COUNTY OF SHASTA
STATE OF CALIFORNIA

SHASTA COUNTY ALL DISTRICTS SEWER SYSTEM MANAGEMENT PLAN

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SHASTA COUNTY ALL DISTRICTS
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INTRODUCTION

SHASTA COUNTY MAINTAINED PUBLIC SEWER SYSTEMS

The Shasta County Department of Public Works operates and maintains three separate sanitary sewer systems within the County. All are County Service Areas (CSA's) which derive their operating revenue from sewer fees within each service area. Funds do not comingle between CSA's and no County general funds are used to supplement service area budgets. The governing board of each CSA is the Shasta County Board of Supervisors.

The three sanitary sewer systems are:

Table INT-1: Shasta County Maintained Public Sewer Systems

NAME	ABBREVIATION	LOCATION	MILES OF SEWER PIPE
Whispering Pines	CSA #13	Shingletown	3
Cottonwood	CSA #17	Cottonwood	25
Palo Cedro	CSA #8	Palo Cedro	9
Total			37

STATE GENERAL WASTE RECHARGE REQUIREMENTS

On May 2, 2006, the State Water Resources Control Board adopted Order No. 2006-0003-DWQ, which created Statewide General Waste Discharge Requirements for Sanitary Sewer Systems (GWDR).This new requirement affects all public owned sanitary sewer systems with a length greater than one mile. It requires each sanitary sewer system to:

- Report all Sewer System Overflows (SSO's) on a State maintained website; and,
- Develop Sewer System Management Plans (SSMP's).

This document is intended to meet the second requirement of developing an SSMP for each of the three Shasta County maintained public sanitary sewer systems.

In their GWDR, the State Water Resources Control Board specified there be a minimum of twelve sections to the required SSMP and provided some detail of the minimum requirements for each twelve sections. The twelve section requirements are summarized in the following table:

Table INT-2: Required sections of a Sewer System Management Plan (SSMP)

Number	Section	Sub-Section	Description
1	Goals		Develop SSMP Goals
2	Organization		Show agency's organization and chain of communication for SSO reporting

3	Legal Authority		Provide legal authority (Ordinances) to operate and maintain sewer systems
4a	Operations and Maintenance Program	Mapping	Provide adequate mapping of sewer to assist in maintenance
4b	Operations and Maintenance Program	Preventative Maintenance	Describe routing preventative maintenance activities
4c	Operations and Maintenance Program	Rehabilitation and Replacement Plan	Describe rehabilitation and replacement programs for sewer systems
4d	Operations and Maintenance Program	Training	Describe sewer system personnel training programs
5a	Design and Performance Standards	Installation and Repair Standards	Describe standards for design and construction of new sewer and rehabilitation projects
5b	Design and Performance Standards	Inspection and Testing Standards	Describe inspection and testing standards for new sewer and rehabilitation projects
6	Overflow Emergency Response Plan		Describe the plan to be used in the event of a sewer overflow
7	Fats, Oils and Grease Control Program (FOG)		Describe the agency's FOG program
8	System Evaluation and Capacity Assurance Plan		Develop a master plan to accommodate existing and future sewer needs
9	Monitoring, Measurement and Program Modifications		Develop an information management structure for maintenance and assessment
10	SSMP Program Audits		Conduct periodic internal audits of the SSMP and update document as needed
11	Communications Program		Develop and execute a communication program for community SSMP input
12	Certification	SSMP Certification	Present SSMP to the Board of Supervisors and certify approval

SSMP FORMAT

The Shasta County Sewer System Management Plan (SSMP) is and will be a living document. It will first be made available to the public when completed and will be periodically updated. Furthermore, as monitoring and audits are completed in the future, existing sections of the SSMP will be updated. As noted above, Shasta County maintains three separate public sewer systems and, theoretically, each will need its own complete SSMP. However, many of the twelve required sections of the SSMP will be identical for each of the SSMP's for the three sewer systems and it would be a duplication of effort to repeat and print the sections three times.

Accordingly, the Shasta County Sewer System Management Plan will be contained in a binder so it can be easily updated and revised. In order to assist the reader in understanding what the GWDR requires in a particular section of the SSMP, a shadow box is presented at the beginning of each section containing the exact requirements for the section, copied from the adopted GWDR.

SHASTA COUNTY ALL DISTRICTS
SEWER SYSTEM MANAGEMENT PLAN

1.0 GOALS

1.0 GWDR Requirements

- **<u>Requirement</u>: The goal of the SSMP is to provide a plan and schedule to properly manage, operate and maintain all parts of the sanitary sewer system. This will help reduce and prevent SSO's as well as mitigate and SSO's that occur.**

1.1 Introduction

Goals are the crux of any plan. They are the defining targets in which more specific objectives of this SSMP are aimed. Even though Shasta County could develop a number of very specific goals as developed in further sections of this SSMP, they are best summed up in the following general goals.

1.2 Shasta County SSMP Goals

Shasta County has established the following SSMP goals for the three public sewer systems that it maintains:

- Effectively use the elements of the SSMP to reduce the amount of sewer system overflows to protect public health and the environment.
- Provide adequate Operations and Maintenance in all districts.
- Ensure that all new and rehabilitated sewers systems are designed and built to current standards.
- Update the existing emergency response plan to include new regulations for reporting.
- Protect the public sewer systems from fats, oils and grease buildup.
- Ensure adequate sewer capacity is available in all districts for wet weather flows and growth.
- Ensure adequate funding support and resources are provided to meet the above goals.
- Develop a communications program with elected officials and the public (our customers) to provide the support needed for the above goals.
- Workforce Planning and Development.

2.0 ORGANIZATION

2.0 GWDR Requirements

Requirements: The SSMP must identify:

a. **The name of the agency's responsible or authorized representative;**
b. **The name and telephone number for management, administrative and maintenance personnel responsible for implementing specific measures in the SSMP program. The SSMP must identify lines of authority through the organization chart or similar document with a narrative explanation; and,**
c. **The chain of communication for reporting SSO's from receipt of a complaint or other information, including the person responsible for reporting the SSO's to the State and Regional Board and other Agencies if applicable (such as County Health Officer, County Environmental Health Agency, Regional Water Board, and/or State Office of Emergency Services (OES)).**

2.1 Introduction

Of the many departments in the Shasta County government structure, the one charged with the responsibility of maintaining the three publicly owned, County maintained sewage collection systems is the Department of Public Works. The department has a number of divisions. The CSA Operations Division maintains all County operated sewer systems. The Development Services Division handles minor engineering and design matters, and the Administrative Office provides support billing and financial services. Additional information about the Department of Public Works and its divisions can be found on the Shasta County Website at www.co.shasta.ca.us.

2.2 Authorized Representative

With regards to the General Waste Discharge Requirements for Sanitary Sewer Systems, the authorized representative for Shasta County is the Deputy Director of Operations. The name and phone number of that person is listed later in Table 2- 1.

2.3 Organization Chart (Lines of Authority)

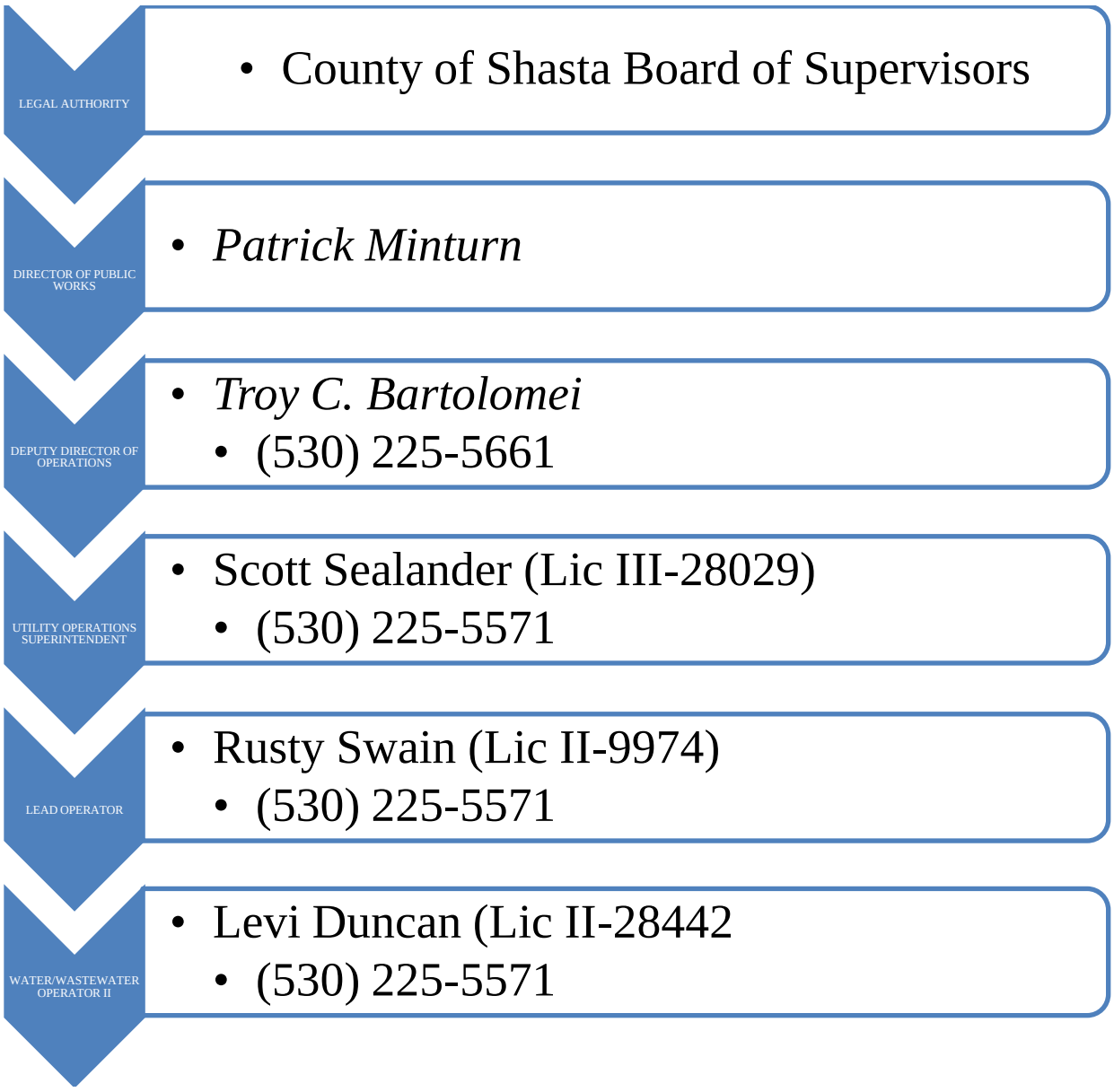
An organization chart listing the Department of Public Works personnel is shown in Figure 2-1. The line of authority from the Shasta County Board of Supervisors to the CSA Operations Employees in the field is shown on the chart. As can be seen on the chart, the Deputy Director of Operations is responsible for maintenance of the three sewage collection systems in Shasta County and managing the CSA Operations division.

The CSA Operations division provides personnel, equipment and materials to maintain approximately 37 miles of public sewage collection systems listed on Table INT-1. The CSA Operations division also provides wastewater treatment plant personnel, equipment and materials to maintain the treatment plants/leachfields. The Utility Operations Superintendent manages the field and in-plant operations of the CSA Operations division.

Development Services Division personnel provide engineering services to the three sewage collection systems and direction to the public seeking to connect to or annex into those CSA's. The Development Services Division contract with outside consultants for engineering services when needed.

The Administrative Office provides support billing and financial services.

Figure 2-1: Line of Authority



2.4 Chain of Command for SSO's

When a Sewer System Overflow (SSO) occurs in one of the three Shasta County maintained sewage collection systems, it is usually reported by the public. The call normally goes to the Sheriff's Office or

occasionally directly to the Public Works front desk. The call sets off a chain of actions resulting in the SSO being contained, repaired and cleaned, and the SSO reported to the appropriate authorities, as prescribed by the General Waste Discharge Requirement, local regulations and County protocol.

The Chain of Communication and formal procedures used in reporting SSOs in Shasta County maintained sewage collection systems are shown in Figure 2-1. The figure does not include the independent alarm systems installed at most County sewage lift stations. When stations go into alarm, the system automatically alerts the on-call CSA Operations employee of a potential problem and works through the list until it receives a call-back.

3.0 LEGAL AUTHORITY

3.0 GWDR Requirements

Requirement: Each enrollee must demonstrate, through sanitary sewer system use ordinances, services agreements, or other legally binding procedures, that it possesses the necessary legal authority to:

a. Prevent illicit discharges into the sanitary sewer system, including I/I from satellite wastewater collection systems and laterals, stormwater, unauthorized debris, etc.
b. Require proper design and construction of sewers and connections
c. Ensure access for maintenance, inspection and repairs to publicly owned portions of laterals
d. Limit discharge of FOG and other debris that may cause blockages
e. Enforce violations of its sewer ordinances

3.1 Introduction

The County relies on its Code, Ordinances and Construction Standards to provide the legal basis to make certain that the connection and discharge requirements of its wastewater systems are met.

3.2 Shasta County Code, Chapters 8.40 and 13.12

All CSA's are covered by Chapters 8.40 and 13.12 of the Shasta County Code. Article 8.40.140.C forbids illicit discharges. Articles 8.40.030 and 8.40.040 require adequately designed and functioning connects. Article 13.12.060 ensures access to inspect and repair public facilities. Section 8.40.160 defines violation of established procedures.

Appendix A-1 contains Chapter 8.40 of the Shasta County Code and **Appendix A-2** contains Chapter 13.12.

3.3 Fats, Oils and Grease (FOG)

The three sewer systems serve rural areas with few restaurants and no industries that generate fats, oils and greases. At this time the Department of Resource Management, through its Environmental Health Division's restaurant inspection program, regulates excessive discharge of FOG's.

4.0 OPERATIONS AND MAINTENANCE

4.0 Operations and Maintenance Program

Requirement: The SSMP must include those elements listed below that are appropriate and applicable to the enrollee's system:

This section contains subsection 4a, Collection System Mapping, subsection 4b, Preventative Operation and Maintenance subsection 4c, Rehabilitation and Replacement Plan.

4a.0 Collection System Mapping

Requirement: Each wastewater collection system agency shall maintain up-to-date maps of its wastewater collection system facilities, showing all gravity line segments and manholes, pumping facilities, pressure pipes and valves, and applicable storm water pumping facilities.

4a.1 Introduction

Because there are only three sewer system of limited size, Shasta County continues to keep maps and technical drawings on paper for use in the field. All drawings have also been saved in a digital format for reference and reprinting when field copies become unreadable.

When a system is modified, changes are noted on the current electronic maps and drawings.

4b.0 Preventative Operation and Maintenance

Requirement: Describe routine preventative operation and maintenance activities by staff and contractors, including a system for scheduling regular maintenance and cleaning of the sanitary sewer system with more frequent cleaning and maintenance target at known problem areas. The Preventative Maintenance (PM) program should have a system to document scheduled and conducted activities, such as work orders.

4b.1 Introduction

There are three basic parts of a sewer collection system: sewer pipelines, manholes and sewage pump stations. Both pipeline and pump stations can overflow and need a regular preventative maintenance program performed. Generally, manholes require maintenance only when they deteriorate and need rehabilitation or replacement (see Section 4c, Condition Assessment). A summary of the current Preventative Operation and Maintenance Programs for the three Shasta County maintained sewer districts are summarized below:

4b.2 Sewer Pipeline Preventative Operation and Maintenance

Shasta County maintains 37 total miles of sewer pipeline in three sewer districts. Regular preventative maintenance of the sewer pipeline consists of the following:

- A wet well, an underground vertical pit that sewage from a gravity sewer flows into.
- Pumps that pump the sewage from the wet well through force main pipe to discharge into a manhole on an uphill gravity sewer.
- Level controls (floats) in the wet well that sense the level of the sewage in the well and turn the pumps on and off.

GRAVITY SEWER CLEANING

About 95% of the above sewer mileage consists of gravity sewers, where wastewater flows by gravity down the pipe from manhole to manhole. Cleaning the gravity pipe is what prevents a buildup of roots, debris and grease from blocking the sewer and causing a sewer system overflow (SSO). The cleaning is done with a sewer cleaning truck which uses high pressure water sent through a hose that is pushed up the sewer line. A nozzle at the end of the hose scours the inside of the sewer pipe washing debris and grease down to the lower manhole where it is vacuumed into the truck for disposal at a landfill. In the case of roots, a rotating cutter can be attached to the nozzle that will cut away the roots intruding into the pipe through a joint or crack.

All gravity sewers maintained by Shasta County have been mapped and are cleaned on an as-needed basis when inspections or complaints reveal a need.

PRESSURE SEWER CLEANING

There are two types of pressurized sewers: force mains leading a sewage pump station to a gravity sewer at the top of a hill and low pressure sewers. Low pressure sewers are sewage collection systems where each connection (home) has a septic tank to remove solids from their sewage and a pump that pumps the remaining water into a pressurized sewer maintained by the sewer district. Pressurized sewers generally do not cause SSOs; however, material may accumulate on the inside wall of the pipe reducing their efficiency. In order to maintain efficiency, cleaning is performed by forcing a "Pipe Pig" through the pipe. A "Pipe Pig" is a shaped piece of foam rubber that scrubs the inside of the pipe removing any buildup which is forced through the pipe by water pressure.

Pressurized sewers are not "pigged" more frequently than once every five years on an as-needed basis.

ROOT TREATMENT

When an excessive amount of roots are found entering a gravity sewer pipe through a condition assessment (see Section 4c.0 below), the roots can be chemically treated so they die back from the sewer pipe. A herbicide foam is flushed down the sewer pipe, attaches to the roots and is absorbed into them. In a few weeks they die back from the sewer joint or crack, eliminating growth for two or more years. When used properly, the herbicide will not harm the plant (usually trees) or the wastewater treatment plant. Shasta County has an as needed program of root treatment in all sewer districts.

4b.3 Sewage Pump Station Preventative Operation and Maintenance

Sewage pump stations are facilities that pump wastewater from a low spot up to a gravity sewer at the top of the next hill. They generally consist of the following:

- A wet well, an underground vertical pit that sewage from a gravity sewer flows into;
- Pumps that pump the sewage from the wet well through force main pipe to discharge into a manhole on an uphill gravity sewer;
- Level controls (floats) in the wet well that sense the level of the sewage in the well and turn the pumps on and off;
- An electric (sometimes electronic) control panel that runs the level controls, pumps and any other electrical items at the station;
- Alarm systems that radio transmits to a base station alerting of any alarms that may be detected at the station;
- A building for controls and possibly chemicals used in the sewage;
- Chemical feed equipment (optional) that disperses chemicals or enzymes into the sewage in the wet well to control odors and grease buildup;
- Either an emergency generator or underground storage (for the sewage) in case of a power failure;
- Security fencing; and,
- Landscaping.

Sewage pump stations are not manned continuously like a wastewater treatment plant. They are automated and only need to be checked on a regular basis when preventative maintenance is performed. At present, Shasta County maintains nine sewage pump stations in the three sewer systems. During normal operations, they are checked by maintenance workers once a week.

During visits, preventative maintenance includes, but is not limited to:

- Pumping down and washing down the wet well to remove buildup of grease and grit;
- Recordation of pump hours to checking for abnormal pump use which can signify a mechanical problem;
- Cleaning the floats and probes;
- Listening for abnormal sounds signifying problems; and,
- Cleaning the building and removing garbage from the site.

Five of the sewage pump stations have back-up generators so that they can operate during power outages. They are automated and only need to be checked on a regular basis when preventative maintenance is performed. During normal operations, they are checked by maintenance workers once a week.

4b.4 Maintenance Documentation

Maintenance performed on gravity sewers and pressure sewers is documented on the Sewer System Management Program, detailed in Section 4c.3. The computer software program contains all Shasta County maintained sewers. When a sewer is cleaned, the work activity is entered into the program to create a record. That record can be used as a justification to make changes to the preventative maintenance program as needed.

Records of maintenance on sewage pump stations are kept in binders and folders at the maintenance shop. The records not only show what maintenance has been performed, but also provide workers with information for ordering pasts and equipment for the stations. Records also show maintenance of odor control equipment and logs of customer complaints and their resolution.

4c.0 Rehabilitation and Replacement Plan

Requirement: Develop a rehabilitation and replacement plan to identify and prioritize system deficiencies and implement short-term and long-term rehabilitation actions to address each deficiency. The program should include regular visual and TV inspections of manholes and sewer pipes, and a system for ranking the condition of sewer pipes and scheduling rehabilitation. Rehabilitation and replacement should focus on sewer pipes that are at risk of collapse or prone to more frequent blockages due to pipe defects. Finally, the rehabilitation and replacement plan should include a capital improvement plan that addresses proper management and protection of the infrastructure assets. The plan shall include a time schedule for implementing the short- and long-term plans plus a schedule for developing the funds needed for the capital improvement plan.

4c.1 Introduction

This section of the State WDR requires sewer system operators to develop rehabilitation and replacement plans which contain:

- A condition assessment of the existing sewer system;
- A prioritization of the deficiencies found in the condition assessment;
- Development of both short and long term rehabilitation actions to address deficiencies found; and,
- A time schedule for the rehabilitation actions.

4c.2 Condition Assessment

There are three basic parts of a sanitary sewer system: pipelines, manholes and sewage pump stations. New sewers, manholes and pump stations generally are in good condition and, therefore, pipes do not plug (causing overflows), manholes do not leak groundwater and pump stations do not fail and overflow. As they age, pipelines can get roots growing into them (looking for water), the pipes can crack or break, and they can develop leaks where groundwater enters the pipe causing excessive Infiltration and Inflow (I/I). As manholes age, they can start leaking groundwater through their walls, they can allow surface water to enter through the lid during rainstorms and the concrete can deteriorate from a reaction to sewer gasses. Sewer pump stations are mechanical and have a certain life to them. At different times during that life, various parts will need rehabilitation and/or replacement.

A condition assessment is a review of the three basic parts of a sewer system to determine their condition. This review is performed by an inspection of each part. Sewer pipelines are first inspected by closed circuit television. A camera is run through the entire length of the sewer allowing the operator to view (and record on tape) the condition of the inside of the sewer pipe. Roots, grease buildup, structural defects and I/I can be easily seen and recorded. Sewer pipelines are also inspected by "Smoke Testing". In an effort to find sources of Inflow (surface water entering the sewer system), non-toxic smoke is forced into the sewer system with blowers, moving moves up the pipes and sewer services to structures and eventually coming out through building plumbing roof vents. When smoke surfaces at other locations like illegal drains connected to the sewer, open cleanouts and cracks in the sewer pipe, the locations are noted and corrected. Manholes are inspected at the same time they are opened to place the TV camera into the sewer pipe, enabling their conditions to be noted and recorded. Sewage pump stations are somewhat different. They are normally visited once or twice a week while normal preventative maintenance is

performed (see Section 4b.3). As deteriorated conditions are noted, they are placed on a rehabilitation program for pump stations.

4c.3 Prioritization of Deficiencies

A condition assessment of a sewer pipeline or manhole produces information regarding the deficiencies of those facilities. Due to the relatively small size of the sewer systems, when deficiencies are discovered, they are repaired as soon as is practicable.

4c.4 Short and Long Term Rehabilitation Actions

Once deficiencies are found, short and long term rehabilitation measures can be scheduled. Those measures can be, but are not limited to the following:

PIPELINES

- Joint sealing all or part of a joint;
- Slip lining a pipe;
- Use of a root cutter and/or chemical root killer if roots are present;
- Spot repair of the sewer at structurally deficient locations; or,
- Replacement with new sewer pipe.

MANHOLES

- Interior relining to seal I?I and/or stop deterioration;
- Raising the manhole lid to prevent inflow; or,
- Total manhole replacement.

PUMP STATIONS

- Replacement of various components of the pump station;
- Partial replacement to resolve structural deficiencies; or,
- Lift station replacement.

4c.5 Time Schedule

Once a condition assessment of all or a portion of a sewer system has been completed, observed deficiencies prioritized, and short and long term rehabilitation and replacement measures determined, a time schedule for such work can be developed. Due to the relatively small size of the sewer systems, when deficiencies are discovered, they are repaired as soon as is practicable.

4d.0 Training

Requirements: Provide training on a regular basis for staff in sanitary sewer system operations and maintenance and require contractors to be appropriately trained.

4d.1 Introduction

Training of employees and contractors is an important aspect of a Sewer System Management Plan (SSMP). Without proper training, maintenance and construction of the sewer system may be performed in an inefficient or an unsafe manner that could result in a disabling or life threatening injury. Shasta County is fully staffed for most sewer maintenance work and only contracts out maintenance and construction work (on an individual project basis) that cannot be done by staff or to augment the staff during heavy work loads.

The County Training Program is outlined on Figure 4d-1. It consists of three parts:

- Contractor required training;
- Employee initiative training; and,
- County provided training.

4d.2 Contractor Required Training

Some examples of work contracted out include:

- Manhole coating;
- Root treatment/control;
- Sewer TV work;
- Hydro-cleaning; and
- Sewer rehabilitation.

Through the bidding and qualifications process, when a contractor is hired to perform maintenance on a sewer system, it is required that they are qualified to do the work and have provided training to their employees. A County inspector is assigned to insure work is properly completed. With regards to safety training, however, a County Safety Inspector may also be assigned to the project. That person meets with the contractor to review his safety procedures, especially those for confined space entry and traffic control. If the contractor and his employees are not fully trained in these procedures, they are not allowed to proceed with the work until trained.

4d.3 Employee Initiative Training

Shasta County encourages all of its employees to pursue career advancement training. This often involves college classes for an associate, bachelor or an advanced degree. By taking college classes and obtaining a degree, employees may apply and be eligible for of a broader range of County positions.

4d.4 County Provided Training

Most CSA employees begin work at Shasta County as a extra help employees, which is an entry level position requiring no prior experience with sewer maintenance. Many have already taken the basic water and wastewater treatment class at eh local junior college. They usually have minimal safety training and often need additional training for their job. People in the Engineering Section are either graduate engineers or experienced technicians that have the skills to do their job. Accordingly, training opportunities provided by the County for those employees vary.

Training for both categories of employees can be grouped into three categories:

- Safety Training;
- Work Performance Training; and,
- Advancements in the Wastewater Industry Training

These classes are provided to employees through all day, partial day and 30 minute tailgate classes on a regular basis throughout the year. Tailgate sessions are held once a week.

4d.4a Safety Training

Safety training is especially important for CSA employees. On a daily basis, they operate potentially dangerous equipment, work around hazardous materials and there is a potential for serious accidents. Engineering employees have less exposure to such hazards and, therefore, require less safety training, with First Aid, CPR, Confined Space Entry and Traffic Control usually being sufficient. The Public Works Safety Officer and his staff make certain that CSA staff exceed legal and industrial safety training requirements.

4d.4b Work Performance Training

As noted above, most CSA employees come to work for the County with little training. Shasta County provides a number of in-house training classes. These types of classes are also provided by wastewater industry organizations like the Water Environment Federation, the California Water Environment Association, the Central Valley Clean Water Association and others. Outside classes can be in the form of multiple day conferences where attendees rotate through a series of classes they choose, partial day seminars and even benchmarking and luncheon sessions. They all can provide an employee with training on how to perform their job in better and more efficient ways. Engineering staff also participates in such classes, usually those provided by industry organizations. Funding is provided in the Engineering and CSA budgets to pay for such training when appropriate.

4d.4c Advancements in the Wastewater Industry

The wastewater industry continuously develops new technology to cope with the growing volume of wastewater to be treated, increasing regulatory demands and the need to control costs. Due to these changes, County employees must also keep up with advancements, not only in wastewater treatment technology, but in technology and equipment to move wastewater to the treatment plant and equipment maintenance. This type of training is generally provided by the industry organizations noted above in their conferences, seminars and training sessions. Funding is provided in the Engineering and CSA budgets to pay for training when appropriate.

4d.5 Training Records

Training session records are kept for each training session and are placed in each employee personnel file, managed by the Department of Public Works.

4d.6 Safety Officer

Coordinating and providing the Shasta County Safety Training Program is a full time job. The County has assigned an engineering technician as liaison to the Safety Officer to manage this job. This person coordinates all in-house training and teaches many of the classes. Where specialized skills or equipment is required, the liaison engages and coordinates with an appropriate instructor.

4e.0 Contingency Equipment and Replacement Inventories

Requirement: Provide equipment and replacement part inventories, including identification of critical replacement parts.

4e.1 Introduction

This section requires that Shasta County have sufficient parts and equipment to maintain its sewer infrastructure in inventory. The pasts and equipment can be categorized as follows:

- Parts needed for sewer pipe maintenance and repair;
- Parts needed for sewer lift station maintenance and repair; and,
- Equipment needed to maintain both sewer lines and sewage lift stations.

Shasta County sewer maintenance personnel operate out of the Cottonwood Wastewater Treatment Plant located in east Cottonwood. The Cottonwood Plant has a building that houses offices, a locker room, a maintenance shop and space for parts storage. There is also two fenced yards for parking rolling stock. Each treatment facility has a storage area for parts. Most rolling stock maintenance is performed by the Department of Public Works Road Division in their vehicle maintenance facility in South Redding.

4e.2 Pipe Maintenance Parts

Pipe maintenance pasts consist primarily of a supply of pipe in various sizes and types and a supply of couplers and clamps to connect them together. For repairing damaged forcemain (pressure pipes), wrap around pipe clamps are also needed. A sufficient inventory of pipe, clamps and couplers are kept at the Cottonwood Plant for emergency use. When a scheduled pipe repair is contemplated requiring large amounts of pipe or clamps, materials are purchased and delivered prior to the beginning of the project.

4e.3 Lift Station Maintenance Parts

Sewage lift station maintenance parts consist of the majority of mechanical pasts in the station. They can be, but are not limited to:

- Spare pumps and motors;
- Floats and switches; or,
- Electric controls.

A sufficient inventory of lift station parts are kept at the Cottonwood Plant or at the individual lift stations for emergency use. When a scheduled lift station repair is proposed, materials are purchased and delivered prior to the beginning of the project beginning.

Lift stations are designed to maintain operation with one of their pumps out of service. They also have 12 to 24 hours of overflow storage (for power failures).

4e.4 Maintenance Equipment

Shasta County has sewer maintenance equipment in inventory for repairing sewer pipes and sewage lift stations. If additional equipment is needed, it can be rented locally.

5.0 DESIGN AND PERFORMANCE PROVISIONS

5.0 Design and Performance Provisions

Requirement: The SSMP must identify:

- **Design and construction standards and specifications for the installation of new sanitary sewer systems, pump stations and other appurtenances; and for the rehabilitation and repair of existing sanitary sewer systems; and,**
- **Procedures and standards for inspecting and testing the installation of new sewers, pumps, and other appurtenances and for rehabilitation and repair projects.**

5.1 Introduction

When new sewers and sewage pump stations are constructed in the three Shasta County maintained sewage collection systems, they are designed, constructed, tested and inspected in accordance with published standards. Generally, new sewer construction is completed by a land developer and the consulting engineer (hired by the developer) to design the sewers in accordance with the Shasta County Land Development Standards. The contractors, hired by the developer, construct and test sewer facilities in accordance with the Shasta County guidelines. During construction, inspection of the contractor's work is performed by employees of the Shasta County Department of Resource Management and the Department of Public Works. Sewer rehabilitation and repair projects are normally designed by the engineering staff from the Department of Public Works, Development Services Division, using industry standards developed for specific projects.

5.2 Shasta County Land Development Standards

The Shasta County Land Development Standards are a large document containing rules, regulations and design standards for designing all facets of land development in Shasta County. It contains sections on, but not limited to, land divisions, street improvements, grading, soil systems, plan preparation, inspection, storm drainage and water systems. Chapter 7 contains sewerage design criteria, a copy of which is contained in Appendix "B". A full copy of the Land Development Standards can be purchased at the front counter of the Shasta County Department of Resources Management.

Chapter 7 is used by engineers when planning and designing public sewer systems to be added to those already maintained by Shasta County. Pre-design reports and improvement plans are then submitted to Resource Management, which in turn gives the sewage sections to the Public Works Development Services division, where County staff provide plan checking and approval before construction.

5.3 Rehabilitation and Repair Standards

Often when existing sewers are in need of rehabilitation or repair, specialized construction methods are used rather than new sewer standards. When that type of construction is needed, engineers in the Development Services division develop project specific design and construction standards with the project being send out to bid. Specifications for projects like pipe lining and pipe bursting are drawn from published industry standards and are incorporated into the projects.

6.0 OVERFLOW EMERGENCY RESPONSE PLAN

6.0 GWDR Requirements

Requirements: Each Enrollee shall develop and implement an overflow emergency response plan that identifies measures to protect public health and the environment. At a minimum, this plan must include the following:

- **(a) Proper notification procedures so that the primary responders and regulatory agencies are informed of all SSOs in a timely manner;**
- **(b) A program to ensure an appropriate response to all overflows;**
- **(c) Procedures to ensure prompt notification to appropriate regulatory agencies and other potentially affected entities (e.g. health agencies, Regional Water Boards, water suppliers, etc.) of all SSOs that potentially affect public health or reach the waters of the State in accordance with the MRP. All SSOs shall be reported in accordance with this MRP, the California Water Code, other State Law, and other applicable Regional Water Board WDRs or NPDES permit requirements. The SSMP should identify the officials who will receive immediate notification;**
- **(d) Procedures to ensure that appropriate staff and contractor personnel are aware of and follow the Emergency Response Plan and are appropriately trained;**
- **(e) Procedures to address emergency operations, such as traffic and crowd control and other necessary response activities; and**
- **(f) A program to ensure that all reasonable steps are taken to contain and prevent the discharge of untreated and partially treated wastewater to waters of the United States and to minimize or correct any adverse impact on the environment resulting from the SSOs, including such accelerated or additional monitoring as may be necessary to determine the nature and impact of the discharge.**

6.1 Introduction

Figure 2-1 shows the Chain of Communication within Shasta County when a Sewer System Overflow (SSO) occurs and is called in to County officials.

