700	3,200	3,200	3,900
3020/3491	-	-	-	-	-	-	-	-	0	-	670	7,590	8,850
5799	3,350	2,570	3,270	10,290	5,340	5,460	4,610	17,190	6325	8,040	3,940	1,420	2,870
4741	5,510	5,770	4,860	4,320	11,930	4,190	2,530	5,050	2995	3,460	3,300	3,110	4,890
9109	6,940	5,110	5,470	6,010	4,680	14,200	13,360	31,650	11190	9,020	7,530	6,760	12,870
6794	2,250	10,010	7,170	4,290	2,860	6,140	7,210	11,270	9625	12,040	2,860	4,470	3,680
7920	4,260	1,680	1,840	1,850	4,180	11,400	8,790	11,220	9205	9,620	1,140	890	2,500
757	780	5,770	8,630	12,190	5,210	7,530	5,110	8,890	6915	8,720	6,170	4,670	7,050
7914	10,730	10,480	13,550	14,000	7,150	10,340	9,230	7,820	6440	3,650	4,050	4,740	16,060
8221	7,770	5,980	6,590	9,060	17,490	18,280	13,160	35,090	13325	13,490	19,450	7,840	7,640
9691	3,860	2,980	3,310	3,030	9,690	11,390	14,610	17,600	13610	12,610	3,910	780	5,760
5766	6,600	5,000	5,000	5,900	5,200	13,700	12,100	24,300	15500	18,900	8,700	6,900	7,600
3623	5,800	6,000	3,370	5,160	10,250	18,460	11,040	22,310	12855	14,670	13,520	8,030	12,030
5802	140	110	1,440	1,730	5,860	15,380	13,690	21,870	14245	14,800	5,880	2,580	1,530
hy7590	-	-	-	-	-	-	-	50,000	0	-	1,400	15,400	8,000
9326	0	0	0	0	0	900	15,400	21,200	10500	5,600	4,900	3,800	5,900
4709	15,580	10,870	11,970	11,420	11,990	11,090	9,070	9,300	8870	8,670	11,500	9,620	24,210
9689	11,120	9,960	10,390	9,300	8,140	10,220	4,050	14,720	11945	19,840	12,200	6,050	7,830
5879	5,100	8,300	4,600	5,900	6,600	7,100	2,900	4,100	2950	3,000	1,900	1,500	17,300
6796	6,180	3,890	4,500	6,850	13,870	18,820	6,520	13,460	10925	15,330	3,510	3,010	4,350
9651	17,220	6,110	6,140	3,850	5,590	10,440	9,590	8,790	7565	5,540	4,690	1,400	6,310
679	3,050	7,210	4,620	1,882	13,988	13,080	17,200	45,010	16005	14,810	2,850	1,330	5,320
9692	1,190	950	440	1,330	600	3,470	14,590	6,730	15670	16,750	2,810	580	7,280
ce105	810	940	720	1,300	16,930	5,890	990	7,940	1260	1,530	1,090	9,600	20
5798	13,230	11,260	9,840	9,120	13,930	24,930	9,350	56,710	8620	7,890	7,940	9,380	17,580
9669	1,440	1,050	1,570	1,460	12,420	18,140	13,140	26,470	11840	10,540	1,750	1,360	2,570
7714	3,560	2,630	3,050	4,640	17,200	12,420	20,310	61,000	19360	18,410	9,120	9,790	14,330
266	200	-	200	100	2,100	1,900	600	8,400	8650	16,700	13,100	12,300	18,700
2327	7,820	5,070	6,810	6,160	20,190	15,300	7,730	21,310	8550	9,370	7,310	1,450	5,690
2329	60	3,080	4,170	3,860	1,250	100	10	64,010	9410	18,810	4,700	4,330	4,580
6952	3,500	2,220	2,910	2,770	8,930	18,830	21,230	18,460	12285	3,340	2,360	2,330	2,460
2328	4,280	4,470	6,390	4,870	6,500	21,060	19,100	120,110	13365	7,630	2,040	3,800	4,390
6418	2,610	1,690	2,640	3,650	9,560	20,770	14,430	36,250	15410	16,390	3,330	2,440	5,080
9613	1,540	1,700	1,260	2,600	2,320	3,240	1,010	3,380	10360	19,710	80	1,750	2,380
9426	21,300	18,000	14,300	17,800	1,400	7,100	2,800	14,400	3550	4,300	20,200	1,300	8,500
8223	4,350	4,010	4,570	5,620	12,000	22,580	15,930	35,740	14720	13,510	2,060	4,540	7,490
5363	11,850	8,960	9,630	14,090	19,550	16,460	29,920	30,130	24725	19,530	10,620	10,630	12,640
9696	2,310	1,410	2,840	3,220	5,210	22,050	8,900	15,160	7670	6,440	1,420	1,030	5,250
9632	1,640	1,440	2,570	2,460	1,190	21,300	12,150	26,700	16660	21,170	1,920	480	90
9605	28,800	10,040	12,350	14,230	17,100	19,600	16,360	31,980	18185	20,010	9,440	7,330	18,660
5362	450	460	420	420	580	9,270	18,690	73,610	20775	22,860	420	340	240
397	3,080	2,380	3,460	4,060	10,090	22,340	23,450	56,760	24365	25,280	2,660	3,340	3,840
9695	4,430	1,070	3,820	5,850	8,500	20,900	23,230	23,920	11810	390	610	210	780
9751	5,310	4,440	4,070	25,970	17,130	5,270	3,930	13,660	3370	2,810	1,920	1,900	13,070
5609	28,630	22,450	22,800	27,430	20,760	30,420	16,080	34,440	26245	36,410	40,790	22,680	33,290
9595	2,000	1,400	1,400	1,500	16,190	25,400	18,200	27,500	18000	17,800	1,600	600	2,000
9674	7,950	14,270	3,260	21,830	21,970	28,230	8,560	45,110	14720	20,880	7,780	5,370	7,110
1814	7,430	7,200	11,360	8,600	27,690	30,080	21,500	25,860	21620	21,740	10,940	5,040	16,160
1648	25,740	1,220	3,000	3,450	6,480	26,060	22,710	44,320	24220	25,730	2,070	990	3,640
797	5,970	6,020	8,170	4,980	14,340	23,460	31,050	69,050	25920	20,790	5,000	5,160	9,210
9107	1,000	1,200	700	300	7,000	26,500	-	87,300	2950	5,900	3,300	-	-
9664	6,510	3,570	3,470	4,470	600	2,730	28,020	-	14010	-	-	-	960
8219	2,580	6,070	3,380	15,920	8,920	7,650	28,420	31,070	14210	-	-	-	-
7271	340	2,500	5,810	3,590	29,530	18,820	1,224	40,370	8177	15,130	3,480	13,280	27,550
9657	-	-	-	-	30	25,020	29,300	90,630	25630	21,960	7,660	140	12,840

9653	200	13,630	1,300	30,740	630	270	1,110	1,050	915	720	1,360	3,200	9,350
3452	4,200	1,460	4,510	4,210	19,190	32,160	30,220	55,830	29625	29,030	6,030	2,690	4,450
7719	7,610	5,830	6,600	8,730	9,700	18,360	13,130	32,590	24970	36,810	10,130	9,800	13,460
6417	3,460	2,990	3,290	3,760	9,710	32,020	34,180	45,020	32555	30,930	30,030	5,510	3,290
9112	2,570	2,300	2,550	2,510	1,810	2,200	32,950	126,510	17790	2,630	1,700	2,250	2,360
3001	15,170	6,970	5,250	6,030	14,660	20,350	22,710	53,170	28955	35,200	5,680	3,650	12,040
8224	4,400	1,040	1,080	1,660	3,790	28,790	31,750	13,440	18405	5,060	60	1,500	1,690
59	31,080	28,870	37,040	40,870	31,830	38,460	39,280	103,390	45910	52,540	36,370	20,520	20,680
5360	5,980	6,410	7,140	5,490	10,370	36,060	4,770	29,310	5810	6,850	4,680	3,860	5,160
9004	5,670	4,730	6,150	12,270	32,890	37,700	21,320	58,130	21945	22,570	6,360	4,580	6,450
2330	9,370	2,750	1,940	3,820	4,370	35,430	9,020	35,490	10275	11,530	2,510	3,320	3,090
9679	33,730	4,690	190	3,030	810	210	2,010	2,980	2295	2,580	730	670	15,460
7869	6,840	5,230	6,440	5,990	16,120	38,840	21,210	48,960	28455	35,700	19,590	13,920	9,170
2324	6,340	4,860	900	1,080	2,250	31,140	35,750	84,240	34220	32,690	5,750	2,230	1,400
7873	3,170	1,410	740	570	460	670	36,040	59,080	34045	32,050	2,520	1,620	2,830
3901	4,600	3,840	4,960	6,560	22,470	39,900	24,580	52,280	19375	14,170	5,690	2,820	11,330
9648	6,300	3,650	6,320	8,310	23,730	39,600	36,700	52,230	20105.5	3,511	1,360	-	9,480
2325	4,150	3,220	3,490	4,840	20,780	44,360	31,170	63,690	37045	42,920	10,130	8,530	7,670
6187	28,160	26,240	32,820	47,820	6,600	19,060	14,890	29,610	19335	23,780	9,570	5,830	13,890
9672	30	20	20	30	33,920	39,530	15,360	30,530	29015	42,670	90	50	50
9646	18,310	15,250	14,380	90	5,610	40,600	28,110	50,540	36005	43,900	4,050	3,950	33,770
9754	8,560	3,690	3,390	3,040	7,770	35,750	48,350	67,580	38035	27,720	3,870	1,880	5,420
3583	2,300	2,130	2,100	3,830	6,300	9,870	41,550	99,900	44795	48,040	4,550	1,760	1,210
2333	970	1,090	820	850	1,790	48,410	34,960	33,060	32485	30,010	4,010	1,050	1,610
595	14,000	1,100	400	1,800	100	23,600	7,100	-	3600	100	600	-	47,600
4204	3,640	2,440	2,670	2,700	17,420	51,730	44,230	92,860	30170	16,110	2,490	1,630	5,390
hy9949	-	-	700	-	16,100	-	4,300	33,000	27350	50,400	42,700	4,500	-
7912	4,210	3,310	2,210	3,010	33,800	52,870	25,660	54,170	23320	20,980	2,890	1,990	6,610
9107	42,650	39,790	40,530	54,550	37,180	17,200	16,470	26,420	20060	23,650	3,400	4,030	7,140
5358	13,910	11,590	9,670	15,210	33,870	46,980	53,490	50,990	57175	60,860	20,940	11,790	13,580
573	3,120	8,420	3,920	5,400	7,390	49,040	51,220	39,670	26115	1,010	260	90	20
9629	43,790	38,810	50,690	62,610	18,790	10,510	17,620	29,080	16845	16,070	25,830	19,200	13,620
7794	3,570	3,410	4,580	6,130	29,220	55,800	51,390	75,550	46515	41,640	6,070	3,450	5,490
9601	12,700	20,700	9,200	16,000	6,800	23,900	26,500	68,100	41450	56,400	5,400	18,100	3,600
2331	1,740	1,750	1,810	2,000	4,320	4,300	55,890	80,840	33435	10,980	1,920	1,550	2,100
571	31,690	21,800	21,330	25,580	36,300	60,710	41,000	75,160	34295	27,590	4,320	4,510	11,140
3994/2353	20,230	8,280	9,280	35,770	45,850	63,600	50,110	192,880	47305	44,500	14,320	6,980	28,570
9929	-	100	40	730	5,730	18,220	14,850	69,750	36100	57,350	22,770	6,680	20
8202	10,720	7,450	8,140	8,940	27,240	38,990	40,510	56,560	51205	61,900	5,170	3,880	9,160
9589	44,900	15,200	11,300	12,300	30,900	70,400	49,700	72,000	47350	45,000	11,700	13,100	57,800
2626	610	3,460	-	-	9,290	28,840	60,720	132,880	52155	43,590	14,980	8,440	3,430
9682	-	-	-	-	1,270	60,120	61,780	104,950	46630	31,480	30	-	7,050
7791	16,300	5,870	10,880	8,770	24,520	71,420	68,490	87,550	56920	45,350	14,040	9,360	24,050
790	30,180	17,320	18,130	17,490	16,830	11,960	38,320	58,990	36170	34,020	77,750	74,750	30,690
2624	11,250	3,010	2,820	3,850	19,210	41,040	17,350	53,610	15220	13,090	11,900	40,320	71,820
4205	2,830	3,250	4,450	9,730	25,470	46,840	48,390	158,890	60145	71,900	39,170	37,420	12,130
4863	22,000	16,000	22,000	17,500	32,900	47,500	7,000	34,900	42050	77,100	10,400	8,000	38,100
3096	6,390	5,990	3,780	4,550	38,680	74,660	41,880	110,670	45985	50,090	10,770	7,820	48,300
5914	26,300	8,520	12,440	16,610	32,980	43,010	82,730	83,240	71530	60,330	24,620	21,820	38,280
7933	67,020	54,630	59,350	59,890	59,700	75,600	45,460	105,010	65500	85,540	82,720	60,420	119,770
2326	2,530	600	490	530	570	650	5,810	60,700	41975	78,140	410	530	490
8228	15,290	13,480	12,690	17,110	63,650	82,640	66,920	67,440	67140	67,360	13,150	3,610	10,150
566	13,740	17,080	14,930	28,260	66,250	84,630	37,310	168,890	56585	75,860	5,620	4,690	7,410
3676	24,930	11,830	12,780	15,230	19,010	94,110	66,720	84,570	64420	62,120	46,990	39,950	48,120
7268	44,990	23,900	39,870	33,910	61,160	86,490	66,260	77,360	41770	17,280	2,920	2,960	4,090
9635	100	570	240	610	83,730	9,450	51,330	15,470	25665	-	250	410	35,290
8222	7,860	5,090	6,260	6,560	34,420	95,240	61,610	165,180	56130	50,650	5,590	5,540	8,730
572	10,210	11,180	18,600	18,040	72,770	99,690	50,240	90,180	53835	57,430	44,770	8,620	15,580
1209	20,290	18,610	15,780	16,920	3,360	96,140	92,880	109,000	66960	41,040	17,760	10,740	14,970
9627	7,280	3,160	9,740	17,380	26,170	66,390	56,460	189,280	77165	97,870	7,040	16,580	3,710
8099	95,000	0	0	0	0	0	0	0	0	0	0	0	0
3218	4,230	2,100	1,940	9,390	59,240	57,830	97,100	83,250	76405	55,710	4,590	5,370	6,260
1200	76,390	71,420	28,230	43,520	31,630	106,920	71,690	104,510	87545	103,400	16,120	18,090	114,560
9614	-	350	230	1,080	94,140	100,010	105,310	160,400	82415	59,520	4,180	4,510	6,310
9660	7,060	4,660	8,540	19,790	47,130	111,210	109,610	212,370	103190	96,770	8,480	3,720	4,950
6951	32,030	8,380	6,740	8,160	8,810	45,190	37,230	102,000	76420	115,610	61,600	10,100	21,750
3144	13,180	12,340	8,560	3,770	4,700	44,140	59,760	101,070	62575	65,390	114,760	55,960	43,100
9699	6,020	1,720	270	1,440	3,150	2,370	2,220	3,440	2355	2,490	1,750	1,640	114,560
6792	19,000	37,300	31,240	33,000	11,490	128,940	102,730	102,530	96390	90,050	17,470	10,010	12,450
9637	42,290	25,290	4,030	9,430	39,960	119,630	127,380	179,100	113435	99,490	49,750	8,550	22,670
2353	16,480	9,070	18,600	35,660	84,020	131,760	117,160	134,990	91910	66,660	15,950	6,570	11,310
9997	7,180	3,070	4,580	28,930	31,970	93,390	91,160	213,300	112680	134,200	58,780	17,770	54,420
2332	890	730	940	1,060	640	560	220	202,110	74820	149,420	710	650	400
918	6,800	4,100	5,300	7,300	92,200	88,200	152,300	316,000	154500	156,700	4,100	3,100	4,600
595	20,800	12,900	16,600	28,100	112,900	168,300	170,600	353,000	163100	155,600	69,200	24,200	45,300
9642	41,430	50,640	48,320	42,730	123,610	168,450	135,520	262,710	168425	201,330	151,830	113,180	157,160
9477	7,200	12,800	16,800	9,800	49,900	114,000	134,400	257,300	152900	171,400	11,200	9,300	12,300
9617	-	-	-	40	4,450	49,880	67,990	268,050	121345	174,700	9,390	140	-
7272	117,320	126,720	65,780	78,240	104,580	249,320	120,460	118,800	106100	91,740	72,540	72,480	89,020
8220	5,960	5,100	4,990	5,920	15,770	31,070	220,620	29,450	123870	27,120	5,850	8,010	6,450
7269	145,190	119,870	113,960	139,420	177,840	252,040	179,050	4,070	91055	3,060	1,470	160	8,950

9995	78,400	273,140	4,370	2,480	4,590	44,750	6,230	11,060	13740	21,250	27,860	16,760	18,080
2693	6,100	-	200	1,100	29,700	42,600	329,300	186,400	209150	89,000	5,100	3,400	159,600
2014	271,170	188,350	193,880	206,580	289,150	438,090	365,920	939,640	473210	580,500	276,230	160,080	348,150
5616	303,600	302,800	682,800	157,500	231,700	427,500	345,300	720,800	403300	461,300	738,400	2,330,500	2,581,400
Totals by Month	***2,482,200***	***2,125,230***	***2,159,300***	***2,002,872***	***3,538,698***	***6,316,562***	***6,054,184***	***11,181,530***	6090732.5	***6,127,281***	***2,853,710***	***3,726,650***	***5,277,160***

Totals by Month	***Jan***	***Feb***	***Mar***	***Apr***	***May***	***Jun***	***Jul***	***Aug***	***Sep***	***Oct***	***Nov***	***Dec***
Gal/month	***2,482,200***	***2,125,230***	***2,159,300***	***2,002,872***	***3,538,698***	***6,316,562***	***6,054,184***	***11,181,530***	***6,127,281***	***2,853,710***	***3,726,650***	***5,277,160***
Adjusted	2,482,200	2,125,230	2,159,300	2,002,872	3,538,698	6,316,562	6,054,184	6,090,733	6,127,281	2,853,710	3,726,650	5,277,160
	331,845	284,122	288,676	267,764	473,088	844,460	809,383	814,269	819,155	381,512	498,215	705,503

11.9
4.1
7.8

Date: 06.12.14
Crew: GJ, CH, TL

Site: Upper Perch (P1)
Weather: Clear Cloudy Rain

Wetted Width = 7.8 **ft**

Number of Cells= 5   Wetted Width / # of cells = Cell Width = 1.56

Tagline Start = 4.1 **ft**

1st Velocity Point = Cell Width/2 = 0.78 **+ Tagline Start** 4.1 **=** 4.88

***After finding your **1st Velocity Point**, ADD **Cell Width** to find next velocity point

Tagline	Depth (ft)	Velocity (ft/sec)	Misc. / Comments	
4.1		0	Tagline Start (wetted edge)	
4.88	1.05	0.49	1st Velocity Point	.80
6.44	0.95	0.22		.33
8.00	0.85	0.47		.62
9.56	0.4	0.47		0.29
11.12	0.1	0		
11.9		0	tagline end	

total : 2.045

Date: 06.12.14
Crew: GJ, CH, TL

Site: Lower Perch (P2)
Weather: (Clear) Cloudy Rain

11.8
2.3
9.5

Wetted Width = 9.5 **ft**

Number of Cells= 5   Wetted Width / # of cells = Cell Width = 1.9

Tagline Start = 2.3 **ft**

1st Velocity Point = Cell Width/2 = 0.95 **+ Tagline Start** 2.3 = 3.25

***After finding your **1st Velocity Point**, ADD **Cell Width** to find next velocity point

Tagline	Depth (ft)	Velocity (ft/sec)	Misc. / Comments
2.3		0	**Tagline Start** (wetted edge)
3.25	0.53	0.55	**1st Velocity Point**
5.15	0.55	0.57	
7.05	0.28	0.97	
8.95	0.70	0.71	
10.85	0.49	0.01	
11.8		0	tagline end

total : 2.619

Perch Creek Streamflow Data

Measuring Site	***Date Surveyed***	***Flow (cfs)***
Second Weir down from Site 6	1/2/2014	2.2
Second Weir down from Site 6	9/26/2013	2.3

Measuring Site	***Date Surveyed***	***Flow (cfs)***
70' below CG#6 ck. access	9/30/2010	4.3
70' below CG#6 ck. access	9/15/2010	3.9
70' below CG#6 ck. access	8/31/2010	4.2
70' below CG#6 ck. access	8/19/2010	6
70' below CG#6 ck. access	8/5/2010	7.8
70' below CG#6 ck. access	9/25/2008	2.8

Measuring Site	***Date Surveyed***	***Flow (cfs)***
75 feet below Pearch Creek CG	9/18/2006	3.5
75 feet below Pearch Creek CG	10/11/2005	2.4

Measuring Site	***Date Surveyed***	***Flow (cfs)***
80' below CG#6 ck. access	9/21/2009	2.4
80' below CG#6 ck. access	9/20/2007	2.8

Measuring Site	***Date Surveyed***	***Flow (cfs)***
120' below campground	9/22/2004	2.3
120' below campground	9/25/2003	2.1

Measuring Site	***Date Surveyed***	***Flow (cfs)***
Trail down to pool at gate in Perch Creek CG	8/6/2012	4.1
Trail down to pool at gate in Perch Creek CG	6/14/2012	12
Trail down to pool at gate in Perch Creek CG	7/27/2011	6.9
Trail down to pool at gate in Perch Creek CG	7/1/2011	11.2
Trail down to pool at gate in Perch Creek CG	6/14/2011	16.5
Trail down to pool at gate in Perch Creek CG	8/24/2010	3.5
Trail down to pool at gate in Perch Creek CG	8/2/2010	7.2
Trail down to pool at gate in Perch Creek CG	7/13/2010	9.3
Trail down to pool at gate in Perch Creek CG	8/31/2009	1.9
Trail down to pool at gate in Perch Creek CG	7/31/2009	2.6
Trail down to pool at gate in Perch Creek CG	8/8/2007	5
Trail down to pool at gate in Perch Creek CG	9/5/2006	2.1
Trail down to pool at gate in Perch Creek CG	8/9/2006	3.4
Trail down to pool at gate in Perch Creek CG	7/10/2006	5.2
Trail down to pool at gate in Perch Creek CG	6/15/2006	11.9
Trail to pool at gate in P.C. Cmpgrnd	9/27/2005	1.5
Trail to pool at gate in P.C. Cmpgrnd	8/4/2005	4.4
Trail to pool at gate in P.C. Cmpgrnd	7/8/2005	11
Trail to pool at gate in P.C. Cmpgrnd	6/13/2005	17.8
Trail to pool at gate in P.C. Cmpgrnd	8/30/2004	2.7

Trail to pool at gate in P.C. Cmpgrnd	8/2/2004	2.9
Trail to pool at gate in P.C. Cmpgrnd	6/10/2004	5.3
Trail to pool at gate in P.C. Cmpgrnd	9/24/2003	2
Trail to pool at gate in P.C. Cmpgrnd	9/5/2002	1
Trail to pool at gate in P.C. Cmpgrnd	7/31/2002	5.2

Measuring Site	***Year***	***Average Flow (cfs)***
Trail to pool at gate in P.C. Cmpgrnd	2012	8.1
Trail to pool at gate in P.C. Cmpgrnd	2011	11.5
Trail to pool at gate in P.C. Cmpgrnd	2010	6.7
Trail to pool at gate in P.C. Cmpgrnd	2009	2.3
Trail to pool at gate in P.C. Cmpgrnd	2007	5.0
Trail to pool at gate in P.C. Cmpgrnd	2006	5.7
Trail to pool at gate in P.C. Cmpgrnd	2005	8.7
Trail to pool at gate in P.C. Cmpgrnd	2004	3.6
Trail to pool at gate in P.C. Cmpgrnd	2003	2.0
Trail to pool at gate in P.C. Cmpgrnd	2002	3.1

Measuring Site	***Month***	***Average Flow (cfs)***
Trail to pool at gate in P.C. Cmpgrnd	June	12.7
Trail to pool at gate in P.C. Cmpgrnd	July	7.3
Trail to pool at gate in P.C. Cmpgrnd	August	3.9
Trail to pool at gate in P.C. Cmpgrnd	September	1.9

SMALL WATER SYSTEM TREATMENT RECORDS
ORLEANS COMMUNITY SERVICES DISTRICT SYSTEM NO. 1200729

Month/Year: 12/13

Operator: Jim Trask

Date	Time	Meter Reading (gallons)	Water Treated (gallons)	Turbidities: Raw (NTU)	Turbidities: Filtered (NTU)	Polymer Feed: Dosage (ppm)	Polymer Feed: Tank Vol. (gal)	Polymer Feed: Solution Used (gal)	Chlorination: Dosage (ppm)	Chlorination: Tank Vol. (gal)	Chlorination: Solution Used (gal)	Chlorination: *Residual entering distribution (ppm)	Remarks (note backwashes, pump settings, solution added, maintenance, etc.)
1	945	835833	130900										
2	11:43	837378	154500										
3	300	836991	61300										
4	9:00	840131	314000										
5	3:00P	842175	204400	snow									
6	430P	844035	186000										
7	730P	846070	203500										
8	300P	847931	186100										
9	900	849684	175300										
10	10:00	852476	279200										
11	400P	856340	386500										
12	3:00P	859874	353500										
13	1030	861735	186000										
14	6:00P	864711	297600										
15	5:30P	866557	184600										
16	2:00P	867490	93300										
17	1130	868373	88300										
18	400P	869467	109400										
19	330P	870490	102300										
20	1200P	871360	87000										
21	4:00P	872499	113900										
22	10:00P	873605	110600										
23	200P	874444	83900										
24	8:00	875130	68600										
25	8:00P	876200	107000										
26	130P	876650	45000										
27	130P	877820	117000										
28	200P	879000	118000										
29	730P	881181	218100										
30	730P	882477	129600										
31	1130	884078	160100										

* Chlorine residual entering distribution system must be greater than or equal to 0.2 ppm.

Polymer Solution Strength = ________ Name of polymer used: ________ Chlorine Solution Strength = ________ See back for other special monitoring...

16- check Tanks and filters; Tanks full; Test water

17- Check filters + Tanks; tanks full test water

18- Check Tanks + filters Tanks full test water

19- Check Tanks + filters; Tanks full; test water; Ready for line when Trib digging

20- check filters + tanks tanks full test water

21- checked filters & TANKS ~~[illegible]~~ TANKS full, Tested water

22- checked filters & TANKS, TANKS full, tested water

23- check Tanks + filters; tanks full test water Read meters
christmas eve

24- Check Tanks + filters; Tanks full test water

christmas
25- check tanks + filters tanks full test water

26- check Tanks + filters Tanks full test water Read meters

27- check Tanks + filter tanks full test water Read meters

sat
28- Check Tanks + filters Tanks full test water

sun
29- check tanks + filters tanks full. test water

Read meters
30- check tanks + filters tanks full test water

New Year eve
31- check tanks + filter tanks full test water

Filter - Tubidities

1				
2				
3				

SMALL WATER SYSTEM TREATMENT RECORDS
ORLEANS COMMUNITY SERVICES DISTRICT SYSTEM NO. 1200729

Month/Year: Dec/13

Operator: ____________

Date	Time	Meter Reading (gallons)	Water Treated (gallons)	Turbidities Raw (NTU)	Turbidities Filtered (NTU)	Polymer Feed Dosage (ppm)	Polymer Feed Tank Vol. (gal)	Polymer Feed Solution Used (gal)	Chlorination Dosage (ppm)	Chlorination Tank Vol. (gal)	Chlorination Solution Used (gal)	*Residual entering distribution (ppm)	Remarks (note backwashes, pump settings, solution added, maintenance, etc.)
1		754229	544200	.21	.16	.01	24	∅	.5	21	3	.1	
2		760034	580500	.19	.15	.01	24	∅	.2	14/50	4	.3	overflow
3	3:00P	764157	412300	.27	.15	.01	24	∅	.2	47	3	.2 70/70	overflow
4	900	766875	266800	.20	.13	.01	24	∅	.2	46	1	.2	overflow
5	3:00P	769025	270000	.18	.13	.01	24	∅	.6	38	3	.5	
6	430	771075	265000	.20	.17	.01	24	∅	.5	34	4	.4 50/50	~~Snow~~ Cold
7	430	773275	220000	.21	.10	.01	24	∅	.3	32	2	.2	Snow
8	3:00	775337	206200	.20	.09	.01	24	∅	.4	27	5	.3 70/70	Cold
9	900	777232	189500	.19	.10	.01	24	∅	.4	23	4	.3	Cold
10	10:00	780235	300300	.20	.12	.01	24	∅	.5	16	7	.3	Cold
11	4:00P	784310	407500	.21	.12	.01	24	∅	.4	8/50	8	.3	cold freezing
12	3:00	787985	367500	.20	.13	.01	24	∅	.4	47	3	.3 50/50	12gl Cl2 + 5ml Poly + 38gl H2O
13	10:30	790025	204000	.18	.12	.01	24	∅	.5	44	3	.3	
14	12:00P	793257	323200	.80	.17	.01	24	∅	.3	40	4	.2	
15	5:30P	795269	201100	.79	.14	.01	24	∅	.4	38	2	.3	
16	2:00	796411	114300	.53	.13	.01	24	∅	.3	37	1	.2 60/60	
17	1130	797545	113400	.20	.11	.01	24	∅	.3	35	2	.2	
18	400P	801010	346500	.18	.15	.01	24	∅	.2	34	1	.2 70/70	Power out - overflow
19	330P	802240	123000	.16	.13	.01	24	∅	.3	31	3	.2	
20	12:00P	803295	105500	.15	.13	.01	24	∅	.4	29	2	.2	
21	9:00P	804667	137200	.20	.11	.01	24	∅	.3	26	3	.2	
22	6:00P	806000	133300	.25	.12	.01	24	∅	.3	22	4	.2	
23	1:00P	807035	103500	.22	.13	.01	24	∅	.3	20	2	.2	
24	8:00	807850	81500	.16	.13	.01	24	∅	.3	18	2	.2	
25	8:00P	809300	145000	.16	.11	.01	24	∅	.2	15	3	.2 90/90	
26	130P	809960	66000	.17	.13	.01	24	∅	.3	13	2	.2	
27	2:30	811320	136000	.17	.13	.01	24	∅	.3	9	4	.2	
28	2:00A	812709	138400	.17	.12	.01	24	∅	.4	5/50	4	.2	12gl Cl2 + 5ml Poly + 33gl H2O
29	730P	815080	237600	.20	.13	.01	24	∅	.3	47	3	.2	
30	130P	816467	138700	.17	.11	.01	24	∅	.4	45	2	.2	
31	1130	818175	170800	.15	.10	.01	24	∅	.4	43	2	.3	

* Chlorine residual entering distribution system must be greater than or equal to 0.2 ppm.

Polymer Solution Strength = ________ Name of polymer used: ____________ Chlorine Solution Strength = ________ See back for other special monitoring...

(12) Backwash #1 (16) Backwash #2 (17) Backwash #3

SMALL WATER SYSTEM TREATMENT RECORDS
ORLEANS COMMUNITY SERVICES DISTRICT SYSTEM NO. 1200729

Month/Year: NOV 13

Operator: Jim Trask

Date	Time	Meter Reading (gallons)	Water Treated (gallons)	Turbidities Raw (NTU)	Turbidities Filtered (NTU)	Polymer Feed Dosage (ppm)	Polymer Feed Tank Vol. (gal)	Polymer Feed Solution Used (gal)	Chlorination Dosage (ppm)	Chlorination Tank Vol. (gal)	Chlorination Solution Used (gal)	*Residual entering distribution (ppm)	Remarks (note backwashes, pump settings, solution added, maintenance, etc.)
		791860											
1	2:20P	793111	125100										
2	3:00p	795029	191700										
3	3:00p	796166	113800										
4	130p	797617	145100										
5	1130	798970	135300										
6	800	800185	121500										
7	330P	802140	195500										
8	130P	803455	131500										
9	5:30p	805176	172100										
10	12:30p	806283	110700										
11	900	807530	124700										
12	400P	809435	190500										
13	400P	810830	139500										
14	400P	812260	143000										
15	700 A	813105	84500										
16	6:20P	815216	211100										
17	6:30p	816597	139100										
18	730P	817680	108300										
19	400P	819363	166300										
20	700P	820843	148000										
21	8:00	822072	122900										
22	6:30Pm	823708	163600										
23	10:30P	825302	167400										[illegible]
24	5:00P	826456	107400										
25	5:30Pm	827899	144300										
26	2:30Pm	829114	121500										[illegible]
27	10:15Pm	830258	114400										[illegible]
28	12:15Pm	831811	155300										[illegible]
29	10:45Am	833135	132400										[illegible]
30	11:00Am	834524	138900										[illegible]
DEC 1	9:45Am	835833	130900										[illegible]
DEC 2	11:45Am	837378	154500										

* Chlorine residual entering distribution system must be greater than or equal to 0.2 ppm.

Polymer Solution Strength = ________ Name of polymer used: ________ Chlorine Solution Strength = ________

See back for other special monitoring...

16- checked filters & TANKS, TANKS full, Tested water

17- checked filters & TANKS TANKS full Tested water

18- check filters + Tanks Tanks full test water

KZO meetings

19- check filters + tanks tanks full test water

20- check filters + tanks tanks full test water

21-

22- Ch. FILTERS & TANKS = OK - Tanks Full - TEST WATER - Ch. FERRIS Rch. Rd. Pumphouse = OK

23- checked filters & TANKS, TANKS full, Tested water

24- checked filters & TANKS TANKS full Tested water

25- ch. FILTERS & TANKS = OK - Tanks Full - Tested WATER - Ch. FERRIS Rch. Rd. Pumphouse = OK

26- ch. FILTERS & TANKS = OK - Tanks Full - Tested WATER - Ch. FERRIS Rch. Rd. Pumphouse = OK CHARGE INVERTER BATTERIES

27- ch. FILTERS & TANKS = OK - Tanks Full - Tested WATER - Ch. FERRIS Rch. Rd. Pumphouse = OK

28- Ch. FILTERS & TANKS = OK - Tanks Full - Tested Water - Ch. FERRIS Rch. Rd. Pumphouse = OK

29- Ch. FILTERS & TANKS = OK - TANKS Full - Test WATER = OK - Ch. FERRIS Rch. Rd. Pumphouse = OK

30- ch. FILTERS & TANKS = OK - TANKS Full - Test WATER = OK - Ch. FERRIS Rch. Rd. Pumphouse = OK CHARGE INVERTER BATTS

DEC. 1- ch. FILTERS & TANKS = OK - Tanks Full - Test water = OK - Ch. FERRIS Rch. Rd. Pumphouse = OK

DEC. 2 ch. FILTERS & TANKS = OK - TANKS Full - TEST WATER = OK -

Filter · Tubidities

1				
2				
3				

SMALL WATER SYSTEM TREATMENT RECORDS
ORLEANS COMMUNITY SERVICES DISTRICT SYSTEM NO. 1200729

Month/Year: NOV 13

Operator: Jim Trask

Date	Time	Meter Reading (gallons)	Water Treated (gallons)	Turbidities Raw (NTU)	Turbidities Filtered (NTU)	Polymer Feed Dosage (ppm)	Polymer Feed Tank Vol. (gal)	Polymer Feed Solution Used (gal)	Chlorination Dosage (ppm)	Chlorination Tank Vol. (gal)	Chlorination Solution Used (gal)	*Residual entering distribution (ppm)	Remarks (note backwashes, pump settings, solution added, maintenance, etc.)
		664800								17			
1	3:00P	666200	140000	.19	.12	.01	24	∅	.2	13/50	4	.2 60/60	12gal Cl2 + 5m/L + 24gal H2O
2	9:00P	668329	212900	.12	.11	.01	24	∅	.4	47	3	.3	
3	3:00P	669594	126500	.15	.12	.01	24	∅	.4	45	2	.3	
4	130P	671220	163600	.16	.10	.01	24	∅	.4	42	2	.3	
5	1130	672750	153000	.23	.12	.01	24	∅	.4	40	2	.3	
6	8:00	674095	134500	.18	.10	.01	24	∅	.4	38	2	.3 50/50	
7	330P	676275	218000	.34	.11	.01	24	∅	.3	36	2	.3 60/60	
8	130P	677756	148100	.20	.13	.01	24	∅	.3	34	2	.3	
9	5:20P	679652	189600	.14	.12	.01	24	∅	.2	32	2	.2	
10	12:30P	680951	129900	.14	.15	.01	24	∅	.2	30	2	.2	
11	9:00	682350	139900	.20	.11	.01	24	∅	.2	28	2	.2 70/70	
12	4:00P	684500	215000	.28	.17	.01	24	∅	.3	20	8	.2	
13	4:00P	686065	156500	.87	.18	.01	24	∅	.3	19	1	.2	
14	4:00P	687735	167000	.86	.17	.01	24	∅	.3	17/50	2	.2	
15	700	688725	99000	.21	.11	.01	24	∅	.5	48	2	.3 50/50	12gal Cl2 + [illegible] + 29gal H2O
16	6:30P	691010	237300	.13	.14	.01	24	∅	.3	45	3	.2	
17	6:30P	692641	164300	.16	.10	.01	24	∅	.3	43	2	.2	
18	130P	693877	123600	.25	.12	.01	24	∅	.3	41	2	.2	
19	4:00P	695723	183100	.23	.13	.01	24	∅	.2	40	1	.2	
20	7:00	697420	169200	.20	.16	.01	24	∅	.1	38	2	.2 70/70	
21	3:00P	698865	144500	.21	.17	.01	24	∅	.3	35/50	3	.2	4gal Cl2 + 10gal H2O
22	6:30Pm	705255	639000	.24	.18	.01	24	∅	.2	48	2	.1	SET LMI Pump @ 55/55
23	10:30	711629	637400	.80	.20	.01	24	∅	.3	45	3	.2	
24	5:00P	715605	397600	.19	.14	.01	24	∅	.1	40	5	.1	
25	5:30Pm	721604	599900	.19	.17	.01	24	∅	.2	38	2	.1	SET LMI Pump @ 80/80
26	2:30Pm	726662	505800	.18	.17	.01	24	∅	.2	37	1	.1	change inverter batteries
27	10:15Am	731382	472000	.18	.16	.01	24	∅	.0	37	∅	.4	Hand chlor tank - change inverter
737625 28	12:15Pm	[illegible]	[illegible]	.19	.17	.01	24	∅	.4	32	5	.2	∅ [illegible] gal used 624300
29	10:45Am	742971	597200	.18	.18	.01	24	∅	.3	26	6	.1	SET LMI Pump @ 65/65
30	11:00Am	748787	581000	.16	.14	.01	24	∅	.3	21	5	.1	Change inverter Batteries
Dec 1 [illegible]	9:45AM	754229	544200	.21	.16	.01	24	∅	.5	14	7	.3	∅
DEC: 2	11:45Am	[illegible] 760034	586550	.19	.15	.01	24	∅	.2	10	4	.1	

*Chlorine residual entering distribution system must be greater than or equal to 0.2 ppm.

Polymer Solution Strength = .01   Name of polymer used: Praestol 186K   Chlorine Solution Strength = 12.5%   See back for other special monitoring... BATTS.

(13) Backwash #1
(26) Hand chlor. Tank 1/3 gal Cl2 charge inverter Batteries   SET LMI Cl2 pump @ 60/60
(30) Hand chlor. Tank & charge invert.
(25) Hand chlor. Tank 1/3 gal Cl2
(27) Hand chlor. Tank 1/3 gal Cl2 (2x) inverter on Line

SMALL WATER SYSTEM TREATMENT RECORDS
ORLEANS COMMUNITY SERVICES DISTRICT **SYSTEM NO. 1200729**

Month/Year: 10/13

Operator: Jim Trask

Date	Time	Meter Reading (gallons)	Water Treated (gallons)	Turbidities: Raw (NTU)	Turbidities: Filtered (NTU)	Polymer Feed: Dosage (ppm)	Polymer Feed: Tank Vol. (gal)	Polymer Feed: Solution Used (gal)	Chlorination: Dosage (ppm)	Chlorination: Tank Vol. (gal)	Chlorination: Solution Used (gal)	Chlorination: *Residual entering distribution (ppm)	Remarks (note backwashes, pump settings, solution added, maintenance, etc.)
		756444											
1	1:00P	757081	63700										
2	830A	757590	50900										
3	330P	758520	94500										
4	12:00	759070	55060										
5	2:30	760161	109100										
6	3:30	761152	99100										
7	1:00P	761968	81600										
8	11:00	762742	77400										
9	12:00P	763685	94300										
10	9:00	764196	51100										
11	11:00	765000	80400										
12	7:30P	766109	110900										
13	400P	766740	63100										
14	1200P	767305	56500										
15	200P	768230	92500										
16	130P	768973	74300										
17	430P	769922	94900										
18	11:00A	770853	93100										
19	10:00	773123	227000										
20	7:30P	774512	138900										
21	930	775415	90300										
22	130P	777388	187300										
23	230P	778940	185200										
24	830P	781135	219500										
25	3:00	782255	112000										
26	8:30P	784249	199200										
27	3:30P	785527	127900										
28	4:00P	787220	169300										
29	4:00P	788695	147500										
30	200P	790175	148000										
31	500P	791860	164100										

* Chlorine residual entering distribution system must be greater than or equal to 0.2 ppm.

Polymer Solution Strength = ______ Name of polymer used: ______ Chlorine Solution Strength = ______ See back for other special monitoring...

16-	Check filters + Tanks Tanks full Test water worked on intake
17-	check filters + tanks Tanks full Test water Repair Leak At meter
18-	Check filters + Tanks Tanks full test water
19-	checked filters & Tanks Tanks full Tested water
20-	Checked filters & Tanks, Tanks full Tested Water
21-	check Tanks + filters; Tanks full Test water Dentist App.
22-	check Tanks + filters; Tanks full Test water Read meters
23-	check Tanks + filters; Tanks full Test water Read meters work on intake
24-	check Tanks + filters Tanks full Test water
25-	check Tanks + filters Tanks full Test water Read meters clean intake - work on intake
26-	Checked Tanks filters, Tanks full, Tested Water
27-	Checked Tanks & filters, Tanks full, Tested Water Read meters
28-	check Tanks + filters Tanks full Test water Picked up compressor
29-	Turned off sys to work on intake - water worked a little - check Tanks + filters Tanks full to ½ - Test water
30-	check Tanks + filters; Tanks full test water work on intake
31-	check Tanks + filters Tanks full Test water Returned Compressor worked on intake

Filter - Tubidities

1				
2				
3				

SMALL WATER SYSTEM TREATMENT RECORDS
ORLEANS COMMUNITY SERVICES DISTRICT SYSTEM NO. 1200729

Month/Year: Oct 13

Operator: James Trask

Date	Time	Meter Reading (gallons)	Water Treated (gallons)	Turbidities: Raw (NTU)	Turbidities: Filtered (NTU)	Polymer Feed: Dosage (ppm)	Polymer Feed: Tank Vol. (gal)	Polymer Feed: Solution Used (gal)	Chlorination: Dosage (ppm)	Chlorination: Tank Vol. (gal)	Chlorination: Solution Used (gal)	Chlorination: *Residual entering distribution (ppm)	Remarks (note backwashes, pump settings, solution added, maintenance, etc.)
		620030								37			
1	1:00P	620875	84500	.82	.19	.01	24	Ø	.3	33	4	.2 90/90	
2	8:30	621615	74000	.28	.18	.01	24	Ø	.2	30	3	.2	
3	3:20	622877	126200	.19	.13	.01	24	Ø	.3	24	6	.2	
4	12:00	623675	74800	.24	.12	.01	24	Ø	.2	20/24	4	.2 90/90	4gl Cl2
5	7:30	627299	377400	.21	.13	.01	24	Ø	.0	23	1	.1	
6	3:30	628539	118500	.25	.15	.02	24	Ø	.3	18	5	.2	
7	1:00P	629570	98600	.23	.18	.01	24	Ø	.3	15	3	.2	
8	11:00	630630	106000	.18	.19	.01	24	Ø	.4	12/50	3	.2 60/60	12gl Cl2 + 5n/l poly + 26gl H2O
9	12:00P	631855	122300	.18	.12	.01	24	Ø	.3	47	3	.2	
10	9:00	632570	71500	.20	.12	.01	24	Ø	.4	46	1	.2	
11	11:00	633645	107500	.19	.12	.01	24	Ø	.3				
12	7:30P	634797	115200	.25	.17	.01	24	Ø	.3	483	[illegible]	.2	
13	9:00	635797	99500	.23	.15	.01	24	Ø	.3	42	1	.2	
14	12:00P	636700	91300	.18	.15	.01	24	Ø	.3	40	2	.2	
15	2:00P	637935	123500	.27	.13	.01	24	Ø	.3	38	2	.2	
16	1:30P	638970	103300	.18	.11	.01	24	Ø	.3	38	2	.2 80/80	
17	4:30P	640270	130000	.22	.12	.01	24	Ø	.3	33	3	.2	
18	11:00	641365	109500	.18	.11	.01	24	Ø	.3	31	2	.2	
19	10:00P	643882	251700	.16	.15	.01	24	Ø	.2	24	2	.2	
20	7:30P	645422	154000	.17	.16	.01	24	Ø	.2	20	4	.2	
21	9:30	646450	102800	.16	.12	.01	24	Ø	.2	17	3	.2 ~~90/90~~	~~4gl Cl2~~ 90/90
22	1:30P	648555	210500	.17	.13	.01	24	Ø	.3	11/50	6	.2	12gl Cl2 + 5n/l poly + 27gl H2O
23	2:30P	650450	189500	.20	.13	.01	24	Ø	.8	46	40	.3 50/50	
24	3:30P	652770	232000	.18	.12	.01	24	Ø	.4	40	6	.2	
25	2:00	654060	129000	.19	.13	.01	24	Ø	.3	37	3	.2 70/70	
26	9:30P	656964	220400	.14	.14	.01	24	Ø	.3	34	3	.2	
27	3:30P	657712	144800	.19	.13	.01	24	Ø	.3	30	6	.2	
28	4:00P	659620	190800	.20	.13	.01	24	Ø	.3	26	4	.2	
29	4:00P	661265	164500	.18	.12	.01	24	Ø	.2	23	3	.2	
30	3:00	662930	166500	.18	.12	.01	24	Ø	.3	20	3	.2	
31	5:00P	664860	187000	.19	.13	.01	24	Ø	.3	17	3	.2	

* Chlorine residual entering distribution system must be greater than or equal to 0.2 ppm.

Polymer Solution Strength = .01 Name of polymer used: Praestol 1861s Chlorine Solution Strength = 12.5% See back for other special monitoring...

SMALL WATER SYSTEM TREATMENT RECORDS

ORLEANS COMMUNITY SERVICES DISTRICT SYSTEM NO. 1200729

Month/Year: Sept 2013

Operator: James Trask

Date	Time	Meter Reading (gallons)	Water Treated (gallons)	Turbidities: Raw (NTU)	Turbidities: Filtered (NTU)	Polymer Feed: Dosage (ppm)	Polymer Feed: Tank Vol. (gal)	Polymer Feed: Solution Used (gal)	Chlorination: Dosage (ppm)	Chlorination: Tank Vol. (gal)	Chlorination: Solution Used (gal)	Chlorination: *Residual entering distribution (ppm)	Remarks (note backwashes, pump settings, solution added, maintenance, etc.)
1	200	706076	127800										
2	830P	709405	332900										
3	130P	711010	160500										
4	615	712330	132000										
5	12:00P	715121	279100										
6	1230P	717361	224000										
7	10:00p	720730	336900										
8	9:00	723172	244200										
9	1230	724600	192800										
10	1200P	727350	275000										
11	130P	730505	315500										
12	230P	733205	270000										
13	1200P	735510	230500										
14	9:00p	739664	315400										
15	2:00p	740058	137400										
16	230P	741712	168400										
17	300P	743610	189800										
18	11:00A	744940	133000										
19	12:00P	746738	179800										
20	1:00P	748593	185500										
21	9:00p	749934	134100										
22	9:00p	750753	81900										
23	300P	751320	56700										
24	4:00P	752057	73700										
25	330P	752725	66800										
26	130P	753393	66800										
27	1230P	754030	63700										
28	800p	754980	95000										
29	9:00p	755902	92200										
30	230P	756444	54200										
31													

* Chlorine residual entering distribution system must be greater than or equal to 0.2 ppm.

Polymer Solution Strength = ________ Name of polymer used: ____________ Chlorine Solution Strength = ________ See back for other special monitoring...

month/yr = Sept 2013 OCSD Operator = Jim Trask

Date-Time	Activity
1	checked filters & TANKS, TANKS FULL tested water chked Intake Sunny
2	Check Tanks + filters Tanks full test water Labor day
3	Check Tanks + filters Tanks full test water
4	Check Tanks + filters Tanks full test water
5	Check Tanks + filters; tanks full test water
6	Check Tanks + filter; Tanks full Check water
7 sat	checked Tanks & Filters; Tanks are full, tested water good
8 Sun	checked TANKS & Filters; TANKS FULL, tested water good Sunny
9	Check Tanks + filters; tanks full; test water Clean path to intake pipe
10	Check Tanks + filters; tanks full; test water Took end out of water
11	Check filters + tanks, Tanks full; test water Test intake w/o extra water
12	Check filter + tanks; Tanks full; test water weed eat by tank
13	Check filters + tanks; tanks full; test water
14	checked filters & tanks, TANKS full; Tested water
15	checked filters & Tanks Tanks full; Tested water

Filter · Turbidities

1				
2				
3				

SMALL WATER SYSTEM TREATMENT RECORDS

ORLEANS COMMUNITY SERVICES DISTRICT SYSTEM NO. 1200729

Month/Year: Sept -2013 Operator: James Trask

Date	Time	Meter Reading (gallons)	Water Treated (gallons)	Turbidities: Raw (NTU)	Turbidities: Filtered (NTU)	Polymer Feed: Dosage (ppm)	Polymer Feed: Tank Vol. (gal)	Polymer Feed: Solution Used (gal)	Chlorination: Dosage (ppm)	Chlorination: Tank Vol. (gal)	Chlorination: Solution Used (gal)	Chlorination: *Residual entering distribution (ppm)	Remarks (note backwashes, pump settings, solution added, maintenance, etc.)
1	2:00	564421	134800	.15	.14	.01	24	Ø	.2	34	3	.2	
2	830P	567900	347900	.16	.12	.01	24	Ø	.2	29	5	.2 80/80	
3	130P	569615	171300	.20	.18	.01	24	Ø	.2	24	5	.2	
4	8:15	570680	106550	.18	.14	.01	24	Ø	.2	20/50	4	.2 50/50	10 gal Cl2 + 20 gal H2O
5	1200P	574015	333500	.19	.13	.01	24	Ø	.3	47	3	.2	
6	1230P	576390	237500	.20	.14	.01	24	Ø	.2	45	2	.2 70/70	
7	10:00	579957	356700	.17	.13	.01	24	Ø	.3	37	8	.2	
8	9:00	582522	256500	.19	.14	.01	24	Ø	.3	32	5	.2	
9	1230A	584010	148800	.25	.12	.01	24	Ø	.3	29	3	.2	
10	1200	586740	273000	.23	.13	.01	24	Ø	.2	23	6	.2 80/80	
11	1:30	590180	344000	.42	.16	.01	24	Ø	.4	14	9	.2	
12	7:30P	593075	289500	.37	.25	.01	24	Ø	.3	8	6	.2	
13	1200	595575	250000	.20	.14	.01	24	Ø	.3	3/50	5	.2 60/60	12 gal Cl2 + 5 m/c Poly + 35 gal H2O
14	9:00P	598947	337200	.15	.14	.01	24	Ø	.3	45	5	.2	
15	2:30P	600837	189000	.21	.16	.01	24	Ø	.3	43	2	.2	
16	2:30P	602250	181300	.19	.15	.01	24	Ø	.3	40	3	.2	
17	300P	604300	205000	.48	.12	.01	24	Ø	.2	36	4	.2 70/70	
18	11:00A	605720	142000	.18	.17	.01	24	Ø	.2	33	3	.2 90/90	
19	1200P	657725	200500	.20	.13	.01	24	Ø	.2	23	8	.2 70/70	
20	100P	609950	242500	.19	.13	.01	24	Ø	.3	18/50	8		
21	9:00P	611427	157700	.15	.19	.01	24	Ø	.1	16	4	.1	
22	9:00	612488	106100	.13	.15	.01	24	Ø	.1	14	2	.1	
23	3:00P	613225	73700	.19	.16	.01	24	Ø	.2	12/50	2	.2	12 gal Cl2 + 5 m/c Poly + 35 gal H2O
24	4:00P	614215	99000	.21	.15	.01	24	Ø	.3	49	2	.2	
25	330P	615151	93600	.17	.15	.01	24	Ø	.3	47	1	.2	
26	130P	616062	91100	1.38	.16	.01	24	Ø	.4	46	1	.2	
27	1230P	616955	89300	.20	.12	.01	24	Ø	.3	45	1	.2	
28	8:00	618190	124300	.16	.12	.01	24	Ø	.3	42	3	.2	
29	9:00	619324	113400	.24	.22	.01	24	Ø	.2	39	3	.2	
30	330P	620030		.54	.19	.01	24	Ø	.2	38	2	.2 90/90	
31													

* Chlorine residual entering distribution system must be greater than or equal to 0.2 ppm.

Polymer Solution Strength = .01 Name of polymer used: Praestol 186K Chlorine Solution Strength = 12.5% See back for other special monitoring...

(9) Back wash #1 (10) Back wash #2 (11) Back wash #3

Month/Year: August 2013

SMALL WATER SYSTEM TREATMENT RECORDS
ORLEANS COMMUNITY SERVICES DISTRICT SYSTEM NO. 1200729

Operator: JAMES TRASK

Date	Time	Meter Reading (gallons)	Water Treated (gallons)	Turbidities: Raw (NTU)	Filtered (NTU)	Polymer Feed: Dosage (ppm)	Tank Vol. (gal)	Solution Used (gal)	Chlorination: Dosage (ppm)	Tank Vol. (gal)	Solution Used (gal)	*Residual entering distribution (ppm)	Remarks (note backwashes, pump settings, solution added, maintenance, etc.)
		670032											
1	9:30P	624332											
2	10:00	627377	430000										
3	10:00	631222	306500										
4	2:00	632470	332400										
5	12:30	635220	124900										
6	330	639685	275000										
7	930	641610	446500										
8	900	644920	192500										
9	1230P	647737	282000										
10	930	650844	330700										
11	600	653267	310700										
12	530A	654350	232400										
13	500P	658415	108300										
14	1200 P	660475	406500										
15	930	662775	206000										
16	1030	665620	230000										
17	10:30	670035	284500										
18	4:00	672103	441500										
19	11:00	673917	206800										
20	10:00	676850	181400										
21	1:00P	680000	293300										
22	330P	682413	315000										
23	11:00	683927	242300										
24	11:30	688280	151400										
25	9:00	689691	434200										
26	300P	691115	141100										
27	200P	693457	142400										
28	730P	698690	234200										
29	8:00P	699313	323300										
30	2:30A	701075	262300										
31	12:40	704798	176200										
			372300										

Polymer Solution Strength = ________ Name of polymer used: ________________

* Chlorine residual entering distribution system must be greater than or equal to 0.2 ppm.

Chlorine Solution Strength = ________ See back for other special monitoring...

[illegible] = August 2013 OCSD Operator = James Tras

Date-Time	Activity
1	Checked Filters & Tanks; Tanks Full; Tested water good. Overcast/warm. WEED Eated
2	Checked Filters & Tanks; Tanks Full. Tested Water good
3	Checked Filters & Tanks; Tanks Full; Tested water good. Worked on cl2 pump
4	Checked Filters & Tanks; Tanks Full, Tested Water
5	Checked Filters & Tanks; Tanks Full; Tested water good
6	check filters + tanks; tank full. test water. Changed cl2 Pump
7	check filters + tanks; Tanks full Test water. 10 hr. Put on new pump, yellow Tank
8	check filters + Tanks; Tanks full. Test water. 10 hr. Take forestry fire men Around Tank
9	check filter + Tanks; Tanks full Test water. Show fire crews Around Tank. 12 hr
10	checked filters & Tanks; Tanks Full; Tested Water
11	Checked Filters & Tanks, Tanks Full, Tested Water
12	check filters + tanks Tanks full test water. Sample to Lab. fire meeting
13	check tanks + filters; tanks full test water. Reprime. pump - cl2
14	check Tanks + filters; Tanks full Test water. weed eat + mode Around Tanks
15	check Tanks + filters Tanks full Test water. Showed USDA Around the [illegible]

SMALL WATER SYSTEM TREATMENT RECORDS

ORLEANS COMMUNITY SERVICES DISTRICT   SYSTEM NO. 1200729

Month/Year: august 2013

Operator: James Trask

Date	Time	Meter Reading (gallons)	Water Treated (gallons)	Turbidities Raw (NTU)	Turbidities Filtered (NTU)	Polymer Feed Dosage (ppm)	Polymer Feed Tank Vol. (gal)	Polymer Feed Solution Used (gal)	Chlorination Dosage (ppm)	Chlorination Tank Vol. (gal)	Chlorination Solution Used (gal)	*Residual entering distribution (ppm)	Remarks (note backwashes, pump settings, solution added, maintenance, etc.)
		473991											
1	4:30P	478472	448100	.17	.17					38	4		
2	6:00	481647	317500	.14	.17	.01	24	Ø	.1	31	4	.1	
3	10:30	485141	349900	.19	.16	.01	24	Ø	.1	30	1	.1	
4	2:00	486927	178300	.20	.18	.01	24	Ø	.1	30	0	.1	pump malfunction
5	12:50	489[illegible]	286500	.24	.17	.01	24	Ø	.2				
6	330P	494490	463100	.20	.18		24	Ø	.2			.1	Hand Cl2
7	9:30	496510	204000	.20	.12	.01	24	Ø	.2	27	3	.1 70/70	Hand Cl2
8	900	499460	295000	.19	.12	.01	24	Ø	.2	23	4	.1	Hand Cl2
9	1230P	502888	342800	.16	.13	.01	24	Ø	.2	10	13	.1	Hand Cl2
10	9:30	506544	365600	.16	.15	.01	24	Ø	.3	3/50	3	.3 60/60	12 gl Cl2 + 5 poly + 38 gl H2O New tank & pump
11	600	509063	251900	.17	.16	.01	24	Ø	.3	47	3	.2	
12	530	510320	125700	.19	.15	.01	24	Ø	.3	41	6	.2	
13	500P	514490	417000	.20	.13	.01	24	Ø	.2	40	1	.2 70/70	
14	1200	516620	218000	.19	.14	.01	24	Ø	.1	38	2	.1	
15	930	519015	239500	.18	.12	.01	24	Ø	.3	36	2	.2	
16	1030	521980	296500	.20	.13	.01	24	Ø	.3	30	6	.2	
17	1030	526537	455700	.16	.15	.01	24	Ø	.2	25/29	5	.2 80/80	Add 4 gl Cl2
18	4:00	528705	216800	.18	.15	.01	24	Ø	.3	18	11	.2	
19	1100	530625	192000	.21	.12	.01	24	Ø	.3	14	4	.2	
20	10:00	533583	295800	.18	.13	.01	24	Ø	.3	9	5	.2	
21	1:00P	536940	335700	.20	.15	.01	24	Ø	.3	3/50	6	.2 60/60	Empty 12 gl Cl2 + 5 poly + 38 gl H2O
22	330P	539548	260800	.25	.15	.01	24	Ø	.3	46	4	.2	
23	1100	541160	161200	.22	.16	.01	24	Ø	.2	40	6	.2 80/80	
24	1130	545698	458800	.16	.16	.01	24	Ø	.3	37	3	.2	
25	8:00	547234	154600	.19	.16	.01	24	Ø	.2	25	12	.2	
26	3:00P	548758	152400	.25	.15	.01	24	Ø	.2	20	5	.2	
27	200P	551217	245900	.35	.14	.01	24	Ø	.2	16	4	.2	
28	730P	554560	334300	.32	.12	.01	24	Ø	.2	10	6	.2 90/90	
29	8:00P	557305	274500	.27	.13	.01	24	Ø	.3	2/50	8	.2 60/60	12 gl Cl2 5 gl Poly + 36 gl H2O
30	2:30P	559200	189500	.22	.14	.01	24	Ø	.4	46	4	.2	
31	12:50	563073	387300	.15	.12	.01	24	Ø	.2	37	4	.2	

* Chlorine residual entering distribution system must be greater than or equal to 0.2 ppm.

Polymer Solution Strength = .01   Name of polymer used: Praestol 186k   Chlorine Solution Strength = 12.5%   See back for other special monitoring...

(6) Back wash # 1 & 2 (7) # 3

SMALL WATER SYSTEM TREATMENT RECORDS
ORLEANS COMMUNITY SERVICES DISTRICT SYSTEM NO. 1200729

Month/Year: July 2013

Operator: Jim Trask

Date	Time	Meter Reading (gallons)	Water Treated (gallons)	Turbidities Raw (NTU)	Turbidities Filtered (NTU)	Polymer Feed Dosage (ppm)	Polymer Feed Tank Vol. (gal)	Polymer Feed Solution Used (gal)	Chlorination Dosage (ppm)	Chlorination Tank Vol. (gal)	Chlorination Solution Used (gal)	Chlorination *Residual entering distribution (ppm)	Remarks (note backwashes, pump settings, solution added, maintenance, etc.)
		518422											
1	1130	520800	117800										
2	930	522000	250000										
3	1000	526550	355000										
4	1130	529615	306500										
5	1:00 P	532490	282500										
6	11:30	533557	111700										
7	9:00	537414	385700										
8	200P	541185	377100										
9	700	543248	206300										
10	12:00	547720	447200										
11	100P	551325	360500										
12	10:00	554345	302000										
13	7:30	559157	481200										
14	2:00	561435	227800										
15	3:00 P	564550	311500										
16	230P	567855	330500										
17	300P	572180	432500										
18	330 P	575920	374000										
19	1000	578150	223000										
20	8:00a	580733	258300										
21	11:30	586056	532300										
22	12:30	587564	150800										
23	11:00a	591002	343800										
24	2:00p	594914	391200										
25	10:00a	597009	209400										
26	2:30	600909	390100										
27	8:30	604997	408800										
28	9:30	606912	191500										
29	2:00p	610027	311500										
30	3:30	617113	708600										
31	9:30a	620032	291900										

* Chlorine residual entering distribution system must be greater than or equal to 0.2 ppm.

Polymer Solution Strength = ________ Name of polymer used: ________ Chlorine Solution Strength = ________ See back for other special monitoring...

Month/YR = July 2013 OCSD Operator = James Trask

Date-Time	Activity
1	200 gl min 11:30. worked on intake Gallery weed eat Hot Check Tanks + filters ; Tanks full ; Test water
2	weed eat check tanks + filters ; tanks full ; test water ;
3	Pre-app. weed eat check tanks + filters tanks full test water
4	4 July check Tanks + filters ; Tanks full ; Test water ;
5	check Tanks + filters Tanks full Test water
6	Checked Tanks filters ; Tanks full ; Tested water good Hot
7	Checked Tanks filters & Tanks full ; Tested water ; good Hot
8	checked Tanks + filters & tanks full ; test water Drain little tanks - Refill
9	check filters + Tanks Tanks full test water Take samples to Lab
10	clean screen 400 gl/min out check filters + tank Tanks full test water.
11	Type 300 gl/min out check filters + tanks tanks full test water
12	weed eat around shed Check filters + tanks tanks full . test water
13 SAT	Hot checked filters + tanks Tanks full Tested water good
14 SUN	Checked filters + Tanks Tank full tested water good Hot
15	Check Tanks + filter Tank [illegible] [illegible] [illegible] Test water Read met

Filter · Tubidities

1				
2				
3				

SMALL WATER SYSTEM TREATMENT RECORDS
ORLEANS COMMUNITY SERVICES DISTRICT SYSTEM NO. 1200729

Month/Year: July 2013

Operator: James Trask

Date	Time	Meter Reading (gallons)	Water Treated (gallons)	Turbidities Raw (NTU)	Turbidities Filtered (NTU)	Polymer Feed Dosage (ppm)	Polymer Feed Tank Vol. (gal)	Polymer Feed Solution Used (gal)	Chlorination Dosage (ppm)	Chlorination Tank Vol. (gal)	Chlorination Solution Used (gal)	*Residual entering distribution (ppm)	Remarks (note backwashes, pump settings, solution added, maintenance, etc.)
		363682								35			
1	11:30	369955	127300	.29	.18	.01	24	Ø	.3	32	3	.2	
2	9:30	367445	249000	.30	.19	.01	24	Ø	.3	26	6	.2	
3	1000	371155	371000	.32	.13	.01	24	Ø	.2	18	8	.2	
4	11:30	374415	326000	.23	.13	.01	24	Ø	.3	8/50	10	.2 80/80	
5	1:00P	377445	303000	.20	.13	.01	20	Ø	.4	45	3	.2 60/60	12gl Cl2 + 5ml Poly + 30gl H2O
6	11:30	381784	433900	.21	.16	.01	24	Ø	.2	36	9	.2	
7	1:00	382687	90300	.20	.15	.01	24	Ø	.3	34	2	.2	
8	200P	386650	396300	.26	.13	.01	24	Ø	.3	23	11	.2	
9	700	388977	232700	.22	.14	.01	24	Ø	.2	18	5	.2	Drain Little Tanks
10	12:00	393590	461300	.25	.15	.01	24	Ø	.2	7/50	11	.2 70/70	
11	1:00P	397350	376000	.24	.14	.01	24	Ø	.4	42	8	.2 60/60	12gl Cl2 + 5ml Poly + 31gl H2O
12	10:00	400500	315000	.23	.14	.01	24	Ø	.2	37	5	.2 74/74	
13	7:30	406675	617900	.26	.15	.01	24	Ø	.1	31	6	.1	
14	2:00	410682	400700	.32	.17	.01	24	Ø	.1	30	1	.1	
15	3:00P	413516	483400	.20	.16	.01	24	Ø	.3	30	0	.1	Tank overflow Hand Cl2
16	2:30P	416965	344900	.25	.17	.01	24	Ø	.3	25	5	.2 90/90	
17	3:00P	423430	496500	.26	.17	.01	24	Ø	.4	5/50	20	.2 60/60	12gl Cl2 + 5ml Poly + 33gl H2O
18	3:30P	427307	387700	.27	.17	.01	24	Ø	.4	42	8	.3	
19	10:00	429630	233300	.24	.15	.01	24	Ø	.2	36	6	.2 70/70	
20	8:00a	432390	276860	.19	.16	.01	24	Ø	.3	32	4	.2	
21	11:30	435935	355700	.23	.16	.01	24	Ø	.3	15	17	.2	
22	12:30	439507	157280	.18	.14	.01	24	Ø	.3	11	4	.2	
23	11:00a	443042	353500	.18	.13	.01	24	Ø	.3	5/50	6	.2	12gl Cl2 + 5ml Poly + 35gl H2O
24	3:00P	448070	402800	.17	.14	.01	24	Ø	.5	45	5	.2 60/60	
25	10:00a	449372	230200	.18	.16	.01	24	Ø	.2	37	8	.1 65/65	
26	2:30	453428	405600	.18	.15	.01	24	Ø	.2	29	8	.1	
27	8:30	457674	429600	.19	.16	.01	24	Ø	.2	20	9	.1	
28	1:30P	460925	327800	.18	.16	.01	24	Ø	.2	19/50	1	.1	9gl Cl2 + 2ml Poly + 23gl H2O
29	2:00P	464175	325000	.17	.17	.01	24	Ø	.3	49	1	.1	
30	3:30P	470455	628000	.17	.16	.01	24	Ø	.3	44	5	.2 77/77	
31	9:30a	473991	353000	.17	.17	.01	24	Ø	.3	25	11	.2	

* Chlorine residual entering distribution system must be greater than or equal to 0.2 ppm.

Polymer Solution Strength = .61 Name of polymer used: Praestol 186K Chlorine Solution Strength = 12.5% See back for other special monitoring...