The County's Emergency Response Plans are included in Appendix D.

7.0 FATS, OILS AND GREASE (FOG) CONTROL PROGRAM

7.0 GWDR Requirement

Requirement: Each Enrollee shall evaluate its service area to determine whether a FOG control program is needed. If an Enrollee determines that a FOG program is not needed, the Enrollee must provide justification for why it is not needed. If FOG is found to be a problem, the Enrollee must prepare and implement a FOG source control program to reduce the amount of these substances discharged to the sanitary sewer system. This plan shall include the following as appropriate:

(a) An implementation plan and schedule for a public education outreach program that promotes proper disposal of FOG;
(b) A plan and schedule for the disposal of FOG generated within the sanitary sewer system service area. This may include a list of acceptable disposal facilities and/or additional facilities needed to adequately dispose of FOG generated within a sanitary sewer system service area;
(c) The legal authority to prohibit discharges to the system and identify measures to prevent SSOs and blockages caused by FOG;
(d) Requirements to install grease removal devices (such as traps or interceptors), design standards for the removal devices, maintenance requirements, BMP requirements, record keeping and reporting requirements;
(e) Authority to inspect grease producing facilities, enforcement authorities, and whether the Enrollee has sufficient staff to inspect and enforce the FOG ordinance;
(f) An identification of sanitary sewer system sections subject to FOG blockages and establishment of a cleaning maintenance schedule for each section; and
(g) Development and implementation of source control measures for all sources of FOG discharged to the sanitary sewer system for each section identified in (f) above.

7.1 Introduction

Fats, Oils and Grease (FOG) in sewer pipes are the cause of most Sewer System Overflows (SSOs) in smaller diameter pipes. All three form solids as they cool in the sewer, mix with other solids, and then stick to something in the sewer pipe. The solid FOG then starts to build up until finally it completely plugs the sewer causing a backup which overflows to the surface. The FOG buildup may be at a joint in the pipe, at a broken section of pipe or at roots intruding into the pipe. Although broken pipe and roots can cause blockages of their own, by controlling the amount of FOG that gets into a sewer system, the frequency of SSOs can be reduced.

The three sewer systems serve rural areas with few restaurants and no industries that generate fats, oils and greases. At this time the Department of Resource Management, through its Environmental Health Division’s restaurant inspection program, regulates excessive discharge of FOG’s.

8.0 SYSTEM EVALUATION AND CAPACITY ASSURANCE PLAN

8.0 GWDR Requirement

Requirement: The Enrollee shall prepare and implement a capital improvement plan (CIP) that will provide hydraulic capacity of key sanitary sewer system elements for dry weather peak flow conditions, as well as the appropriate design storm or wet weather event. At a minimum, the plan must include:

(a) Evaluation: Actions needed to evaluate those portions of the sanitary sewer system that are experiencing or contributing to an SSO discharge caused by hydraulic deficiency. The evaluation must provide estimates of peak flows (including flows from SSOs that escape from the system) associated with conditions similar to those causing overflow events, estimates of the capacity of key system components, hydraulic deficiencies (including components of the system with limiting capacity) and the major sources that contribute to the peak flows associated with overflow events;
(b) Design Criteria: Where design criteria do not exist or are deficient, undertake the evaluation identified in (a) above to establish appropriate design criteria; and
(c) Capacity Enhancement Measures: The steps needed to establish a short- and long-term CIP to address identified hydraulic deficiencies, including prioritization, alternatives analysis, and schedules. The CIP may include increases in pipe size, I/I reduction programs, increases and redundancy in pumping capacity, and storage facilities. The CIP shall include an implementation schedule and shall identify sources of funding.
(d) Schedule: The Enrollee shall develop a schedule of completion dates for all portions of the capital improvement program developed in (a)-(c) above. This schedule shall be reviewed and updated consistent with the SSMP review and update requirements.

8.1 Introduction

This section of the SSMP requires that each of the County's sewer systems be periodically evaluated to determine if their pipes have the capacity to carry expected sewer flows.

There are three basic types of Sewer System Overflows (SSO's): (1) grease, root and debris, (2) structural related and (3) capacity related. Grease, root and debris related SSO's are a function of the Operation and Maintenance Plan detailed in Section 4b. Structural related SSO's are normally found in a Condition Assessment and are repaired under Rehabilitation and Replacement Plan detailed in Section 4c. The subject of this section, Capacity related SSO's, have one or both of the following causes: First, at times more sewage connections are allowed to connect to a sewer system than it was designed to handle. This can cause SSO's during peak times of the day. Second, some collection systems have excessive infiltration and inflow (I/I) which, during heavy wet weather conditions, can cause overflows due to the sewer pipes not being large enough to handle increased flows. I/I is groundwater that enters the sewage system through broken sewer pipes infiltration and inflow is the surface water that enters the sewer through some inlet. Inflow sources can be illegal connections of roof and yard drains into the sewer, cleanouts without caps into which drainage enters or even storm drainage systems accidentally connected to the sewer system

8.2 Capacity Analysis

To evaluate the capacity of a given sewer system, a hydraulic model is needed. A hydraulic model is a calculation of the expected sewage flows in any given location of sewer system, based on assumed and/or measured design criteria. During a capacity assessment, calculated wastewater flows are compared to the capacity of existing sewer pipes to determine if they can transport wastewater flows without overflowing.

The modeling methods used to evaluate capacity are left to the judgment of the Development Services engineer examining the problem.

The following capacity analyses are included:

Appendix	Title
C-1	Shasta County Service Area No. 8 1991 Master Sewer Plan
C-2	CSA #13 – Alpine Meadows System Report and 15-Year Maintenance Plan
C-3	West Cottonwood Sewer capacity Analysis

9.0 MONITORING, MEASUREMENT AND PROGRAM MODIFICATIONS

9.0 GWDR Requirement

Requirement: The enrollee shall:

(a) Maintain relevant information that can be used to establish and prioritize appropriate SSMP activities;
(b) Monitor the implementation and, where appropriate, measure the effectiveness of each element of the SSMP;
(c) Assess the success of the preventative maintenance program;
(d) Update program elements, as appropriate, based on monitoring or performance evaluations; and
(e) Identify and illustrate SSO trends, including: frequency, location, and volume.

9.1 Introduction

This chapter is probably one of the most important parts of developing a Sewer System Management Plan (SSMP). Once all programs and projects listed in the previous chapters are implemented, they will need to be monitored and measured in some form they can be evaluated to determine their effectiveness. This evaluation is done by collecting data on a yearly basis that will show how effective they are in reaching the goals of the SSMP, reducing Sewer System Overflows (SSOs) and protecting the environment.

Each of the three County maintained sewage collection systems covered by this SSMP will have different actions, activities and projects designed to accomplish the primary goals of the plan. Since the activities will not be the same, the monitoring and measurement of each district will not be the same. Accordingly, the recording and evaluation of monitoring and measurement of each of the three sewer districts will be presented in each binder and not in this general binder (see SSMP Introduction, Page Int-4). The individual documents should be referenced when individual monitoring, measurement and program modifications are reviewed for any of the districts.

9.2 Maintain relevant Information

GWDR Requirement (a) compels each of the three sewer districts develops its own actions and programs to meet the goals of the SSMP, activities will be selected to be monitored and measured on a yearly basis that will be specific for each district's circumstances. The following is a sample of a number of activities that could be monitored and measured depending on the needs of each individual CSA.

9.3 Monitor the Effectiveness of the SSMP and Success of the Preventative Maintenance Program

Requirements (b) and (c) of the GWDR mandate Shasta County to monitor the effectiveness of the SSMP and the success of the preventative maintenance program. Several years of data collected under the previous section (for each district) will be needed before this requirement can be completed. It is expected that the appropriate sections of each district's SSMPs will be completed after the end of Fiscal Year 2015-16, allowing two full years of data to be used.

9.4 Update Program Elements

To meet GWDR requirement (d), data collected through Fiscal Year 2015-16, SSMP program elements can be updated based on their performance. This update should be completed in the first half of Fiscal Year 2016-17.

9.5 Identify and Illustrate SSO Trends

Shasta County began reporting SSO’s on the State Water Resources Control Board's web site based reporting system in September 2007. The information placed into that data base is extensive and adequately identifies and illustrates each SSO after September 2007. During the preparation of each of the three district's SSMPs, SSO information was collected from 2004 to the present and is included in each of the district plans (See Section 9 in each).

10.0 SSMP PROGRAM AUDITS

10.0 GWMP Requirements

Requirement: As part of the SSMP, the Enrollee shall conduct periodic internal audits, appropriate to the size of the system and the number of SSOs. At a minimum, these audits must occur every two years and a report must be prepared and kept on file. This audit shall focus on evaluating the effectiveness of the SSMP and the Enrollee's compliance with the SSMP requirements identified in this subsection, including identification of any deficiencies in the

10.1 Introduction

The above requirement directs each of the three Shasta County maintained sewage collections and their SSMP be audited, or reviewed, at least every two years to determine the following:

- The effectiveness of each individual SSMP;
- The District's compliance with that SSMP; and,
- Any deficiencies needing correction in each SSMP.

Such audits will be completed within two years of the formal certification of each SSMP; additional audits will be completed at intervals no more than every two years after that.

SSMP Program Audits will derive their information from and complement the requirements of Section 9, Monitoring, Measurement, and Program Modifications. This section of the SSMP requires the following to be completed for each district:

- Maintain relevant information about SSMP activities;
- Monitor and measure the effectiveness of each element of the SSMP;
- Assess the success of the preventative maintenance program;
- Update the SSMP based on the data collected; and,
- Identify SSO trends

Section 10, SSMP Program Audits, are periodic written reports summarizing the data, trends and conclusions reached in Section 9. These reports are used by each district to modify their SSMP to more effectively maintain the sewer systems and reduce sewer system overflows.

The first audit of all three CSA's should be completed near the end Fiscal Year 2013-14.

11.0 COMMUNICATION PROGRAM

11.0 GWMP Requirement

Requirement: The Enrollee shall communicate on a regular basis with the public on the development, implementation, and performance of its SSMP. The communication system shall provide the public the opportunity to provide input to the Enrollee as the program is developed and implemented.

The Enrollee shall also create a plan of communication with systems that are tributary and/or satellite to the Enrollee's sanitary sewer system.

11.0 Introduction

This requirement directs the three Shasta County maintained sewage collection systems to communicate on a regular basis with the public, which are their customers. The communication is to take place during both the development of the SSMP and the implementation of the SSMP (after the document is complete). The CSA's communicate with their customers through newsletters mailed with sewer bills to each sewer connection.

In addition, the Alpine Meadows CSA (#13) has a Citizen's Advisory Committee (CAB) which meets regularly to discuss the status of system and review the CSA's budget. The CAB will be appraised of the status of the SSMP.

11.2 Communications Program

In addition to mailed communications, the SSMP and other documents will be available on the County's web site. Members of the public may also request copies of the SSMP and other pertinent information receive them in other formats, subject to County Policy.

12.0 SSMP Completion and Certification

12.0 GWMP Requirement

Requirement: Both the SSMP and the Enrollee's program to implement the SSMP must be certified by the Enrollee to be in compliance with the requirements set forth above and must be presented to the Enrollee's governing board for approval at a public meeting. The Enrollee shall certify that the SSMP, and subparts thereof, are in compliance with the general WDRs within the time frames identified in the time schedule provided below.

In order to complete this certification, the Enrollee's authorized representative must complete the certification portion in the Online SSO Database Questionnaire by checking the appropriate milestone box, printing and signing the automated form, and sending the form to:

State Water Resources Control Board
Division of Water Quality
Attn: SSO Program Manager
P.O. Box 100
Sacramento, CA 95812

The SSMP must be updated every five (5) years, and must include any significant program changes. Re-certification by the governing board of the Enrollee is required when significant updates to the SSMP are made. To complete the re-certification process, the Enrollee shall enter the data in the Online SSO Database and mail the form to the State Water Board, as described above.

12.1 Introduction

The Shasta County Board of Supervisors is the governing Board of the three CSA's and is required to approve the SSMP. After that, the County's authorized representative to the State Water Resources Control Board will update the appropriate database.

Within 5 years (before summer of 2017) a full update of the SSMP shall be completed. Should the changes appear "significant," the Board of Supervisors will reconsider the plan.

Chapter 8.40

SEWAGE DISPOSAL SYSTEMS

Sections:

8.40.010 Intent.

It is the intention of the board of supervisors of the county in enacting this chapter to implement and supplement the provisions of Articles 2 and 3 of Chapter 6, Part 3, Division 5 (commencing with section 5410) of the Health and Safety Code. (Prior code § 3431)

8.40.020 Definitions.

When used in this code, the following words or terms have the meaning indicated, unless the context in which any word or term is used requires another meaning:

"Annual revenue requirement" means the total projected financial requirement for rendering monitoring, inspection and abatement services, including cost of overhead and administration.

"Building" means residence, mobile home, place of business, other structure or place where persons reside, congregate or are employed and includes any vehicle used as a residence or place of business.

"Costs" mean the total expense, including county administrative costs, of repairing or abating a faulty or malfunctioning nonconventional system.

"Director" means the director of health services for the county.

"Fees" means the total expense, including county administrative expense, of monitoring and inspecting nonconventional systems.

"Health hazard" means any condition or set of conditions whereby sewage may reach or be carried to human beings, their food, homes or belongings.

"Health officer" means the the county health officer.

"Nonconventional system" means a sewage or wastewater disposal system for which a permit has been issued by the county after October 21, 1980, and which does not meet the construction and performance criteria for conventional septic tank and leachfield systems established by Appendix I of the Uniform Plumbing Code, 1979 edition, as amended by resolution of the board of supervisors. (Prior code § 3430)

8.40.030 Occupancy—Sewage disposal system required.

No person shall occupy or use for human habitation any building when a sewage disposal system is required for its intended use unless and until a functioning sewage disposal system has been constructed and installed pursuant to a valid sewage disposal permit as required by this code. No person shall occupy or use for human habitation any building equipped with a sewage disposal system that is not functioning or that creates or causes a health hazard. (Prior code § 3432)

8.40.040 Sewage disposal restrictions.

No person shall construct, maintain, operate, use or cause or permit discharge from any sewage disposal system which causes or is likely to cause:

A. Sewage overflowing any lands whatever, except treated effluent applied to the surface of land as part of a sewage disposal system authorized by a valid permit issued by the health officer and in compliance with applicable waste discharge requirements of the regional water quality control board;

B. Sewage surfacing from any subsurface disposal field, seepage pit or other pit or trench;

C. Sewage emptying, flowing, seeping or draining into any stream, spring, river, lake, subterranean water or other waters within the county;

D. Sewage being accessible to humans, rodents or insects;

E. Contamination of any well, spring, stream, river, lake or other source or potential source of domestic water. (Prior code § 3433)

8.40.050 Nonconventional disposal system—Monitoring and inspection.

The board of supervisors finds and declares that the public health, safety and welfare require that certain nonconventional wastewater disposal systems be monitored, inspected and their failures abated in an expeditious manner. The board further finds that the monitoring, inspection and abatement services rendered by the county benefit the owners of real property on which nonconventional systems are permitted in that without these services the property would be incapable of development. The board further finds that the installation of such a system without a proper permit and the operation or maintenance of such a system without monitoring and inspection constitutes a health hazard and public nuisance. (Prior code § 3434)

8.40.060 Nonconventional disposal system—Permit required—Fees.

No person shall install, operate or maintain a nonconventional system without a sewage disposal permit from the health officer. Prior to issuance of the permit, a charge in addition to the permit charge will be levied to defray the county's expenses in inspecting construction and monitoring performance of the system between the completion of the system and the time the fees are included on the tax roll. The permit shall be signed by the owner of the real property on which the nonconventional system is to be installed, operated or maintained and shall contain a covenant running to the benefit of the county in which the owner covenants for himself, his heirs, successors and assigns to pay all monitoring and inspection fees and abatement costs. The permit shall be recorded with the county recorder. (Prior code § 3435)

8.40.070 Nonconventional disposal system—Inspection and monitoring fee.

The fee for inspecting and monitoring nonconventional systems shall be set by resolution of the board of supervisors. The fee shall be a lien and assessment on the real property. (Prior code § 3436)

8.40.080 Nonconventional disposal system—Determination of fees.

At least once annually and more frequently if required, the director will prepare a schedule of fees to be charged for the monitoring and inspection services provided to owners of nonconventional systems. The fees shall be sufficient to meet the annual revenue requirements. The fees shall reflect the actual cost of rendering the services and the benefits derived from the services and may vary according to the nature of the use discharging sewage into the system and the size, design and complexity of the system. The director, with the concurrence of the executive officer, shall present the schedule of fees to the board of supervisors which will modify or adopt the schedule by resolution. (Prior code § 3437)

8.40.090 Nonconventional disposal system—Fees owner's responsibility.

The owner of real property on which there is a nonconventional system is responsible for the payment of fees for inspection and monitoring and the costs of abatement services. The real property is security for the payment of the fees and costs. (Prior code § 3437.1)

8.40.100 Nonconventional disposal system—Repair and abatement.

A. When, upon inspection and monitoring, the health officer determines a system is malfunctioning or requires preventive maintenance the owner will be notified. The owner shall repair the malfunction, perform the maintenance or otherwise abate the problem within fifteen days from the time the notice is mailed. If the owner fails or refuses to perform the work

required, the health officer shall cause the work to be done and the cost of such work shall be paid by the owner.

B. The owner shall be given notice of the cost. If costs remain unpaid for fifteen days, they shall be delinquent and shall bear interest at the maximum legally permissible rate until the costs become an assessment.

C. Nothing herein shall limit the authority of the health officer to abate nuisances or address health hazards as provided elsewhere in this code or as provided by state law. (Prior code § 3437.2)

8.40.110 Nonconventional disposal system—Delinquent costs.

On or before July 1st of each year, the director shall transmit to the board of supervisors a list of delinquent costs with a request that they become a lien on the real property benefitted. The owner shall be given notice of the time when the board will hear the matter and an opportunity to be heard. If the board determines the services have been rendered and the costs are unpaid, the board shall determine that the costs, together with accrued interest as provided by Section 8.40.100, constitute a lien and assessment upon the real property. (Prior code § 3437.3)

8.40.120 Nonconventional disposal system—Fee collection.

All fees and all costs that have been rendered a lien and assessment by the board of supervisors shall be included on the real property tax bills and collected along with and in the same manner as real property taxes and shall become delinquent at the same time as unpaid taxes. (Prior code § 3437.4)

8.40.130 Nonconventional disposal system—Trust fund.

All assessments, costs and fees shall be credited to a special trust fund to be used exclusively for the purposes of this chapter. All expenses of the county for services rendered pursuant to this chapter shall be charged to the special trust fund. (Prior code § 3437.5)

8.40.140 County septage disposal facilities.

A. The operation and monitoring of the county septage disposal facilities (hereafter facilities) shall be as outlined under the California Regional Water Quality Control Board Order No. 77-279, as effective on November 18, 1977 for the regional facility near the city of Anderson and Order No. 87-100, dated July 21, 1987, for the Fall River Mills service area facility. The provisions of the orders are incorporated herein by reference as though set forth in full. Copies of the orders shall remain on file in the office of the clerk of the board of supervisors and the department of public works and the environmental health office.

B. A uniform use fee sufficient to cover the cost of operation and maintenance of the facilities, including annual capital recovery of the cost of improvements, shall be established by resolution of the board of supervisors and shall be reviewed at least annually by the director of public works. The fees shall be paid to the department of public works, based

upon information received from the department of public health through the registration procedures for septic tank pumpers set forth in Chapter 6 (commencing with section 25000) of Division 20 of the Health and Safety Code.

C. Unless authorized by the health officer or the director of public works or the representative of either, no person shall enter upon the grounds of any facility or deposit or place any substance or matter upon the grounds of any facility. No person shall discharge any substance other than domestic sewage sludge without prior written approval of the health officer.

D. The director of public works is authorized to require any person using the county septage disposal facilities to enter into an agreement with the county setting forth the conditions for use of those facilities. (Ord. 93-11 § 1, 1993; Ord. 494-333 § 1, 1988: Ord. 494-329 § 1, 1987: prior code § 3438)

8.40.150 Enforcement officer designated.

It shall be the duty of the county health officer to enforce the provisions of this chapter, and the county health officer, or his duly authorized representative is hereby empowered to enter at any reasonable hour any premises necessary in the enforcement of this chapter. (Prior code § 3439)

8.40.160 Violation.

A violation of any provision of this chapter is a misdemeanor. (Prior code § 3440)

Chapter 13.12

COUNTY SERVICE AREAS

Sections:

13.12.010 Rules and regulations—Generally.

Unless otherwise determined by the board of supervisors of the county, all services provided in county service area or zone thereof located therein, shall be made in accordance with these rules and regulations. Fees and charges noted herein shall be fixed and collected by the board of supervisors to pay, in whole or in part, for the cost of rendering a particular service. The revenue obtained thereby may be in lieu of, or supplemental to, revenue obtained by the levy of taxes. The charges may vary by reason of the nature of the use or the month in which the service is rendered to correspond to the cost and the value of the service. The charges may be determined by apportioning the total cost, not otherwise offset by other available revenue, of the service area to each parcel therein in proportion to the estimated benefits from such service to be received by each parcel. Failure to comply with any provision of this division may result in discontinuance of the service rendered. As used in this chapter, "sewage disposal service" includes but is not limited to services which may be provided in an on-site wastewater disposal zone pursuant to provisions of Ch. 3, Part 2, Div. 6. of the Health and Safety Code (commencing with Section 6950 et seq.) (Ord. 96-4 (part), 1996: prior code § 5400)

13.12.020 Application for service— Fee.

Application for an extended service in a county service area shall be made in writing on a form available at the department of public works, CSA division. The application shall include any required application fee. No applicant will be denied service on the grounds of race, color, national origin or sex. Applicants for service shall deposit with the department of public works, CSA division an amount equal to the estimated cost for materials, equipment and labor necessary to initiate the service. (Ord. 96-4 (part), 1996: prior code § 5401)

13.12.030 Water service connection—Fee.

The county retains ownership of all service connections through to the customer side of the meter including the meter box and cover. Meters will be placed in the locations desired by the customer as nearly as possible and feasible, but the department of public works, CSA division shall determine the actual location of each meter. (Ord. 96-4 (part), 1996: prior code § 5402)

13.12.040 Water rates and charges.

Each metered service will be charged the established basic monthly or bimonthly

charge starting with the month of the initial delivery of water. The basic monthly or bimonthly charge will continue thereafter on all parcels for which a meter has been installed.

A. The director of public works shall have the authority to allow customers with a meter to be charged the applicable standby fees if the property is to receive regular water service for less than three consecutive months per year. Upon request from a customer to be converted to stand-by status the CSA personnel will discontinue water service. A service charge will be charged, initially in the amount of twenty-five dollars but subject to change to reflect the actual future costs by the board of supervisors resolution, to cover the costs of administering this change. Water service will be restored to regular status upon request from the customer and it will be turned on no later than the next business day. If the customer requests that water service be restored outside of regular business hours a service charge equal to the costs incurred may be charged.

B. A monthly standby charge, where applicable, shall be paid by the owner of each parcel in the service area for which delivery of water or sewage disposal services has not been initiated, whether structures are present on the property or not. The monthly standby charge may be waived by the director of public works upon his determination that service is not readily available to a particular parcel.

C. Upon approval of the director of public works, motels, duplexes, apartment houses, mobile home parks and other residential uses with more than one living unit in one building or in a single development project may be granted water service with a single meter. The standard commercial rate will be charged for water use and in addition the basic monthly or bimonthly residential rate will be charged per rental unit or space, whether occupied or not. The property owner is responsible for payment of water bills, regardless of whether his property is occupied or unoccupied or in possession of another. Under no circumstances will two or more property owners be allowed to share a meter.

D. Whenever a check is returned by a customer's bank for whatever reason the department may charge that customer's account for the additional administrative costs incurred. Initially this charge will be set at twelve dollars per check. This charge may be adjusted in the future to reflect any increases in administrative costs by adoption of a resolution by the board of supervisors. (Ord. 96-4 (part), 1996: prior code § 5403)

13.12.050 Water service—Billing.

A. All fees and charges for services shall be collected periodically by the public works director or his authorized representative on the bills provided therefore. The billing shall consist of a basic monthly or bimonthly charge plus a charge based on the variations in usage or benefit of the service rendered, along with any other applicable fees or penalties.

B. Where metered service is provided, each meter shall be read by an employee of the county or a person authorized to do so by the public works director on or about the day of the month currently in effect for closing of books.

C. Bills are due and payable within twenty days after the billing date. A penalty of ten percent may be charged if the bill is not paid within twenty days after the billing date. Service may be discontinued to a customer who fails to pay the charges billed within forty days of the billing date. A notice of intent to discontinue service will be sent by regular mail to a customer twenty days before the service is disconnected. If

the customer is a tenant, notice will also be given to the property owner. If payment has not been made by the fifteenth day after notice of intent to discontinue service has been issued, a final disconnection notice (second notice) will be mailed via regular U.S. mail to the service account property informing the customer that service will be disconnected in five days unless payment is received. If the customer is a tenant, notice will also be mailed to the property owner. A service charge, initially to be fifteen dollars but subject to change to reflect actual future costs by board of supervisors resolution, will be assessed to each customer for which a second notice has been mailed. Services which have been disconnected for nonpayment of bills or at the owner's request will accrue charges and penalties plus the actual cost of reconnection. The basic monthly or bimonthly charge shall continue to accrue following discontinuance of service and charges so accruing shall also be paid before the resumption of service. Unpaid fees for water, sewer or garbage service will be collected in accordance with the provisions of Government Code Section 25215.5, as it may be amended from time to time.

D. Upon the written request of the property owner bills may be addressed to tenants for payment. The property owner remains responsible for payment of the bill. (Ord. 96-4 (part), 1996: prior code §§ 5404, 5405)
(Ord. No. 2010-02, § 1, 4-27-2010)

13.12.060 County employees—Unrestricted access.

County employees shall have unrestricted access at all reasonable hours to premises supplied with water or sewage services to determine whether county rules and regulations regarding these services are being observed. Only duly authorized employees or agents of the county may connect or disconnect water service to any parcel or open, close or otherwise adjust any regulating device in a water system. (Ord. 96-4 (part), 1996: prior code § 5406)

13.12.070 Damage to county-owned equipment—Property owner liable.

Any damage occurring to a meter, or other appliances, pipes or other county equipment or property caused by a tenant or property owner, shall be charged to the property owner and is due and payable upon presentation by the county to the property owner or tenant of a bill therefor. (Ord. 96-4 (part), 1996: prior code § 5407)

13.12.080 Water-receiving equipment—Customer responsibility.

The customer shall furnish and install at his own risk and expense that portion of the water system which begins at the outlet side of the meter. Such water-receiving equipment shall remain the property of the customer and he is responsible for its maintenance and repair. The county may require the customer to adjust, replace or discontinue using any water-receiving or regulating equipment on his side of the meter which disturbs or inconveniences other customers. The county shall not buy for or sell pipe, pipe fittings, valves or other plumbing equipment to individuals, or undertake the installation or repair of private lines. Where reduced or increased pressure is desired by the customer, he shall be responsible for installing and maintaining the necessary regulators, pumps, and relief valves, on his side of the meter, at his expense. The county is not responsible for damage caused to faucets, valves or other equipment which may be opened at any time that the water is turned on at the meter or for the failure of a water system to deliver water to any cus-

tomer or for any consequential damages which may result from such a failure. (Ord. 96-4 (part), 1996: prior code § 5408)

13.12.110 Extension of service—Requirements—Bond.

Extensions of service to individuals, subdivisions, groups, or a community of users, shall be constructed at the sole expense of the person or entity applying for the extension, and shall meet or exceed minimum standards of design and construction of facilities, as required by the public works director. Plans and specifications shall be submitted to and approved by the public works director before any construction commences. Construction shall be done by a contractor or other party acceptable to the public works director. Upon completion of the installation, appropriate easements or rights-of-way shall be conveyed to the county. An agreement shall be executed by the applicant, guaranteeing to the county all the construction for a period of one year after the construction is accepted by the county against defective design, defective material and faulty workmanship. The agreement shall require a bond in the amount of seventy-five percent of the estimated construction cost of the work done. The bond requirement may be waived by the public works director for minor extensions. (Ord. 96-4 (part), 1996: prior code § 5410)

13.12.120 Administrative costs.

All costs incurred by the county for furnishing and administering the services provided in a county service area or zone thereof shall be a charge against the service area or zone and are deemed to be part of the cost of rendering the affected service. (Ord. 96-4 (part), 1996: prior code § 5411)

CHAPTER 7

COUNTY SERVICE AREAS

SANITARY SEWER

AND

WATER SYSTEM STANDARDS

CHAPTER 7 - COUNTY SERVICE AREAS
SANITARY SEWER AND WATER SYSTEM STANDARDS

A. GENERAL PROVISIONS

1. General Requirements

a. All sanitary sewer and water system improvements to be accepted by a County Service Area (CSA) shall conform to the requirements as described herein, unless otherwise approved by the CSA.

b. In the event of any conflict between these CSA standards and other standards (e.g. Shasta County road standards), these CSA standards shall govern.

c. In the event that the subject CSA is not presently capable of providing the desired water/sewer service to the subject parcel, it shall be the responsibility of the applicant to make any necessary improvements to the CSA facilities necessary to serve the property. Such improvements may include extension of water and/or sewer lines, improvements to supply, treatment, storage and distribution facilities, and any additional facilities that may be required.

d. All necessary CSA facility improvements necessary to serve the customer shall be constructed at the sole expense of the customer. Said facilities shall meet or exceed minimum standards of design and construction of facilities, as required by the CSA and these Standards. Any deviations from these Standards shall be approved by the CSA and certified by a Civil Engineer registered in the State of California.

e. All plans and specifications for improvements to CSA facilities shall be prepared by a registered civil engineer and shall be submitted to the CSA for approval. Plans and specifications shall be approved by the CSA prior to the commencement of any related construction. Any construction that is to be accepted by a CSA shall be done by a licensed contractor.

f. Where reduced or increased pressure is desired by the customer, he/she shall be responsible for installing and maintaining the necessary regulators, pumps, and relief valves at their sole expense. Said facilities shall not be installed on the supply side of the meter without written approval of the CSA.

g. An encroachment permit shall be required for all work within the County rights of way.

h. In no event shall service laterals extend more than 60' into public rights of way unless otherwise approved by the CSA.

i. Where sanitary sewer or water mains are not aligned within County rights of way, a 20-foot minimum width easement shall be provided to the CSA, with terms approved by the CSA. Easements shall allow ingress and egress by maintenance personnel, vehicles and heavy equipment for the purposes of inspecting, maintaining and repairing CSA facilities. In addition, an all-weather

gravel road, 12-foot minimum width, shall be provided to all blowoffs, hydrants, air valves, manholes and similar facilities.

2. Acceptance and Ownership

   a. Prior to acceptance of sanitary sewer or water system improvements, the applicant shall submit, to the CSA, as-built plans, a certificate of completion, and all other items specified by the CSA and shall pay all inspection, capital improvement, connection fees and other charges as established by the CSA and the County.

   b. Prior to acceptance of any sanitary sewer or water system improvements, all facilities to be operated and maintained by a CSA shall be dedicated to the CSA, along with all related rights of way and easements. The CSA shall assume ownership of all water service facilities through the meter, including the meter box and cover. All facilities past the outlet side of the meter shall remain the property of the customer, and the maintenance and repair of the facilities shall be the responsibility of the customer. Likewise, the CSA will assume ownership for all sewer facilities to the property line, including the cleanout. All sewer facilities past the property line shall remain the property of the customer, and the maintenance and repair of the facilities shall be the responsibility of the customer. The CSA shall assume no responsibility for facilities they do not accept. Maintenance, repair and operation of all non-accepted facilities shall remain the responsibility of the owner and the CSA shall assume no obligations thereto.

   c. An agreement shall be executed by the applicant guaranteeing all dedicated facilities for a period of one year after acceptance by the CSA against defects in design, materials and workmanship. The agreement shall require a bond in the amount of seventy-five percent of the estimated construction cost of the improvements, unless waived by the CSA.

3. Fees and Costs

   a. A deposit for the CSA to review and inspect a proposed community water or sewage disposal system will be required. This deposit shall be in accordance with the Fee Schedule for Plan Check and Inspection Deposit in Chapter 2 of these development standards. Should the water or sewer improvements be part of a subdivision or other development project, only one deposit will be required in accordance with the cost of the entire project.

   b. In addition, for annexations of existing facilities or formation of new districts fees shall be as set forth in Appendices 7-1 and 7-2.

4. Household Equivalents

   a. The household equivalents used for design purposes and to calculate sewer fees are listed in Table 7-1. As a minimum each parcel shall be assigned one household equivalent.

TABLE 7-1

SEWER HOUSEHOLD EQUIVALENTS

NO.	COMMERCIAL, RESIDENTIAL, AND SPECIAL GROUPS	* HOUSEHOLD EQUIVALENT
1	Residential - Single Family & Duplex	1.0/Unit
2	Residential - Multiple Family, Apartment	.6/Unit
3	Residential Mobile Home	1.0/Unit
4	Mobile Home Park	.8/Space
5	Bakery - Wholesale	1.0/1000Ft²
6	Barber Shop	0.3/Chair
7	Bar w/o Dining Facilities	2.0/Establish
8	Beauty Shop	0.5/Chair
9	Car Wash - Self-service w/recycle	1.0/Bay
10	Church (schools not included)	0.2/1000Ft²
11	City, County, Federal Buildings	0.8/1000Ft²
12	Department and Retail Store	0.5/1000Ft²
13	Convalescent Home	0.5/Bed
14	Health Club	0.8/1000Ft²
15	Hospital	1.0/Bed
16	Industry, Light (dry)	0.1/1000Ft²
17	Laundromat	0.5/Washer
18	Laundry (Industrial)	Case by Case
19	Medical & Dental Office	1.0/1000Ft²
20	Motel Without Dining Facilities	0.5/Room 0.6 w/Kitchen
21	Mortuary	1.5/Slumber Room
22	Professional Office	0.8/1000Ft²
23	Recreational Hall	Case by Case
24	Repair Shop	.50/Stall
25	Restaurant: A. Large 24-hour Chain B. Large (> 2500 Ft²) C. Small (< 2500 Ft²) D. Pizza Parlor E. Fast Food Establishment: I. Major Chain II. Local	 4.6/1000Ft² 4.6/1000Ft² 4.6/1000Ft² 4.6/1000Ft² 4.6/1000Ft² 4.6/1000Ft²
26	School: A. Elementary B. Secondary (w/Showers)	 0.08/Student 0.10/Student
27	Service Station: A. With Convenience Store B. Highway Location - High Volume C. Other Location	 0.5/Pump 0.75/Pump 0.5/1000Ft²
28	Theater	0.02/Seat
29	Market: A. Supermarket (Chain Store Size) B. Small Convenience Market (no gas) C. Market w/o Garbage Disposal	 0.75/1000Ft² 0.5/1000Ft² 0.5/1000Ft²
30	Warehouse	Case by Case

* See Section B.3. "Flow Criteria"

b. Household equivalents for buildings that are undefined or intended for multiple types of occupancy shall be determined by the zoning as defined in the Shasta County Code. These household equivalents are given in Table 7-2.

TABLE 7-2

SEWER HOUSEHOLD EQUIVALENTS
FOR FACILITIES WITH UNDEFINED OR MULTIPLE OCCUPANCY TYPES

ZONE	DEFINITION PER SHASTA COUNTY CODE	* HOUSEHOLD EQUIVALENT
C-1	Local Convenience	1.3/1000Ft²
C-2	Community Commercial	2.0/1000Ft²
C-O	Office Commercial	1.3/1000Ft²
C-H	Highway Commercial	1.8/1000Ft²
C-R	Commercial Recreational	1.5/1000Ft²
C-M	Commercial Light Industrial	1.8/1000Ft²

* See Section B.3. "Flow Criteria"

5. Classifications

a. All single family dwellings, public schools, churches, and nonprofit organizations with water services not greater than 3/4 inch in diameter shall be classified as residential services. Any service greater than 3/4 inch in diameter shall be classified as commercial.

b. Upon approval of the CSA, motels, duplexes, apartment houses, mobile home parks, and other residential uses with multiple living units on a single parcel may be granted water service with a single meter.

6. Reimbursement to Developer

a. The CSA may require the oversizing of the improvements to provide additional capacity for the benefit of existing CSA customers, or for the future benefit of properties not presently served by the CSA. In the event that such oversized facilities are to be accepted by the CSA and dedicated to the public, the developer may request the CSA to administer a reimbursement agreement, persuant to Section 2.A.6. "Reimbursement to Developer" of the Shasta County Development Standards, for the costs of oversizing.

7. Policies And Standards Not a Limitation

a. The policies and standards established by this section are not a limitation upon the powers of an approving authority to protect public health and safety and to ensure consistency between the projects and all elements of the General Plan, all other applicable laws, policies and standards of Shasta County, the CSA, and all applicable state and federal laws and standards. The CSA may, with appropriate findings, deviate from the design or construction standards for an individual project in order to be consistent with adjacent or neighboring projects; to avoid physical obstructions which are extremely difficult or impossible to remove; to avoid irreparable damage to a natural feature; and to handle similar situations which are unforseen by these standards.

B. CSA SANITARY SEWER DESIGN AND CONSTRUCTION CRITERIA

1. General Requirements

a. Sewers shall meet the following design requirements except where specifically approved otherwise by the CSA. Any sewers installed within another utilities' LAFCO Sphere of Influence shall also meet that agency's standards, which shall govern in the event of conflict. All construction shall conform to latest edition of Standard Specifications for Public Works Construction (SS), unless modified herein.

2. Acceptable Materials

a. Trunks, mains, collectors, and sewer service connections (4" and larger) shall be PVC — solid wall SDR 35 per ASTM D-3034. Between a residential structure and the property line, laterals may be ABS conforming to ASTM D2751-83a.

3. Flow Criteria

a. Except for CSA #8, Palo Cedro, design of sewer lines within the Shasta County Service Areas shall be based upon an average daily flow of 250 gallons per household equivalent per day times a peaking factor (Figure S-1) plus 1,500 gallons per acre per day for stormwater and groundwater infiltration. The sewer lines in CSA #8 shall be based upon an average daily flow of 195 gallons per household equivalent per day times a peaking factor (Figure S-1) plus 1,500 gallons per acre per day for stormwater and groundwater infiltration.

4. Resistance Factor

a. Mains and collector sewer lines shall be designed with a minimum Manning coefficient of n = 0.013.

5. Minimum Slope

a. The minimum slope allowed for sewer lines shall be:

TABLE 7-3
MINIMUM ALLOWABLE SEWER LINE SLOPE

DIAMETER	NORMAL MINIMUM SLOPE	ABSOLUTE MINIMUM	NOTE
6"	0.0065	0.0052	Absolute minimum slopes for larger sewers shall be based on 2 feet per second flow when full.
8"	0.0040	0.0033	
10"	0.0030	0.0025	
12"	0.0025	0.0020	

b. Any dead end line with a length of 200 feet, or less, shall have a minimum slope of S = 0.0065.

6. Minimum Size

a. The minimum size sewer line shall be 6-inch, except 4-inch may be used for laterals for individual services. For mains which serve C, I or MU general plan land use areas the minimum size shall be 8-inch. Sewer mains serving over 100 connections shall be 8-inch minimum. Where master plans have been developed, the sewers shall be sized pursuant to such plans. When such plans are not available the sewer shall be sized on anticipated ultimate development in the tributary area.

7. Minimum Radius

a. The minimum allowable radius of curvature in the sewer lines shall be as shown in Table 7-4.

TABLE 7-4
MINIMUM RADIUS CURVES FOR SEWER LINES
(RADII IN FEET)

Based on 1½ times the manufacturers' recommended minimums	
DIAMETER	PVC SDR 35
6"	225
8"	300
10"	375
12"	450
15"	525

8. Minimum Cover

   a. Minimum depth of cover shall be as follows:

      (1) 5.0 feet over main line in street and 3.0 feet in cross country areas

      (2). 4.5 feet to invert of service connections at property line unless otherwise approved by the CSA.

9. Manhole Spacing

   a. Manhole spacing and locations shall be as follows:

      (1) Sewers 6- to 8-inch : 400 feet maximum
      (2) Sewers 10- to 12-inch : 500 feet maximum
      (3) Sewers 15-inch and larger : 1,000 feet maximum
      (4) At all angle points in horizontal and vertical alignment (except where vertical curves are permitted)
      (5) At the terminal end of all lines (except where rodholes are permitted)
      (6) At all connecting sewers

10. Drop Manholes

    a. Drop manholes will not be permitted unless approved by the CSA.

11. Rodholes

    a. Rodholes will only be allowed on a sewer less than 200 feet long, and when the line serves four or less connections.

12. Final Testing

    a. Prior to acceptance of the sewer, the lines shall be tested for leakage, cleaned, flushed, balled, mandrelled and televised. Sewer extensions of less than 1,000 feet with no vertical curves between manholes are not required to be televised. All final testing discussed herein shall be considered to be part of the work and shall be performed at the expense of the applicant.

13. Plugging

    a. The downstream end of all new lines shall be plugged until the sewer is accepted by the CSA. The plug will be removed by CSA personnel at the time the sewers are placed into operation.

14. Maximum Depth of Cover

    a. Mains shall not be designed with cover exceeding 15 feet from finish surface grade, without special permission from the CSA.

15. Acceptable Depth for Service

    a. Sewer depth shall be such as to obtain gravity service to all potential building sites using a minimum building sewer grade of 1 percent (1/8-inch per foot) with the connecting service invert at the crown of the main sewer, and 18 inches to invert at the building site.

16. Crown Matching and Manhole Inverts

    a. Where pipe sizes increase, the crowns shall match in elevation and the manhole invert shall slope the diameter difference. On all manholes with other than straight through piping the manhole invert shall slope at least 0.17 foot.

17. Vertical Curves

    a. Vertical curves are permitted only when a straight grade is deemed impractical by the CSA.

18. Sewer/Water Main Separation

    a. Sewers shall normally be 10-foot minimum from water mains (clear dimensions). A 15-foot spacing between water and sewer, typically with sewer 5 feet to one side of road centerline, is required for urban construction . In rural areas water and sewer main lines shall be outside the pavement edge on opposite edges of the road and should not lie directly below any surface drainage ditches. Sewers shall be separated from water mains pursuant to State Health Department Standards when lesser spacing is necessary for practical construction.

19. Property Line Cleanouts

    a. Property line cleanouts shall be installed on laterals on all sewer systems.

20. Laterals Connecting at Manholes

    a. Laterals may enter directly into manholes providing the invert is at the grade of the crown of the exiting sewer.

21. No Service Connections to Force Mains

    a. Laterals shall not be connected to force mains.

22. No Joint Service Laterals

    a. Joint use of a single lateral by two property owners is not permitted.

23. Individual Pumping Systems

    a. Use of individual sewage pump stations or sewage pumps in combination with septic tanks will not be permitted unless approved by the CSA.

24. Plans

a. Sewer improvement plans shall be at 1"=100' or larger scale. A profile must be included. Ground elevations along the sewer, at lateral connection points, and at potential building sites, shall be based on field surveys or topographic maps prepared in accordance with National Mapping Standards with contour intervals of 2 feet or less. Bench mark data, north arrow, scale, street names, invert elevations, property and right of way lines, existing utilities, sewer grades, sewer locations, and special construction features shall be shown on the plans.

25. Inspection

a. All sewer construction shall be subject to inspection by the CSA. No work shall be performed without a minimum of five working days advance written notice to the CSA.

26. Compaction Testing

a. Where facilities are to be dedicated to the CSA, compaction tests shall be conducted by a California registered Civil Engineering or Geotechnical Engineering Company, or by an approved materials testing laboratory. Tests shall be taken at a minimum of every 1,000 feet, and no less than two per job, and two additional tests shall be performed for each failing test. Test locations shall be selected by the CSA's inspector. Compaction tests shall be done in compliance with California test methods 216 and 231.

C. WATER SYSTEM DESIGN AND CONSTRUCTION CRITERIA

1. General Requirements

a. Water systems shall meet the following design requirements except where specifically approved by the CSA. Any water system installed within another utilities' LAFCO Sphere of Influence shall also meet that agency's standards which shall also govern in the event of a conflict. All construction shall conform to latest edition of Standard Specifications for Public Works Construction (SS), unless modified herein and shall conform to Title 22, State of California Water Works Standards.

2. Pipe Material

a. Water main piping shall be either ductile iron pipe or PVC. Services 3" and larger shall be ductile iron, or Class 150 C900 PVC. Services less than 3" shall be copper, except services from 1 1/2 inches to 3 inches may be Schedule 80 PVC.

3. Pipe Size

a. All water main piping serving fire hydrants shall be 6-inch minimum.

b. Where master plans have been developed, the water main pipe size shall conform to the master plan. In the absence of a master plan, the pipe size shall be adequate to maintain a minimum pressure of 45 psi, and not cause the static pressure to drop more than 20 percent of normal under peak domestic demands at ultimate development. During fire flows, coincident with the maximum daily demand, residual pressures in the mains shall not fall below 20 psi.

c. When piping is needed only to accommodate service connections the size shall be large enough to have not more than 3 pounds per square inch of (psi) pressure loss when all services are operating at their maximum meter capacities. Minimum size shall be 2-inch.

4. Fire Hydrants

a. Fire hydrant type, spacing and installation details shall conform to the latest version of the Fire Safety Standards for Shasta County.

5. Blowoffs

a. Blowoffs shall be provided at all pronounced low points and on any main which dead ends more than 10 feet past a fire hydrant.

6. Requirements for Reduced Pressure Backflow Valves, Double Checks, And Detector Checks

a. Backflow prevention using approved devices to control cross connections shall be accomplished pursuant to the State of California, Title 17, Regulations Concerning Cross Connections. Backflow prevention devices shall be installed on private property, but as close to the water meter connection as practical, and at locations which are available for inspection by, CSA, County and Health Agencies personnel. Backflow devices shall conform to the attached standard details when applicable. For sizes and types of backflow preventers not shown in these standards, the details in the latest City of Redding standards shall be used.

b. Fire services may or may not require a backflow prevention device. Each such service shall be reviewed with respect to State of California Title 17, Assembly Bill 2503, and the memorandum from the State Fire Marshall's Office of December 10, 1984 regarding Cross Connection Control Requirements on Certain Classes of Fire Sprinkler Systems AB 2503.

7. Air Valves

a. Air valves shall be combination types installed on all high points in the distribution system, except when an active service connection can be placed at the high point and there is no reason for air to accumulate at that high point other than during construction, repair, or total system pressure loss. An air

valve shall always be placed at the first high point where air could gain entry into the system from a well, a surface water supply, or from a hydropneumatic tank.

b. Air valves shall have a minimum nominal size of 1-inch. Two-inch or larger sizes shall be used on mains larger than 10 inches in accordance with engineering principles as recommended by air valve manufacturers.

8. Valves

a. Line valves shall be spaced generally no more than 1,000 feet apart (pursuant to California Waterworks Standards) except in rural locations or on pipelines larger than 12-inch in diameter. Valves should generally be placed at the beginning of all dead end runs and at intersections of gridded piping.

9. Minimum Cover

a. Minimum depth of cover shall be 3.0 feet for water mains.

10. Plans

a. Improvements plans shall be prepared by a State of California registered civil engineer in accordance with standard care of the industry. Plans shall be at 1" = 100' or larger scale. High points shall be identified with an elevation. Plans shall include north arrow, scale, street names, property and right of way lines, existing utilities, connection details, location of pipeline within right of way, locations of all appurtenances including: services, valves, fire hydrants, air valves, blowoffs, and other special construction features.

11. Inspection

a. All water system construction shall be subject to inspection by the CSA. No work shall be performed without a minimum of five working days advance written notice to the CSA.

12. Compaction Testing

a. Where facilities are to be dedicated to the CSA, compaction tests shall be conducted by a California registered Civil Engineering or Geotechnical Engineering Company, or by an approved materials testing laboratory. Tests shall be taken at a minimum of every 1,000 feet, and no less than two per job, and two additional tests shall be performed for each failing test. Test locations shall be selected by the CSA's inspector. Such tests shall be considered to be part of the work and shall be performed at the expense of the applicant. Compaction tests shall be done in compliance with California test methods 216 and 231.

D. TECHNICAL SPECIFICATIONS FOR TRENCH EXCAVATION, BACKFILL AND SURFACE RESTORATION

1. General

   a. Trench backfill above the pipe zone will be divided into the following classifications:

      (1) CLASS "A" BACKFILL: Use in all paved areas, graveled roads, shoulders, driveways, and at other locations as shown on the Plans. (See Standard Details)

      (2) CLASS "C" BACKFILL: Use in all areas where Class "A" backfill is not utilized. (See Standard Details)

      (3) CONCRETE ENCASEMENT OR CONCRETE CAP: May be installed when there will be insufficient cover over the pipe for proper protection and prior approval has been obtained from the CSA. (See Standard Details)

2. Materials

   a. Materials will be divided into the following classifications:

      (1) TRENCH STABILIZATION MATERIAL: Clean imported gravel, free from clay balls and organic matter. Reasonably uniform gradation from fine sand to 2-1/2-inch maximum. Gradation shall be such as to fill all large voids with fines to prevent piping of native soils and prevent rapid and free movement of groundwater.

      (2) PIPE BEDDING: Imported clean sand or well graded sand gravel mix, maximum size of 3/4-inch, free from all organic matter and debris; minimum sand equivalent of 28.

      (3) IMPORTED GRAVEL BACKFILL: A reasonably well-graded silty sand or a well-graded silt, sand, and gravel mixture with a maximum particle size of 3 inches and a minimum sand equivalent of 28. Aggregate base material may be substituted.

         (a) Select native material meeting the above requirements may be used; however, proof that the select native materials meet these requirements will be required.

      (4) NATIVE BACKFILL: Material excavated from the trench. Free of roots and debris with no rocks larger than 6 inches in greatest dimension.

(5) AGGREGATE BASE: Aggregate base shall conform to requirements of Chapter 2, Section G-6, "Aggregate Base," of the Shasta County Development Standards.

(6) PERMANENT PAVEMENT: Permanent pavement shall conform to the requirements of Chapter 2, Section G-5, "Asphalt Concrete," of the Shasta County Development Standards.

(7) TEMPORARY PAVEMENT: Temporary Pavement shall conform to Class "D2" crushed aggregate per SS 203-6 with SC-800 liquid asphalt per SS 203-2.

(8) TACK COAT: Tack coat shall conform to SS-lh emulsified asphalt.

(9) CONCRETE: All concrete for pipe encasements shall, at a minimum, conform to Class 420-C-2000 concrete per SS. 201-1. All concrete for cap in Class "A" backfill shall be Class D high early strength Portland cement concrete (7-sack Type III cement with 2 percent calcium chloride by weight) Caltrans Standard Specifications.

(10) SLURRY MIX: Slurry mix shall consist of a concrete mix with each cubic yard containing one sack of Portland Cement, 12 gallons of water, 2,600 pounds of 3/8-inch rock, and 800 pounds of sand.

3. Workmanship

a. Workmanship will be divided into the following classifications:

(1) EROSION CONTROL: All trench excavation, backfill and surface restoration shall comply with Chapter 4, Section D7, "Erosion Control," of the Shasta County Development Standards.

(2) EXCAVATION: Water entering the trench shall be controlled such that it does not interfere with bedding, backfill, and pipe placement. The depth of the trench for water piping shall be such as to maintain the minimum cover requirements and to conform to the general slope and grade of the existing terrain. No low spots or high spots will be allowed except at air valves, blow-off valves, where service connections are at high points in pipe profile, or instances where unknown utility locations require variations from the slopes of the existing terrain. The depth of the trench for sewers shall be such that the pipe inverts may be laid at the Plan elevations.

(3) OVER EXCAVATION: Any part of the trench extending below the proper grade shall be corrected with approved bedding material.

(a) If soft, spongy, unstable, or other unsuitable material is encountered upon which the bedding material or pipe is to be placed, this

unsuitable material shall be removed to a depth approved by the CSA and replaced with trench stabilization material suitably densified.

(4) BEDDING: Bedding shall be defined as that material supporting, surrounding, and extending to 6 inches above the top of the pipe. Where it becomes necessary to remove boulders or other interfering objects at subgrade for bedding, any void below such subgrade shall be filled with bedding material.

(a) Prior to pipe installation, bedding shall be placed to a minimum depth of 4 inches and then leveled and shaped to provide a firm base for the pipe. Bell holes shall be dug to allow the pipe to be supported by the bottom of the pipe barrel over its full length.

(b) After the pipe has been laid and approved for covering, bedding shall then be placed and densified by hand tamping with an approved T-bar tool. Particular care shall be taken to provide solid backing against the underside of the pipe. The degree of compaction shall not be less than 90 percent of the laboratory maximum density. Bedding shall be placed in 8-inch maximum lifts. A vibrating plate compactor shall be used at the top of the bedding material, 6 inches above the top of the pipe. Bedding shall be placed in the manner described above, regardless of the class of backfill above the bedding material. For water mains the applicant shall then install the pipe findertape in the trench as shown on the Standard Details.

(5) BACKFILL: Class "A" backfill shall be placed in uniform layers not to exceed 8 inches in loose thickness and compacted to 95 percent relative compaction. Compaction shall be by mechanical tamping, vibration, or other approved methods. Compaction shall immediately follow the pipe backfill operation.

(a) Class "C" native backfill shall be firmly compacted by mechanical means. No specific compaction requirements must be met, however, any settlement of trenches during the one year guarantee period shall be promptly repaired at no additional cost to the CSA.

(6) COMPACTION: Where tests indicate the compaction is unsatisfactory, the CSA may reject the work up to half the way to the next acceptable test.

(a) The CSA may order additional compaction tests at any location where work has been found not to be in conformance with the Specifications. Frequency and other requirements for compaction testing is described in the Design Criteria.

(7) TEMPORARY SURFACE RESTORATION: Refer to SS 306-1.5.1. Delete the last two paragraphs and add, "Temporary pavement shall be

placed within 24 hours after completion of the backfill operation except for the road crossings (or other locations where two-way traffic is impaired) where temporary pavement or slurry mix backfill shall be placed to finish grade at the end of each working day. Where slurry mix backfill to finish grade is used rather than temporary paving, the trench surface shall be repaired with temporary paving as needed in the event of raveling. The temporary pavement mixture shall be placed and compacted per SS 302-5.4 and 302-5.5 except that the mixture may be laid cold. A tack coat will be required to the edges of existing paving per SS 302-5.3. No prime coat is required."

(8) PERMANENT TRENCH SURFACE RESTORATION: Prior to the installation of permanent pavement the temporary pavement, if used, shall be removed and the subgrade prepared per SS 301-1 excluding Section 301-1.7. Aggregate base placement shall conform to SS 301-2.2 and 301-2.3. Permanent trench surface restoration shall, unless otherwise directed by the CSA, be applied to the limits of existing pavement. Existing pavement widths from centerline or reference points will be measured where the pipeline will be along the edge of the road. The paving will be replaced to these measured widths and any obliterated fog line striping. Pavement replacement adjacent to normal trench surface restoration may be ordered as well. Placement and compaction of the permanent pavement shall be in accordance with SS 302-5.4, 302-5.5, 302-5.6, and 302-5.7. The contact surface of all cold pavement joints, valve boxes, and the like shall be painted (tack coat) with Grade ss-1h emulsified asphalt immediately before the adjoining asphalt is placed.

(9) SETTLEMENT: Settlement of pavement over trenches during the one year guarantee period shall be considered a result of improper or inadequate compaction of the backfill or base materials. All pavement deficiencies noted during the guarantee period shall be promptly repaired at no additional cost to the CSA, regardless of the acceptability of previous compaction tests.

(10) CONCRETE THRUST BLOCKS: Concrete thrust blocks shall be installed at points along underground pressure piping where a hydraulic thrust exerts a force upon an unrestrained fitting. Thrust blocks shall conform to thrust block details as shown in these Standards.

E. TECHNICAL SPECIFICATIONS FOR SANITARY SEWER

1. General

   a. Types of pipes will be divided into the following classifications:

      (1) TYPES OF PIPES:

         (a) Sewer main and lateral pipe to the property line shall be polyvinyl chloride (PVC).

         (b) Lateral pipe from the property line to the structure shall be PVC or ABS sewer pipe.

2. Materials

   a. Types of materials will be divided into the following classifications:

      (1) POLYVINYL CHLORIDE PIPE AND FITTINGS: PVC pipe and fittings shall comply with ASTM D3034. The minimum standard dimension ratio shall be SDR 35. The joints shall be Ring-Tite manufactured by J-M, Fluid-Tite manufactured by Certainteed, or approved equal.

      (2) ACRYLONITRILE-BUTADIENE-STYRENE (ABS) PIPE: ABS pipe and fittings shall conform to ASTM D2751-83a. All joints shall be solvent welded.

      (3) PIPE COUPLINGS: Pipe couplings used for joining different types of pipe shall be water-tight neoprene using stainless steel bands and shall be Fernco, Calder Co., or approved equal.

      (4) CLEANOUT BOXES: Protective boxes used for lateral cleanouts shall be Cook Concrete Products, No. 10T12 Traffic Box, Christy G-5, or equal. All lids shall have the word "SEWER" cast into the cast iron cover with prominent letters.

      (5) LATERAL TAPS: Lateral outlets on the main sewer shall normally be made with a tee or wye tee such that lateral horizontal alignment is 90° to main. When approved by the CSA, a tap may be made in the main using a hole saw. The coupon shall be removed and a Romac style CB saddle shall be installed pursuant to manufacturer's directions.

      (6) SEWER SADDLE: Sewer saddles used for joining laterals to main line sewers shall be water tight with adjustable stainless steel strap, bolts, nut, and washers. The body shall be ductile iron with corrosion resistant paint. The gasket shall be rubber compounded for sewer use. The saddle shall be

Romac "CB," Sealtite, or equal. The applicant shall obtain approval from the CSA prior to installation.

3. Workmanship

(1) INSTALLATION OF PIPE:

(a) Before lowering into the trench, the pipe shall be inspected for defects, and all cracked or broken pipe shall be discarded. The ends and interior of the pipe shall be clean. Belled ends shall be laid upgrade. Handling of the pipe shall be accomplished in a manner that will not damage the pipe.

(b) After lowering the pipe into the trench, the bell or coupling end and spigot shall be cleaned of any foreign matter. The joint shall be made in accordance with the manufacturer's printed instructions. Care shall be taken not to buckle or disturb previously laid pipe.

(c) Each joint shall be inspected to insure that it is properly made before backfilling is done. Care shall be taken to prevent any dirt or foreign matter from entering the open end of the pipe. Where it is necessary to cut pipe, such cuts shall be neatly made. The laid pipe shall be true to line and grade and, when completed, the sewer shall have a smooth and uniform invert.

(d) Connections to pipe stubs of a different pipe material shall be made with a suitable connector. Connectors must be approved by the CSA prior to installation.

(2) LINE AND GRADE TOLERANCE:

(a) Sewers shall initially be installed within ±1/4-inch (.02') of planned grade. Following backfill and within one year from construction, the sewer grade shall not vary more than ±1-inch from grade and be such as to not cause stagnant water to pond with a depth of more than 1½ inches.

(b) The horizontal alignment of sewers shall not deviate more than 2 inches from the planned alignment.

(3) TEES AND LATERALS: The exact location of laterals shall be approved by the CSA. Tee branches shall be fully supported by firm material. Pipe and bends shall be installed to the same standards as specified above. Rubber ring caps shall be installed at the ends of all laterals.

(4) CLEANING SEWERS: The pipe shall be cleaned in the following manner:

(a) The cleaning shall be completed with an inflatable rubber ball, of a size that will inflate to fit snugly into the pipe, with a rope or cord fastened to the ball so the ball's position can be known and controlled at all times. The ball shall be placed in the last cleanout or manhole on the pipe to be cleaned, and water shall be introduced behind it. The ball shall be passed through the pipe with only the force of the water impelling it. All debris flushed out ahead of the ball shall be removed at the first manhole where its presence is noted. In the event cemented or wedged debris, or a damaged pipe shall stop the ball, the obstruction shall be removed.

(5) MANDREL TEST: All PVC sewers, except laterals, shall have a mandrel test in accordance with SS 306-1.2.12.

(6) WATER-TIGHTNESS TEST:

(a) Tests for water-tightness shall be performed in the presence of the CSA's representative. The applicant shall furnish all labor, materials, tools, and equipment required to make the tests. No testing for final acceptance of pipe will be done until the trench has been fully backfilled and acceptably compacted to finish grade, or if the sewer is under pavement, to the pavement subgrade.

(b) All sections of pipe shall be tested. Tests shall be made from manhole to manhole or manhole to rodhole. The sewer shall be complete with laterals, and trenches shall be backfilled prior to testing.

(c) Where leakage is in excess of the specified rate, the sewer shall immediately be uncovered, repaired, and retested until the amount of leakage is reduced to a quantity within the specified rate before the sewer will be accepted.

(d) The CSA will determine whether the test is to be by exfiltration or by infiltration. In most instances, an exfiltration test will be required.

(7) EXFILTRATION TEST: All sanitary sewers shall be tested with air unless approved otherwise by the County.

(8) AIR TESTING:

(a) Air testing shall be done immediately following cleaning of the pipe. Air testing shall be performed in accordance with the Uni-Bell Plastic Pipe Association's "Recommended Practice for Low-Pressure Air Testing of Installed Sewer Pipe." See Table 7-5.

(b) Air shall be slowly supplied to the plugged pipe installation until the internal air pressure reaches 4.0 pounds per square inch greater than the average back pressure of any groundwater that may submerge the

pipe, except that the maximum pressure shall not exceed 9 psi. At least 2 minutes shall be allowed for temperature stabilization before proceeding further.

(c) The rate of air loss shall then be determined by measuring the time interval required for the internal pressure to decrease from 3.5 to 2.5 pounds per square inch greater than the average back pressure of any groundwater that may submerge the pipe. Test sections with less than 625 square feet of internal surface area shall be considered acceptable when the leakage rate does not exceed 0.0015 cubic feet per minute per square foot of internal surface area. Test sections with greater than 625 square feet of internal surface area shall be considered acceptable when the leakage rate does not exceed 1.0 cubic foot per minute. See Table 7-5 for maximum allowable test times that correspond to these limits.

(8) TESTING WITH WATER: When directed, testing with water shall be done by filling the upper manhole with water to a depth of at least 3 feet over the top of the pipe or groundwater level, whichever is higher, with the end plugged at the lower manhole. The rate of leakage shall be determined by measuring the amount of water required to maintain the water level in the upper manhole. The test shall be maintained for a period of at least 2 hours. Leakage shall not be in excess of the rate of 20 gallons per inch of pipe diameter per 1,000 feet of pipe per day.

(9) INFILTRATION TEST:

(a) In the event that sufficient groundwater is present, as determined by the CSA, an infiltration test shall be required. In this case, the pipe shall be tested for water tightness by installing plugs at the upper end of the pipe and at the lower end on the exit side of a manhole. The rate of leakage will be determined by periodically removing and measuring the water accumulated at the lower manhole.

(b) Leakage shall not be in excess of the rate specified for water testing by exfiltration.

(10) TELEVISION INSPECTION: Upon completion of balling and cleaning, mandrel testing and leakage testing, and all backfill and compaction to grade, the main sewers (excluding laterals) shall all be television inspected. (Unless exempted for extensions smaller than 1,000 feet per Design Criteria.) During the television inspection, a continuous flow of water of from 1 to 10 gallons per minute shall be flowing in the sewer to allow observation of the profile and the determination of acceptability of any observed sags. Any sags greater than allowed, pipe offsets or broken pipe shall be repaired. Television inspection shall occur no sooner than 7 days after completion of the sewers and no less than 30 days following

completion of all sewers for the project. Television inspection shall conform to Section 5 in the 1990 Edition of National Association of Sewer Service Companies (NASSCO).

TABLE 7-5

SPECIFICATION TIME REQUIRED FOR A 1.0 PSIG PRESSURE DROP FOR SIZE AND LENGTH OF PIPE INDICATED FOR Q = 0.0015

1 Pipe Diameter (in)	2 Minimum Time (min:sec)	3 Length for Minimum Time (ft)	4 Time for Longer Length (sec)	Specification Time for Length (L) Shown (min:sec)							
				100 ft	150 ft	200 ft	250 ft	300 ft	350 ft	400 ft	450 ft
4	3:46	597	0.380 L	3:46	3:46	3:46	3:46	3:46	3:46	3:46	3:46
6	5:40	398	0.854 L	5:40	5:40	5:40	5:40	5:40	5:40	5:42	6:24
8	7:34	298	1.520 L	7:34	7:34	7:34	7:34	7:36	8:52	10:08	11:24
10	9:26	239	2.374 L	9:26	9:26	9:26	9:53	11:52	13:51	15:49	17:48
12	11:20	199	3.418 L	11:20	11:20	11:24	14:15	17:05	19:56	22:47	25:38
15	14:10	159	5.342 L	14:10	14:10	17:48	22:15	26:42	31:09	35:36	40:04
18	17:00	133	7.692 L	17:00	19:13	25:38	32:03	38:27	44:52	51:16	57:41
21	19:50	114	10.470 L	19:50	26:10	34:54	43:37	52:21	61:00	69:48	78:31
24	22:40	99	13.674 L	22:47	34:11	45:34	56:58	68:22	79:46	91:10	102:33
27	25:30	88	17.306 L	28:51	43:16	57:41	72:07	86:32	100:57	115:22	129:48
30	28:20	80	21.366 L	35:37	53:25	71:13	89:02	106:50	124:38	142:26	160:15
33	31:10	72	25.852 L	43:05	64:38	86:10	107:43	129:16	150:43	172:21	193:53
36	34:00	66	30.768 L	51:17	76:55	102:34	128:12	153:50	179:29	205:07	230:46

NOTES:
1. If length of test section is less than the length for minimum time as shown in Column 3, then required test time equals maximum time shown in Column 2.
2. If length of test section exceeds length for minimum time as shown in Column 3, then required test time is computed based on formula in Column 4 where "L" = Length of pipe section in feet.
3. The length of laterals connected to the test section is normally disregarded unless the test fails by a very small amount, then the test time can be recomputed using the appropriate formula.

F. TECHNICAL SPECIFICATIONS FOR MANHOLES

1. Materials

a. PRECAST CONCRETE MANHOLE SECTIONS:

(1) All precast sections, including riser sections, cones, grade rings, flat slab tops, eccentric cones, all per ASTM C478. Grade rings shall be standard product, manufactured particularly for use in manhole construction, sized to fit the cones on which they are to be placed, and the wall height shall be not less than 2 inches high, nor more than 6 inches high.