(2) Backwashed #1 (3) Back wash #2 (4) Back washed #3

SMALL WATER SYSTEM TREATMENT RECORDS
ORLEANS COMMUNITY SERVICES DISTRICT SYSTEM NO. 1200729

Month/Year: June 2013

Operator: Jim Trask

Date	Time	Meter Reading (gallons)	Water Treated (gallons)	Turbidities		Polymer Feed			Chlorination				Remarks (note backwashes, pump settings, solution added, maintenance, etc.)
				Raw (NTU)	Filtered (NTU)	Dosage (ppm)	Tank Vol. (gal)	Solution Used (gal)	Dosage (ppm)	Tank Vol. (gal)	Solution Used (gal)	*Residual entering distribution (ppm)	
		454325											
1	11:00	456496	217100										
2	12:00a	457148	65200										
3	12:00P	459000	185200										
4	1000	460600	160000										
5	900	462475	187500										
6	930	464865	239000										
7	1100	467495	263000										
8	11:00P	472166	467100										
9	9:30a	473014	84800										
10	1130	475875	286100										
11	1130	478450	257500										
12	1000	480650	220000										
13	930	482745	209500										
14	400P	485972	322700										
15	800P	488880	290800										
16	900P	491250	237000										
17	1:00P	492730	148000										
18	1000	494590	186000										
19	11:00	496754	216400										
20	5:30	499435	268100										
21	1200P	501030	159500										
22	200	504990	396000										
23	100	505994	90800										
24	1:00P	507455	156100										
25	330P	508553	109800										
26	1030	509333	78000										
27	1:00P	510416	108200										
28	7:00	511795	138000										
29	9:00	516664	486900										
30	11:30	519422	275800										
31													

* Chlorine residual entering distribution system must be greater than or equal to 0.2 ppm.

Polymer Solution Strength = ________ Name of polymer used: ________ Chlorine Solution Strength = ________ See back for other special monitoring...

MONTH/YR = June 2013 OCSD OPERATOR = Jim Trask

Date-Time	Activity
1	Checked Filters & TANKS; TANKS Full, Tested Water = good Sunny
2	Checked Filters & TANKS; TANKS Full, Tested water = good Sunny
3	Check filters + Tanks; Tanks full; Test water — weed eat Around office
4	Showed some people filters for internet Tower — check filters + Tanks Tanks full; test water
5	Valve to Tommy's Turned on full per Tommy — Check filters + tanks; Tanks full test water ~~tank~~ take sample to Lab
6	filled Holes back of office — Check filters + Tanks; Tanks full Test water
7	made Arown Tank — Check filters + Tanks Tanks full Test water w Hot
8	Checked filters & TANKS; TANKS Full, Test water - good Hot
9	Checked filters & TANKS; TANKS Full Tested water good Hot
10	Use out of little tanks — Checked filters + tanks, tanks full test water worked on more water intake
11	Checked ~~tanks~~ tanks + filters tanks full test water Got more water to intake
12	filter #1 Back washed — check filters + tanks Tanks full Test water
13	check filters + tanks; Tanks full test water — worked on water to intake
14	2 leaks by intake dry — Check filter + Tanks; Tanks full Test water — worked on water intake
15	Check filters + tanks Tanks full Test water Telly called at 7:30 can't make it

Filter - Tubidities

1				
2				
3				

SMALL WATER SYSTEM TREATMENT RECORDS
ORLEANS COMMUNITY SERVICES DISTRICT SYSTEM NO. 1200729

Month/Year: June 2013

Operator: James Trask

Date	Time	Meter Reading (gallons)	Water Treated (gallons)	Turbidities Raw (NTU)	Turbidities Filtered (NTU)	Polymer Feed Dosage (ppm)	Polymer Feed Tank Vol. (gal)	Polymer Feed Solution Used (gal)	Chlorination Dosage (ppm)	Chlorination Tank Vol. (gal)	Chlorination Solution Used (gal)	*Residual entering distribution (ppm)	Remarks (note backwashes, pump settings, solution added, maintenance, etc.)
		293690				.01	24	0					
1	11:00	296201	251100	.19	.16	.01	24	0	.3	26		.2	
2	12:00	297939	173800	.22	.12	.01	24	0	.3	24	2	.2	
3	1200P	298870	93100	.28	.14	.01	24	0	.3	18	6	.2	
4	1000	300760	189000	.23	.13	.01	24	0	.4	12/50	6	.2 60/60	82 gl Cl2 + 5m/L Poly + 26gl H2O
5	900	302762	200200	.23	.15	.01	24	0	.5	47	3	.3 50/50	
6	930	305285	252300	.20	.12	.01	24	0	.4	45	2	.2 60/60	
7	11:00	308080	279500	.22	.14	.01	24	0	.3	40	5	.2	
8	11:00p	312900	482000	.18	.16	.01	24	0	.2	30	10	.1	
9	9:30a	313817	91700	.29	.13	.01	24	0	.2	29	1	.1	
10	11 30	316825	300800	.21	.13	.01	24	0	.3	23	6	.2 70/70	10z for 2 [illegible] Then 70/70
11	11:00	319260	243500	.20	.13	.01	24	0	.3	15	8	.2	
12	1000	321777	251700	.19	.13	.01	24	0	.3	8/50	7	.2 50/50	12gl Cl2 + 5m/L Poly + 30gl Cl2
13	930	324060	228300	.19	.12	.01	24	0	.4	45	5	.3	
14	400P	327588	352800	.33	.15	.01	24	0	.2	40	5	.2 70/70	
15	800P	330650	306200	.22	.16	.01	24	0	.4	33	7	.3	
16	900P	333152	250200	.21	.16	.01	24	0	.3	26	7	.2	
17	1100P	334745	159300	.20	.13	.01	24	0	.3	23	3	.3	
18	10:00	336720	197500	.21	.16	.01	24	0	.3	17/50	6	.2 50/50	1-2gl Cl2 + 5m/L Poly + 21gl H2O
19	1100	339094	237400	.16	.14	.01	24	0	.3	47	3	.2	
20	5:30P	341957	286300	.20	.16	.01	24	0	.3	44	3	.2	
21	1200P	343760	174300	.28	.15	.01	24	0	.4	41	3	.2	
22	200	347888	418800	.18	.14	.01	24	0	.2	36	5	.2	60/60 TG
23	100	348839	95100	.17	.15	.01	24	0	.3	35	1	.2	
24	100P	350395	125600	.28	.16	.01	24	0	.3	32	3	.2	
25	330P	351910	131500	.31	.16	.01	24	0	.2	30	2	.1	70/70
26	1030	352865	95500	.28	.17	.01	24	0	.3	27	3	.2	
27	100P	354250	138500	.30	.18	.01	24	0	.3	23/50	4	.2	8gl Cl2 + 5m/L Poly + 19gl H2O
28	700	355732	148200	.30	.17	.01	24	0	.4	48	2	.2	
29	9:00	360805	507100	.27	.13	.01	24	0	.3	40	8	.2	
30	11:20	363682	287900	.19	.17	.01	24	0	.2	35	5	.2	
31													

* Chlorine residual entering distribution system must be greater than or equal to 0.2 ppm.

Polymer Solution Strength = .01 Name of polymer used: Pracostol 186 K Chlorine Solution Strength = 12.5% See back for other special monitoring...

(12) Backwashed #1 (18) Backwashed #2

Month/Year: MAY 2013

SMALL WATER SYSTEM TREATMENT RECORDS
ORLEANS COMMUNITY SERVICES DISTRICT SYSTEM NO. 1200729

Operator: James Trask

Date	OCT Time	Meter Reading (gallons)	Water Treated (gallons)	Turbidities		Polymer Feed			Chlorination				Remarks (note backwashes, pump settings, solution added, maintenance, etc.)
				Raw (NTU)	Filtered (NTU)	Dosage (ppm)	Tank Vol. (gal)	Solution Used (gal)	Dosage (ppm)	Tank Vol. (gal)	Solution Used (gal)	*Residual entering distribution (ppm)	
		416470											
1	1:00	417800	133000										
2	10:00	419067	126700										
3	11:00	420870	180300										
4	10:30	423344	247400										
5	11:30	423897	55300										
6	1130	424850	95300										
7	830	425478	62800										
8	10:00	425928	45000										
9	930	426383	45500										
10	1030	427235	85200										
11	9:00 P	429201	206000										
12	9:00 a	429802	50100										
13	1230	431736	193400										
14	1100	432655	91900										
15	930	434420	176500										
16	1030	435520	110000										
17	230P	436415	89500										
18	11:00	436371	19600										
19	6:15	439191	81000										
20	130p	440875	164400										
21	3:00P	442988	216200										
22	2:00P	443867	87900										
23	930	444910	104300										
24	1006	446500	169000										
25	11:30	449311	271100										
26	12:30a	449921	61000										
27	930P	451200	127900										
28	1130	451600	40000										
29	1100	452435	83500										
30	1030	453290	85500										
31	1000	454325	103500										

* Chlorine residual entering distribution system must be greater than or equal to 0.2 ppm.

Polymer Solution Strength = ______ Name of polymer used: ______ Chlorine Solution Strength = ______ See back for other special monitoring...

Month/YR = MAY 2013 OCSD OPERATOR = Jim Trask

Date-Time	Activity
1	Check Tanks + filters; Tanks full; Test water; Pick-up paint for office
2	Check Tanks + filters Tanks full; Test water
3	Check Tanks + filters Tanks full Test water
4	Checked Tanks & Filters; Tanks Full; Tested water = good. POWER OUT / HOT overflow. Turned off valve HOT / power out
5	Checked Tanks & Filters, Tanks Full; Tested water = good. overflowed
6	Check Tanks + filters; Tanks part full - filled up - Test water. Check pump to see how many cycles before not working
7	check Tanks + filters; Tanks full; Test water; Take samples to Lab
8	Check Tanks + filters; tanks full test water. PAINT office some cut in, weed eat sump
9	Check Tanks + filters; Tanks full Test water weed eat some of the Road
10	Check Tanks + filters; Tanks full; Test water; Paint office
11	Checked Tanks & Filters, Tanks full, Tested water = good HOT
12	Checked Tanks & Filters; Tanks Full, Tested water / good. HOT Weed eat Tank Plant Fire hyd. Mowed
13	Checked filters + tanks, tanks full Tested water. Paint office
14	Checked filter + Tanks tanks full Test water. moved things around in office
15	Check Filters + tanks Tanks full Test water. Paint Office. Brake in line from Reach Road

Filter · Tubidities

1				
2				
3				

SMALL WATER SYSTEM TREATMENT RECORDS
ORLEANS COMMUNITY SERVICES DISTRICT SYSTEM NO. 1200729

Month/Year: MAy 2013

Operator: JAmes TrAsk

				Turbidities		Polymer Feed			Chlorination				
Date	Time	Meter Reading (gallons)	Water Treated (gallons)	Raw (NTU)	Filtered (NTU)	Dosage (ppm)	Tank Vol. (gal)	Solution Used (gal)	Dosage (ppm)	Tank Vol. (gal)	Solution Used (gal)	*Residual entering distribution (ppm)	Remarks (note backwashes, pump settings, solution added, maintenance, etc.)
		246480								41			
1	1:00	248024	138400	.23	.15	.01	24	Ø	.4	40	1	.2 50/50	
2	10 00	249087	106300	.24	.13	.01	24	Ø	.3	38	2	.2	
3	11:00	251455	236800	.19	.13	.01	24	Ø	.3	36	2	.2	
4	10:30A	254220	276500	.19	.16	.01	24	Ø	.1	35	1	.0	Turned off Valve 11:25
5	11:30	254854	63400	.22	.14	.01	24	Ø	.3	34	1	.2 70/70	Turn Valve on 11:30am
6	1130	257570	271600	.22	.13	.01	24	Ø	.3	32	2	.2	
7	630	258515	95500	.19	.15	.01	24	Ø	.3	30	2	.2	
8	1000	259400	88500	.19	.14	.01	24	Ø	.3	28	2	.2	
9	930	260200	80000	.20	.13	.01	24	Ø	.3	25	3	.2	
10	1030	261367	116700	.19	.13	.01	24	Ø	.3	23	2	.2	
11	9:00A	263715	234800	.24	.17	.01	24	Ø	.3	17	6	.2	
12	9:00a	264361	64600	.17	.15	.01	24	Ø	.3	15	2	.2	
13	12 30	266510	214900	.21	.14	.01	24	Ø	.3	10/50	5	.2	
14	11:00	267895	136500	.19	.14	.01	24	Ø	.6	48	7	.3 60/50	11gl Cl_2 + 5m/c Poly + 30gl H_2O
15	930	269640	176500	.18	.17	.01	24	Ø	.5	45	3	.3	
16	1030	271012	137200	.38	.11	.01	24	Ø	.5	42	3	.4	
17	230	272360	134800	.20	.12	.01	24	Ø	.4	40	2	.3	RAIN
18	11:00	274275	192500	.14	.13	.01	24	Ø	.3	35	2	.2	
19	6:15P	275674	139900	.22	.16	.01	24	Ø	.2	36	1	.2 ~~50/50~~	
20	130P	277463	178900	.28	.13	.01	24	Ø	.3	31	5	.2 70/70	
21	300P	279777	231400	.18	.12	.01	24	Ø	.4	23	8	.3	
22	200P	280902	112500	.19	.12	.01	24	Ø	.3	20	3	.2	
23	930	282096	119400	.18	.12	.01	24	Ø	.4	16	4	.3	
24	1000	284000	190400	.18	.12	.01	24	Ø	.3	12/50	4	.2 50/50	11gl Cl_2 + 5m/L Poly + 23gl H_2O
25	1130P	287156	315600	.20	.14	.01	24	Ø	.3	48	2	.2	
26	12:30a	287866	71000	.26	.12	.01	24	Ø	.3	47	1	.2	
27	900P	289515	1649	.22	.12	.01	24	Ø	.3	45	2	.2	
28	1130	290074	55900	.22	.15	.01	24	Ø	.1	44	1	.1 70/70	
29	1100	291207	113300	.19	.12	.01	24	Ø	.4	41	3	.2	
30	1030	292350	114300	.20	.13	.01	24	Ø	.3	38	3	.2	
31	1000	293670	132000	.19	.13	.01	24	Ø	.3	35	3	.2	

* Chlorine residual entering distribution system must be greater than or equal to 0.2 ppm.

Polymer Solution Strength = .01 Name of polymer used: PrAestol 186K Chlorine Solution Strength = 12.5% See back for other special monitoring...

SMALL WATER SYSTEM TREATMENT RECORDS
ORLEANS COMMUNITY SERVICES DISTRICT SYSTEM NO. 1200729

Month/Year: April 2013

Operator: James Trask

Date	Time	Meter Reading (gallons)	Water Treated (gallons)	Turbidities: Raw (NTU)	Turbidities: Filtered (NTU)	Polymer Feed: Dosage (ppm)	Polymer Feed: Tank Vol. (gal)	Polymer Feed: Solution Used (gal)	Chlorination: Dosage (ppm)	Chlorination: Tank Vol. (gal)	Chlorination: Solution Used (gal)	Chlorination: *Residual entering distribution (ppm)	Remarks (note backwashes, pump settings, solution added, maintenance, etc.)
		395715											
1	1000	396068	35300										
2	930	396585	51700										
3	1130	397187	60200										
4	11:00	397748	65100										
5	700	398072	32400										
6	12:30	398979	90700										
7	11:00	399088	20900										
8	100P	399705	61700										
9	1130	400720	101600										
10	1030	401185	46500										
11	1100	401850	66500										
12	900	402310	46000										
13	9:30	403160	85000										
14	12:00p	403361	20100										
15	830	403726	36500										
16	1030	404200	47400										
17	11:00	404907	70700										
18	1130	405538	63100										
19	11:00a	406218	68000										
20	12:00p	406632	41400										
21	2:00	407538	90600										
22	11:00	408235	70300										
23	8:00	408986	75100										
24	830	409983	99700										
25	1130	410992	100900										
26	1000	412067	107500										
27	11:30	413925	185800										
28	3:30p	414644	71900										
29	900	415280	63600										
30	930	416470	119000										
31													

* Chlorine residual entering distribution system must be greater than or equal to 0.2 ppm.

Polymer Solution Strength = ________ Name of polymer used: ____________ Chlorine Solution Strength = ________ See back for other special monitoring...

16- Check Filters + Tank, Tanks full; Test water H_2O meeting

Turn ON ~~H2O~~ Deano's water

17- Check filters + Tanks Tanks full test water

Power off   Used gen. To Run Pump

18- Check filters + Tanks Tanks full Test water Did Not work

sun/overcast

19- Checked filters & Tanks, Tanks full Tested water/ok

Sunny

20- Checked filters & Tanks, Tanks full & Tested water/ok

Sunny

21- Checked Tanks & filters, Tanks are full, Tested water/ok

Sunny

22- Check Tanks + filters Tanks full test water

23- Check Tanks + filters, Tanks full test water   Read meter

24- Check Tanks + filters tanks full Test water   Read meters

getting ready to put in extra water   Read meters

25- Check Tanks + filters Tanks full Test water

Rain office ceiling

26- Check Tanks + filters Tanks full

27- Checked Tanks & filters Tanks full, Tested water / good / Sun

Sun

28- Checked Tanks & filters, Tank full, Tested water / good

Put in another water from creek

29- Check Tanks + filters Tanks full Test water

~~Pick up paint for office~~

30- Check Tanks + filters Tanks full, Test water   Check + clean screen + [illegible] up Pump

31-

Filter · Tubidities

1				
2				
3				

SMALL WATER SYSTEM TREATMENT RECORDS
ORLEANS COMMUNITY SERVICES DISTRICT **SYSTEM NO. 1200729**

Month/Year: April 2013 Operator: James Trask

Date	Time	Meter Reading (gallons)	Water Treated (gallons)	Turbidities Raw (NTU)	Turbidities Filtered (NTU)	Polymer Feed Dosage (ppm)	Polymer Feed Tank Vol. (gal)	Polymer Feed Solution Used (gal)	Chlorination Dosage (ppm)	Chlorination Tank Vol. (gal)	Chlorination Solution Used (gal)	Chlorination *Residual entering distribution (ppm)	Remarks (note backwashes, pump settings, solution added, maintenance, etc.)
		215292								21			
1	10:00	215917	62500	.32	.15	.01	24	Ø	.2	20	1	.2 90/90	
2	930	216705	78800	.22	.18	.01	24	Ø	.3	17	3	.2	
3	1130	217632	92700	.25	.16	.01	24	Ø	.3	15	2	.2	
4	1100	218405	77300	.20	.15	.01	24	Ø	.4	13	2	.2	
5	700	219031	62600	.24	.18	.01	24	Ø	.3	10/50	3	.2 50/60	12 gl Cl2 + 5m/c Poly 28 gl H_2O
6	1230	220399	136800	.25	.16	.01	24	Ø	.3	48	2	.2	
7	11:00	220717	31800	.28	.19	.01	24	Ø	.3	47	1	.2	
8	1:00p	223051	233400	.52	.16	.01	24	Ø	.4	47	0	.2	overflow – Pump off
9	1130	224300	124900	.24	.12	.01	24	Ø	.4	45	2	.2	
10	1630	225166	86600	.27	.14	.01	24	Ø	.5	43	2	.2	
11	1100	226164	99800	.21	.15	.01	24	Ø	.5	40	3	.3	
12	900	226912	74800	.21	.15	.01	24	Ø	.4	38	2	.3	
13	930	228222	131000	.16	.16	.01	24	Ø	.3	34	2	.3	
14	1200	228672	45000	.21	.17	.01	24	Ø	.4	35	1	.3	
15	830	229362	65400	.25	.18	.01	24	Ø	.3	33	2	.2	
16	1030	230363	100160	.23	.17	.01	24	Ø	.3	32	1	.2	
17	11:00	231420	105700	.24	.15	.01	24	Ø	.3	30	2	.2	
18	1130	232550	560000	.26	.15	.01	24	Ø	.3	31	1	.2	
19	11:00a	233642	109200	.23	.15	.01	24	Ø	.1	26	5	.1	75/75
20	2:00p	234623	99600	.25	.14	.01	24	Ø	.3	24	2	.2	70/68
21	2:00	235560	92800	.21	.13	.01	24	Ø	.3	21	3	.2	
22	11:00	236493	92700	.17	.13	.01	24	Ø	.3	19	2	.2	
23	400	237470	97700	.19	.12	.01	24	Ø	.3	17	2	.2	
24	830	238658	118800	.18	.15	.01	24	Ø	.3	15	2	.2	
25	1130	239948	129000	.19	.13	.01	24	Ø	.3	12	3	.2	
26	1000	241235	128700	.20	.13	.01	24	Ø	.3	10/50	2	.2 60/60	12 gl Cl2 + 5m/c Poly + 28 gl H_2O
27	11:30	243411	217600	.17	.15	.01	24	Ø	.6	46	4	.4	
28	330p	244274	86300	.22	.13	.01	24	Ø	.5	45	1	.3	
29	800	245040	76600	.20	.16	.01	24	Ø	.5	43	2	.3 50/50	
30	930	246440	140000	.21	.14	.01	24	Ø	.4	41	2	.2	
31													

* Chlorine residual entering distribution system must be greater than or equal to 0.2 ppm.

Polymer Solution Strength = .01 Name of polymer used: PeACosTol 186K Chlorine Solution Strength = 12.5% See back for other special monitoring...

(15) BACK WASH #1+2 (16) BACK WASH #3

SMALL WATER SYSTEM TREATMENT RECORDS

ORLEANS COMMUNITY SERVICES DISTRICT SYSTEM NO. 1200729

Month/Year: MArch -2013

Operator: Jim Trask

Date	Time	Meter Reading (gallons)	Water Treated (gallons)	Turbidities: Raw (NTU)	Turbidities: Filtered (NTU)	Polymer Feed: Dosage (ppm)	Polymer Feed: Tank Vol. (gal)	Polymer Feed: Solution Used (gal)	Chlorination: Dosage (ppm)	Chlorination: Tank Vol. (gal)	Chlorination: Solution Used (gal)	Chlorination: *Residual entering distribution (ppm)	Remarks (note backwashes, pump settings, solution added, maintenance, etc.)
		376891											
1	11:00	377367	47600										
2	10:00	377968	60100										
3	12:00	378241	27300										
4	900	378675	43400										
5	830	379075	40000										
6	1100	379593	51800										
7	1000	379977	38400										
8	1000	380387	41000										
9	800	380650	26300										
10	500P	381210	56000										
11	1000	381460	25000										
12	1000	381878	41800										
13	900	382300	42200										
14	1000	383350	105000										
15	1000	384864	151400										
16	11:37P	386313	144900										
17	3:30 P	388552	223900										
18	900	389736	118400										
19	1000	390263	52700										
20	10:00a	390696	43300										
21	1030	391144	44800										
22	930	391577	43300										
23	9:00	392357	78000										
24	11:30	392961	60400										
25	930	392995	3400										
26	1130	393497	50200										
27	930	393862	36500										
28	130P	394371	50900										
29	9:30	394714	34300										
30	1130P	395558	84400										
31	11:30a	395715	15700										

* Chlorine residual entering distribution system must be greater than or equal to 0.2 ppm.

Polymer Solution Strength = ________ Name of polymer used: ________ Chlorine Solution Strength = ________ See back for other special monitoring...

Month/YR = March 2013 OCSD Operator = Jim Trask

Date-Time	Activity
1	Checked Tanks + filters; Tanks full; Test water
2	checked Tanks + Filters Tanks full, Tested water OK overcast
3	checked Tanks + Filters; Tanks full, Tested water OK Sunny
4	Checked Tanks + filters, Tanks full Test water
5	Checked Tanks + filters, Tanks full Test water RAIN Took samples To Lab
6	Check Tanks + Filters, Tanks full. Test water RAIN
7	Check Tanks + filters; Tanks full Test water RAIN
8	Check Tanks + filters, Tanks full Test water
9 SAT	check Tanks + Filters; Tanks full; Test water
10 SUN	check Filters + Tanks Tanks full; Test water
11	check filters + Tanks Tanks full. Test water; mud office
12	Check filters + Tanks Tanks full. Test water; weeded by tanks
13	check filters + tanks. Tanks full; Test water
14	
15	

Filter - Tubidities

1				
2				
3				

SMALL WATER SYSTEM TREATMENT RECORDS
ORLEANS COMMUNITY SERVICES DISTRICT SYSTEM NO. 1200729

Month/Year: MArch 2013

Operator: Jim TRASK

Date	Time	Meter Reading (gallons)	Water Treated (gallons)	Turbidities Raw (NTU)	Turbidities Filtered (NTU)	Polymer Feed Dosage (ppm)	Polymer Feed Tank Vol. (gal)	Polymer Feed Solution Used (gal)	Chlorination Dosage (ppm)	Chlorination Tank Vol. (gal)	Chlorination Solution Used (gal)	*Residual entering distribution (ppm)	Remarks (note backwashes, pump settings, solution added, maintenance, etc.)
		186100								40			
1	1100	186938	33200	.30	.18	.01	24	0	.3	39	1		
2	10:00	187474	53600	.29	.16	.01	24	Ø	.3	38	1	.2	
3	12:00	188535	106100	.79	.12	.01	24	Ø	.3	36	2	.2	
4	900	189240	70500	.26	.17	.01	24	Ø	.3	35	1	.2	
5	830	190000	76000	.20	.16	.01	24	Ø	.3	34	1	.2	
6	1100	190914	91400	.16	.16	.01	24	Ø	.3	33	1	.2 79/70	
7	1000	191650	73600	.21	.16	.01	24	Ø	.3	32	1	.2	
8	1000	192425	77500	.18	.13	.01	24	Ø	.3	30	2	.2	
9	800	193111	68600	.20	.15	.01	24	Ø	.3	28	2	.2	
10	500P	194215	110400	.27	.15	.01	24	Ø	.3	25	3	.2	
11	1000	194725	51000	.19	.15	.01	24	Ø	.3	23	2	.2	80/80
12	1000	195535	81000	.23	.16	.01	24	Ø	.3	21	2	.2	
13	900	196362	82700	.19	.15	.01	24	Ø	.3	19	2	.2	
14	1000	197635	127300	.30	.15	.01	24	Ø	.4	15	4	.2 70/70	
15	1000	199280	164500	.20	.14	.01	24	Ø	.3	11	4	.2	
16	11:??p	200112	83200	.21	.16	.01	24	Ø	.3	7	4	.2	
17	3:30P	203321	320900	.19	.16	.01	24	Ø	.3	3/9	—	.2	2 Cl2 + 4 gal H_2O
18	900	204600	127900	.17	.13	.01	24	Ø	.4	5/50	4	.2 60/60	10 gal Cl2 + 5 gal poly + 35 gal H_2O
19	1000	205452	85200	.20	.14	.01	24	Ø	.3	48	2	.2	
20	10:??	206252	77500	.22	.17	.01	24	Ø	.2	47	1	.2 70/70	
21	1030	207018	76100	.22	.17	.01	24	Ø	.2	45	2	.2 ~~80/80~~	
22	930	207760	74200	.21	.18	.01	24	Ø	.3	42	3	.2	
23	9:??	209030	127000	.17	.17	.01	24	Ø	.3	40	2	.2	
24	11:??	209????	85800	.17	.12	.01	24	Ø	.3	36	2	.2	
25	830	210111	23100	.20	.15	.01	24	Ø	.3	36	2	.2	
26	1130	210925	81400	.21	.13	.01	24	Ø	.3	35	1	.2	
27	930	211355	43000	.23	.17	.01	24	Ø	.3	34	1	.2	
28	130P	213000	164500	.20	.15	.01	24	Ø	.3	34	1	.2	80/80 RAW
29	9:30	213704	70400	.25	.16	.01	24	Ø	.2	30	4	.2	100/100 Then 80/80
30	1150	214995	127100	.22	.16	.01	24	Ø	.2	27	3	.2	
31	11:30am	215292	31700	.21	.19	.01	24	Ø	.2	21	3	.2	

* Chlorine residual entering distribution system must be greater than or equal to 0.2 ppm.

Polymer Solution Strength = .01 Name of polymer used: PoAc osTol 186K Chlorine Solution Strength = 12.5% See back for other special monitoring...

(31) Back wash #1 (32) Back wash #2&3

SMALL WATER SYSTEM TREATMENT RECORDS
ORLEANS COMMUNITY SERVICES DISTRICT SYSTEM NO. 1200729

Month/Year: Feb 13

Operator: James Trask

Date	Time	Meter Reading (gallons)	Water Treated (gallons)	Turbidities: Raw (NTU)	Turbidities: Filtered (NTU)	Polymer Feed: Dosage (ppm)	Polymer Feed: Tank Vol. (gal)	Polymer Feed: Solution Used (gal)	Chlorination: Dosage (ppm)	Chlorination: Tank Vol. (gal)	Chlorination: Solution Used (gal)	Chlorination: *Residual entering distribution (ppm)	Remarks (note backwashes, pump settings, solution added, maintenance, etc.)
		359022											
1	11:00	359790	71800										
2	6:30	360604	86900										
3	1000	361098	49400										
4	930	361665	57700										
5	11:00	362448	78300										
6	200P	363323	87500										
7	1030	363895	57200										
8	1200	364633	73800										
9	0700	365430	79700										
10	3:30	365980	55000										
11	1130	366544	56400										
12	800	367170	62600										
13	1000	367883	71300										
14	11:00	368576	69300										
15	1000	369207	63100										
16	330P	370052	84500										
17	12:30	370690	63400										
18	900	371584	89900										
19	1030	371890	30600										
20	11:00	372630	74000										
21	1100	373327	69700										
22	1 30P	374028	70100										
23	7:300	374776	74900										
24	10:00	375020	24400										
25	1:00P	375900	78000										
26	1030	376164	36400										
27	1000	376499	33400										
28	1100	376891	39300										
29													
30													
31													

* Chlorine residual entering distribution system must be greater than or equal to 0.2 ppm.

Polymer Solution Strength = ________ Name of polymer used: ________ Chlorine Solution Strength = ________ See back for other special monitoring...

Month/YR = Feb 2013 OCSD Operator = Jim Trask

Date-Time	Activity
1	Check Tanks; filters: Tanks full; Test water — Smashed Little finger Right hand — Put in Meter At Helth center
2	Checked TANKS & filters: TANKS full: Tested water: OK — Cold / overcast
3	Checked TANKS & filters TANKS full; Tested water ok
4	Check Tanks & filters Tanks full Test water — worked on mudding office
5	check filters & tanks Tanks full Test water — Took sample To Lab Crosby. R&S.
6	Check filters & Tanks; tanks full Test water — finished puting in meter
7	Check Tank & filters Tanks full test water
8	check Tanks & filters Tanks full Test water — Sanded mud in office
9	Checked Tanks & filters TANKS full / Tested water ok — Sunny/chill
10	Checked Tanks & filters TANKS full; Tested water OK — Sunny
11	checked Tanks & filters Tanks full Test water — Sanded office
12	Check Tanks & filters Tanks full Test water — Picked up Desk for office used my truck 190 miles
13	Check Tanks & filters Tanks full Test water — mud office 2nd coat
14	check Tanks & filters Tanks full Test water — Replaced Valve — Pump Gas off on — 15 water flows — 10 on all way
15	Check Tanks & filters Tanks full Test water

Filter - Tubidities

1	2-				
2	2-				
3	2-				

SMALL WATER SYSTEM TREATMENT RECORDS

ORLEANS COMMUNITY SERVICES DISTRICT   SYSTEM NO. 1200729

Month/Year: Feb 2013   Operator: James Trask

Date	Time	Meter Reading (gallons)	Water Treated (gallons)	Turbidities: Raw (NTU)	Turbidities: Filtered (NTU)	Polymer Feed: Dosage (ppm)	Polymer Feed: Tank Vol. (gal)	Polymer Feed: Solution Used (gal)	Chlorination: Dosage (ppm)	Chlorination: Tank Vol. (gal)	Chlorination: Solution Used (gal)	Chlorination: *Residual entering distribution (ppm)	Remarks (note backwashes, pump settings, solution added, maintenance, etc.)
		159977											
1	11:00	161063	108600	.29	.20	.01	24	Ø	.3	46	1	.2 60/60	
2	[illegible]	163317	125400	.24	.22	.01	24	X	.4	45	1	.3	
3	1:00	163014	69700	.23	.24	.01	24	Ø	.5	44	1	.3	
4	930	163815	80100	.28	.22	.01	24	Ø	.5	42	2	.3 60/60	
5	1100	164876	106100	.31	.22	.01	24	Ø	.5	40	2	.3 50/50	
6	2:00P	166014	113800	.30	.21	.02	24	Ø	.4	39	1	.3	
7	1030	166806	79200	.34	.21	.02	24	Ø	.3	38	1	.2 ~~60/60~~	70/70
8	1200	167815	100900	.24	.20	.02	24	Ø	.3	36	2	.2	
9	2:00	169030	124500	.29	.27	.02	24	Ø	.3	34	2	.2	
10	3:30	169907	84700	.24	.25	.02	24	Ø	.3	32	2	.2	
11	1130	170761	85400	.29	.22	.02	24	Ø	.4	30	2	.2 65/65	
12	900	171612	85100	.28	.23	.02	24	Ø	.3	28	2	.2	
13	10:00	172645	103300	.30	.22	.02	24	Ø	.3	26	2	.2	
14	11:00	173665	102000	.20	.16	.02	24	Ø	.3	24	2	.2	
15	1000	174575	91000	.21	.14	.02	24	Ø	.2	23	1	.2 70/70	
16	330P	175768	119300	.20	.13	.02	24	Ø	.3	20	3	.2	
17	12:30	176661	89300	.19	.16	.01	24	Ø	.3	18	2	.2	
18	9:00	177667	120600	.22	.16	.01	24	Ø	.2	16	2	.2	
19	1030	178330	46300	.25	.16	.01	24	Ø	.3	15	1	.2	
20	11:00	179315	98500	.20	.12	.01	24	Ø	.2	13	2	.2 50/50	
21	1100	180241	92600	.20	.13	.01	24	Ø	.3	10	3	.2	
22	1:30P	181218	97700	.19	.15	.01	24	Ø	.3	7/50	3	.2	12gl Cl_2 5gl Poly + 30gl H_2O
23	7:00	182230	107200	.16	.14	.01	24	Ø	1.0	47	3	.5 60/60	NDB cl_2 high
24	10:00	182740	45600	.18	.13	.01	24	Ø	.7	45	2	.4	
25	1:00	183824	108400	.28	.14	.01	24	Ø	.7	42	3	.5 50/50	
26	1030	184505	68100	.18	.13	.01	24	Ø	.5	42	0	.4	
27	1000	185288	78300	.20	.13	.01	24	Ø	.5	41	1	.4	
28	1100	186106	81800	.37	.14	.01	24	Ø	.4	40	1	.3	
29													
30													
31													

* Chlorine residual entering distribution system must be greater than or equal to 0.2 ppm.

Polymer Solution Strength = .01   Name of polymer used: POACOST al 186K   Chlorine Solution Strength = 12.5%   See back for other special monitoring...

SMALL WATER SYSTEM TREATMENT RECORDS

ORLEANS COMMUNITY SERVICES DISTRICT SYSTEM NO. 1200729

Month/Year: JAN 2013

Operator: JIM TRASK

Date	Time	Meter Reading (gallons)	Water Treated (gallons)	Turbidities: Raw (NTU)	Turbidities: Filtered (NTU)	Polymer Feed: Dosage (ppm)	Polymer Feed: Tank Vol. (gal)	Polymer Feed: Solution Used (gal)	Chlorination: Dosage (ppm)	Chlorination: Tank Vol. (gal)	Chlorination: Solution Used (gal)	Chlorination: *Residual entering distribution (ppm)	Remarks (note backwashes, pump settings, solution added, maintenance, etc.)
		339710											
1	500P	340349	63900										
2	11:00	340625	27600										
3	930	341110	48500										
4	1630	341665	55500										
5	1100P	342278	61300										
6													
7	10 00	342820	54200										
8	1130	343350	53000										
9	900	343805	45500										
10	1200	344438	63300										
11	930	344846	40800										
12	230	345572	72600										
13	530P	34[illegible]355	78300										
14	1:00P	347055	70000										
15	1130	348063	100800										
16	900	348861	79800										
17	130P	349960	109900										
18	830	350687	72700										
19	530P	351910	122300										
20	430P	352685	77500										
21	1030	353222	53700										
22	1100	353994	77200										
23	10:00	3546[illegible]	62300										
24	2:00Pm	355187	57000										
25	1030	355585	39800										
26	9:00P	356371	78600 [illegible]										
27	4:00	356903	53200										
28	930	357316	41300										
29	11:00	357825	50900										
30	9:30A	358346	52100										
31	10:00	359022	67600										

* Chlorine residual entering distribution system must be greater than or equal to 0.2 ppm.

Polymer Solution Strength = ________ Name of polymer used: ________ Chlorine Solution Strength = ________ See back for other special monitoring...

MONTH/YR = JAN 2013 OCSD OPERATOR = JIM TRASK

Date-Time	Activity
1	Check ~~water~~ filters + Tanks; Tanks full; Test water; HAPPY NEW YEAR! Tom Horns Tank full - over flow
2	check filters + tanks tanks full; Test water BACK wash #2 work on office Cold
3	check filters + Tank Tanks full; Test water, BACK wash #3 "DR App." Cold
4	Check filters + Tank Tanks full Test water work on office.
5 SAT	check filters + Tank Tanks full Test water
6	Telly No show - No call
7	check filters + Tank tanks full Test water work on office
8	check filter + tanks Tanks full Test water
9	Check filters + Tanks Tanks full Test water Pick-up Drywall Lift ~~worked~~ samples To Lab
10	Check filters + tanks Tanks full Test water Put up dry wall
11	check filters + Tanks Tanks full test water put up drywall
12 SAT	JT - 6 hr check filters + tanks Tanks full test water Put up dry wall
13 SUN	JT Check Tanks + filters; tanks full Test water put up dry wall
14	check Tanks + filters tanks full test water ~~Clean up office~~ put up dry wall
15	Check Tanks + filters; tanks full; Test water Line to BACK wash Tank Broke H2O meeting Clean up office

Filter · Tubidities

1				
2				
3				

SMALL WATER SYSTEM TREATMENT RECORDS
ORLEANS COMMUNITY SERVICES DISTRICT SYSTEM NO. 1200729

Month/Year: JAN 2013 Operator: Jim TRASK

Date	Time	Meter Reading (gallons)	Water Treated (gallons)	Turbidities Raw (NTU)	Turbidities Filtered (NTU)	Polymer Feed Dosage (ppm)	Polymer Feed Tank Vol. (gal)	Polymer Feed Solution Used (gal)	Chlorination Dosage (ppm)	Chlorination Tank Vol. (gal)	Chlorination Solution Used (gal)	*Residual entering distribution (ppm)	Remarks (note backwashes, pump settings, solution added, maintenance, etc.)
		130285				.01				30			
1	500 P	131403	111800	.22	.18	.01	24	Ø	.3	27	3	.2	
2	11:00	132035	63200	.21	.17	.01	24	Ø	.2	25	2	.2 89/80	
3	930	132857	82200	.23	.18	.01	24	Ø	.3	23	2	.2	
4	1030	133832	97560	.26	.19	.01	24	Ø	.3	20/50	3	.2	
5	11:00p	135038	120600	.24	.19	.01	24	Ø	.3	16	4	.2	
6													
7	10:00	136248	121000	.26	.20	.01	24	Ø	.4	13	3	.2	
8	1130	137180	93200	.23	.20	.01	24	Ø	.3	10/50	3	.2 60/60	12gl Cl2 + 5 m/L Poly + 28gl H2O
9	900	137966	78600	.24	.19	.01	24	Ø	.4	48	2	.2	
10	12:00	138947	98100	.26	.19	.01	24	Ø	.4	47	1	.3 70/70	
11	9:30	139678	73100	.25	.20	.01	24	Ø	.2	46	1	.2 70/70	
12	2:30	140789	110600	.28	.20	.01	24	Ø	.4	45	1	.2	
13	530	141931	114700	.27	.19	.01	24	Ø	.5	41	4	.3 60/60	
14	1:00P	142825	89400	.26	.21	.01	24	Ø	.4	39	2	.3	
15	1130	144048	122300	.31	.18	.01	24	Ø	.4	38	1	.2	
16	900	145074	102600	.26	.19	.01	24	Ø	.3	36	2	.2	
17	130P	146450	137600	.29	.20	.01	24	Ø	.3	34	2	.3 70/70	
18	830	147389	93900	.25	.19	.01	24	Ø	.3	32	2	.2	
19	530P	149000	161100	.27	.20	.01	24	Ø	.3	29	3	.2	
20	430P	150070	107000	.23	.20	.01	24	Ø	.3	26	3	.2	
21	1030	150833	76300	.23	.17	.01	24	Ø	.4	25	1	.2	
22	11:00	151898	106500	.29	.20	.01	24	Ø	.3	22	3	.2	
23	10:00	152815	91700	.30	.19	.01	24	Ø	.3	20	2	.2	
24	2:00pm	153825	101000	.27	.21	.01	24	Ø	.4	18	2	.3	Ø
25	10:30	154513	68800	.32	.21	.01	24	Ø	.3	16	2	.2	
26	9:00	155768	125500	.29	.20	.01	24	Ø	.2	14	2	.2	
27	4:00	156563	79500	.48	.18	.01	24	Ø	.2	12	2	.2 74/75	OOB
28	930	157220	65700	.33	.19	.01	24	Ø	.3	11	1	.2	
29	11:00	158090	87000	.27	.20	.01	24	Ø	.3	10/50	1	.2 60/60	12gl Cl2 + 7 m/L Poly + 28gl H2O
30	9:30a	158930	84600	.31	.18	.01	24	Ø	.4	48	2	.3	
31	10:00	159977	104100	.29	.20	.01	24	Ø	.4	47	1	.3	

Jims (beside row 24)

* Chlorine residual entering distribution system must be greater than or equal to 0.2 ppm.

Polymer Solution Strength = .01 Name of polymer used: POAeSTOl 186K Chlorine Solution Strength = 12.5% See back for other special monitoring...

#1 Backwash Dec 31 ② Backwash #2 ③ Backwash #3 ㉙ Backwash #1 ㉚ Backwash #2 ㉛ Backwash #3

STATE OF CALIFORNIA
STATE WATER RESOURCES CONTROL BOARD

DIVISION OF WATER RIGHTS

ORDER

Application 25533 Permit 17573 License ____

ORDER APPROVING A NEW DEVELOPMENT SCHEDULE, ADDING AN ENDANGERED SPECIES TERM, AND AMENDING THE PERMIT

WHEREAS:

1. Permit 17573 was issued to Orleans Community Services District on March 9, 1979.

2. On January 23, 1985 the State Water Resources Control Board approved a new completion schedule that specifies that complete use of water be made by December 31, 1993.

3. A petition for an Extension of Time in which to develop the project and apply the water to the proposed use was filed with the State Water Resources Control Board on February 28, 1996. Full beneficial use of water was dependent upon complete build out within the permittee's service area.

4. The permittee has proceeded with diligence and good cause has been shown for the extension of time.

5. Fish and/or wildlife species have been or may be listed under the federal Endangered Species Act and/or the California Endangered Species Act.

NOW, THEREFORE, IT IS ORDERED THAT:

1. Paragraph 9 of the permit is amended to read as follows:

   Complete application of water to the authorized use shall be made by December 31, 2008.

2. The addition of Paragraph 18 to read as:

   This permit does not authorize any act which results in the taking of a threaten or endangered species or any act which is now prohibited, or becomes prohibited in the future, under either the

California Endangered Species Act (Fish and Game Code sections 2050 to 2097) or the federal Endangered Species Act (16 U.S.C.A. sections 1531 to 1544). If a "taking" will result from any act authorized under this water right, the permittee shall obtain an incidental take permit prior to construction or operation. Permittee shall be responsible for meeting all requirements of the applicable Endangered Species Act for the project authorized under this permit.

(0000014)

Dated: **FEBRUARY 9 1999**

Harry M. Schueller, Chief
Division of Water Rights

STATE OF CALIFORNIA
THE RESOURCES AGENCY
STATE WATER RESOURCES CONTROL BOARD

DIVISION OF WATER RIGHTS

ORDER

APPLICATION 25533 PERMIT 17573 LICENSE

ORDER APPROVING A NEW DEVELOPMENT SCHEDULE AND AMENDING THE PERMIT

WHEREAS:

1. A petition for extension of time within which to develop the project and apply the water to the proposed use has been filed with the State Water Resources Control Board.

2. The permittee has proceeded with diligence and good cause has been shown for extension of time.

NOW, THEREFORE, IT IS ORDERED THAT:

1. Paragraph 9 of the permit is amended to read as follows:

   COMPLETE APPLICATION OF THE WATER TO THE PROPOSED USE SHALL BE MADE ON OR BEFORE December 1, 1993

2. Paragraph 12 of this permit is deleted. A new Paragraph 12 is added as follows:

   Pursuant to California Water Code Sections 100 and 275, and the common law public trust doctrine, all rights and privileges under this permit and under any license issued pursuant thereto, including method of diversion, method of use, and quantity of water diverted, are subject to the continuing authority of the State Water Resources Control Board in accordance with law and in the interest of the public welfare to protect public trust uses and to prevent waste, unreasonable use, unreasonable method of use, or unreasonable method of diversion of said water.

   The continuing authority of the Board may be exercised by imposing specific requirements over and above those contained in this permit with a view to eliminating waste of water and to meeting the reasonable water requirements of permittee without unreasonable draft on the source.

Permittee may be required to implement a water conservation plan, features of which may include but not necessarily be limited to: (1) reusing or reclaiming the water allocated; (2) using water reclaimed by another entity instead of all or part of the water allocated; (3) restricting diversions so as to eliminate agricultural tailwater or to reduce return flow; (4) suppressing evaporation losses from water surfaces; (5) controlling phreatophytic growth; and (6) to installing, maintaining, and operating efficient water measuring devices to assure compliance with the quantity limitations of this permit and to determine accurately water use as against reasonable water requirements for the authorized project. No action will be taken pursuant to this paragraph unless the Board determines, after notice to affected parties and opportunity for hearing, that such specific requirements are physically and financially feasible and are appropriate to the particular situation. The continuing authority of the Board also may be exercised by imposing further limitations on the diversion and use of water by the permittee in order to protect public trust uses. No action will be taken pursuant to this paragraph unless the Board determines, after notice to affected parties and opportunity for hearing, that such action is consistent with California Constitution Article X, Section 2; is consistent with the public interest and is necessary to preserve or restore the uses protected by the public trust. (0000012)

3. Paragraph 17 is added to this permit as follows:

Permittee shall consult with the Division of Water Rights and the Department of Water Resources and develop and implement a water conservation plan or actions. The proposed plan or actions shall be presented to the Board for approval within one year from the date of this permit (order) or such further time as may, for good cause shown, be allowed by the Board. A progress report on the development of a water conservation plan may be required by the Board within this period.
(0000029)

Dated: JANUARY 23 1985

Raymond Walsh

Raymond Walsh, Chief
Division of Water Rights

STATE OF CALIFORNIA
THE RESOURCES AGENCY
STATE WATER RESOURCES CONTROL BOARD
DIVISION OF WATER RIGHTS

PERMIT FOR DIVERSION AND USE OF WATER

PERMIT 17573

Application 25533 of Orleans Community Services District

P. O. Box 128, Orleans, California 95556

filed on October 18, 1977, has been approved by the State Water Resources Control Board SUBJECT TO VESTED RIGHTS and to the limitations and conditions of this Permit.

Permittee is hereby authorized to divert and use water as follows:

1. Source:	Tributary to:
Perch Creek	Klamath River

2. Location of point of diversion:	40-acre subdivision of public land survey or projection thereof	Section	Township	Range	Base and Meridan
S1100 ft. & W400 ft. from NE Corner of Section 32	NE¼ of NE¼	32	11N	6E	H

County of Humboldt

3. Purpose of use:	4. Place of use:	Section	Township	Range	Base and Meridan	Acres
Irrigation						
Domestic						
Recreational						
Stockwatering	Within the Boundaries of					
	the Orleans Community					
	Services District	1	10N	5E	H	
		6	10N	6E	H	
		36	11N	5E	H	
	29, 30, 31, &	32	11N	6E	H	

The place of use is shown on map filed with the State Water Resources Control Board.

WRCB 14 (11-72)

27962-983 10-74 2M OSP

5. THE WATER APPROPRIATED SHALL BE LIMITED TO THE QUANTITY WHICH CAN BE BENEFICIALLY USED AND SHALL NOT EXCEED: (A) 1.74 CUBIC FEET PER SECOND BY DIRECT DIVERSION FROM APRIL 1 TO SEPTEMBER 1 OF EACH YEAR FOR IRRIGATION; (B) 0.321 CUBIC FOOT PER SECOND BY DIRECT DIVERSION FROM JANUARY 1 TO DECEMBER 31 OF EACH YEAR FOR DOMESTIC, RECREATIONAL AND STOCKWATERING USES. THE MAXIMUM AMOUNT DIVERTED UNDER THIS PERMIT FOR ALL USES SHALL NOT EXCEED 751 ACRE-FEET PER YEAR. (0000005)

6. THE AMOUNT AUTHORIZED FOR APPROPRIATION MAY BE REDUCED IN THE LICENSE IF INVESTIGATION WARRANTS. (0000006)

7. ACTUAL CONSTRUCTION WORK SHALL BEGIN ON OR BEFORE TWO YEARS FROM DATE OF PERMIT AND SHALL THEREAFTER BE PROSECUTED WITH REASONABLE DILIGENCE, AND IF NOT SO COMMENCED AND PROSECUTED, THIS PERMIT MAY BE REVOKED. (0000007)

8. SAID CONSTRUCTION WORK SHALL BE COMPLETED ON OR BEFORE DECEMBER 1, 1982. (0000008)

9. COMPLETE APPLICATION OF THE WATER TO THE PROPOSED USE SHALL BE MADE ON OR BEFORE DECEMBER 1, 1983. (0000009)

10. PROGRESS REPORTS SHALL BE SUBMITTED PROMPTLY BY PERMITTEE WHEN REQUESTED BY THE STATE WATER RESOURCES CONTROL BOARD UNTIL LICENSE IS ISSUED. (0000010)

11. PERMITTEE SHALL ALLOW REPRESENTATIVES OF THE STATE WATER RESOURCES CONTROL BOARD AND OTHER PARTIES AS MAY BE AUTHORIZED FROM TIME TO TIME BY SAID BOARD, REASONABLE ACCESS TO PROJECT WORKS TO DETERMINE COMPLIANCE WITH THE TERMS OF THIS PERMIT. (0000011)

12. PURSUANT TO CALIFORNIA WATER CODE SECTIONS 100 AND 275, ALL RIGHTS AND PRIVILEGES UNDER THIS PERMIT AND UNDER ANY LICENSE ISSUED PURSUANT THERETO, INCLUDING METHOD OF DIVERSION, METHOD OF USE, AND QUANTITY OF WATER DIVERTED, ARE SUBJECT TO THE CONTINUING AUTHORITY OF THE STATE WATER RESOURCES CONTROL BOARD IN ACCORDANCE WITH LAW AND IN THE INTEREST OF THE PUBLIC WELFARE TO PREVENT WASTE, UNREASONABLE USE, UNREASONABLE METHOD OF USE, OR UNREASONABLE METHOD OF DIVERSION OF SAID WATER.

THE CONTINUING AUTHORITY OF THE BOARD MAY BE EXERCISED BY IMPOSING SPECIFIC REQUIREMENTS OVER AND ABOVE THOSE CONTAINED IN THIS PERMIT WITH A VIEW TO MINIMIZING WASTE OF WATER AND TO MEETING THE REASONABLE WATER REQUIREMENTS OF PERMITTEE WITHOUT UNREASONABLE DRAFT ON THE SOURCE. PERMITTEE MAY BE REQUIRED TO IMPLEMENT SUCH PROGRAMS AS (1) REUSING OR RECLAIMING THE WATER ALLOCATED; (2) USING WATER RECLAIMED BY ANOTHER ENTITY INSTEAD OF ALL OR PART OF THE WATER ALLOCATED; (3) RESTRICTING DIVERSIONS SO AS TO ELIMINATE AGRICULTURAL TAILWATER OR TO REDUCE RETURN FLOW; (4) SUPPRESSING EVAPORATION LOSSES FROM WATER SURFACES; (5) CONTROLLING PHREATOPHYTIC GROWTH; AND (6) INSTALLING, MAINTAINING, AND OPERATING EFFICIENT WATER MEASURING DEVICES TO ASSURE COMPLIANCE WITH THE QUANTITY LIMITATIONS OF THIS PERMIT AND TO DETERMINE ACCURATELY WATER USE AS AGAINST REASONABLE WATER REQUIREMENTS FOR THE AUTHORIZED PROJECT. NO ACTION WILL BE TAKEN PURSUANT TO THIS PARAGRAPH UNLESS THE BOARD DETERMINES, AFTER NOTICE TO AFFECTED PARTIES AND OPPORTUNITY FOR HEARING, THAT SUCH SPECIFIC REQUIREMENTS ARE PHYSICALLY AND FINANCIALLY FEASIBLE AND ARE APPROPRIATE TO THE PARTICULAR SITUATION. (0000012)

13. THE QUANTITY OF WATER DIVERTED UNDER THIS PERMIT AND UNDER ANY LICENSE ISSUED PURSUANT THERETO IS SUBJECT TO MODIFICATION BY THE STATE WATER RESOURCES CONTROL BOARD IF, AFTER NOTICE TO THE PERMITTEE AND AN OPPORTUNITY FOR HEARING, THE BOARD FINDS THAT SUCH MODIFICATION IS NECESSARY TO MEET WATER QUALITY OBJECTIVES IN WATER QUALITY CONTROL PLANS WHICH HAVE BEEN OR HEREAFTER MAY BE ESTABLISHED OR MODIFIED PURSUANT TO DIVISION 7 OF THE WATER CODE. NO ACTION WILL BE TAKEN PURSUANT TO THIS PARAGRAPH UNLESS THE BOARD FINDS THAT (1) ADEQUATE WASTE DISCHARGE REQUIREMENTS HAVE BEEN PRESCRIBED AND ARE IN EFFECT WITH RESPECT TO ALL WASTE DISCHARGES WHICH HAVE ANY SUBSTANTIAL EFFECT UPON WATER QUALITY IN THE AREA INVOLVED, AND (2) THE WATER QUALITY OBJECTIVES CANNOT BE ACHIEVED SOLELY THROUGH THE CONTROL OF WASTE DISCHARGES. (0000013)

14. THE EQUIVALENT OF THIS CONTINUOUS FLOW ALLOWANCE FOR ANY 30-DAY PERIOD MAY BE DIVERTED IN A SHORTER TIME, PROVIDED THERE BE NO INTERFERENCE WITH OTHER VESTED RIGHTS AND INSTREAM BENEFICIAL USES; AND PROVIDED FURTHER THAT ALL TERMS OR CONDITIONS PROTECTING INSTREAM BENEFICIAL USES BE OBSERVED. (0000027)

15. FOR THE PROTECTION OF FISH AND WILDLIFE, PERMITTEE SHALL DURING THE PERIOD:
(A) FROM JANUARY 1 THROUGH APRIL 30 BYPASS A MINIMUM OF 8 CUBIC FEET PER SECOND;
(B) FROM MAY 1 THROUGH JUNE 30 BYPASS A MINIMUM OF 4 CUBIC FEET PER SECOND;
(C) FROM JULY 1 THROUGH OCTOBER 31 BYPASS A MINIMUM OF 1.5 CUBIC FEET PER SECOND;
(D) FROM NOVEMBER 1 THROUGH DECEMBER 31 BYPASS A MINIMUM OF 4 CUBIC FEET PER SECOND.
THE TOTAL STREAMFLOW SHALL BE BYPASSED WHENEVER IT IS LESS THAN THE DESIGNATED AMOUNT FOR THAT PERIOD. (0140060)

16. NO WATER SHALL BE DIVERTED UNDER THIS PERMIT UNTIL PERMITTEE HAS INSTALLED A DEVICE, SATISFACTORY TO THE STATE WATER RESOURCES CONTROL BOARD, WHICH IS CAPABLE OF MEASURING THE FLOW REQUIRED BY THE CONDITIONS OF THIS PERMIT. SAID MEASURING DEVICE SHALL BE PROPERLY MAINTAINED. (0060062)

This permit is issued and permittee takes it **subject to the following provisions of the Water Code:**

Section 1390. A permit shall be effective for such time as the water actually appropriated under it is used for a useful and beneficial purpose in conformity with this division (of the Water Code), but no longer.

Section 1391. Every permit shall include the enumeration of conditions therein which in substance shall include all of the provisions of this article and the statement that any appropriator of water to whom a permit is issued takes it subject to the conditions therein expressed.

Section 1392. Every permittee, if he accepts a permit, does so under the conditions precedent that no value whatsoever in excess of the actual amount paid to the State therefor shall at any time be assigned to or claimed for any permit granted or issued under the provisions of this division (of the Water Code), or for any rights granted or acquired under the provisions of this division (of the Water Code), in respect to the regulation by any competent public authority of the services or the price of the services to be rendered by any permittee or by the holder of any rights granted or acquired under the provisions of this division (of the Water Code) or in respect to any valuation for purposes of sale to or purchase, whether through condemnation proceedings or otherwise, by the State or any city, city and county, municipal water district, irrigation district, lighting district, or any political subdivision of the State, of the rights and property of any permittee, or the possessor of any rights granted, issued, or acquired under the provisions of this division (of the Water Code).

Dated: MARCH 9 1979

STATE WATER RESOURCES CONTROL BOARD

Walter G. Pettit

for ***Chief, Division of Water Rights***

Appendix C Water Demand and Storage Calculations

This Appendix contains the calculations performed to determine water demand.

Orleans Water Demands Using CCR Title 22 Chapter 16 (Based on meter data)

Average Daily Demand	ADD	133,574	gpd
Max Daily Demand	MDD	315,828	gpd
Peak Hourly Demand	PHD	19,739	gph
Peak Hourly Demand	PHD	329	gpm

*All data above originates in spreadsheet "OCSD Usage per meter month by month-idh"

Orleans Water Demands with losses Using CCR Title 22 Chapter 16 (Based on meter data)

Average Daily Demand	ADD	146,931	gpd
Max Daily Demand	MDD	347,411	gpd
Peak Hourly Demand	PHD	21,713	gph
Peak Hourly Demand	PHD	362	gpm

*All data above originates in spreadsheet "OCSD Usage per meter month by month-idh"

Projected future demands using meter data with losses

Years in the Future	Present	10	20	30
Average Daily Demand	146,931	156,290	165,649	175,007
Max Daily Demand	347,411	369,539	391,667	413,795
Connections	157	167	177	187

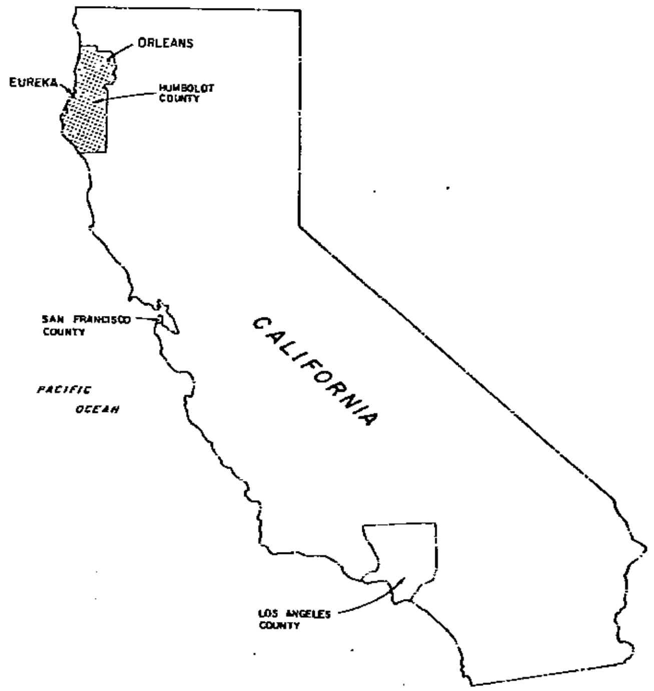
Storage Calculations	***Volume (gallons)***
Working	146,931
Fire	123,000
Emergency	64,500
Total	334,431

Appendix D Design Drawings for Orleans CSD Water System

This Appendix contains the as built drawings for Orleans CSD provided by the client.

ORLEANS COMMUNITY SERVICES DISTRICT

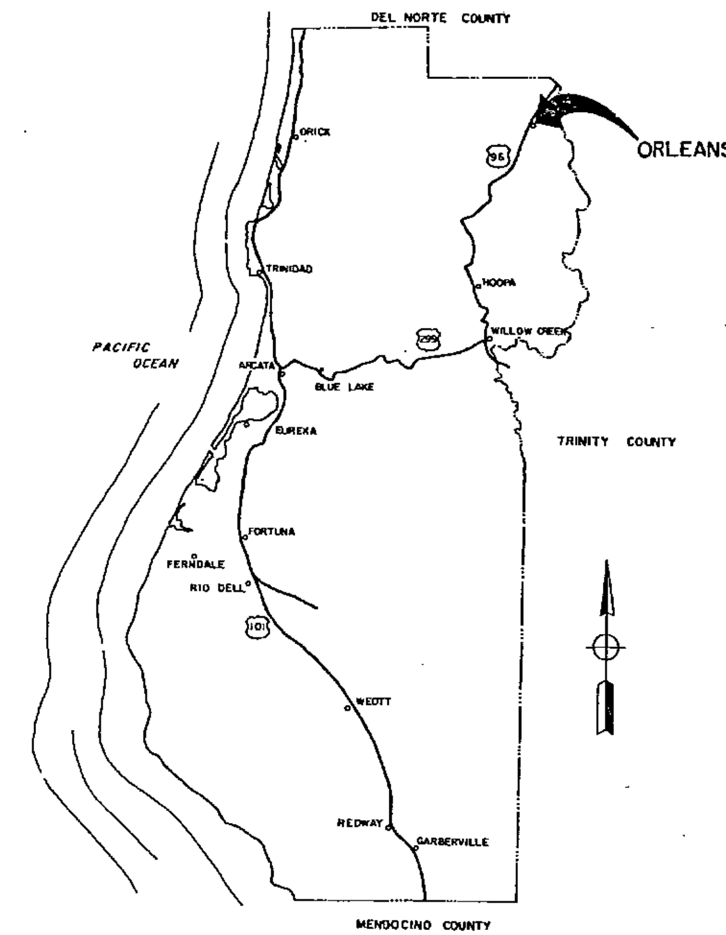
WATER SYSTEM



LOCATION MAP
SCALE - 1 : 5,000,000

SHEET INDEX

SHEET NO.	DESCRIPTION
1	COVER SHEET
2	INDEX SHEET
3	TANK DETAILS
4	TANK SITE
5	DIVERSION FACILITY AND PEARCH CREEK CROSSING
6	TRENCH DETAILS
7	BOOSTER STATIONS & STD. DETAILS
8	STANDARD DETAILS
9	STANDARD DETAILS
10	TRENCH SHORING AND SAFETY REQUIREMENTS
11	SOIL LOGS
12	TRAFFIC DETAILS
13	KLAMATH RIVER CABLE CROSSING
14	KLAMATH RIVER CABLE CROSSING SITE PLANS
15	KLAMATH RIVER CABLE ANCHORAGE DETAILS
16	PEARCH CREEK CABLE CROSSING
17	PEARCH CREEK CABLE ANCHORAGE AND TYPICAL SUSPENDED CABLE DETAILS
18-50	PLAN AND PROFILE



VICINITY MAP
NO SCALE

BOARD OF DIRECTORS
THOMAS P. JORDAN
LLOYD H. DOWNS
LONNIE JOHNSON
ORVILLE FELTMAN
JACK G. CLARK

PLANS AND SPECIFICATIONS APPROVED BY THE BOARD OF DIRECTORS OF THE ORLEANS COMMUNITY SERVICES DISTRICT, COUNTY OF HUMBOLDT, STATE OF CALIFORNIA, THIS 7th DAY OF April 1978.