(2) All precast components shall have bell and spigot or tongue and groove ends.

b. MANHOLE FRAMES AND COVERS: All manhole frames and covers shall be casted iron conforming to ASTM Designation A48, Class 30. Each cover shall have the word "SEWER", "S", or "SANITARY SEWER", cast into the top with 2-inch high letters. Castings shall be of a consistently high quality and shall be free of material and manufacturing defects. Following cleanup and final machining, an asphaltic paint or similar protective coating shall be applied.

c. RODHOLE FRAME AND COVER: Cast iron, conforming to ASTM A48, Class 30. D&L Model H6530 (8"), H6520 (6"), Traffic Box, or equal, with the word "SEWER", "S", or Sanitary Sewer cast into the cover with prominent letters.

d. MORTAR: A proportion of one part Portland cement to two parts clean, well graded sand which will pass a 1/8-inch screen. Admixtures may be used not exceeding the following percentages of weight of cement: Hydrated lime, 10 percent; diatomaceous earth or other inert materials, 5 percent. Consistency of mortar shall be such that it will readily adhere to the surfaces. Mortar mixed for longer than 30 minutes shall not be used.

e. PRECAST MANHOLE BASES: Bases shall be a minimum of 60-inch diameter, 4 inches of concrete below outlet invert with No. 4 horizontal reinforcing bars at 6 inches on center, as manufactured by E.W. Cook Co., Teichert, Inc., or equal. Riser sections in pre-cast bases shall have wall reinforcement equal to standard manhole risers, plus additional reinforcement at openings.

f. WATERSTOPS: Waterstops shall be neoprene rubber gaskets with multiple fins and a stainless steel cinch band.

g. MECHANICAL RUBBER SEAL (MRS): Mechanical rubber seal (MRS) shall be used at all connections to existing manholes. The MRS shall be a rubber boot type coupling using only rubber, stainless steel or PVC compounds as manufactured by Calpico Co. LinxSeal, KOR-N-SEAL Company, Millford, NH

(603/673-8680), PSX by Press Seal Gasket Corp., Ft. Wayne, IN (219/483-0521), Z LOK XP by A LOK Products, Tullytown, PA (215/945-5600), or equal. The internal cavity between the pipe and the structure on the inside of the structure shall be filled with polyurethane caulk (Vulkem, Sikaflex, or equal) flush to the interior surface.

2. Workmanship

a. CAST IN PLACE CONSTRUCTION:

(1) Manholes shall be constructed only when the temperature is above 32°F. All work shall be protected against freezing. Water shall be removed from the excavation and the excavation maintained "dry" during construction of the manhole and during the time required for the concrete or mortar to develop sufficient strength to resist rupture by groundwater pressure. All pipes connected to manholes shall have a joint within two pipe diameters of the manhole wall.

(2) Manhole inverts shall be formed as shown in the Standard Details, either by laying pipe through and cutting out the top portion before completion of the base of the manholes or by forming "U" shaped channels in the concrete base slab. Cut edges of pipe laid through the manhole shall be fully covered by concrete when the manhole invert is complete. The finished invert shall be smooth and true to grade. No mortar or broken pieces of pipe shall be allowed to enter the sewers.

(3) A groove shaped to match the tongue of the first precast concrete riser section of the manhole shall be formed in the base slab. A circular metal form suited to the particular precast manhole manufacturer's joint shall be used to form the groove.

b. PRECAST CONSTRUCTION:

(1) Except as specified herein, all precast manhole sections and grade rings shall be set in joint sealing compound. Joint sealing compound components shall be applied in the field.

(2) The top joint between the frame and the first grade ring shall be set with mortar for adjustment of the final cover elevation. Mortar joints shall not be more than 2 inches thick. Excess mortar shall be trimmed flush.

(3) Joint sealant shall be applied in accordance with the manufacturer's recommendations to the surfaces shown on the Plans. Surfaces receiving joint sealant shall be dry and cleaned of all oil, grease, and loose particles. Sealant shall be applied to the previously placed manhole section.

(4) The upper manhole section shall be placed immediately after placing sealant. All excess joint sealant forced out of the joint on the inside of the manhole shall be removed or troweled smooth.

(5) After completion of the manhole, all plugs shall be completely removed from the sewers and all loose material shall be removed from the manhole.

c. LATERAL SEWER CONNECTIONS: Direct connections to manholes shall be installed with the crown of the lateral sewer pipe 4 inches higher than the crown of the downstream main sewer pipe. The manhole invert shall be channeled for lateral sewers in the same manner as for main sewers.

d. PIPE STUBS: Pipe stubs for future connections shall extend one and one-half to two pipe diameters beyond the concrete base and shall be plugged with standard gasketed plugs in couplings or caps.

e. CONNECTION TO EXISTING MANHOLES:

(1) The connection shall be made in such manner that the modified manhole is equal to a new manhole in appearance and performance. A channel approximately 2 inches larger all around than the connecting pipe shall be cut in the existing manhole base. The rough cut channel shall be finished to its final smooth and uniform shape with mortar.

(2) Particular care shall be taken to obtain a watertight joint where new pipes must penetrate existing manholes. Pipe openings shall be core drilled. A mechanical rubber seal and then mortar shall be installed inside of manhole at cavity. The mechanical rubber seal shall have stainless steel bolts and nuts. Any other method of penetration shall be approved by the CSA.

f. WATER-TIGHTNESS TEST:

(1) Rodholes shall be tested for water-tightness along with the sewers to which they are connected.

(2) All manholes will be visually inspected by the CSA; there shall be no evidence of leakage of water into any manhole from outside sources or any imperfections which allow such leakage. All manholes shall be tested for water-tightness by the applicant and observed by the CSA. The test shall be made, with all connecting pipes plugged, by filling the manhole with clean water to within 2 inches of the bottom of the cast iron frame. The leakage rate for a 4-foot diameter manhole shall not exceed 0.25 gallons per hour per foot of depth or 2.0 gallons per hour, whichever is less, over a test period of not less than one hour. (NOTE: Two gallons per hour leakage is a drop of about 1-inch in a 24-inch diameter grade ring.) Allowable leakage rates will be proportionately increased for manholes with diameters greater than 4 feet.

(3) Visible leaks in a manhole that are observed during the one year guarantee period shall be suitably repaired as approved by the CSA.

G. TECHNICAL SPECIFICATIONS FOR WATER MAIN PIPE AND APPURTENANCES

1. Materials

a. WATER MAIN PIPE: Water main pipe 4 inches through 12 inches in diameter, unless otherwise shown, shall be polyvinyl chloride (PVC) or ductile iron (DI). Two-inch and smaller piping shall be copper tubing except where otherwise approved by the CSA.

b. POLYVINYL CHLORIDE PIPE (PVC):

(1) Polyvinyl chloride pipe (PVC) shall be manufactured, tested, and marketed in accordance with AWWA C900 and shall be Class 150, SDR 18, unless otherwise approved by the CSA.

(2) PVC pipe smaller than 4-inch in diameter shall be Schedule 40 thickness class conforming to ASTM 1785. Pipe joints shall be solvent welded. Fittings shall be Schedule 40 solvent weld-type conforming to ASTM D2466.

(3) All fittings for 4-inch and larger PVC pipe shall be either cast iron or ductile iron conforming to ANSI A21.10 (AWWA C110) and cement mortar lining and bituminous coated ANSI A21.4 (AWWA C104) and ANSI A21.6 or ANSI A21.51. As an option for mechanical or push on joint, fittings shall conform to AWWA C153. Buried fittings shall be wrapped in polyethylene film conforming to AWWA C105.

(4) Fittings for 4-inch and larger PVC pipe may be either mechanical joint or a push-on joint such as Tyler or equal.

(5) PVC pipe shall not be stored or handled in a manner that will permit exposure to sunlight or high temperatures for an extended period.

c. CAST IRON AND DUCTILE IRON PIPE AND FITTINGS:

(1) Ductile iron pipe shall conform to SS 207-9.2.1 and SS 207-9.2.2 and AWWA C151. Ductile iron pipe 4 inches and smaller shall be Class 51, and 6 inches and larger shall be Class 50, except where thicker classes are required for threading flanges or other connections.

(2) Pipe shall be furnished with flanged, mechanical joint, or push on joint for the type of connections.

(3) Fittings shall be either cast iron or ductile iron fittings manufactured in accordance with SS 207-9.2.3 (AWWA C110). Mechanical joint or push on joint may, as an option, conform to AWWA C153.

(4) All pipe and fittings shall be cement lined and sealed; and coated in accordance with the SS 207-9.2.4 (AWWA C104).

(5) The pressure rating, metal thickness class, net weight of pipe without lining, length of pipe, and name of manufacturer shall be clearly marked on each length of pipe in accordance with AWWA C106.

(6) All flanges shall be flat faced ANSI Class 125. Flange gaskets shall be full-faced, 1/8-inch thick rubber.

(7) Flanged pipe shall be shop fabricated to the exact lengths required so that no field cutting or threading is required, except where flanged coupling adaptors are specified.

(8) Bolts and nuts for all underground connections shall be low alloy steel in accordance with the ASTM A193 Class B or AWWA C111 such that the bolts are cathodic to the coupling. Bolts and nuts for aboveground connections shall be either low alloy steel as specified above or cad-plated bolts in accordance with ASTM A307 Grade A or B. Bolts and nuts inside valve boxes and submerged or damp locations shall be 304 stainless steel.

(9) Where Ductile Iron or Cast Iron Pipe and Fittings are buried, the pipe and fittings shall be encased with polyethylene film conforming to AWWA C105.

d. PIPE FINDER TAPE: Pipe finder tape shall be a mylar encased aluminum foil bearing the words, "CAUTION: buried waterline below." Printing shall be under the mylar (reverse printed) so as to be readable through the clear mylar. Surface printing on the tape is not acceptable. The tape shall be blue in color, 2 inches wide, Lineguard Detectable Marking Tape, Type 3 Allen Systems, Inc. Detecto-Tape, or equal.

e. LOCATION WIRE: Location wire shall be solid copper No. 10, insulated, soft drawn wire.

f. COPPER TUBING: Copper tubing shall be per ASTM B88, Type K. Soft annealed copper shall be used without fittings where buried or encased in concrete. Size as specified on the Plans or in these Specifications shall be OD of the tubing. End connections shall be compression style.

g. GALVANIZED STEEL PIPE (GSP):

(1) Galvanized steel pipe shall be hot dip galvanized, standard weight (Schedule 40) conforming to ASTM A120, unless otherwise approved by the CSA. Fittings shall be hot dip galvanized malleable iron Class 150 conforming to ASTM A388 and ANSI B16.3. Connections shall be threaded in accordance with ANSI B2.1, Pipe Threads, unless otherwise approved by the CSA.

(2) A coating shall be applied to the exterior surfaces of all buried galvanized steel pipe and fittings. The coating shall be conformable polyethylene-backed butyl tape, 35 mils thick, such as Polyken 930 manufactured by the Polyken Division of the Kendall Company, Chicago, Illinois; Tapecoat Company, Inc., Evanston, Illinois; or equal. The surface preparation, type of primer and application, and application of tape, including the amount of lap, shall be in accordance with the recommendations of the coating manufacturer.

h. SERVICE SADDLES: Service saddles shall be all brass or bronze when used on PVC pipe, 360-degree support around the pipe. Service saddles for blow-off assemblies and for use on ductile iron pipe shall have ductile iron bodies with two Type 304 stainless steel straps. All service saddles shall be designed for use on PVC pipe or DI pipe, whichever is being used. Brass or bronze service saddles shall be Mueller, Ford, or equal. Service saddles for blow-off assemblies shall be Romac 202S, Ford, or equal.

i. GATE VALVES, TWO INCHES AND LARGER: Gate valves, two inches and larger, for use on PVC, DI and GSP piping shall be 125-pound, totally encapsulated disk, solid wedge resilient seat valves, with non-rising stem, open to left, and have O-ring seals. Exposed valves shall have handwheel operators. Buried valves shall have two-inch square wrench nuts. The valves shall be Mueller, Waterous, or equal, and conform to AWWA C509. Buried gate valves shall be wrapped in polyethylene film pursuant to AWWA C105.

j. VALVE BOXES AND MISCELLANEOUS BOXES: Valve boxes and miscellaneous boxes shall be provided for all valves placed underground. Boxes shall be traffic rated with cast iron ring and cover and concrete main body, Brooks Products, Inc., No. 1-RT, Christy G-5, Cook Concrete Products No. 10T12, or equal. Boxes shall be furnished with 8-inch PVC pipe (SDR 35 MIN) extension sleeves. The lid shall be marked "WATER." The bottom of valve box extensions shall be centered and cut to fit the valve and then sealed with polyurethane foam, mortar, or other approved sealant to prevent soil migration into the box extension.

k. GATE VALVES, EXPOSED, TWO INCHES AND SMALLER: Gate valves, exposed, two inches and smaller, shall be 125-pound, wedge disk type, with non-rising stem, screwed connections, furnished with handwheel operators. Valves shall be bronze and shall open left. The valves shall be Powell No. 207, Crane No. 438, or equal. Use only bronze valves on copper piping.

l. BURIED BUTTERFLY VALVES: Buried butterfly valves shall be tight closing, rubber seated, Class 150, in conformance with AWWA C504 and shall have a cast iron body and disk construction with stainless steel shafts and bearings requiring no lubrication. Valve ends shall be flanged mechanical joint or push on joint. Flanges shall have 125-pound facing and drilling. Valves shall be complete with a sealed reducing-type underground operator and 2-inch square operating nut. Valve operators shall be capable of withstanding an overload input torque of 450 foot pounds at full open or closed position without damage to the valve or valve operators and shall require 48 turns to change the valve setting from full open to full closed and shall be Dresser Model 450, Mueller Line Seal III, or equal.

m. EXTENSION STEMS: Extension stems shall be provided for all buried valves set deeper than 3 feet to the operating nut. Extension stems shall be a minimum of 1-1/2 inches in diameter. Extension stems shall be Schedule 40 steel pipe, with a welded plate box at the bottom which fits over the valve operation nut, a set screw to secure the bottom box to the valve nut, have a 2-inch operating nut welded to the top of the stem, and extend to within 12 inches of the ground surface.

n. CORPORATION STOPS: Corporation stops shall be bronze, full bore, sized per service line Mueller, Ford, Jones No. J-3403, or equal. End configurations shall be IPS, flare or pack joint.

o. WATER METERS: Water meters for individual services shall be a Sensus Model SRSG, or approved equal, complete with one meter coupling on the outlet for adapting to IPS pipe. Meters shall all read in gallons or cubic feet as specified by the CSA.

p. ANGLE METER STOPS: Angle meter stops shall be bronze, as manufactured by Ford, Jones, Mueller, or equal, complete with padlock wings, flare nut suitable for copper tubing, and meter coupling nut and gasket for meters specified above.

q. METER BOXES: Water boxes for meters shall be as follows:

TABLE 7-6
WATER BOXES

METER SIZE	NOTE	BOX SIZE MINIMUM I.D.	COOK CONCRETE* BOX/VAULT #	Christy* Box/Vault #
5/8"x3/4"	(a)	10¼"x17¼"	B0.75	B9W/B9G Lid
1"	(a)	12"x20"	B1.0	B12 W/B12G Lid
1½"	(a)	13¼"x24"	B1.5	B30 W/B30G Lid
2"	(a)	17"x30"	B2.0	B36 W/B36G Lid
3"	(b)	30"x48"	B4.0	B48
4"	(b)	30"x60"	B5.0	B52
6"	(b)	48"x78"	V4.0 6.5	R37P

*or approved equal

Notes:

(1) Reinforced concrete cover with 5"x8" cast iron hinged reading lid.

(2) Steel checker plate lids with 5"x8" or 10" round self closing reading lid centered over meter register. For 3" and 4" meters a two piece lid is required. For 6" meters a four piece lid is required.

(3) Vault design for meters and associated equipment larger than 6" require the approval of the CSA. Size and depth should be adequate to allow access for maintenance and/or meter removal.

(4) Vault design for combination domestic/fire detector meters shall meet manufacturers recommendations and shall require the approval of the CSA.

(5) H-10 steel traffic lids shall be required for any box in driveways, parking areas, shoulders or areas with rolled curb.

r. COMBINATION AIR RELEASE AND VACUUM VALVES: Combination air release and vacuum valves shall have cast iron bodies and covers and stainless steel floats, float guides, bushings, and level pins of stainless steel or bronze. Valves shall be designed for operating service to 300 psi, and shall be APCO, Crispin, or approved equal.

s. COMBINATION AIR VALVE (CAV) ENCLOSURE/BOX: Combination air valve (CAV) enclosure/box shall be as follows:

Case 1 - **Above Grade Enclosure** - See Standard Detail W-21. (Available from Cook Concrete Products with precast concrete slab, or other fabricators)

Case 2 - **Below Grade Box**

TABLE 7-7
BELOW GRADE BOXES

VALVE SIZE	NOTE	BOX SIZE MINIMUM I.D.	COOK CONCRETE* BOX #	CRISTY* BOX #
2", 3" & 4"	(a,c)	17"x30"	B2.0	B36
6" & 8"	(b,c)	30"x48"	B3.0	B48

* or approved equal

Notes:

(1) For 2", 3" & 4" valve box a one piece lid shall be required.

(2) For 6" & 8" valve box a two piece lid shall be required.

(3) Lids shall be solid reinforced concrete marked "Water," except when boxes are in driveway traffic areas or next to rolled curb and gutter, where H-10 steel traffic lids are required.

t. BACTERIOLOGICAL SAMPLING STATION ENCLOSURE: Bacteriological sampling station enclosure shall be as follows:

(1) See Standard Detail W-13 for Materials and Plumbing Installation.

(2) See Standard Detail W-14 for Materials and Enclosure Design.

u. BACKFLOW DEVICE ASSEMBLY BOXES, VAULTS: Backflow device assembly boxes and vaults shall be as follows:

Double Check (DC)

* Carson Industry Box No. 1419-13 w/No 1419-3 lid - ¾" or 1" (DC)
* Carson Industry Box No. 1320-13 w/No 1320-3 lid - 1½" or 2" (DC)
* Carson Industry Box No. 1730-12B and lid - 3" or 4" (DC)
* Cook 6U vault or Christy R37 pit w/approved lid by Water Utility - 6" or 8" (DC)
* or equal

Single Check (SC)

Christy B-40 w/B40D or equal.

v. BLOWOFF VALVE BOXES: Blowoff valve boxes for blow-off assemblies shall be Cook No. 2.0 meter boxes, Christy B36, or equal.

w. FIRE HYDRANTS:

(1) Fire hydrants shall be waterous Pacer WB67, with oil reservoir, bronze seat ring, weather shield and bronze nut, mechanical attached nozzles, Mueller Super Centurion 200, Kennedy Guardian K-81A, or equal, equipped with chained nozzle caps. The fire hydrants shall have a five and one-quarter inch minimum hydrant valve, two 2-1/2-inch hose nozzles, and one 4-1/2-inch steamer nozzle. The operating nut shall be a 1-inch pentagon nut. The hose and steamer nozzles, operating nut, and direction of opening shall be per National Standard Specifications. The hydrant shall have a 42-inch bury to the bottom of the connecting pipe and shall have an automatically operated stop and drain. Fire hydrants shall conform to AWWA C502.

(2) A 6-inch diameter lateral and gate valve conforming to these Specifications shall be provided from the main waterline to each hydrant.

x. FLANGED COUPLING ADAPTERS (FCA) AND FLEXIBLE COUPLINGS (FC):

(1) Flanges coupling adapters (FCA) and Flexible Couplings (FC) shall be of the style and type recommended by the manufacturer and approved by the CSA. Steel couplings shall be fusion epoxy lined and coated (8 mil minimum thickness). All couplings shall be supplied with low alloy steel nuts and bolts per AWWA C111 or equal. Flanged coupling adapters shall be furnished and installed with adequately sized thrust protection anchor bosses and anchor studs unless thrust is restrained by concrete thrust blocks. The pipe shall be drilled for installation of the studs. Flanged coupling adapters and flexible couplings shall be sized to be compatible with the pipe on which they are to be installed and shall be as manufactured by Dresser, Rockwell, or equal.

(2) Buried flanged coupling adapters and flexible couplings shall be wrapped with polyethylene film per AWWA C105.

2. Workmanship

a. All work shall conform to Plan details, the Standard Water System Details and the manufacturer's recommendations.

b. Materials shall be handled in a manner that will not damage the material or its coating. Before installation, each article shall be inspected, and any damaged material discarded. Any damaged coating shall be repaired.

c. The interior and ends of the pipe and appurtenances shall be clean. When it is necessary to cut pipe, such cuts shall be neatly made.

d. Pipe and fittings shall be installed in strict conformance with the manufacturer's recommendations. Maximum pipeline joint deflections and minimum curve radii shall conform to these Standards and with published tables prepared by the manufacturers. Additional vertical angle fittings shall be installed where required to maintain conformance with the manufacturer's published tables on maximum pipeline joint deflections and minimum curve radii. Up to one additional coupling per 20-foot length of PVC pipe or in 18-foot length of DI pipe may be installed in lieu of an additional vertical fitting, provided the installation is in compliance with the manufacturer's recommendations.

e. Pipes shall be laid with the bell end ready to receive the next pipe. Bell holes shall be dug and the trench bottom graded such that the pipe is supported along the barrel and not the bell.

f. In addition to exercising extreme care to keep the inside of the pipe clear of dirt and debris during installation, temporary plugs shall be inserted or placed over all ends of the pipe except during periods of continuous observation such as during pipeline installation.

g. PIPE CUTTING: All pipe shall be cut to fit accurately without damaging the pipe or lining and so as to leave a smooth end at right angles to the axis of the pipe.

h. PIPE THREADS: Pipe ends shall be reamed to the full bore of the pipe. Threads shall conform to ASNI B2.1. In making up threaded joints, an accepted thread lubricant shall be applied to the male threads only.

i. PIPE JOINTING: Pipe jointing for cast iron pipe shall conform to SS 306-1.2.6 and 306-1.2.8, respectively. Pipe jointing for PVC pipe shall conform to SS 306-1.2.9 or 306-1.2.10, as applicable.

j. METALLIC PIPE COVERINGS: All buried ductile iron pipe, fittings, and valves shall be wrapped with polyethylene film per AWWA C105. All galvanized iron pipe shall be tape wrapped pursuant to the description under Materials in this section.

k. FLANGED JOINTS: Flanged joints shall be square and watertight with even pressure on the gaskets.

l. WATER SYSTEM TESTING: Upon completion of the installation of the water mains and appurtenances and all parts of the system shall be pressure tested in the presence of a representative of the CSA. Each section of water main between line valves shall be tested separately by closing the adjacent line valves and bringing the isolated section up to a test pressure that will cause the pressure at the lowest point in the isolated section to be at least 150 pounds per square inch or 50 pounds per square inch above the maximum working pressure, whichever is greater, and maintain at least that pressure for a minimum of one hour. At the end of the test period, the test pressure shall be at least equal to the starting test pressure in order to properly determine any leakage.

m. Leakage shall not be in excess of 2 gallons per inch of diameter per 1,000 feet of pipe per 24 hours. Leakage shall be determined by pumping into the closed system from a barrel and maintaining the required pressure or by other means approved by the CSA. Where leakage is in excess of the specified rate, the amount of leakage shall be reduced to a quantity within the specified rate before the installation is accepted. In addition, all visible leaks shall be repaired.

n. Where interconnections are made between an existing and a new system at other than existing isolation valves the interconnection piping between the existing system and the first new isolation valve will not have to be pressure tested. However, when these interconnections are made and pressurized, any noticeable leaks shall be corrected.

o. Where the new system interconnects to an existing system at an existing isolation valve, the new system shall be either tested against the existing isolation valve or against a temporary thrust protected blind flange, cap or plug within 15 feet of the existing valve to test against.

p. If the second option is used the final connection to the existing valve after the pressure test is completed will not have to be tested but any noticeable leaks shall be corrected.

q. All Class 200 or SDR 14 8-inch piping shall be tested at 200 psi.

r. STERILIZATION FOR COMPLETED WATERLINES: Sterilization for completed waterlines shall be done per AWWA C651-86, Section 5.2, Continuous Feed Method. Once the water system has been successfully hydrostatically tested, it shall be flushed of all dirt and debris. Following adequate flushing, the entire system shall be chlorinated by one of the following methods: sodium hypochlorite or calcium hypochlorite and water mixture. Chlorinating agent shall be applied at the beginning of the section adjacent to the feeder connection and shall be injected through a corporation cock, hydrant, or other connection ensuring treatment of the entire line. Water shall be fed slowly into a new line with chlorine applied in amounts to produce a residual of not less than ten parts per million in all parts of the line for a period of not less than 24

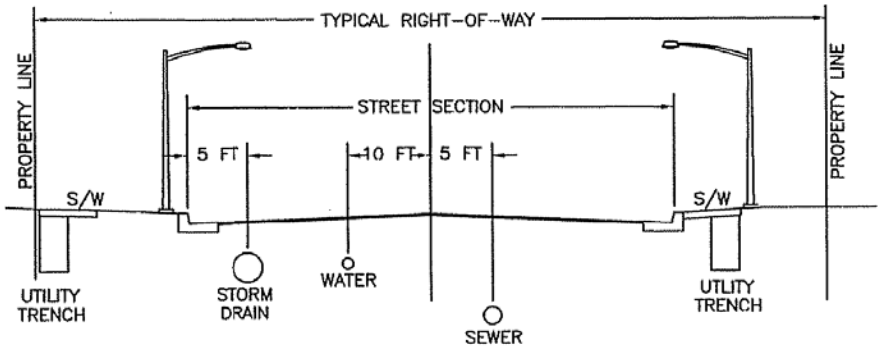
hours. During the chlorination process, all valves and accessories shall be operated.

s. The tablet method of applying the chlorine as specified in AWWA C651-86 may be used. If this method does not provide adequate disinfection, chlorine shall be applied by one of the above described methods until acceptable bacteriological tests are obtained.

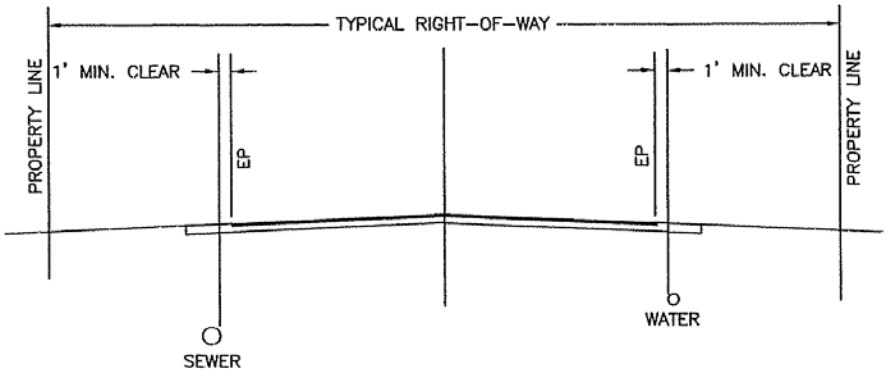
t. After chlorination, the water shall remain in the pipeline, or be diluted until the chlorine residual has dropped to below two parts per million before it is flushed from the extremities of the system. Furthermore, it may be necessary to land apply the chlorinated water or otherwise dechlorinate the water in order to discharge it to any storm drain, drainage channel or surface water where damage could occur to fish or other aquatic life or in violation of any governmental laws or regulations. All of the pipeline shall then be drained and refilled with a bacteriologically acceptable water supply. The new pipeline shall then be tested for bacteriological acceptability as determined by a minimum of four test samples for coliform bacteria taken from CSA selected points in the pipeline. If such tests indicate contamination, the pipeline shall be disinfected again.

u. At connections to the existing system where some sections of piping cannot be reasonably disinfected in the normal procedure, all new pipe, fittings, etc. shall be sprayed or swabbed inside and out with a strong (one to five percent) chlorine solution prior to installation and installed in a sanitary manner so as not to contaminate the system. Should contaminants such as dirt or dirty water be allowed to enter the existing piping, the existing water system shall be flushed and disinfected as required by the CSA.

FIGURE G–1



URBAN



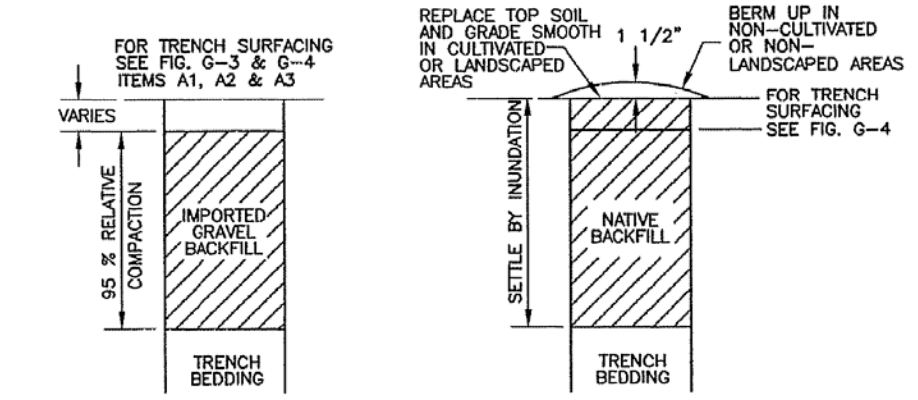
RURAL

SCALE: NTS	DATE: JUNE 1996	• SHASTA COUNTY SERVICE AREAS •	
		APPROVED BY: William E. Lyman	UTILITY LOCATIONS
MARK / DATE	REVISION	WILLIAM E. LYMAN	

FIGURE G--2

NOTES:

1. CONCRETE FOR ENCASING PIPE SHALL BE CLASS 420–C–2000.
2. BEDDING MATERIAL FOR ALL PIPE INCLUDING DUCTILE IRON SHALL BE GRAVEL OR CRUSHED ROCK AND SHALL HAVE A MAXIMUM SIZE OF 3/4" AND BE REASONABLY GRADED FROM COARSE TO FINE WITH A MINIMUM SAND EQUIVALENT OF 28.
3. IMPORT GRAVEL BACKFILL SHALL BE STREAM GRAVEL OR CRUSHED ROCK AND BE REASONABLY WELL GRADED FROM COARSE TO FINE WITH A MAXIMUM SIZE OF 3" AND A MINIMUM SAND EQUIVALENT GREATER THAN 28.
4. ON ALL CONCRETE ENCASED PIPES, PIPE SHALL BE SUPPORTED ON CONCRETE BLOCKS, GROUT PADS, OR BY OTHER APPROVED METHOD. TWO SUPPORTS SHALL BE REQUIRED PER JOINT OF PIPE. CARE SHALL BE TAKEN NOT TO FLOAT PIPE WHILE PLACING CONCRETE.
5. SERVICE LATERALS TO HAVE SAME BEDDING AND BACKFILL AS MAINS.
6. FOR CONC ENCASED PVC PIPE USE VERTICAL (METAL OR PLASTIC) SHEET IN TRENCH TO FORM CONTROLLED JOINT AT COUPLINGS AT MAXIMUM SPACE OF 10' ON CENTER. WRAP COUPLING WITH 2" THICK INSULATION. CENTER SHEET ON COUPLING.

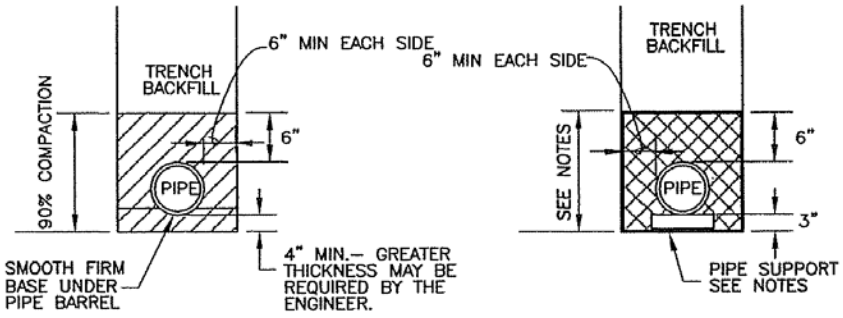


FOR TRENCH IN R/W WHERE NATIVE MATERIAL HAS A SAND EQUIVALENT OF LESS THAN 28

CLASS 'A'

FOR TRENCH NOT IN R/W AND NOT IN STREAMBED

CLASS 'C'

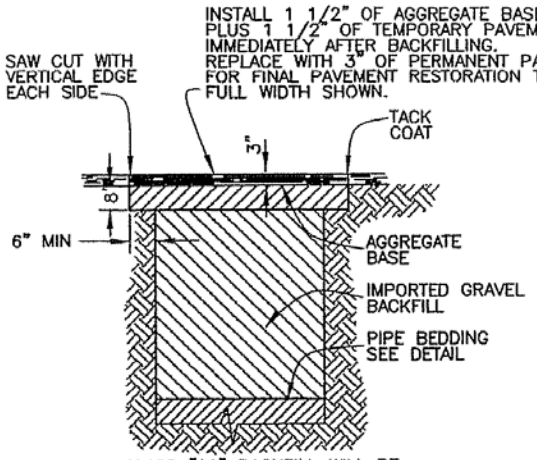


BEDDING

CONCRETE ENCASEMENT

SCALE: NTS	DATE: AUG 1996	• SHASTA COUNTY SERVICE AREAS •	
		APPROVED BY: William E. Lyman	TRENCH BACKFILL
MARK / DATE / REVISION		WILLIAM E. LYMAN	

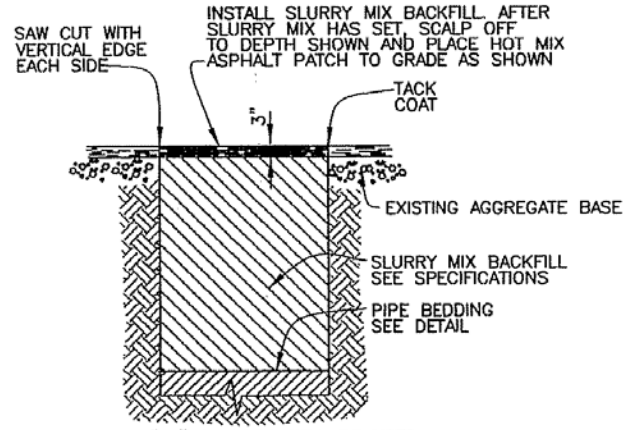
FIGURE G-3



CLASS "A1" BACKFILL WILL BE USED IN COUNTY ROADS WHERE PAVING IS LONGITUDINAL TO ROAD AND ACROSS DRIVEWAYS.