Thomas P. Jordan
THOMAS P. JORDAN
PRESIDENT

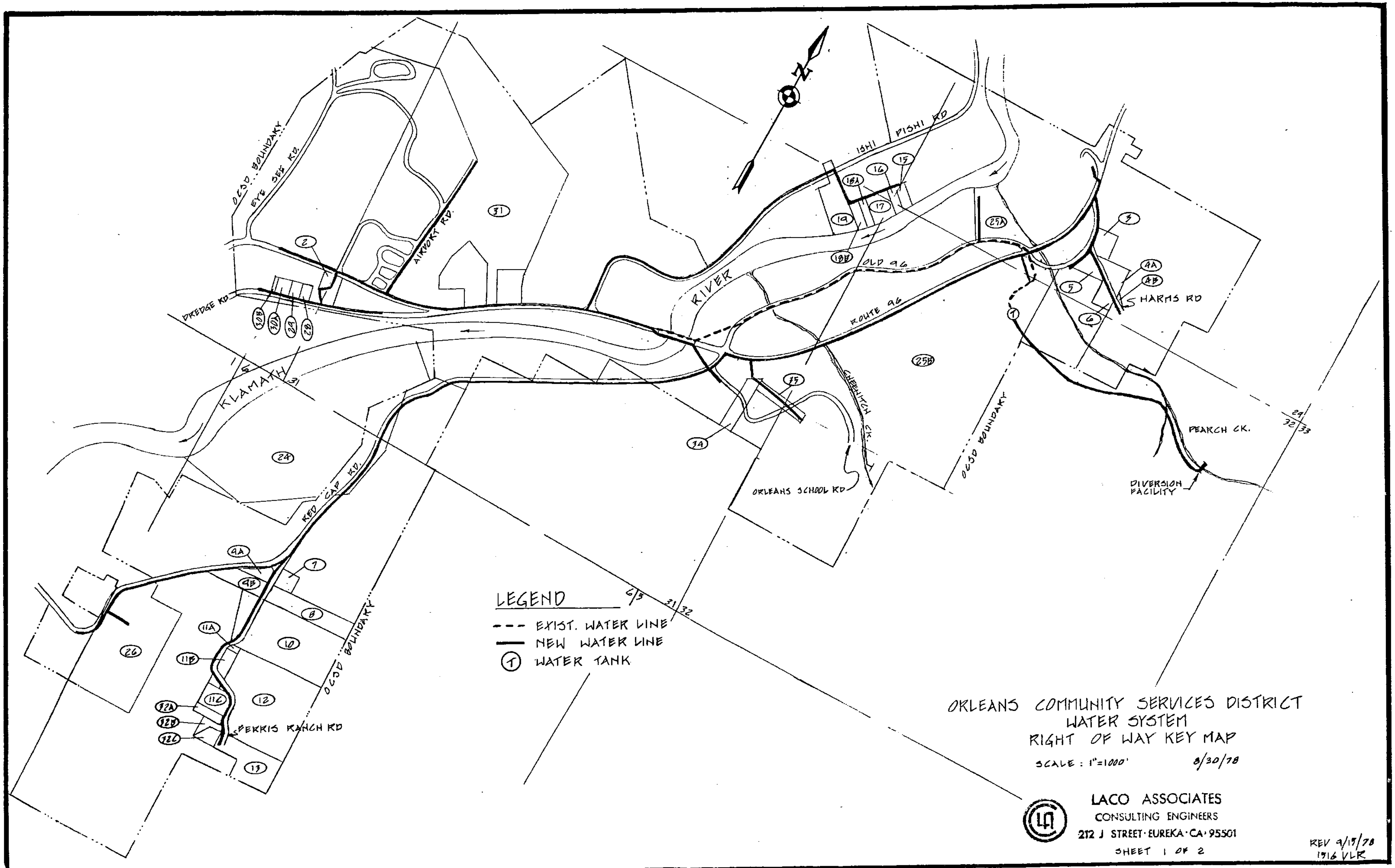
NO.	DATE	REVISIONS	DATE	DESIGNED BY
			1/11/78	RSF
			SCALE: AS SHOWN	DRAWN BY: b
			JOB NO. 1515	CHECKED BY:

ORLEANS COMMUNITY SERVICES DISTRICT
WATER SYSTEM

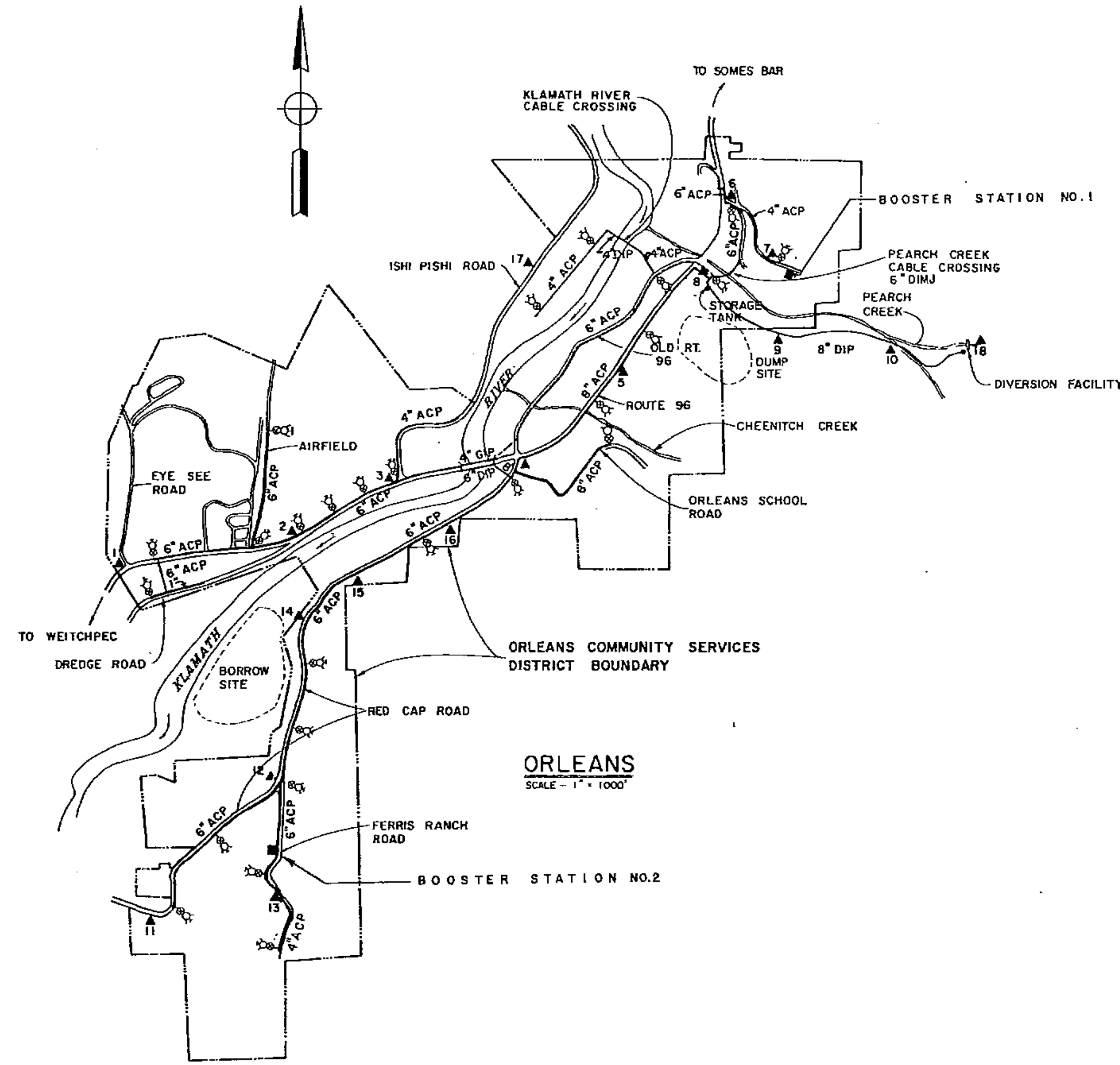
LACO ASSOCIATES
CONSULTING ENGINEERS
212 J STREET EUREKA, CALIF. 443-5054

COVER SHEET

SHEET 1 OF 50 SHEETS


N
OCSD BOUNDARY
EYE SEE RD.
AIRPORT RD.
DREDGE RD
KLAMATH
RIVER
ISHI PISHI RD
OLD 96
ROUTE 96
HARMS RD
CHEENITCH CK.
ORLEANS SCHOOL RD
OCSD BOUNDARY
PEARCH CK.
DIVERSION FACILITY
RED CAP RD.
OCSD BOUNDARY
PERRIS RANCH RD
2
2A
2B
3
4A
4B
5
6
7
8
9A
9B
10
11A
11B
11C
12
12A
12B
12C
13
15
16
17
18A
18B
19
24
25A
25B
26
30A
30B
31
34
35
LEGEND
EXIST. WATER LINE
NEW WATER LINE
WATER TANK
ORLEANS COMMUNITY SERVICES DISTRICT
WATER SYSTEM
RIGHT OF WAY KEY MAP
SCALE : 1"=1000'
8/30/78
LACO ASSOCIATES
CONSULTING ENGINEERS
212 J STREET · EUREKA · CA · 95501
SHEET 1 OF 2
REV 9/15/78
1516 VLR

AC	=	ASPHALT CONCRETE
ACP	=	ASBESTOS CEMENT PIPE
AGG	=	AGGREGATE
ALT	=	ALTERNATE
ANC	=	ANCHOR
BF	=	BUTTERFLY
BLDG	=	BUILDING
BRGS	=	BEARINGS
CIP	=	CAST IRON PIPE
C	=	CENTERLINE
CL	=	CLASS
CMP	=	CORRUGATED METAL PIPE
CONC	=	CONCRETE
CONT	=	CONTINUOUS
CONST	=	CONSTRUCTION
COR	=	CORNER
CTRS	=	CENTERS
CY	=	CUBIC YARDS
CTB	=	CEMENT TREATED BASE
CRB	=	CRUSHER RUN BASE
CTS	=	COPPER TUBING SIZE
DET	=	DETAIL
DI	=	DROP INLET
DIA	=	DIAMETER
DIMJ	=	DUCTILE IRON PIPE MECHANICAL JOINT
DIP	=	DUCTILE IRON PIPE
DF	=	DOUGLAS FIR
DS	=	DOWN SPOUT
E	=	EAST
EA	=	EACH
ELEV	=	ELEVATION
ELEC	=	ELECTRICAL
ESM'T	=	EASEMENT
EXC	=	EXCAVATION
EXT	=	EXTERIOR
FAB	=	FABRICATION
FB	=	FLAT BAR
FIN GR	=	FINISH GRADE
FL	=	FLOOR
FL	=	FLOW LINE
FH	=	FIRE HYDRANT
GL	=	GAS LINE
GA	=	GAUGE
GALV	=	GALVANIZED
GRND	=	GROUND
GPM	=	GALLONS PER MINUTE
G.V.	=	GATE VALVE
ID	=	INSIDE DIAMETER
INCL	=	INCLUDED
JCT	=	JUNCTION
LT	=	LEFT
MATL	=	MATERIAL
MAX	=	MAXIMUM
MB	=	METAL BOLT
MIN	=	MINIMUM
N	=	NORTH
N.C. THD	=	NATIONAL COARSE THREAD
NO.	=	NUMBER
NTS	=	NOT TO SCALE
OC	=	ON CENTERS
OD	=	OUTSIDE DIAMETER
OH	=	OVERHEAD
OSHA	=	OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION REGULATIONS
PL	=	PLATE OR PROPERTY LINE
PLC	=	PLASTIC COATED STEEL
PSI	=	POUNDS PER SQUARE INCH
PE	=	POLYETHYLENE
PB	=	POLYBUTYLENE
PVC	=	POLYVINYLCHLORIDE
PERM	=	PERMANENT
PG&E	=	PACIFIC GAS & ELECTRIC
PRV	=	PRESSURE RELIEF OR PRESSURE REDUCING VALVE
QTY	=	QUANTITY
RCP	=	REINFORCED CONCRETE PIPE
REQ'D	=	REQUIRED
RWD	=	REDWOOD
RSP	=	ROCK SLOPE PROTECTION
R/W	=	RIGHT OF WAY
S	=	SOUTH
SCH	=	SCHEDULE
SHT	=	SHEET
SQ	=	SQUARE
SEC	=	SECTION
SPEC	=	SPECIFICATION
STA	=	STATION
SD	=	STORM DRAIN
STD	=	STANDARD
STL	=	STEEL
TDH	=	TOTAL DYNAMIC HEAD
THD	=	THREAD
TYP	=	TYPICAL
UGC	=	UNDERGROUND CABLE
V	=	VOLT
VCP	=	VITRIFIED CLAY PIPE
VERT	=	VERTICAL
W	=	WEST
WL	=	WATER LINE
W/	=	WITH
WWM	=	WELDED WIRE MESH
&	=	AND
ø	=	DIAMETER



ORLEANS

SCALE - 1" = 1000'

LEGEND

- GATE VALVE UNLESS OTHER WISE SPECIFIED
- FIRE HYDRANT w/ VALVE
- METER
- 6" — INDICATES SIZE OF PIPE
- ▲ — INDICATES SOIL SAMPLE LOCATION
- INDICATES WATER LINE TIES TO EXISTING
- 3 / 5 — DETAIL NUMBER / SHEET DETAIL SHOWN ON
- ■ — BOOSTER STATION

NO.	DATE	REVISIONS

DATE 1/11/78	DESIGNED BY RSF
SCALE 1"=1000'	DRAWN BY
JOB NO. 1515	CHECKED BY

REGISTERED PROFESSIONAL ENGINEER RANDALL S. FORBES No. 28493 CIVIL STATE OF CALIFORNIA

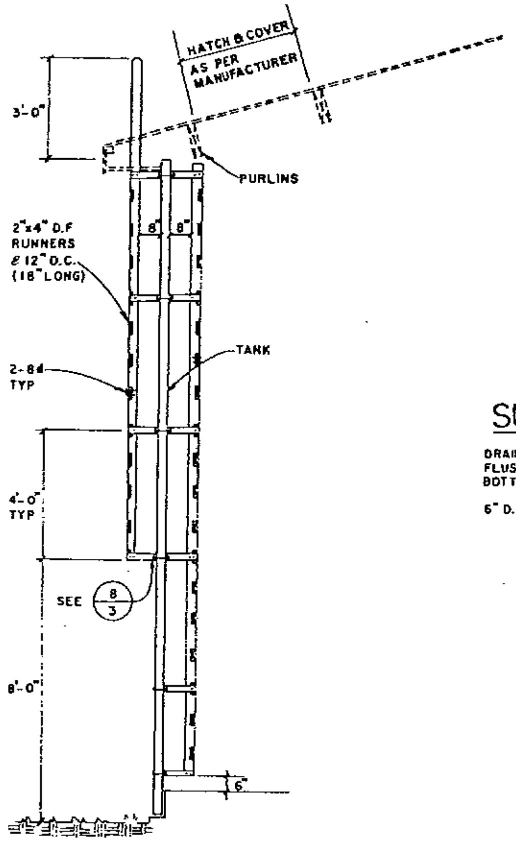
ORLEANS COMMUNITY SERVICES DISTRICT

WATER SYSTEM

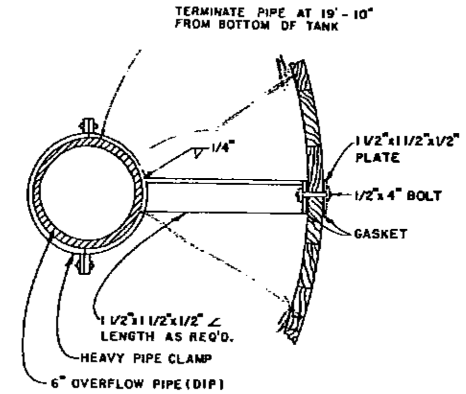
LACO ASSOCIATES
CONSULTING ENGINEERS
212 J STREET EUREKA, CALIF. 443-5054

INDEX SHEET
ABBREVIATIONS & SYMBOLS

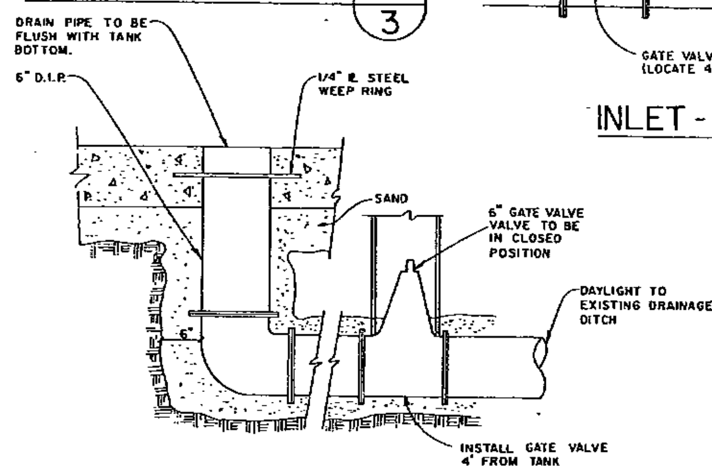
SHEET 2 OF 50 SHEETS



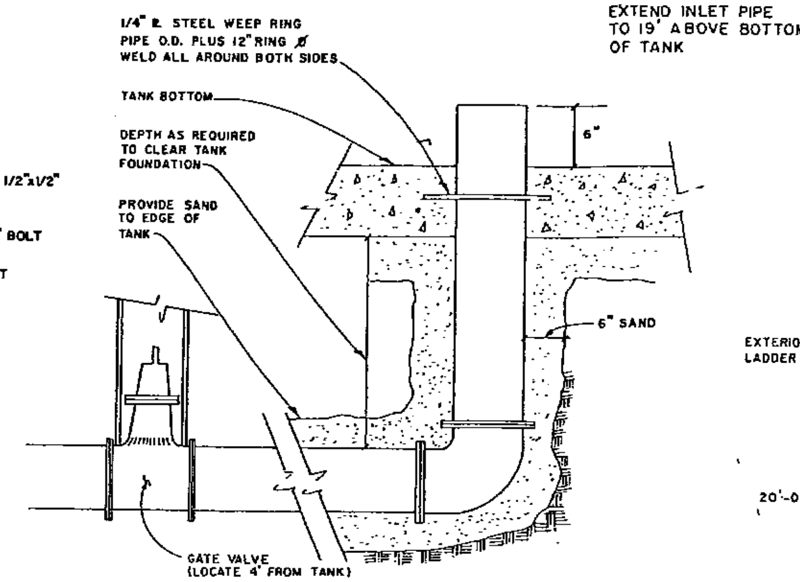
LADDER DETAIL 1/3



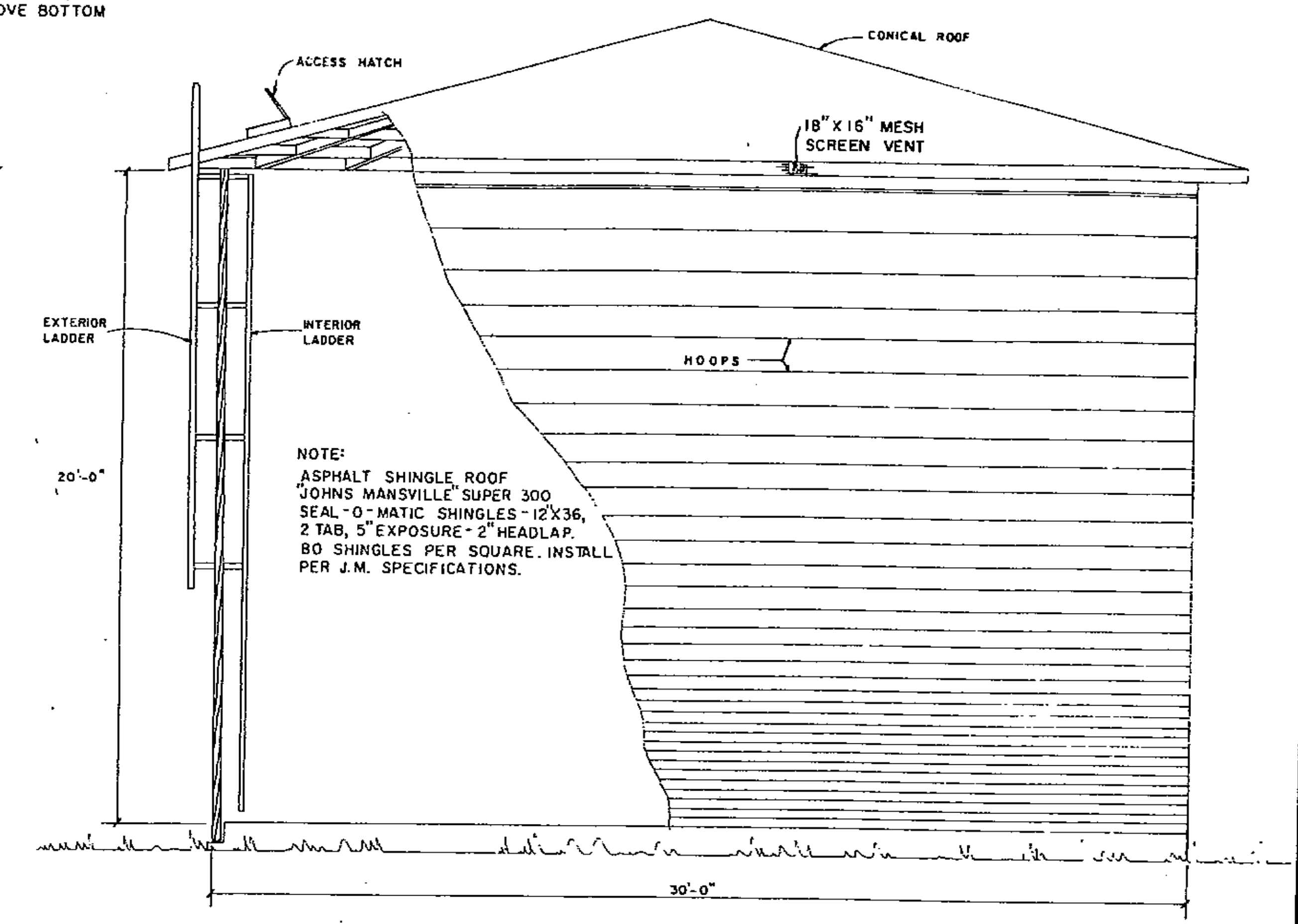
OVERFLOW SUPPORT DETAIL 2/3



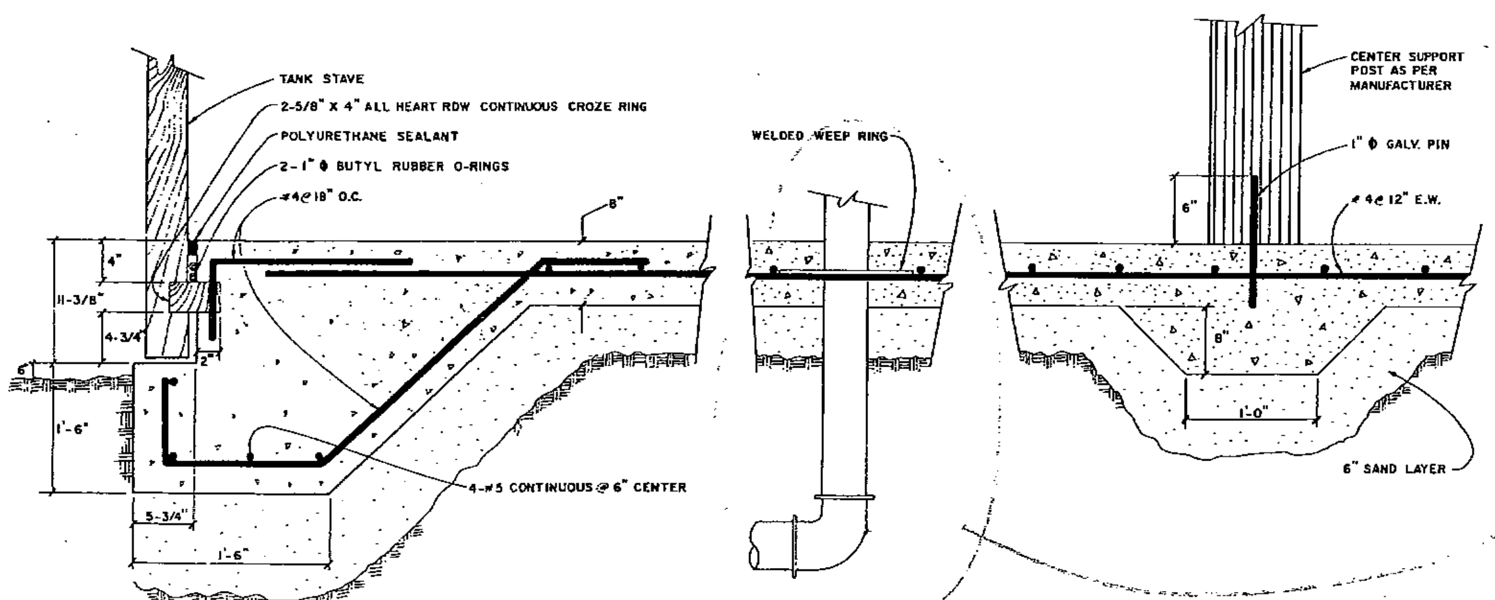
DRAIN DETAIL 3/3



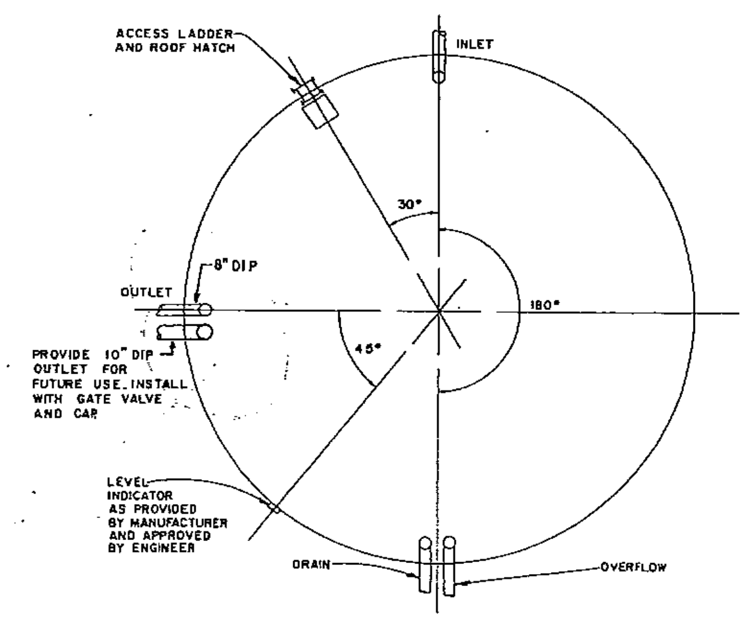
INLET - OUTLET DETAIL 4/3



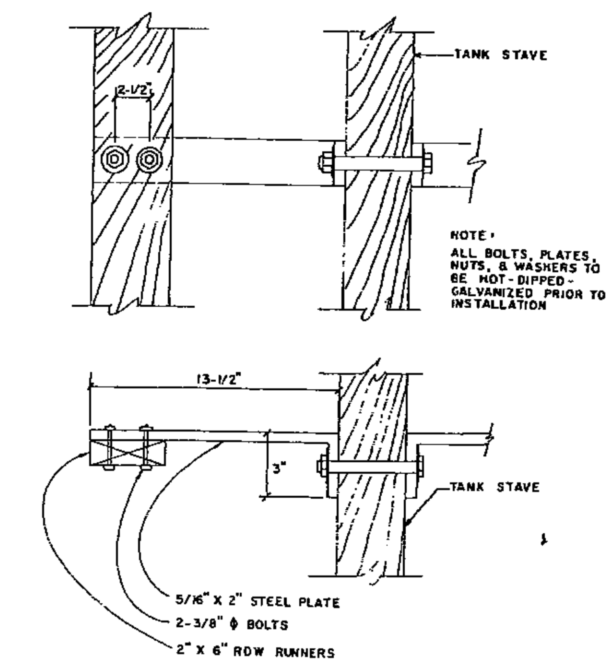
TANK ELEVATION 7/3



TANK FOUNDATION DETAIL 5/3



TANK PLAN 6/3



LADDER SUPPORT 8/3

NO.	DATE	REVISIONS			DATE	DESIGNED BY
					1/11/78	RSF
					SCALE AS SHOWN	DRAWN BY CB
					JOB NO. 1515	CHECKED BY

REGISTERED PROFESSIONAL ENGINEER RANDALL L. FORBES No. 28423 CIVIL STATE OF CALIFORNIA

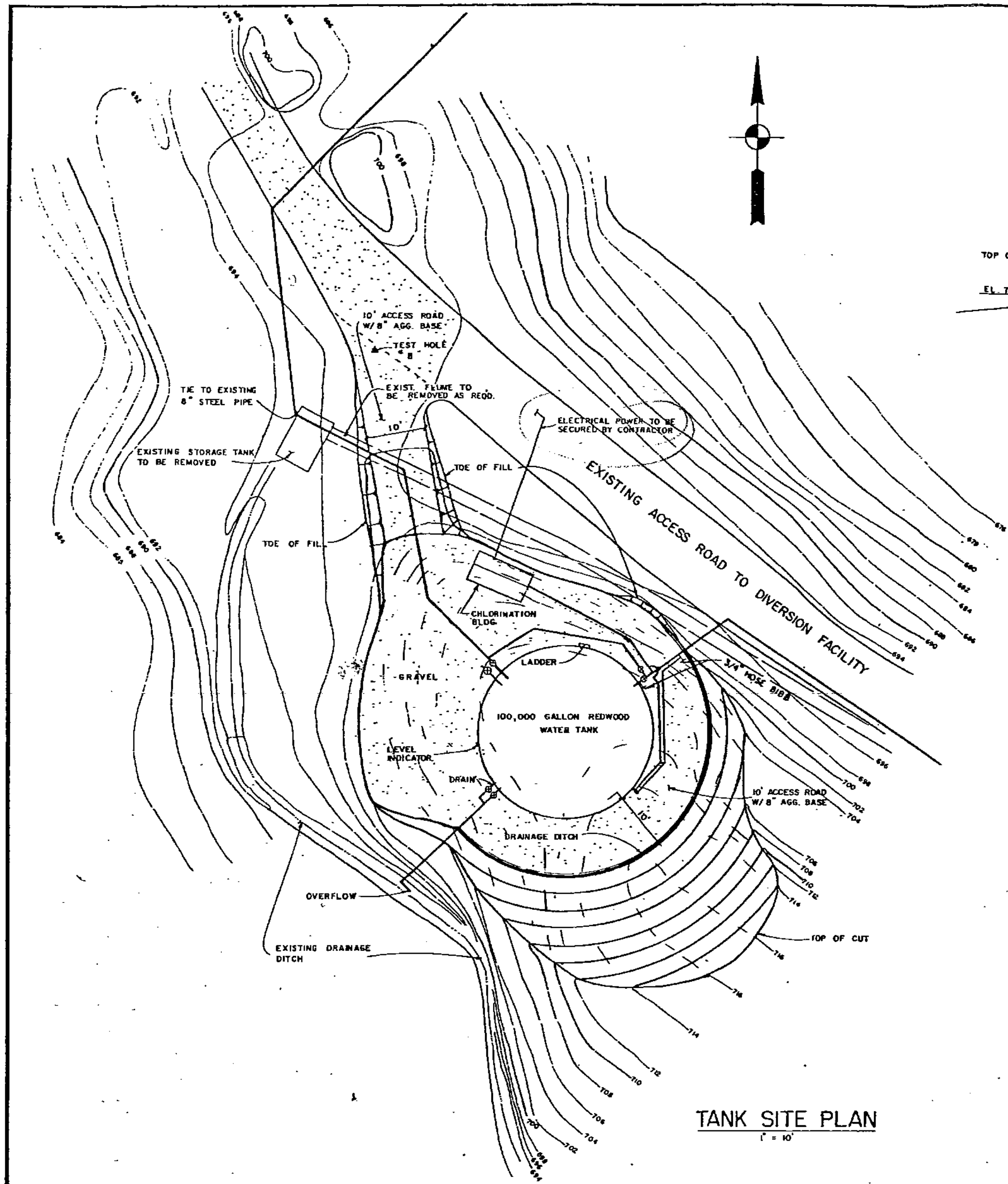
ORLEANS COMMUNITY SERVICES DISTRICT

WATER SYSTEM

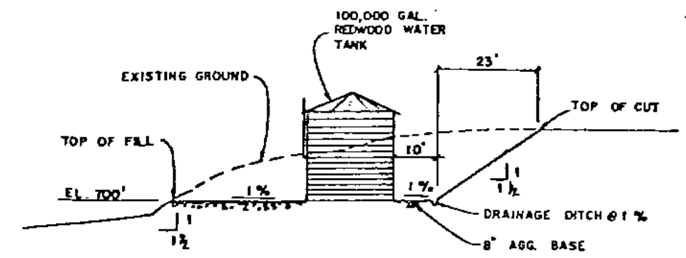
LACO ASSOCIATES
CONSULTING ENGINEERS
212 J STREET EUREKA, CALIF. 443-5054

TANK DETAILS

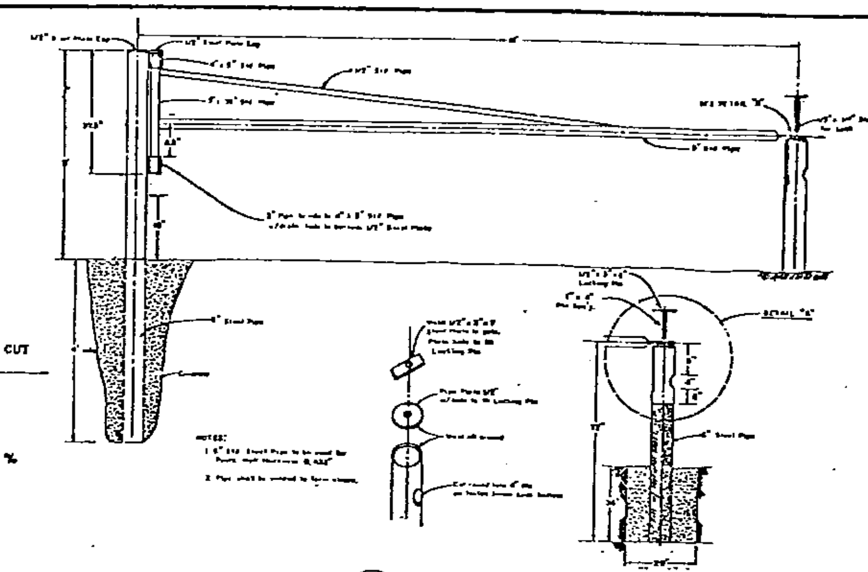
SHEET 3 OF 50 SHEETS



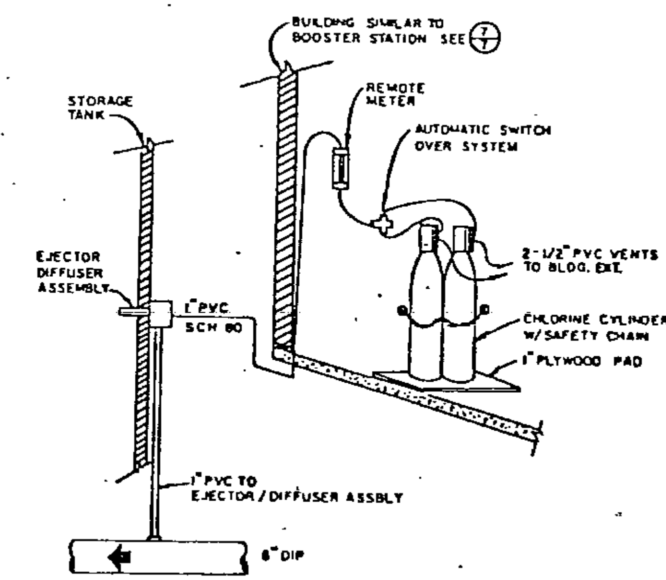
TANK SITE PLAN
1" = 10'



ELEVATION



GATE DETAIL (1/4)
NTS



CHLORINE PIPING SCHEMATIC (2/4)
NTS

NO.	DATE	REVISIONS		

DATE 1/11/78	DESIGNED BY RSF
SCALE AS SHOWN	DRAWN BY
JOB NO. 1515	CHECKED BY

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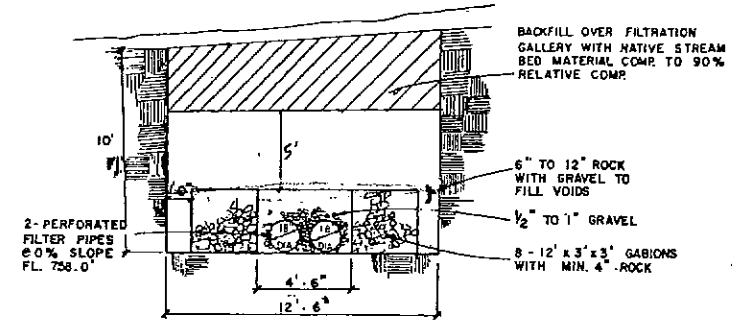
ORLEANS COMMUNITY SERVICES DISTRICT

WATER SYSTEM

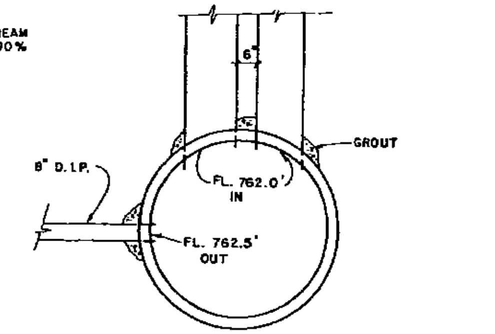
LACO ASSOCIATES
CONSULTING ENGINEERS
21st J STREET EUREKA, CALIF. 443-5054

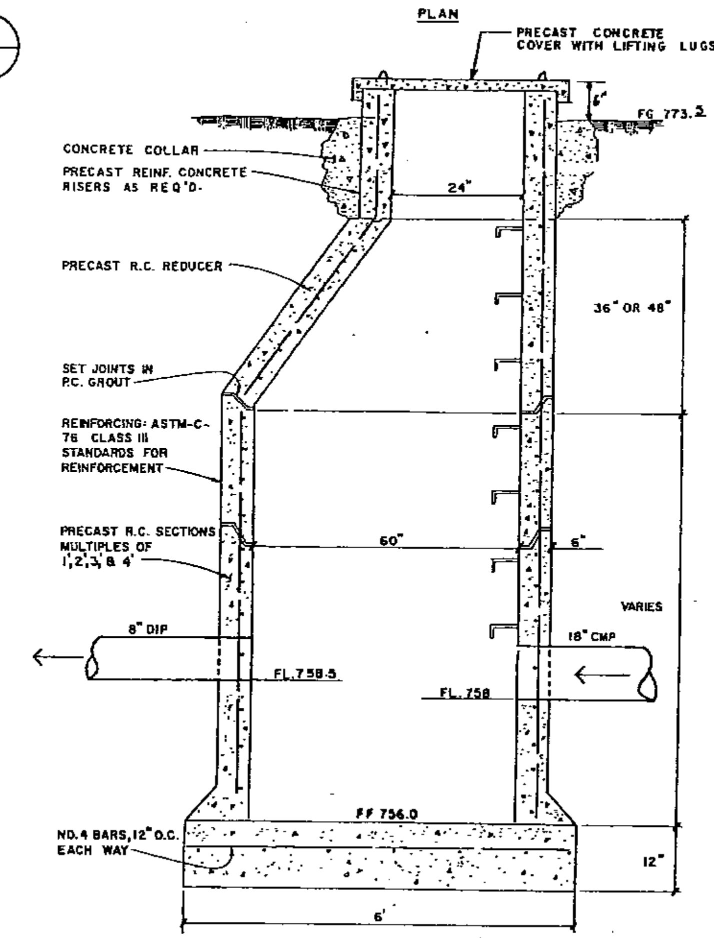
TANK SITE

SHEET 4 OF 50 SHEETS

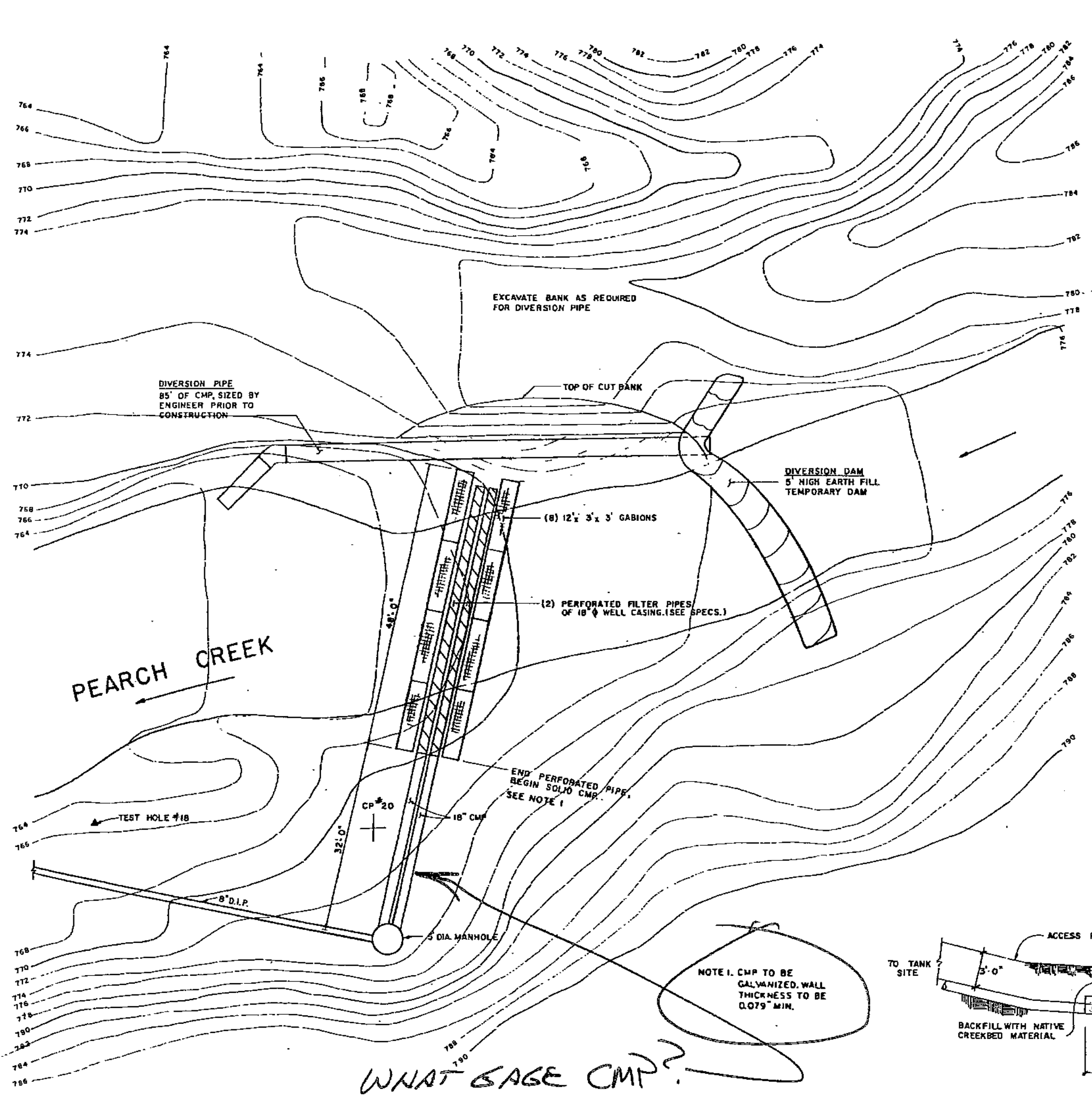


FILTER DETAIL 3/5



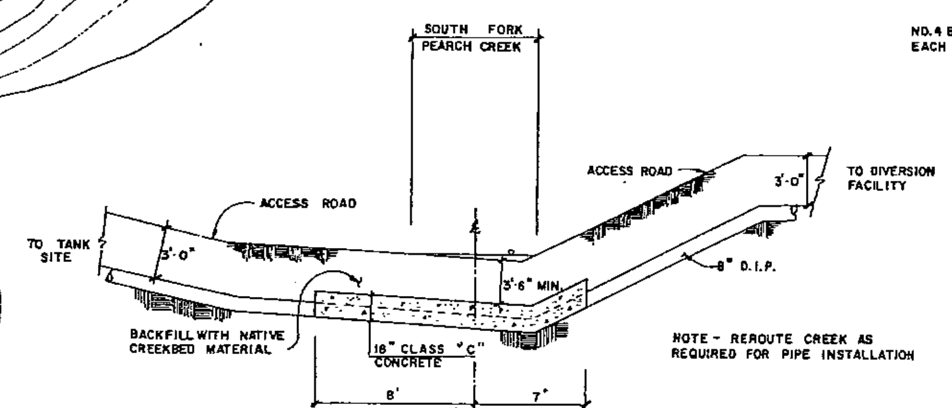


MANHOLE DETAIL 4/5



DIVERSION SITE PLAN 1/5

1"=10'-0"



PEARCH CREEK CROSSING 2/5

NO.	DATE	REVISIONS

DATE	DESIGNED BY
1/11/78	RSF
SCALE: AS SHOWN	DRAWN BY: B. [illegible]
JOB NO. 1515	CHECKED BY: [illegible]

REGISTERED PROFESSIONAL ENGINEER RANDALL S. FORBES STATE OF CALIFORNIA

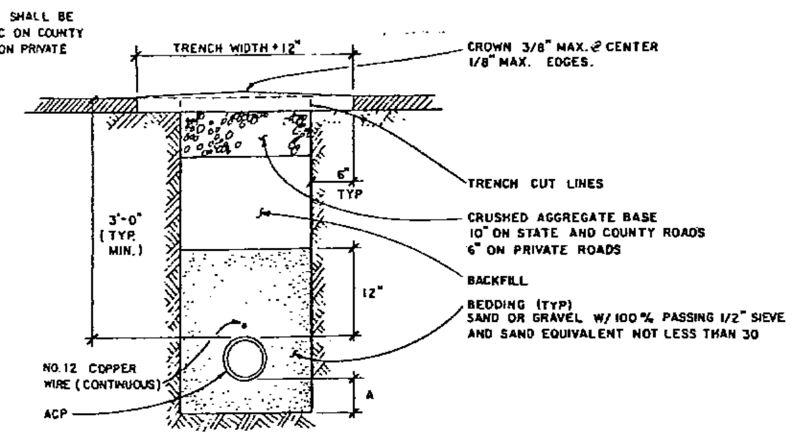
ORLEANS COMMUNITY SERVICES DISTRICT

WATER SYSTEM

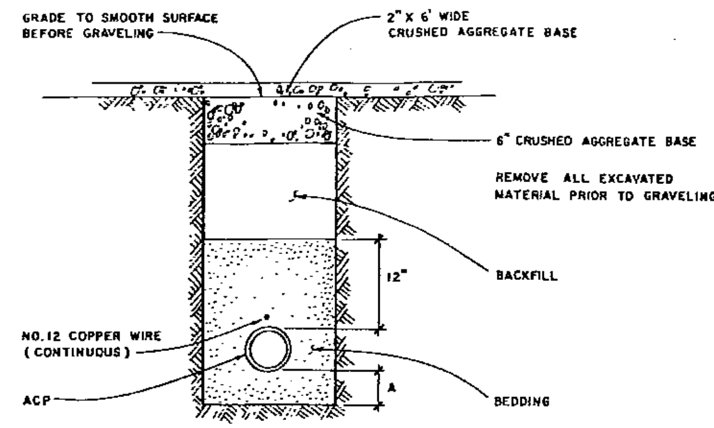
LACO ASSOCIATES
CONSULTING ENGINEERS
212 J STREET EUREKA, CALIF. 443-5054

DIVERSION FACILITY AND PEARCH CREEK CROSSING

SHEET 5 OF 50 SHEETS



IMPROVED STATE AND COUNTY ROADS (1/6)

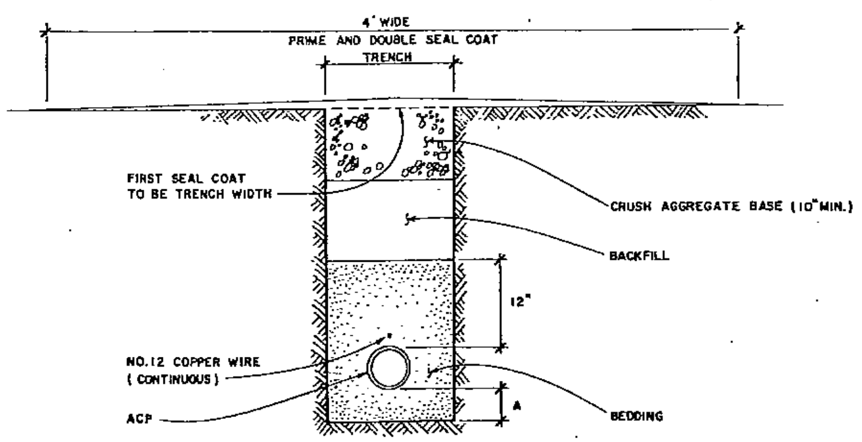


GRAVELED ROADS (2/6)

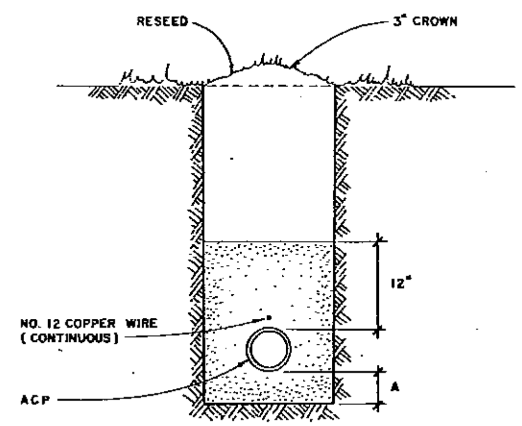
PIPE SIZE	A (INCHES)	TRENCH WIDTH MAX — MIN
10"	3	34 — 24
8"	3	32 — 18
6"	3	30 — 18
4"	3	30 — 18
2" TO 3/4"	NA	18 — 12

USE MANUFACTURERS RECOMMENDED DIMENSIONS FOR BEDDING AND TRENCH WIDTH IF DIFFERENT FROM CHART.

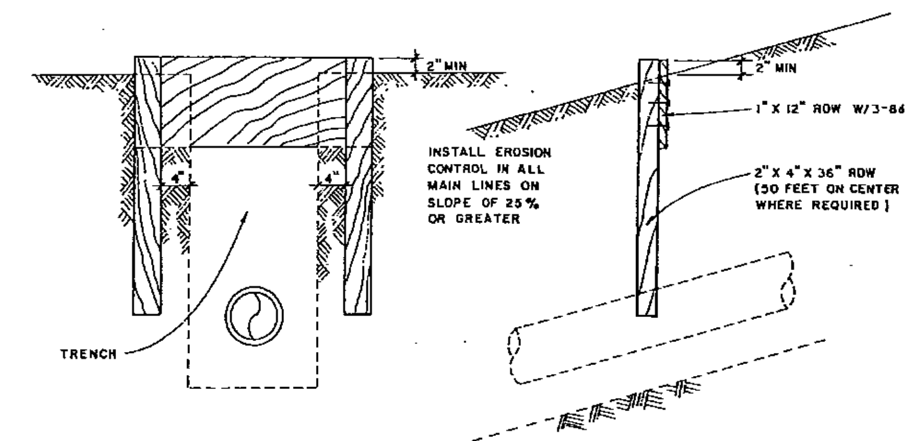
TRENCH DIMENSION CHART (3/6)



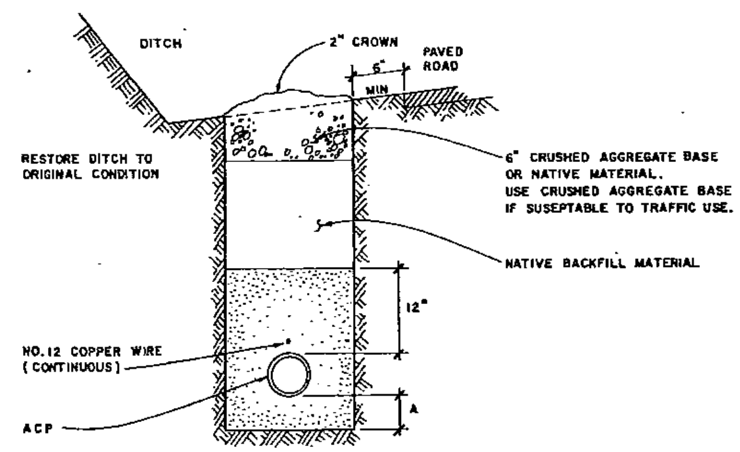
SEAL COATED COUNTY AND PRIVATE ROADS (6/6)



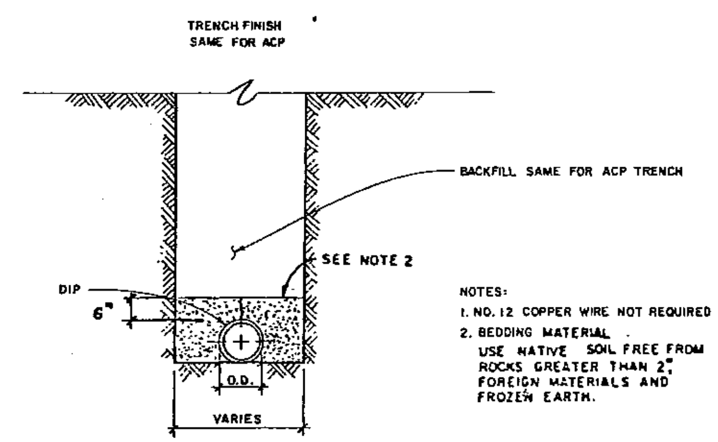
UNIMPROVED AREAS (5/6)



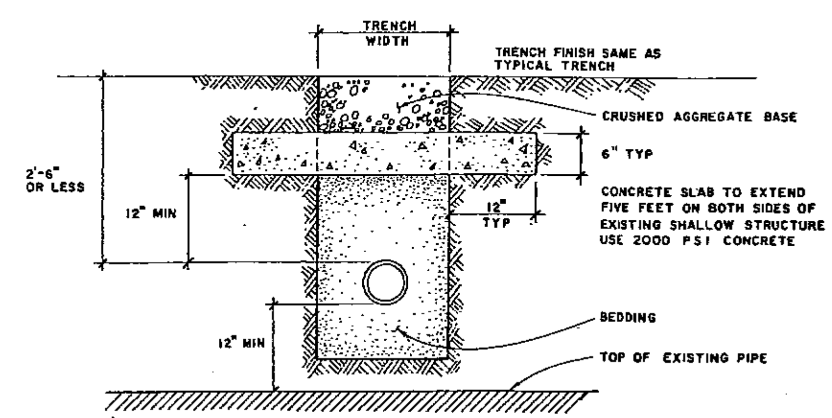
EROSION CONTROL (4/6)



OFF ROAD AREAS (7/6)



DUCTILE IRON PIPE TRENCH (8/6)



SHALLOW TRENCH DETAIL (9/6)

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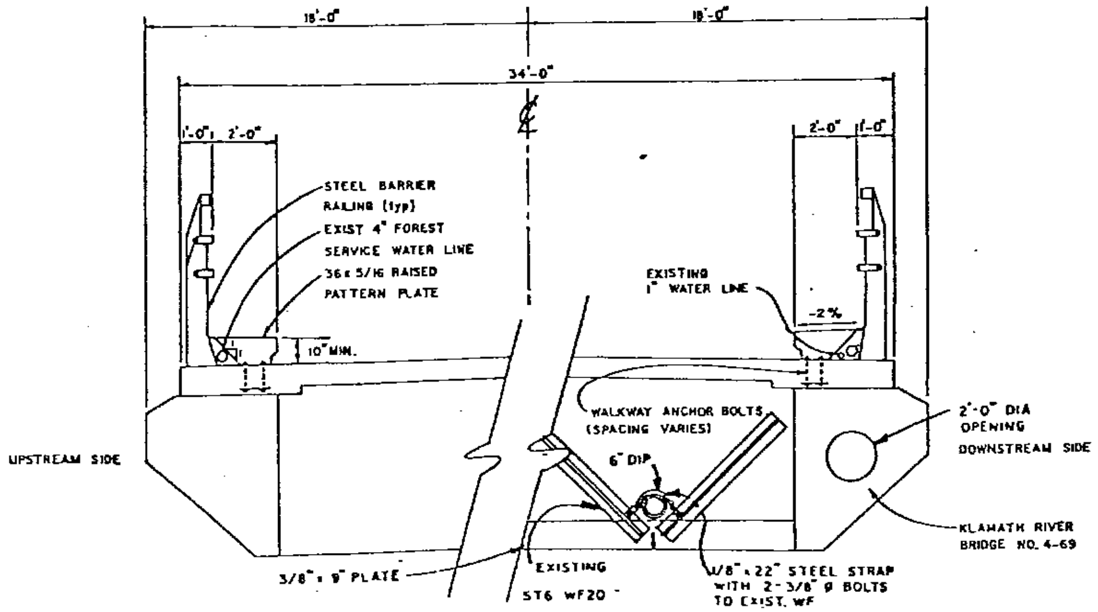
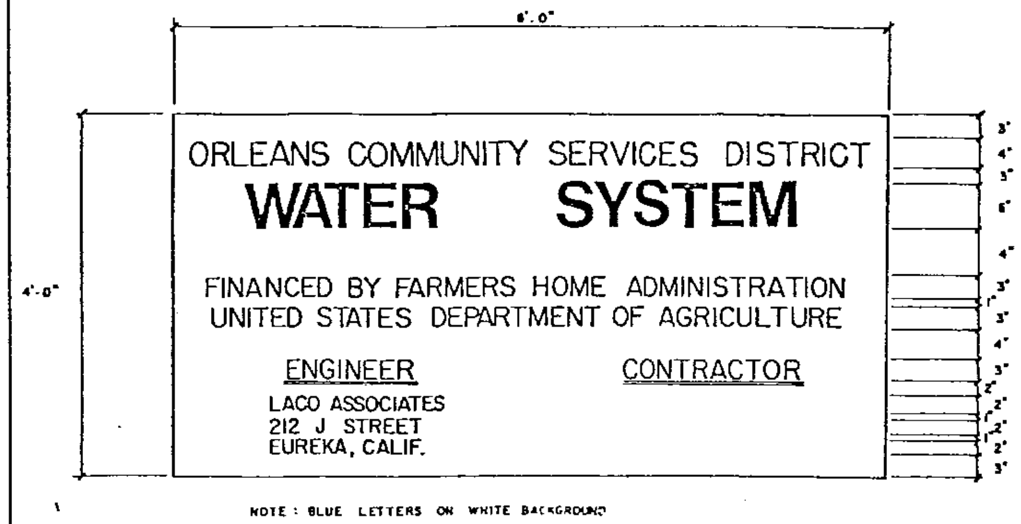
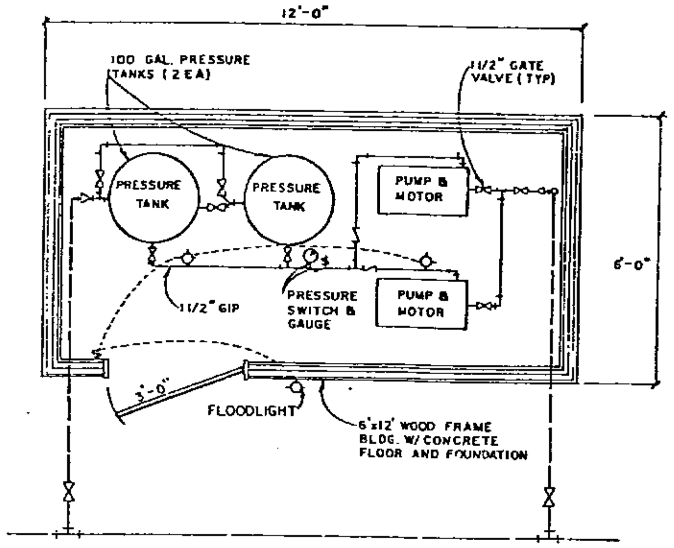
TRENCH DETAILS

SHEET 6 OF 50 SHEETS

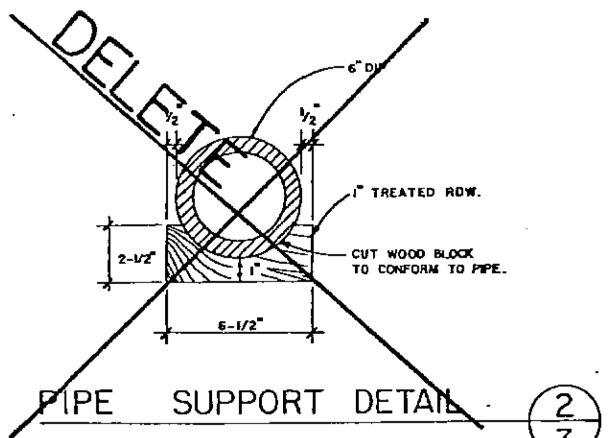


KLAMATH RIVER - BRIDGE CROSSING (1/7)

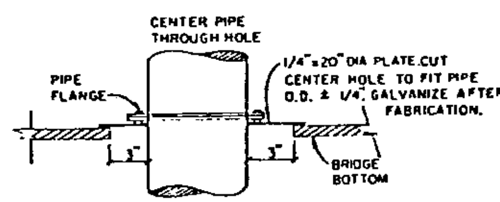




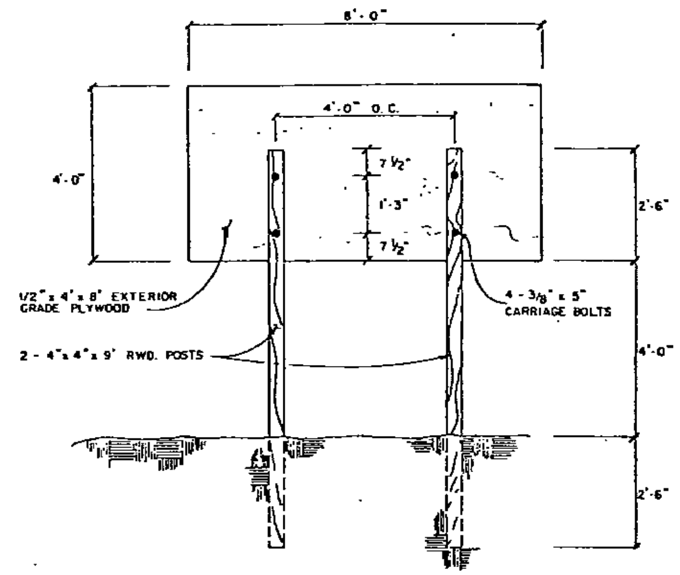
PLAN (7/7)
1/2"=1'-0"



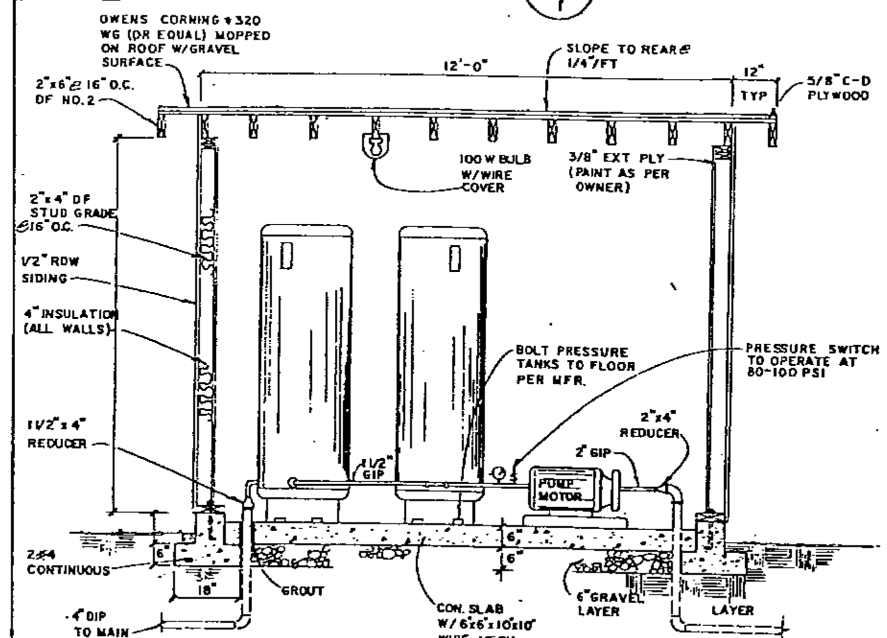
PIPE SUPPORT DETAIL (2/7)



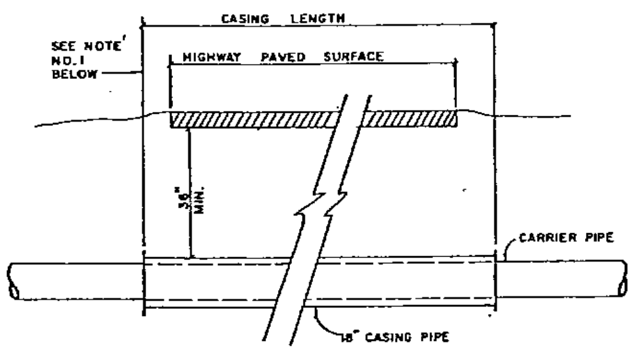
KLAMATH RIVER BRIDGE PIPE INSTALLATION DETAIL (4/7)



CONSTRUCTION SIGN (3/7)

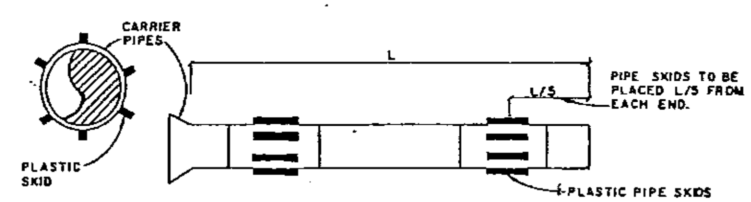


ELEVATION (8/7)



HIGHWAY CROSSING (5/7)
NTS

NOTES:
1. CASING SHALL EXTEND AT LEAST FIVE FEET BEYOND SLOPE LIMITS. WHERE SLOPE LIMITS ARE NOT CLEARLY DEFINABLE AS IN LEVEL GRADES, ENCASEMENT SHALL EXTEND AT LEAST FIVE FEET BEYOND CURB OR SHOULDER LINES.
2. ALL PIPE PLACED THROUGH A CASING SHALL HAVE RESTRAINED JOINTS.



PIPE SKID DETAIL (6/7)
NTS

NOTES:
1. PUMPS SHALL BE BERKELEY TYPE "A"-1 1/2" x PH2 (3450 RPM, 5HP W/MECHANICAL SEAL AND SHAFT SLEEVE) OR EQUAL.
2. MEDALIST DIVISION "POSI-PRESSURE" MODEL PP 319 104 GAL SEALED TANK. (OR EQ) TO OPERATE AT 80-100 PSI.
3. ⋈ INDICATES GATE VALVE

BOOSTER STATION

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WATER SYSTEM

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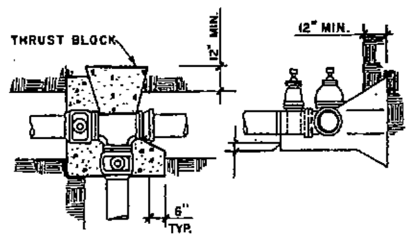
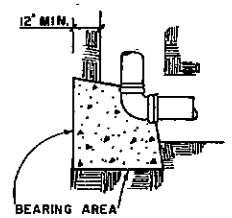
BOOSTER STATIONS AND STANDARD DETAILS

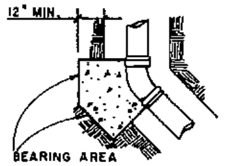
SHEET 7 OF 50 SHEETS



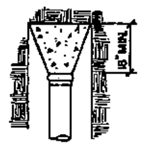
TEE



90° BEND
PLAN



45° BEND
PLAN

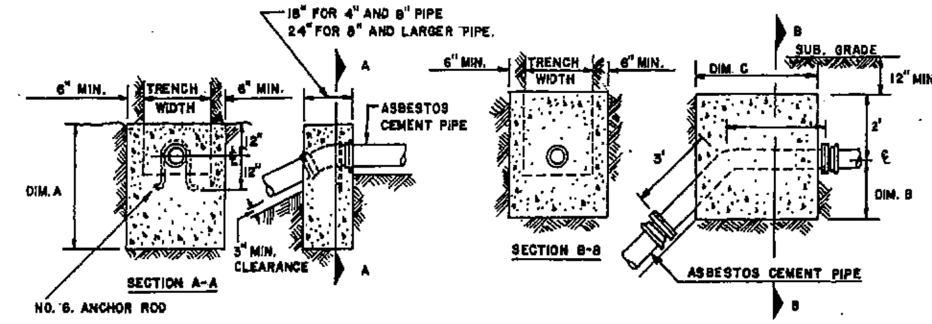


CAP
PLAN

HORIZONTAL DEFLECTIONS

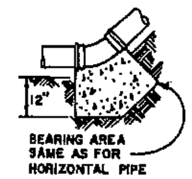
MINIMUM BEARING AREAS (SQ.FT.)					
PIPE SIZE	TEE WYE CAP	90° BEND	45° BEND	22-1/2° BEND	11-1/4° BEND
4"	4	5	4	3	2
6"	5	6	4	3	2
8"	6	8	6	5	4
10"	10	12	6	5	4

NOTES:
1. THRUST BLOCK DETAILS BASED ON 150 PSI PRESSURE, 1000 PSF SOIL BEARING PRESSURE AND 2000 PSI CONCRETE.
2. CAST THRUST BLOCKS AGAINST UNDISTURBED EARTH.
3. ALL VALVES SHALL BE CLUSTERED AS SHOWN FOR THE CONDITION.

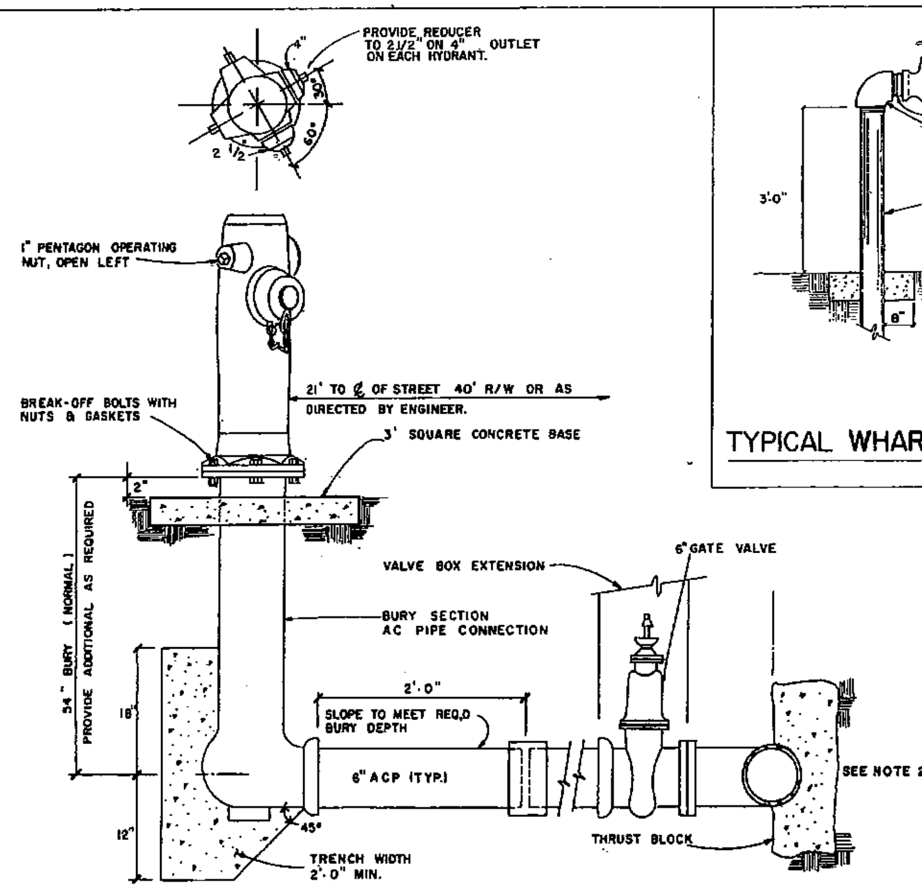


VERTICAL DEFLECTIONS

ANGLE OF BEND	4" MAIN.	6" MAIN	8" MAIN	10" MAIN
45°	A=2'-3" B=6" C=2'-0"	B=12" C=3'-0"	B=1'-3" C=4'-0"	B=2'-9" C=4'-6"
22-1/2°	A=2'-3" B=4" C=1'-3"	B=8" C=1'-6"	B=12" C=2'-0"	B=1'-3" C=3'-0"

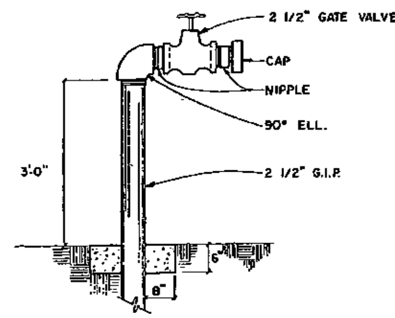


TYPICAL THRUST BLOCKS (2/8)

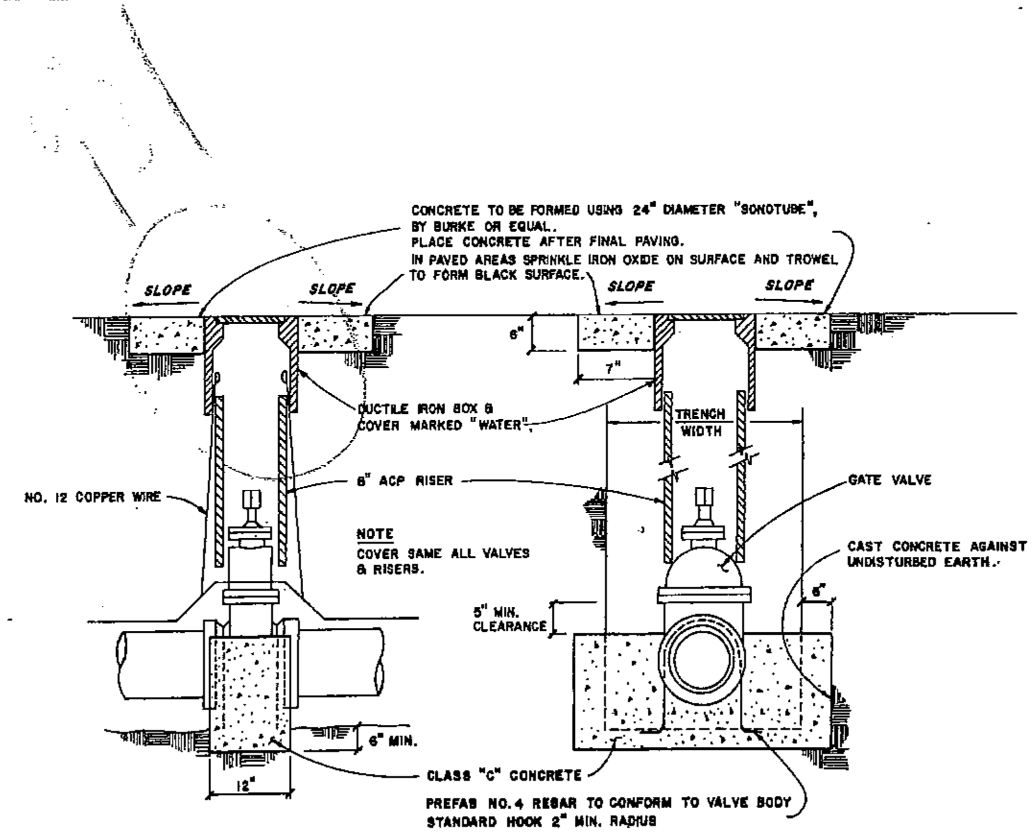


NOTE:
1. COLOR - TRAFFIC YELLOW, REPAINT ONE FIELD COAT AFTER INSTALLATION
2. INSTALL REDUCER OR REDUCING TEE AS REQUIRED BY MAIN SIZE.
3. PROVIDE ADDITIONAL BURY AS REQUIRED TO SET HYDRANT FLANGE ABOVE GRADE.