NOTE: WHERE REMAINING PAVING IS LESS THAN 1' WIDE AFTER TRENCHING, REMOVE AND REPLACE PAVEMENT TO EDGE OF EXISTING PAVING @ FULL THICKNESS.

CLASS 'A1' BACKFILL

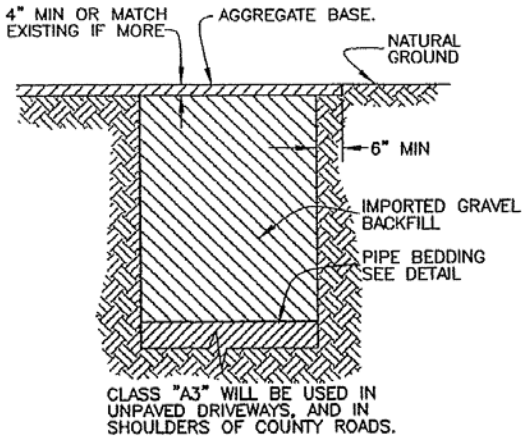


CLASS "A2" BACKFILL WILL BE USED IN ALL PAVED STREET CROSSINGS. IT MAY ALSO BE USED AT OTHER LOCATIONS IN LIEU OF CLASS "A1"

CLASS 'A2' BACKFILL

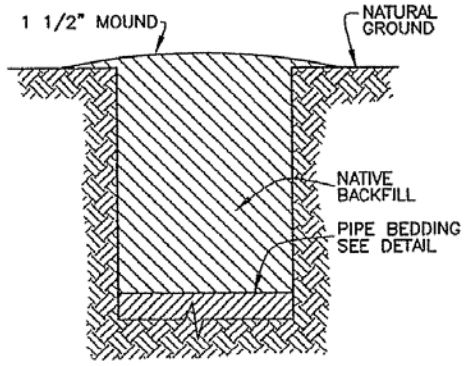
SCALE: NTS	DATE: JUNE 1996	• SHASTA COUNTY SERVICE AREAS •	
		APPROVED BY: William E. Lyman	TRENCH RESURFACING
MARK / DATE / REVISION		WILLIAM E. LYMAN	

FIGURE G–4



CLASS 'A3' BACKFILL

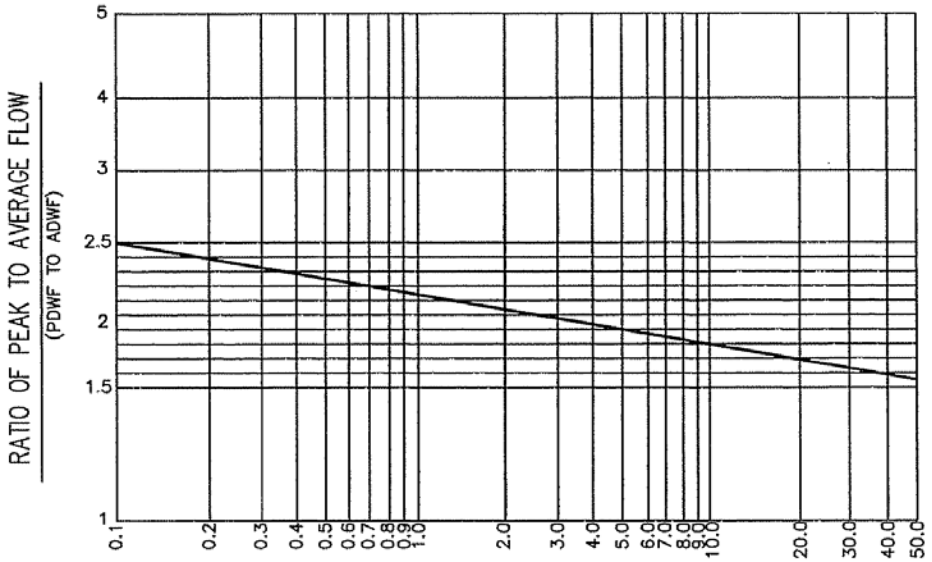
NOTE: WHEN IN CULTIVATED OR LANDSCAPED AREAS THE TOP 1' OF SOIL SHALL BE REPLACED WITH EXISTING OR IMPORTED TOP SOIL. THE SURFACE SHALL BE RE–LEVELED FOLLOWING INUNDATION AND TRENCH SETTLEMENT. LAWNS OR OTHER LANDSCAPING SHALL THEN BE REPLACED.



CLASS 'C' BACKFILL

SCALE: NTS	DATE: JUNE 1996	• SHASTA COUNTY SERVICE AREAS •	
		APPROVED BY: William E. Lyman	TRENCH RESURFACING
MARK / DATE / REVISION		WILLIAM E. LYMAN	

FIGURE
S-1



SEWAGE FLOW PEAKING FACTORS

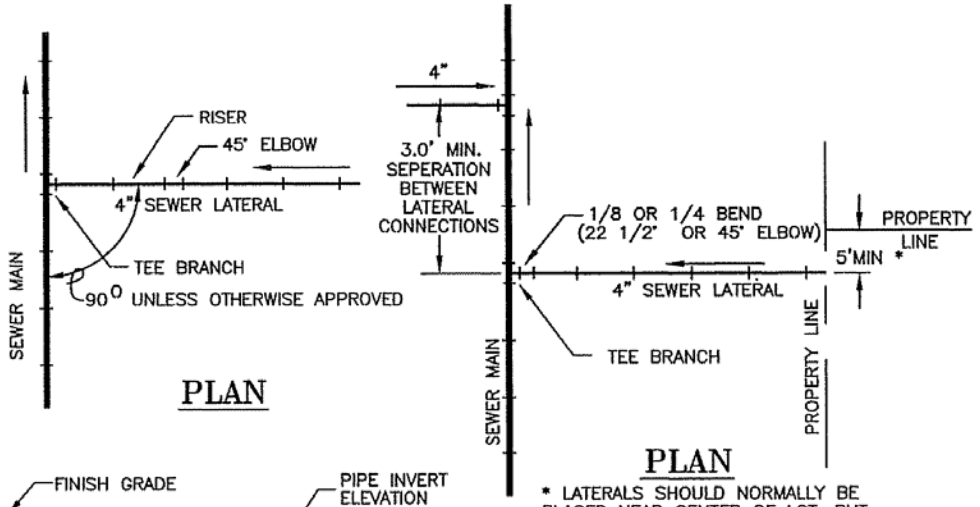
(DOES NOT INCLUDE I & I)

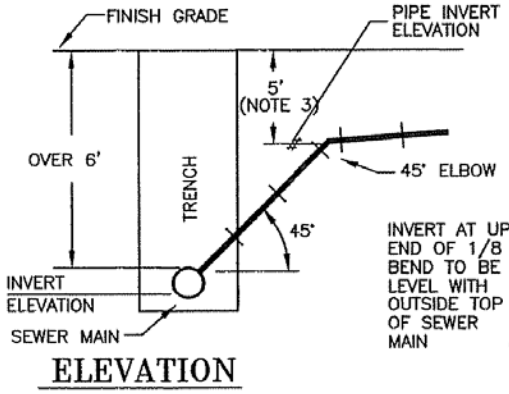
SCALE: NTS	DATE: JUNE 1996	• SHASTA COUNTY SERVICE AREAS •	
		APPROVED BY: William E. Lyman	PEAKING FACTORS
MARK / DATE	REVISION	WILLIAM E. LYMAN	

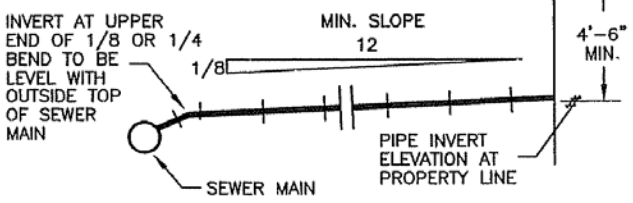
FIGURE S-2

NOTES:

1. 90° TAPS ARE ACCEPTABLE.
2. RISERS SHALL BE INSTALLED WHEN DEPTH OF SEWER EXCEEDS 6 FT.
3. VERTICAL INSTALLATIONS (STOVEPIPING) WILL NOT BE ALLOWED.
4. WHERE MAIN IS IN AN EASEMENT, INSTALL A TEE, PIPE BRANCH TO PROPERTY LINE, CLEANOUT AND PLUG.







TYP. HOUSE CONNECTION RISER

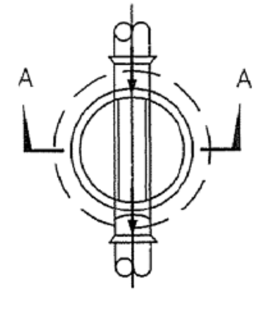
WHEN COVER OVER 6'

TYP. HOUSE CONNECTION

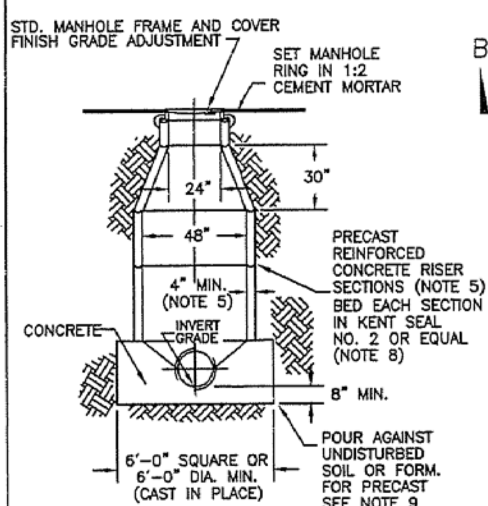
SCALE: NTS	DATE: JUNE 1996	• SHASTA COUNTY SERVICE AREAS •	
		APPROVED BY: William E. Lyman	TYPICAL HOUSE CONNECTION
MARK / DATE / REVISION		WILLIAM E. LYMAN	

NOTES:

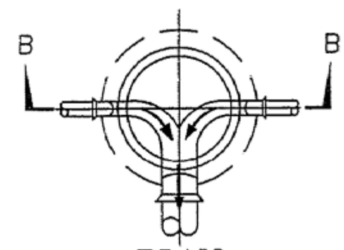
1. WHERE MANHOLES ARE NOT LOCATED IN STREETS OR TRAVELED WAY PLACE TOP OF MANHOLE 12" TO 18" ABOVE EXISTING GROUND UNLESS OTHERWISE SHOWN ON PLANS.
2. ALL CONCRETE USED IN MANHOLE BASE & COLLAR SHALL BE CLASS 520-C-2500.
3. ECCENTRIC TYPE CONC. CONE SECTION SHALL BE INSTALLED IN PLACE OF CONCENTRIC CONES WHEN DIRECTED BY THE COUNTY. WHEN ECCENTRIC CONE SECTION IS INSTALLED, THE VERTICAL WALL SHALL BE LOCATED DOWNSTREAM.
4. PIPE MAY BE LAID THROUGH A LINE MANHOLE EXCEPT WHEN A GRADE OR LINE CHANGE OCCURS. MINIMUM DROP THROUGH ALL OTHER MANHOLES SHALL BE THE DIFFERENCE IN DIAMETER IN UPSTREAM AND DOWNSTREAM PIPES OR 0.17 FT. WHICH EVER IS GREATER.
5. PRECAST REINFORCED CONCRETE PIPE SEGMENTS SHALL CONFORM TO ASTM DESIGNATION: C478-70 4" MIN. THICKNESS.
6. PRECAST REINFORCED CONCRETE MANHOLE RISER SECTIONS SHALL BE FORMED WITH MALE AND FEMALE ENDS.
7. PRECAST CONCRETE BASES MANUFACTURED BY COOK CONC. PRODUCTS OR TEICHERT AGGREGATE MAY BE USED IN LIEU OF POURED IN-PLACE BASES. PROVIDE 3" MIN COMPACTED & LEVELED SAND OR 3/4" MINUS GRAVEL UNDER PRECAST BASES.
8. ALL SEGMENTS SHALL BE BEDDED IN FLEXIBLE JOINT SEALANT: (KENT-SEAL NO. 2 OR EQUAL). A DOUBLE BEAD SHALL BE USED IF SEALANT IS 3/4-INCH OR 1-INCH DIAMETER. A SINGLE BEAD SHALL BE USED IF THE SEALANT IS 1 1/4-INCH OR GREATER DIAMETER.
9. ON CAST IN PLACE BASES USE CIRCULAR METAL FORM TO SHAPE FULL DEPTH GROOVE TO MATCH TONGUE ON RISER SECTION. BOTTOM OF GROOVE TO BE 1" MIN ABOVE TOP OF PIPE.
10. ON CAST IN PLACE BASES A RUBBER RING JOINT SHALL BE PROVIDED WITHIN 2 DIAMETERS OF BASE.



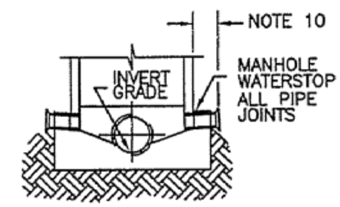
PLAN



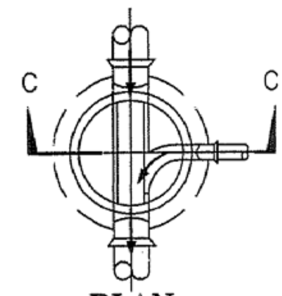
SECTION A-A



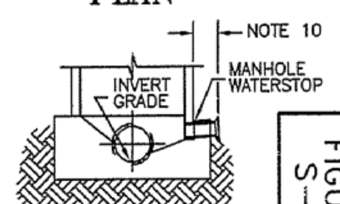
PLAN



SECTION B-B



PLAN

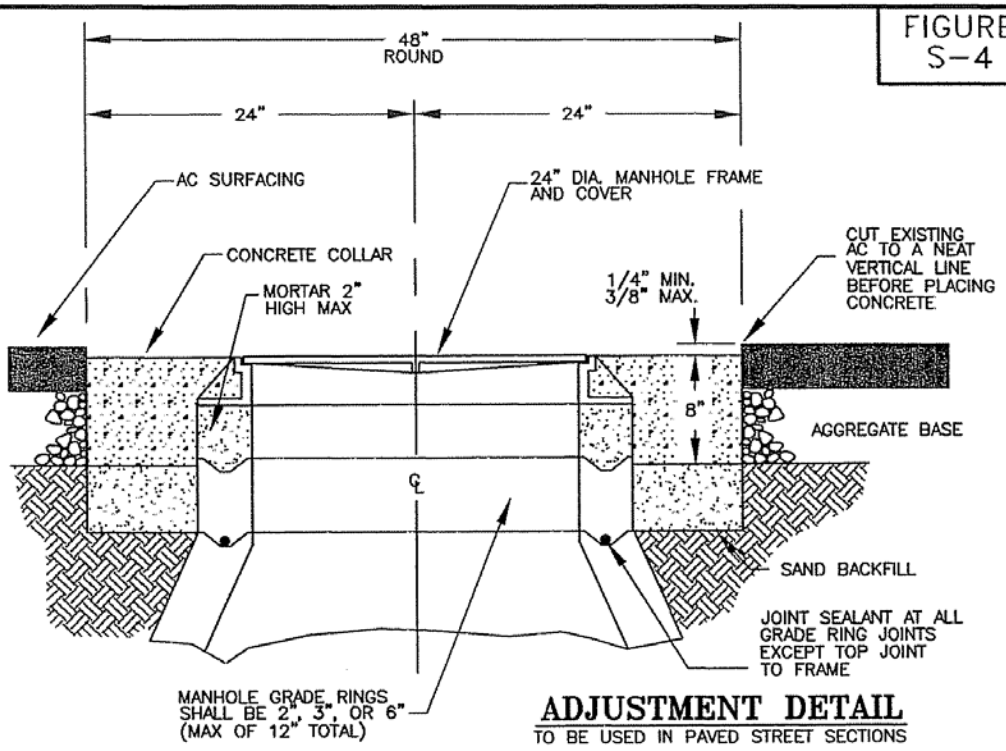


SECTION C-C

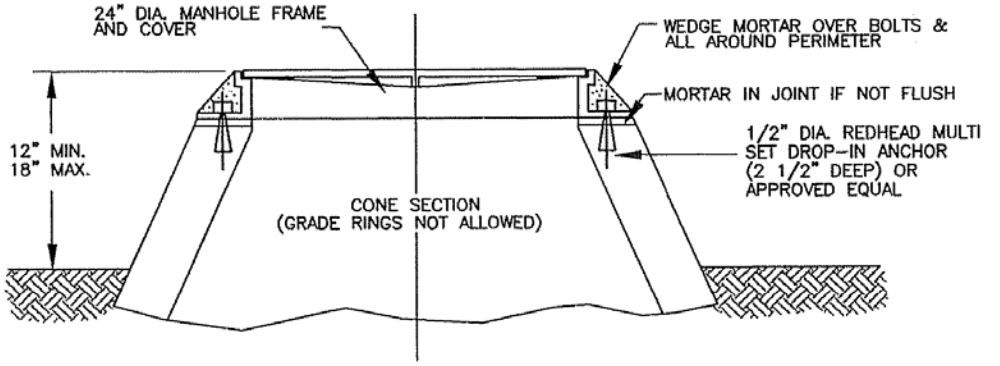
FIGURE S-3

SCALE: NTS	DATE: JUNE 1996	• SHASTA COUNTY SERVICE AREAS •
MARK / DATE / REVISION	APPROVED BY: William E. Lyman (signature) WILLIAM E. LYMAN	STANDARD 4 FT. SEWER MANHOLE

FIGURE S-4



ADJUSTMENT DETAIL
TO BE USED IN PAVED STREET SECTIONS



NOTE:

WHEN MANHOLES ARE IN SHOULDERS, THE SHOULDER SHALL BE PAVED TO EXTEND STREET GRADE WITH TAPPERED FLARES TO CONC COLLAR EXTENDING 20' ON EACH SIDE OF MANHOLE AND A MINIMUM OF 1' FROM THE MANHOLE LID.

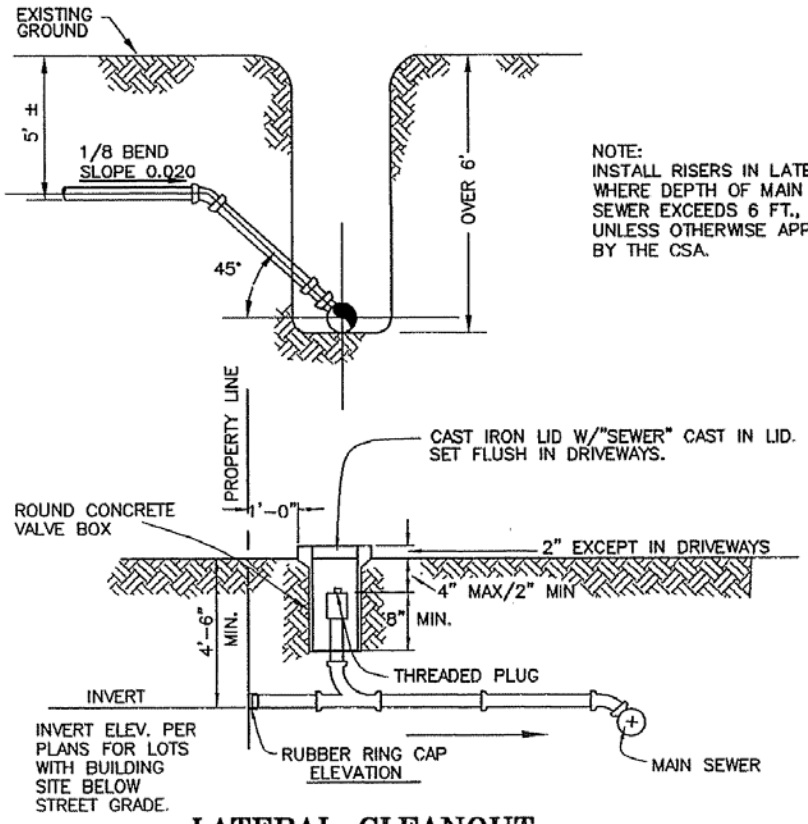
ADJUSTMENT DETAIL
TO BE USED IN UNIMPROVED AREAS
(SHOWING REQUIRED FRAME ASSEMBLY ANCHORAGE)

SCALE: NTS	DATE: AUG 1996	• SHASTA COUNTY SERVICE AREAS •	
		APPROVED BY: William E. Lyman	MANHOLE ADJUSTMENT AND ANCHORAGE DETAILS
MARK / DATE / REVISION		WILLIAM E. LYMAN	

FIGURE S-5

BACKFILL FOR SERVICE CONNECTION PIPE SHALL BE THE CLASS APPROPRIATE FOR THE SERVICE CONNECTION PIPE LOCATION.

SERVICE CONNECTIONS ARE 4--INCH--DIAMETER PIPE UNLESS OTHERWISE NOTED.



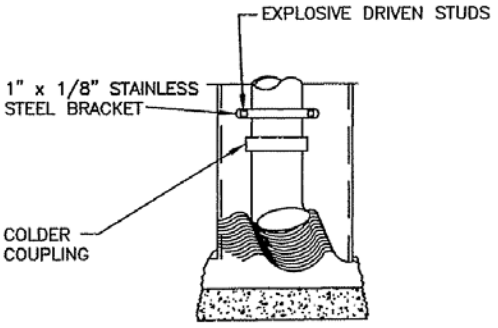
LATERAL CLEANOUT
NTS

SCALE: NTS	DATE: JUNE 1996	• SHASTA COUNTY SERVICE AREAS •	
		APPROVED BY: William E. Lyman	LATERAL CLEANOUT
MARK / DATE / REVISION		WILLIAM E. LYMAN	

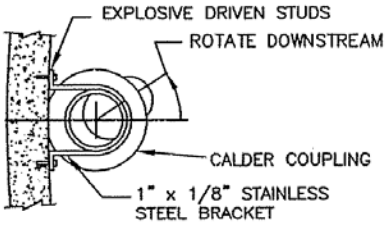
FIGURE S-6

NOTES:

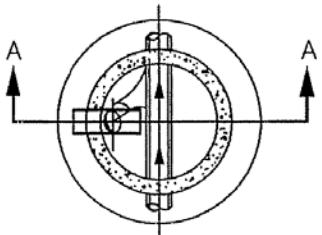
1. INSIDE DROP MANHOLES ALLOWED WHEN THE GRADE DIFFERENCE IS 6' OR MORE ON EXISTING FACILITIES OR WHEN DIRECTED BY THE ENGINEER.
2. THIS TYPE DROP MANHOLE CONSTRUCTION MAY BE UTILIZED ONLY WHEN 8" OR SMALLER PIPE IS USED.
3. VERTICAL PIPE SHALL BE 6" FOR BOTH 6" AND 8" INCOMING LINES. 4" VERTICAL PIPE MAY BE USED FROM 4" INCOMING LINES.
4. CAST IRON SOIL PIPE SHALL BE USED IN THE DROP SECTION OF THE MANHOLE. USE NO HUB TEES.
5. A CALDER COUPLING OR EQUAL SHALL BE USED ON THE JOINT IMMEDIATELY OUTSIDE THE MANHOLE.
6. A MINIMUM OF ONE STAINLESS STEEL BRACKET PER JOINT OF PIPE SHALL BE USED. A MINIMUM OF TWO BRACKETS SHALL BE USED PER MANHOLE INSTALLATION.



SECTION D-D

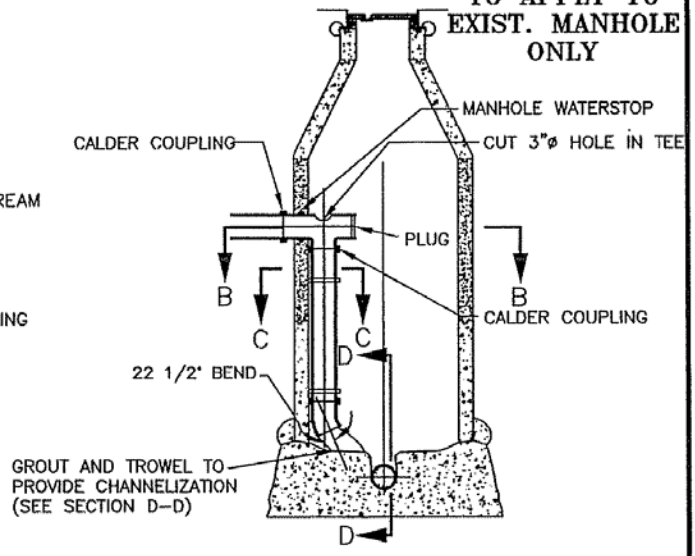


SECTION C-C



SECTION B--B

THIS STANDARD TO APPLY TO EXIST. MANHOLE ONLY



SECTION A-A

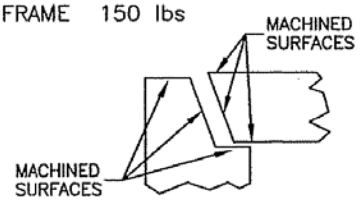
SCALE: NTS	DATE: JUNE 1996	• SHASTA COUNTY SERVICE AREAS •	
		APPROVED BY: William E. Lyman	STANDARD INSIDE DROP MANHOLE
MARK	DATE	REVISION	WILLIAM E. LYMAN

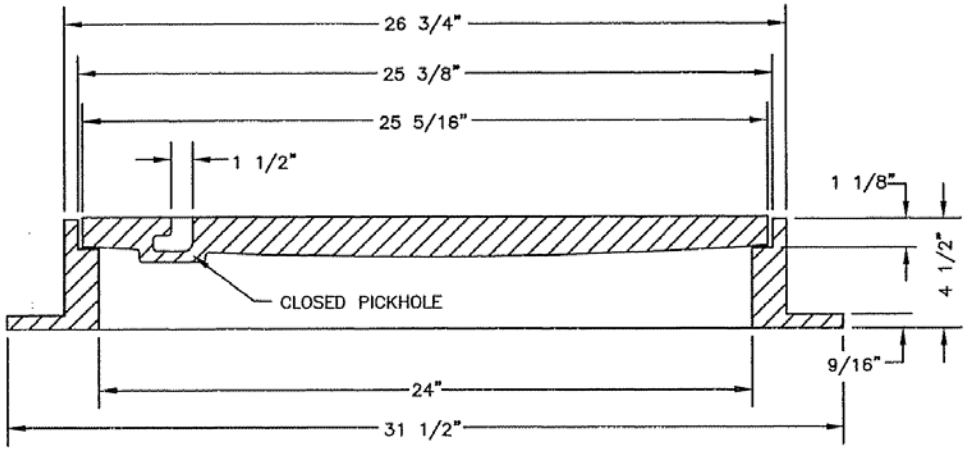
FIGURE S-7

ACCEPTABLE MANUFACTURERS

SOUTH BAY FOUNDRY
SFB 1900 CPH
COVER 130 lbs
FRAME 140 lbs

D AND L SUPPLY
D&L A-1024
COVER 130 lbs
FRAME 150 lbs





LID SECTION

NOTES:

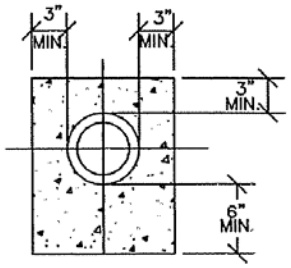
1. FRAME AND COVER FULLY MACHINED ON SURFACES AS SHOWN FOR PERFECT NO-ROCK, NO-STICK FIT.
2. STANDARD COVER MARKINGS "SANITARY SEWER". CASTING SHALL BE ORDERED WITH APPROPRIATE MARKING.
3. CASTING SHALL BE FURNISHED WITH BLIND PICKHOLES.
4. CASTINGS SHALL BE DIPPED IN ASPHALT PAINT.
5. ALL PARTS OF ACCEPTABLE ASSEMBLIES ARE INTERCHANGEABLE.

SCALE: NTS	DATE: JUNE 1996	• SHASTA COUNTY SERVICE AREAS •	
		APPROVED BY: William E. Lyman	24 INCH MANHOLE COVER ASSEMBLY (STREET TYPE)
MARK / DATE / REVISION		WILLIAM E. LYMAN	

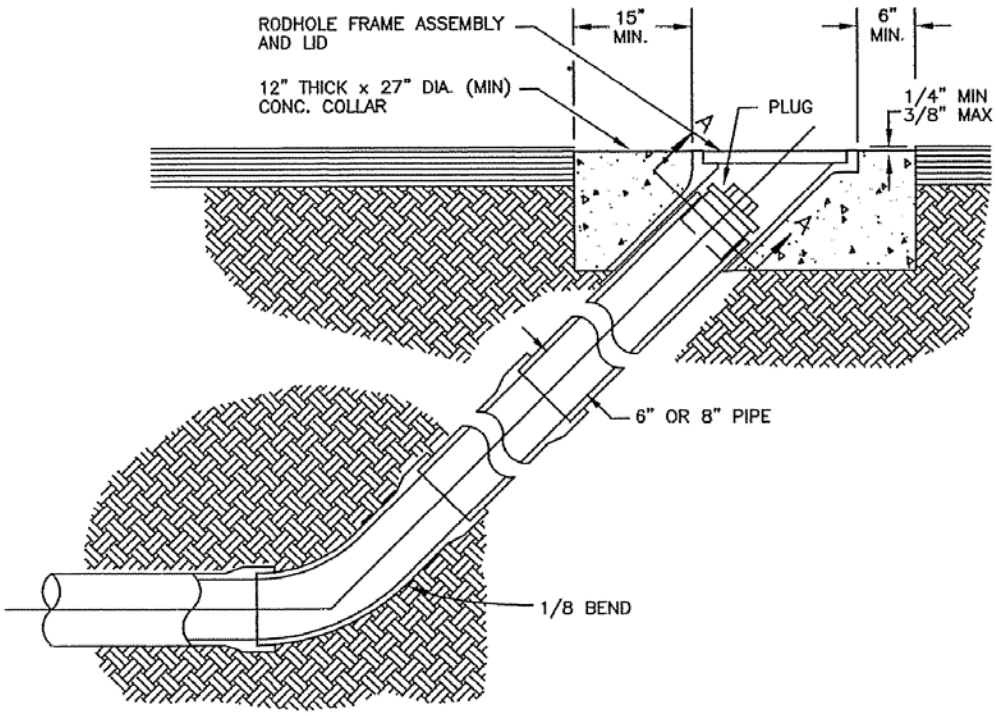
FIGURE S-8

NOTES:

1. ALL CONCRETE SHALL BE CLASS 520-C-2500.
2. CONCRETE COLLAR AROUND RODHOLE FRAME SHALL BE OVAL IN SHAPE TO MATCH FRAME ASSEMBLY.



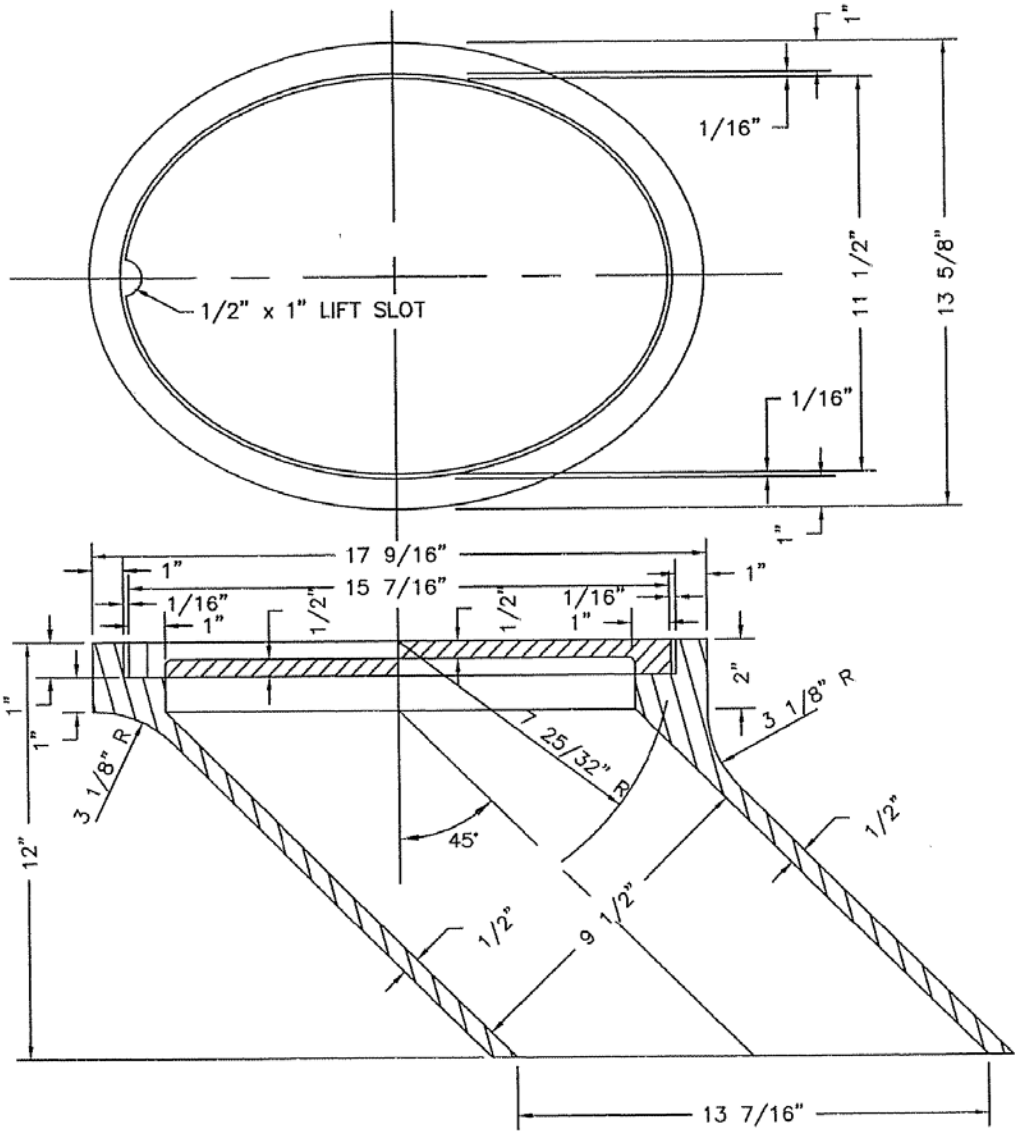
SECTION A-A



SCALE: NTS	DATE: JUNE 1996	• SHASTA COUNTY SERVICE AREAS •	
		APPROVED BY: William E. Lyman	RODHOLE INSTALLATION
MARK / DATE	REVISION	WILLIAM E. LYMAN	

FIGURE S-9

PINKERTON FOUNDRY NO. A-211 OR EQUAL.
FRAME PART NO. A-212 APPROX. WT. 104 LBS.
COVER PART NO. A-213 APPROX. WT. 22 LBS.