TYPICAL FIRE HYDRANT (1/8)



TYPICAL WHARF HYDRANT (4/8)



TYPICAL IN-LINE VALVE (3/8)

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ORLEANS COMMUNITY SERVICES DISTRICT

WATER SYSTEM

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212 J STREET EUREKA, CALIF. 443-5054

STANDARD DETAILS

SHEET 8 OF 50 SHEETS

NOTES:

(1) ALL METER BOXES MUST BE SET TRUE AND PERPENDICULAR TO STREET.

(2) SET METER DIAL TO READ FROM STREET. ALL METERS SHALL READ IN GALLONS.

(3) METER HEAD SHALL BE LOCATED DIRECTLY UNDER READING LID.

(4) ALL METER BOXES SHALL HAVE CAST IRON READING HEADING.

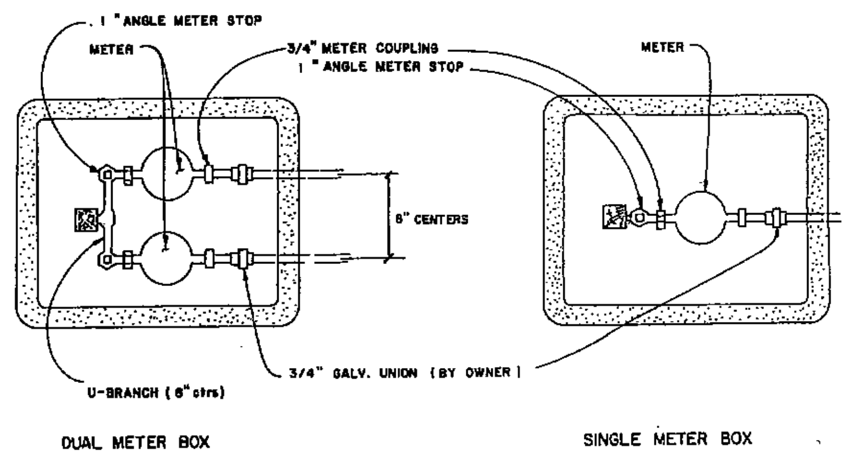
(5) COPPER TRACER WIRE TO BE INSTALLED WITH ALL MAINS, SERVICES AND AIR VALVE INSTALLATIONS.

(6) KNOCK OUTS SHALL BE KNOCKED OUT PRIOR TO PLACING METER BOX.

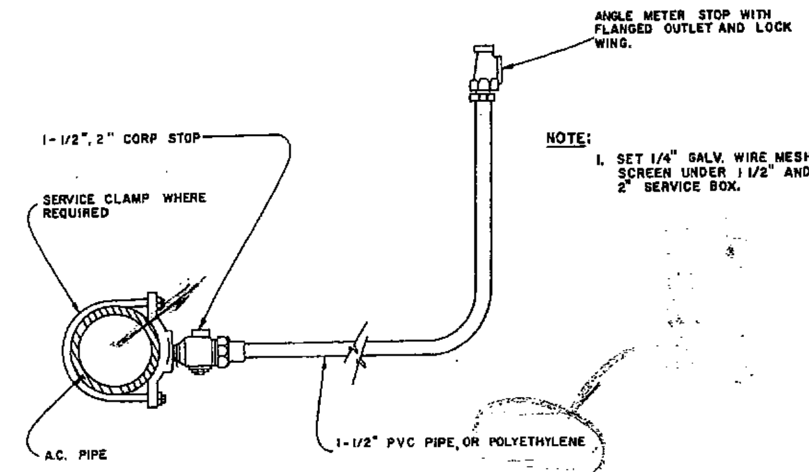
(7) PROVIDE TRAFFIC LID IN ALL AREAS SUBJECT TO TRAFFIC ACCESS.

(8) IN AREAS WHERE METER BOX CANNOT BE SET OUT OF TRAVELED WAY, SET BOX ½" ABOVE ADJACENT GROUND.

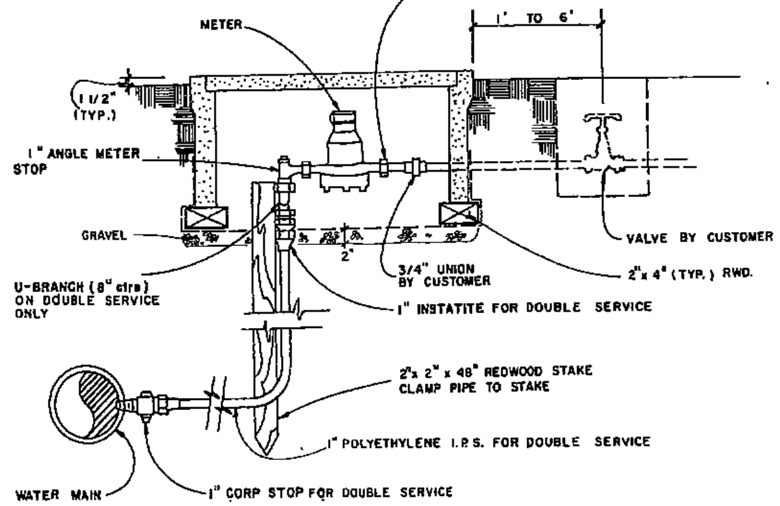
(9) SPACE BETWEEN METER BOXES SHALL BE THREE (3) INCHES.



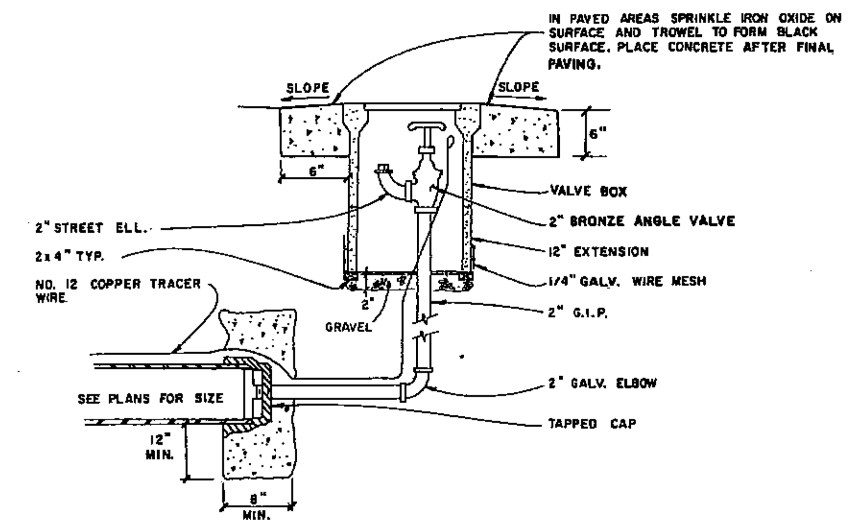
METER BOX PLAN VIEW 2/9



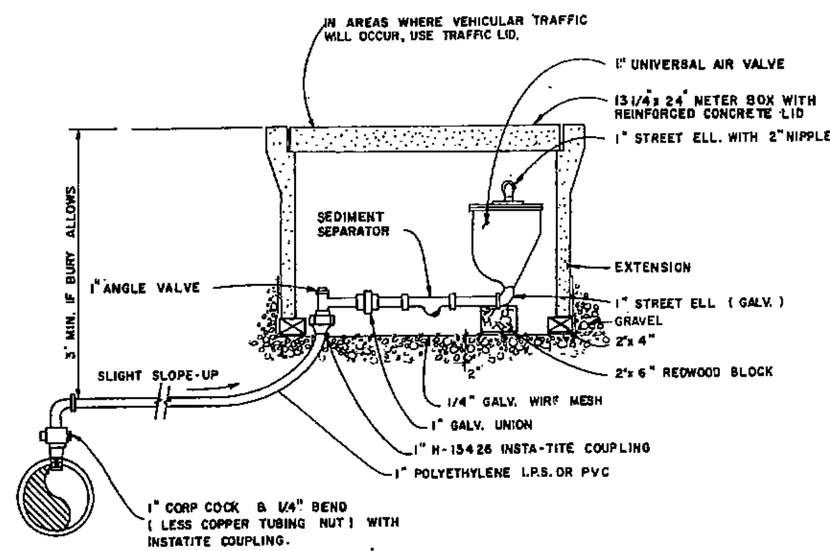
TYPICAL 1 1/2" OR 2" SERVICE 5/9



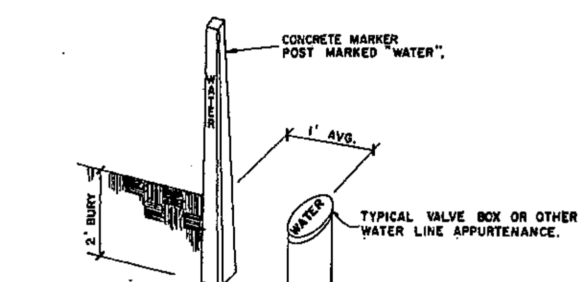
TYPICAL SERVICE ASSEMBLY 1/9



TYPICAL 2" BLOWOFF 6/9

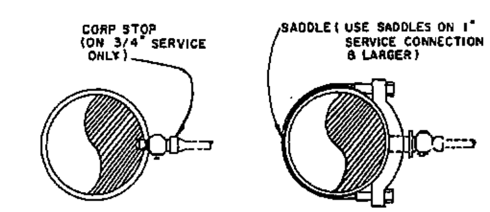


AIR VACUUM RELIEF ASSEMBLY 4/9



NOTE: PROVIDE IN ALL LOCATIONS WHERE VALVE IS NOT IN ROADWAY.

VALVE MARKER POST 3/9



1. USE WET OR DRY "GUIDED" TAPPING MACHINE FOR ALL AC PIPE TAPS. INSERT STOP TO LEAVE ONLY 1 TO 3 THREADS VISABLE.
2. RUN ALL SADDLES AT 90° TO MAIN.

DISTRIBUTION MAIN SERVICE CONNECTION 7/9

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STANDARD DETAILS

SHEET 9 OF 50 SHEETS

MINIMUM TRENCH SHORING REQUIREMENTS

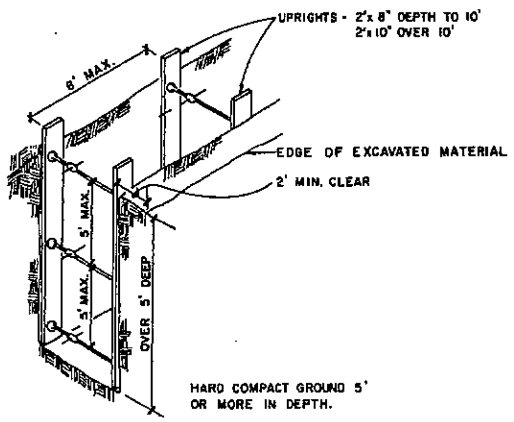
HARD COMPACT GROUND

Trenches 5 feet or more deep and over 8 feet long must be braced at intervals of 8 feet or less.

A strut brace is required for each 4 foot zone into which the trench depth can be divided, with at least two braces for each set of uprights.

Steel screw-type trench braces must have a foot or base plate on each end of the pipe, placed horizontally and bearing firmly against uprights. Hydraulic metal jack units, properly maintainedand of equivalent strength, also are acceptable.

Timber braces must be in good condition, free from imperfections affecting their strength, well cleated, and rigidly wedged.



HORIZONTAL STRUT BRACES

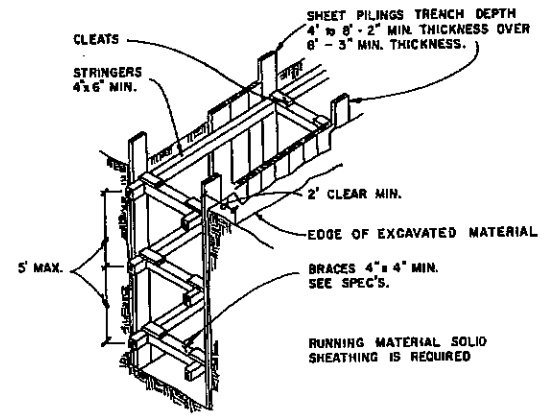
Width of Trench Ft. (inc)	Size of Wood Braces	Size of Pipe Braces
1 - 3	4" x 4"	1-1/2" STD
3 - 6	4" x 6"	2" STD
6 - 8	6" x 6"	2" STD
8 - 10	6" x 8"	3" STD
10 - 12	8" x 8"	3" STD

Trenches wider than 12 feet must have braces of correspondingly larger dimensions.

FILLED OR UNSTABLE GROUND

SHEETING must be provided and must be sufficient to hold the material in place.

LONGITUDINAL-STRINGER DIMENSIONS depend upon the strut and stringer spacing and upon the degree of instability encountered.



ACCESS

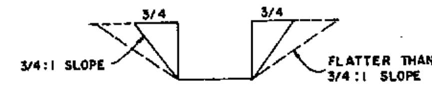
In trenches five feet or more deep ladders must extend at least 2-1/2 feet above the top, unless a safer means of getting in and out of the trench is provided. There must be a ladder within 50 feet of any worker in a trench.

PIPE INSTALLATION

Length or diameter of pipe being installed does not permit variance with shoring requirements. Shoring protection is required within at least 4 feet of any workman.

ALTERNATE TRENCH PROTECTION SLOPING

Trench or excavation walls must be sloped no less than 3/4 horizontal to 1 vertical as an alternate method to shoring. Soil instability may, however, require a flatter slope.



PROTECTIVE SHIELDS

Protective shields or welder's huts may be substituted for shoring systems to provide local protection for workmen in trenches. Approval of their design and construction shall be secured from the Division of Industrial Safety by the employer before use.

DESIGN BY REGISTERED ENGINEER

A civil engineer, registered in California must design and submit detailed data to the Division of Industrial Safety for alternate effective shoring systems. The design must include a soil evalutation study, a slope stability study, and an estimation of forces to be resisted, together with plans and specifications of the materials and methods to be used.

Upon review of the application and supporting data, the Division may accept the provisions of the alternate proposal or add such modifications as appear just and reasonable.

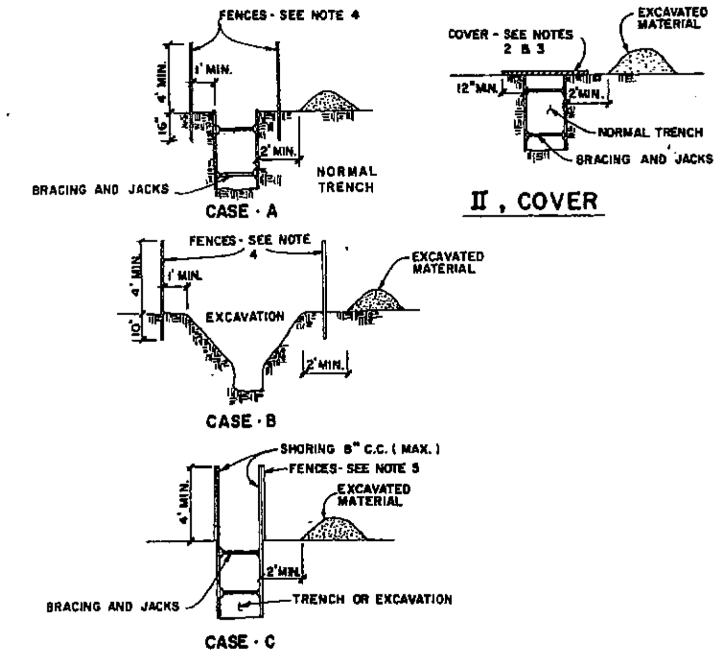
TRENCH SHORING SPECIFICATIONS

SOIL TYPE	DEPTH Feet	UPRIGHTS Size In.	UPRIGHTS Horz. Spacing, Feet	BRACES Size In.	BRACES Horz. Spacing Feet	STRINGERS Size In.	STRINGERS Vertical Spacing, Feet
Hard	5 -10	2X8	8	4X4	8	Where indicated	
Compact	Over 10	3X8	6	4X6	6	Where indicated	
Unstable	5 -10	2X8	4	4X4	4	Where indicated	
	Over 10	3X8	Solid	4X6	6	4X6	
Running	4 - 8	2X8	Solid	4X4	6	4X6	
	Over 8	3X8	Solid	6X6	6	6X6	

NOTES:

1. CONTRACTOR SHALL CONFORM TO ALL OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (OSHA) STANDARDS AND ALL OTHER APPLICABLE CODES AND REGULATIONS.

MINIMUM PUBLIC SAFETY REQUIREMENTS



I, FENCES

1. EXCEPTIONS: FENCES OR COVERS WILL BE OPTIONAL WITH THE CONTRACTORS IF THE EXCAVATION IS EITHER:
   a. Less than 3 feet deep
   b. Less than 5 feet deep with sufficient warning devices such as lanterns, flashers, or barricades.
   c. For Case B, less than 3 feet deep in the vertical portion with upper side slopes of: 1:1 or flatter
   d. In an area that is not accessible to the public or that is more than 1/2 mile from any place of public use or habitation.
2. COVERS MAY BE:
   a. 1/4" steel plates)
   b. 2" planks) non-vehicular traffic
   c. 3/4" plywood)
3. WHEN STEEL PLATE COVER IS BEING USED FOR VEHICULAR TRAFFIC, IT IS THE CONTRACTOR'S RESPONSIBILITY TO PROVIDE PROPER TRENCH BRACING AND STEEL PLATES WITH SUFFICIENT STRENGTH TO WITHSTAND TRAFFIC LOADING.
4. FOR CASES "A" AND "B" FENCES MAY BE:
   a. wood pickets tied with wire and posts 8'cc
   b. 2" x 4" posts 8'cc and wire mesh
   c. 2" x 4" posts 8'cc with top and bottom rail and chicken wire
   d. same as note 5 item c
5. FOR CASE "C" FENCES MAY BE:
   a. wood pickets tied with wire and bottom rail
   b. top and bottom rail with chicken wire
   c. three rails equally spaced with bottom rail 6" above ground
6. POST FOR FENCES SHALL BE 2" x 4" WOOD OR EQUIVALENT STEEL OR PIPE. IN PAVED AREAS, POSTS MAY BE FLUSH WITH SURFACE IF SUFFICIENTLY ANCHORED AND BRACED. RAILS SHALL BE 1" x 4" WOOD.

NO.	DATE	REVISIONS

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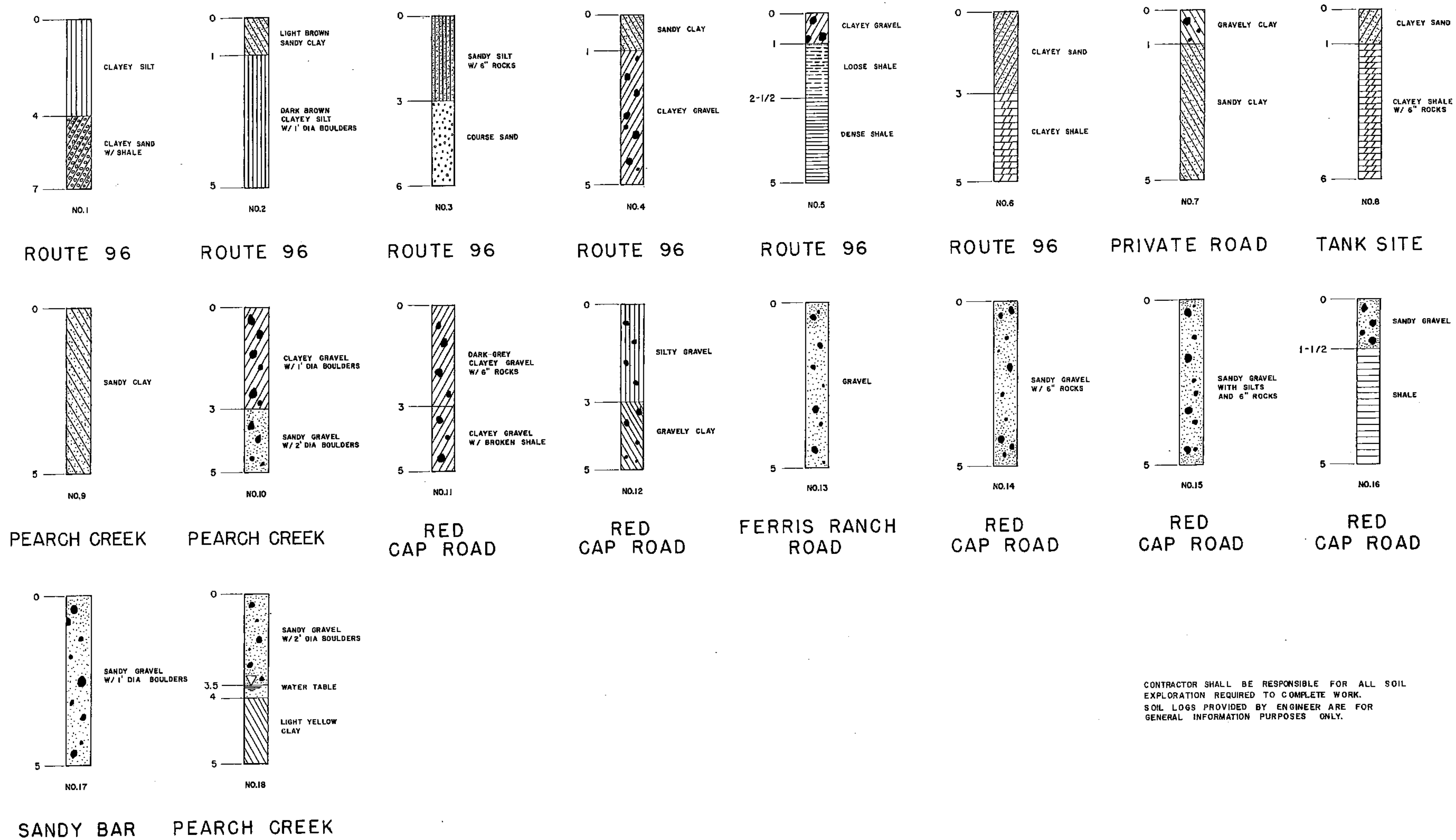
TRENCH SHORING & SAFETY REQUIREMENTS

SHEET 10 OF 50 SHEETS



CONTRACTOR SHALL BE RESPONSIBLE FOR ALL SOIL EXPLORATION REQUIRED TO COMPLETE WORK. SOIL LOGS PROVIDED BY ENGINEER ARE FOR GENERAL INFORMATION PURPOSES ONLY.

NO.	DATE	REVISIONS

DATE 1/11/78 — DESIGNED BY RSF — SCALE NO SCALE — DRAWN BY — JOB NO. 1515 — CHECKED BY

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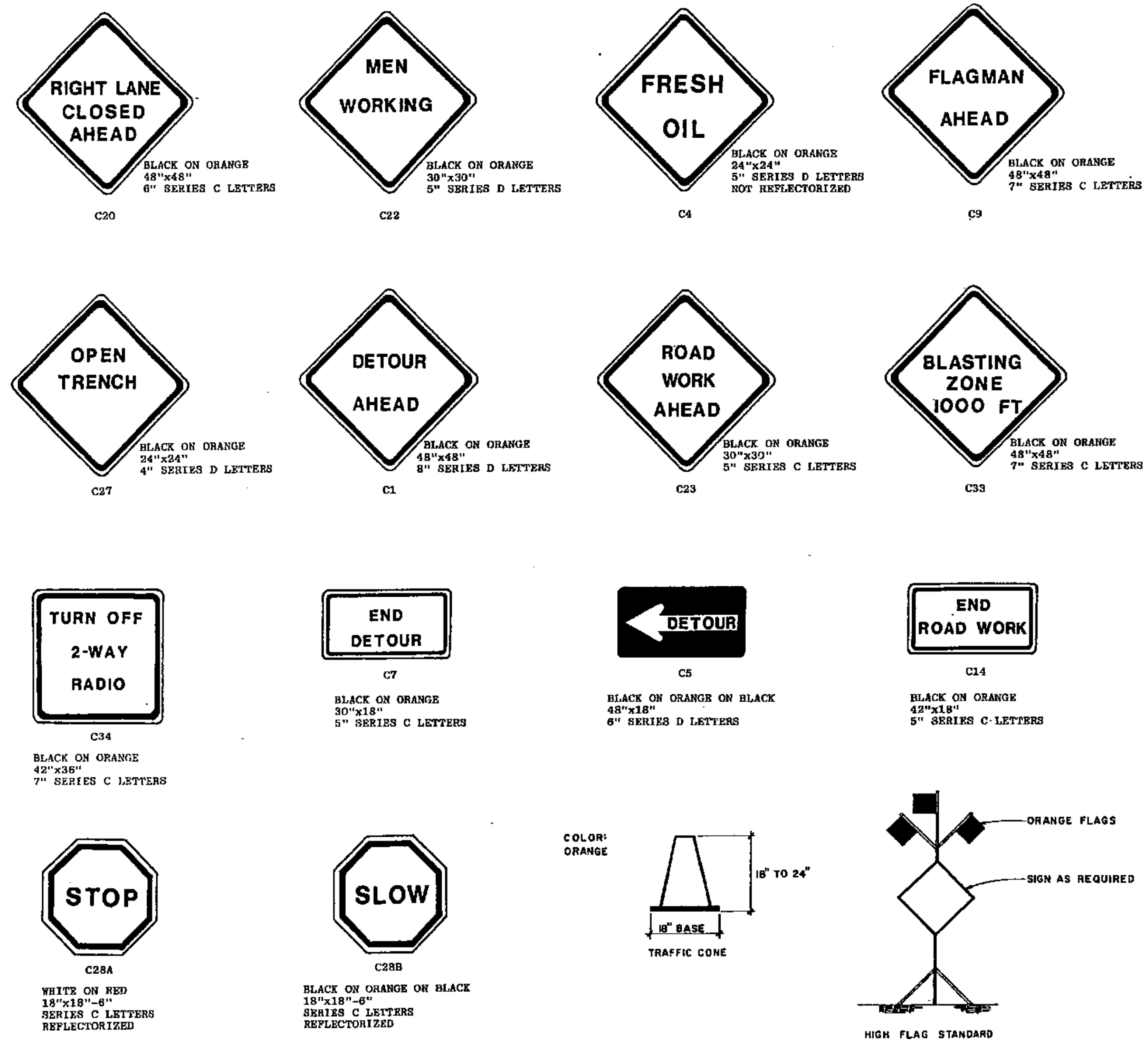
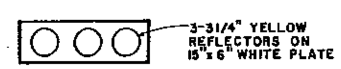
SOIL LOGS

SHEET 11 OF 50 SHEETS





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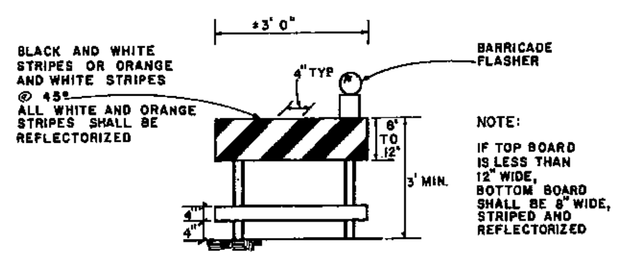


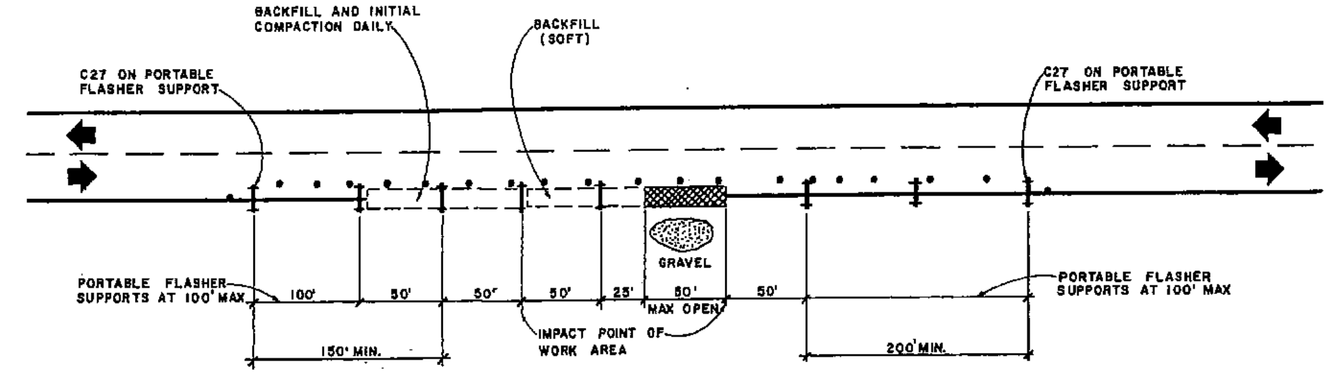
NOTES:

(1) ALL WARNING SIGNS, LIGHTS AND SAFETY DEVICES AS SPECIFIED SHALL CONFORM TO THE "MANUAL OF TRAFFIC CONTROLS", CHAPTER 5, STATE OF CALIFORNIA, BUSINESS AND TRANSPORTATION AGENCY, DEPARTMENT OF TRANSPORTATION, 1977.

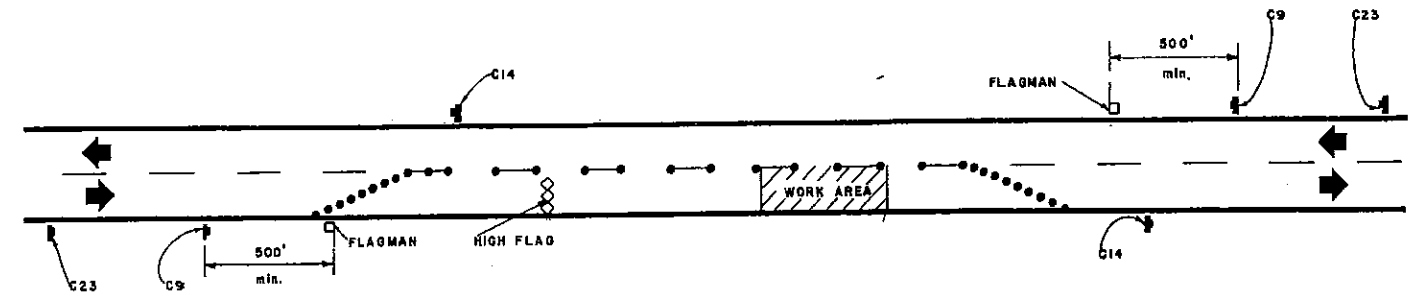
(2) ALL SIGNS AND CONES USED AT NIGHT SHALL BE REFLECTORIZED.

(3) SIGNS C22 AND C9 SHALL BE REMOVED WHEN NO WORK IS IN PROGRESS.

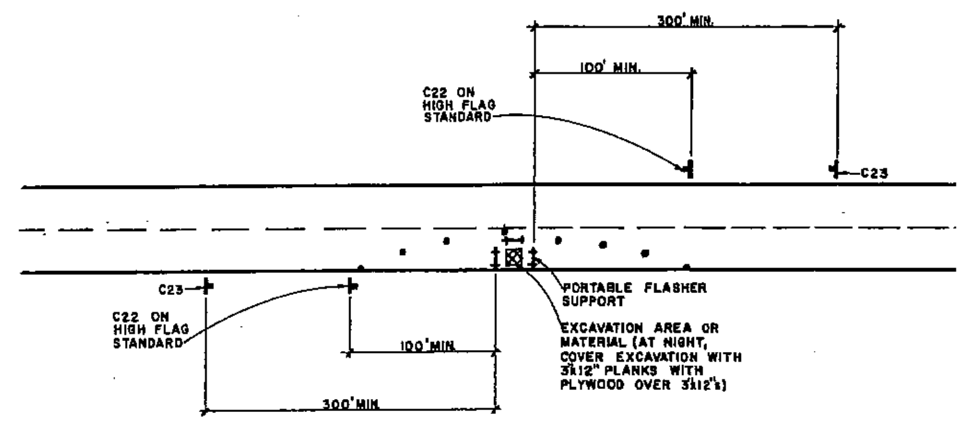
(4) UNDER SPECIAL CONDITIONS, TRAFFIC SIGNS AND SAFETY DEVICES MAY BE RELOCATED AS APPROVED BY THE ENGINEER.



TYPICAL NIGHTTIME REQUIREMENTS (1/12)



TYPICAL SIGNING FOR LANE CLOSURE ON TWO LANE ROAD (2/12)



SIGNING AT EXCAVATION (3/12)

NOTES:

(1) OPERATIONS OFF THE PAVEMENT SUCH AS MOVING, SPRAYING OR SLOPE BLADING DO NOT REQUIRE ADVANCE WORK SIGNS.

(2) GUARDRAIL REPAIRS OFF THE PAVED LANES MAY BE PROTECTED BY THE TRUCK EQUIPPED WITH FLASHING AMBER LIGHTS PARKED ON THE SHOULDER.

(3) CROSSWALK AND PAVEMENT MARKING ON ALL STREETS MAY BE PROTECTED BY PLACEMENT OF CONES AND HIGH FLAGS WHERE NECESSARY.

(4) ON HEAVILY TRAVELED ROADS C23 AND C9 SIGNS AND ONE OR TWO FLAGMEN MAY BE USED.

(5) CONES OR DELINEATORS SHOULD BE PLACED AT 50' MAXIMUM INTERVALS ON TAPERS, 100' MAXIMUM INTERVALS ON CURVES, AND 200' MAXIMUM INTERVALS ON TANGENTS.

(6) ALL EQUIPMENT SHALL BE INSPECTED AND MAINTAINED AT ALL TIMES.

LEGEND

- ▮ SIGN
- ● CONE OR DELINEATOR
- ⬅ DIRECTION OF TRAFFIC
- ↕ INDICATES TYPE K MARKER ON PORTABLE FLASHER SUPPORT

NO.	DATE	REVISIONS	DATE	DESIGNED BY
			1/11/78	RSF
			SCALE: AS SHOWN	DRAWN BY: K
			JOB NO. 1515	CHECKED BY: [signature]

REGISTERED PROFESSIONAL ENGINEER — RANDALL S. FORBES — CIVIL — STATE OF CALIFORNIA

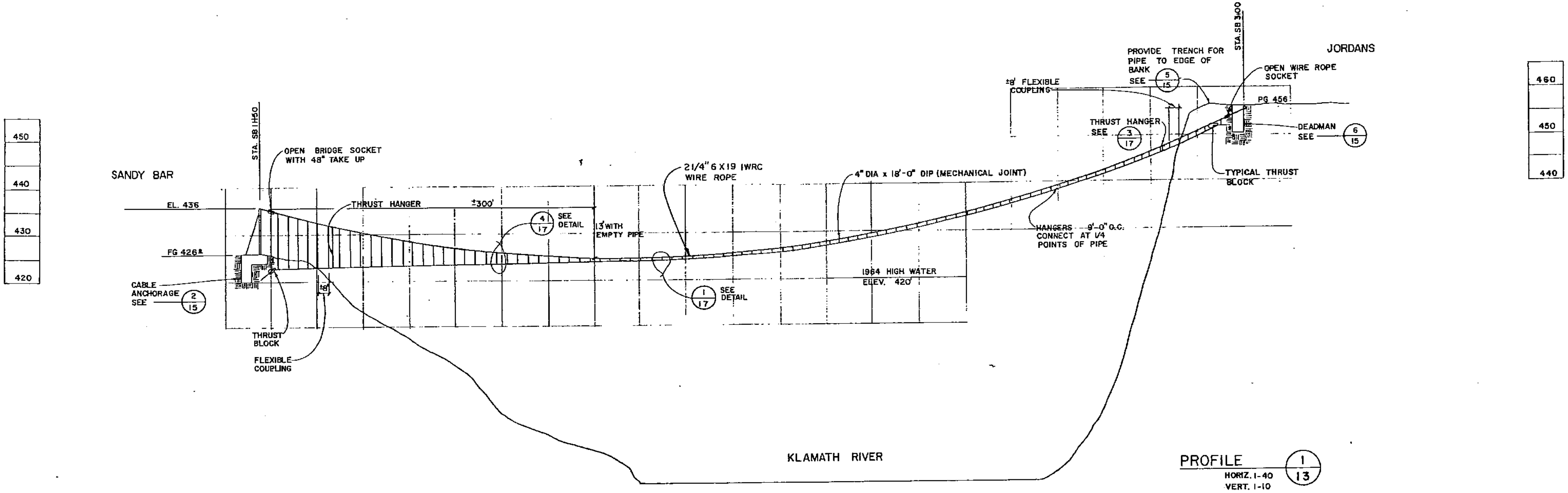
ORLEANS COMMUNITY SERVICES DISTRICT

WATER SYSTEM

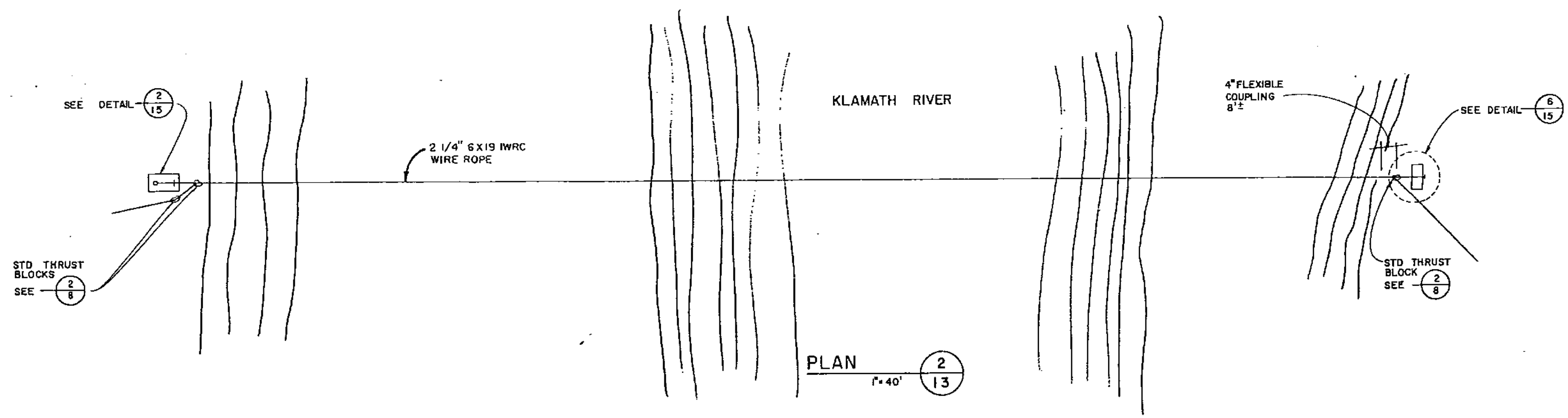
LACO ASSOCIATES
CONSULTING ENGINEERS
212 J STREET EUREKA, CALIF. 443-5054

TRAFFIC DETAILS

SHEET 12 OF 50 SHEETS



PROFILE 1/13
HORIZ. 1-40
VERT. 1-10



PLAN 2/13
1" = 40'

NO.	DATE	REVISIONS

DATE	DESIGNED BY
1/11/78	RSF
SCALE: AS SHOWN	DRAWN BY: CK
JOB NO. 1515	CHECKED BY

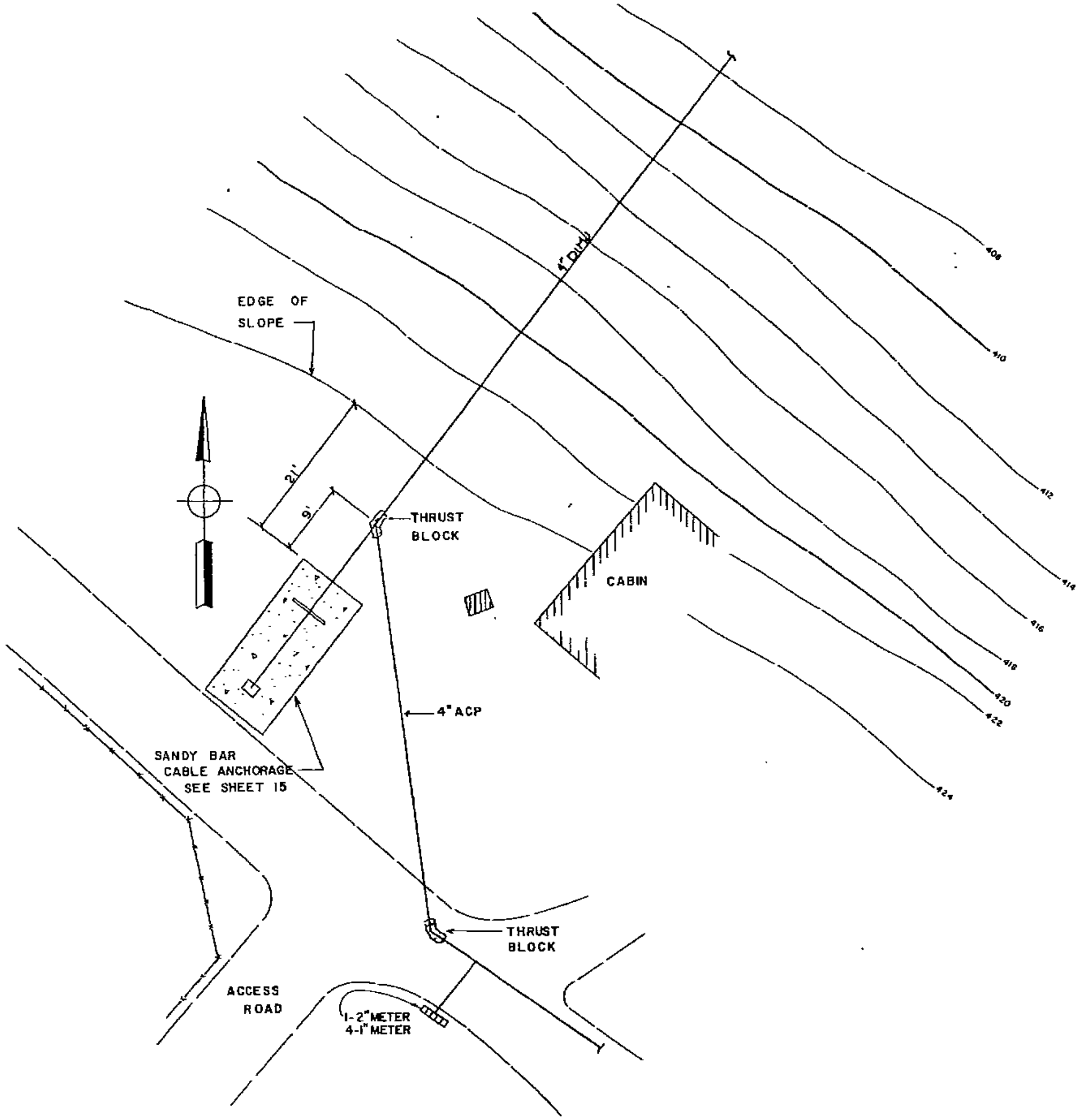
ORLEANS COMMUNITY SERVICES DISTRICT

WATER SYSTEM

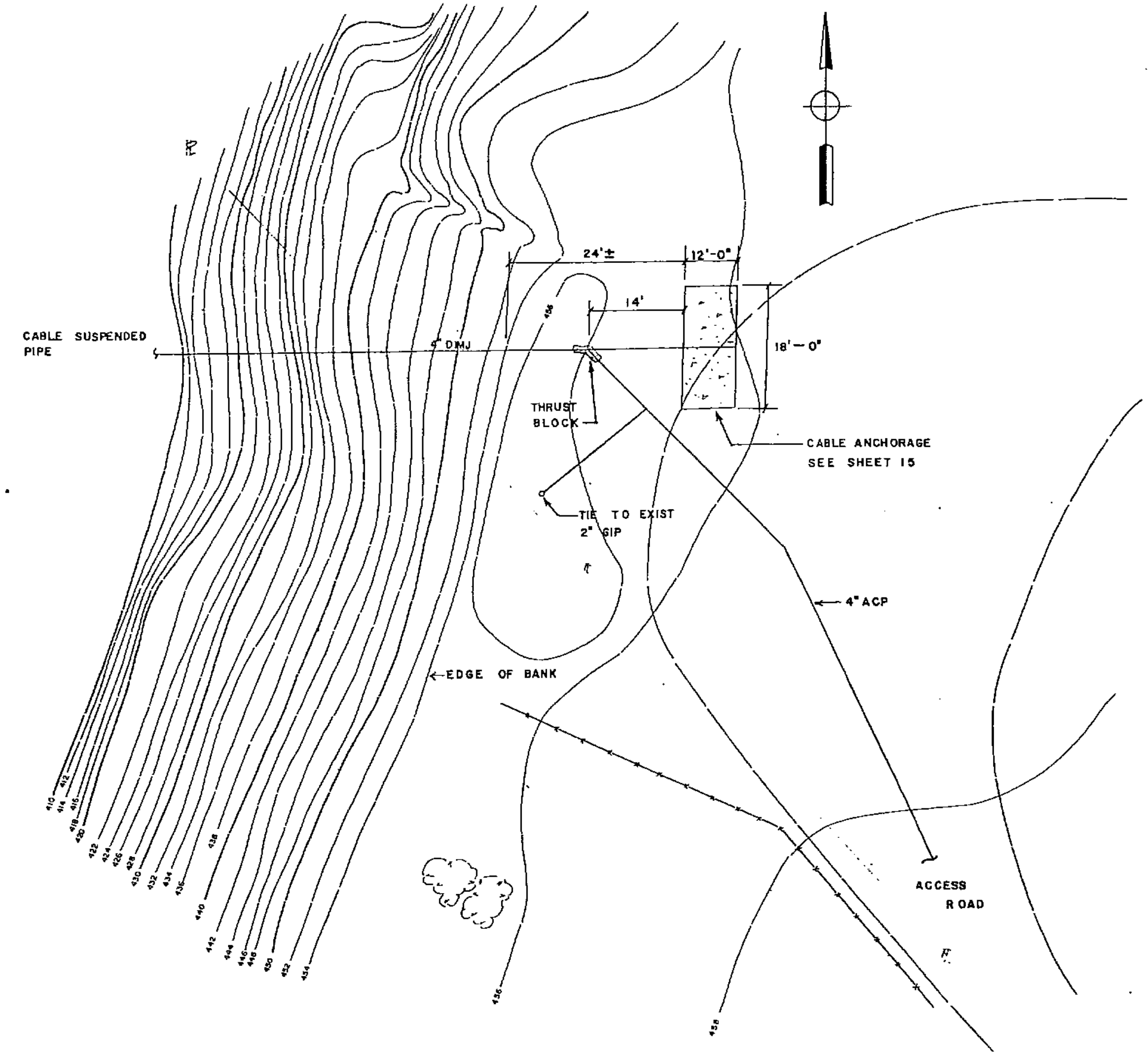
LACO ASSOCIATES
CONSULTING ENGINEERS
212 J STREET EUREKA, CALIF. 443-5054

KLAMATH RIVER CABLE CROSSING

SHEET 13 OF 50 SHEETS



WEST SIDE OF KLAMATH RIVER (1/14)
1" = 10'-0"



EAST SIDE OF KLAMATH RIVER (2/14)
1" = 10'-0"

NO.	DATE	REVISIONS

DATE: 1/11/78 | DESIGNED BY: RSF | SCALE: 1" = 10' | DRAWN BY: B | JOB NO.: 1515 | CHECKED BY:

ORLEANS COMMUNITY SERVICES DISTRICT

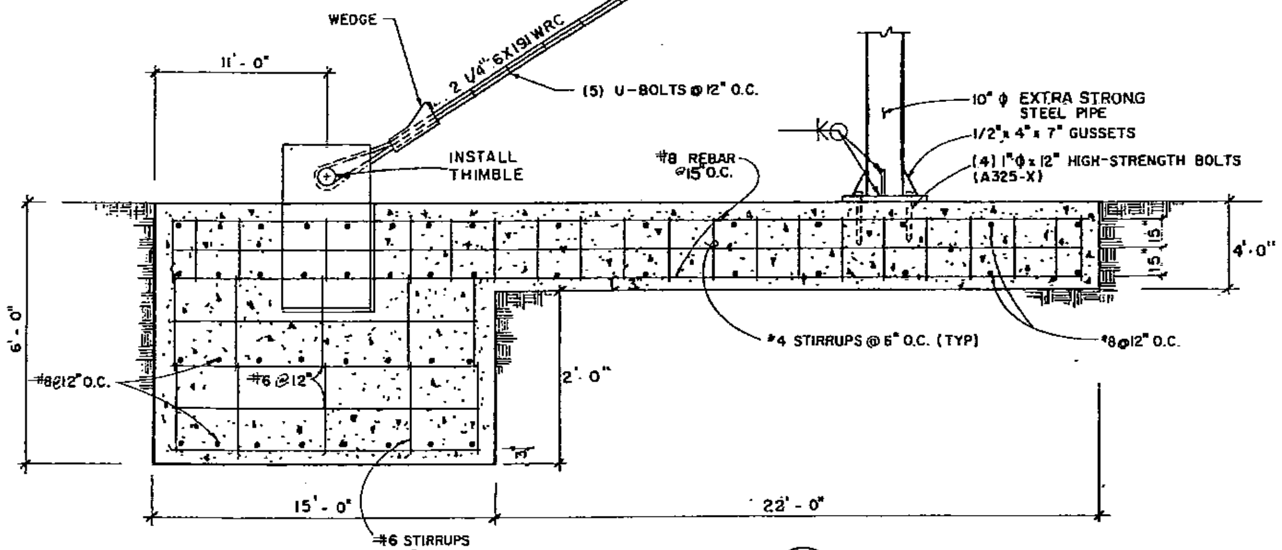
WATER SYSTEM

LACO ASSOCIATES
CONSULTING ENGINEERS
212 J STREET EUREKA, CALIF. 443-5054

KLAMATH RIVER CABLE CROSSING SITE PLANS

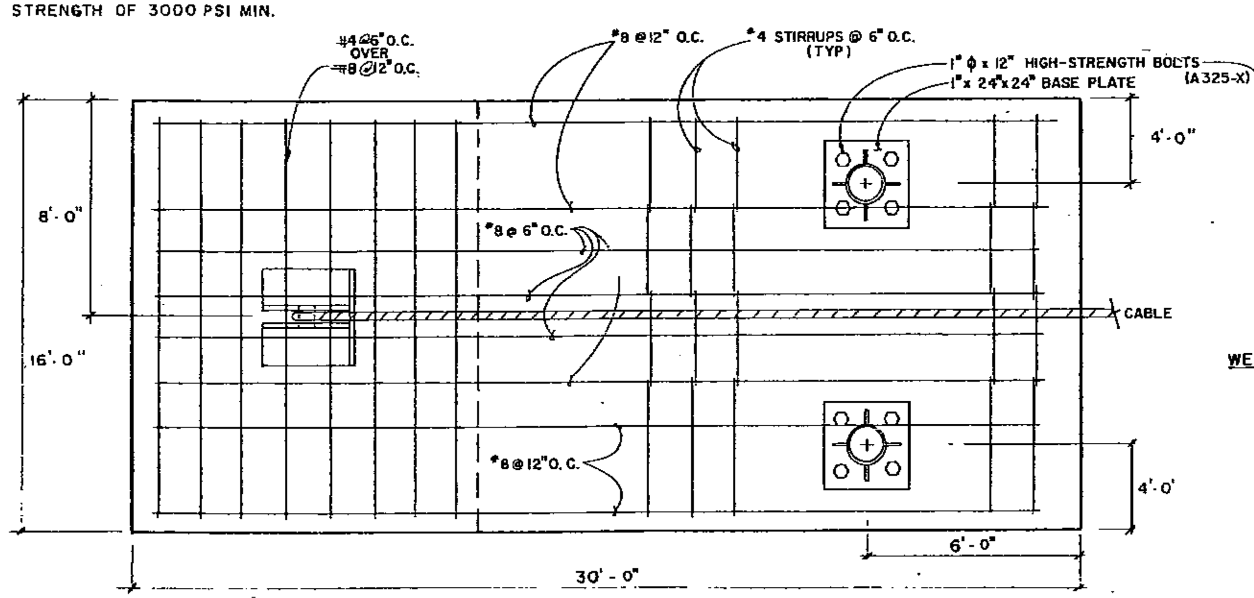
SHEET 14 OF 50 SHEETS

CONCRETE TO HAVE A 28 COMPRESSIVE STRENGTH OF 3000 PSI MIN.

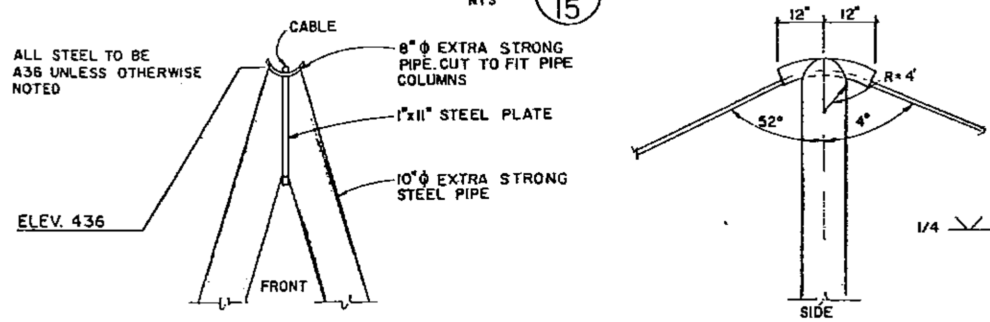


ELEVATION 1/15
NTS

CONCRETE TO HAVE A 28 DAY COMPRESSIVE STRENGTH OF 3000 PSI MIN.

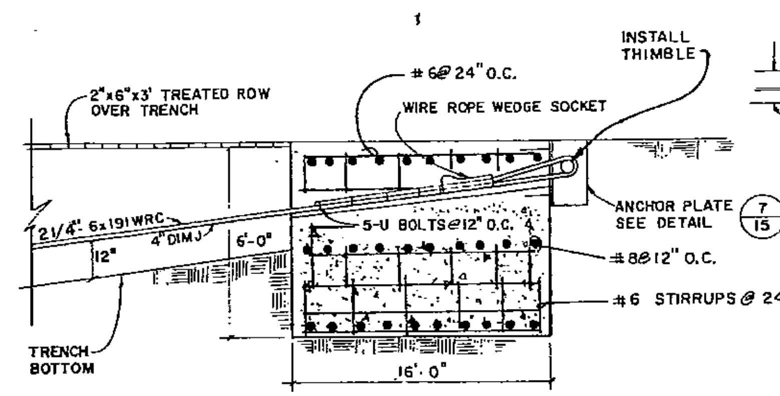


PLAN 2/15
NTS

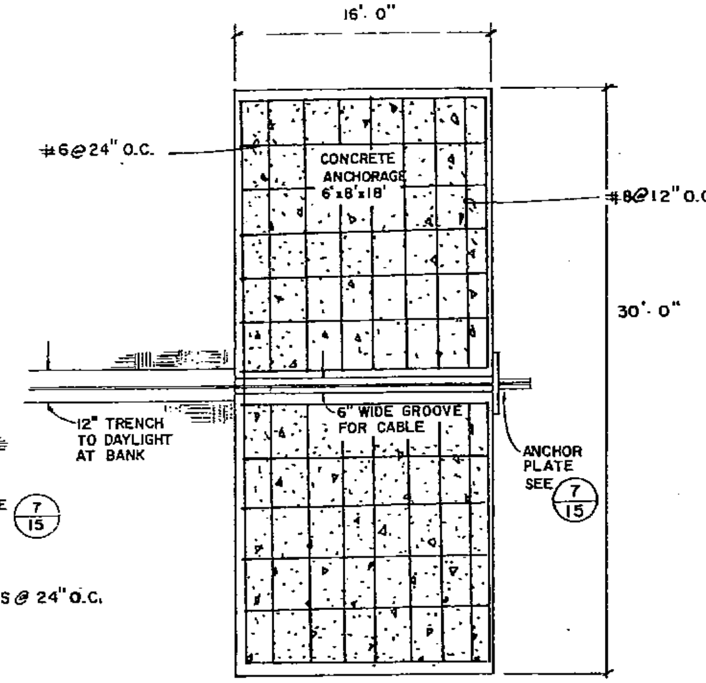


TOWER DETAIL 3/15
NTS

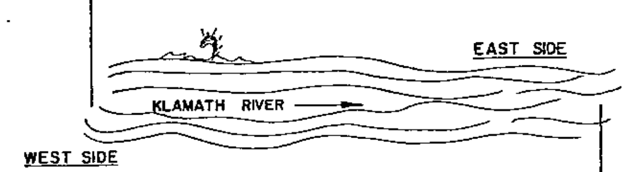
CONCRETE TO HAVE A 28 COMPRESSIVE STRENGTH OF 3000 PSI MIN.