SCALE: NTS	DATE: JUNE 1996	• SHASTA COUNTY SERVICE AREAS •
	APPROVED BY: William E. Lyman	RODHOLE FRAME AND COVER ASSEMBLY (6" SLOPE TYPE)
MARK / DATE / REVISION	WILLIAM E. LYMAN	

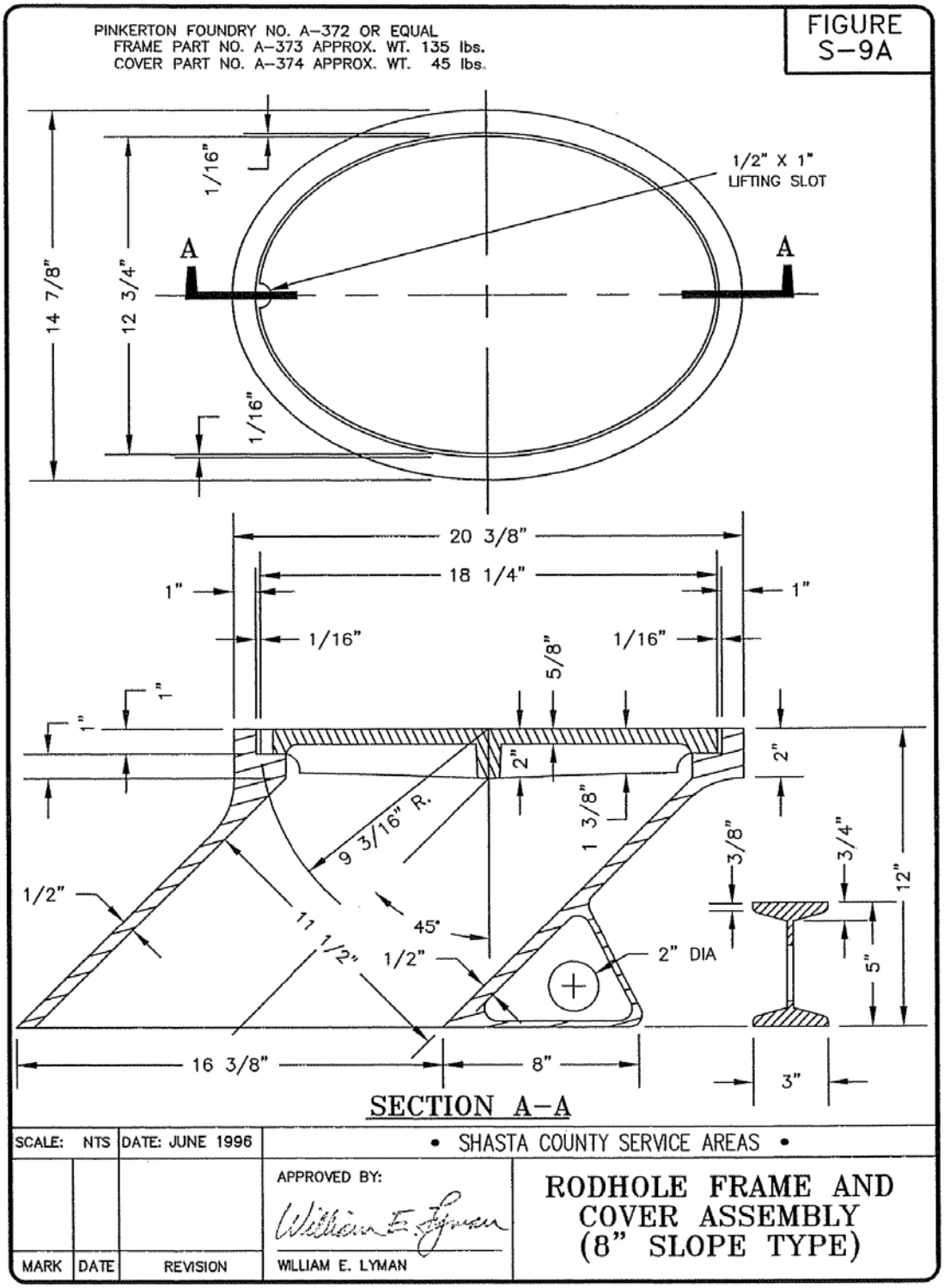
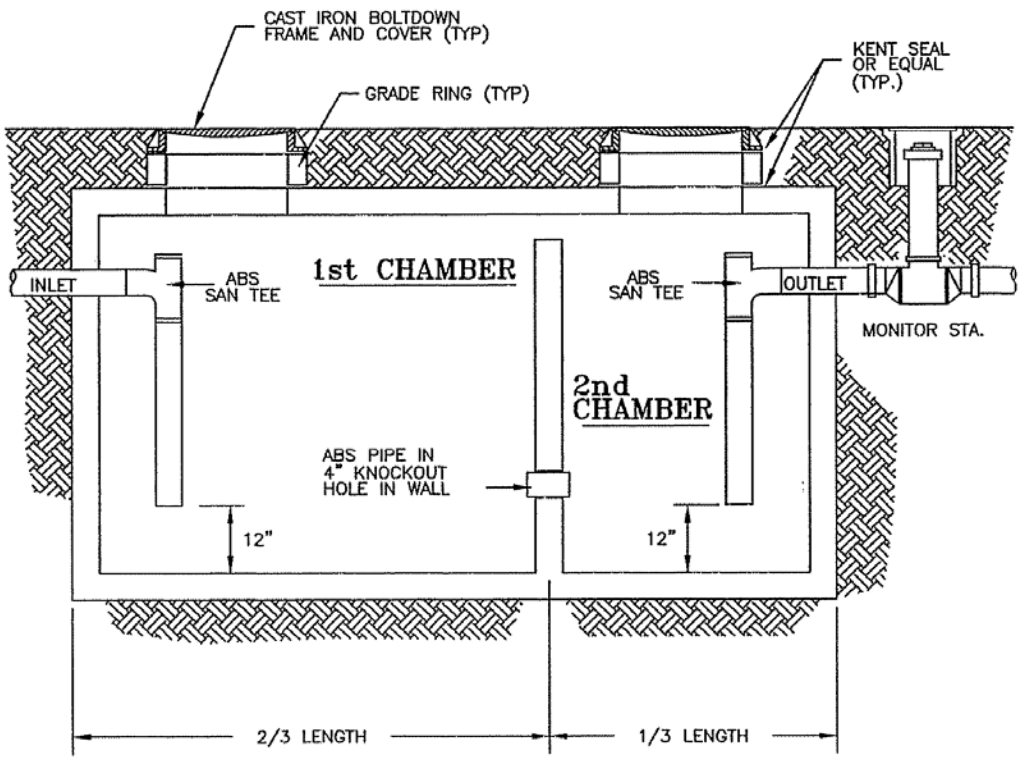

PINKERTON FOUNDRY NO. A–372 OR EQUAL
FRAME PART NO. A–373 APPROX. WT. 135 lbs.
COVER PART NO. A–374 APPROX. WT. 45 lbs.
FIGURE S–9A
1/2" X 1" LIFTING SLOT
A
A
14 7/8"
12 3/4"
1/16"
1/16"
20 3/8"
18 1/4"
1"
1"
1/16"
1/16"
5/8"
1"
1"
2"
2"
1 3/8"
9 3/16" R.
1/2"
11 1/2"
45°
1/2"
2" DIA
3/8"
3/4"
12"
5"
16 3/8"
8"
3"
SECTION A–A
SCALE: NTS
DATE: JUNE 1996
• SHASTA COUNTY SERVICE AREAS •
APPROVED BY:
WILLIAM E. LYMAN
MARK
DATE
REVISION
RODHOLE FRAME AND COVER ASSEMBLY (8" SLOPE TYPE)

FIGURE
S–10



SCALE: NTS	DATE: JUNE 1996	• SHASTA COUNTY SERVICE AREAS •	
		APPROVED BY: William E. Lyman	OIL AND GREASE INTERCEPTOR (OGI)
MARK / DATE	REVISION	WILLIAM E. LYMAN	

FIGURE S-10A

SHASTA COUNTY SERVICE AREA

OIL AND GREASE INTERCEPTORS (OGI)

REQUIREMENT:

Oil and Grease Interceptors are required for all industrial and for commercial food establishments where pretreatment of wastewater effluent is indicated as necessary to capture greases, oils, or food solids.

This standard applies to all new construction, tenant improvements, remodels, and existing systems which are in need of upgrading.

OGI's will be sized from industry submitted, certified food preparation facility survey information. The sizing criteria will follow the Uniform Plumbing Code (UPC) appendix H. The interceptor size (in gallons) will be established by the formula below.

SIZING CRITERIA:

(a) Parameters; The parameters for sizing a grease interceptor are hydraulic loading and grease storage capacity, for one or more fixtures.

(b) Sizing Formula; The size of the interceptor shall be determined by the following formula:

Number of meals per peak hour* X waste flow rate** X retention time*** X storage factor**** = interceptor size (liquid capacity)

* Meals Served at Peak Hour (or), Total Seating Capacity

** Waste Flow Rate:

a.	With dishwashing machine	6 gallon flow
b.	Without dishwashing machine	5 gallon flow
c.	Single service kitchen	2 gallon flow
d.	Food waste disposer	1 gallon flow

*** Retention Times

Commercial kitchen waste dishwasher	2.5 hours
Single service kitchen single serving	1.5 hours

**** Storage Factors

Fully equipped commercial kitchen	8 hour operation : 1 16 hour operation: 2 24 hour operation: 3
Single Service Kitchen	1.5

SCALE: NTS	DATE: SEPT 1996	• SHASTA COUNTY SERVICE AREAS •	
		APPROVED BY: William E. Lyman	OIL AND GREASE INTERCEPTORS (OGI)
MARK / DATE	REVISION	WILLIAM E. LYMAN	

FIGURE
S–10B

The minimum size OGI allowed by the County is 1250 gallons. For very large OGI requirements the maximum size required will be established on a case by case basis. Adjustments for extenuating circumstances will include establishment of an agreed upon OGI maintenance (pumping) schedule, between the facility owner/operator and the County.

DESIGN

All new construction and upgrades, having an OGI requirement, shall be constructed to include a sample monitoring station.

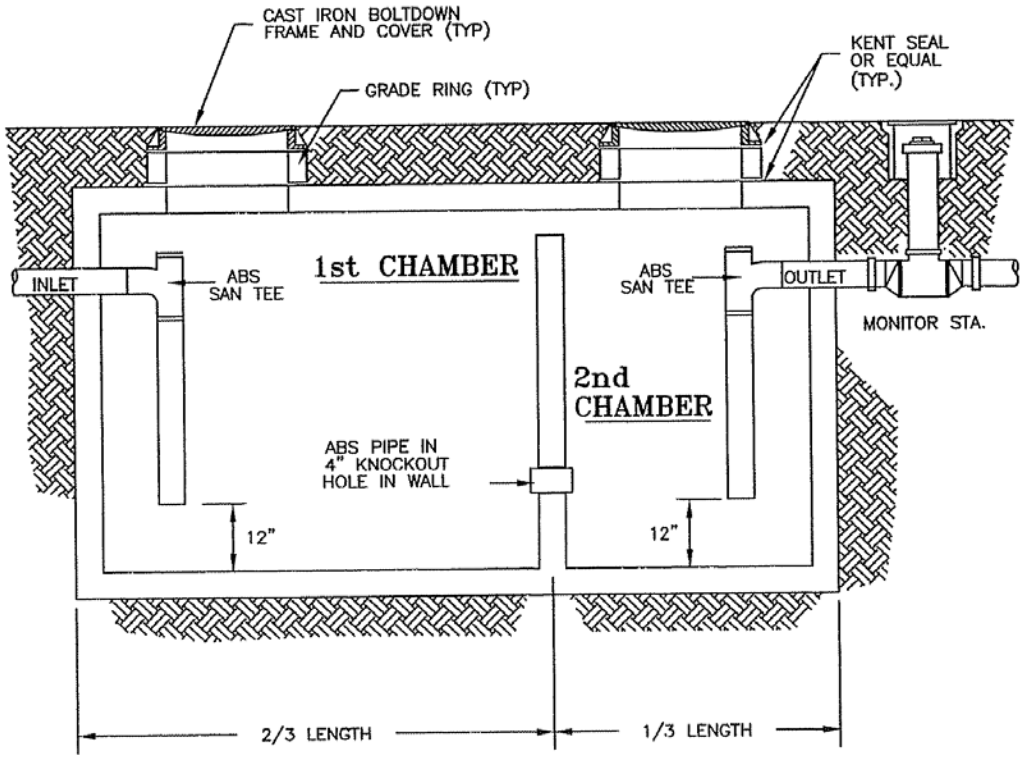
Facilities required to install OGI's and/or sample monitoring stations, shall install units of approved designs on file with the County Construction Standards.

If an existing undersized unit is structurally sound and installed properly, then, in lieu of replacing it with a larger unit, the owner may choose to install an additional unit in series with the existing unit to satisfy the total size capacity required.

All required OGI's shall be installed and properly maintained with all internal required plumbing of proper design and length in place at all times.

SCALE: NTS	DATE: SEPT 1996	• SHASTA COUNTY SERVICE AREAS •
MARK / DATE / REVISION	APPROVED BY: WILLIAM E. LYMAN	OIL AND GREASE INTERCEPTORS (OGI)

FIGURE
S–11



SCALE: NTS	DATE: JUNE 1996	• SHASTA COUNTY SERVICE AREAS •
		APPROVED BY: William E. Lyman WILLIAM E. LYMAN
MARK / DATE / REVISION		SAND AND OIL INTERCEPTOR (SOI)

FIGURE S-11A

SHASTA COUNTY SERVICE AREA

SAND AND OIL INTERCEPTORS (SOI)

REQUIREMENT:

Sand and Oil Interceptors are required for industrial and commercial establishments where pretreatment of wastewater effluent is necessary to capture solids (sand, silts etc.) or floatables (oils etc.).

This standard applies to all new construction, tenant improvements, remodels, and existing systems which are in need of upgrading.

SOI's will be sized from industry submitted, certified Industrial Waste Survey information or by County field inspection data. The sizing criteria will follow the Plumbing Code (UPC) appendix I-9. The UPC does not specify requirements for all specific applications; however, The basic formula may be easily adapted to differing applications or parameters.

SIZING CRITERIA:

(a) Parameters; The parameters for sizing the SOI units are hydraulic loading, retention time, and storage factor for one or more fixtures or industrial applications.

(b) Sizing Formula; The size of the SOI will be determined by use of the following formula:

Number of units washed per hour* X waste flow rate** X retention time*** X storage factor**** = interceptor size (liquid capacity)

* NUMBER of units washed per hour (ie.,auto's, engines, parts, etc.)

** Waste Flow Rate – gallons per unit cleaned (for intermittent use), or gallons per hour (for constant use)

*** Retention Times 2.0 hours

**** Storage Factors – vehicle/equipment/parts, etc. washing

a.	Self service/public	1.5 hours
b.	Employee operated automated/commercial	2.0 hours
c.	Other industrial/commercial applications	2.0 hours

The minimum size SOI allowed by the County is 100 gallons. Adjustments for extenuating circumstances will include establishment of an agreed upon SOI maintenance (pumping) schedule, between the facility owner/operator and the County.

SCALE: NTS	DATE: SEPT 1996	• SHASTA COUNTY SERVICE AREAS •	
		APPROVED BY: William E. Lyman	SAND AND OIL INTERCEPTORS (SOI)
MARK / DATE / REVISION		WILLIAM E. LYMAN	

FIGURE S-11B

DESIGN

All new construction and upgrades, where SOI's are required, such units shall be constructed to include a sample monitoring station.

Facilities required to install SOI's and/or sample monitoring stations, shall install units of approved designs on file with the County Construction Standards. The use of auxiliary or alternate pretreatment systems in conjunction with or in lieu of an SOI unit must be approved by the County prior to installation.

If an existing undersized unit is structurally sound and installed properly, then, in lieu of replacing it with a larger unit, the owner may choose to install an additional unit in series with the existing unit to satisfy the total size capacity required.

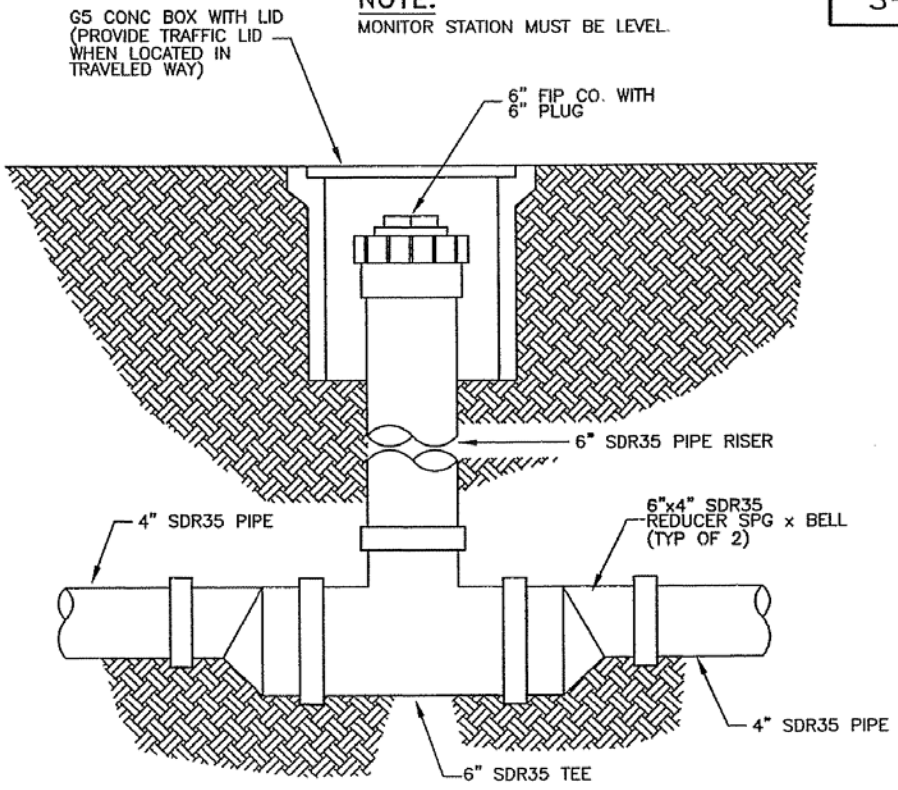
The standard SOI drawing (Figure S-11) applies to units of 100 through 1,500 gallon capacity. Units over 1,500 gallon capacity must have at least 3 compartments.

All required SOI's shall be installed and properly maintained with all internal required plumbing of proper design and length in place at all times.

SCALE: NTS	DATE: SEPT 1996	• SHASTA COUNTY SERVICE AREAS •	
		APPROVED BY: William E. Lyman	SAND AND OIL INTERCEPTORS (SOI)
MARK / DATE	REVISION	WILLIAM E. LYMAN	

FIGURE S-12

NOTE:
MONITOR STATION MUST BE LEVEL.



PARTS LIST

1	6" SDR35 TEE
2	6"x4" SDR35 REDUCER (SPG x BELL)
1	6" FIP COLLAR
1	6" PLUG
1	G5 CONC. BOX
1	G5 SEWER LID

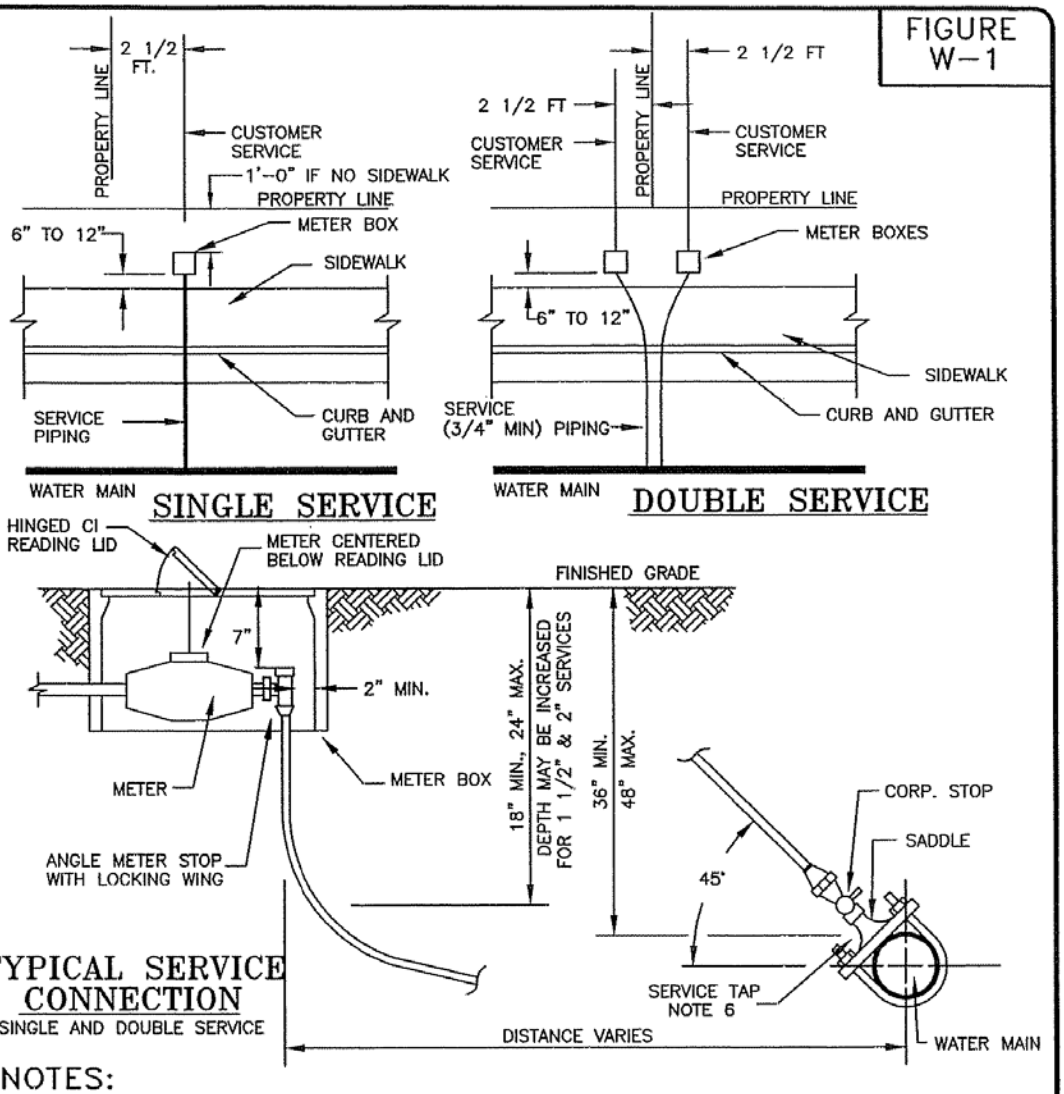
IF REQUIRED

1	4" ABS CPLG
1	4" ABS x SDR BUSHING

SCALE: NTS	DATE: JUNE 1996	• SHASTA COUNTY SERVICE AREAS •
		APPROVED BY: William E. Lyman
MARK / DATE / REVISION		WILLIAM E. LYMAN

INTERCEPTOR MONITOR STATION

FIGURE W-1



TYPICAL SERVICE CONNECTION

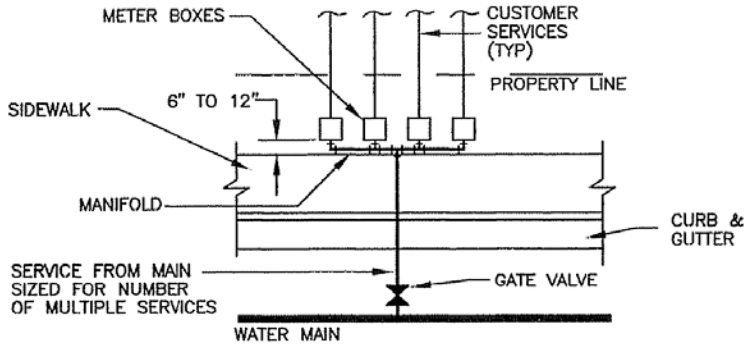
SINGLE AND DOUBLE SERVICE

NOTES:

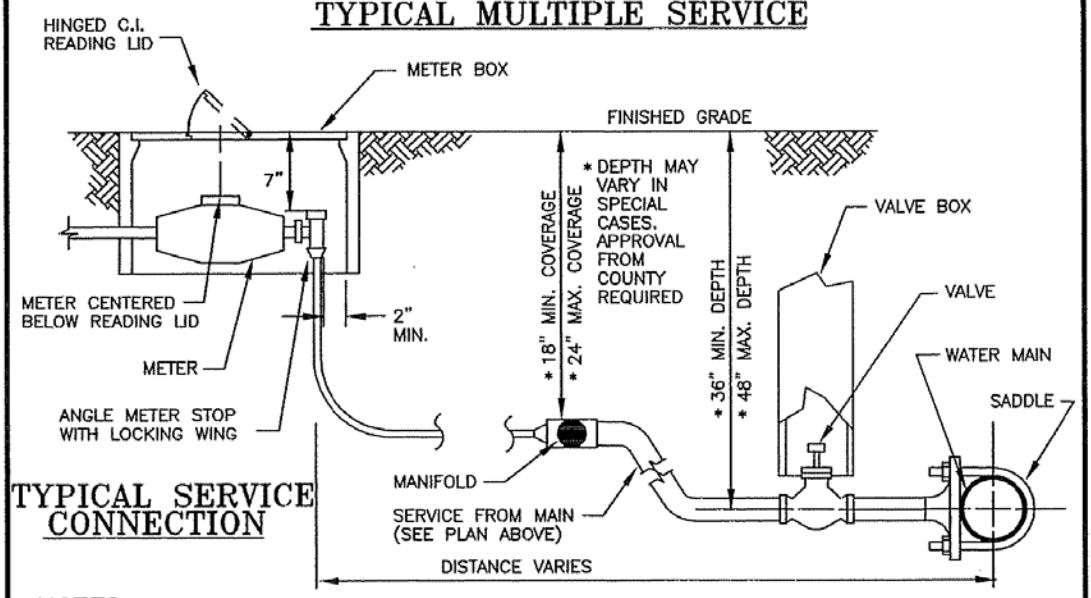
1. STANDARD METER SIZE SHALL BE 3/4" x 5/8", FOR 3/4" SERVICE.
2. OTHER SERVICE SIZES THRU 2" SHALL HAVE THE SAME SIZE METER AS THE SERVICE LINE SIZE INCLUDING FULL 3/4" SERVICE.
3. METER BOXES SHALL HAVE CONCRETE LIDS (STEEL TRAFFIC LIDS IN DRIVEWAYS, SHOULDERS, PARKING AREAS, OR AREAS WITH ROLL CURB) WITH HINGED CI. READING LIDS.
4. ANGLE METER STOP VALVE SHALL BE POSITIONED IN METER BOX SO THAT METER REGISTER WILL BE CENTERED UNDER READING LID.
5. METER BOXES AND SERVICE PIPING SHALL BE INSTALLED WITH A MINIMUM OF 2 1/2 FT. CLEARANCE FROM ALL ELECTRICAL TRANSFORMERS, LIGHT STANDARDS AND OTHER UTILITY BOXES OR VAULTS.
6. ONLY SERVICE TAPS FOR 1 1/2" AND 2" MAY BE TAPPED OTHER THAN AT A 45° ANGLE, BUT ONLY WITH PRIOR APPROVAL OF THE COUNTY.

SCALE: NTS	DATE: JUNE 1996	• SHASTA COUNTY SERVICE AREAS •	
		APPROVED BY: William E. Lyman	WATER SERVICE CONNECTION SINGLE / DOUBLE 3/4" THRU 2"
MARK / DATE	REVISION	WILLIAM E. LYMAN	

FIGURE W-2



TYPICAL MULTIPLE SERVICE



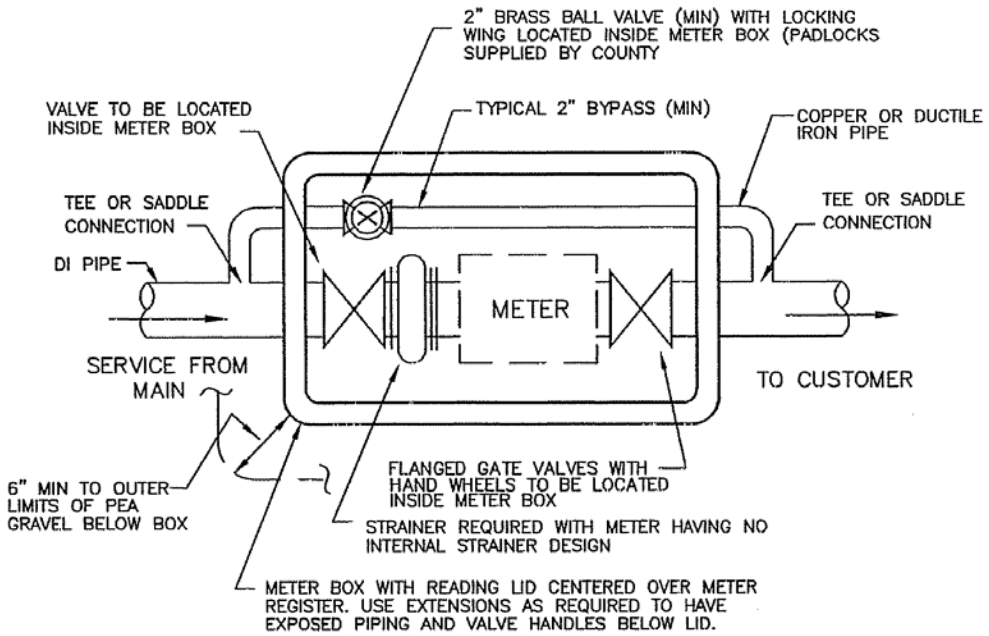
TYPICAL SERVICE CONNECTION

NOTES

1. REFER TO NOTES ON FIGURE W-1.
2. MANIFOLD TO BE SAME SIZE AS SERVICE FROM MAIN.

SCALE: NTS	DATE: JUNE 1996	• SHASTA COUNTY SERVICE AREAS •	
		APPROVED BY: William E. Lyman	WATER SERVICE CONNECTION 3/4" THRU 2" (3 SERVICES OR MORE)
MARK / DATE / REVISION		WILLIAM E. LYMAN	

FIGURE W-3



TYP. BYPASS INSTALLATION

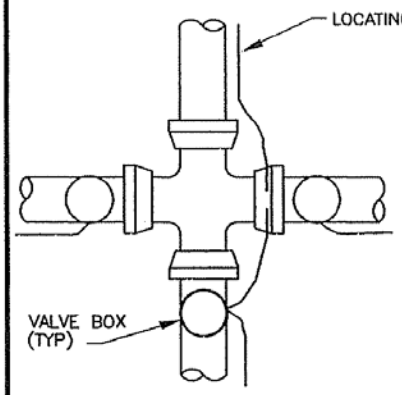
3 INCH AND LARGER

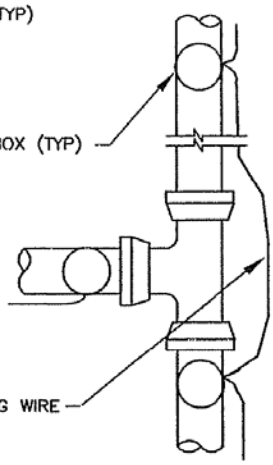
NOTES:

1. MAXIMUM DEPTH OF METER REGISTER TO BE TWENTY FOUR (24) INCHES.
   NOTE: ALL METERS WHICH, DUE TO PLUMBING PROBLEMS, CANNOT BE RAISED TO MEET THE ABOVE DEPTH LIMIT SHALL HAVE A REMOTE READ OR REGISTER EXTENSION. ITEMS TO BE SUPPLIED BY CUSTOMER AND APPROVED BY THE COUNTY.
2. ALL VAULTS FOR 3" AND LARGER SERVICES REQUIRE 12" MIN PEA GRAVEL DEPTH BELOW BOX
3. COPPER BYPASS TO BE DIELECTRICALLY SEPARATED FROM DI SADDLE OR TEE USING UNION OR NYLON BUSHING.
4. METER TYPE TO BE APPROVED BY COUNTY BASED ON CONDITIONS OF USAGE.
5. METER TO BE REMOVEABLE BY METER COUPLINGS OR FLANGED COUPLING ADAPTERS.