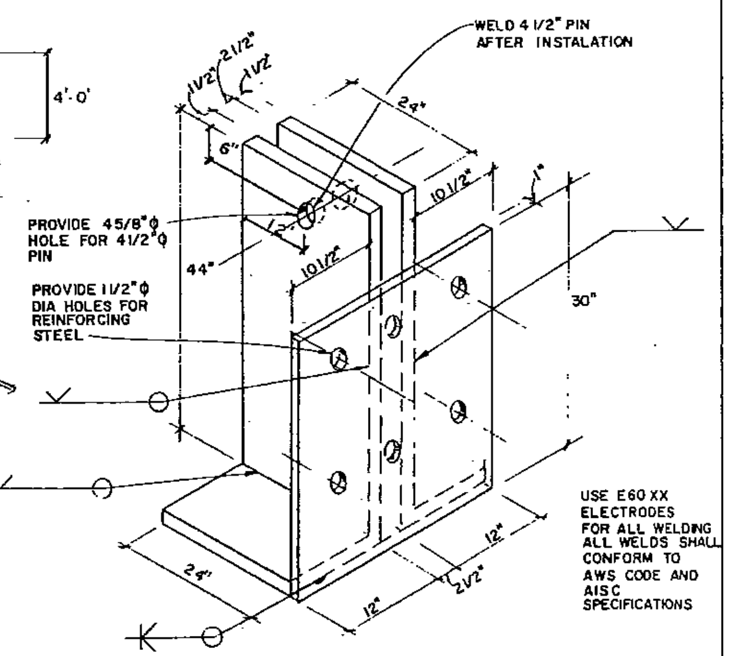


ELEVATION 5/15
3/8" = 1'-0"

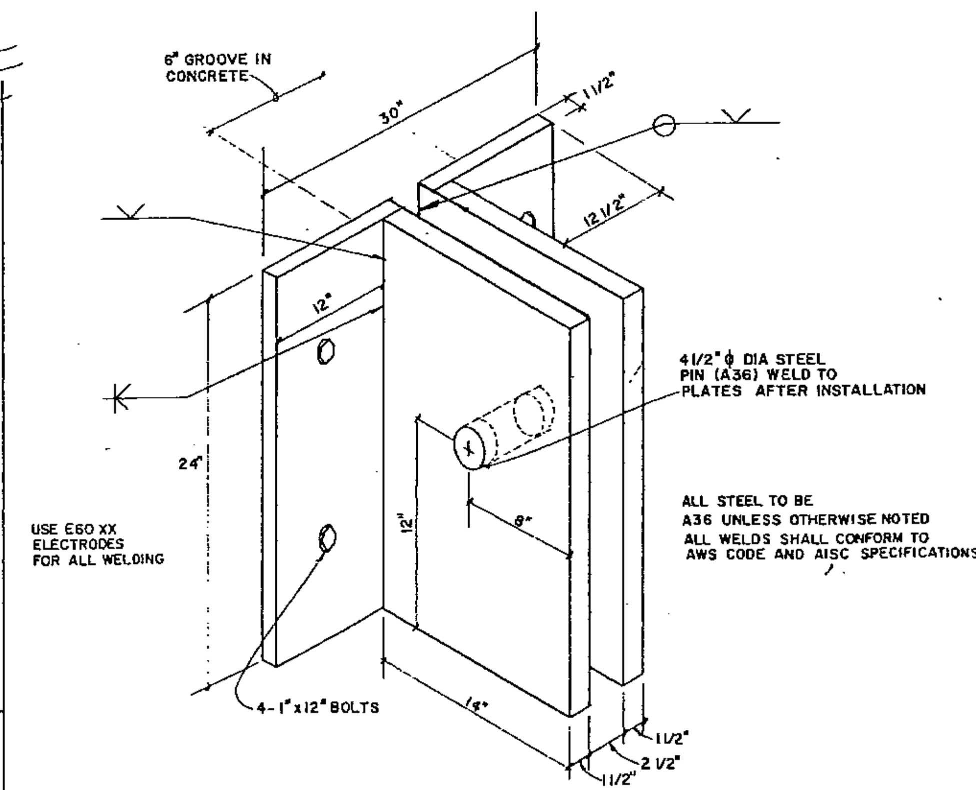


PLAN 6/15
3/8" = 1'-0"





ANCHOR PLATE 4/15
NTS



ANCHOR PLATE 7/15
NTS

NO.	DATE	REVISIONS

DATE 1/11/78 — DESIGNED BY RSF
SCALE AS SHOWN — DRAWN BY [signature]
JOB NO. 1515 — CHECKED BY [signature]

REGISTERED PROFESSIONAL ENGINEER — RANDALL S. FORBES — No. [illegible] — STATE OF CALIFORNIA

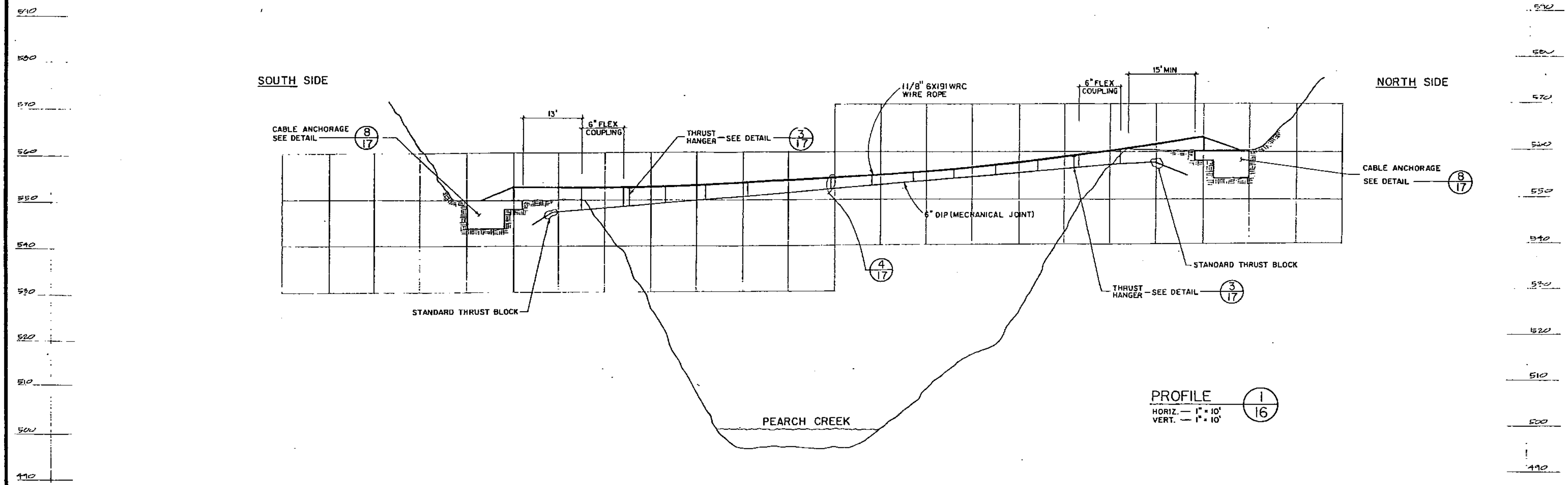
ORLEANS COMMUNITY SERVICES DISTRICT

WATER SYSTEM

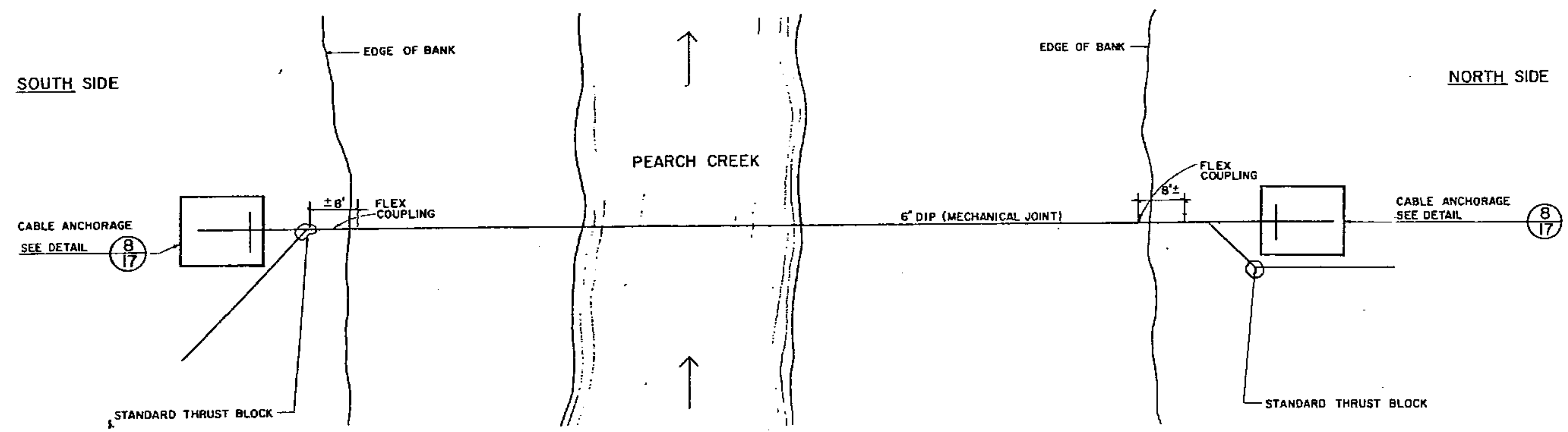
LACO ASSOCIATES
CONSULTING ENGINEERS
212 J STREET EUREKA, CALIF. 443-5054

KLAMATH RIVER
CABLE ANCHORAGE DETAILS

SHEET 15 OF 50 SHEETS



PROFILE 1/16
HORIZ. — 1" = 10'
VERT. — 1" = 10'



PLAN 2/16
1" = 10'

NO.	DATE	REVISIONS

DATE 4/7/78 — DESIGNED BY RSF
SCALE AS NOTED — DRAWN BY D. NELSON
JOB NO. 1515 — CHECKED BY

REGISTERED PROFESSIONAL ENGINEER — RANDALL S. FORBES — No. 28493 — STATE OF CALIFORNIA

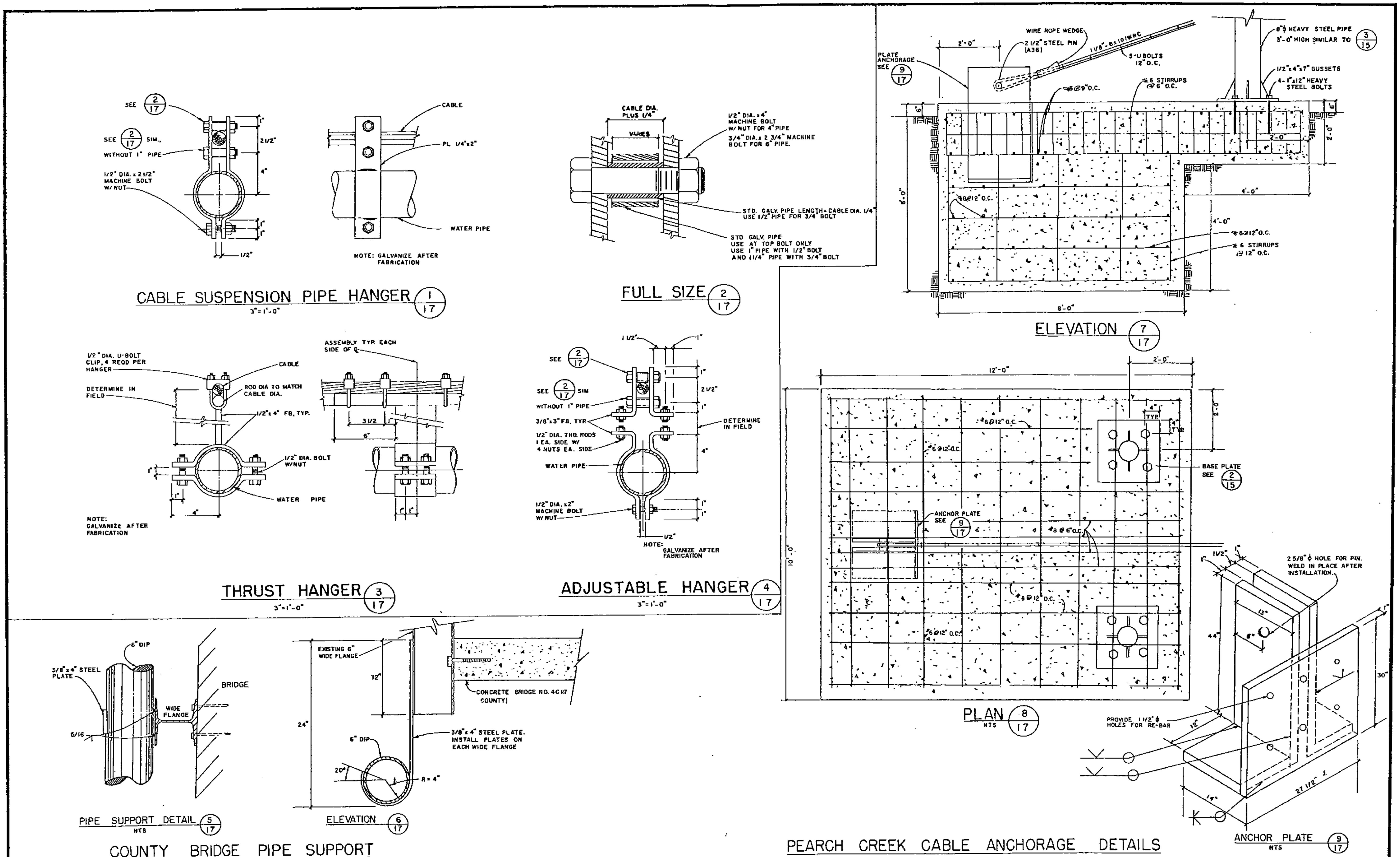
ORLEANS COMMUNITY SERVICES DISTRICT

WATER SYSTEM

LACO ASSOCIATES
CONSULTING ENGINEERS
212 J STREET EUREKA, CALIF. 443-5054

PEARCH CREEK
CABLE CROSSING

SHEET 16 OF 50 SHEETS



NO.	DATE	REVISIONS

DATE 1/11/78 | DESIGNED BY RSF | SCALE AS SHOWN | DRAWN BY | JOB NO. 1515 | CHECKED BY

REGISTERED PROFESSIONAL ENGINEER RANDALL S. FORBES STATE OF CALIFORNIA

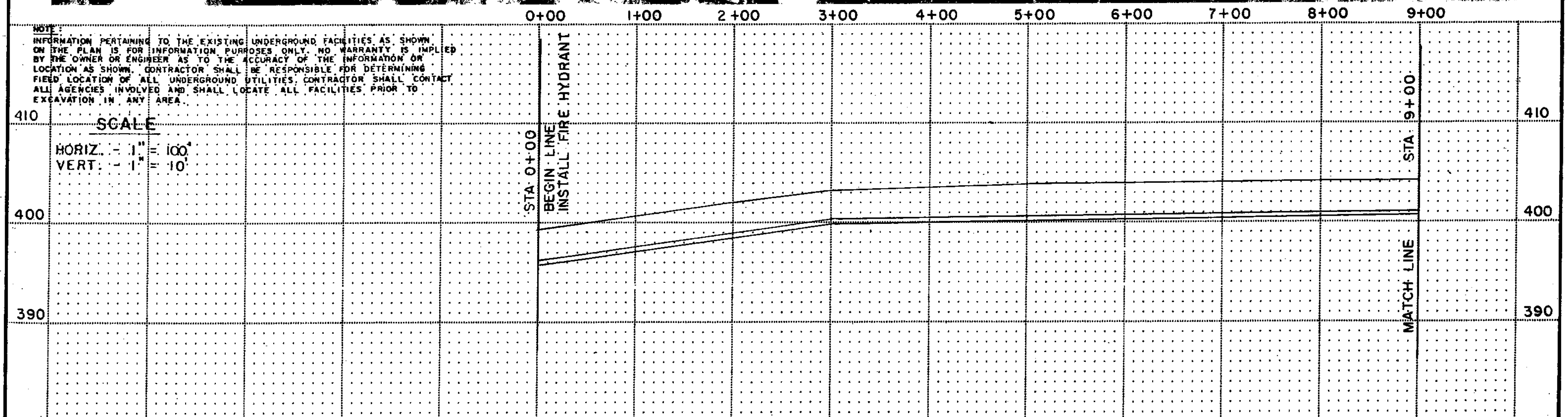
ORLEANS COMMUNITY SERVICES DISTRICT

WATER SYSTEM

LACO ASSOCIATES
CONSULTING ENGINEERS
212 J STREET EUREKA, CALIF. 443-5054

PEARCH CREEK CABLE ANCHORAGE AND TYPICAL SUSPENDED CABLE DETAILS

SHEET 17 OF 50 SHEETS



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SCALE

HORIZ. - 1" = 100'
VERT. - 1" = 10'

NO.	DATE	REVISIONS

DATE	DESIGNED BY
3-15-78	R.F.
SCALE	DRAWN BY JEFF
JOB NO. 1515	CHECKED BY G.J.C

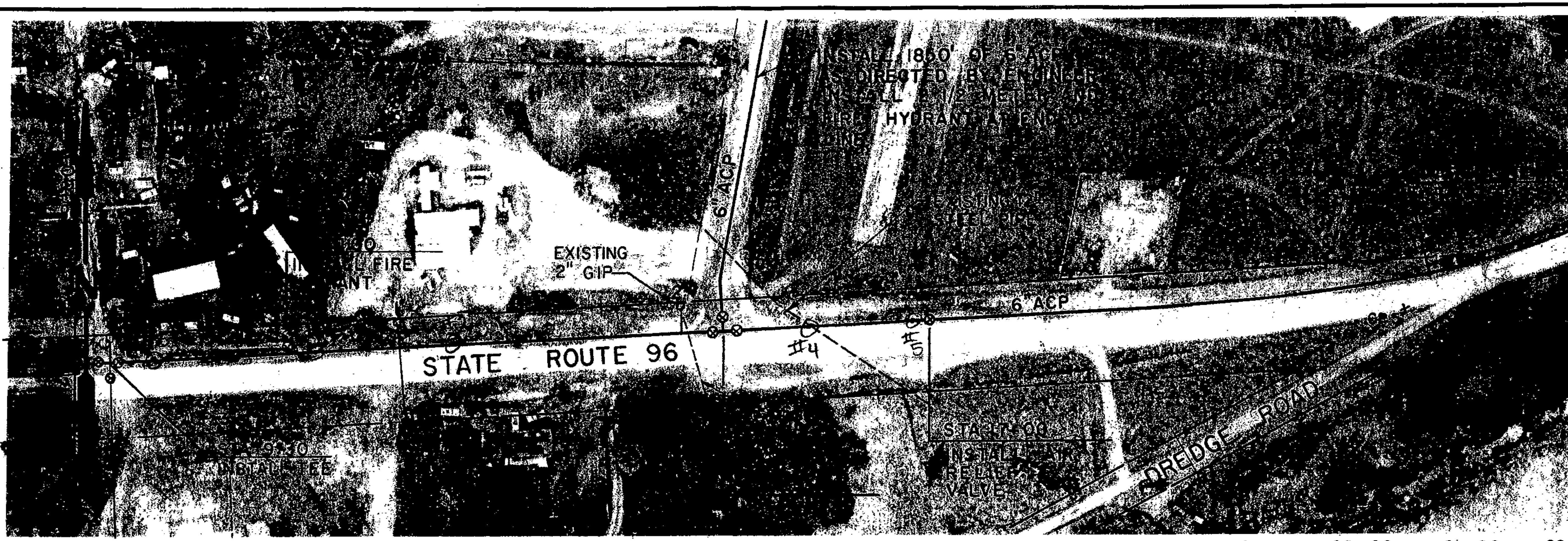
ORLEANS COMMUNITY SERVICES DISTRICT

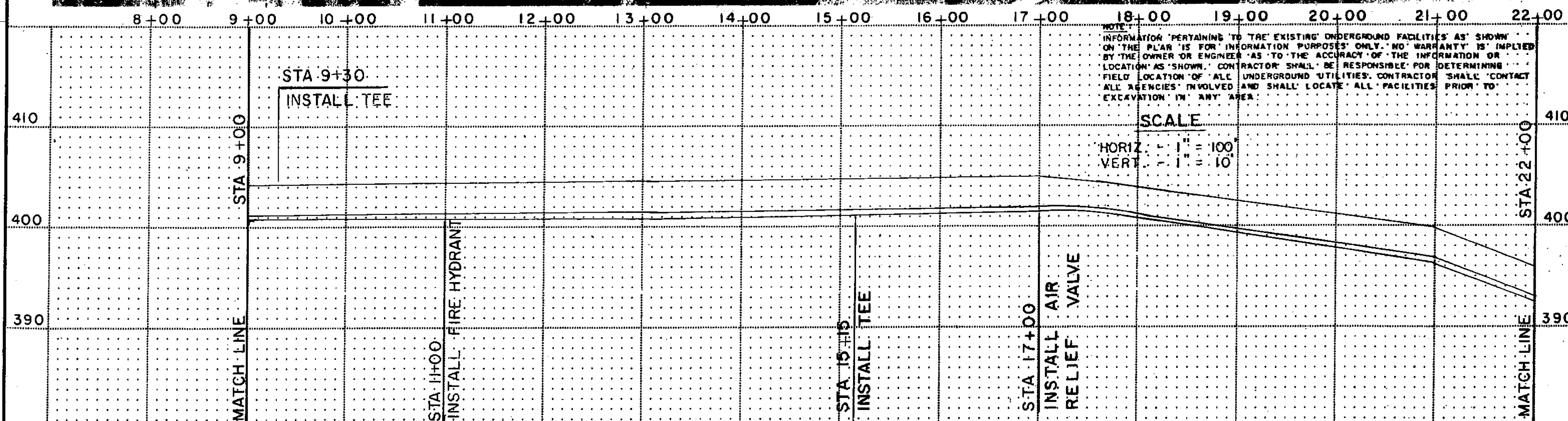
WATER SYSTEM

LACO ASSOCIATES
CONSULTING ENGINEERS
212 J STREET EUREKA, CALIF. 443-5054

HIGHWAY 96
STA 0+00 STA 9+00

SHEET 18 OF 50 SHEETS





NO.	DATE	REVISIONS

DATE: 3-15-78	DESIGNED BY: R.F.
SCALE	DRAWN BY: JEFF
JOB NO. 1515	CHECKED BY

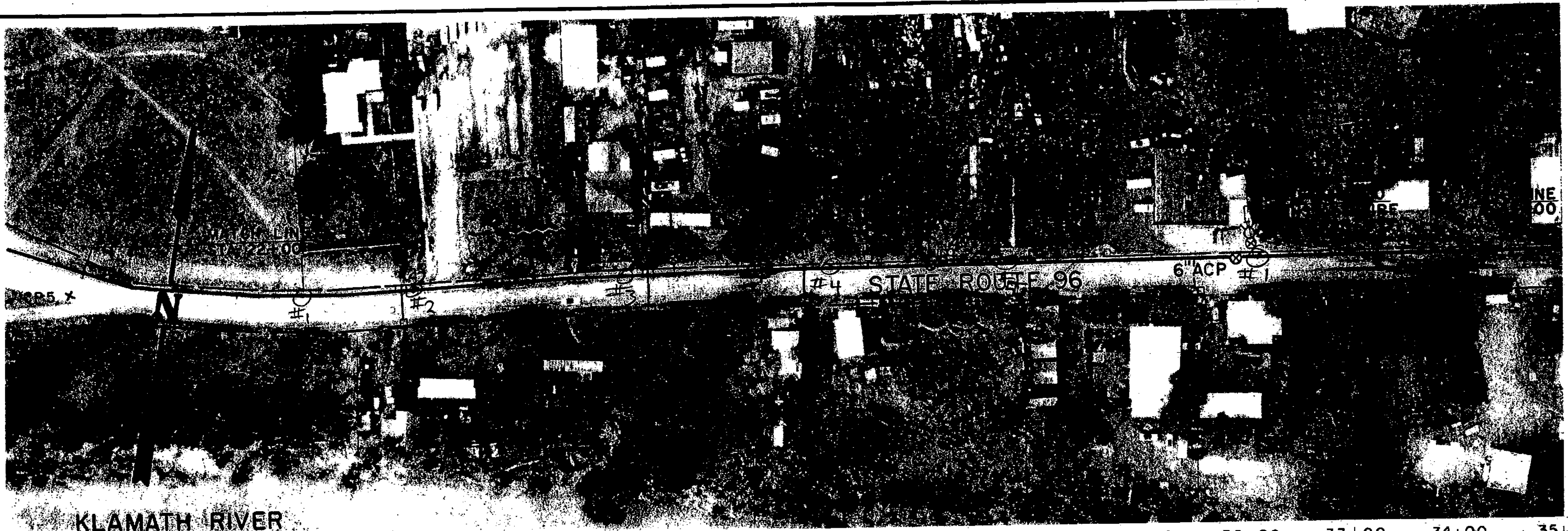
ORLEANS COMMUNITY SERVICES DISTRICT

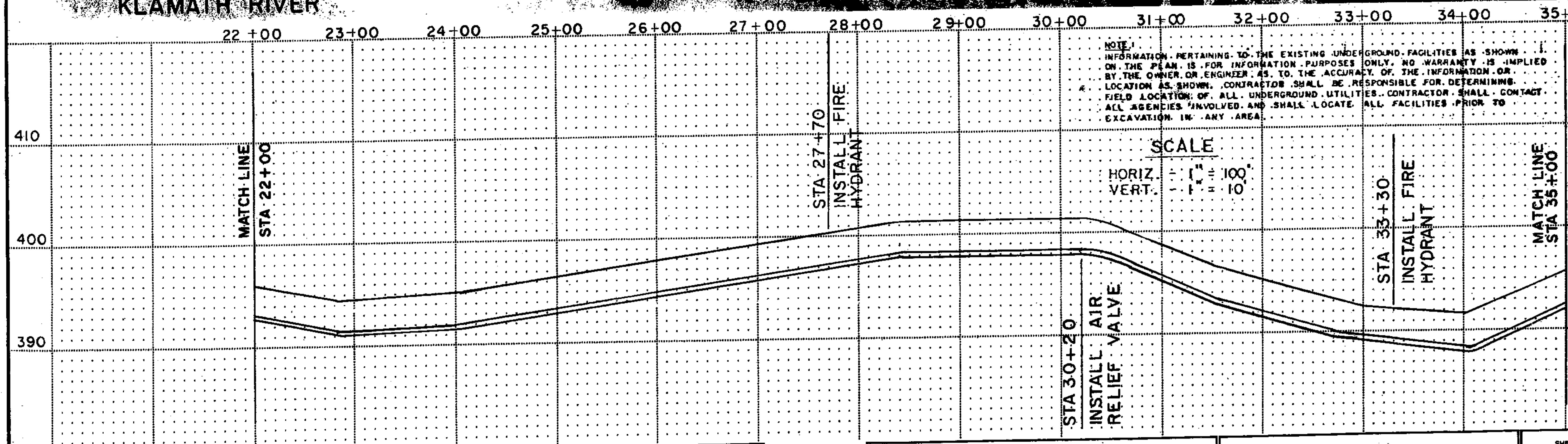
WATER SYSTEM

LACO ASSOCIATES
CONSULTING ENGINEERS
212 J STREET EUREKA, CALIF. 443-5054

HIGHWAY 96
STA 9+00 STA 22+00

SHEET 19 OF 50 SHEETS





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SCALE
HORIZ. - 1" = 100'
VERT. - 1" = 10'

NO.	DATE	REVISIONS

DATE: 3-15-78
DESIGNED BY: R. F.
SCALE:
DRAWN BY: JEFF
JOB NO.: 1515
CHECKED BY:

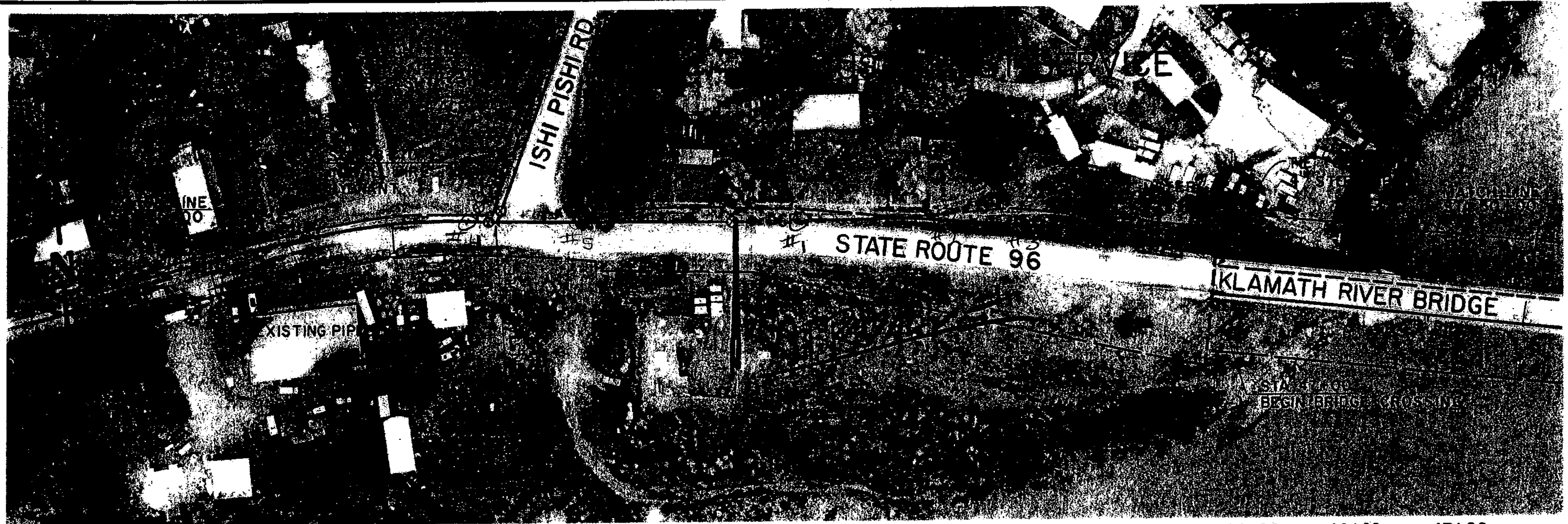
ORLEANS COMMUNITY SERVICES DISTRICT

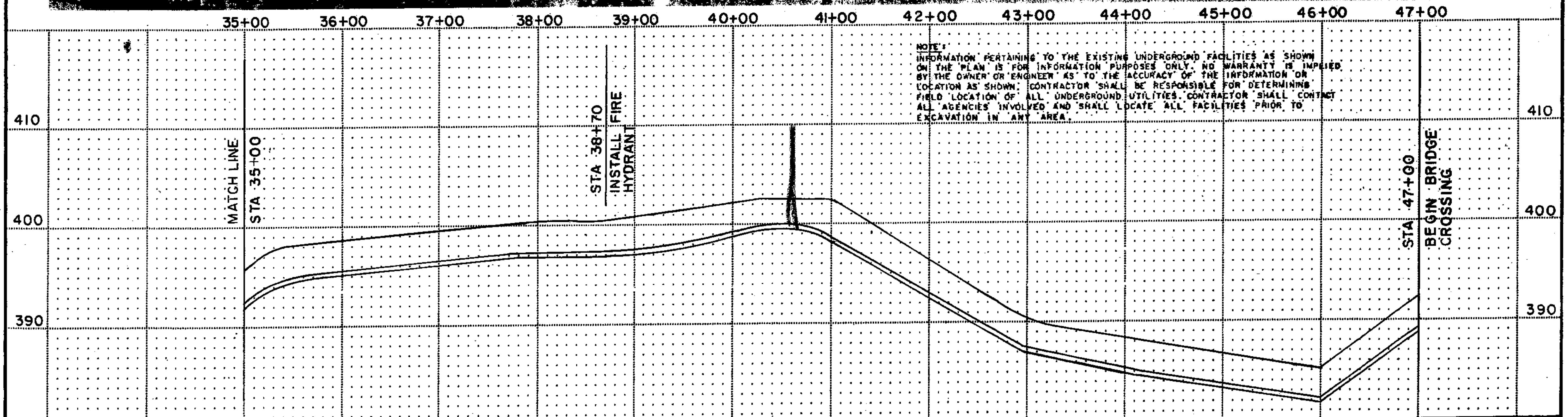
WATER SYSTEM

LACO ASSOCIATES
CONSULTING ENGINEERS
212 J STREET EUREKA, CALIF. 443-6054

HIGHWAY 96
STA 22+00 STA 35+00

SHEET 20 OF 50 SHEETS





NO.	DATE	REVISIONS

DATE 3-15-78 | DESIGNED BY R. F. | SCALE | DRAWN BY JEFF | JOB NO. 1515 | CHECKED BY

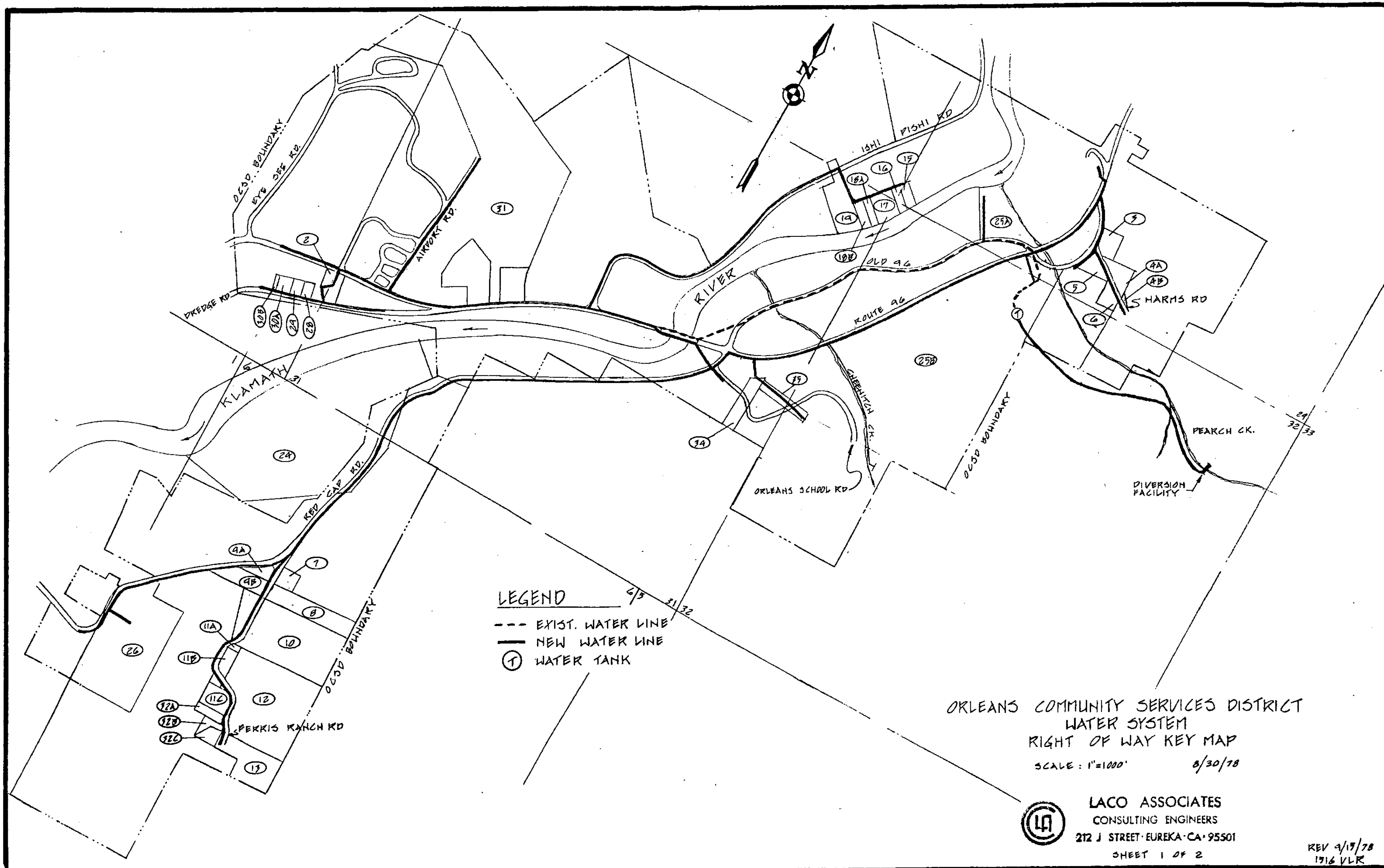
ORLEANS COMMUNITY SERVICES DISTRICT

WATER SYSTEM

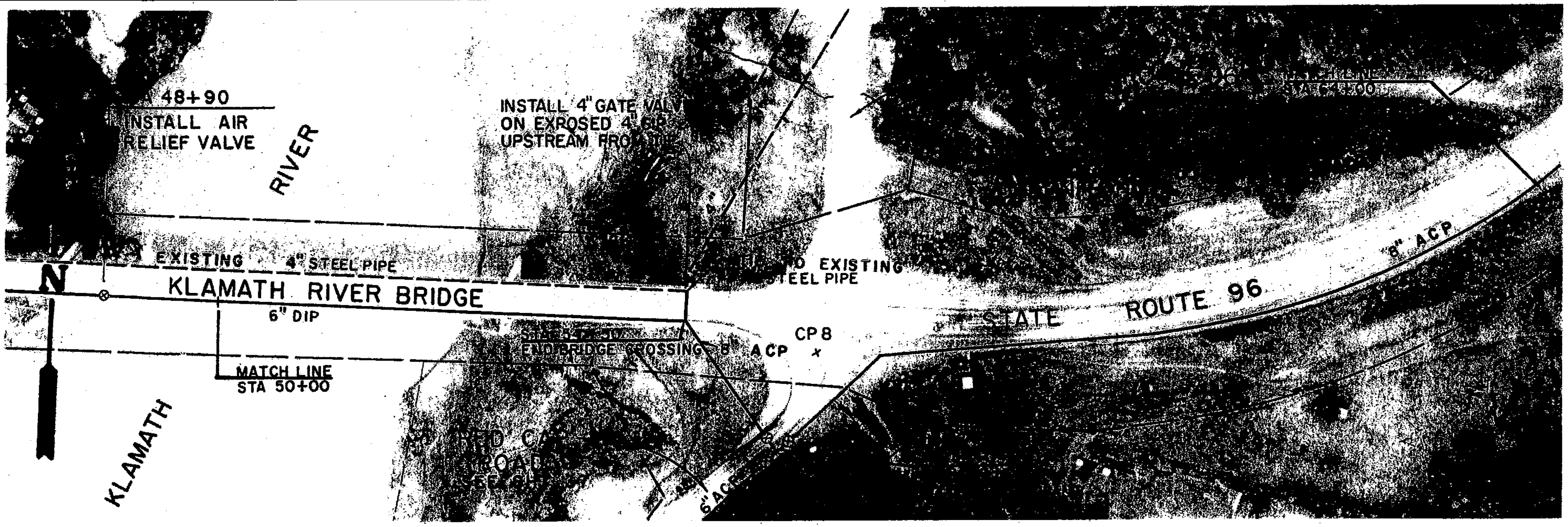
LACO ASSOCIATES
CONSULTING ENGINEERS
212 J STREET EUREKA, CALIF. 443-5054

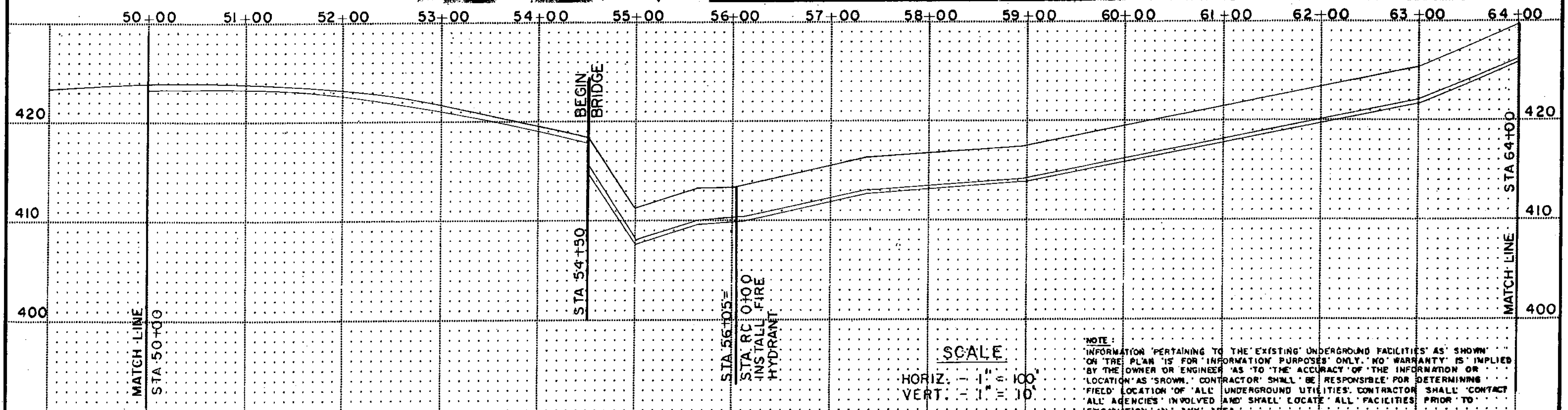
HIGHWAY 96
STA 35+00 STA 50+00

SHEET 21 OF 50 SHEETS



OCSD BOUNDARY
EYE SEE RD.
AIRPORT RD.
DREDGE RD
KLAMATH
RIVER
ISHI PISHI RD
OLD 96
ROUTE 96
HARMS RD
CHEENITCH CK.
ORLEANS SCHOOL RD
PEARCH CK.
DIVERSION FACILITY
RED CAP RD.
PERKIS RANCH RD
LEGEND
EXIST. WATER LINE
NEW WATER LINE
WATER TANK
ORLEANS COMMUNITY SERVICES DISTRICT
WATER SYSTEM
RIGHT OF WAY KEY MAP
SCALE : 1"=1000'
8/30/78
LACO ASSOCIATES
CONSULTING ENGINEERS
212 J STREET · EUREKA · CA · 95501
SHEET 1 OF 2
REV 9/13/78
1916 VLR





NOTE:
INFORMATION PERTAINING TO THE EXISTING UNDERGROUND FACILITIES AS SHOWN ON THE PLAN IS FOR INFORMATION PURPOSES ONLY. NO WARRANTY IS IMPLIED BY THE OWNER OR ENGINEER AS TO THE ACCURACY OF THE INFORMATION OR LOCATION AS SHOWN. CONTRACTOR SHALL BE RESPONSIBLE FOR DETERMINING FIELD LOCATION OF ALL UNDERGROUND UTILITIES. CONTRACTOR SHALL CONTACT ALL AGENCIES INVOLVED AND SHALL LOCATE ALL FACILITIES PRIOR TO EXCAVATION IN ANY AREA.

NO.	DATE	REVISIONS

DATE 3-15-78 | DESIGNED BY R.F. | SCALE | DRAWN BY JEFF | JOB NO. 1515 | CHECKED BY

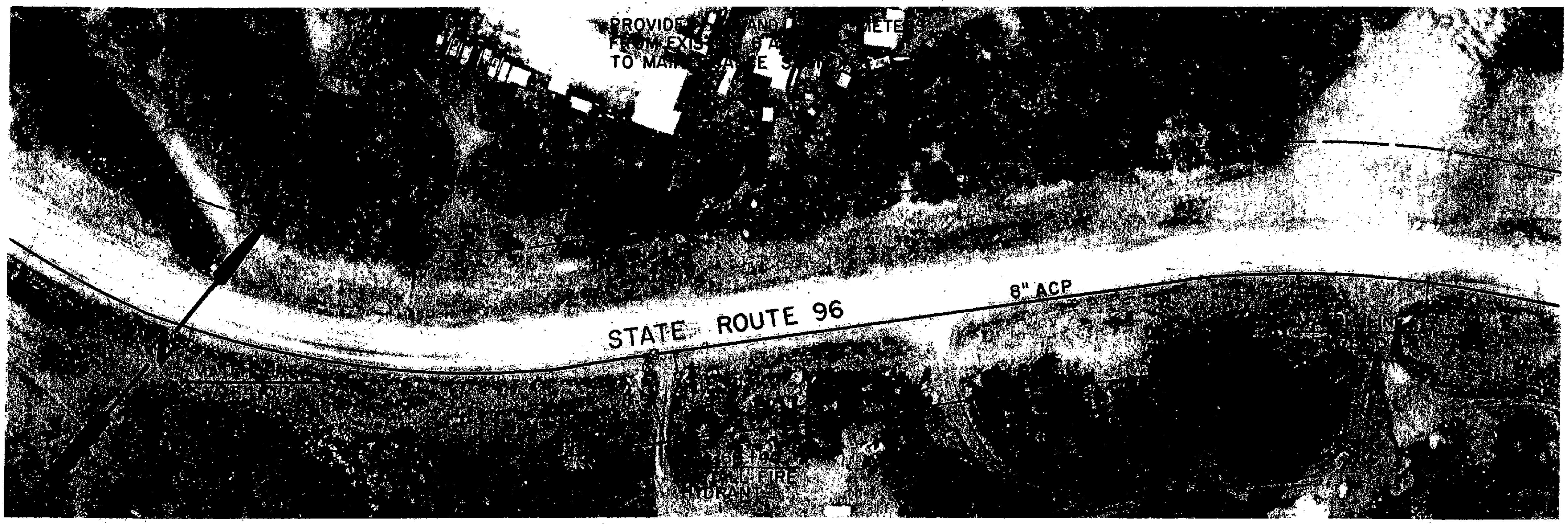
ORLEANS COMMUNITY SERVICES DISTRICT

WATER SYSTEM

LACO ASSOCIATES
CONSULTING ENGINEERS
212 J STREET EUREKA, CALIF. 443-5054

STATE HIGHWAY 96
STA 50+00 STA 64+00

SHEET **22** OF **50** SHEETS



NOTE:

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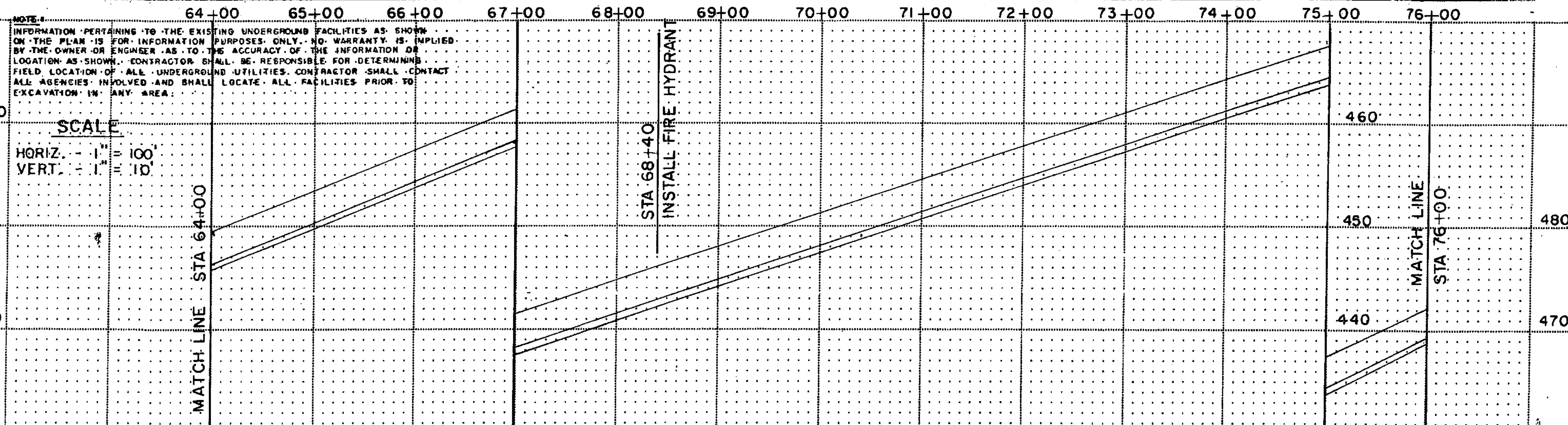
SCALE

HORIZ. - 1" = 100'
VERT. - 1" = 10'



NO.	DATE	REVISIONS

DATE 3-15-78 | DESIGNED BY R.F. | SCALE | DRAWN BY JEFF | JOB NO. 1515 | CHECKED BY

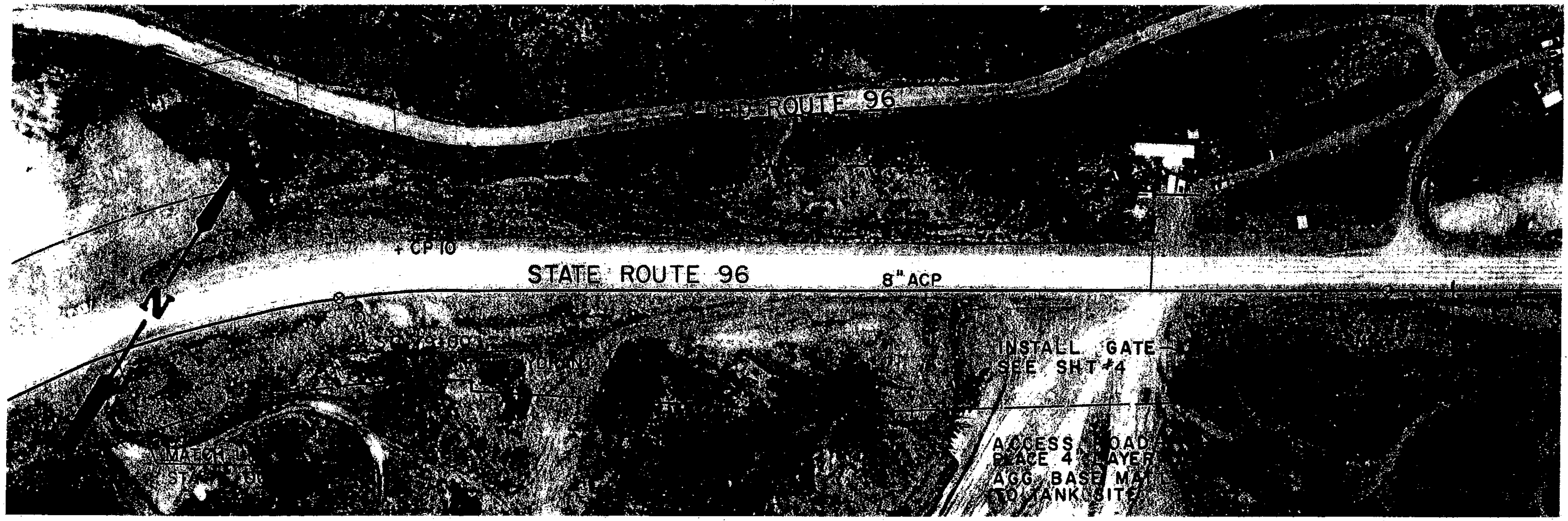
ORLEANS COMMUNITY SERVICES DISTRICT

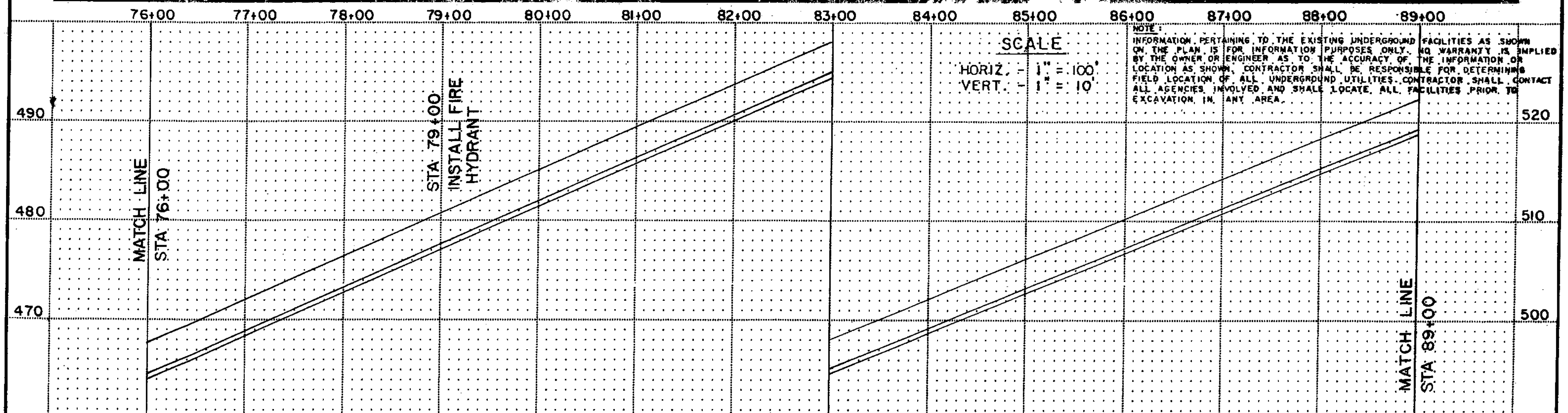
WATER SYSTEM

LACO ASSOCIATES
CONSULTING ENGINEERS
212 J STREET EUREKA, CALIF. 443-5064

HIGHWAY 96
STA 64+00 STA 76+00

SHEET 23 OF 50 SHEETS





SCALE
HORIZ. - 1" = 100'
VERT. - 1" = 10'

NOTE:
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NO.	DATE	REVISIONS

DATE	DESIGNED BY
3-15-78	R.F.
SCALE	DRAWN BY: JEFF
JOB NO. 1515	CHECKED BY

ORLEANS COMMUNITY SERVICES DISTRICT

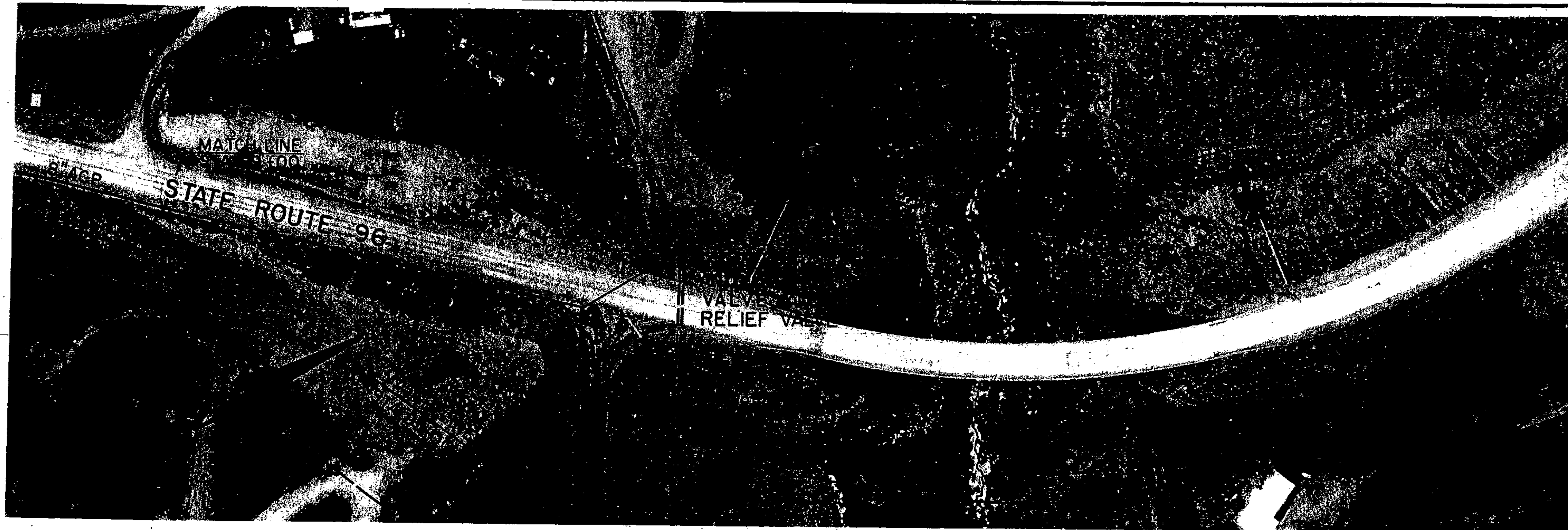
WATER SYSTEM

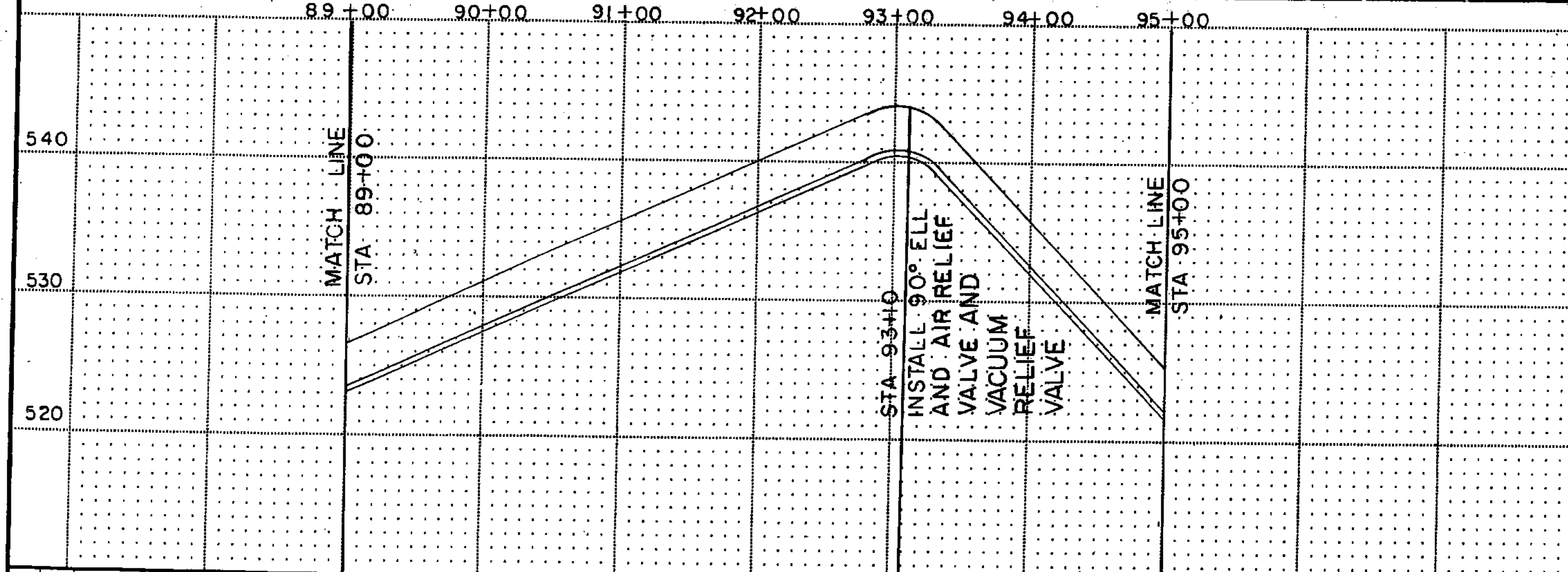
LACO ASSOCIATES
CONSULTING ENGINEERS
212 J STREET EUREKA, CALIF. 443-5054

STATE HIGHWAY 96

STA 76+00 STA 89+00

SHEET 24 OF 50 SHEETS





NOTE :
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SCALE
HORIZ. - 1" = 100'
VERT. - 1" = 10'

540
530
520

NO.	DATE	REVISIONS

DATE	DESIGNED BY
3-15-78	R. F.
SCALE	DRAWN BY K
JOB NO. 1515	CHECKED BY

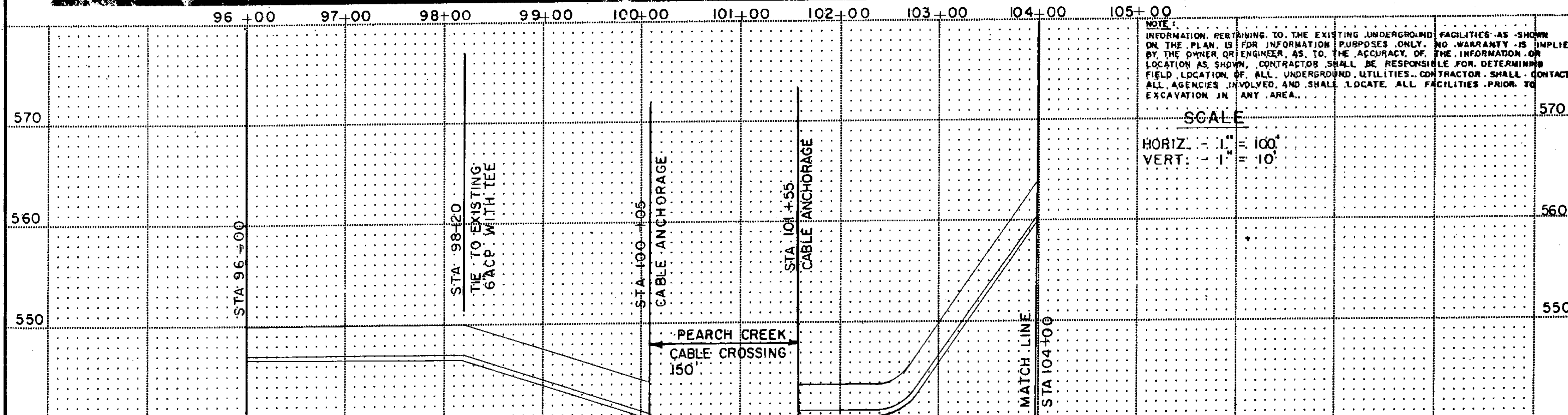
ORLEANS COMMUNITY SERVICES DISTRICT

WATER SYSTEM

LACO ASSOCIATES
CONSULTING ENGINEERS
212 J STREET EUREKA, CALIF. 443-5054

STATE HIGHWAY 96
STA 89+00 STA 95+00

SHEET 25 OF 50 SHEETS



NOTE :
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SCALE
HORIZ. - 1" = 100'
VERT. - 1" = 10'

NO.	DATE	REVISIONS	DATE	DESIGNED BY
			3-15-78	R.F.
			SCALE	DRAWN BY JEFF
			JOB NO. 1515	CHECKED BY

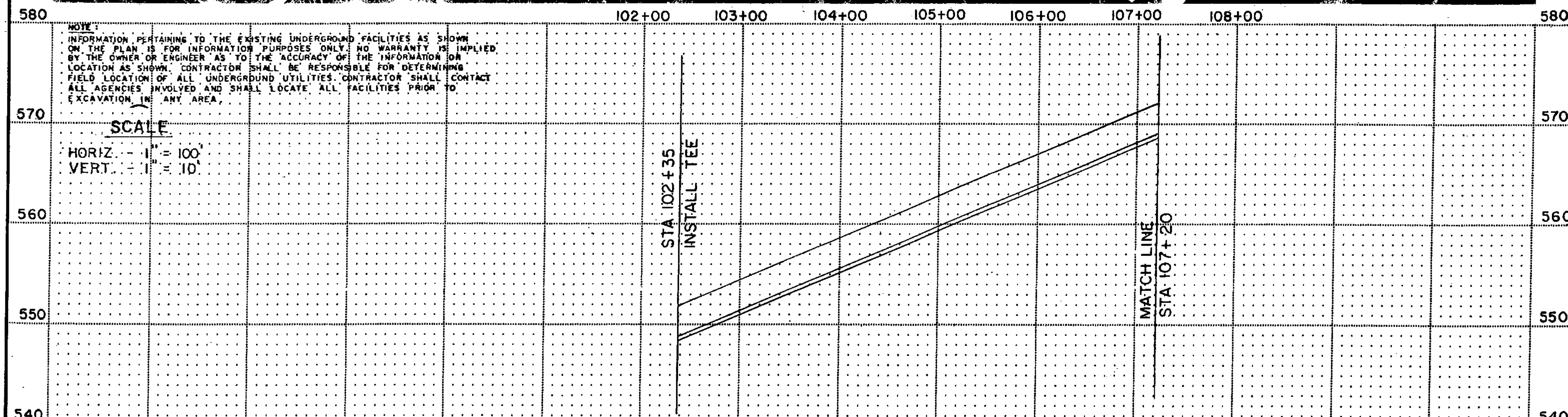
ORLEANS COMMUNITY SERVICES DISTRICT

WATER SYSTEM

LACO ASSOCIATES
CONSULTING ENGINEERS
212 J STREET EUREKA, CALIF. 443-5064

PEARCH CREEK
STA 96+00 STA 104+100

SHEET 26 OF 50 SHEETS



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SCALE
HORIZ. - 1" = 100'
VERT. - 1" = 10'

NO.	DATE	REVISIONS

DATE 3-15-78 | DESIGNED BY R.F. | SCALE | DRAWN BY JEFF | JOB NO. 1515 | CHECKED BY

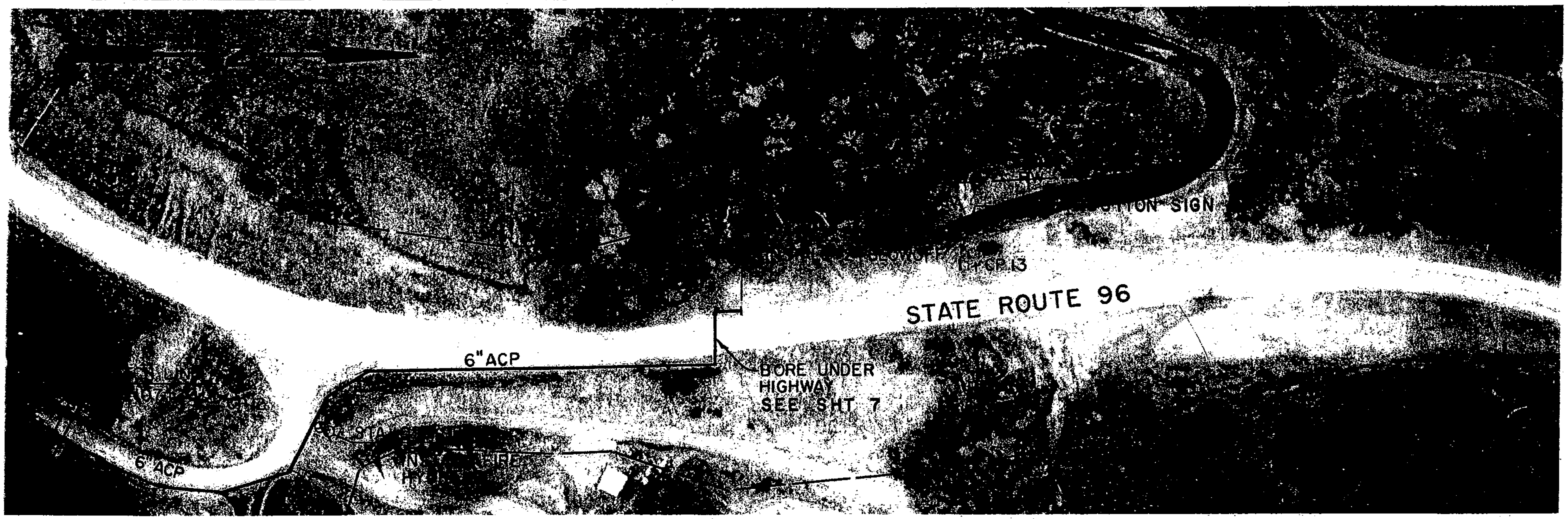
ORLEANS COMMUNITY SERVICES DISTRICT

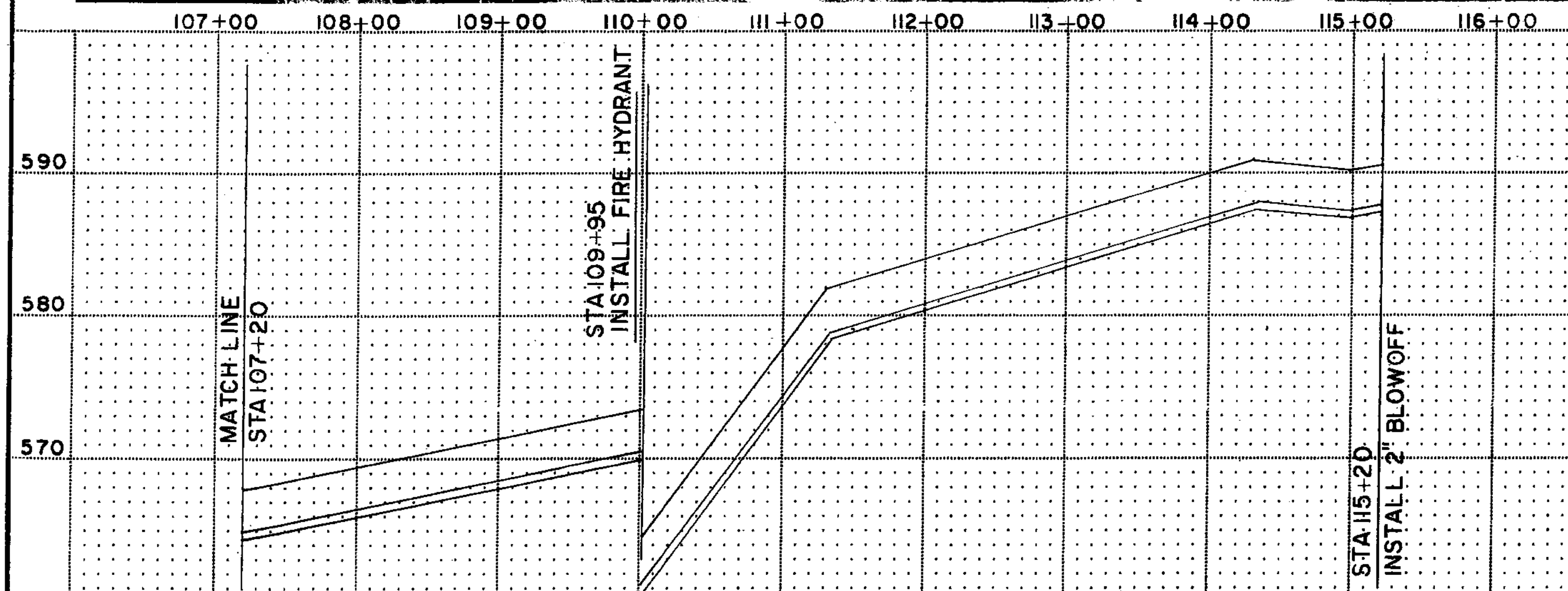
WATER SYSTEM

LACO ASSOCIATES
CONSULTING ENGINEERS
212 J STREET EUREKA, CALIF. 443-5054

COUNTY ROAD
STA 102+35 STA 107+20

SHEET 27 OF 50 SHEETS





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SCALE
HORIZ. - 1" = 100'
VERT. - 1" = 10'

NO.	DATE	REVISIONS

DATE 3-15-78 | DESIGNED BY R. F. | SCALE | DRAWN BY K | JOB NO. 1515 | CHECKED BY

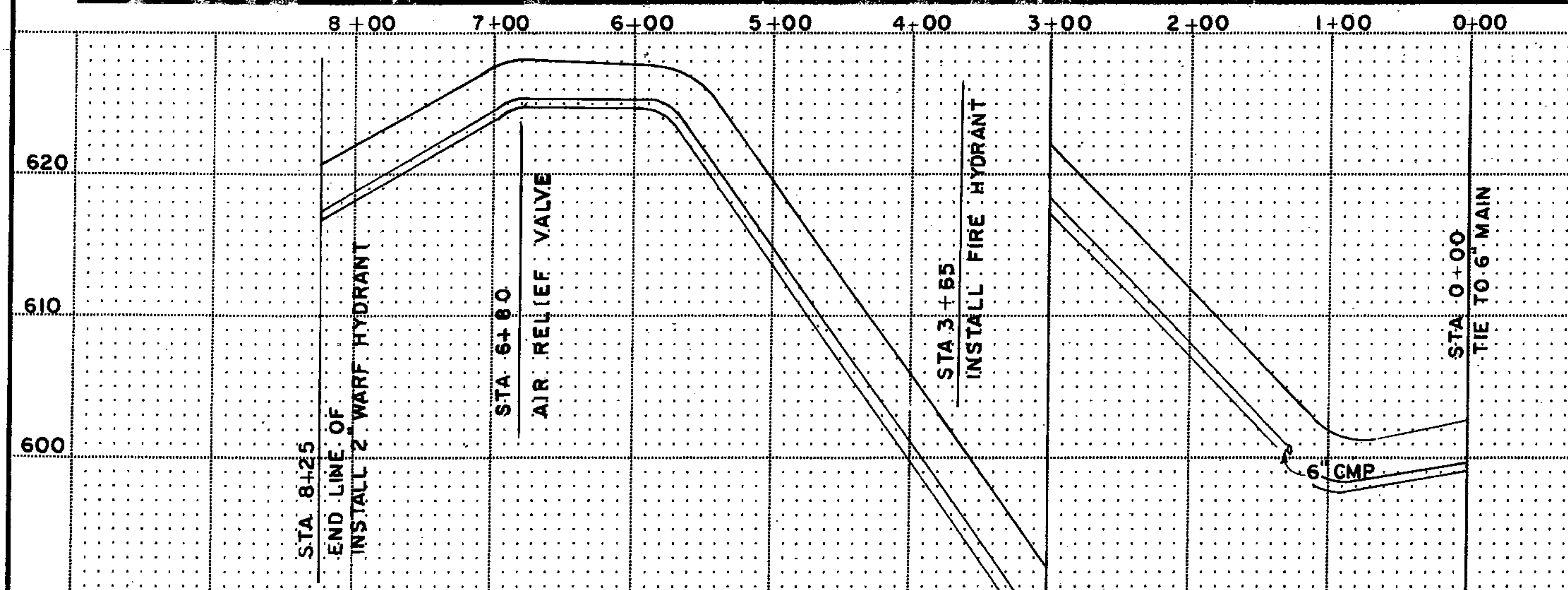
ORLEANS COMMUNITY SERVICES DISTRICT

WATER SYSTEM

LACO ASSOCIATES
CONSULTING ENGINEERS
212 J STREET EUREKA, CALIF. 443-5054

HIGHWAY 96
STA 107+20 STA 115+20

SHEET 28 OF 50 SHEETS



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SCALE

HORIZ. - 1" = 100'
VERT. - 1" = 10'

NO.	DATE	REVISIONS

DATE 3-15-78 | DESIGNED BY R. F.
SCALE | DRAWN BY JEFF
JOB NO. 1515 | CHECKED BY

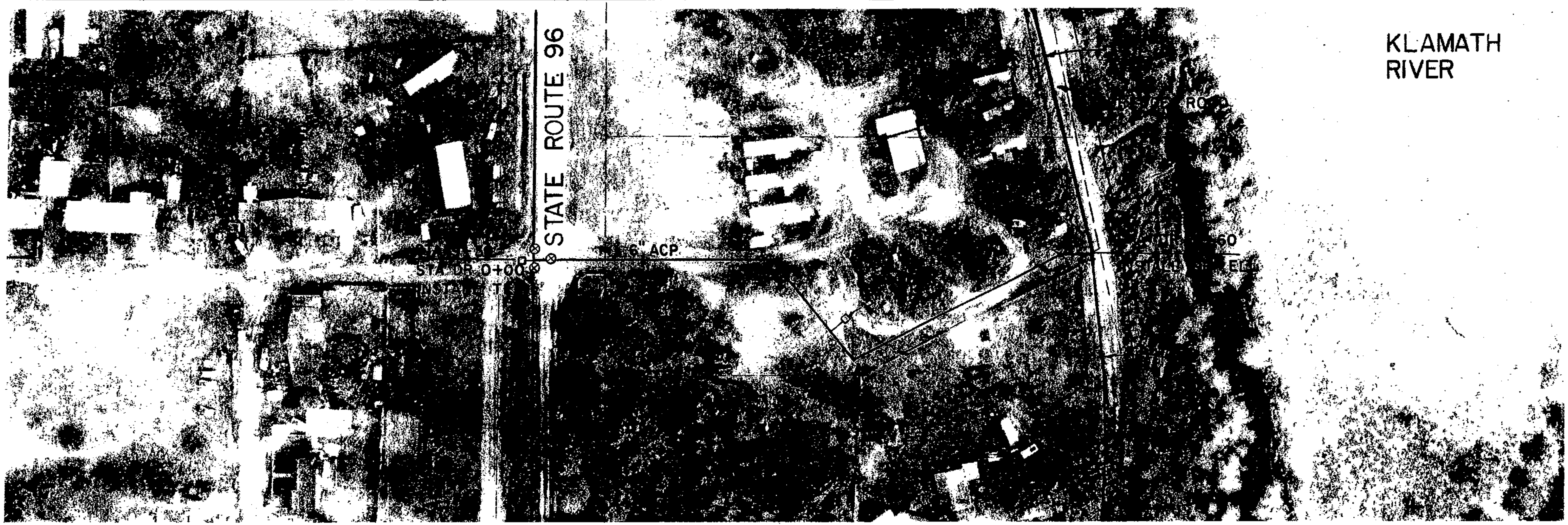
ORLEANS COMMUNITY SERVICES DISTRICT

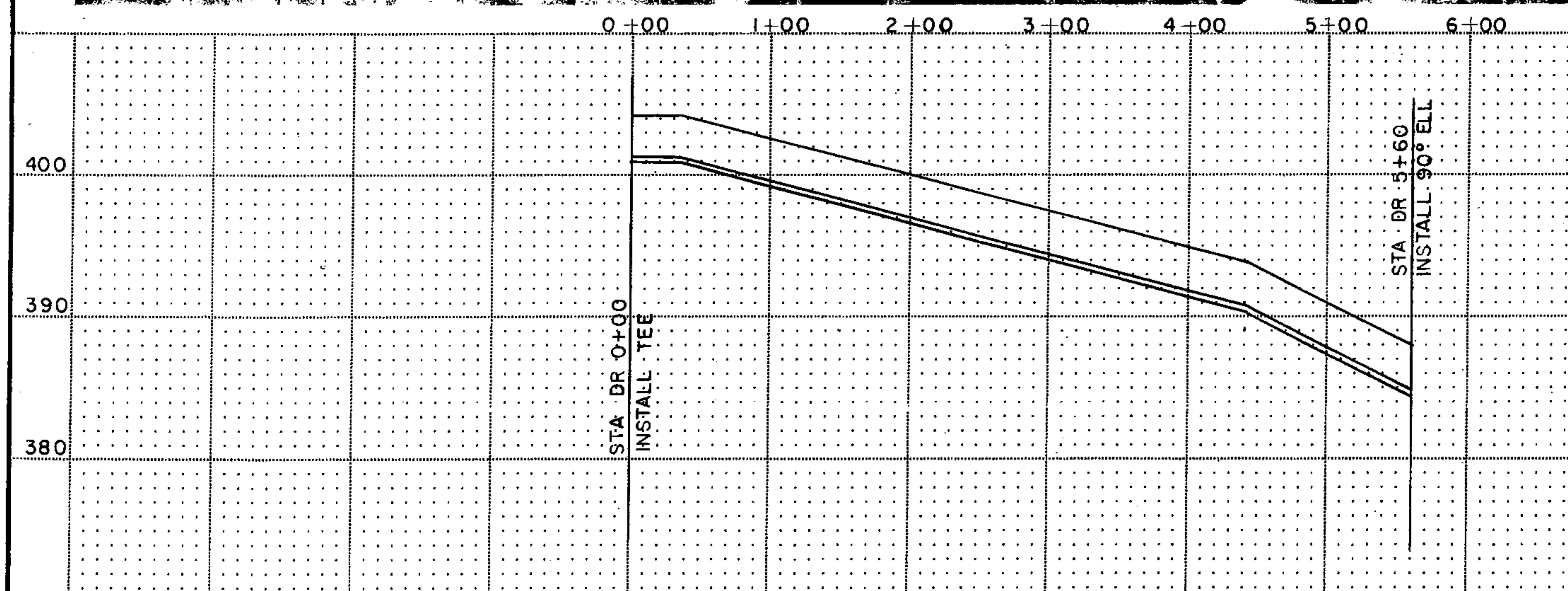
WATER SYSTEM

LACO ASSOCIATES
CONSULTING ENGINEERS
212 J STREET EUREKA, CALIF. 443-5054

HARMS ROAD
STA 0+00 STA 8+25

SHEET 29 OF 50 SHEETS





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SCALE
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VERT. - 1" = 10'

NO.	DATE	REVISIONS

DATE 3-15-78	DESIGNED BY R.F.
SCALE	DRAWN BY JEFF
JOB NO. 1515	CHECKED BY

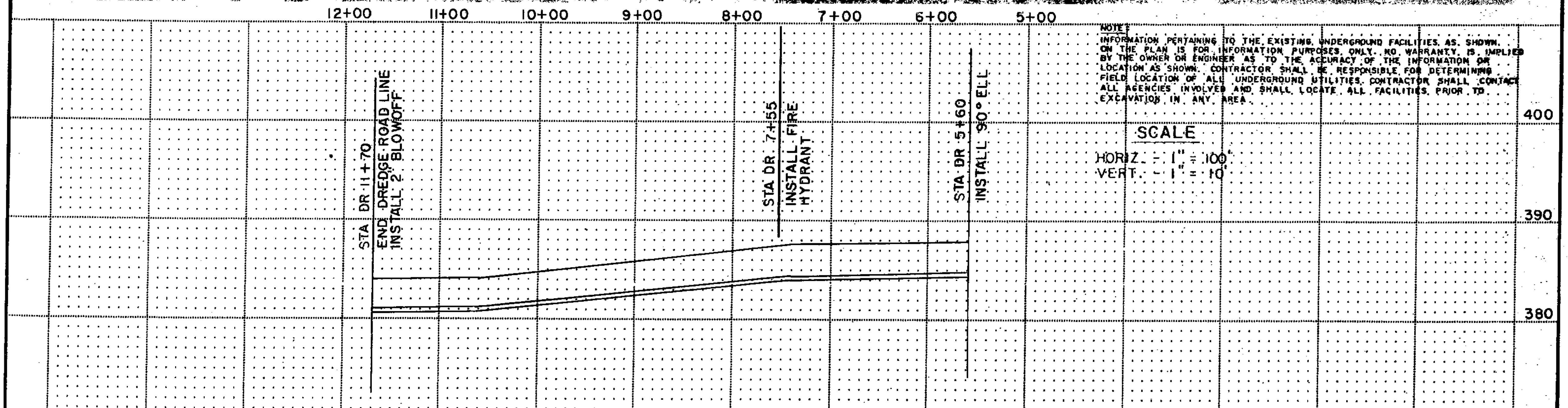
ORLEANS COMMUNITY SERVICES DISTRICT

WATER SYSTEM

LACO ASSOCIATES
CONSULTING ENGINEERS
212 J STREET EUREKA, CALIF. 443-5054

DREDGE ROAD
STA 0+00 STA 5+60

SHEET 30 OF 50 SHEETS



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SCALE
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VERT. - 1" = 10'

NO.	DATE	REVISIONS

DATE: 3-15-78
DESIGNED BY: R. F.
SCALE:
DRAWN BY: JEFF
JOB NO.: 1515
CHECKED BY:

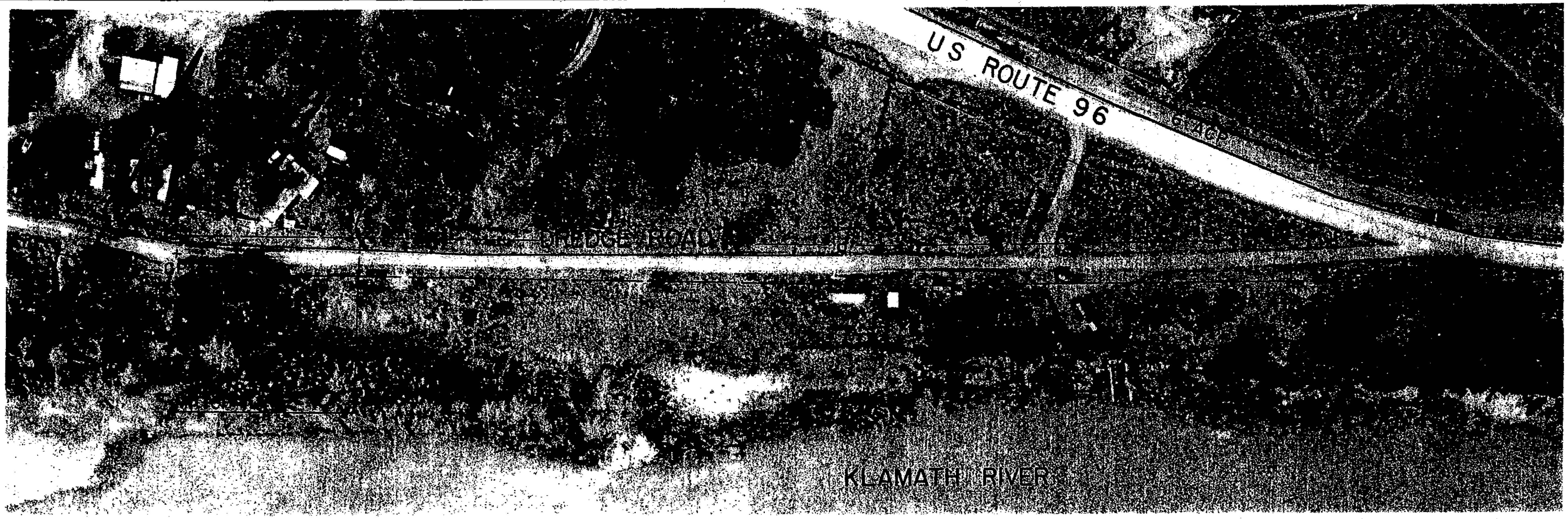
ORLEANS COMMUNITY SERVICES DISTRICT

WATER SYSTEM

LACO ASSOCIATES
CONSULTING ENGINEERS
212 J STREET EUREKA, CALIF. 443-5054

DREDGE ROAD
STA 5+60 STA 11+70

SHEET 31 OF 50 SHEETS



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DATE 3-15-78 | DESIGNED BY R.F. | SCALE | DRAWN BY JEFF | JOB NO. 1515 | CHECKED BY

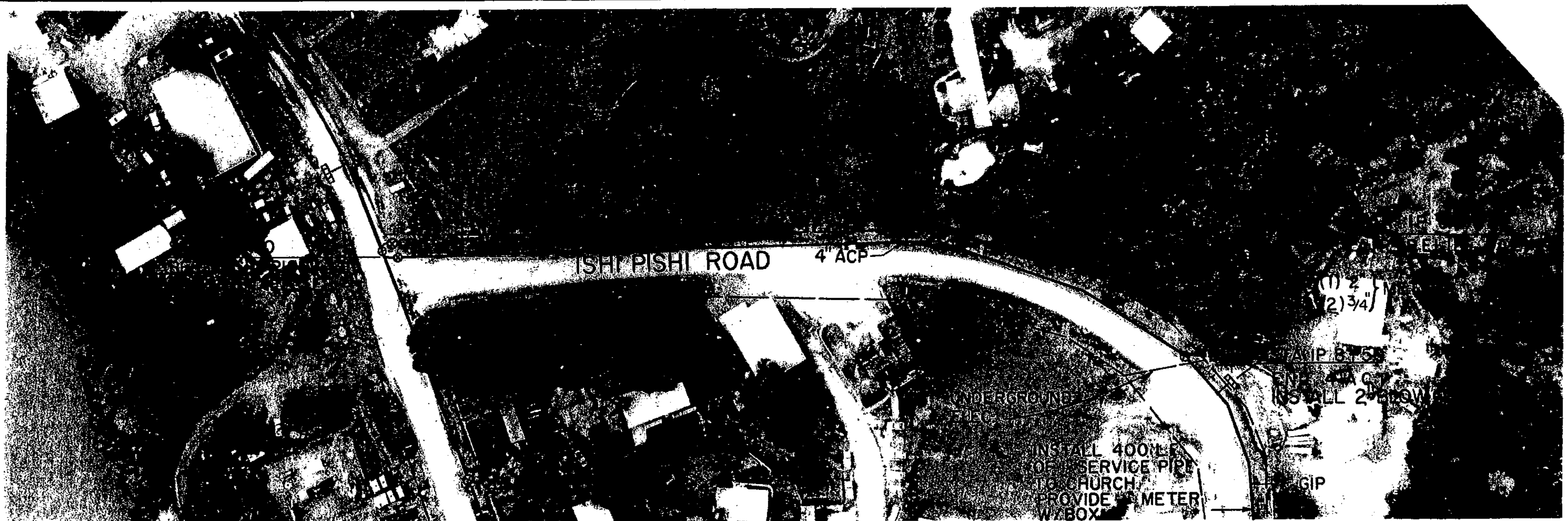
ORLEANS COMMUNITY SERVICES DISTRICT

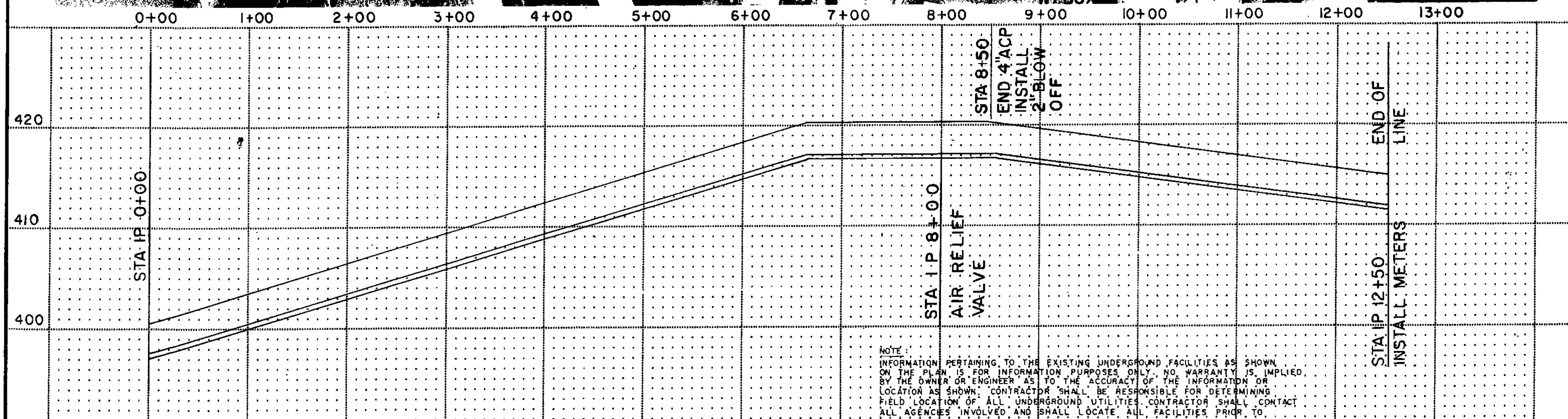
WATER SYSTEM

LACO ASSOCIATES
CONSULTING ENGINEERS
212 J STREET EUREKA, CALIF. 443-5054

DREDGE ROAD

SHEET 32 OF 50 SHEETS





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NO.	DATE	REVISIONS	DATE	DESIGNED BY
			SCALE	DRAWN BY ON
			JOB NO.	CHECKED BY

ORLEANS COMMUNITY SERVICES DISTRICT

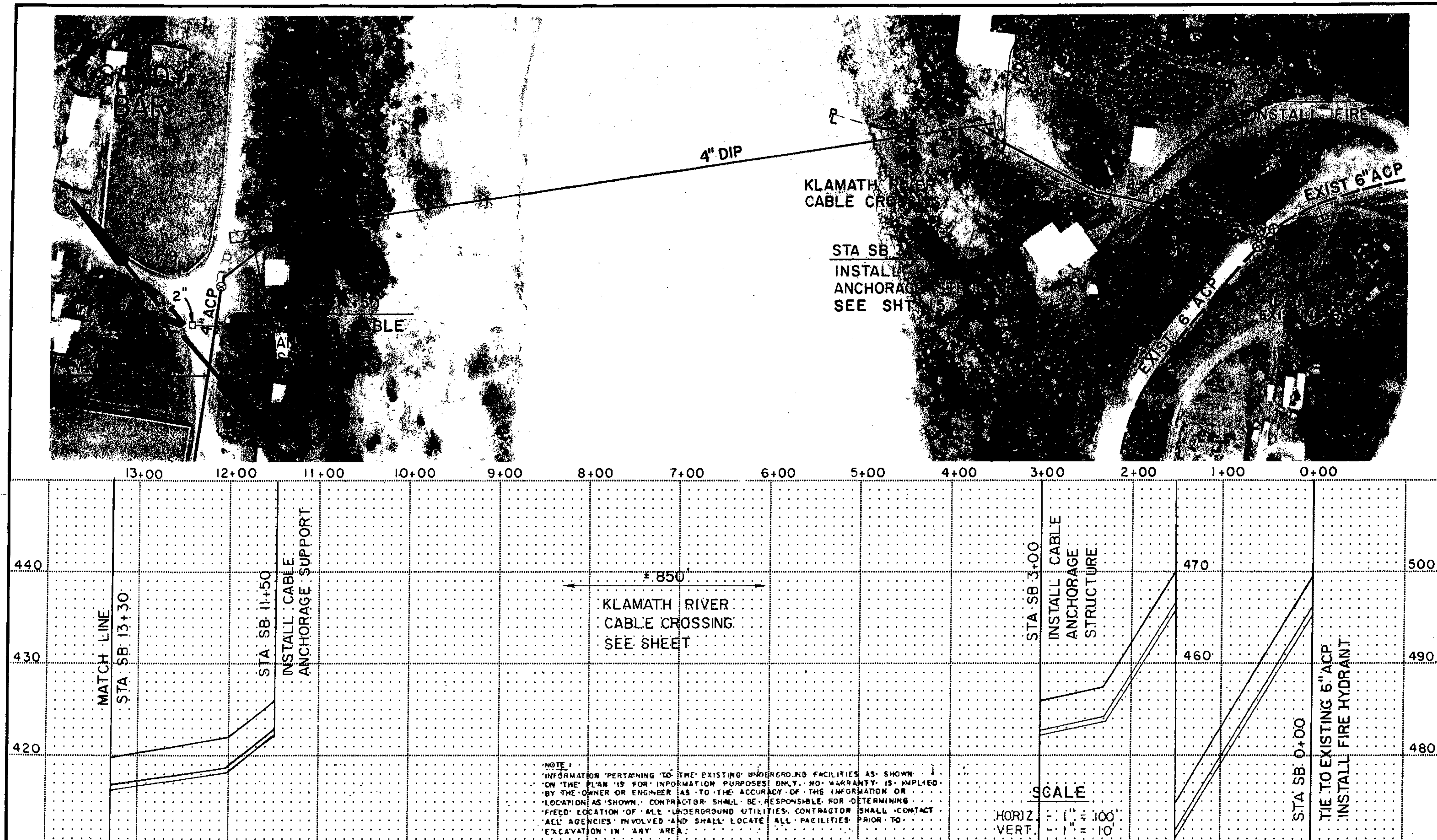
WATER SYSTEM

LACO ASSOCIATES
CONSULTING ENGINEERS
212 J STREET EUREKA, CALIF. 443-5054

ISHI PISHI ROAD

STA 0+00 STA 12+50

SHEET 33 OF 50 SHEETS



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DATE: 3-15-78 | DESIGNED BY: R.F.
SCALE: | DRAWN BY: JEFF
JOB NO.: 1515 | CHECKED BY:

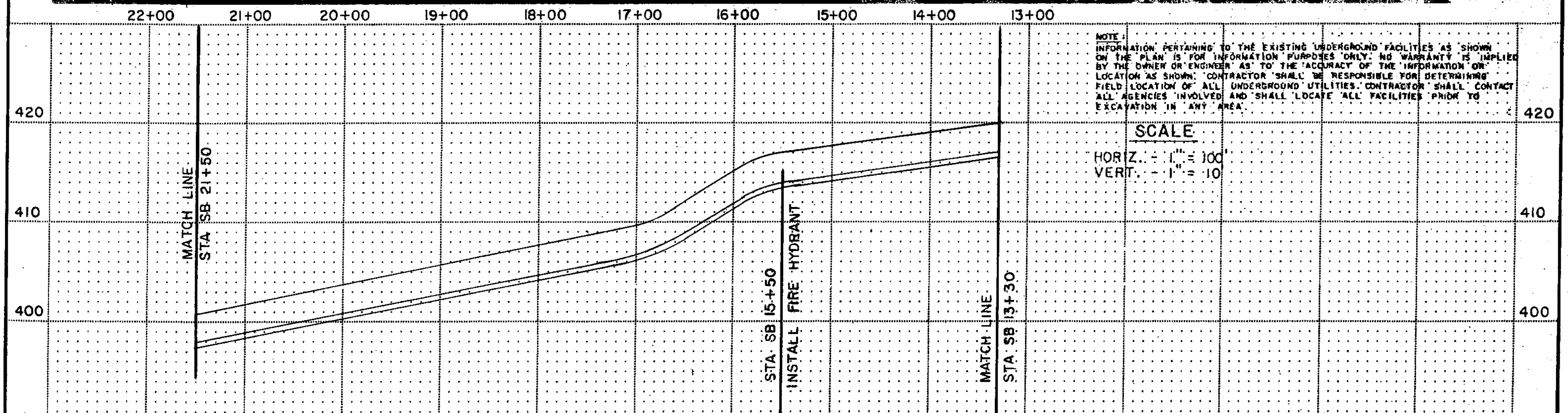
ORLEANS COMMUNITY SERVICES DISTRICT

WATER SYSTEM

LACO ASSOCIATES
CONSULTING ENGINEERS
212 J STREET EUREKA, CALIF. 443-5054

SANDY BAR
STA 0+00 - STA 13+30

SHEET 34 OF 50 SHEETS



NO.	DATE	REVISIONS

DATE: 3-15-78
DESIGNED BY: R.F.
SCALE:
DRAWN BY: JEFF
JOB NO.: 1515
CHECKED BY:

ORLEANS COMMUNITY SERVICES DISTRICT

WATER SYSTEM

LACO ASSOCIATES
CONSULTING ENGINEERS
212 J STREET EUREKA, CALIF. 443-5054

SANDY BAR
STA 13+30 STA 21+50

SHEET 35 OF 50 SHEETS

NOTE:
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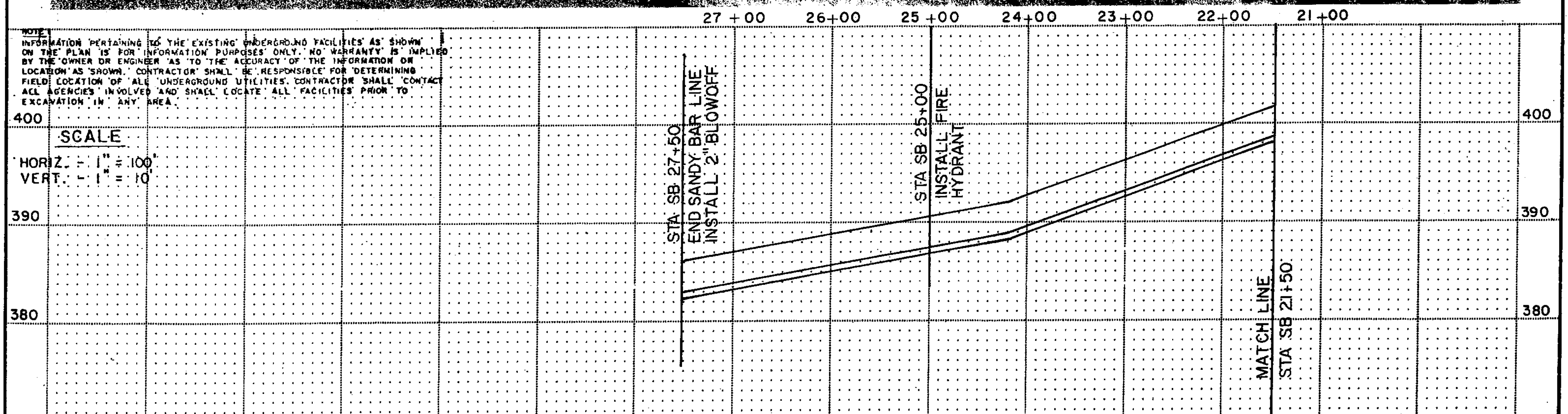


NO.	DATE	REVISIONS		

DATE	DESIGNED BY
3-15-78	R.F.
SCALE	DRAWN BY JEFF
JOB NO. 1515	CHECKED BY

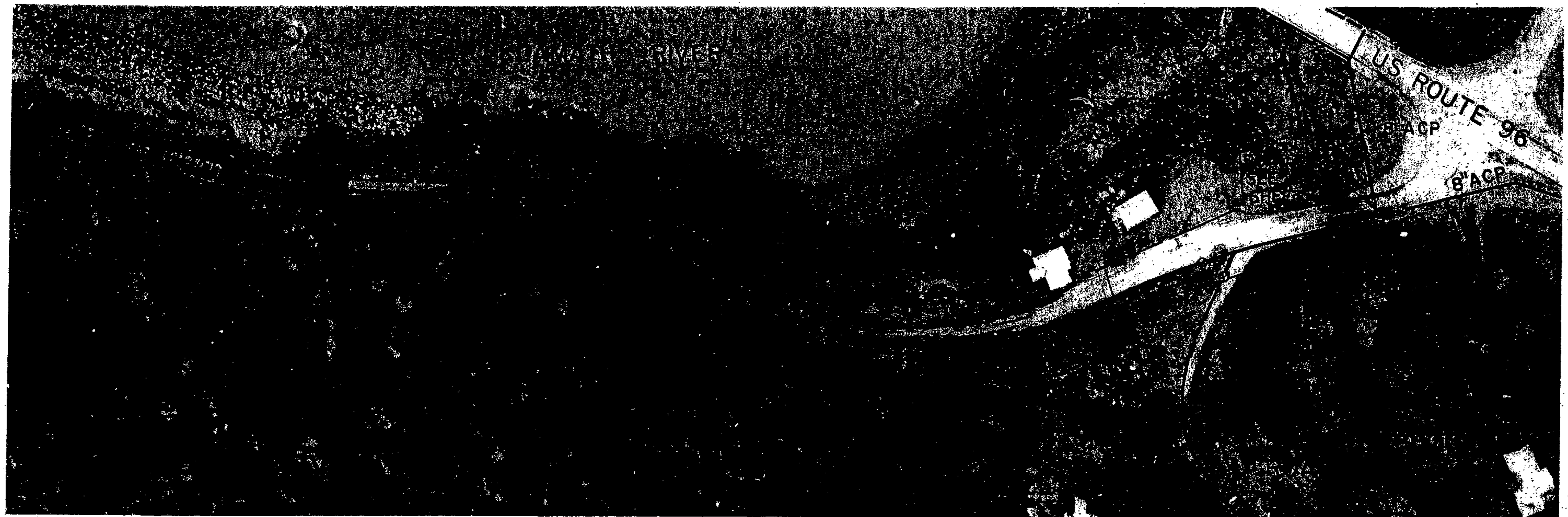
ORLEANS COMMUNITY SERVICES DISTRICT

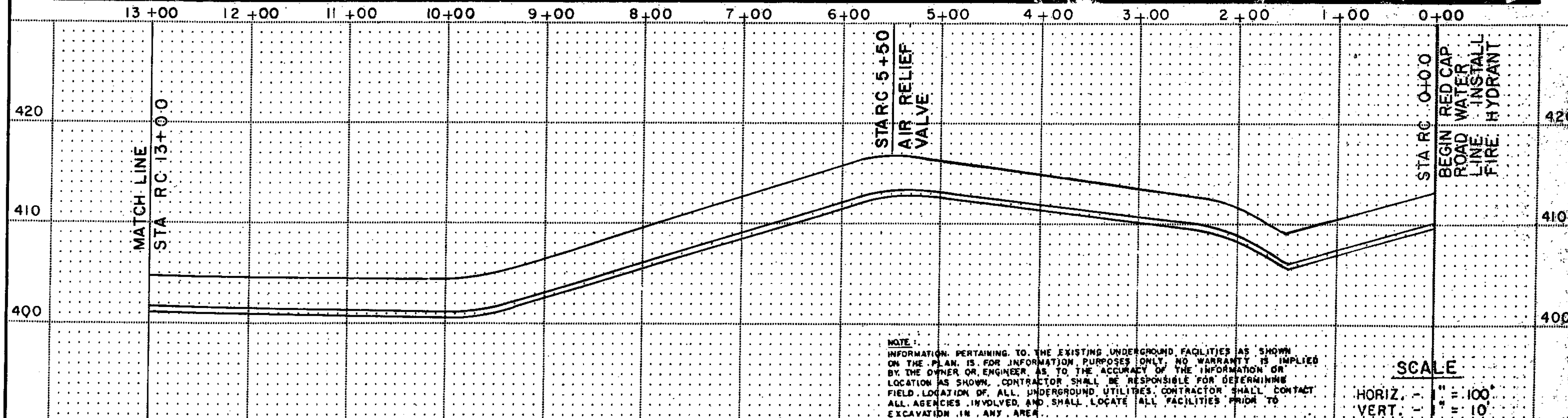
WATER SYSTEM

LACO ASSOCIATES
CONSULTING ENGINEERS
212 J STREET EUREKA, CALIF. 443-5054

SANDY BAR
STA. 21+50 STA.25+00

SHEET **36** OF **50** SHEETS





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NO.	DATE	REVISIONS

DATE 3-15-78 | DESIGNED BY R.F. | SCALE | DRAWN BY K | JOB NO. 1515 | CHECKED BY

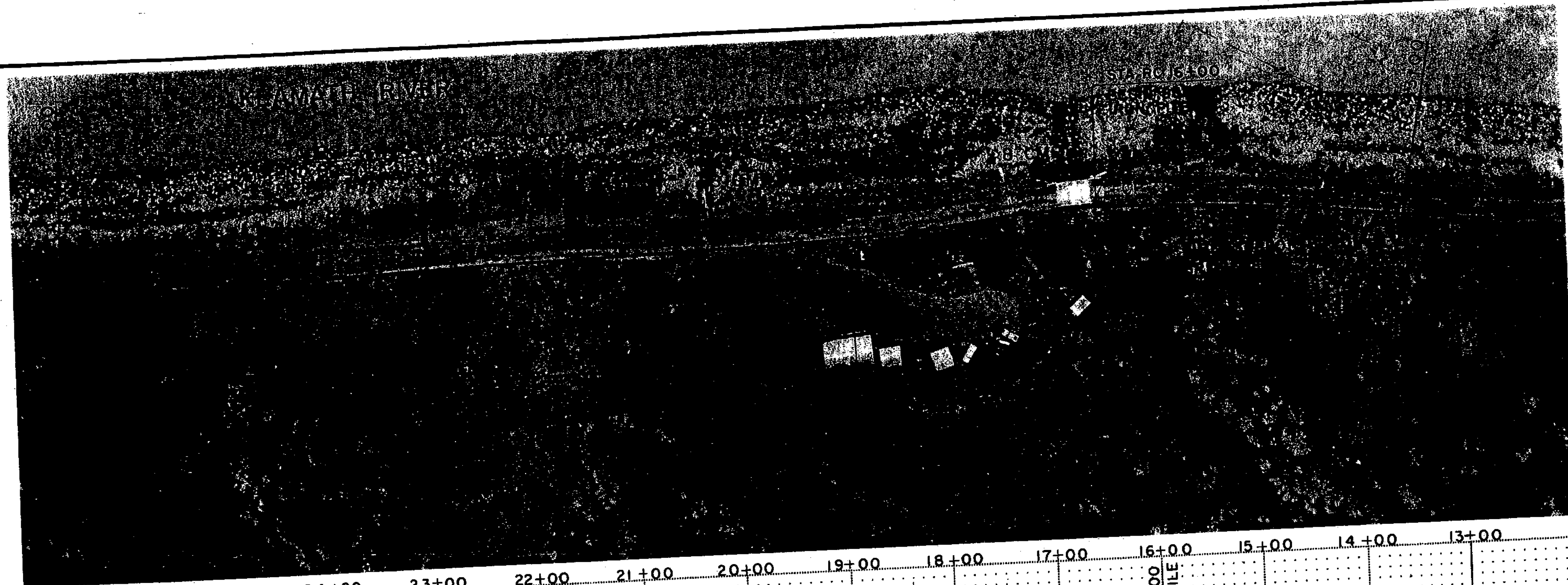
ORLEANS COMMUNITY SERVICES DISTRICT

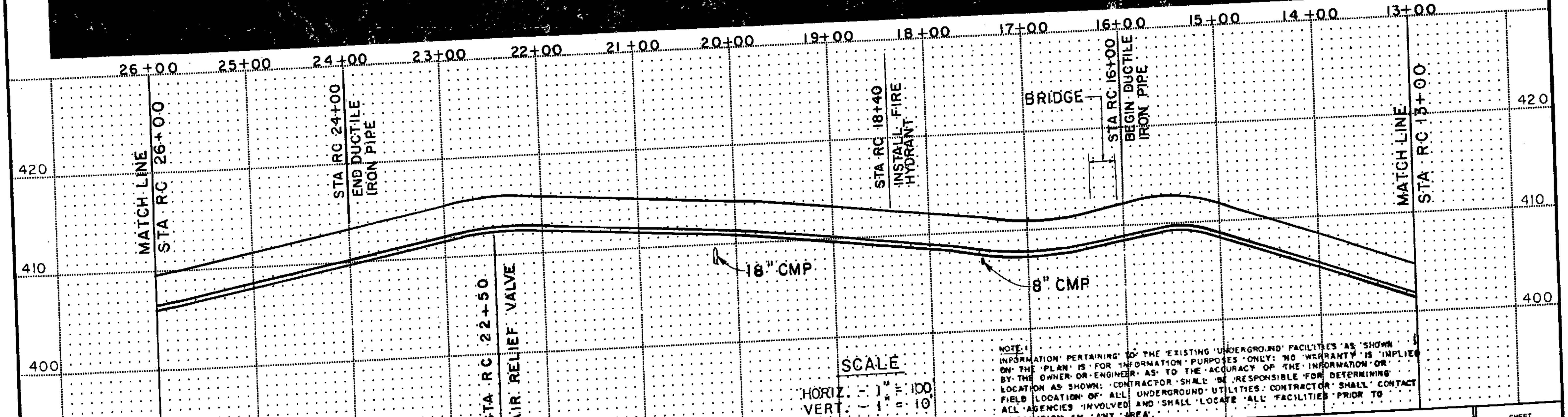
WATER SYSTEM

LACO ASSOCIATES
CONSULTING ENGINEERS
212 J STREET EUREKA, CALIF. 443-5054

RED CAP ROAD
STA RC0+00 STA RC13+00

SHEET 37 OF 50 SHEETS





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NO.	DATE	REVISIONS		

DATE	DESIGNED BY
3-15-78	R.F.
SCALE	DRAWN BY
JOB NO.	CHECKED BY

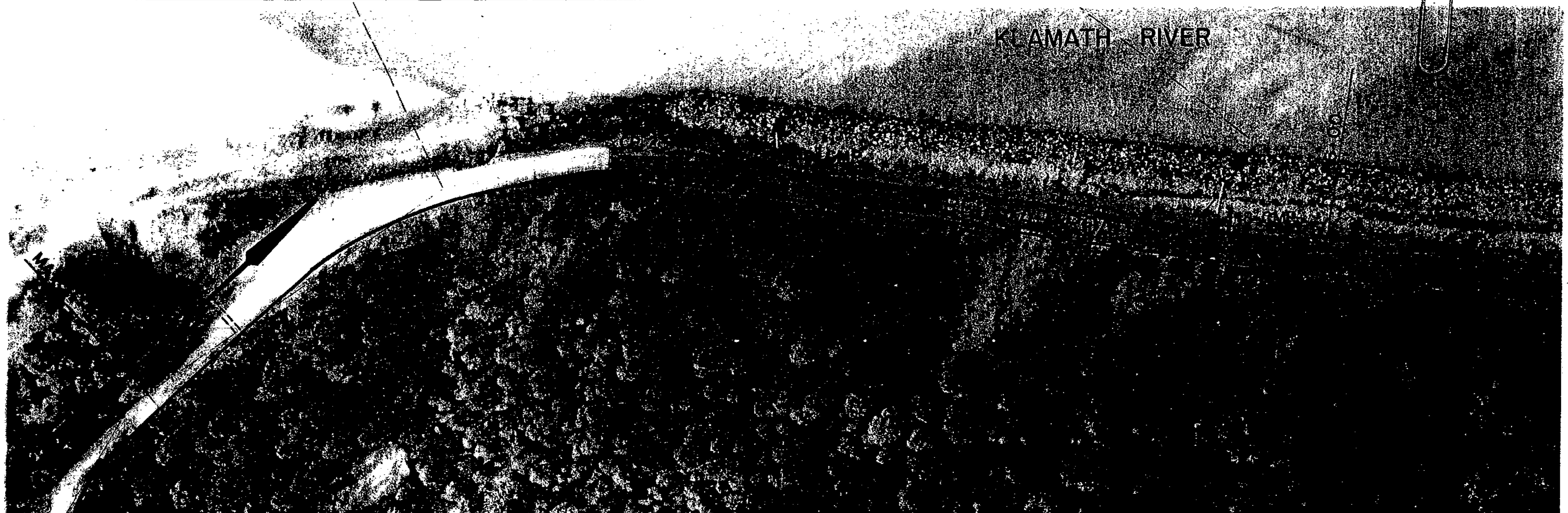
ORLEANS COMMUNITY SERVICES DISTRICT

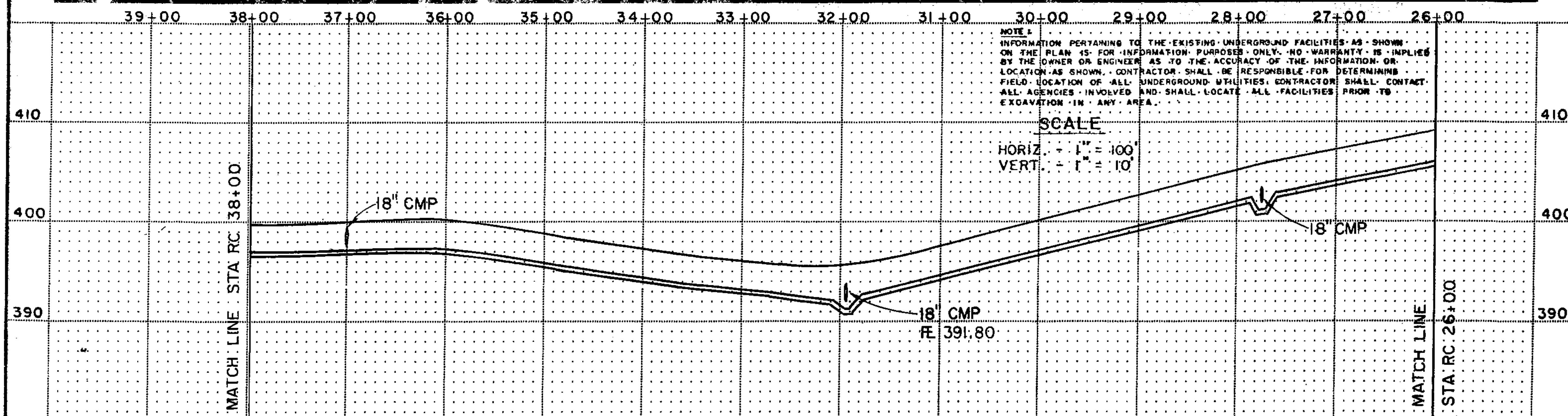
WATER SYSTEM

LACO ASSOCIATES
CONSULTING ENGINEERS
212 J STREET EUREKA, CALIF. 443-5054

RED CAP ROAD
STA RC13+00 STA RC 26+00

SHEET 38 OF 50 SHEETS





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SCALE
HORIZ. - 1" = 100'
VERT. - 1" = 10'

NO.	DATE	REVISIONS

DATE 3-15-78 | DESIGNED BY R.F. | SCALE | DRAWN BY JEFF | JOB NO. 1515 | CHECKED BY

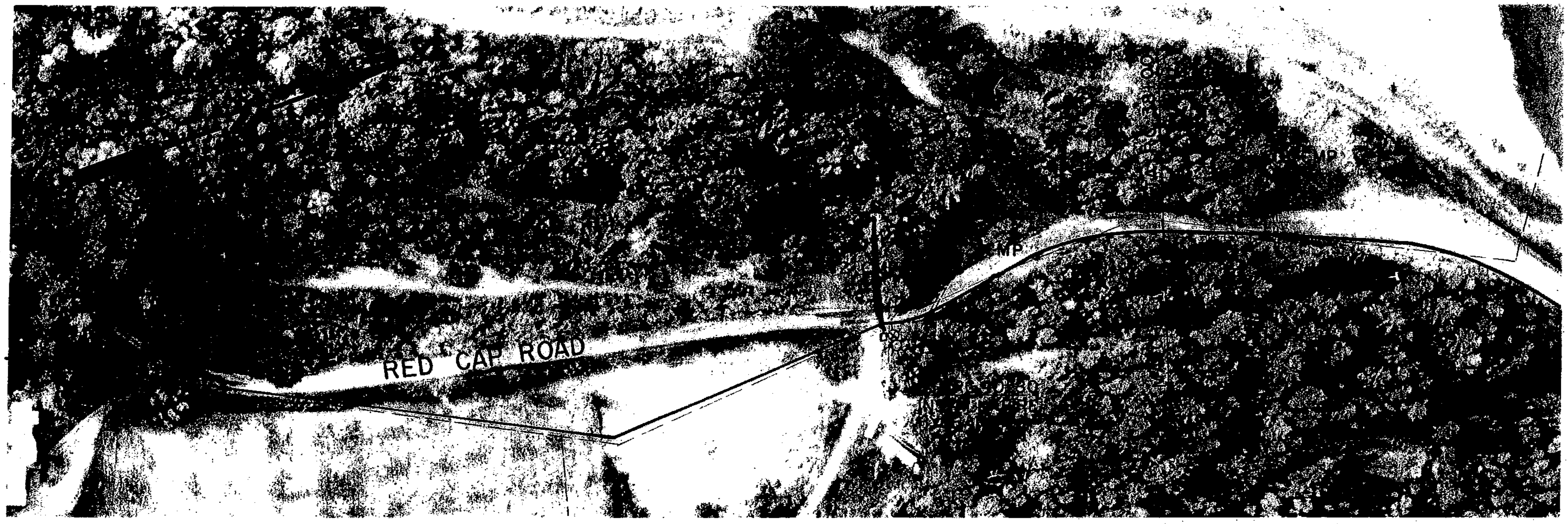
ORLEANS COMMUNITY SERVICES DISTRICT

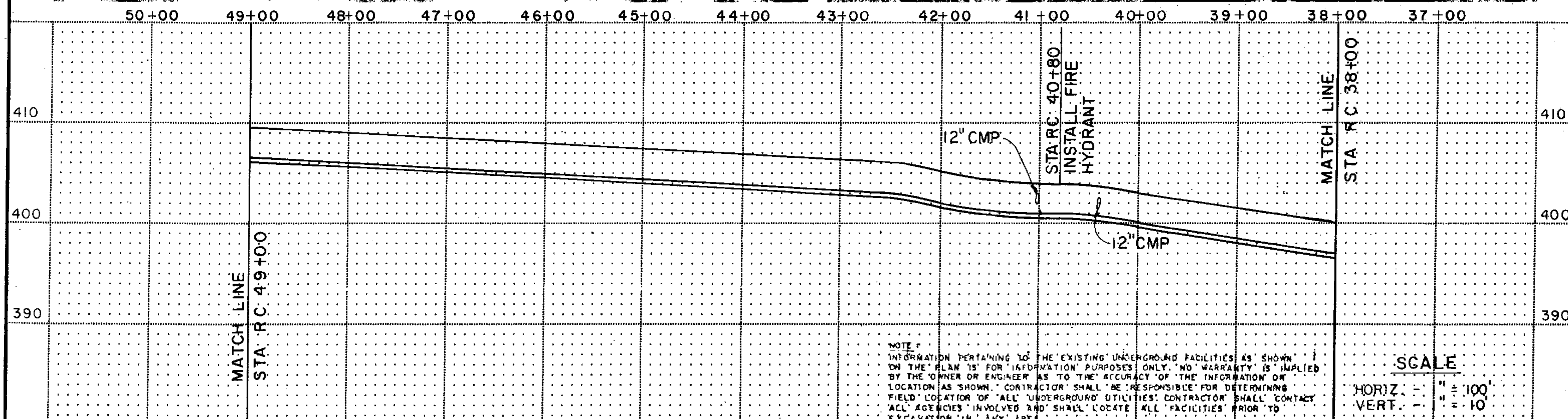
WATER SYSTEM

LACO ASSOCIATES
CONSULTING ENGINEERS
212 J STREET EUREKA, CALIF. 443-5054

RED CAP ROAD
STA RC 26+00 – STA RC 38+00

SHEET 39 OF 50 SHEETS





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NO.	DATE	REVISIONS

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JOB NO. 1515	CHECKED BY

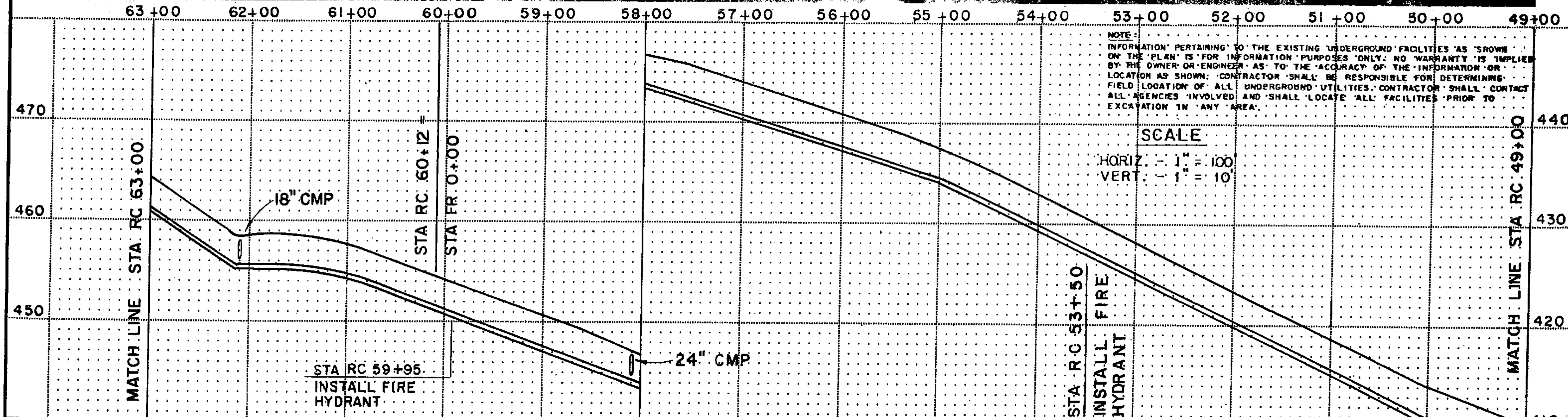
ORLEANS COMMUNITY SERVICES DISTRICT

WATER SYSTEM

LACO ASSOCIATES
CONSULTING ENGINEERS
212 J STREET EUREKA, CALIF. 443-5054

RED CAP ROAD
STA RC 38+00 – STA RC 49+00

SHEET 40 OF 50 SHEETS



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VERT. – 1" = 10'

NO.	DATE	REVISIONS

DATE 3·15·78 | DESIGNED BY R. F.
SCALE | DRAWN BY JEFF
JOB NO. 1515 | CHECKED BY

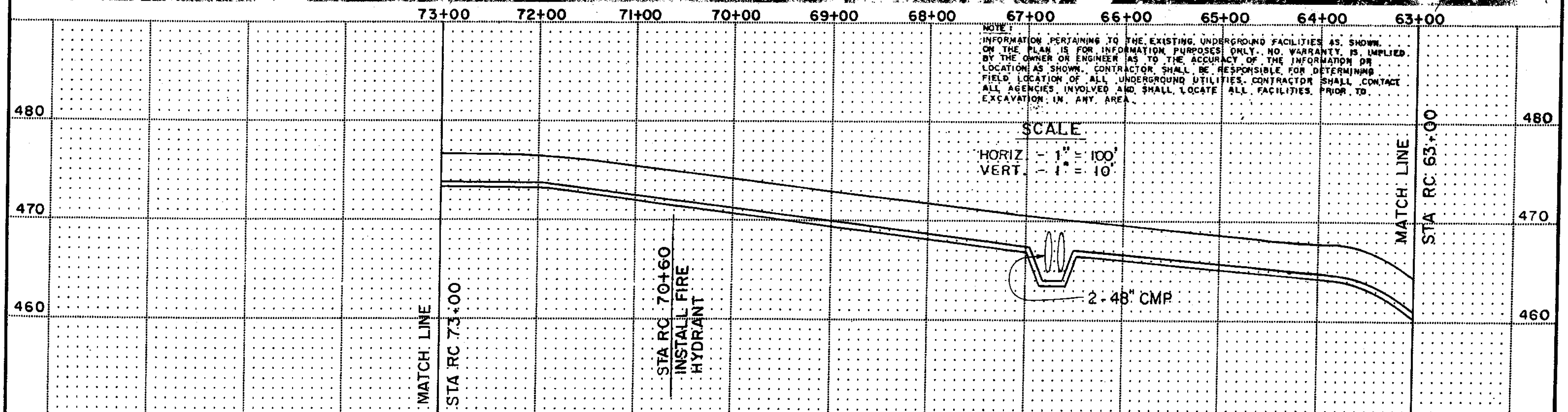
ORLEANS COMMUNITY SERVICES DISTRICT

WATER SYSTEM

LACO ASSOCIATES
CONSULTING ENGINEERS
212 J STREET EUREKA, CALIF. 443-5054

RED CAP ROAD
STA RC 49+00 STA RC 63+00

SHEET 41 OF 50 SHEETS



NO.	DATE	REVISIONS

DATE 3-15-78 | DESIGNED BY R.F. | SCALE | DRAWN BY JEFF | JOB NO. 1515 | CHECKED BY

ORLEANS COMMUNITY SERVICES DISTRICT

WATER SYSTEM

LACO ASSOCIATES
CONSULTING ENGINEERS
212 J STREET EUREKA, CALIF. 443-5054

RED CAP ROAD
STA RC 63+00 — STA RC 73+00

SHEET 42 OF 50 SHEETS

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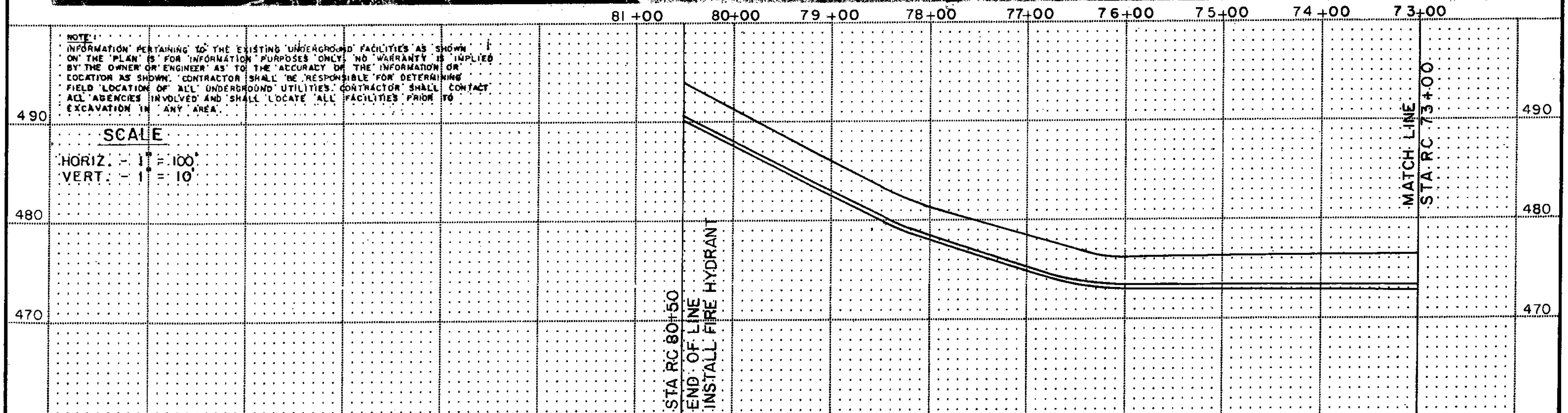
VERT. - 1" = 10'



NO.	DATE	REVISIONS

DATE 3-15-78 | DESIGNED BY R.F. | SCALE | DRAWN BY JEFF | JOB NO. 1515 | CHECKED BY

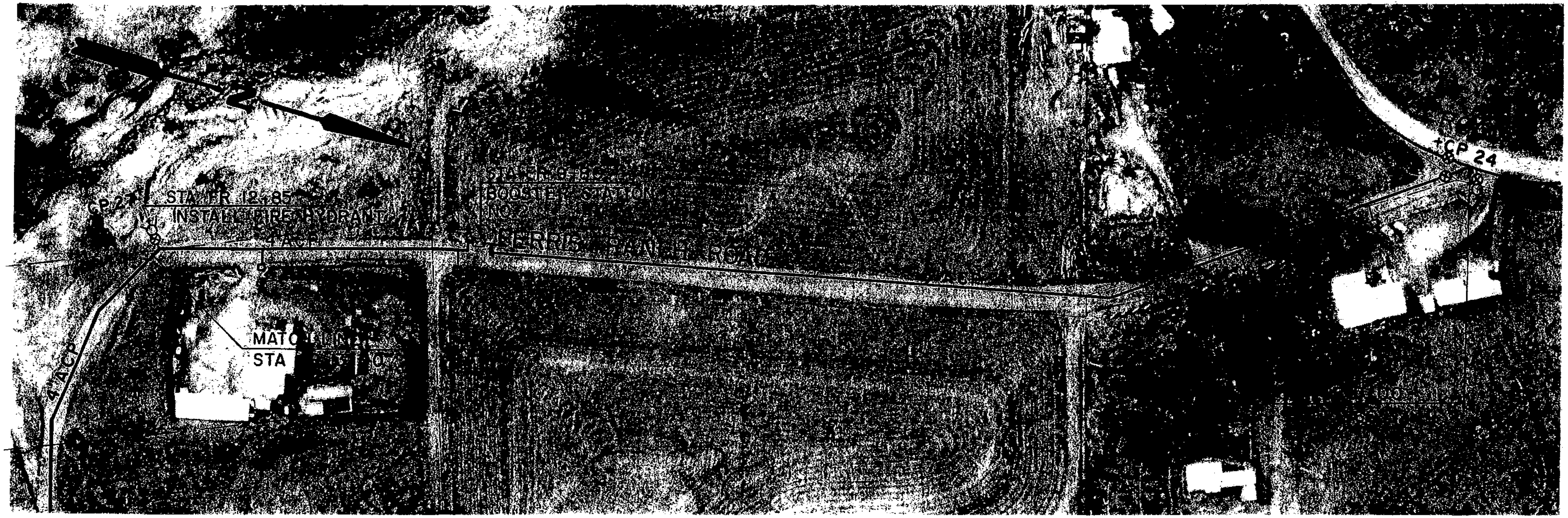
ORLEANS COMMUNITY SERVICES DISTRICT

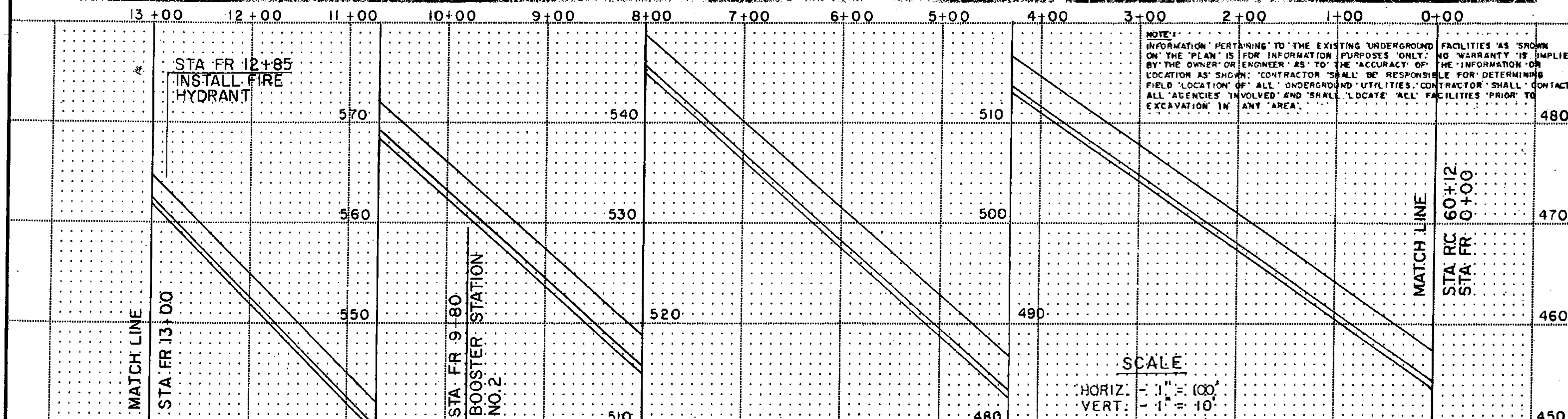
WATER SYSTEM

LACO ASSOCIATES
CONSULTING ENGINEERS
212 J STREET EUREKA, CALIF. 443-5054

RED CAP ROAD
STA RC 73+00 - STA RC 80+50

SHEET 43 OF 50 SHEETS





NO.	DATE	REVISIONS		

DATE	DESIGNED BY
3-15-7	R.F.
SCALE	DRAWN BY
	JEFF
JOB NO.	CHECKED BY
1515	

ORLEANS COMMUNITY SERVICES DISTRICT

WATER SYSTEM

LACO ASSOCIATES

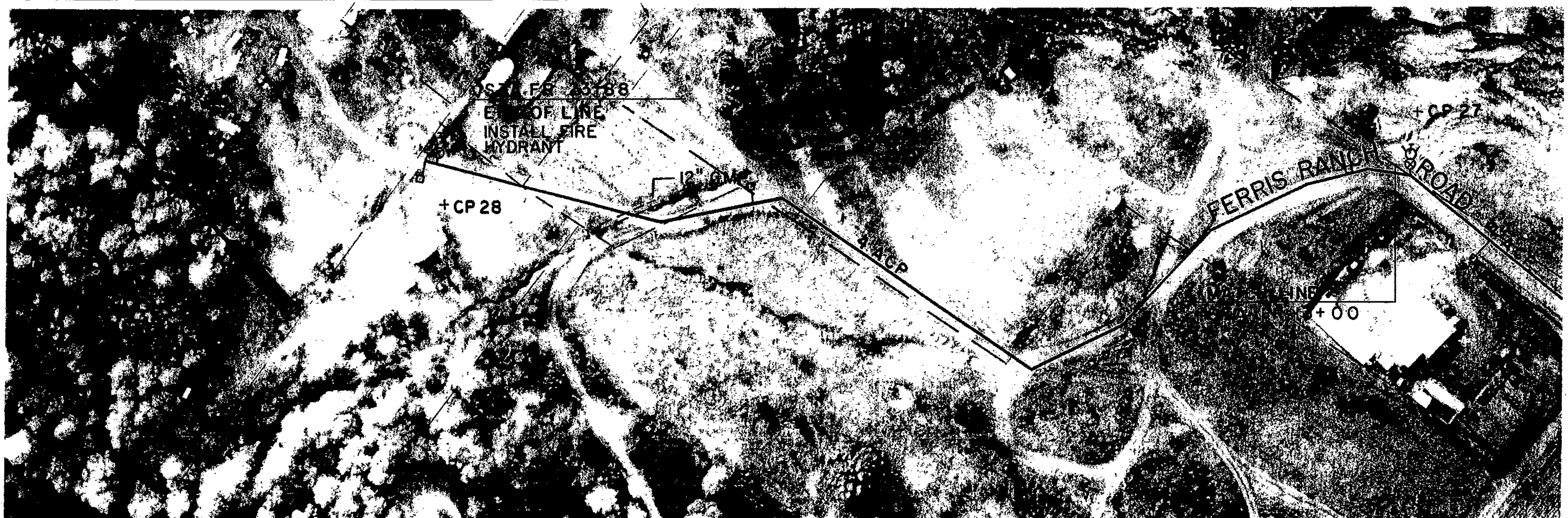
CONSULTING ENGINEERS

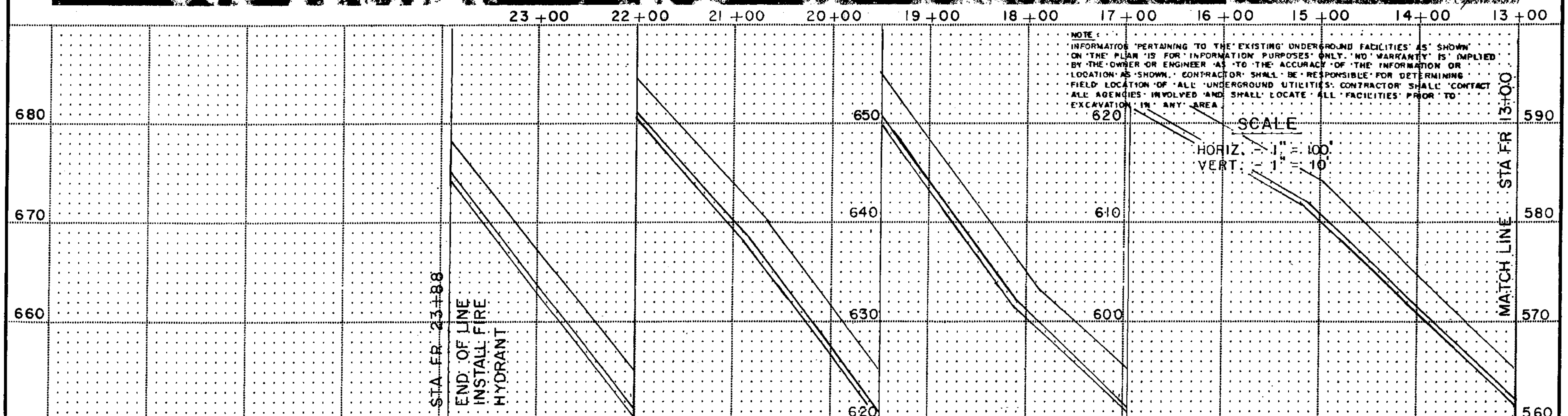
912 J STREET EUREKA, CALIF. 443-5054

FERRIS RANCH ROAD

STA FR 0+00 STA FR 13+00

SHEET **44** OF **50** SHEETS





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SCALE
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NO.	DATE	REVISIONS

DATE 3-15-78 | DESIGNED BY R.F. | SCALE | DRAWN BY JEFF | JOB NO. 1515 | CHECKED BY

ORLEANS COMMUNITY SERVICES DISTRICT

WATER SYSTEM

LACO ASSOCIATES
CONSULTING ENGINEERS
212 J STREET EUREKA, CALIF. 443-5054

FERRIS RANCH ROAD
STA 13+00 STA 23+88

SHEET 45 OF 50 SHEETS

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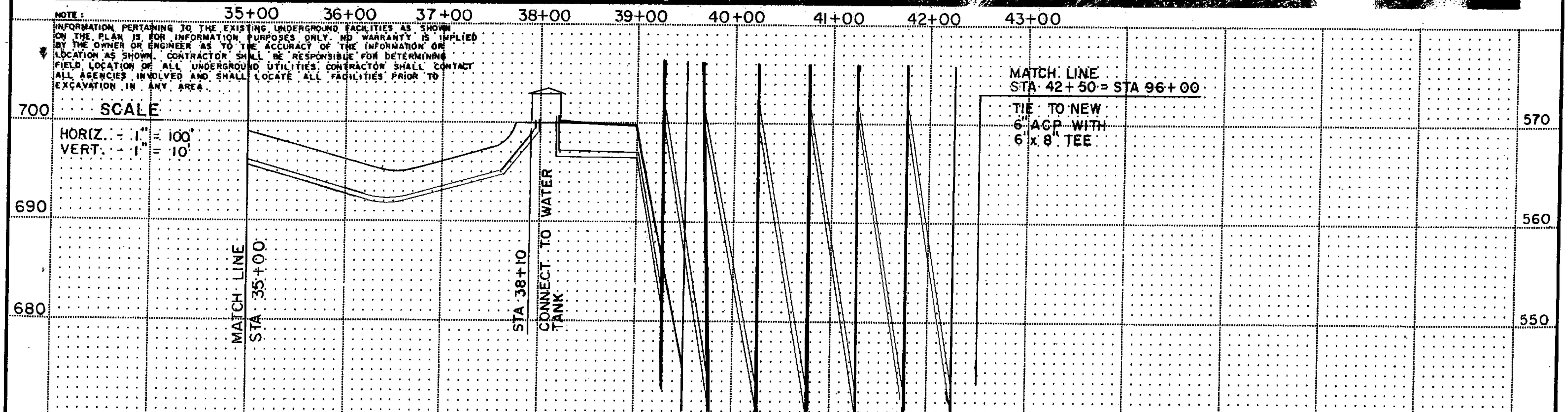


NO.	DATE	REVISIONS

DATE: 3·15·78
DESIGNED BY: R. F.
SCALE:
DRAWN BY: JEFF
JOB NO.: 1515
CHECKED BY:

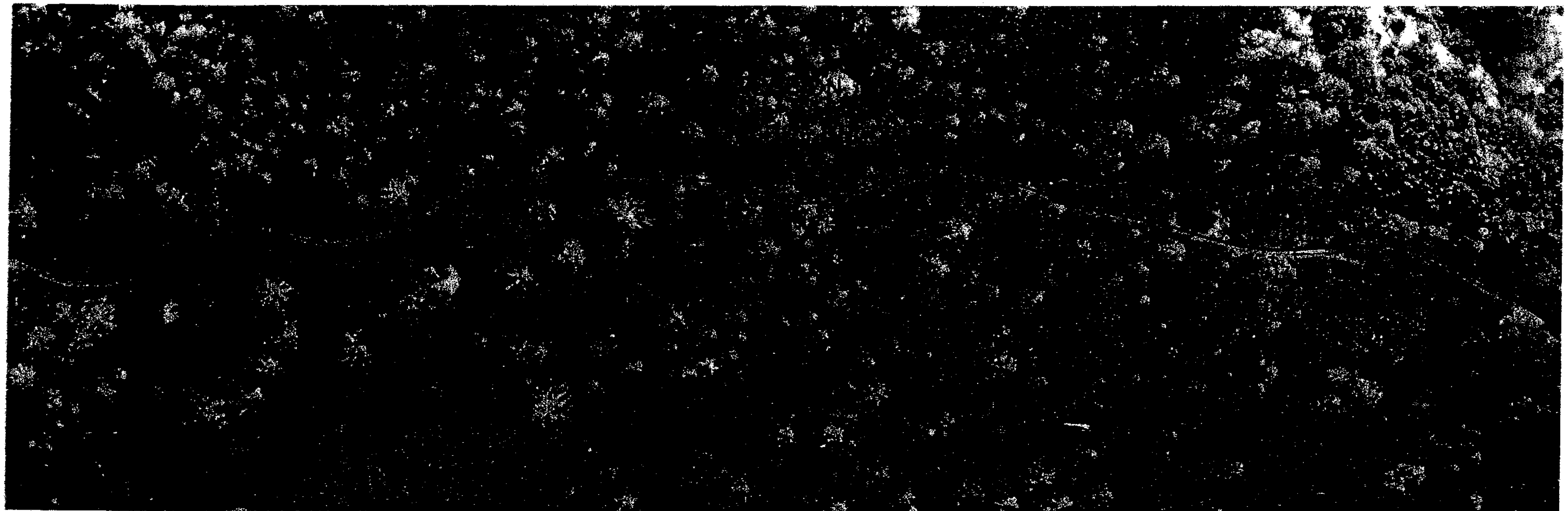
ORLEANS COMMUNITY SERVICES DISTRICT

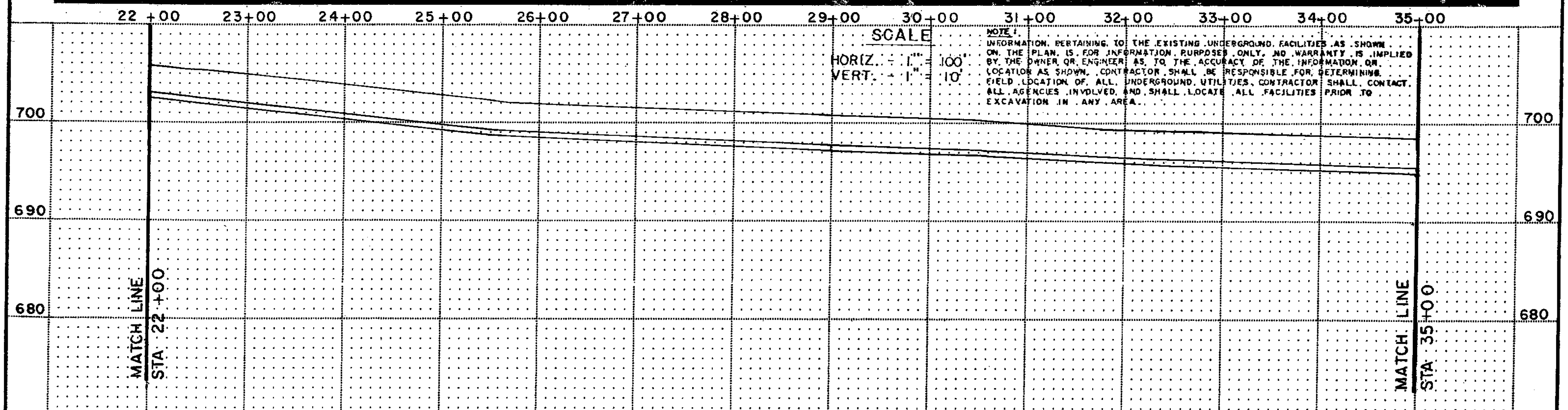
WATER SYSTEM

LACO ASSOCIATES
CONSULTING ENGINEERS
212 J STREET EUREKA, CALIF. 443-5054

PEARCH CREEK
STA 35+00 STA 42+50

SHEET 46 OF 50 SHEETS





SCALE
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NO.	DATE	REVISIONS

DATE	DESIGNED BY
3-15-78	R.F.
SCALE	DRAWN BY JEFF
JOB NO. 1515	CHECKED BY

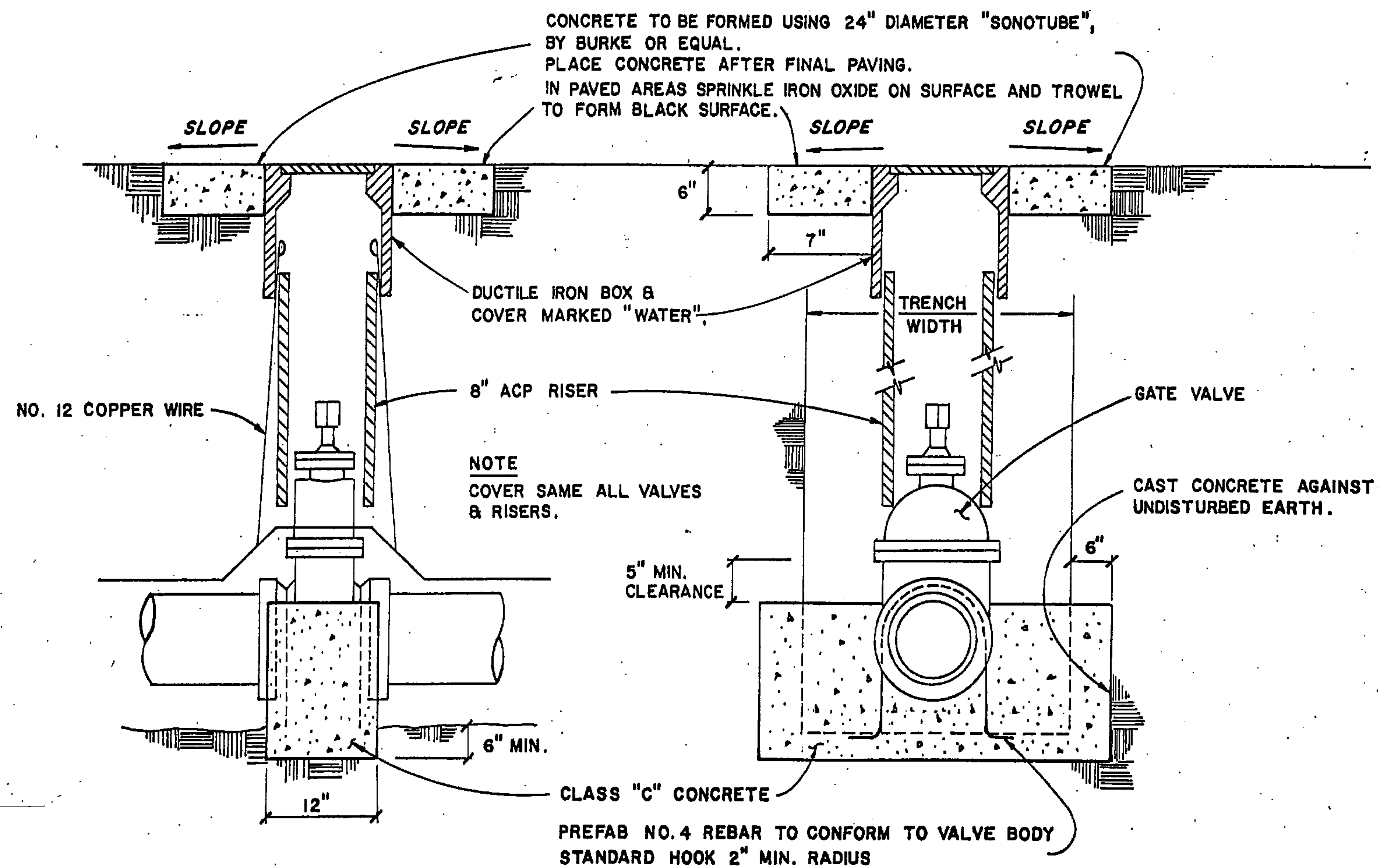
ORLEANS COMMUNITY SERVICES DISTRICT

WATER SYSTEM

LACO ASSOCIATES
CONSULTING ENGINEERS
212 J STREET EUREKA, CALIF. 443-5054

PEARCH CREEK
STA 22+00 STA 35+00

SHEET 47 OF 50 SHEETS



CONCRETE TO BE FORMED USING 24" DIAMETER "SONOTUBE",
BY BURKE OR EQUAL.
PLACE CONCRETE AFTER FINAL PAVING.
IN PAVED AREAS SPRINKLE IRON OXIDE ON SURFACE AND TROWEL
TO FORM BLACK SURFACE.
SLOPE
SLOPE
SLOPE
SLOPE
6"
7"
DUCTILE IRON BOX &
COVER MARKED "WATER".
TRENCH
WIDTH
NO. 12 COPPER WIRE
8" ACP RISER
GATE VALVE
NOTE
COVER SAME ALL VALVES
& RISERS.
CAST CONCRETE AGAINST
UNDISTURBED EARTH.
6"
5" MIN.
CLEARANCE
6" MIN.
12"
CLASS "C" CONCRETE
PREFAB NO. 4 REBAR TO CONFORM TO VALVE BODY
STANDARD HOOK 2" MIN. RADIUS