SCALE: NTS	DATE: JUNE 1996	• SHASTA COUNTY SERVICE AREAS •	
		APPROVED BY: William E. Lyman	WATER SERVICE CONNECTION METER & BYPASS DETAIL 3" SERVICES & LARGER
MARK / DATE / REVISION		WILLIAM E. LYMAN	

FIGURE W-4

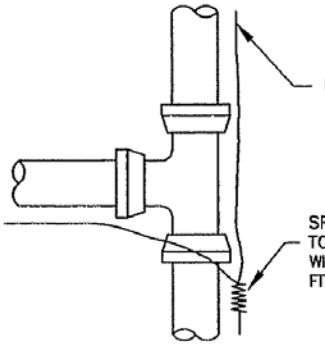




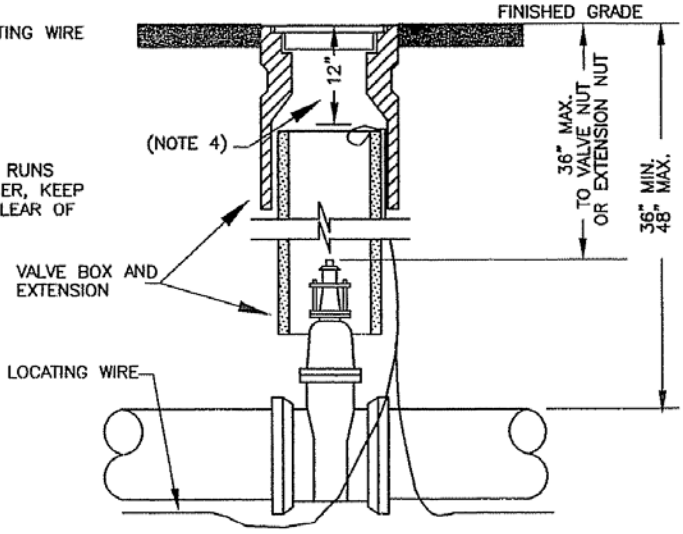
NOTICE:

LOCATING WIRE SHALL BE INSTALLED WITH ALL NON-METALLIC MAINS AND OFF STREET FIRE SERVICES & HYDRANTS

LOCATING WARNING TAPE SHALL BE INSTALLED 12" ABOVE ALL WATER MAINS IN OFFROAD INSTALLATIONS IN ADDITION TO LOCATING WIRE.



SPLICE DETAIL



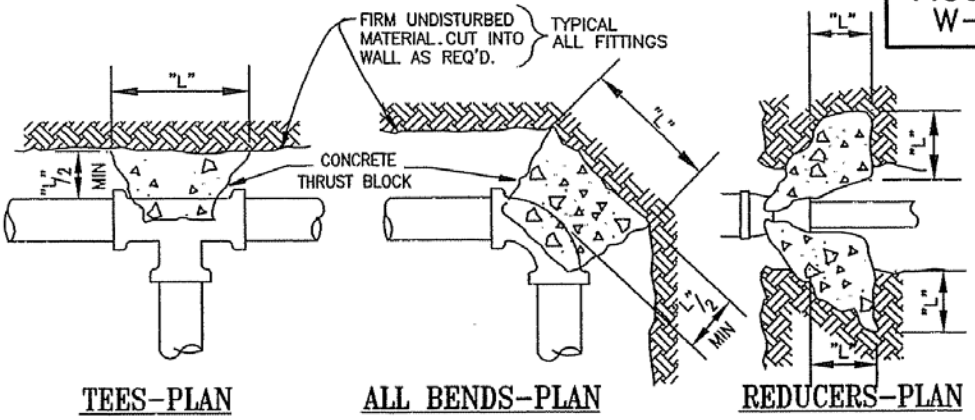
DETAIL AT BOX

NOTES:

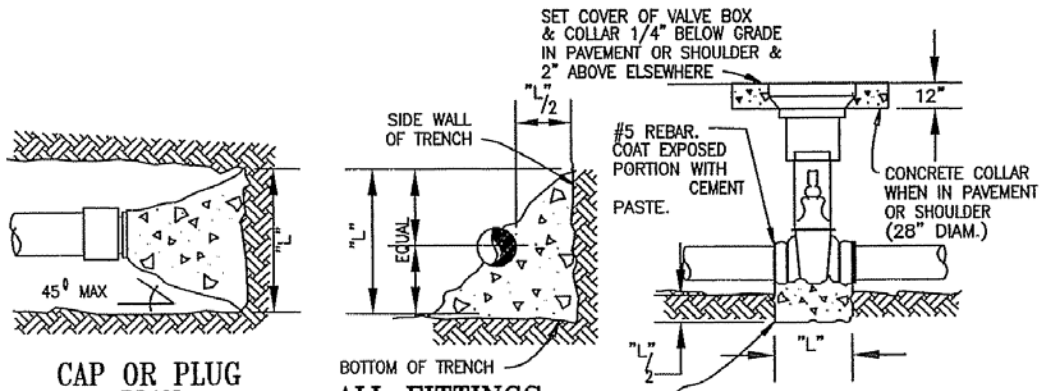
1. BARE WIRE SHALL NOT TOUCH VALVE OR FITTINGS (MAINTAIN 3 INCHES CLEAR DISTANCE)
2. LOCATING WIRE SHALL BE PLACED AT BOTTOM OF TRENCH, NEXT TO PIPE. (DO NOT ATTACH WIRE TO PIPE)
3. ALL VALVES, INCLUDING FIRE HYDRANT VALVES, SHALL HAVE LOCATING WIRES.
4. LOCATING WIRE SHALL BE INSULATED, #10 COPPER.

SCALE: NTS	DATE: JUNE 1996	• SHASTA COUNTY SERVICE AREAS •	
		APPROVED BY: William E. Lyman	LOCATING WIRE WARNING TAPE
MARK / DATE	REVISION	WILLIAM E. LYMAN	

FIGURE W-5



TEES–PLAN ALL BENDS–PLAN REDUCERS–PLAN



CAP OR PLUG PLAN

ALL FITTINGS SECTION

VALVE INSTALLATION ELEVATION

NOTES:

1. THRUST BLOCKS SHALL BE PROVIDED AT ALL BURIED PIPE FITTINGS OF 4" DIA OR LARGER. THRUST BLOCK SIZE IS BASED ON PIPE SIZE, 150 PSI TEST PRESSURE, & SOIL BEARING OF 1200 LB/FT . DIMENSION "L" IS SHOWN IN TABLE 1 & IS BOTH A VERTICAL & HORIZONTAL DIMENSION UNLESS SHOWN OTHERWISE. IF PIPE COVER HAS BEEN APPROVED TO BE LESS THAN 30", INCREASE HORIZONTAL THRUST BLOCKS IN PROPORTION TO 30 INCHES DIVIDED BY THE ACTUAL COVER.
2. SEE TABLE 1 ON FIGURE W–6 FOR "L" DIMENSIONS.

SCALE: NTS	DATE: JUNE 1996	• SHASTA COUNTY SERVICE AREAS •	
		APPROVED BY: William E. Lyman	THRUST BLOCK DETAILS
MARK / DATE / REVISION		WILLIAM E. LYMAN	

FIGURE W–6

TABLE 1

NOMINAL PIPE DIAMETER INCHES	FITTINGS						
	TEE, WYE, OR PLUG	90° BEND	45° BEND	22–1/2° BEND	11–1/4° BEND	REDUCER (BASED ON LARGEST DIA.)	VALVE
4"	18	22	16	15	15	--	--
6"	26	31	23	17	15	--	--
8"	34	40	30	21	15	17	12
10"	41	49	36	26	18	21	12
12"	49	59	44	31	22	25	16
14"	58	68	50	36	26	30	16
16"	66	77	57	41	28	33	18
18"	74	88	65	45	32	37	REQUIRES
20"	81	97	71	50	36	41	SPECIAL
24"	97	115	85	61	43	49	DESIGN

TABLE 2

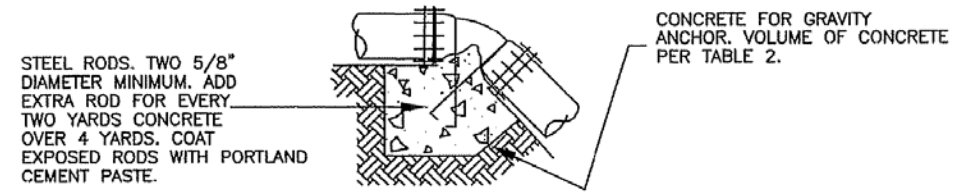
VERTICAL FITTING THRUST BLOCKS

WHERE VERTICAL BENDS ARE DIRECTED WITH THE THRUST TOWARD THE BOTTOM OF THE TRENCH, THEY SHALL HAVE THRUST BLOCKS PER HORIZONTAL BENDS EXCEPT CONCRETE SHALL BEAR AGAINST THE TRENCH BOTTOM.

WHERE VERTICAL BENDS ARE DIRECTED WITH THE THRUST TOWARD THE TOP OF TRENCH, THEY SHALL BE INSTALLED PER THE FOLLOWING DETAIL. MINIMUM ROD EMBEDMENT SHALL BE 30 INCHES FOR 12" AND SMALLER PIPE AND 36 INCHES FOR 14" AND LARGER PIPE.

CUBIC YARDS CONCRETE FOR VERTICAL FITTINGS (SEE DETAIL BELOW)

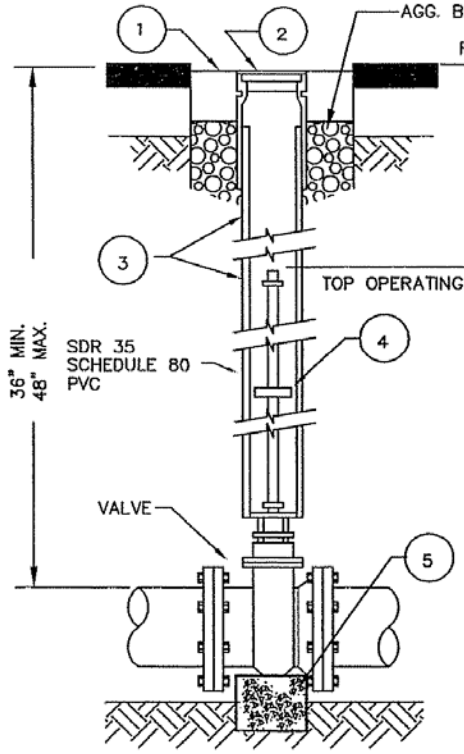
BEND ANGLE	PIPE DIAMETER						
	4"	6"	8"	10"	12"	14"	16" AND OVER
11–1/4°	0	0.4	0.7	0.9	1.3	1.8	REQUIRES
22–1/2°	0.4	0.8	1.3	1.8	2.5	3.4	SPECIAL
45°	0.7	1.4	2.4	3.5	4.9	6.6	DESIGN
90°	1.3	2.5	4.3	4.3	9.1	12.2	



ELEVATION

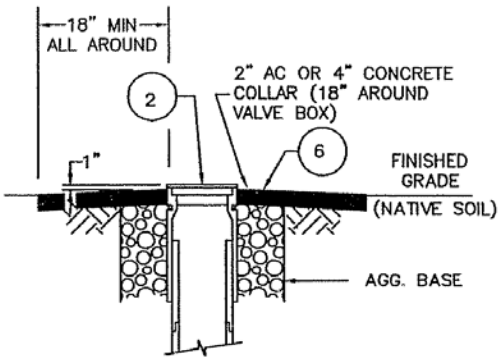
SCALE: NTS	DATE: JUNE 1996	• SHASTA COUNTY SERVICE AREAS •	
		APPROVED BY: William E. Lyman	THRUST BLOCK TABLES
MARK / DATE / REVISION		WILLIAM E. LYMAN	

FIGURE W–7



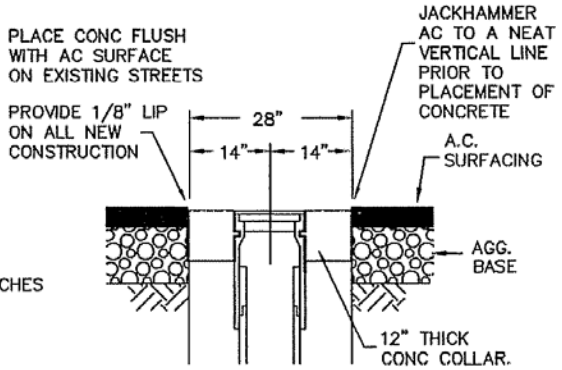
OPERATING NUT EXTENSION DETAIL

REQUIRED WHERE DISTANCE BETWEEN FINISHED GRADE AND TOP OF OPERATING NUT EXCEED 36 INCHES



VALVE COVER PLACEMENT

NATIVE GROUND DETAIL



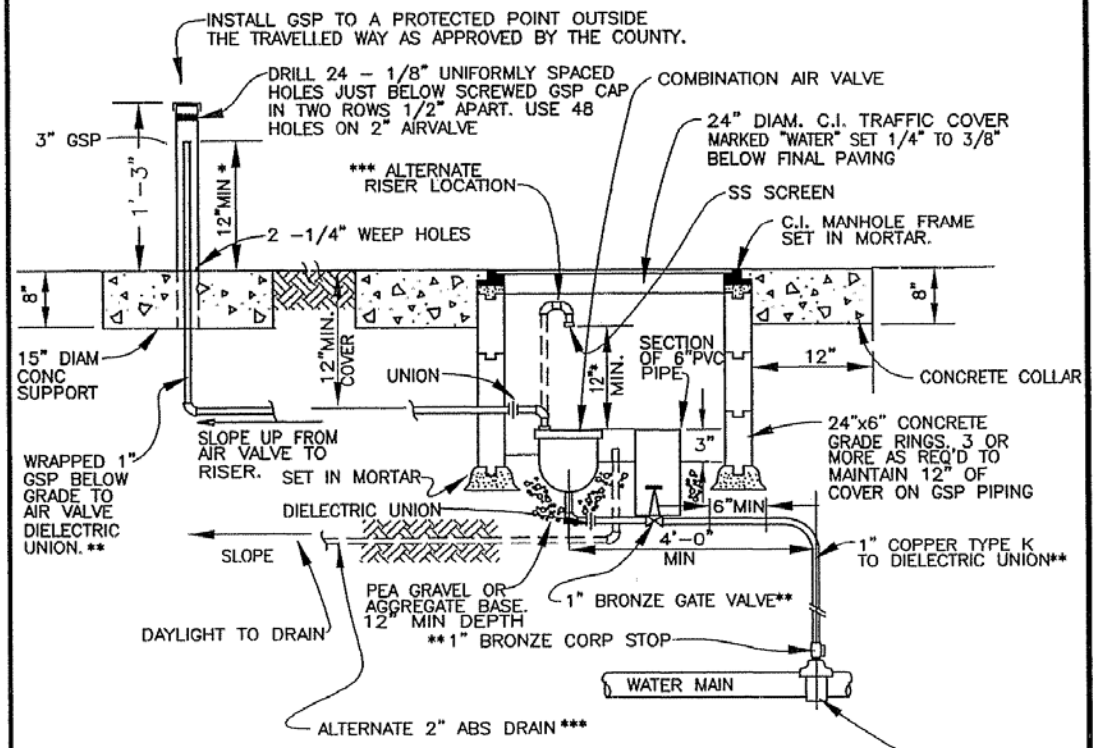
VALVE COVER ADJUSTMENT

NOTES:

1. 28" DIA. X 12" DEEP CONC. COLLAR
2. VALVE BOX
3. VALVE BOX EXTENSION
4. OPERATING NUT EXTENSION W/ 6" DIA. PLATE WASHER WELDED TO EXTENSION AT MID POINT OF ROD.(MIN. LENGTH OF ROD SHALL BE 24 INCHES)
5. PROVIDE CONC. SUPPORT UNDER 8" & LARGER VALVES. SEE FIGURE W–5.
6. PLACE 2" AC. OR 4" THICK CONC. COLLAR 18" AROUND VALVE BOX.
7. NO OPERATING NUT EXTENSION REQUIRED WHERE DISTANCE BETWEEN FINISHED GRADE AND TOP OF VALVE OPERATION NUT IS LESS THAN 36 INCHES.

SCALE: NTS	DATE: JUNE 1996	• SHASTA COUNTY SERVICE AREAS •	
		APPROVED BY: William E. Lyman	WATER VALVE DETAILS PAVED AND UNPAVED SURFACES
MARK / DATE / REVISION		WILLIAM E. LYMAN	

FIGURE
W-8



*** NOTE: AN ALTERNATE TO THE GSP PIPING AND RISER ABOVE GRADE, WHERE APPROVED BY THE ENGINEER, IS TO PLACE THE GSP RISER WITHIN THE MANHOLE AND INSTALL A 2" ABS DRAIN TO APPROVED LOCATION AS SHOWN IN DASHED LINES ABOVE.

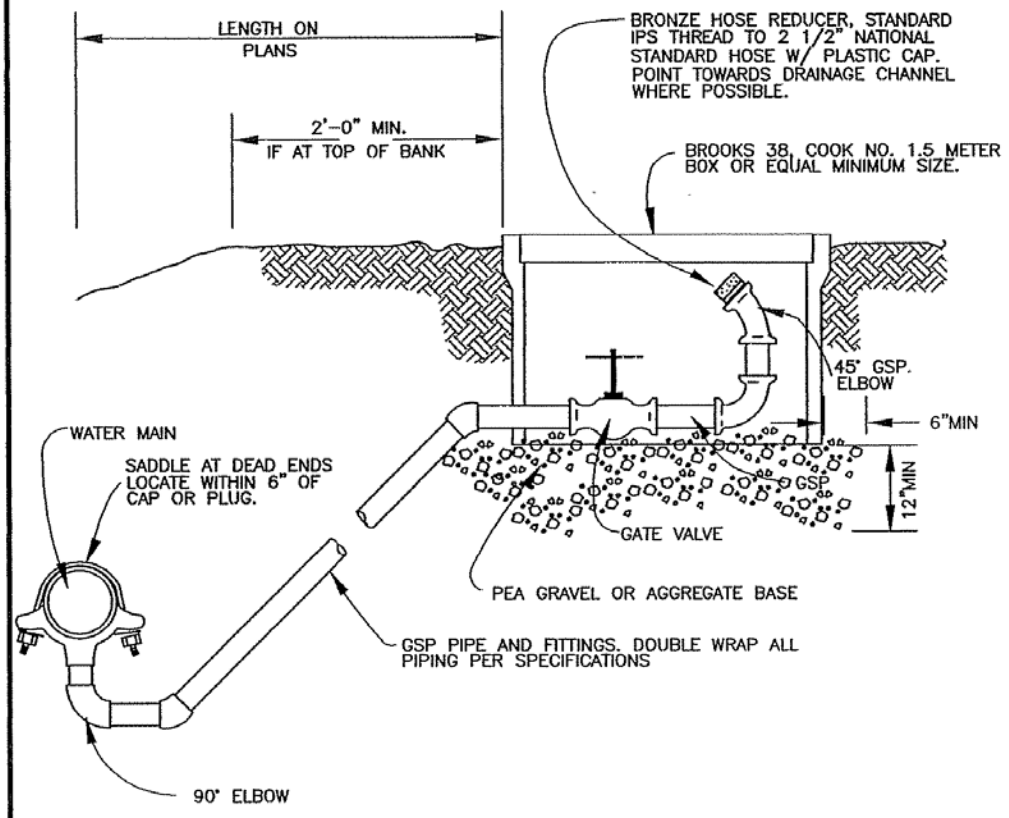
** NOTE: PIPE SIZE SHOWN IS FOR 1" AIR VALVE USE 2" FOR 2" AIR VALVE.

* NOTE: ALSO 12" MIN ABOVE MAX RECORDED FLOOD LEVEL.

**1" BRONZE SERVICE SADDLE AT HIGH SPOT IN WATER MAIN. USE DUCTILE IRON SADDLE WITH NYLON BUSHING ON DUCTILE PIPE

SCALE: NTS	DATE: AUG 1996	• SHASTA COUNTY SERVICE AREAS •	
		APPROVED BY: William E. Lyman	ROADWAY AIR VALVE ASSEMBLY
MARK / DATE / REVISION		WILLIAM E. LYMAN	

FIGURE
W-9



NOTE: BLOWOFF PIPING SIZE TO BE 1/4 OF PIPE DIAMETER, BUT NO SMALLER THAN 2". PIPING DIAMETER & LENGTH FOR BLOWOFF SHALL BE AS SHOWN ON PLANS. EXAMPLE: 2",15'

SCALE: NTS	DATE: JUNE 1996	• SHASTA COUNTY SERVICE AREAS •	
		APPROVED BY: William E. Lyman	BLOWOFF INSTALLATION
MARK / DATE	REVISION	WILLIAM E. LYMAN	

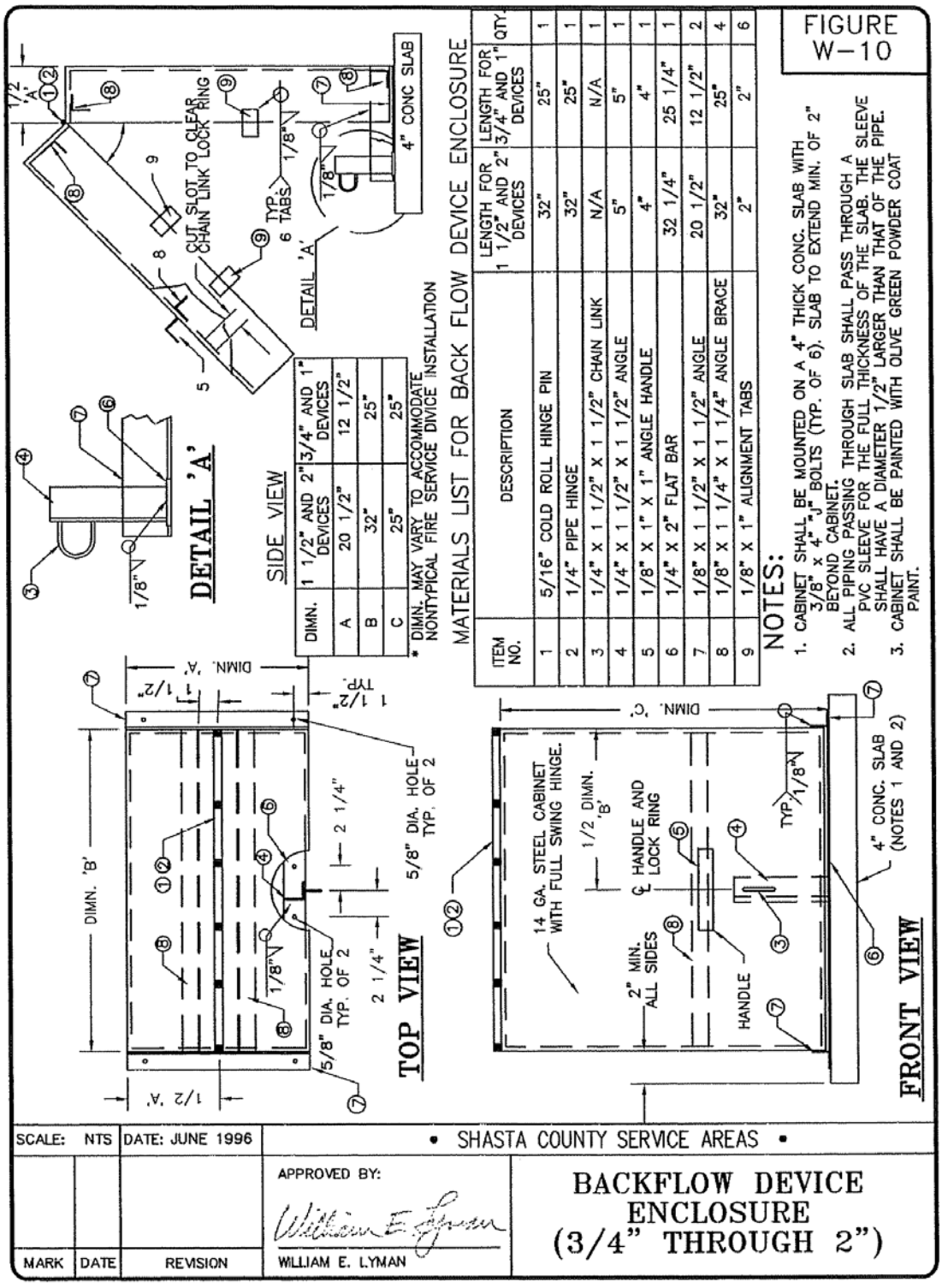
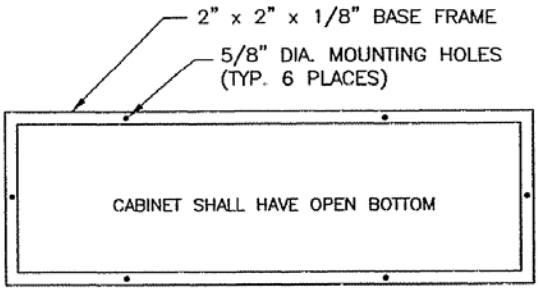


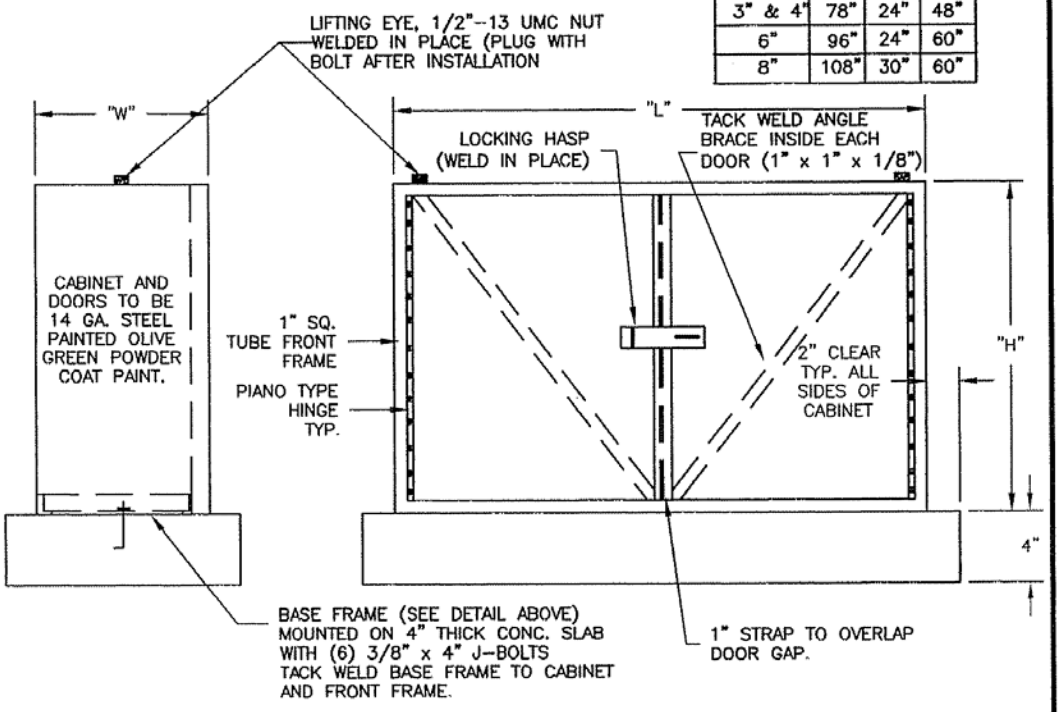
FIGURE W-10
DETAIL 'A'
SIDE VIEW
DETAIL 'A'
4" CONC SLAB
CUT SLOT TO CLEAR CHAIN LINK LOCK RING
TYP. 6 TABS
1/8"
1/2 'A'
DIMN. 'A'
DIMN. 'B'
DIMN. 'C'
1 1/2" TYP.
5/8" DIA. HOLE TYP. OF 2
2 1/4"
TOP VIEW
14 GA. STEEL CABINET WITH FULL SWING HINGE.
1/2 DIMN. 'B'
℄ HANDLE AND LOCK RING
2" MIN. ALL SIDES
HANDLE
TYP. 1/8"
4" CONC. SLAB (NOTES 1 AND 2)
FRONT VIEW
* DIMN. MAY VARY TO ACCOMMODATE NONTYPICAL FIRE SERVICE DIVICE INSTALLATION
DIMN. | 1 1/2" AND 2" DEVICES | 3/4" AND 1" DEVICES
A | 20 1/2" | 12 1/2"
B | 32" | 25"
C | 25" | 25"
MATERIALS LIST FOR BACK FLOW DEVICE ENCLOSURE
ITEM NO. | DESCRIPTION | LENGTH FOR 1 1/2" AND 2" DEVICES | LENGTH FOR 3/4" AND 1" DEVICES | QTY
1 | 5/16" COLD ROLL HINGE PIN | 32" | 25" | 1
2 | 1/4" PIPE HINGE | 32" | 25" | 1
3 | 1/4" X 1 1/2" X 1 1/2" CHAIN LINK | N/A | N/A | 1
4 | 1/4" X 1 1/2" X 1 1/2" ANGLE | 5" | 5" | 1
5 | 1/8" X 1" X 1" ANGLE HANDLE | 4" | 4" | 1
6 | 1/4" X 2" FLAT BAR | 32 1/4" | 25 1/4" | 1
7 | 1/8" X 1 1/2" X 1 1/2" ANGLE | 20 1/2" | 12 1/2" | 2
8 | 1/8" X 1 1/4" X 1 1/4" ANGLE BRACE | 32" | 25" | 4
9 | 1/8" X 1" ALIGNMENT TABS | 2" | 2" | 6
NOTES:
1. CABINET SHALL BE MOUNTED ON A 4" THICK CONC. SLAB WITH 3/8" x 4" "J" BOLTS (TYP. OF 6). SLAB TO EXTEND MIN. OF 2" BEYOND CABINET.
2. ALL PIPING PASSING THROUGH SLAB SHALL PASS THROUGH A PVC SLEEVE FOR THE FULL THICKNESS OF THE SLAB. THE SLEEVE SHALL HAVE A DIAMETER 1/2" LARGER THAN THAT OF THE PIPE.
3. CABINET SHALL BE PAINTED WITH OLIVE GREEN POWDER COAT PAINT.
SCALE: NTS
DATE: JUNE 1996
• SHASTA COUNTY SERVICE AREAS •
APPROVED BY:
WILLIAM E. LYMAN
MARK | DATE | REVISION
BACKFLOW DEVICE ENCLOSURE (3/4" THROUGH 2")

FIGURE W-11



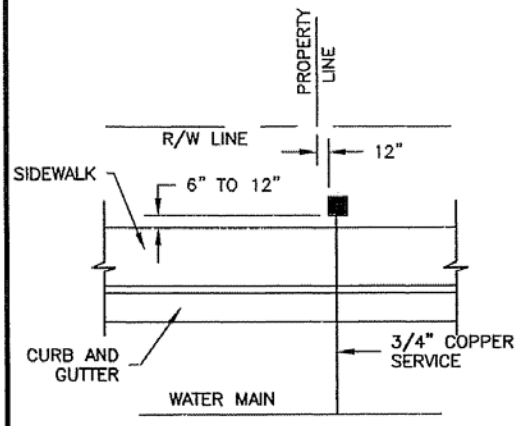
BOTTOM MOUNTING FRAME

CABINET DIMENSIONS			
UNIT SIZE	L	W	H
3" & 4"	78"	24"	48"
6"	96"	24"	60"
8"	108"	30"	60"

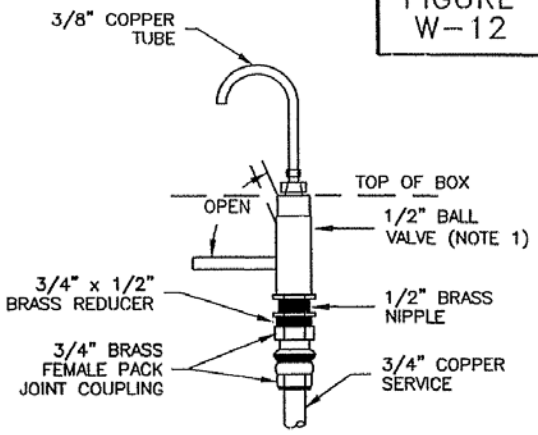


SCALE: NTS	DATE: JUNE 1996	• SHASTA COUNTY SERVICE AREAS •	
		APPROVED BY: William E. Lyman	BACKFLOW DEVICE ENCLOSURE (3" THROUGH 8")
MARK / DATE / REVISION		WILLIAM E. LYMAN	

FIGURE W-12



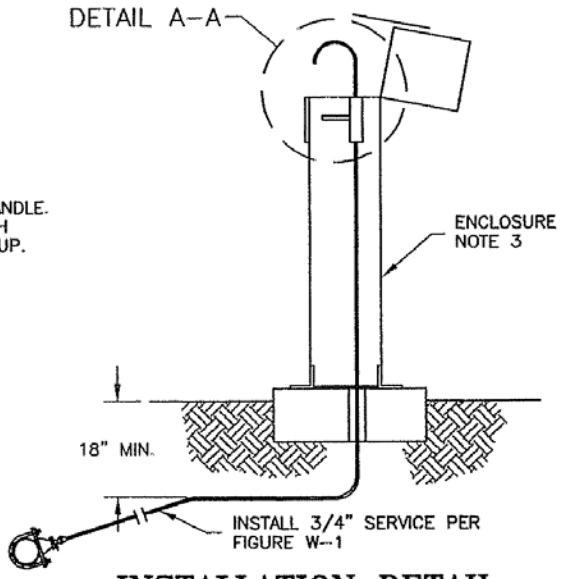
LOCATION



DETAIL A–A

NOTES:

1. BALL VALVE SHALL BE 1/2" APOLLO 600 W.O.G. (70–102–01), OR EQUAL, WITH HANDLE. TOP OF VALVE SHALL BE INSTALLED FLUSH WITH TOP OF BOX. HANDLE SHALL OPEN UP.
2. ALL PIPE FITTINGS TO BE BRASS.
3. FOR BACTERIOLOGICAL STATION ENCLOSURE AND CONCRETE PAD SEE FIGURE W–14.
4. ALL ABOVE GRADE PIPING SHALL BE WRAPPED WTIH ADEQUATE INSULATION TO PREVENT FREEZING. METHOD TO HAVE PRIOR APPROVAL OF THE COUNTY.