NOTE:
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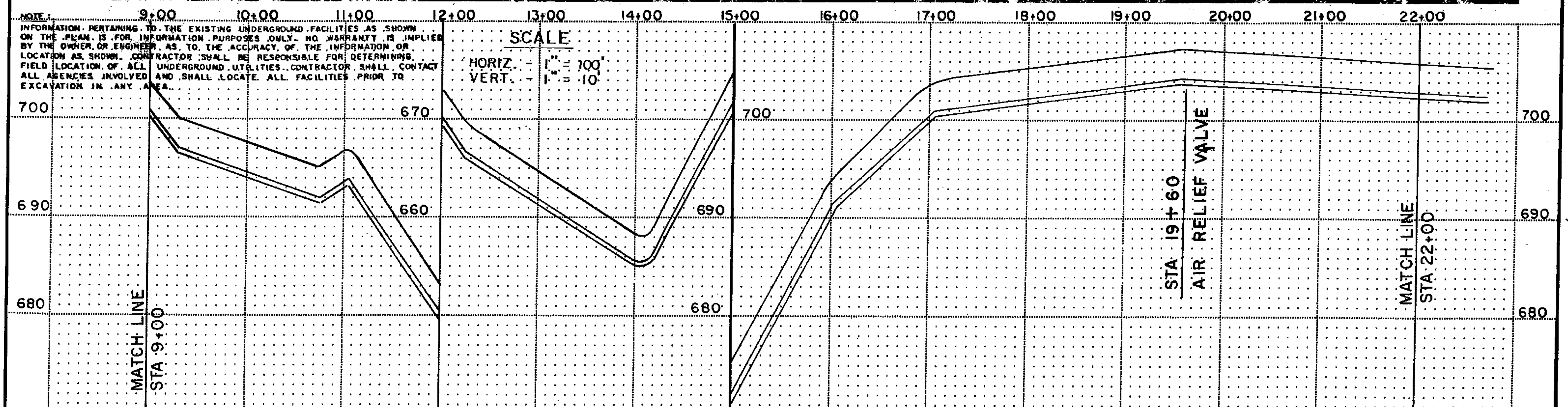


NO.	DATE	REVISIONS	DATE	DESIGNED BY
			3-15-78	R.F.
			SCALE	DRAWN BY
				JEFF
			JOB NO. 1515	CHECKED BY

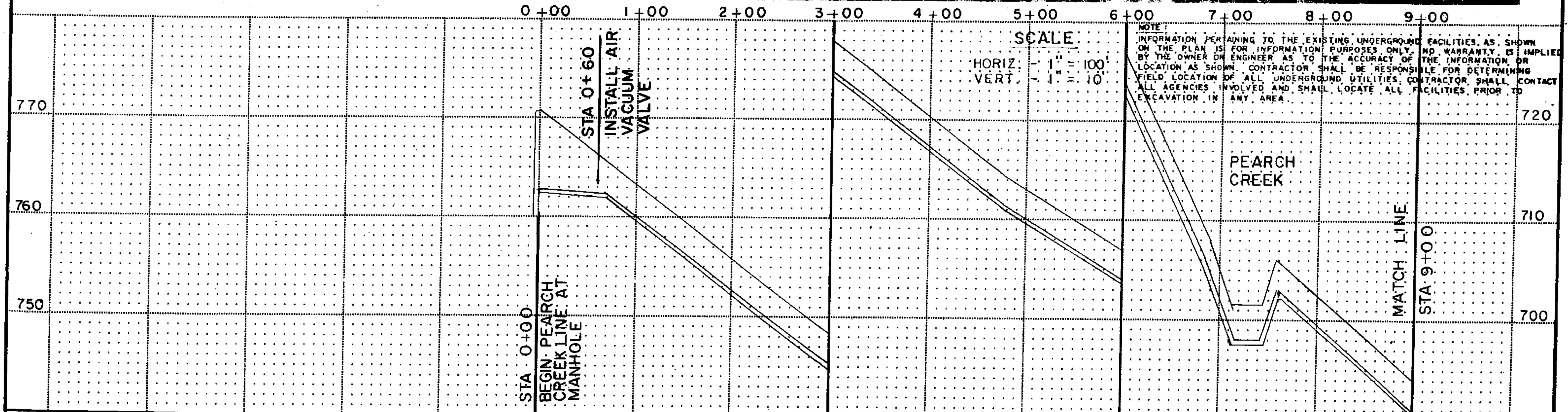
ORLEANS COMMUNITY SERVICES DISTRICT

WATER SYSTEM

LACO ASSOCIATES
CONSULTING ENGINEERS
212 J STREET EUREKA, CALIF. 443-5054

PEARCH CREEK
STA 9+00 STA 22+00

SHEET **48** OF **50** SHEETS



NO.	DATE	REVISIONS

DATE 3-15-78	DESIGNED BY R.F.
SCALE	DRAWN BY JEFF
JOB NO. 1515	CHECKED BY

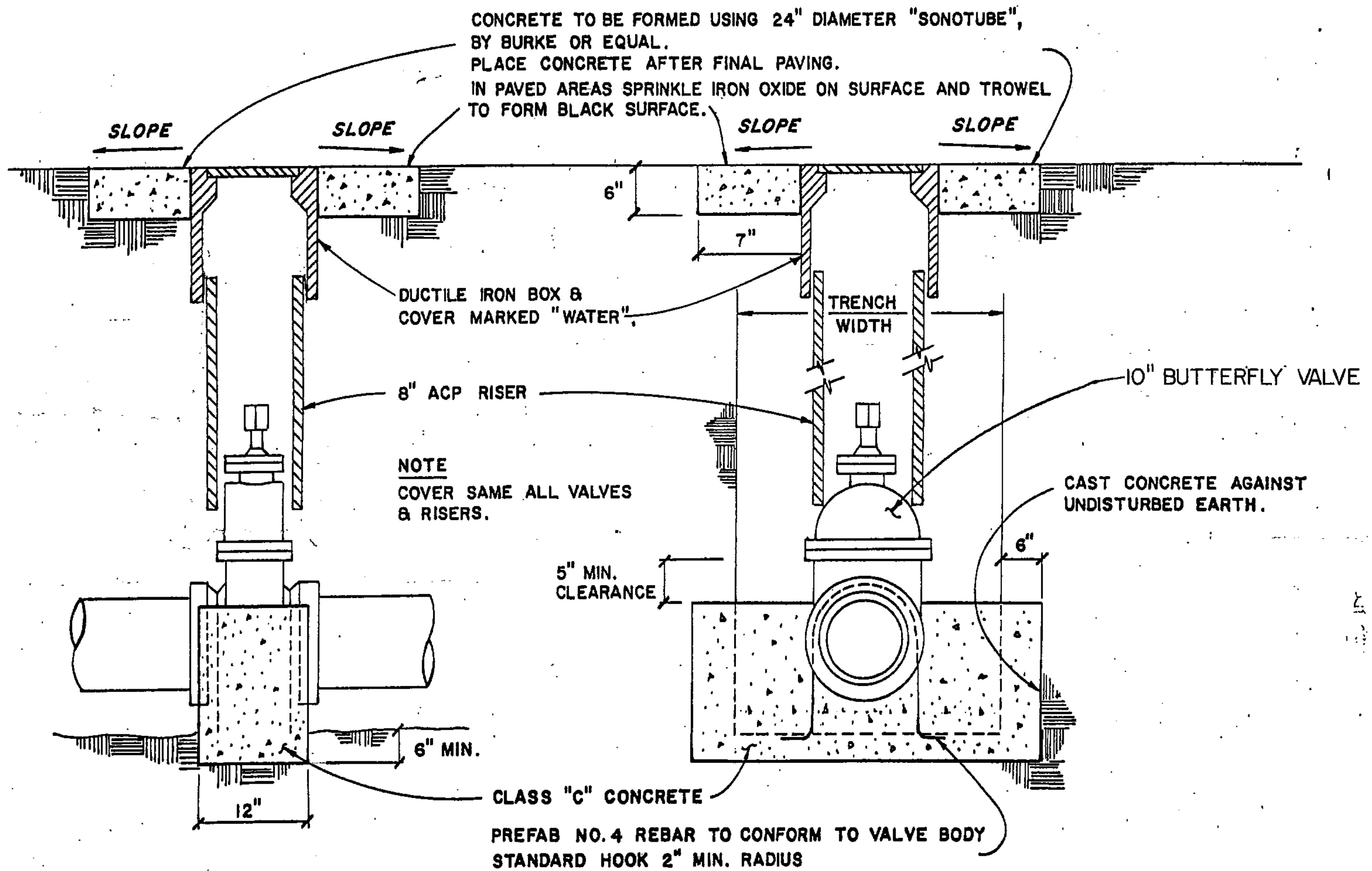
ORLEANS COMMUNITY SERVICES DISTRICT

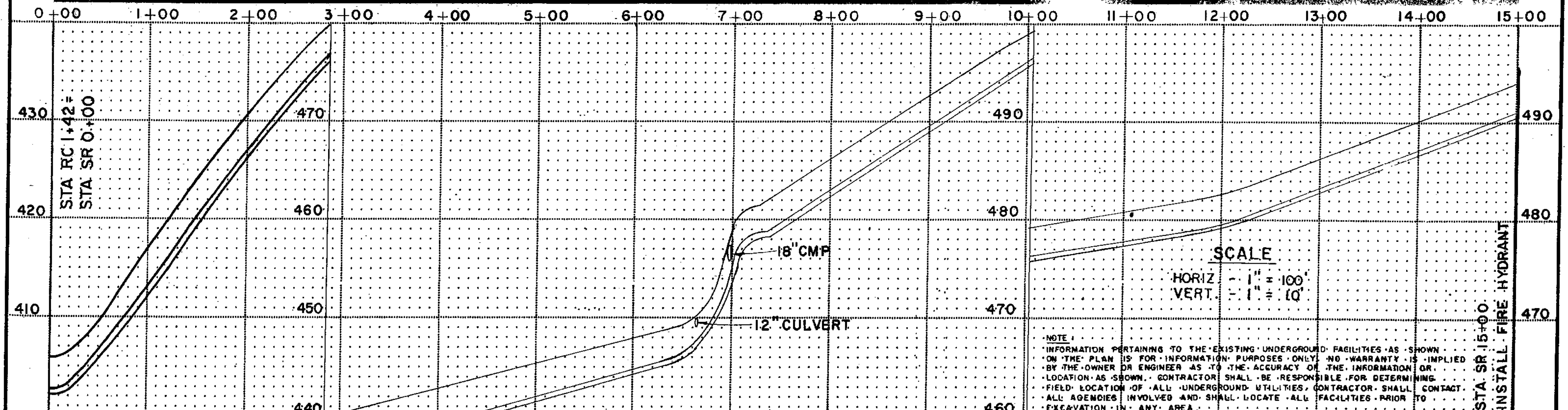
WATER SYSTEM

LACO ASSOCIATES
CONSULTING ENGINEERS
212 J STREET EUREKA, CALIF. 443-5054

PEARCH CREEK
STA 0+00 STA 9+00

SHEET 49 OF 50 SHEETS


CONCRETE TO BE FORMED USING 24" DIAMETER "SONOTUBE", BY BURKE OR EQUAL.
PLACE CONCRETE AFTER FINAL PAVING.
IN PAVED AREAS SPRINKLE IRON OXIDE ON SURFACE AND TROWEL TO FORM BLACK SURFACE.
SLOPE
SLOPE
SLOPE
SLOPE
6"
7"
DUCTILE IRON BOX & COVER MARKED "WATER".
TRENCH WIDTH
10" BUTTERFLY VALVE
8" ACP RISER
NOTE
COVER SAME ALL VALVES & RISERS.
CAST CONCRETE AGAINST UNDISTURBED EARTH.
6"
5" MIN. CLEARANCE
6" MIN.
12"
CLASS "C" CONCRETE
PREFAB NO. 4 REBAR TO CONFORM TO VALVE BODY
STANDARD HOOK 2" MIN. RADIUS



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NO.	DATE	REVISIONS

DATE 3-15-78 | DESIGNED BY R. F.
SCALE | DRAWN BY JEFF
JOB NO. 1515 | CHECKED BY

ORLEANS COMMUNITY SERVICES DISTRICT

WATER SYSTEM

LACO ASSOCIATES
CONSULTING ENGINEERS
212 J STREET EUREKA, CALIF. 443-5054

ORLEANS SCHOOL ROAD
STA 1+00 STA 15+00

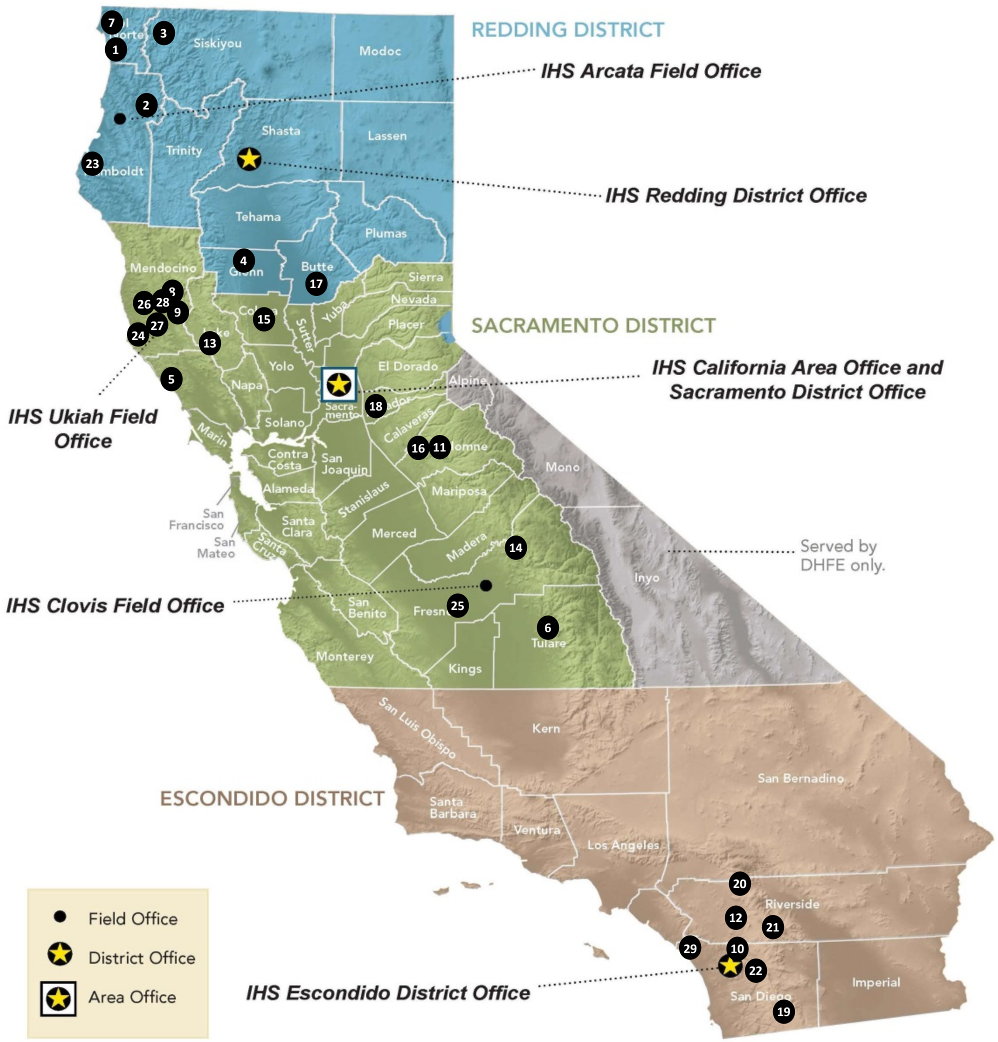
SHEET 50 OF 50 SHEETS

Appendix E Climate Report and Water Stress Information

This Appendix contains information about climate information in the Orleans area and potential water stress sites for Native communities.

Tribal water systems at highest risk due to drought conditions:

Updated March 26, 2014 – *Updates will be made as conditions change and information becomes available.*



Surface water systems:

1. Yurok
2. Hoopa
3. Karuk
4. Grindstone
5. Stewarts Point
6. Tule River
7. Smith River

Communities served by non-Indian water systems:

8. Redwood Valley
9. Coyote Valley
10. San Pasqual (District B)
11. Tuolomne
12. Torres Martinez
26. Sherwood Valley
27. Pinoleville

Groundwater systems:

13. Big Valley
14. Cold Springs
15. Cortina
16. Chicken Ranch
17. Enterprise
18. Ione
19. La Posta
20. Morongo
21. Santa Rosa Reservation
22. Santa Ysabel
25. Santa Rosa Rancheria
28. Old Sherwood Valley
29. Pauma

Salt water intrusion:

23. Table Bluff
24. Manchester/Point Arena
5. Stewarts Point
7. Smith River
1. Yurok (Klamath)

Total Systems to Date = 29

Source: Indian Health Service California Area Office of Environmental Health and Engineering. Based on vulnerability level, system information, and assessments.

A summary of current trends and probable future trends in climate and climate-driven processes for the Six Rivers National Forest and surrounding lands

Ramona J. Butz, Northern Province Ecologist, USDA Forest Service, Pacific Southwest Region. rbutz@fs.fed.us; 707-441-3584*

Hugh Safford, Regional Ecologist, USDA Forest Service, Pacific Southwest Region. hughsafford@fs.fed.us; 707-562-8934.

I. Local trends in climate over the past century

The data presented in this section are derived primarily from three weather stations with long-term meteorological data on and adjacent to the Six Rivers National Forest (SRF) (WRCC 2010). The longest quasi-continuous weather record is provided by the Orleans Station (1931-2009; WRCC 2010), which is located near the town of Orleans and lies at 1060 feet above sea level (323 m) at approximately 41° 18’ N, 123° 32’ W. The Gasquet Ranger Station weather station has precipitation-only data for the period 1949-2009. The station is located at approximately 41° 52’ N, 123° 58’ W at 380 feet above sea level (116 m). The Willow Creek 1 NW weather station, located near the town of Willow Creek at approximately 40° 57’ N, 123° 38’ W at 460 feet above sea level (140 m) provides quasi-continuous temperature and precipitation data from 1969 to 2001. It is missing annual temperature data for the period from 1978-1980. The Mad River station was only operational from 1944-1976, does not include temperature data, and the precipitation data are discontinuous; data from this station are not included in this summary for these reasons. Additional precipitation data are analyzed from long-term precipitation records maintained by each Ranger District on the SRF. Years with more than 15 days of missing temperature data in a single month or 5 days of missing precipitation data in a single month (except between June and September) are excluded from the analyses. We also present spatial data from the PRISM climate dataset, which extrapolates weather station records to the landscape for all years beginning in the late 19th century (Daly et al. 1994, PRISM 2010).

Temperature

The PRISM data suggest that most of the Six Rivers NF area has experienced increases in mean annual temperature of about 1ºC (1.8º F) over the last ¾ century, although some coastal areas have seen a slight decrease in temperature (Fig. 1). Average temperatures at the Orleans station have increased approximately 2º F in the period 1931-2009. This trend is driven by a highly significant increase in mean minimum (i.e., nighttime) temperatures, which have risen by almost 4º F since 1931 (Fig. 2). The Willow Creek station shows an increase in mean and mean minimum temperatures over the available data from 1969-2001 (Fig. 3). As at Orleans, there has been a significant increase of about 2º F in nighttime temperatures since 1969.

Precipitation

Precipitation trends for each Ranger District on the Six Rivers NF are shown in Figs. 4-7. Total annual precipitation for Gasquet, Orleans, and Mad River is steady over the period of record.

*Corresponding author

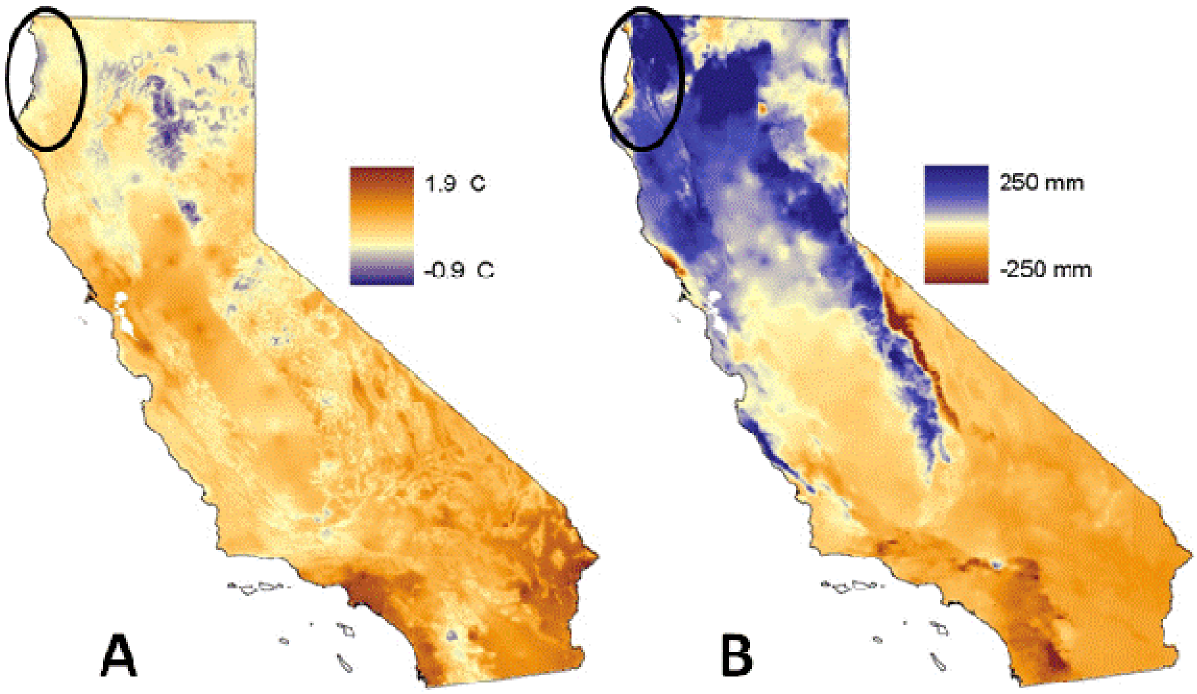


Figure 1. Spatial differences in mean annual temperature (A), and mean annual precipitation (B) between the 1930's and 2000's, as derived by the PRISM climate model. The Six Rivers NF area is found within the circle. Temperatures have risen only moderately across most of the SRF area, although some coastal areas have actually experienced decreased temperatures. The PRISM model suggests that precipitation has increased across most of the area. Graphic courtesy of S. Dobrowksi, Univ. of Montana.

Precipitation at Lower Trinity has increased over the period of record from 1932-2009. There is very high interannual variability in all four precipitation records, such that the value predicted by the regression line in each figure is rarely representative of the actual annual mean. The increase in annual precipitation at the Lower Trinity Ranger Station is being driven by a slight increase in spring (March-April-May) precipitation over the period of record from 1932-present. There were no other significant increases in precipitation by season from any station, and the distribution of precipitation across the year has remained similar through the record.

The 5-yr coefficient of variation of annual precipitation is increasing over time at all stations (Figs. 8-11), which demonstrates that year-to-year variability in precipitation has increased over the course of the last century. Total annual snowfall records on the SRF are too incomplete to allow for analysis.

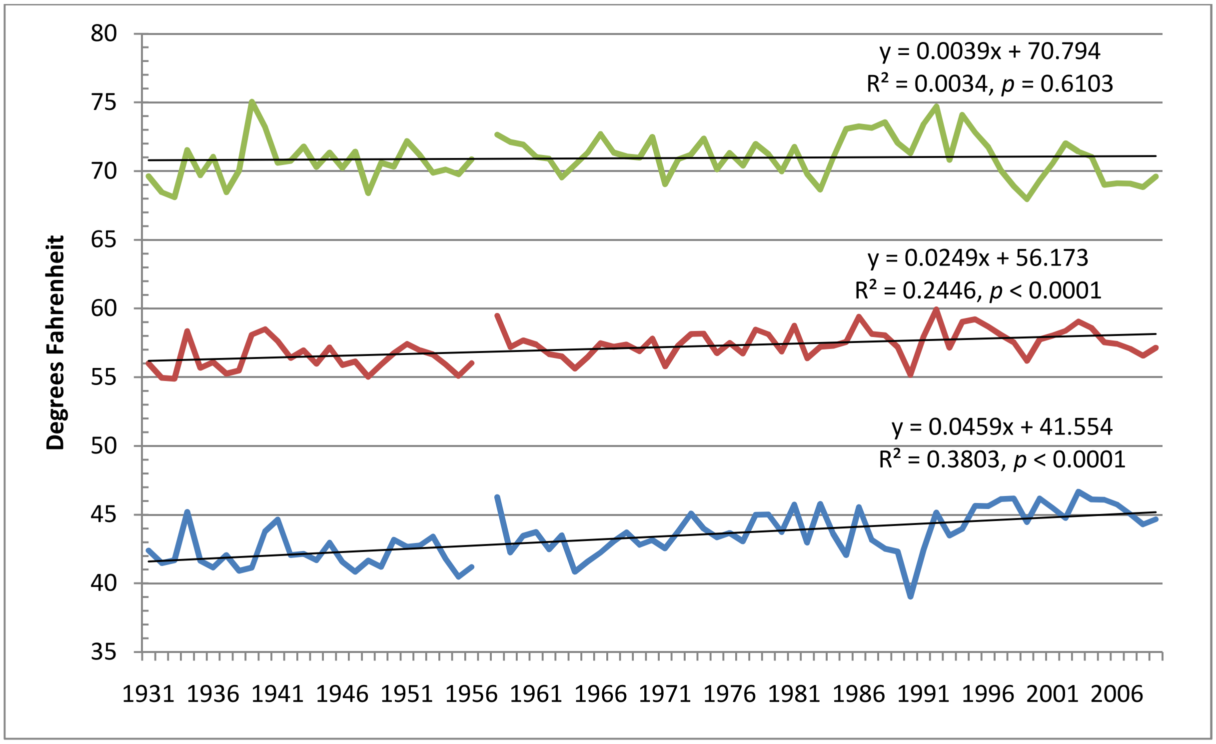


Figure 2. Annual mean, mean maximum, and mean minimum temperatures at Orleans, California, 1931-2009. Trend lines fit with simple linear regression, no transformations employed. Data from WRCC 2010.

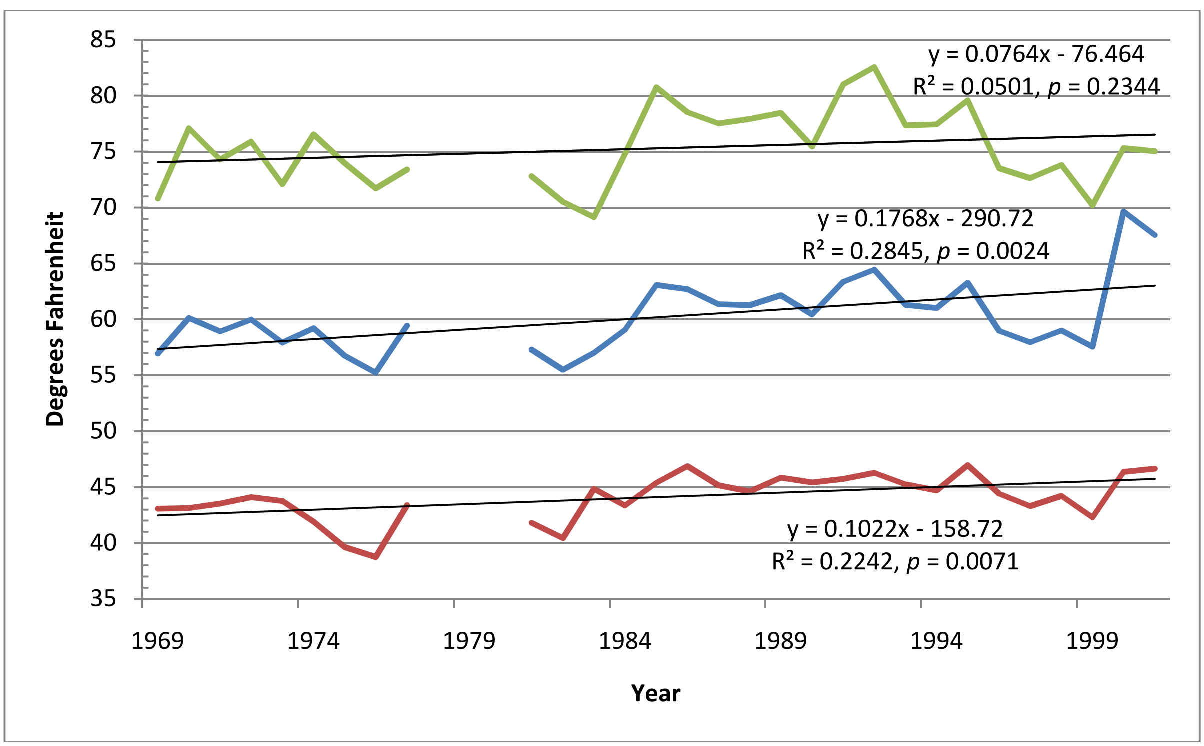


Figure 3. Annual mean, mean maximum, and mean minimum temperatures at Willow Creek, California, 1969-2001. Trend lines fit with simple linear regression, no transformations employed. Data from WRCC 2010.

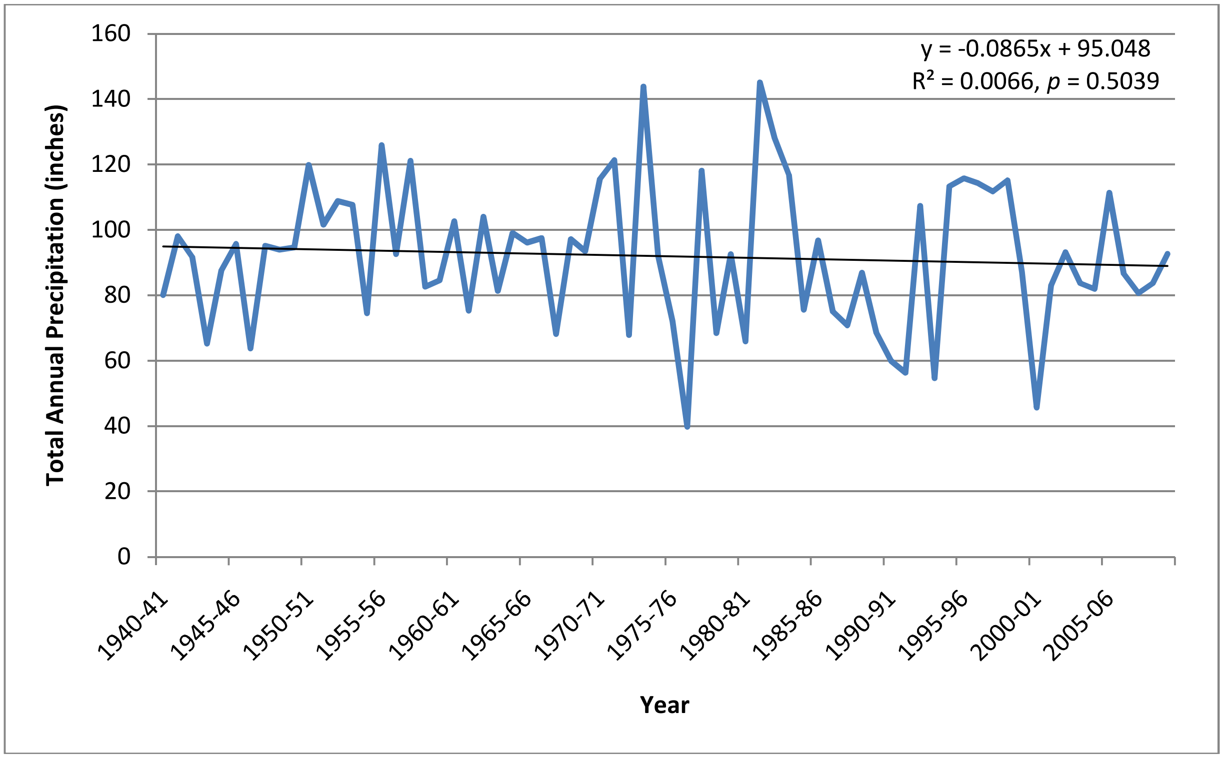


Figure 4. Total annual precipitation at the Gasquet Ranger Station, California, 1940-2009. Data from Six Rivers National Forest 2010.

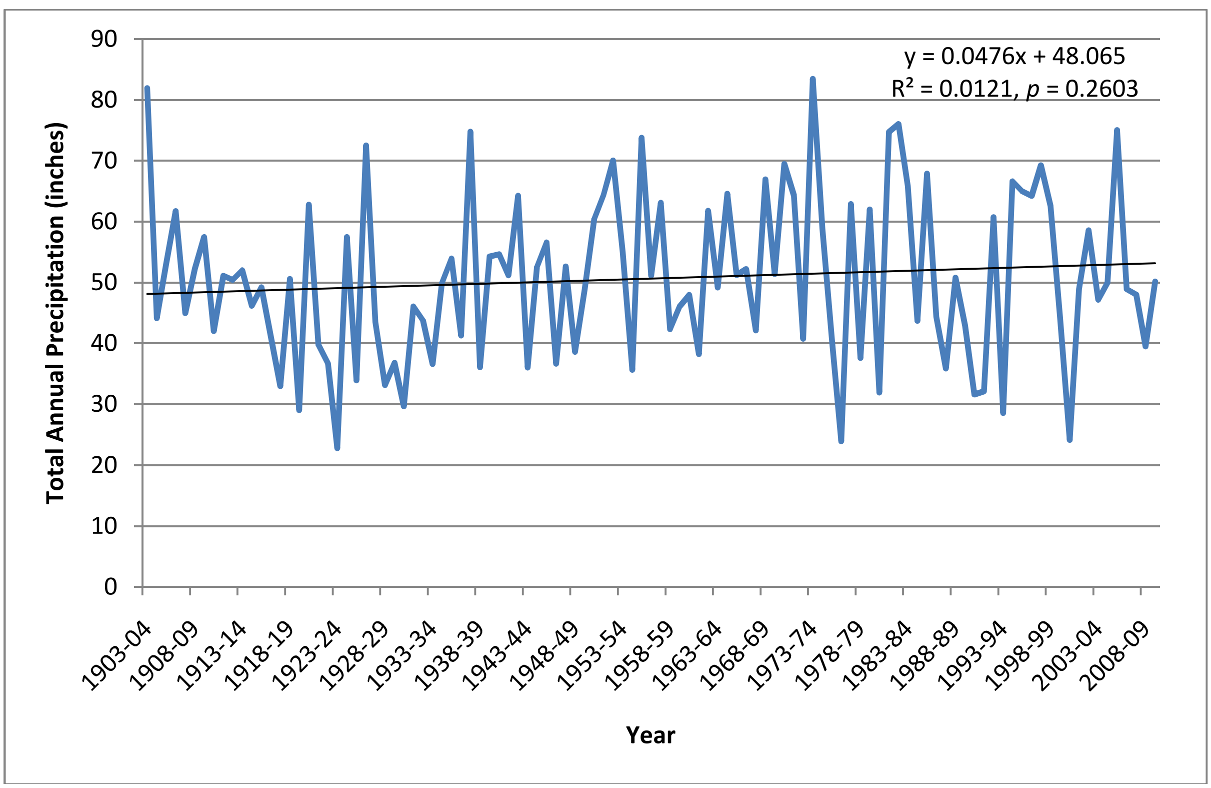


Figure 5. Total annual precipitation at the Orleans Ranger Station, California, 1903-2009. Data from Six Rivers National Forest 2010.

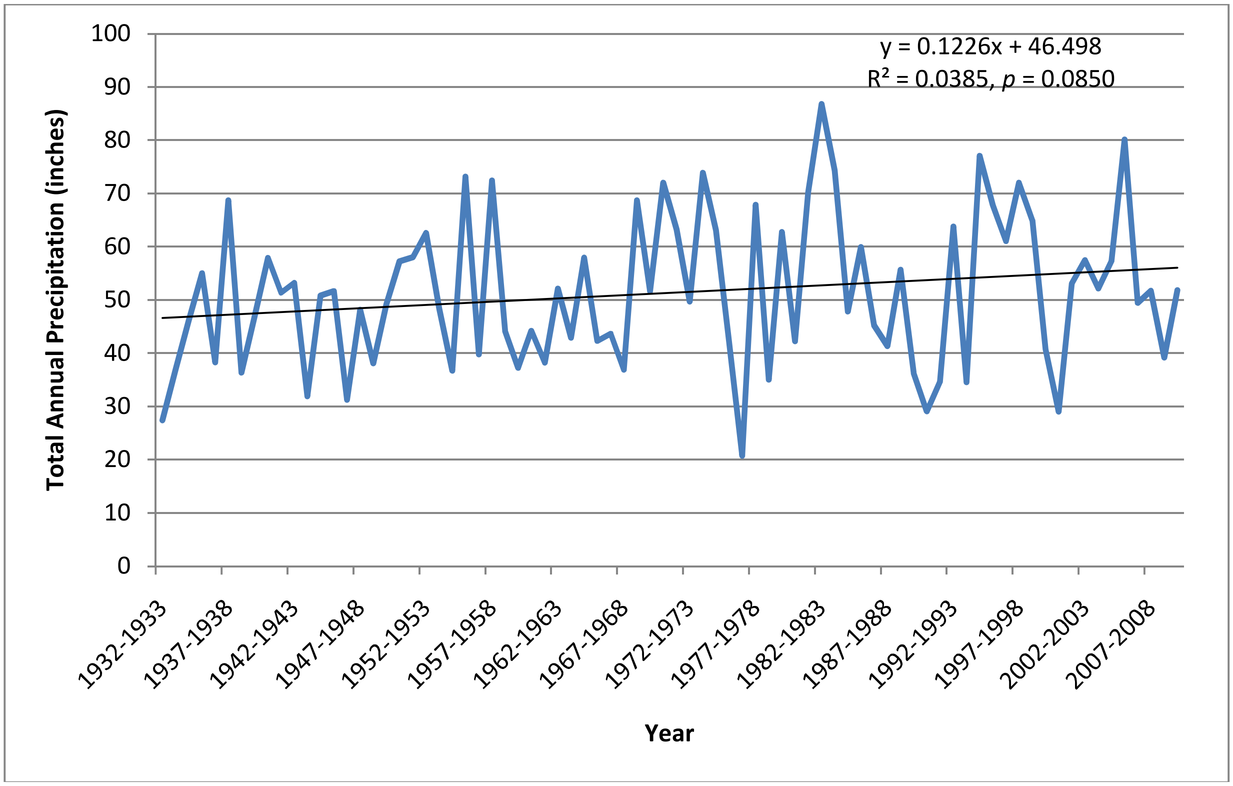


Figure 6. Total annual precipitation at the Lower Trinity Ranger Station, California, 1932-2009. Data from Six Rivers National Forest 2010.

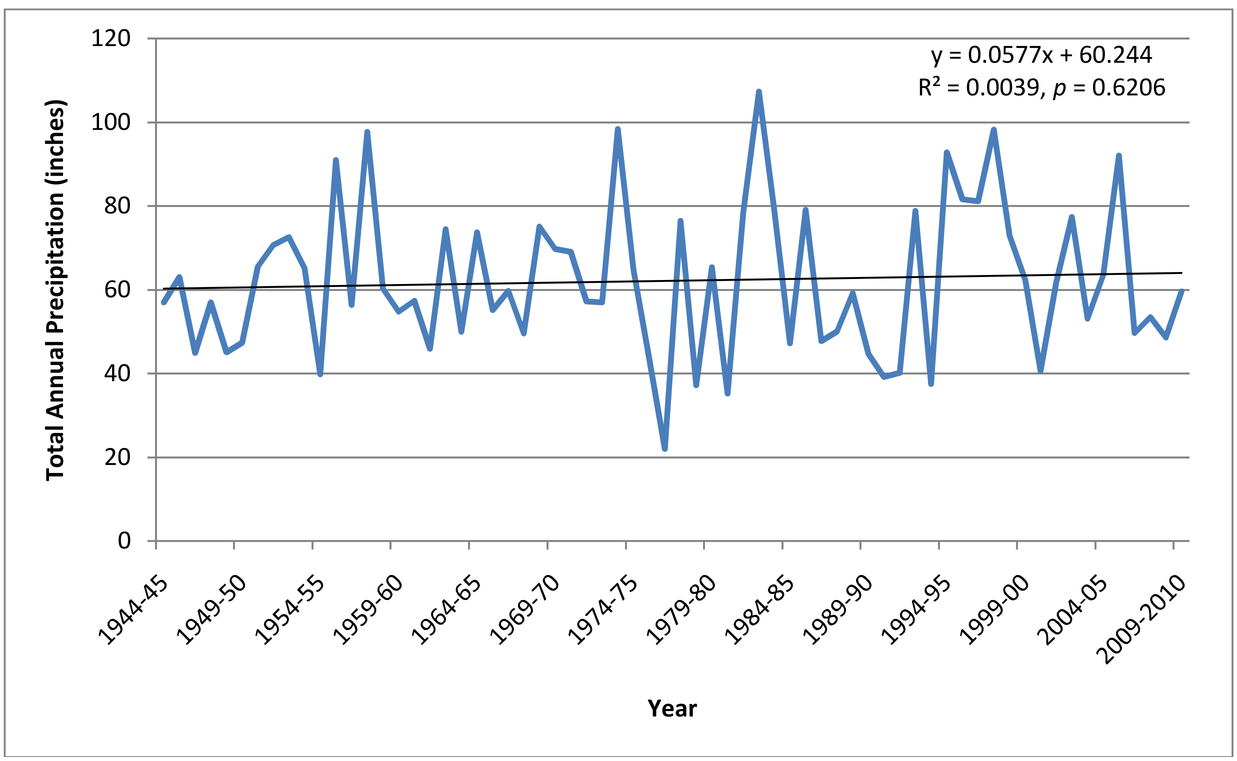


Figure 7. Total annual precipitation at the Mad River Ranger Station, California, 1944-2009. Data from Six Rivers National Forest 2010.

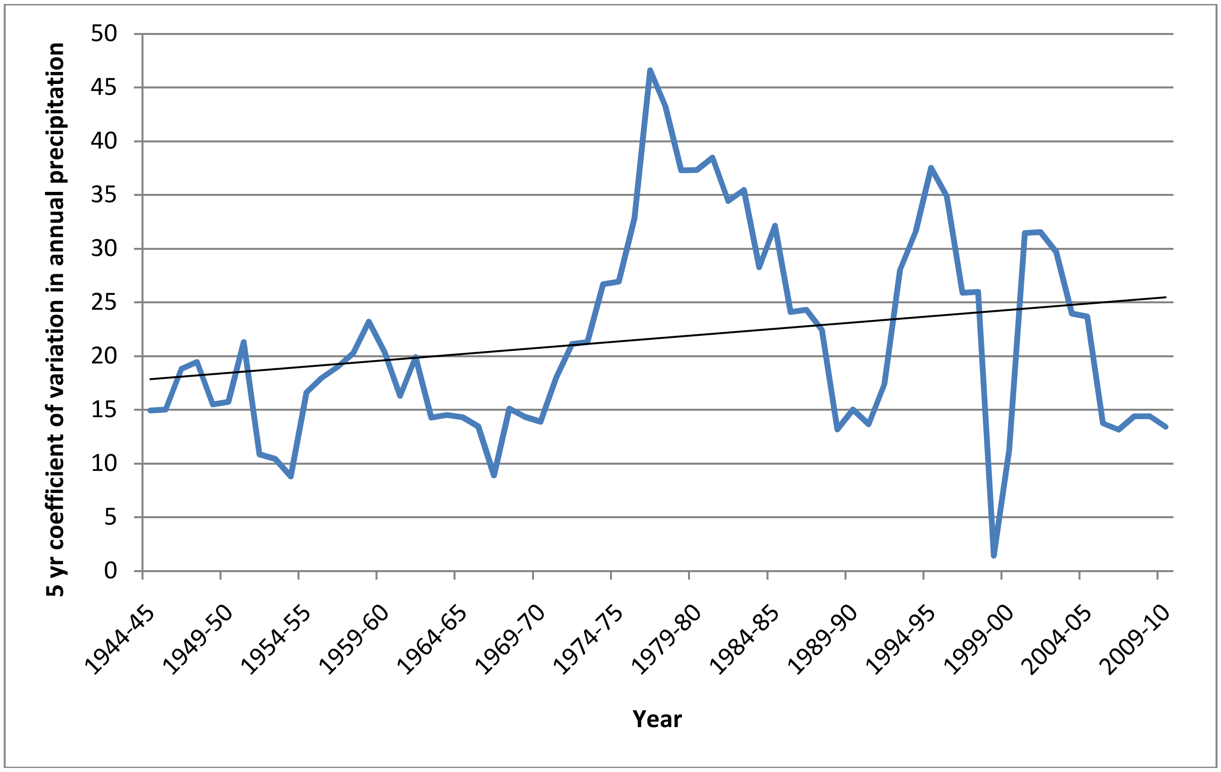


Figure 8. Five-year coefficients of variation in annual precipitation at Gasquet Ranger Station, California. Data from Six Rivers NF 2010.

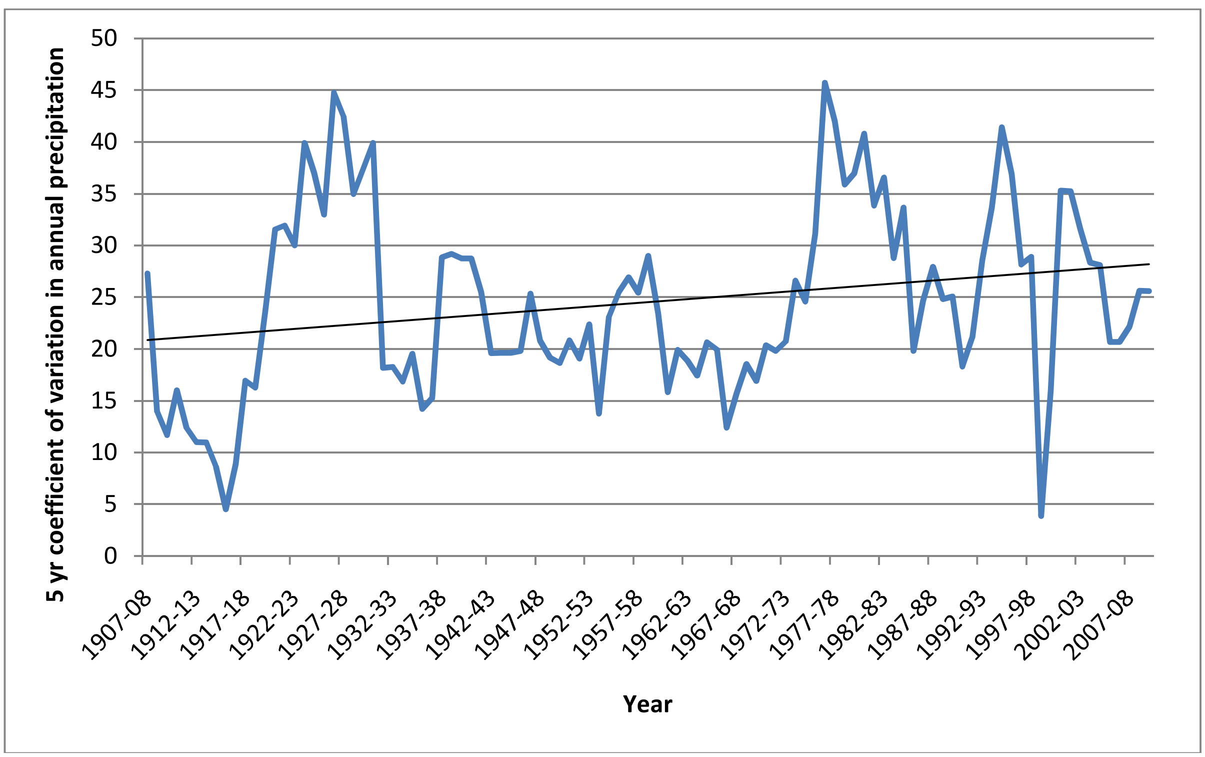


Figure 9. Five-year coefficients of variation in annual precipitation at Orleans Ranger Station, California. Data from Six Rivers NF 2010.

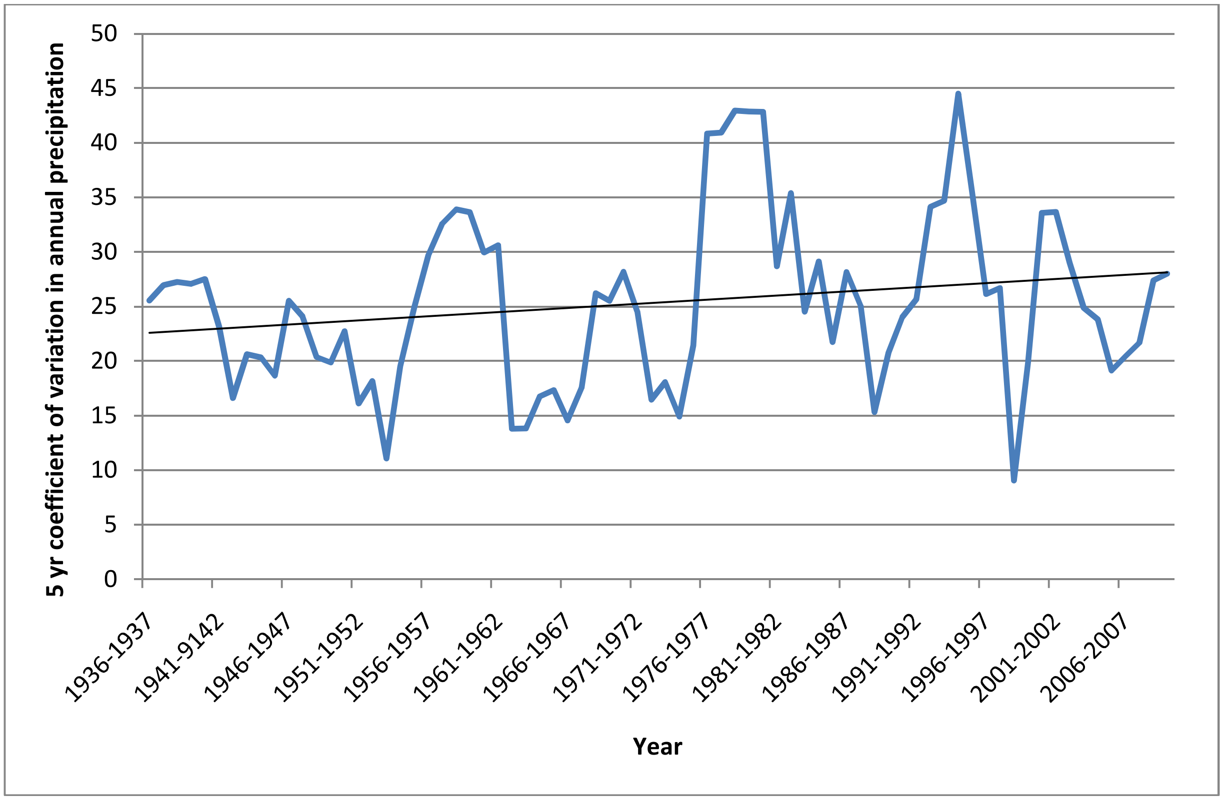


Figure 10. Five-year coefficients of variation in annual precipitation at Lower Trinity Ranger Station, California. Data from Six Rivers NF 2010.

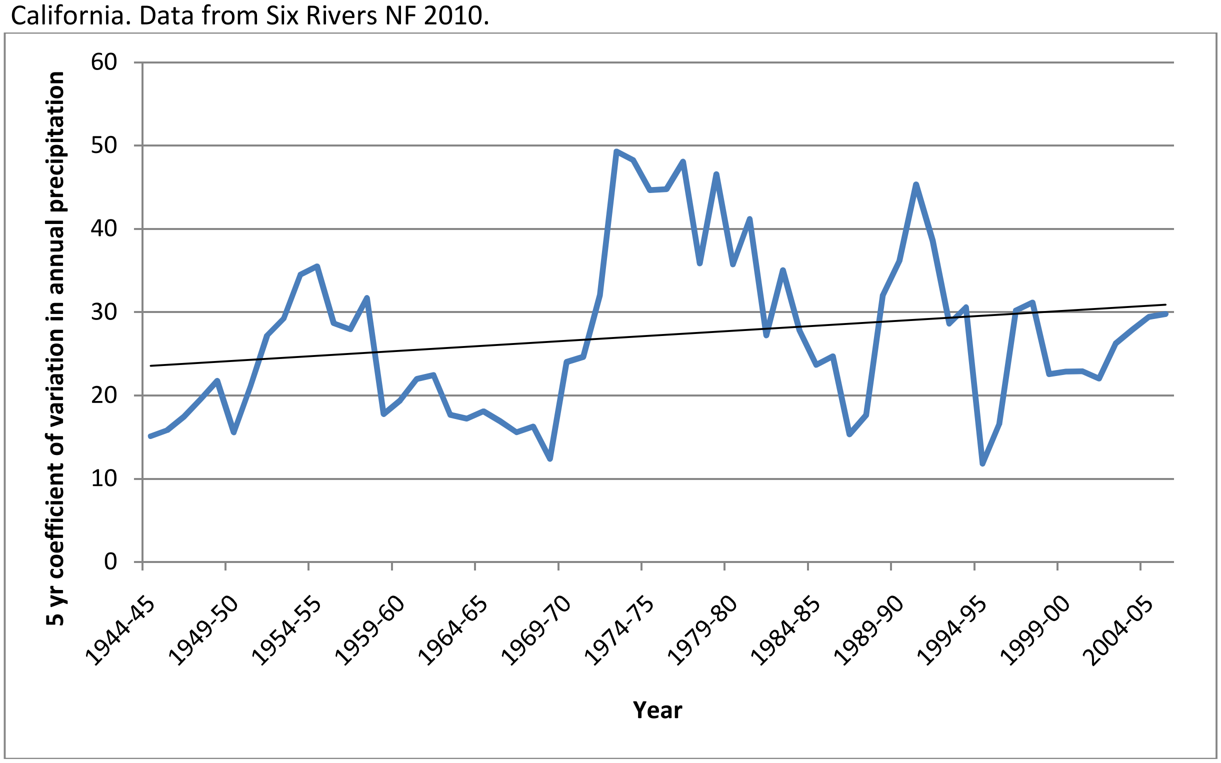


Figure 11. Five-year coefficients of variation in annual precipitation at Mad River Ranger Station, California. Data from Six Rivers NF 2010.

II. Regional trends over the last century linked to climate change

Hydrology

Analyses of hydrometeorological data from the lower Klamath Basin show a decrease in the percentage of precipitation falling as snow and accelerated snowpack melt, resulting in earlier peak runoff and lower base flows (Hamlet et al. 2005; Mote et al. 2005; Regonda et al. 2005; Stewart et al. 2005; Mote 2006; Van Kirk and Naman 2008). Since the 1940s, snow water equivalent (SWE) has decreased while water use has increased (Van Kirk and Naman 2008). Trends in April 1 SWE appear to be driven by temperature, which, along the Pacific Coast, is a function of elevation and latitude (Knowles and Cayan 2004; Mote 2006), and secondarily by precipitation (Hamlet et al. 2005; Mote et al. 2005; Stewart et al. 2005).

Forest fires

Data on forest fire frequency, size, total area burned, and severity all show strong increases in California over the last two to three decades. Westerling et al. (2006) showed that increasing frequencies of large fires (>1000 acres) across the western United States since the 1980's were strongly linked to increasing temperatures and earlier spring snowmelt. Northern California forests have had substantially increased wildfire activity, with most wildfires occurring in years with early springs (Westerling et al. 2006). This increase is likely attributable to both climate and land-use effects. Large percentage changes in moisture deficits in Northern California forests, according to Westerling et al. (2006), were strongly associated with advances in the timing of spring, but this area also includes substantial forested area where fire exclusion, timber harvesting, and succession after mining activities have led to increased forest densities and fire risks (McKelvey et al. 1996; Gruell 2001).

Miller et al. (2010) found no temporal trend in the annual proportion of fire area burning at high-severity within fires >400 ha occurring on the four National Forests of NW California during the period 1987-2008. However, mean and maximum fire size and total annual area burned all increased over the period from 1910 to 2008 and regional fire rotation fell to 95 years by 2008. During 1987-2008, Miller et al. (2010) found that the percentage of high-severity fire in conifer-dominated forests of smaller average diameter and lower percent cover was generally higher than in forests of larger diameter and higher cover. For areas that burned more than once during this period, severity (a measure of the effect of fire on vegetation) in conifer and hardwood forests was higher the second time burned versus the first time burned, regardless of tree density and size class. Closed forests of medium and large diameter trees that had previously burned between 1921 and 1986 burned at lower severities than similar forests that had last burned before 1921. Miller et al.'s (2010) data showed that years with larger fires and greatest area burned were produced by region-wide lightning events, and characterized by less winter and spring precipitation than in years dominated by smaller human ignited fires, but the percentage of high-severity fire was generally less in region-wide lightning events. Miller et al. (2010) also found that forests near the coast were not more susceptible to high severity fire than interior forests, but the size of forest patches burned at high severity was positively related to proximity to the coast.

Forest structure

Fire suppression has been practiced as a federal policy since 1935. In addition, many forests were harvested using even-aged systems early in the 1900s followed by a diverse group of silvicultural operations (Laudenslayer and Darr 1990). Fire exclusion has resulted in increased tree densities and a reduction in shade intolerant species (Parsons and DeBenedetti 1979; North et al. 2007), although the ecological significance of these changes is likely more important in drier, historically pine-dominated forests than in moister, fir-dominated forests. Skinner (1995) found that forest openings decreased and distances between openings increased from 1944 to 1985 in portions of the Dillon, Clear, and Swillup Creek watersheds near Happy Camp. Working at Whiskeytown National Recreation Area, west of Redding, Leonzo and Keyes (2011) documented major changes over the last ½ century in the structure and composition of "relict" old-growth ponderosa pine stands, with young individuals of shade tolerant species like Douglas-fir, white fir and tan oak comprising 10x higher stem densities than the originally dominant pine.

Van Mantgem et al. (2009) recently documented widespread increases in tree mortality in old-growth forests across the west, including northern California. Their plots had not experienced increases in density or basal area during the 15-40 year period between first and last census. The highest mortality rates were documented in the Sierra Nevada, and in middle elevation forests (3300-6700 feet). Higher elevation forests (>6700 feet) showed the lowest mortality rates. Van Mantgem et al. (2009) ascribed the mortality patterns they analyzed to regional climate warming and associated drought stress.

III. Future predictions

Climate

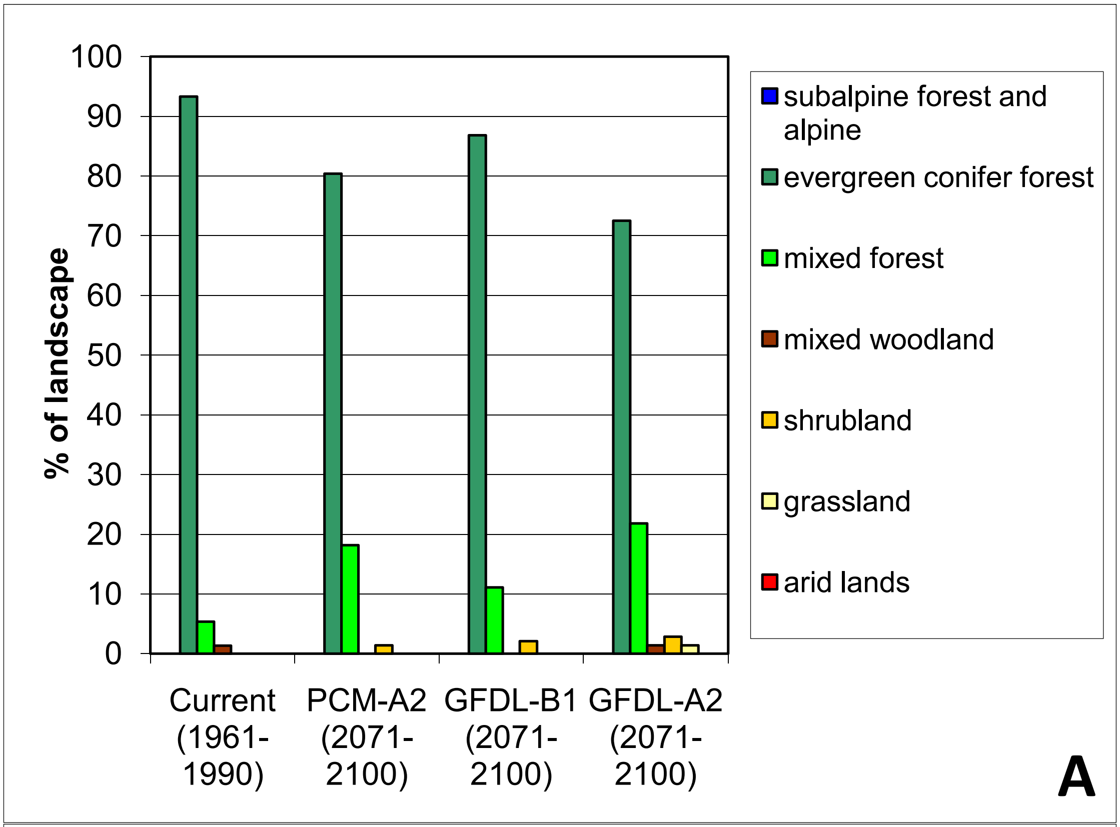
As of today, no published climate change or vegetation change modeling has been carried out for the Six Rivers National Forest. Indeed, few future-climate modeling efforts have treated areas as restricted as the State of California. The principal limiting factor is the spatial scale of the General Circulation Models (GCMs) that are used to simulate future climate scenarios. Most GCMs produce raster outputs with pixels that are 10,000's of km^2 in area. To be used at finer scales, these outputs must be downscaled using a series of algorithms and assumptions – these finer-scale secondary products currently provide the most credible sources we have for estimating potential outcomes of long-term climate change for California. Another complication is the extent to which GCMs disagree with respect to the probable outcomes of climate change. For example, a recent comparison of 21 published GCM outputs that included California found that estimates of future precipitation ranged from a 26% increase per 1º C increase in temperature to an 8% decrease (Gutowski et al. 2000, Hakkarinen and Smith 2003). That said, there was some broad consensus: all of the reviewed GCMs predicted warming temperatures for California, and 13 of 21 predicted higher precipitation (three showed no change and five predicted decreases). According to Dettinger (2005), the most common prediction among the most recent models (which are considerably more complex and, ideally, more credible) is temperature warming by about 9 degrees F by 2100, with precipitation remaining similar or slightly reduced compared to today. Most models agreed that summers will be drier than they are currently, regardless of levels of annual precipitation.

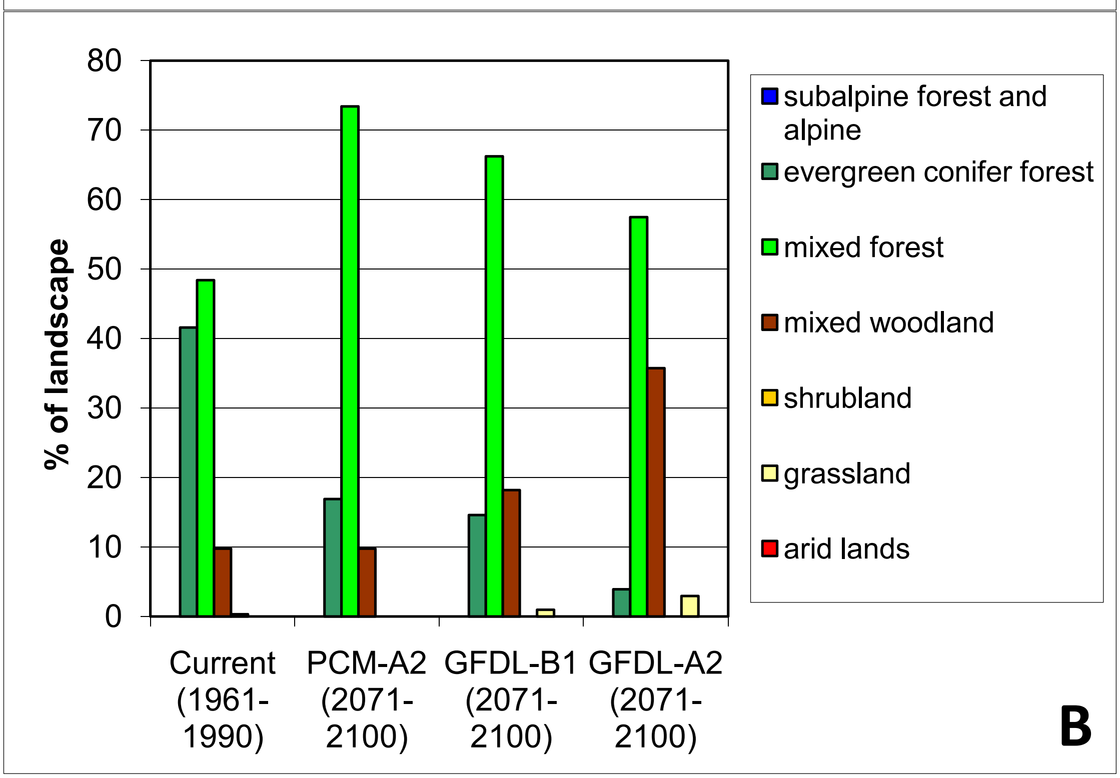
Cayan et al. (2008) use simulations from the NCAR and DOE Parallel Climate Model (PCM1) and the NOAA Geophysical Fluid Dynamics Laboratory CM2.1 model (GFDL) to investigate possible future climate changes in California. In Northern California, by the end of the century, projected precipitation increases slightly or does not change in one model (PCM1) and decreases by 10-20% in the other model (GFDL). Although little change in northern California precipitation is projected during the twenty-first century, there is a modest tendency for increases in the numbers and magnitudes of large precipitation events. While the magnitude of warming varies by both model and emission scenario, California temperatures rise by between 1.7 and 5.8°C between 2000 and 2100 for the set of climate change model simulations. Barr et al. (2010) report projections of slightly less severe warming, from +2.5 to 4.6° C (4.5 to 8.3° F); their precipitation projections range from -11% to +24%, with all models agreeing that growing season precipitation will decrease.

Hydrology
Although climate models diverge with respect to future trends in precipitation over NW California, there is widespread agreement that the trend toward lower SWE and earlier snowmelt will continue (Leung and Wigmosta, 1999; McCabe and Wolock, 1999; Miller et al. 2003; Snyder et al. 2004; Barnett et al. 2005; Zhu et al. 2005; Vicuna et al. 2007; Van Kirk and Naman 2008). In basins without winter snow accumulation, such as the Smith River basin, base flow is relatively insensitive to increasing temperature (Miller et al. 2003). If precipitation does increase, streamflow volumes during high flow events could greatly increase. A 30 percent increase in precipitation translates into a 50 percent increase in mean maximum annual streamflow on the Smith River (Miller et al. 2003).

A downscaling of three climate models (CSIRO, MIROC, and Hadley) for the Rogue River Basin in southwest Oregon and the Klamath River Basin led to the following general future projections for hydrology in NW California and SW Oregon (Doppelt et al. 2008, Barr et al. 2010): Total precipitation may remain roughly similar to historical levels, but may shift in seasonality to fall predominantly in mid-winter months. Rising temperatures will increase the percentage of precipitation falling as rain and decrease snowpack considerably, particularly at lower elevations. The Rogue River Basin is likely to experience more severe storm events, variable weather, higher and flashier winter and spring runoff events, and increased flooding. Both wet and dry cycles are also likely to last longer and be more extreme, leading to periods of deeper drought as well as periods of more extensive flooding. These projections may also hold true for coastal California river basins such as the Smith River basin.

Vegetation
Lenihan et al. (2003, 2008) used a dynamic ecosystem model ("MC1") which estimates the distribution and the productivity of terrestrial ecosystems such as forests, grasslands, and deserts across a grid of 100 km^2 cells. To date, this is the highest resolution at which a model of this kind has been applied in California, but it is not of high enough resolution to be applied to the Six Rivers National Forest as a unit. Based on their modeling results, Lenihan et al. (2003, 2008) projected significant declines in evergreen conifer forests in inland NW California, and their subsequent replacement by Douglas fir-tanoak forest and tanoak-madrone-oak forest under most future climate scenarios (Fig. 12). Projected vegetation changes along the coast were much less dramatic, due to maritime buffering of changes in temperature and precipitation (Fig. 12). Hayhoe et al. (2005) also used the MC1 ecosystem model to predict vegetation and ecosystem changes under a number of different future greenhouse gas emissions scenarios. Their results were qualitatively similar to the Lenihan et al. (2003, 2008) results.


100
90
80
70
60
50
40
30
20
10
0
% of landscape
Current (1961-1990)
PCM-A2 (2071-2100)
GFDL-B1 (2071-2100)
GFDL-A2 (2071-2100)
subalpine forest and alpine
evergreen conifer forest
mixed forest
mixed woodland
shrubland
grassland
arid lands
A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% of landscape
Current (1961-1990)
PCM-A2 (2071-2100)
GFDL-B1 (2071-2100)
GFDL-A2 (2071-2100)
subalpine forest and alpine
evergreen conifer forest
mixed forest
mixed woodland
shrubland
grassland
arid lands
B

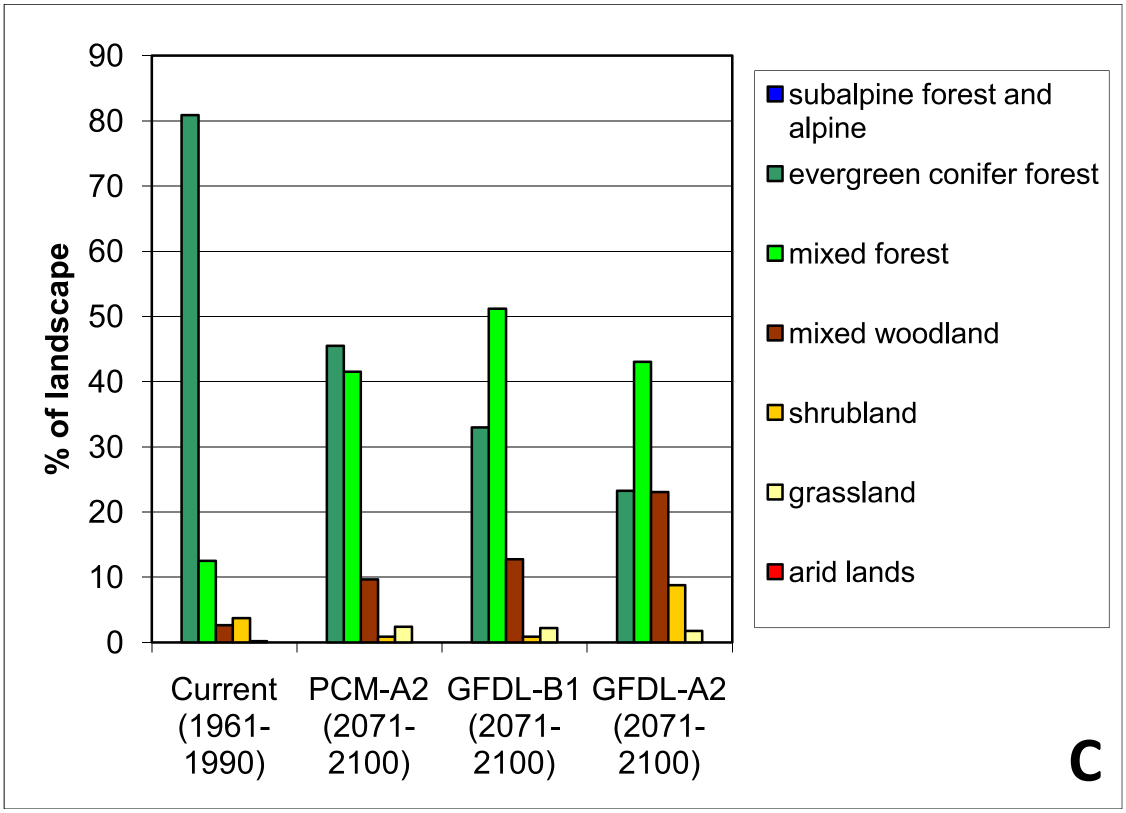

Figure 12. MC1 outputs for the (A) Northern California Coast, (B) Northern California Coast Ranges, and (C) Klamath Mountains Ecological Sections, current vs. future projections of vegetation extent. These Ecological Sections include all of the Six Rivers and Mendocino National Forests, and parts of the Klamath National Forests and Shasta-Trinity National Forest. The GFDL-B1 scenario = moderately drier than today, with a moderate temperature increase (<5.5° F); PCM-A2 = similar ppt. to today, with <5.5° temp. increase; GFDL-A2 = much drier than today and much warmer (>7.2° higher). Significant decreases in evergreen conifer forest are projected for the Coast Range and Klamath Sections, but not for the more maritime Coast Section. Large increases in the hardwood component of forests are projected in all scenarios except for the moderate (GFDL-B1) scenario in the Northern California Coast section. From Lenihan et al. (2008).

Barr et al. (2010) report on a set of MC1 runs under three GCMs for the Klamath River Basin but do not provide quantitative outputs. In general, by 2100 the upper basin (Oregon) is projected to support primarily grassland in place of the sagebrush and juniper ecosystems that currently dominate the area. In the lower basin (California), conditions suitable for hardwood forests (oaks, tan oak, madrone, etc.) are projected to expand while those suitable for conifer-dominated forests are projected to contract.

Fire

The combination of warmer climate with higher CO_2 fertilization will likely cause more frequent and more extensive fires throughout western North America (Price and Rind 1994, Flannigan et al. 2000); fire responds rapidly to changes in climate and will likely overshadow the direct effects of climate change on tree species distributions and migrations (Flannigan et al. 2000, Dale et al. 2001). A temporal pattern of climate-driven increases in fire activity is already apparent in the western United States (Westerling et al. 2006), and modeling studies specific to California expect increased fire activity to persist and possibly accelerate under most future climate scenarios, due to increased growth of fuels under higher CO_2 (and in some cases precipitation), decreased fuel moistures from warmer dry season temperatures, and possibly increased thundercell activity (Price and Rind 1994, Miller and Urban 1999, Lenihan et al. 2003, Westerling and Bryant 2006). By 2100, Lenihan et al.'s (2003) simulations suggest a *c.* 5% to 8% increase in annual burned area across California, depending on the climate scenario (but note that NW coastal California is projected to see less fire; Fig. 12). Increased frequencies and/or intensities of fire in coniferous forest in California will almost certainly drive changes in tree species compositions (Lenihan et al. 2003), and will likely reduce the size and extent of late-successional refugia (USFS and BLM 1994, McKenzie et al. 2004). Thus, if fire becomes more active under future climates, there may be significant repercussions for old growth forest and old growth-dependent biota.

A key question is to what extent future fire regimes in montane California will be characterized by either more or less severe fire than is currently (or was historically) the case. Fire regimes are driven principally by the effects of weather/climate and fuel type and availability (Agee 1993, Bond and van Wilgen 1996). 70 years of effective fire suppression in the semiarid American West have led to fuel-rich conditions that are conducive to intense forest fires that remove significant amounts of biomass (McKelvey et al. 1996, Arno and Fiedler 2005, Miller et al. 2009), and most future climate modeling predicts climatic conditions that will likely exacerbate these conditions. Basing their analysis on two GCMs under the conditions of doubled atmospheric CO_2 and increased annual precipitation, Flannigan et al. (2000) predicted that mean fire severity in California (measured by difficulty of control) would increase by about 10% averaged across the state. Vegetation growth models that incorporate rising atmospheric CO_2 show an expansion of woody vegetation on many western landscapes (Lenihan et al. 2003, 2008; Hayhoe et al. 2005), which could feedback into increased fuel biomass and connectivity and more intense (and thus more severe) fires. Use of paleoecological analogies also suggests that parts of the Pacific Northwest (including northern California) could experience more severe fire conditions under warmer, more CO_2-rich climates (Whitlock et al., 2003). Fire frequency and severity (or size) are usually assumed to be inversely related (Pickett and White 1985), and a number of researchers have demonstrated this relationship for California forests (e.g. Swetnam 1993, Miller and Urban 1999), but if fuels grow more rapidly *and* dry more rapidly – as is predicted under many future climate scenarios – then both severity and frequency may increase. In this scenario, profound vegetation type conversion is all but inevitable.

It is important to note that although much of northern California is projected to experience more frequent and severe fires under future scenarios, Lenihan et al. (2003, 2008) predict a decrease in mean annual area burned for coastal northern California (Fig. 19). Lenihan et al. simulated changes in mean annual area burned for the future period based on changes in vegetation types. For the northwest coast of California, they projected no significant increase in grass or shrub vegetation types that promote higher rates of fire spread in their models. Data from Miller et al. (2010) suggest that fires in the Klamath Mountains, particularly in wetter areas along the western slope, are not experiencing a trend in increasing fire severity (although the overall area of high severity fire is increasing due to increases in annual burned area). This is likely due to the more maritime climate, the importance of the maritime inversion layer over the area in the summer, and the strong influence of topography on fire behavior. Increased upwelling in the California Current under increased CO_2 conditions may intensify fog development and onshore flow during the summer months (Bakun 1990, Snyder et al. 2003), potentially further buffering wetter regions of the North Coast from intensifying fire regimes.

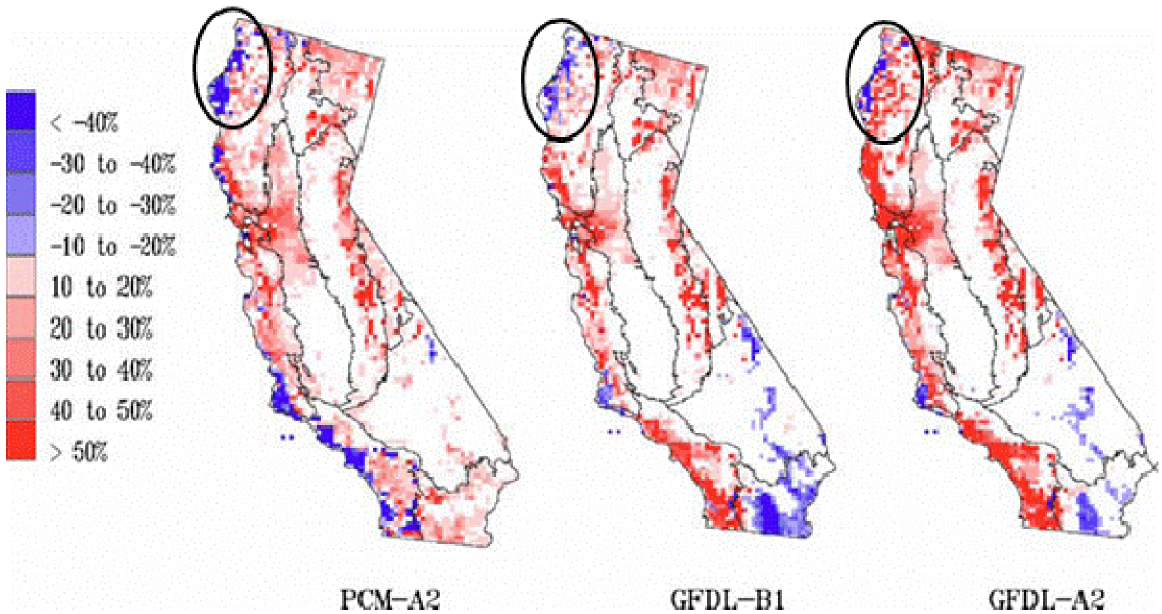

Figure 13. Percent change in projected mean annual area burned for the 2050-2099 period relative to the mean annual area burned for the historical period (1895-2003). Figure from Lenihan et al. (2008). See Fig. 12 for description of the climate and emissions scenarios (PCM-A2, GFDL-B1, GFDL-A2).

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Appendix F Water Conservation Planning

This appendix contains information regarding water contingency and water conservation planning.

U.S. BUREAU OF RECLAMATION

Florence Lake, December 2000

WATER SHORTAGE CONTINGENCY / DROUGHT PLANNING HANDBOOK

United States Department of the Interior
South-Central California Area Office
1243 'N' Street
Fresno, California 93721-1813
April 2003

Guidelines and Worksheets for Preparing Water Shortage Contingency / Drought Plans for USBR SCCAO M&I Water Contractors

United States Bureau of Reclamation Water Shortage Contingency/Drought Planning Handbook

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This handbook contains a compilation of resources from a variety of sources. Portions of the text was excerpted from the Urban Drought Guidebook published by the California Department of Water Resources and updated in 1991. The majority of worksheets found in this handbook were derived from forms developed by the Department of Water Resources for preparation of urban water management plans and water shortage contingency plans. The American Water Works Association's Drought Management Handbook was also used to help develop this handbook.

Overview

By completing the worksheets provided in packet located in the front pocket of this notebook, water districts will be able to meet the requirements for the USBR's M&I Water Shortage Policy and the requirements for drought financial assistance from the California Department of Water Resources and the Department of Health Services.

This handbook has been prepared to assist USBR South Central California Area Office urban water contractors with the preparation of a drought or water shortage contingency plan. It is a planning and implementation guide that will help agencies define the conditions under which a water shortage exists and will help agencies create a list of specified actions that will be taken in response to a shortage. The forms, sample materials, references, resources, and background information used in this guidebook are compiled from water resource planning assistance documents prepared by the California Department of Water Resources, the Army Corps of Engineers, and the Western Drought Coordination Council to provide a template for preparation of a water shortage contingency plan. The USBR Mid-Pacific Region's M&I Water Shortage Policy, September 2001, can be found on page 3.

*Note: Throughout this handbook the word "district" is typically used to refer to water suppliers. Other terms, such as purveyor and agency, are also used. They all refer to "a supplier of water to urban customers".

TABLE OF CONTENTS

Additional Resources and References

LIST OF TABLES AND WORKSHEETS

*Most of the tables and worksheets contained in this document are taken from the forms used to complete an Urban Water Management Plan.

I
INTRODUCTION

In this handbook you will examine ways to prepare your district for water shortages, and identify specific actions your district can take to prevent shortages or to respond to them when they occur. The most effective water shortage response effort begins long before a water shortage occurs. In order to respond most effectively, water districts need to consider all options for preparing for and responding to water shortages.

A. Overview of Water Shortage/Drought Planning in California

Much of California enjoys a Mediterranean-like climate with cool, wet winters and warm, dry summers. On average, 75 percent of the State's average annual precipitation of 23 inches falls between November and March, with half of it occurring between December and February. Floods and droughts occur often, sometimes in the same year. Therefore, planning for water shortages is essential.

The U.S. Bureau of Reclamation, the State of California Department of Water Resources and the CALFED Governor's Advisory Drought Planning Panel's Critical Water Shortage Contingency Plan require water purveyors in California to prepare plans for addressing water shortages for state and federal planning purposes and to be eligible to participate in various water shortage relief programs.

The Reclamation States Emergency Drought Relief Act of 1991 Title II: Drought Contingency Planning Section 202 authorizes the Secretary of the Interior, acting pursuant to Federal Reclamation law, utilizing the resources of the Department of the Interior, and in consultation with other appropriate Federal and State officials, Indian tribes, public, private, and local entities, to prepare or participate in the preparation of cooperative water shortage contingency plans for the prevention or mitigation of adverse effects of drought conditions. Section 203 states that elements of the contingency plans prepared pursuant to section 202 may include, but are not limited to, any or all of the following:

1. Water banks.
2. Appropriate water conservation actions.
3. Water transfers to serve users inside or outside authorized Federal Reclamation project service areas in order to mitigate the effects of water shortage.
4. Use of Federal Reclamation project facilities to store and convey non-project water for agricultural, municipal and industrial, fish and wildlife, or other uses both inside and outside an authorized Federal Reclamation project service area.

5. Use of water from dead or inactive reservoir storage or increased use of ground water resources for temporary water supplies.
6. Water supplies for fish and wildlife resources.
7. Minor structural actions.

The State of California's Urban Water Management Planning Act was enacted in 1985 and requires urban water suppliers serving 3,000 acre-feet of municipal/industrial water per year or 3,000 urban customers, to prepare a comprehensive urban water management plan (UWMP) addressing their current and projected water sources/supplies, water uses, supply reliability, comparison of supply and demand, water demand management (conservation) programs, wastewater recycling and water shortage contingency planning.

In addition, the CALFED Drought Contingency Plan (December 2000) prepared by the Governor's Drought Advisory Panel, outlines a Critical Water Shortage Reduction Marketing Plan, which would provide a water market for agencies experiencing critical water shortages. Criteria for participation in the water marketing program include demonstrating that the purchasing agency has taken appropriate steps to prepare for critical water shortages.

These legal requirements, along with the benefits of avoiding impacts associated with water shortage provide ample incentive for local agencies to prepare a water shortage contingency plan. In an effort to provide specific guidelines for completing a plan, the United States Bureau of Reclamation, South Central California Area Office in Fresno, and the Santa Barbara County Water Agency have developed the following handbook. Water districts can develop a water shortage contingency plan for their agency by completing each of the Worksheets and tables provided.

B. Using This Handbook

This handbook is organized as a series of steps that will assist a water purveyor in completing a water shortage plan. The steps include:

1. Outlining water supply and demand
2. Using information from Step 1 to project water supply shortages
3. Planning for Shortages and Mitigating Impacts
4. Developing a Public Outreach Campaign to ensure customers are aware of supply issues
5. Reviewing how shortages could affect revenue and expenditures
6. Finalizing and adopting your water shortage plan.

To facilitate the completion of each step a worksheet or series of worksheets are provided to organize information for water shortage planning. A packet containing each of the necessary tables for completing the water shortage contingency/drought plan is located in the front pocket of this notebook. USBR staff is available to help water districts adapt the plan outline to their specific, unique situation.

In addition, a number of references and resources for further information are included to guide the water purveyor to other entities that may be able to assist in the development of a water shortage plan.

C. Adopting Your Plan

Once you have completed Tables 1 through 17, you will have all of the materials and information necessary for a complete water shortage plan for your district. The next step is to compile the plan in a manner that will be the most useful for you district. Then your district should officially adopt the plan so that the plan can be implemented as soon as it becomes apparent that a water shortage is imminent. The steps listed below provide a guide for adopting your plan.

1. Announce through local media that draft copies of your water shortage plan are available for review.
2. Set Public Meeting dates to provide the public with a forum for providing comments.
3. Incorporate comments into the draft Water Shortage/Drought Plan to create your Final Plan.
4. Adopt the Water Shortage/Drought Plan through an ordinance.
5. Send official copies of your plan to the Bureau of Reclamation, the California Department of Water Resources, and neighboring water districts.
6. Implement your plan through an aggressive public information campaign.
7. Develop administrative procedures to ensure enforcement of the restrictions outlined in your plan.

II
WATER SUPPLY AND WATER DEMAND INFORMATION
(Getting Started)

In this section you will compile information about your district's current and future water supplies and customer demand. For the purposes of this handbook, the base year is 2000 and the projections are for 2005 and 2010 since these dates correspond to the dates when Urban Water Management Plans will need to be updated. To develop future water supply and demand projections you will need to: know how many service connections you have, know the amount and source of water available to your district in the future (you can incorporate information from your district's long range water supply plan), understand past water use trends, and obtain information regarding future population growth in your service area. You will also need to be sure to include all regulatory and legal requirements that affect your supplies including minimum flow rates for streams, species habitat requirements, and reservoir conservation requirements. The data included in these tables will be used in later sections to develop a worst-case water shortage scenario and to understand the financial impacts of reduced water sales on the district. (Note: These tables were adapted from *City of New Albion, California 2000 Urban Water Management Plan,* which is the sample plan for preparing an Urban Water Management Plans developed by the State of California, The Resources Agency, Department of Water Resources. If you have already prepared an Urban Water Management Plan, you can use the information from those tables in this section.)

Worksheet 1 - Complete the following worksheet by inserting information regarding all supplies available to your agency. For projections be sure to include anticipated reductions due to factors such as seawater intrusion, contamination, land subsidence, and siltation.

Worksheet 1

Available Water Supplies* (Shown in Calendar Years)							
SOURCE*	**3 years ago**	**2 years ago**	**Last Year**	**This Year**	**2005**	**2010**	**Drought of Record**
Surface Water							
1.							
2.							
3.							
Groundwater							
Recycled Water							
Imported Water							
1. CVP							
2. SWP							
3.							
Sales to Other Agencies							
Totals							
*Units of Measure: Acre-feet/Year							

**See Glossary for further explanation of categories.*
Adapted from the Sample *Urban Water Management Plan for the City of New Albion, California 2000.* Prepared by the State of California, Department of Water Resources. December 2000.

Worksheet 2 - Complete the following worksheet by filling in the number of service connections by customer class served by your agency. For projections please use the number of additional dwelling units that will be added in the next 5 or 10 years based on local community or land use plans. If you district uses designations for customer classes than those listed, please substitute the customer class types that your district currently uses.

Worksheet 2

Number of Service Connections By Customer Type* (Shown in Calendar Years)			
Customer type	**2000**	**2005**	**2010**
Single Family			
Multi-Family			
Commercial			
Institutional			
Industrial			
Recreation			
Agriculture			
Total			

**See Glossary for further explanation of categories. If you do not use these category titles for distinguishing customer classes, you may substitute meter sizes or alternative categories.*
Adapted from the forms developed for preparation of *Urban Water Management Plans.* State of California, Department of Water Resources. 2000.

Worksheet 3 - Complete the following worksheet by filling in the total amount of water sold by customer class for each year listed. For projections, use estimates of new developments from community plans as described for Worksheet 2, and population figures as outlined in Worksheet 4 below. If you district uses designations for customer classes than those listed, please substitute the customer class types that your district currently uses.

Worksheet 3

Past, Current and Projected Water Use (Shown in acre-feet per Calendar Year)					
Customer type	**1990**	**1995**	**2000**	**2005**	**2010**
Single Family					
Multi-Family					
Commercial					
Institutional					
Industrial					
Recreation					
Agriculture					
Unaccounted Loss					
Sales to Other Agencies					
Environmental Water Account					
Total					

Adapted from the forms developed for preparation of *Urban Water Management Plans.* State of California, Department of Water Resources. 2000.

Worksheet 4 - Complete the following worksheet by entering current and projected population levels. Utilize one of the methods below to project population changes. To determine per-capita demand, determine total water sales to urban customers (in gallons) - including residential, institutional, industrial, commercial, and recreational - and divide this figure by the total population within your service area. Then divide that amount by 365 (days in a year) to determine gallons per person per day - or per-capita demand.

Worksheet 4

Population and Per-Capita Demand			
	2000	**2005**	**2010**
Population			
Per-Capita Demand			

Adapted from the forms developed for preparation of *Urban Water Management Plans.* State of California, Department of Water Resources, 2000.

Methods for Determining and Projecting Population

It can be difficult to determine a precise number of people living in your service area. There are a number of ways to estimate population within the boundaries of a water district and several sources of information (local planning agency or association of governments, local county assessor's office, California Department of Finance, your district's records of metered accounts) to guide you in developing this information. You will need to determine the best method to use depending on the availability of information in your community and whether or not your district serves a city or an unincorporated area within the local county. The guidelines below provide a method for unincorporated areas and a method for cities.

Method 1 - Unincorporated Areas:

a. Contact your County Assessor's Office to determine the total number of registered voters within the boundaries of your service area. Multiply this number by the ratio of total county population divided by the total number of registered voters within the county. The answer is an estimate of the total population in your service area. If this information is not available, contact the local land-use or demographic planning agency to obtain population figures for your service area. If this information is not available, obtain the data for the number of persons per household, a factor that is available in most areas, and multiply that number by the number of residential meters in your service area to determine an estimated population.

b. If you have used voter registration information to create a base population, then obtain the community's recent historical annual growth rate (a % increase or decrease each year), project the increase in five year increments and add that to the base population derived in the previous step. If your community has an approved land use plan for your area, they may also have population projections. If not, you can use your historical rate of new connections per year and multiply that by the persons per household figure referenced in the previous step.

Method 2 - Incorporated Cities:

a. Visit the California Department of Finance website at www.dof.ca.gov. Choose the link for demographic information, and then follow the link for their Catalog of Publications. The link for Report E-1 outlines population estimates for City and County populations with annual percent change. Use the population estimates provided for your city for the current year**.** ***(See Resource Section 1, Part A for a copy of the 1999 population figures for each city in California from Report E-1).***

b. To project future population, check the city planning agency to see if they have projections. If not, see step "b" in the previous method.

Worksheet 5 – Use the following Worksheet to compare supply (Worksheet 1) and demand (Worksheet 3) totals to determine if anticipated supplies will meet projected demands for the next 20 years.

Worksheet 5

Projected Supply and Demand Comparison (Acre-feet/Year)			
	2000	**2005**	**2010**
Supply totals (From Worksheet 1)			
Demand totals (From Worksheet 3)			
Difference			

Adapted from the forms developed for preparation of *Urban Water Management Plans.* State of California, Department of Water Resources. 2000.

Worksheet 6 -Complete the following Worksheet by filling in the number of acre-feet of supply available during each of the listed scenarios. (You may want to check historical records to determine the largest cut that was ordered during the last water shortage event).

Worksheet 6

Supply Reliability				
		Multiple Dry Years		
Average/ Normal Year	Single Dry Year 20% reduction in supply	Year 2 10% reduction in supply	Year 3 15% reduction in supply	Year 4 20% reduction in supply

Adapted from the forms developed for preparation of *Urban Water Management Plans.* State of California, Department of Water Resources. 2000.

Worksheet 7 – Use Worksheet 7 to list the cost of producing and delivering each of the available water supplies for your district. This information will be utilized later to determine potential financial impacts during a water shortage.

Worksheet 7

Water Production and Delivery Costs ($ Per Acre-Foot)	
Surface Water	
1.	
2.	
3.	
Groundwater	
Imported Water	
1. CVP	
2. State Water	
3.	
Recycled Wastewater	

Adapted from the forms developed for preparation of *Urban Water Management Plans.* State of California, Department of Water Resources. 2000.

Worksheet 8 – Complete the following Worksheet by filling in the current rates for each customer class. For the purposes of this table, it is assumed that you use hundred cubic feet (HCF) as units of water sold. If your district uses a block rate structure, be sure to include rate information for each block. If your district uses a *uniform* rate, fill in the rate next to the row marked Block 1. This information will be utilized later to determine potential financial impacts during a water shortage. If you district uses designations for customer classes than those listed, please substitute the customer class types that your district currently uses.

Worksheet 8

Water Rates to Customers ($ Per Hundred Cubic Feet)		
Customer type		**Rate**
Single Family	Block 1	
	Block 2	
	Block 3	
Multi-Family	Block 1	
	Block 2	
	Block 3	
Commercial	Block 1	
	Block 2	
	Block 3	
Industrial		
Recreation	Block 1	
	Block 2	
	Block 3	
Landscape	Block 1	
	Block 2	
Institutional / Public	Block 1	
	Block 2	
	Block 3	
Agriculture	Block 1	
	Block 2	

Adapted from the forms developed for preparation of *Urban Water Management Plans.* State of California, Department of Water Resources. 2000.

III
PROJECTING AND DEFINING WATER SUPPLY SHORTAGES THAT TRIGGER MITIGATION ACTIONS
(Understand the Risks)

Options to Address Shortages in Worst Case Supply Scenario

Before you can develop a strategy for addressing water shortages, you will need to consider possible shortage scenarios and how they might impact your district. Developing possible water shortage scenarios will help you understand the possible risks a water shortage would pose to your district and will allow you to develop an effective plan for addressing possible shortages. In this section you will develop a hypothetical worst-case supply scenario using consecutive, increasingly dry, water years. Once you have created the worst-case scenario, you will consider alternative ways to address the resulting shortages. The three types of alternatives included in this section are: 1) supply augmentation; 2) demand reduction; and 3) a combination of supply augmentation and demand reduction.

How to Use Worksheets 9 – 9C

Worksheet 9 will help you determine how a multi-year water shortage would affect your district. Worksheets 9A, 9B, and 9C are provided to demonstrate alternative approaches to addressing the hypothetical shortfalls outlined in Worksheet 9.

Worksheet 9A will help you demonstrate how supply augmentation or enhancement would offset water shortages during multiple dry years. Alternative supply augmentation methods are described in detail in Resource Section 1. Some steps to augment water supplies may need to be taken *before* a water shortage, such as importing water for local storage to be available during a water shortage. Other steps, such as conjunctive use of groundwater and surface water supplies, can be taken during the water shortage.

Worksheet 9B will help you illustrate how demand reduction can reduce supply shortfalls. Some demand management strategies (water use efficiency) should be implemented all the time, regardless of water shortages. The California Urban Water Conservation Council's (CUWCC) statewide Urban Water Conservation Memorandum of Understanding contains examples of long-term efficiency measures, called best management practices (BMPs) (For further information check the CUWCC website at www.cuwcc.org or call (916) 552-5885). Short-term demand reduction during water shortage periods can be accomplished using water conservation strategies such as those listed in Worksheet 11.

Worksheet 9C will help you illustrate how both demand reduction and supply augmentation methods can be used together to minimize shortages during multiple dry years.

Worksheet 9 – Use the following Worksheet to project the hypothetical shortages that would be experienced by your district if a multi-year water shortage were to occur. For total supply sources use the information on Worksheet #1 (Total). For total demand use the information developed in Worksheet #3. For planning purposes, the multiple dry water years assume shortages of 10%, 20%, 30%, 40% and 50% respectively (also see Worksheet #6). You may change these percentages or use fewer than five years to more closely match your district's unique situation. However, this scenario is hypothetical and meant to provide an extreme worst- case example to help you plan.

Worksheet 9

Hypothetical Worst-Case Planning Scenario (statewide and local water shortage)						
Source of Supply	**Normal Water Supply** (Acre-feet)	**Multiple Dry Water Years** (Acre-feet)				
		Year 1	**Year 2**	**Year 3**	**Year 4**	**Year 5**
Total Supply Sources						
Percent Supply Shortage		10%	20%	30%	40%	50%
Total Demand (assume average year demand levels)						
Difference						

Adapted from the forms developed for preparation of *Urban Water Management Plans.* State of California, Department of Water Resources. 2000.

Worksheets 9A Supply Augmentation Option, 9B Demand Reduction Option and 9C Simultaneous Supply Augmentation and Demand Reduction Option, will help you illustrate three alternative approaches to addressing the water supply shortages resulting from the hypothetical scenario contained in Worksheet 9.

Worksheet 9A - Use this worksheet to project how supply augmentation methods could be implemented in your district to minimize or eliminate projected shortages.

Worksheet 9A

Hypothetical Worst-Case Planning Scenario (statewide and local water shortage) **Supply Augmentation Option**						
Source of Supply	**Normal Water Supply** (Acre-feet)	**Multiple Dry Water Years** (Acre-feet)				
		Year 1	**Year 2**	**Year 3**	**Year 4**	**Year 5**
Total Supply Sources						
Percent Supply Reduction		10%	20%	30%	40%	50%
New Supplies 1. 2.						
Total Demand (assume average demand)						
Difference						

Adapted from the forms developed for preparation of *Urban Water Management Plans.* State of California, Department of Water Resources. 2000.

Worksheet 9B – Use this worksheet to project how **demand reduction** methods could be implemented in your district to minimize or eliminate projected shortages. Adjust demand levels using the percentages on the demand reduction line, or you can develop you own demand reduction estimates.

Worksheet 9B

Hypothetical Worst-Case Planning Scenario (statewide and local water shortage) **Demand Reduction Option**						
Source of Supply	**Normal year supply** (acre-feet)	**Multiple Dry Water Years** (Acre-feet)				
		Year 1	**Year 2**	**Year 3**	**Year 4**	**Year 5**
Total Supply Sources						
Percent Supply Shortage		10%	20%	30%	40%	50%
Percent Demand Reduction		5%	10%	15%	20%	25%
Total Demand						
Difference						

Adapted from the forms developed for preparation of *Urban Water Management Plans.* State of California, Department of Water Resources. 2000.

Worksheet 9C - Use this worksheet to project how a **combination of water supply augmentation and demand reduction** methods could be implemented in your district to minimize or eliminate projected shortages.

Worksheet 9C

Hypothetical Worst-Case Planning Scenario (statewide and local water shortage) **Simultaneous Supply Augmentation and Demand Reduction Option**						
Source of Supply	**Normal year supply** (acre-feet)	**Multiple Dry Water Years** (Acre-feet)				
		Year 1	**Year 2**	**Year 3**	**Year 4**	**Year 5**
Total Supply Sources						
Percent Supply Shortage		10%	20%	30%	40%	50%
New Supplies 1. 2.						
Percent Demand Reduction		5%	10%	15%	20%	25%
Total Demand						
Difference						

Adapted from the forms developed for preparation of *Urban Water Management Plans.* State of California, Department of Water Resources. 2000.

IV
PREPARING FOR, MINIMIZING, AND RESPONDING TO WATER SHORTAGES
(Develop a Strategy)

A. Introduction

In this section you will examine ways to prepare your district for water shortages, and identify specific actions your district can take to prevent shortages or to respond to them when they occur. The most effective water shortage response effort begins long before a water shortage occurs. In order to respond most effectively, water districts need to consider all options for preparing for and responding to water shortages. There are generally four types of actions to consider: demand reductions, supply alternatives, operational changes and environmental/water quality changes. The following list includes these categories and the associated specific alternatives for districts to evaluate.

List of potential actions to address water shortages

	Demand Reductions
	Voluntary and mandatory use restrictions
	Pricing changes
	Public awareness
	Changes in plumbing codes
	Conservation credits
	Changes in irrigation methods
	Industrial conservation techniques
	Alternatives to water consuming activities
	Supply Alternatives
	New storage
	Reallocation of supplies
	New system interconnections
	Desalination, importation by barge, reuse
	Operational Changes
	Conjunctive use management
	Water banking
	Long-term changes in reservoir release rules
	Conditional reservoir operation and in-stream flows
	Water marketing
	Institutional changes
	Legal changes
	Operational coordination between systems
	Environmental and Water Quality Changes
	Reductions in required low flows
	Alternative means of achieving water quality

Source: U.S. Army Corps of Engineers, *Managing Water for Drought*, September 1994.

In this section you will develop a strategy for responding to water shortages. The worksheets in this section will focus on **demand reduction strategies** and **supply alternatives** in the development of a water shortage strategy. The worksheets will allow you to match specific supply augmentation and demand reduction options with water shortage triggering stages to meet the reduced availability of water supplies during a water shortage in your district.

You may want to investigate options for operational changes or environmental and water quality changes. However, due to the variability in the feasibility of these options from water district to water district, these subjects are not addressed here.

B. Preparing for a Water Shortage

In the previous sections you have analyzed your district's water supply and demand figures and have developed hypothetical worst-case water shortage projections for planning purposes. In this section you will use these hypothetical situations to establish triggers for your water shortage response plan and the actions you will take before and during a water shortage. You will need to consider a number of factors when developing your action plan and choosing water shortage mitigation measures. These considerations include:

- Potential water savings
- Timing required to implement measures
- Direct and indirect costs
- Quality of supplies
- Environmental impacts
- Legal or procedural requirements for implementation
- Community support
- Adequacy of treatment facilities to use supplemental sources
- Staffing requirements

When planning for a water shortage, it is essential to balance supply and demand. The impacts of water shortage hit hardest when agencies place unrealistic expectations on the amount of water supply available and do not include a realistic estimate of the potential for reductions in demand.

A few challenges you will face in preparing for a water shortage include:

- Water shortages are unpredictable events. The duration and severity of water shortages vary and no two water shortage events will have the same impact on a water district. Water districts must be flexible and prepared in order to minimize the effects of a water shortage on customers.

- Water shortages can impact even adjacent districts very differently depending on the source of water supplies used by the districts, the amount of water in held in reserve (water shortage buffer), the type of customers and the types of water efficiency measures practiced in typical, non-drought years.
- It is difficult to invest the time to plan for a water shortage when water supplies are plentiful. We automatically swing into action when crisis strikes, freely funneling time and money into alleviating suffering and property damage. This is crisis management. But once the crisis is over, it seems like too much trouble to invest the time and resources in planning that could ease the effects of the next water shortage.
- The responsibility for responding to water shortages is divided among many governmental jurisdictions including planning departments, water purveyors, public health departments, etc. These entities must coordinate efforts in order to effectively respond to a water shortage event.

There are good reasons to plan for water shortage -- that is, to practice risk management rather than crisis management:

- Droughts are low-profile natural disasters, but analysis shows that they can be as expensive as floods and hurricanes.
- Planning ahead gives decision-makers the opportunity to implement the most cost effective and equitable programs during a water shortage.

C. Develop a Water Shortage Strategy with Stages

In this section, you will develop a specific plan for augmenting supplies during a shortage and reducing demand to a level that can be sustained by the water supply available during a shortage. The types of customers served and the statutory authority of the utility are some of the considerations that need to be taken into account. A good public information program is extremely important for a successful water shortage strategy. Communicating to customers those measures which are necessary at a given level of shortage will determine how well the public accepts the program.

Step 1: **Developing Water Shortage Strategy Stages:**

The best approach to managing water during a water shortage is to use a staged approach, with increasing levels of supply augmentation and demand reduction in each successive stage. A typical water shortage contingency program will have four stages.

Worksheet 10 outlines when each stage of the District's water shortage plan would be enacted. The percentages have been adopted from the California Department of Water Resources *Example Urban Water Management Plan, 2000* (Drought Contingency Plan Chapter) and may be adjusted to more appropriately reflect the percentage reductions that would create threats to human health and the environment in your district. You should review how a shortage in supply of each percentage level (15% to 50%) could affect your district. If normal year supplies are well above current use, then the listed percentages may be fine for your district. If normal year supplies are only slightly more than current demand, you may want to enact the stages of your water shortage plan at smaller percentage levels than those indicated in Worksheet 10.

The stages are designed to be somewhat flexible and it is not intended that an agency would move through each stage in every circumstance. It is more likely that a voluntary program (Stage 1) would be tried at the first sign of a water shortage and then, if conditions worsened, Stage 2 or 3 would be implemented. In the event of an earthquake or other sudden event that severely reduces supply availability, an agency may need to begin Stage 4 actions immediately. The triggers selected by your district for Worksheet 10 will help determine which stage is in effect at any time during a water shortage.

Worksheet 10

Triggers for Implementing Water Shortage Plan	
Stage 1 – Minimal	**15%** Total Supply Reduction
Stage 2 – Moderate	**15-25%** Total Supply Reduction
Stage 3 – Severe	**25-35%** Total Supply Reduction
Stage 4 – Critical	**35-50%** Total Supply Reduction

Adapted from the *Sample Urban Water Management Plan* - Drought Contingency Plan Section. Prepared by the. State of California, Department of Water Resources. 2000.

Step 2 – How to Select Appropriate Drought Mitigation Measures*:

Now that you have defined the Water Shortage Strategy stages, you will need to select the actions that will be taken during each stage. A valuable tool for assessing potential actions for water shortage mitigation is a decision matrix. Water shortage mitigation actions can be aligned along one axis with assessment criteria along the other. You should use the actions listed in Worksheet 11 and the criteria listed below to create this matrix. A point system or a simple plus/minus system can be established to aid in selecting measures. Such a matrix could prove valuable in gaining consensus from water users or other water districts. As the district gains experience implementing various measures, the assessment criteria should be updated or re-evaluated.

The following criteria should be used when preparing a drought mitigation strategy.

Anticipated water savings: The size of the target use group and anticipated savings are key factors for assessing measures.

Consumer acceptance: Any measures must meet with some level of consumer acceptance. Without proper public education and involvement, no measure will meet with a high level of public acceptance. The message must be clear and concise when the drought program is implemented.

Equity: The measures selected must be perceived as equitable to all customer classes. This will enhance the acceptance of the measures selected. If there is a real or perceived inequity between various consumer groups, then the measures may not achieve the desired results. However, since some water uses are assigned a higher priority than others, by law, parity must sometimes be sacrificed.

Sustainability: Another element of assessment is the calculation of a particular measure's sustainability over time. In other words, will the measure provide only a short-term reduction or is it also a viable long-term measure? Each has its place depending on the particular drought event, its anticipated duration, and the long-term water supply situation.

Cost: Careful consideration needs to be given to the cost of implementing mitigation measures. These costs include the cash outlay to promote, coordinate, and enforce a given measure, as well as the costs in lost revenues (See Section VII for more information about rates and revenue stabilization during a drought). In recent droughts some water districts have discovered that their drought measures were so effective in reducing demand, that revenues declined dramatically causing a cash flow crisis for the district. Therefore, both the cost of implementing a measure and the resultant impact on revenue flow must be taken into account so that the intensity of the measures taken can coincide with the severity of the crisis.

Legal and contractual issues: Districts must assess measures from a legal and contractual standpoint. Some existing codes, regulations, ordinances and contracts may need to be revised in order to implement specific drought measures. In particular, the need to make these revisions may affect the timing of when a measure can be implemented.

Policy compatibility: Drought measures should be, the extent possible, compatible with existing long-term policy objectives such as conservation programs.

Reliability history: The measures presented in this handbook have been proven effective and reliable in many areas and under a variety of circumstances. Each district is unique, and must consider its own past experiences or those of similar agencies when assessing the potential of each measure.

Ease of implementation: Some measures may offer substantial mitigation but will prove very difficult to actually implement. The means of implementing each measure should be carefully analyzed to determine if it warrants further consideration.

**(Excerpted from the Drought Management Handbook, American Water Works Association, 2002)*

Step 3: Matching Water Shortage Mitigation Actions to Strategy Stages

A description of the specific supply augmentation and demand reduction measures in each stage should be prepared as shown in Worksheet 11. This list serves as a general guide which you can use to assess each potential action and select from the actions ranked the highest in your decision matrix to determine which actions you will take during each stage. The actual plan developed by your agency should be based on local circumstances so it may not include each action listed.

<u>Supply Augmentation Methods</u>

One way to minimize shortages to customers is to increase supplies **before the** water shortage and/or provide a “water shortage buffer” to serve as a reserve when rainfall is low or other conditions cause reductions in the level of normal supplies available to the district. Methods of supply augmentation can be classified into 5 groups: 1) methods to increase existing supplies or develop new supplies; 2) drawing from reserve supplies; 3) methods to increase efficiency (demand reductions); 4) modifications to operations; and 5) cooperative efforts with other agencies. Worksheet 11 contains several examples of these methods. Resource Section 1, Part B includes information on specific supply augmentation measures.

Implementation of supply augmentation is often difficult because few of these actions can be undertaken quickly. Also, many of these methods involve balancing environmental and jurisdictional considerations. Finally, if reserves are used, these resources must eventually be replenished. Despite the inherent difficulties with using supply augmentation options, even minimal supply augmentation programs have been helpful in water shortage situations. Developing extra supply increases utility credibility with customers by demonstrating that the utility is maximizing its efforts to deal with the water shortage, even before it begins. Also, supply augmentation can provide a water shortage buffer in case of multi-year shortages or can be used to minimize the amount of demand reduction needed to meet temporary supply deficits.

Demand Reduction Methods

Demand reduction is the most straightforward way to address drought-induced water supply deficits. Efforts to help customers reduce demand should first be directed at the customer uses, which are inefficient, wasteful or able to be temporarily reduced or suspended without significant hardship. Since certain conservation actions on the part of the customer may be mandated, enforcement mechanisms are needed for maximum implementation of demand reduction.

The typical demand reduction goals for staged plans normally range from 5-10 percent in the first stage, to as much as 50% in the last stage. Stage 1 relies primarily on voluntary demand reduction actions taken by the water customers. These actions are taken in anticipation of a future water shortage creating a modest water shortage. Subsequent stages are in response to increasingly severe water shortage conditions. Stage 2 utilizes some mandatory measures and Stages 3 and 4 involve water rationing. Stage 4 includes extensive restrictions on water use and would be initiated only in very extreme circumstances. Each stage incorporates and builds on the actions taken in the previous stages.

There are many ways that water districts can request and encourage water conservation from their customers. The success of these efforts depends largely on how well the district communicates with customers and with the media. The level of savings achieved will depend, in part, on how efficiently customers use water before the water shortage begins. On the one hand, if customers use water efficiently before a water shortage begins, the impact of the water shortage is minimized because shortages are less likely to occur (unless the district has not set aside a buffer for shortages). On the other hand, if customers are already efficient in their water use, there is less excess water use to be cut during a water shortage. District managers need to consider current levels of water use when preparing a water shortage action plan in order to understand what level of conservation may be possible during a water shortage.

This section addresses both pre-drought and drought actions. Pre-drought demand reduction measures include implementation of the fourteen best management practices (BMPs) identified in the statewide Memorandum of Understanding (MOU) for Urban Water Conservation in California. These measures are listed in Worksheet 11. These measures are long-term, cost-effective programs that are appropriate for implementation by all urban water districts. Implementation of these measures results in more efficient water use in urban communities. (For more information about these BMPs or a copy of the statewide MOU, visit the California Urban Water Conservation Council's web site at: www.cuwcc.org or call (916) 552-5885.)

Resources Section 1 C contains a key with estimates and ranges of potential demand reduction, timing to realize water savings, and costs to water districts that are based on previous results of similar programs implemented in Santa Barbara County during the 1986-1992 drought.

Worksheet 11: Actions for Your Water Shortage Strategy – Highlight or circle the options your district will use to augment supplies and reduce demand during the next water shortage. You will need to determine the relative costs of, and quantities available from, the potential supplemental supplies for your district. This should be included as part of your district's long-term water supply planning process. You will also need to determine which demand reduction measures will meet your district's needs for potential demand reduction, timing to realize water savings, and cost. Please write the stage in which you will implement each action in the space provided.

Worksheet 11

ACTIONS FOR YOUR WATER SHORTAGE STRATEGY	STAGE
Methods to Increase Existing Supplies	
Increase use of recycled wastewater	
Increase use of nonpotable water for nonpotable uses	
Construct emergency dams	
Re-activate abandoned dams	
Drawing From Reserve Supplies	
Use reservoir dead storage	
Add wells	
Deepen wells	
Re-activate abandoned wells	
Rehabilitate operating wells	
Renegotiate contractually controlled supplies	

Methods to Increase Efficiency	
Suppress reservoir evaporation	
Reduce dam leakage	
Minimize reservoir spills	
Reduce distribution system pressure	
Conduct distribution system water audit	
Conduct distribution system leak detection and repair	
Surge and clean wells	
Modifications to Operations	
Re-circulate wash water	
Blend primary supply with water of lesser quality	
Transfer surplus water to areas of deficit	
Change pattern of water storage and release operations	
Cooperative Efforts with Other Agencies	
Exchanges	
Transfers or interconnections	
Mutual aid agreements	
Best Management Practices	
1. Residential Water Surveys	
2. Residential Plumbing Retrofit	
3. System Water Audits, Leak Detection And Repair	
4. Metering with Commodity Rates	
5. Large Landscape Conservation Programs And Incentives	
6. High-Efficiency Washing Machine Rebate Programs	
7. Public Information Programs	
8. School Education Programs	
9. Conservation Programs For Commercial, Industrial, and Institutional	
10. Wholesale Agency Assistance Programs	
11. Conservation Pricing	
12. Conservation Coordinator	
13. Water Waste Prohibition	
14. Residential Ultra Low Flow Toilet Replacement Programs	
Additional Demand Reduction Actions	
Implement all applicable pre-stage 1 measures	
Provide technical assistance to customers	
Begin public information campaign– water shortage message	
Ask customers for voluntary reductions in use	
Provide incentives to customers to reduce water consumption (rebates, free devices)	
Prohibit wasteful use of water	
Limit number of building permits issued	
Implement water shortage rate structure (Change the water rate structure from a uniform rate to an inclining block rate)	
Plumbing fixture replacement	
Request increased reduction by customers	

Require that eating establishments serve water only when specifically requested by customers	
Prohibit use of running water for cleaning hard surfaces such as sidewalks, driveways, and parking	
Require lodging hotels/motels to post notice of water shortage condition with tips in each guest room	
Provide weekly updates on supply conditions to media and public	
Prohibit some uses of water – i.e., lawn watering using sprinklers	
Institute rationing programs through fixed allotments or percentage cutbacks	
Reduce pressure in water lines	
Prohibit use of ornamental fountains and ponds, except when water is re-circulated (include a sign adjacent to the fountain stating that the water in the fountain is being re-circulated)	
Prohibit filling swimming pools and spas unless the pool or spa is equipped with a pool cover	
Prohibit the use of potable water for cleaning, irrigation and construction purposes, including but not limited to dust control, settling of backfill, flushing of plumbing lines, and washing of equipment, buildings and vehicles	
Vehicles and boats can only be washed at a car wash that recycles water or uses 10 gallons or less of water per cycle or with a bucket and hose equipped with a automatic shut-off nozzle	
Intensify implementation of all measures in previous stages	
Implement mandatory water rationing including per-capita water use allocations for residential customers	
Restrict water use only to priority uses (no lawn watering, car washing)	

Adapted from the *Water Conservation Guidebook No. 7; Urban Drought Guidebook*, Department of Water Resources, 1988.

How to Use Your Strategy When a Shortage is Imminent

Once you have completed Worksheet 11, you have developed an important piece of your strategy for dealing with a water shortage. The following information describes how to implement this portion of your water shortage plan when a shortage is imminent.

Step 1: Evaluate Water Saved by Staged Reductions:

The water savings realized by the demand reduction methods in any stage will vary from month to month. Many methods included in Worksheet 11 emphasize outside water use reduction. Therefore, their effectiveness will be higher in the warmer months. Not only will the percentage of total demand reduction be higher, but the total quantity of water saved will also be larger because of the higher water demand during those months. For example, if a Stage 3 water rationing plan is expected to save 25 percent of the total demand on an annual average basis, savings may be as much as 35 percent in the summer months. There would be a correspondingly lower rate of savings, perhaps 15 percent, during the winter.

Exactly how much water savings can be achieved in any given month is difficult to predict. A service area where most of the water use is residential with a large proportion used for landscape irrigation can expect high summer savings relative to the annual average; whereas a service area with low summer irrigation demands would experience much less variation from the predicted annual average savings. One way to account for this variation is to assume that the savings can be scaled to the normal year demand curve.

Step 2: Select Stage

The estimated water savings from the four-stage plan can be used to decide which stage to select to reduce demand to match available supply at any time before or during a water shortage. The following procedure is recommended.

1. Graph projected water supply. Include the analysis of supplemental sources in determining the available water supply for the coming year.

2. Estimate dry year water demand. Apply the percent savings anticipated for each stage to the projected dry year demand curve. Graph the results as a series of three adjusted demand curves together with the projected dry year demand.

3. Compare supply and demand curves to determine which water shortage stage will reduce demand to match the available supply. Select the appropriate stage and publicize which stage of the water shortage strategy you must enter to sustain use through the shortage. (See Section VI for information on Public Outreach Methods).

Lag Time Problem:

Water agencies frequently assume that they will immediately achieve the levels of water use reduction they are asking for. Especially for areas that have not experienced rationing before, this is unlikely. This is because adjacent water suppliers in the region may have differing messages and it can be difficult to achieve high water use reductions. This is compounded by the fact that customers on a bi-monthly billing cycle do not know how much water they are using until they receive their water bill as long as two months from the start of the program. Also, with the unseasonably mild winter weather usually associated with droughts, water use can actually be higher.

By the time water suppliers realize that they are not achieving the savings they were expecting, or that the response is lagging, less water is available for the rest of the year. The likely result of this lag time effect is that water suppliers will have to leapfrog over Stages 2 and 3 rationing levels all the way to severe levels in order to have sufficient water supplies available to meet demand.

Another effect of the lag time is that suppliers will draw down terminal reservoirs and emergency storage, and overdraft groundwater to make it through later months of the year. That can reduce the supply of water for emergencies and water to meet the next year's needs.

To avoid some of these lag time effects, it is better to ration earlier at levels that are uncomfortable but manageable rather than to wait and later have to live with much more extreme rationing.

V
MONITORING PROCEDURES
(Watch Closely)

Implementation of a water shortage plan includes ongoing monitoring of the effectiveness of the individual conservation measures, monitoring supply availability and monitoring actual water use.

A. Water Production and Use Monitoring

Normal Monitoring Procedure

In normal water supply conditions, production figures are recorded daily. Totals are reported weekly to the Water Treatment Facility Supervisor. Totals are reported monthly to the Water Department Manager and incorporated into the water supply report.

State 1 and 2 Water Shortages

During a Stage 1 or 2 water shortage, daily production figures are reported to the Supervisor. The Supervisor compares the weekly production to the target weekly production to verify that the reduction goal is being met. Weekly reports are forwarded to the Water Department Manager and the Water Shortage Response Team. Monthly reports are sent to the City Council or Board of Directors. If reduction goals are not met, the Manager will notify the governing board so that corrective action can be taken.

Stage 3 and 4 Water Shortages

During a Stage 3 or 4 water shortage, the procedure listed above will be followed, with the addition of a daily production report to the Manager.

Disaster Shortage

During a disaster shortage, production figures will be reported to the Supervisor hourly, and to the Manager and the Water Shortage Response Team daily. Reports will also be provided to the governing board and the local Office of Emergency Services.

B. Supply and Demand Comparison Tracking

It is critical to track available supply and actual use on a regular basis and assure that demand levels do not substantially exceed targets set in Section IV. Compare actual demand and supply with projected demand and supply to determine if stage adjustments are needed. Prior to altering the demand reduction stage, consider any program adjustments such as raising the level of expenditure on public outreach or increasing enforcement efforts. If these actions do not achieve the required stabilization, then adjust the stage. It is best to avoid going up and down in stages because this can hurt public confidence and acceptance. Try to avoid going down until the water shortage is over or the shortage emergency has passed. Using these techniques, you can stay on top of the situation and make informed decisions throughout the duration of the water shortage.

VI
PUBLIC OUTREACH
(Keeping Your Customers Informed)

This section outlines the methods that a water district can use to provide information to the public and the media during a water shortage. It includes a menu of options for informing the public about the water shortage and actions they can take to reduce their water use, and a checklist for keeping the media involved. There is also a Worksheet for identifying media contacts. Sample public information materials such as press releases, bill inserts, advertisements, and workshop topics, along with guidelines for writing a press release are included in the Resources Section 4.

General Public Outreach

The public will be affected by water shortages, and should be involved in water shortage preparedness efforts. During a water shortage, the effectiveness of water shortage responses is often a function of the trust, knowledge, and commitment of the public. Many water managers believe they practice good “public involvement” because they conduct regular meetings at which agency policies are explained and questions from the public answered. But this approach may not be effective in developing trust, knowledge and commitment to agency decisions, nor in inducing changes in water users behavior that can reduce water shortage impacts. The agency needs to develop a comprehensive outreach program that reaches all customers with messages regarding the water situation and specific steps they can take to use water efficiently.

Public participation may help to increase administrative accountability; to supply pertinent information; to evaluate methodological approaches and use priorities; to raise broad but related value questions; to call planners’ attentions to immediate problems; and to make plans more politically acceptable. Generally, effective public involvement has the following characteristics: two-way communication; involvement early and through the entire process; deliberation involving informal and personal processes; and representation of all interests.

There are many methods you can use to inform your customers about the water shortage, and inform them of the steps you would like them to take to conserve. Worksheet 12 presents a list of options for you to use in your outreach efforts.

Worksheet 12 - Place a checkmark by the options that you will consider including in your public awareness campaign during a water shortage.

Worksheet 12

Menu of Options for Public Outreach	
Bill Inserts for water bills	
Public service advertising – run for free by local media	
Paid Advertising – Newspaper	
Paid Advertising – Radio	
Paid Advertising – Television	
Paid Advertising – Movie Slides for local movie theaters	
Paid Advertising – Chamber of Commerce Newsletter	
District newsletter	
Classroom Presentations	
Water Shortage Pamphlet – mass distribution to all customers	
Water Shortage Website	
Public Workshops – Drought Survival – Water conservation	
Water Shortage Information Center	
Public Advisory Committee	
Displays in District Office	
Low flow fixture rebates	
Low flow fixture distribution	
Promote use of Greywater	
Drought Tolerant Plant Tagging Program at local nurseries	
Promoting CIMIS information	
Water Shortage Hotline	
Water Audits	
Displays in Public Libraries, at local schools, shopping malls, etc.	
Bus ads	
Billboards	
Promotional Items with a conservation message (mugs, rulers, stickers, pens)	

Source: Santa Barbara County Water Agency, 2001.

Involving the Media

The local media (newspapers, radio and television stations) in any community is an essential partner in helping a water district increase public awareness regarding a water shortage situation. The media can reach most, if not all, of your customers with information and tips that will help keep water use levels down to the targeted levels. On the other hand, the media can hurt your efforts by distorting the effects that rationing and conservation were having on the community, overly dramatizing situations that are not representative of the community as a whole, or simply presenting a much bleaker picture of the situation than actually exists. For instance, news reporter might only interview customers whose landscapes had died or those who had retrofitted their toilets and were dissatisfied, rather than featuring those who were able to comply with reductions with a minimum of hardship. During water shortages, the majority of the residents are able to successfully cope with water shortage restrictions, at least in the short-run. This fact may not be considered as newsworthy as the stories about people who were unhappy or experiencing hardship.

Some sensationalizing media tactics, such as printing photos of dry, cracked mud from the bottom of a local reservoir, may also have a positive affect. After seeing such photos in the newspaper, local residents will better understand the magnitude of the problem and may be more inspired to conserve. However, when these same pictures are viewed by residents in communities in other parts of the state or country, it may have the negative affect of decreasing tourism if travelers avoid visiting places they perceive as a disaster area.

One recommendation for successfully working with the local media, to use them as allies, is to encourage them to present the positive, everyday efforts of residents as well covering the sensational stories. It is difficult to achieve a 100% accurate representation, but keeping the media informed through press releases or press conferences will help to mitigate the negative affects of dramatized or one-sided reporting.

It is important that the public hear consistent messages from water suppliers in the area, particularly when they are in the same media market. There can be significant differences in the supplies available to adjacent water districts. However, if customers in one district are asked to reduce their water use as much as 30% while their neighbors served by another district are only asked to conserve 10 or 15%, they will question the equity of the program, or become confused. This can lead some of them not to meet their reduction goals.

Analysts drew three conclusions about the media from the 1986-1992 California drought.

1. **The role of the media is not well understood by water managers**.
   The media are governed by their own rules of objective reporting, newsworthiness, and perceptions of what the public wants to know. They cannot be managed by water agencies. If they were, they would not be able to sell news. The questions like, “Are we in a drought?” or “Is the water shortage over?” are not silly questions from the media’s point of view. Reporters understand the thinking modes and perceptions of the general-public much better than water professionals. For them, once the water supply situation is called a water shortage, it automatically implies that behavior has to be changed from normal behavior to crisis behavior. Such a change is newsworthy.

2. **The media cannot improve on imprecise and ambiguous messages**.
   Most likely, the statements will become even more confusing after they are reported in the press. Only unambiguous and complete answers to questions that are asked by the press can be communicated clearly to the public.

3. **Media cannot explain complex water management issues**.
   What is very interesting to water professionals is usually "too dry" for newspapers, radio, and television. Long feature articles on water issues do not sell newspapers, but timely, well-written articles during a water shortage emergency will be read by concerned people.

Checklist for Keeping the Media Involved

____ 1. Create a media list to ensure that all available local media are used – select an official representative at each radio station, newspaper, and television station to serve as a point of contact for water shortage information released from your district. See Worksheet below.
____ 2. Establish a public advisory committee
____ 3. Include public and media in the water shortage planning process
____ 4. Organize water shortage information meetings for the public and the media.
____ 5. Publish and distribute pamphlets on water conservation techniques and water shortage management strategies
____ 6. Organize workshops on water shortage related topics
____ 7. Prepare sample ordinances on water conservation
____ 8. Establish a water shortage information center
____ 9. Write reports for the media early in the course of the water shortage and prepare weekly press releases with current water shortage conditions
____10. Establish a list of authorities on water shortage that can be distributed to the media for further reference.
____11. Organize education activities for the media.
____12. Establish a budget for advertising water shortage programs
____13. Write reports for media early in the event
____14. Prepare reports on the efforts of the water district to conserve water – conjunctive use, system audits, meter retrofits, training for staff, etc.
____15. Establish or use an existing newsletter to provide an overview of water shortage activities, tips for conservation, articles showcasing local conservation efforts on the part of homeowners and businesses.
____16. Conduct press conferences as needed. Use on-location approach if photo opportunities exist (i.e., a local reservoir when reservoir is visibly low)

Worksheet 13 - Use this table to create your media contact list. Be sure to include all media in your community.

Worksheet 13

Media List			
	Name	**email**	**Phone/Fax**
TV Stations - include government access channels			
Print Media - include newspapers from local colleges and news clipping services			
Radio Stations			
Chambers of Commerce			
Political leaders			
Water Dist. Board			
County Sups			
City Council			
Assembly			
Congress			

Source: Santa Barbara County Water Agency, 2001.

Findings Regarding Public Information From 1986-1992 Drought

During the 1986-1992 drought in California, the following findings were made regarding large-scale water shortage-related public awareness campaigns:

1. There was a statistically significant increase in the public's awareness of the water shortage after the campaign, and those who became aware of the water shortage through the campaign were more likely to believe in the seriousness of the water shortage and to conserve water. Television appeared to be the most effective medium for increasing awareness.
2. Even after the campaign, water users greatly underestimated the amount of water they used, but the error was less than before the campaign.
3. The people most willing to reduce water use were also the most likely to report they needed more information on how to do so.

4. The campaign increased trust that the agencies call for conservation was necessary and should be supported.
5. Support for farmers' use of water was greater after the campaign, while support for commercial and industrial use declined. It is generally accepted in social behavior research that conservation campaigns will be more effective if the sacrifices are equitable. This suggests that publicizing the equity of water shortage restrictions may be effective in reducing water use.

VII
ANALYZING REVENUE AND EXPENDITURE IMPACTS
(Staying Solvent)

A complete water shortage plan should include an analysis of the impacts of the water shortage plan activities and the proposed measures to overcome those impacts.

In order to mitigate the financial impacts of a water shortage, a district can establish an emergency fund. The goal is to maintain the fund at 75% of normal annual water department revenue. This fund will be used to stabilize rates during periods of water shortage or disasters affecting the water supply. The district will not have to increase rates as much or as often during a prolonged or severe shortage. However, even with the emergency fund, rate increases will be necessary during a prolonged water shortage. As described earlier in this plan, a Stage 2 shortage requires a 20% reduction in water deliveries, while Stage 3 requires a 35% reduction. The experiences of California water purveyors during the 1986-91 drought shortage demonstrated that actual water use reductions by customers can be considerably larger than requested by the supplier. During the 1986-91 drought shortage it was also politically difficult for many agencies to adopt the rate increases necessitated by a 20 – 50% reduction in sales. When a water shortage emergency is declared, the supply shortage will trigger the appropriate rationing stage and rate increase.

The following Worksheets will provide your district with a step-by-step analysis of how a water shortage will impact the district's revenues and expenditures. In addition, Resources Section 2, Part C outlines how to set up a Rate Stabilization Fund.

Worksheet 14

Projected Ranges of Water Sales by Stage					
	Normal	**Stage 1**	**Stage 2**	**Stage 3**	**Stage 4**
Water Sales - Acre Feet per Year					
Urban					
Agricultural					
Total Acre-Feet per Year					
* Be sure to change percentages to match water shortage stage percentage reductions chosen by the district.					

Adapted from the forms developed for preparation of *Urban Water Management Plans.* State of California, Department of Water Resources. 2000.

Worksheet 15

Revenues and Expenditures (no additional water purchases and no rate increases)					
	Normal	**Stage 1**	**Stage 2**	**Stage 3**	**Stage 4**
Operating Revenues					
Urban					
Agricultural					
Total Water Sales					
Meter Charges					
Total Revenue					
% reduction					
Operating Expenses					
salaries					
overhead					
cost of supply					
production and purification					
transmission and distribution					
customer accounts					
general and administrative					
depreciation					
capital projects					
rate stabilization fund					
Total Operating Expenses					
Surplus or (Deficiency)					

Adapted from the forms developed for preparation of *Urban Water Management Plans.* State of California, Department of Water Resources. 2000.

Worksheet 16

Projected Expenditures for Worst Case Water Supply					
	Normal	**Year 1**	**Year 2**	**Year 3**	**Year 4**
Supply and Cost					
Reservoir					
Acre-Feet					
$ per acre foot					
Groundwater					
Acre-Feet					
$ per acre foot					
Recycled Water					
Acre-Feet					
$ per acre foot					
Total Acre-Feet					
Cost of Supply					

Adapted from the forms developed for preparation of *Urban Water Management Plans.* State of California, Department of Water Resources. 2000.

Worksheet 17

Projected Expenditures for Worst Case Water Supply with Additional Expensive Supplies					
	Normal	**Year 1**	**Year 2**	**Year 3**	**Year 4**
Supply and Cost					
Reservoir					
Acre-Feet					
$ per acre foot					
Groundwater					
Acre-Feet					
$ per acre foot					
Recycled Water					
Acre-Feet					
$ per acre foot					
Water Bank					
Acre-Feet					
$ per acre foot					
Desalinated Water					
Acre-Feet					
$ per acre foot					
Total Acre-Feet					
Cost of Supply					

Adapted from the forms developed for preparation of *Urban Water Management Plans.* State of California, Department of Water Resources. 2000.

VIII.
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