INSTALLATION DETAIL

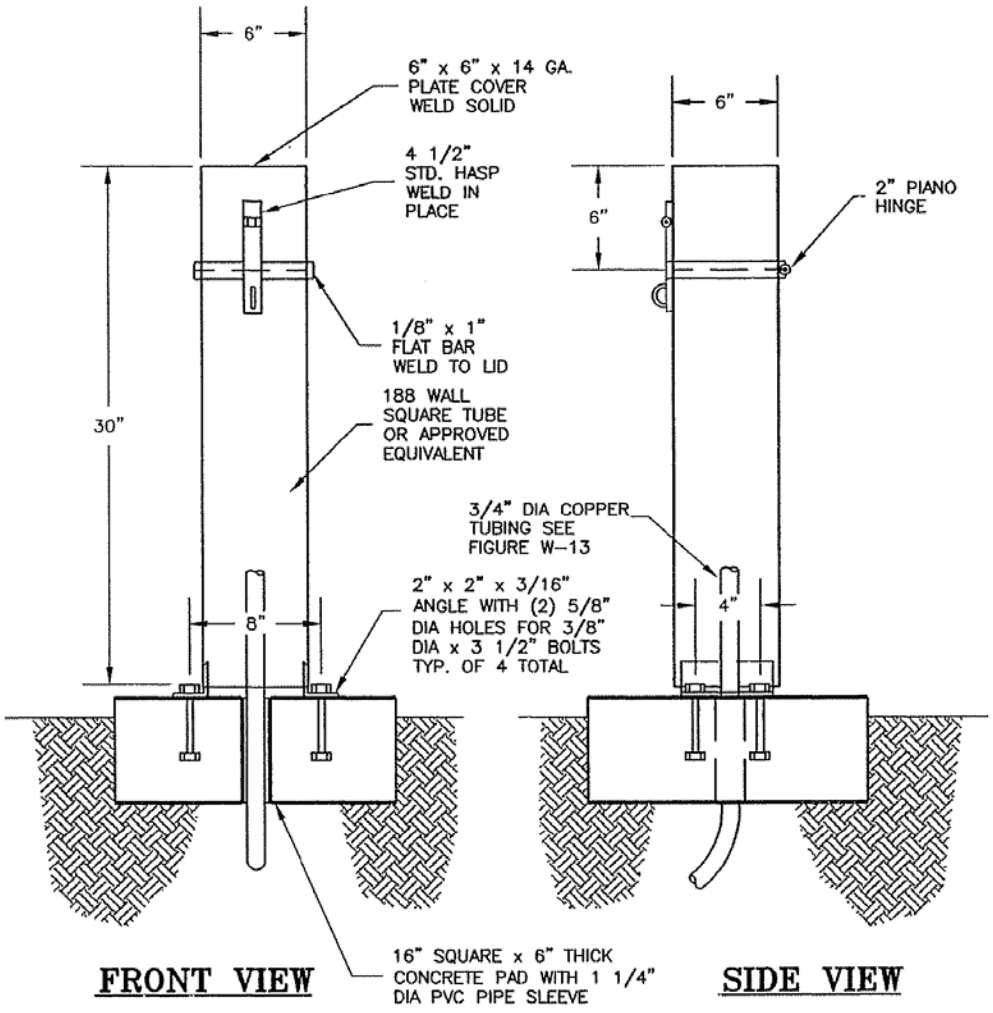
NOTICE:

FIXED BACTERIOLOGICAL SAMPLING STATIONS ARE REQUIRED BY "CALIFORNIA WATERWORKS STANDARDS, TITLE 22." THE ESTABLISHMENT OF REPRESENTATIVE SAMPLE POINTS IS ESSENTIAL TO ASSURE THAT THE SAMPLING RESULTS FOUND ARE GIVING A TRUE INDICATION OF THE BACTERIOLOGICAL QUALITY OF THE WATER SUPPLIED THROUGHOUT THE DISTRIBUTION SYSTEM. BACTERIOLOGICAL SAMPLE STATIONS ARE REQUIRED AND SHALL BE INSTALLED IN NEW SUBDIVISIONS AT LOCATIONS AS DETERMINED BY THE COUNTY.

SCALE: NTS	DATE: JUNE 1996	• SHASTA COUNTY SERVICE AREAS •	
		APPROVED BY: William E. Lyman	BACTERIOLOGICAL SAMPLE STATION INSTALLATION
MARK / DATE / REVISION		WILLIAM E. LYMAN	

FIGURE W–13

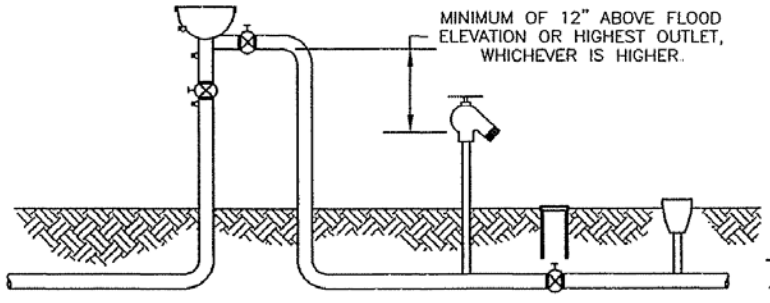
NOTES:
1. ALL EXPOSED STEEL SURFACES SHALL BE OLIVE GREEN POWDER COAT PAINT.
2. CONCRETE TO BE CLASS 500--C–2500
3. ALL BOLTS AND NUTS TO BE GALVANIZED.



SCALE: NTS	DATE: JUNE 1996	• SHASTA COUNTY SERVICE AREAS •
		APPROVED BY: William E. Lyman
MARK / DATE / REVISION		WILLIAM E. LYMAN

BACTERIOLOGICAL SAMPLE STATION ENCLOSURE

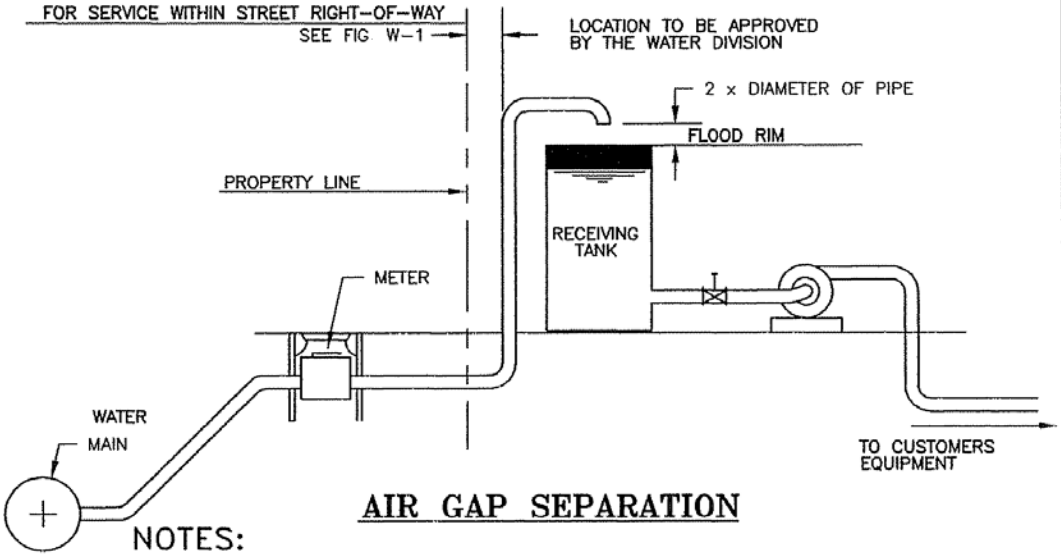
FIGURE W-14



DOWNSTREAM SIDE OF PRESSURE VACUUM BREAKER SHALL BE MAINTAINED UNDER PRESSURE BY A VALVE. THERE SHALL BE NO MEANS OF IMPOSING PRESSURE BY PUMP OR OTHER MEANS.

NOTE:
ONLY ASSEMBLIES TESTED AND CERTIFIED BY AN ACCEPTABLE LABORATORY AND APPROVED FOR USE BY THE CALIFORNIA DEPARTMENT OF HEALTH SERVICES SHALL BE INSTALLED.

PRESSURE VACUUM BREAKER



AIR GAP SEPARATION

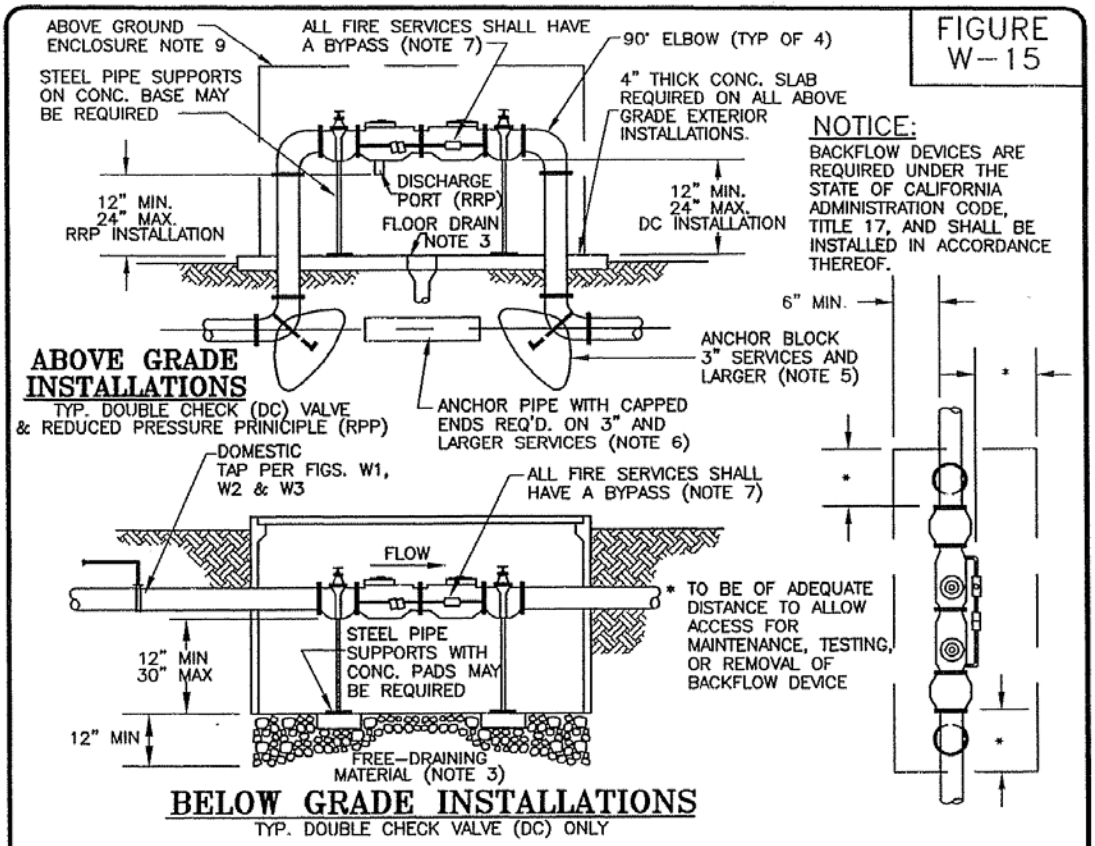
NOTES:

1. RECEIVING TANK SHALL BE LOCATED AS CLOSE TO PROPERTY AS PRACTICAL.
2. NO CONNECTIONS OR TEES SHALL BE ALLOWED IN SERVICE LINE BETWEEN METER AND RECEIVING TANK.
3. FOR INSTALLATION OF WATER SERVICE AND METER SEE FIGURE W-1

NOTE
BACKFLOW CONTROL DEVICES ARE REQUIRED UNDER STATE OF CALIFORNIA ADMINISTRATIVE CODE, TITLE 17, AND SHALL BE INSTALLED IN ACCORDANCE THEREOF.

SCALE: NTS	DATE: MAY 1996	SHASTA COUNTY SERVICE AREAS	
		APPROVED BY: William E. Lyman	AIR GAP SEPARATION
MARK	DATE	REVISION	WILLIAM E. LYMAN

FIGURE W–15



NOTE:

1. ALL CONSTRUCTION AND ALL MATERIALS USED SHALL BE IN ACCORDANCE WITH THE SHASTA COUNTY DEVELOPMENT STANDARDS AND THE SPECIFICATION FOR PUBLIC WORKS CONSTRUCTION. (GREEN BOOK – LATEST EDITION)
2. ALL ABOVE GROUND PIPING INSTALLATIONS, 3/4" THROUGH 2", SHALL BE COPPER OR BRASS AND ALL 3" AND LARGER SHALL BE DUCTILE IRON PIPE WITH FLANGED FITTINGS.
3. WHEN VALVES ARE INSTALLED WITHIN THE CONFINES OF A BUILDING (SPECIAL CASE), ENCLOSURE OR VAULT, ADEQUATE DRAINAGE SHALL BE PROVIDED.
4. A REDUCED PRESSURE PRINICIPLE DEVICE (RPP) MAY BE REQUIRED DEPENDING ON THE APPLICATION. RRP TO BE INSTALLED ABOVE GRADE ONLY.
5. ALL THRUST BLOCKS OR ANCHORS TO BE DESIGNED ON AN INDIVIDUAL BASIS. (SEE FIG. W–5)
6. APPLICANT SHALL HAVE THE OPTION OF DESIGNING AND CONSTRUCTING CONCRETE ANCHORS AS SHOWN OR PLACING A CONTINUOUS CONCRETE BLOCK BETWEEN ELBOWS. IF SOIL IS UNDISTURBED. CONTRACTOR MAY OMIT BRACE WITH PRIOR COUNTY APPROVAL.
7. BYPASS LINES ARE REQUIRED ON ALL FIRE SERVICES WHERE DOUBLE CHECK OF RPP VALVE IS INSTALLED. BYPASS SHALL HAVE A DETECTOR METER AND DOUBLE CHECK OR RRP VALVE. DOMESTIC TAPS ARE PERMITTED ON THE STREET SIDE OF THE BACKFLOW DEVICE ONLY. BACK FLOW DEVICE SHALL BE LOCATED WITHIN COUNTY RIGHT–OF–WAY.
8. ALL STEEL BACKFLOW DEVICES SHALL BE FUSION BONDED EPOXY COATED INTERNALLY AND EXTERNALLY.
9. ABOVE GRADE ENCLOSURE INSTALLATIONS PER FIG. W–11 & W–12.
10. VALVES LARGER THAN 8" SHALL HAVE INDIVIDUALLY DESIGNED VAULTS AND SHALL HAVE APPROVAL OF THE COUNTY PRIOR TO FABRICATION.
11. ALL ABOVE GRADE PIPING AND VALVES SHALL BE WRAPPED WITH ADEQUATE INSULLATION TO PREVENT FREEZING. METHOD SHALL HAVE PRIOR APPROVAL OF THE COUNTY.

SCALE: NTS	DATE: JUNE 1996	• SHASTA COUNTY SERVICE AREAS •
		APPROVED BY: William E. Lyman
MARK / DATE / REVISION		WILLIAM E. LYMAN

DOUBLE CHECK VALVE AND REDUCED PRESSURE PRINICIPLE DEVICES

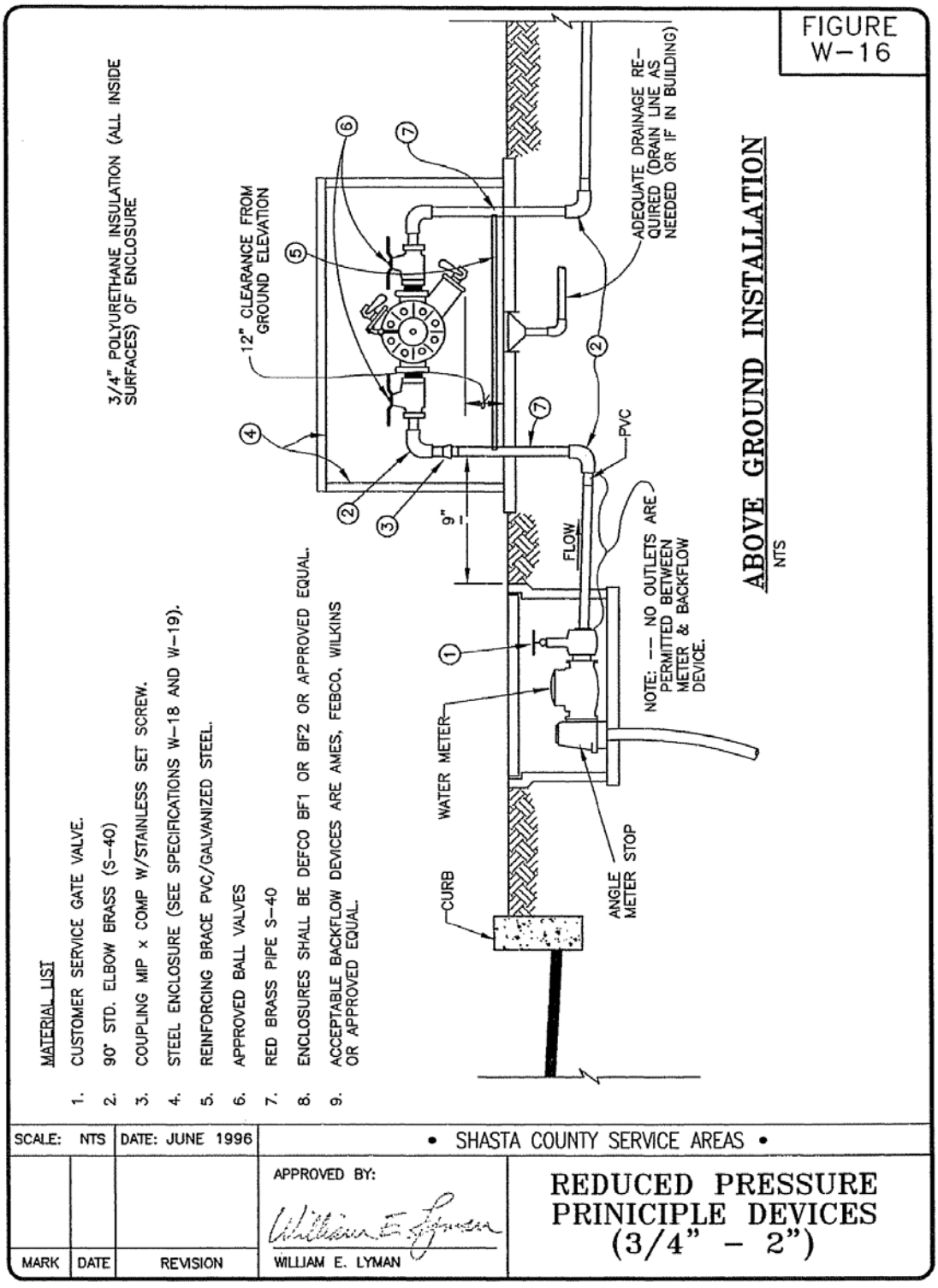
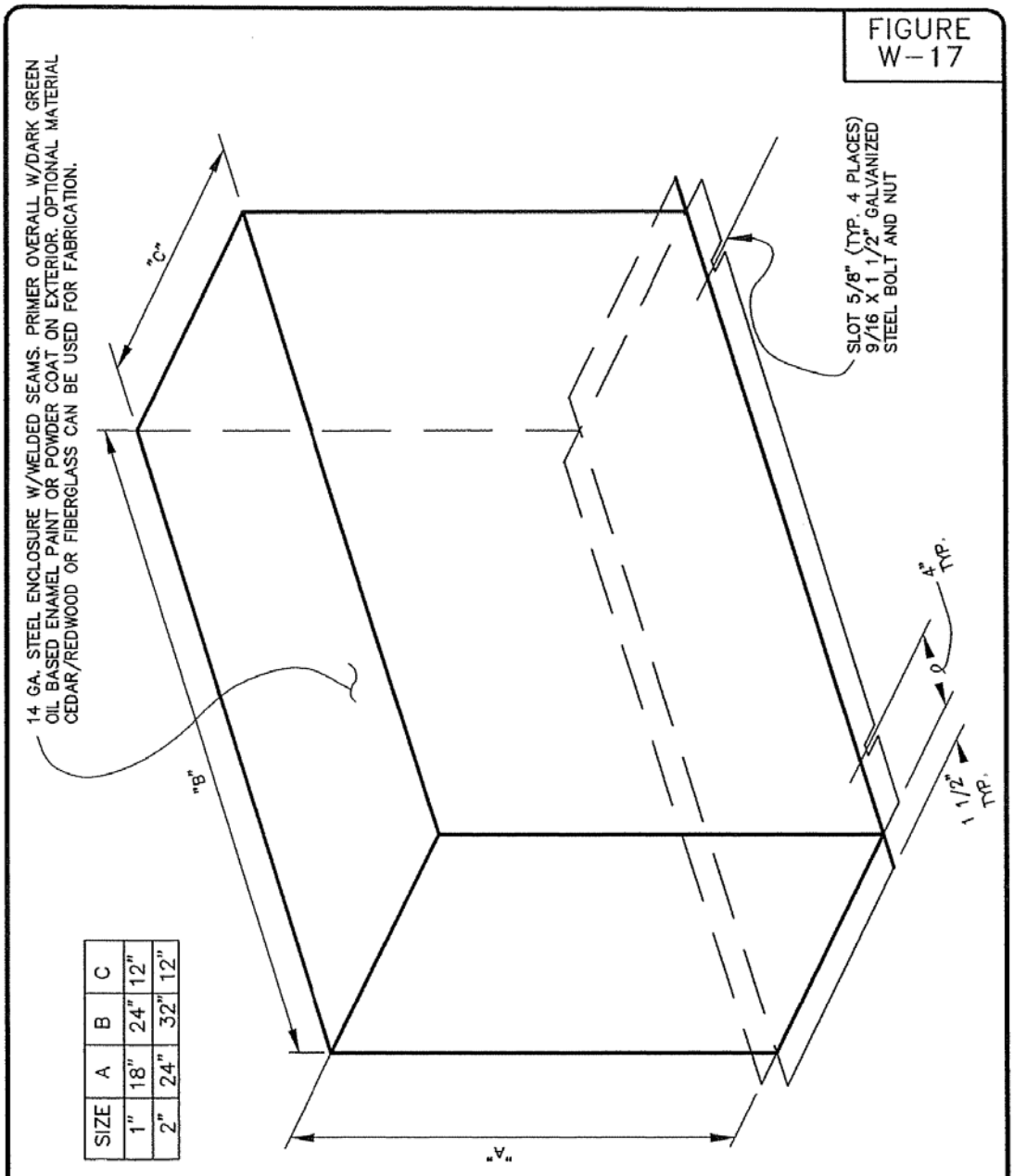


FIGURE W-16
ABOVE GROUND INSTALLATION
NTS
MATERIAL LIST
1. CUSTOMER SERVICE GATE VALVE.
2. 90° STD. ELBOW BRASS (S-40)
3. COUPLING MIP x COMP W/STAINLESS SET SCREW.
4. STEEL ENCLOSURE (SEE SPECIFICATIONS W-18 AND W-19).
5. REINFORCING BRACE PVC/GALVANIZED STEEL.
6. APPROVED BALL VALVES
7. RED BRASS PIPE S-40
8. ENCLOSURES SHALL BE DEFCO BF1 OR BF2 OR APPROVED EQUAL.
9. ACCEPTABLE BACKFLOW DEVICES ARE AMES, FEBCO, WILKINS OR APPROVED EQUAL.
3/4" POLYURETHANE INSULATION (ALL INSIDE SURFACES) OF ENCLOSURE
12" CLEARANCE FROM GROUND ELEVATION
ADEQUATE DRAINAGE REQUIRED (DRAIN LINE AS NEEDED OR IF IN BUILDING)
PVC
9"
FLOW
WATER METER
NOTE: --- NO OUTLETS ARE PERMITTED BETWEEN METER & BACKFLOW DEVICE.
CURB
ANGLE METER STOP
SCALE: NTS
DATE: JUNE 1996
• SHASTA COUNTY SERVICE AREAS •
APPROVED BY:
WILLIAM E. LYMAN
REDUCED PRESSURE PRINICIPLE DEVICES (3/4" - 2")
MARK
DATE
REVISION

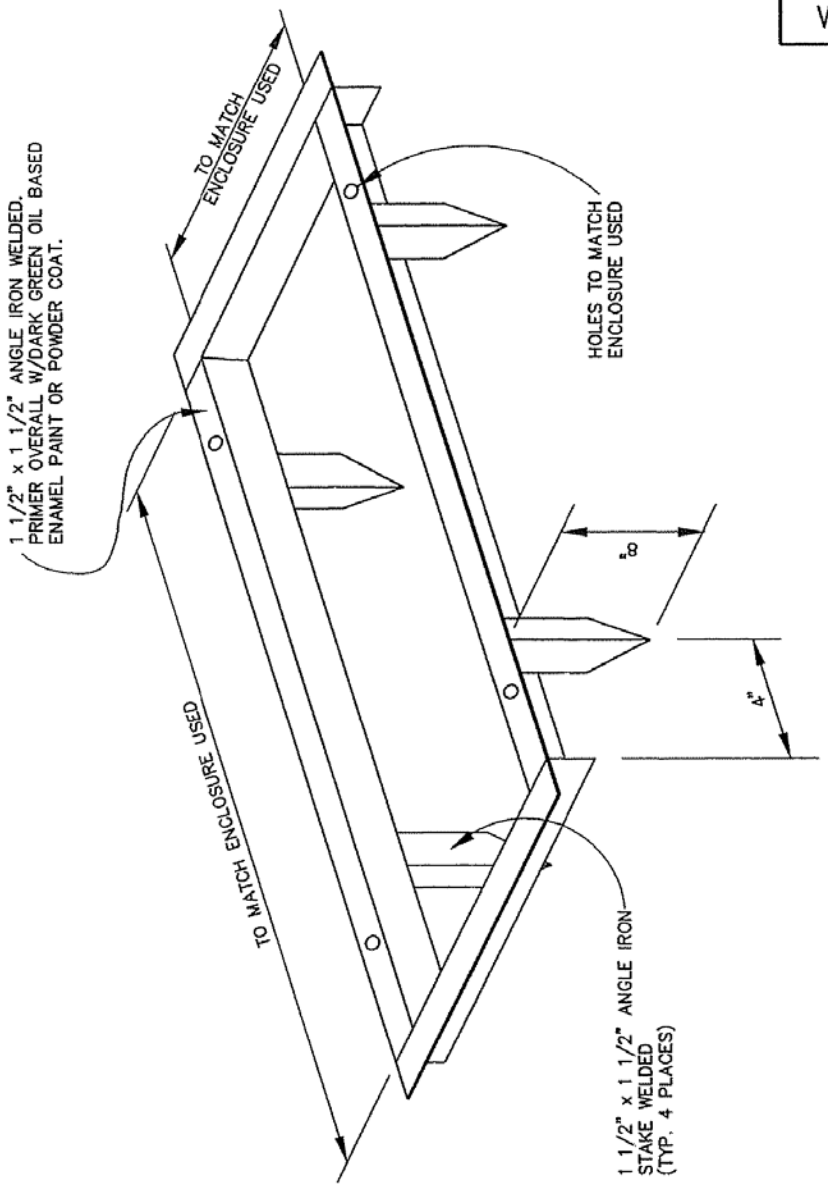
FIGURE W-17



SIZE	A	B	C
1"	18"	24"	12"
2"	24"	32"	12"

SCALE: NTS	DATE: JUNE 1996	• SHASTA COUNTY SERVICE AREAS •	
		APPROVED BY: William E. Lyman	STEEL ENCLOSURE FOR 3/4" -2" REDUCED PRESSURE PRINCIPLE DEVICE
MARK / DATE / REVISION		WILLIAM E. LYMAN	

FIGURE W--18



SCALE: NTS	DATE: JUNE 1996	• SHASTA COUNTY SERVICE AREAS •	
		APPROVED BY: William E. Lyman	ENCLOSURE SUBFRAME FOR 3/4" – 2" REDUCED PRESSURE PRINICIPLE DEVICE
MARK / DATE / REVISION		WILLIAM E. LYMAN	

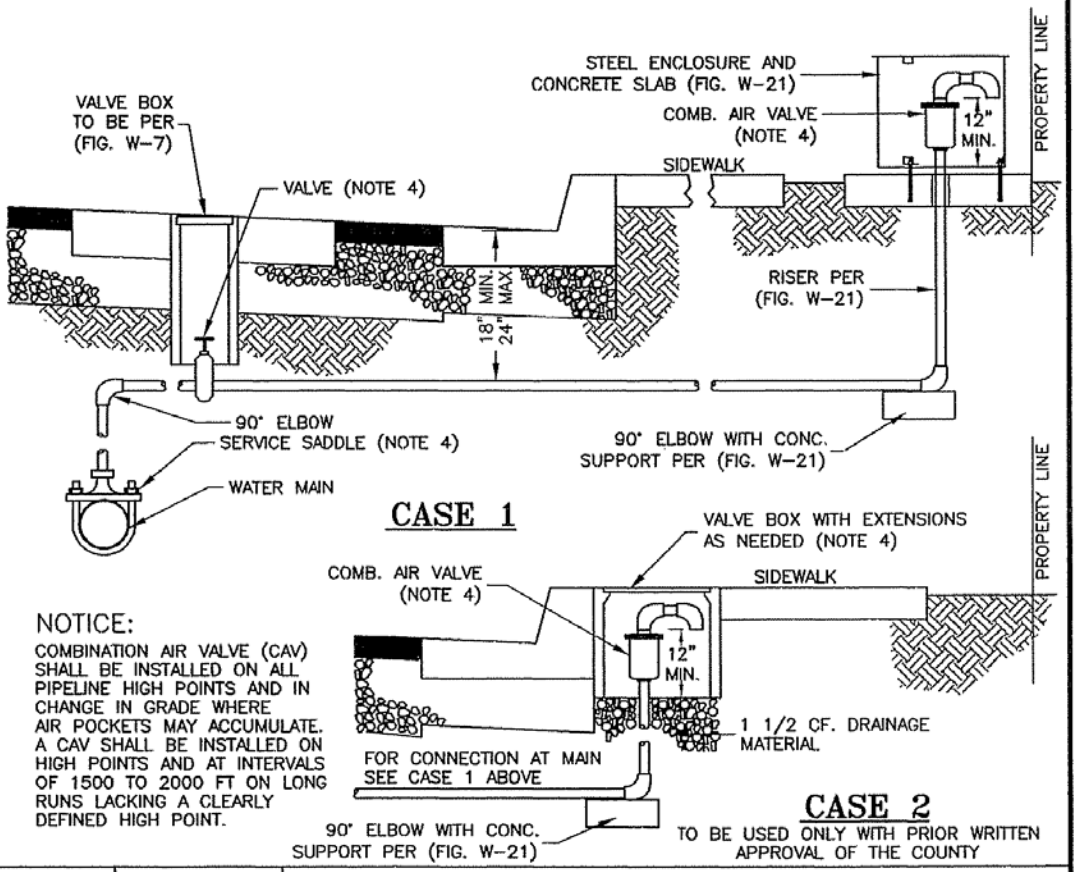
FIGURE W-19

NOTES:

1. CALIFORNIA WATERWORKS STANDARDS, TITLE 22, FOR AIR AND VACUUM RELIEF VALVES STATES THE FOLLOWING:

   (A) VENT OPENINGS FOR AIR AND VACUUM RELIEF AND AIR RELEASE VALVES SHALL BE
   (1) EXTENDED AT LEAST (1) ONE FOOT (0.3m) ABOVE GRADE AND ABOVE MAXIMUM RECORDED HIGH WATER LEVEL. (CASE 1)
   (2) DOWNWARD FACING AND SCREENED.

   (B) WHERE THE REQUIREMENTS OF (A)(1) CANNOT BE PRACTICABLY MET, VENT OPENINGS MAY BE LOCATED IN A SUBSURFACE CHAMBER OR PIT (CASE 2) UNDER THE FOLLOWING CONDITIONS:
   (1) PIT IS ADEQUATELY DRAINED. (METHOD TO BE APPROVED BY THE COUNTY).
   (2) THE PIT DRAIN IS NOT CONNECTED BY PIPE OR OTHER CLOSED CONDUIT TO A SEWER OR STORM DRAIN WITHOUT AN AIR SEPARATION.
2. PIPE AND FITTINGS PER THESE CSA STANDARDS.
3. IN THE CASE OF PRESSURE (HOT) TAP, A CORPORATION STOP SHALL BE INSTALLED.
4. ALL VALVES, VALVE BOXES, COMBINATION AIR VALVES, CORPORATION STOPS, AND SADDLES SHALL BE PER THESE CSA STANDARDS.
5. THE MINIMUM ACCEPTABLE SIZE COMBINATION AIR VALVE SHALL BE 2 INCH. SIZE OF CAV SHALL BE ENGINEERED TO MANUFACTURERS SPECIFICATIONS.



NOTICE:

COMBINATION AIR VALVE (CAV) SHALL BE INSTALLED ON ALL PIPELINE HIGH POINTS AND IN CHANGE IN GRADE WHERE AIR POCKETS MAY ACCUMULATE. A CAV SHALL BE INSTALLED ON HIGH POINTS AND AT INTERVALS OF 1500 TO 2000 FT ON LONG RUNS LACKING A CLEARLY DEFINED HIGH POINT.

SCALE: NTS	DATE: JUNE 1996	• SHASTA COUNTY SERVICE AREAS •
MARK / DATE / REVISION	APPROVED BY: William E. Lyman	COMBINATION AIR VALVE (CAV) AIR AND VACUUM – AIR RELEASE

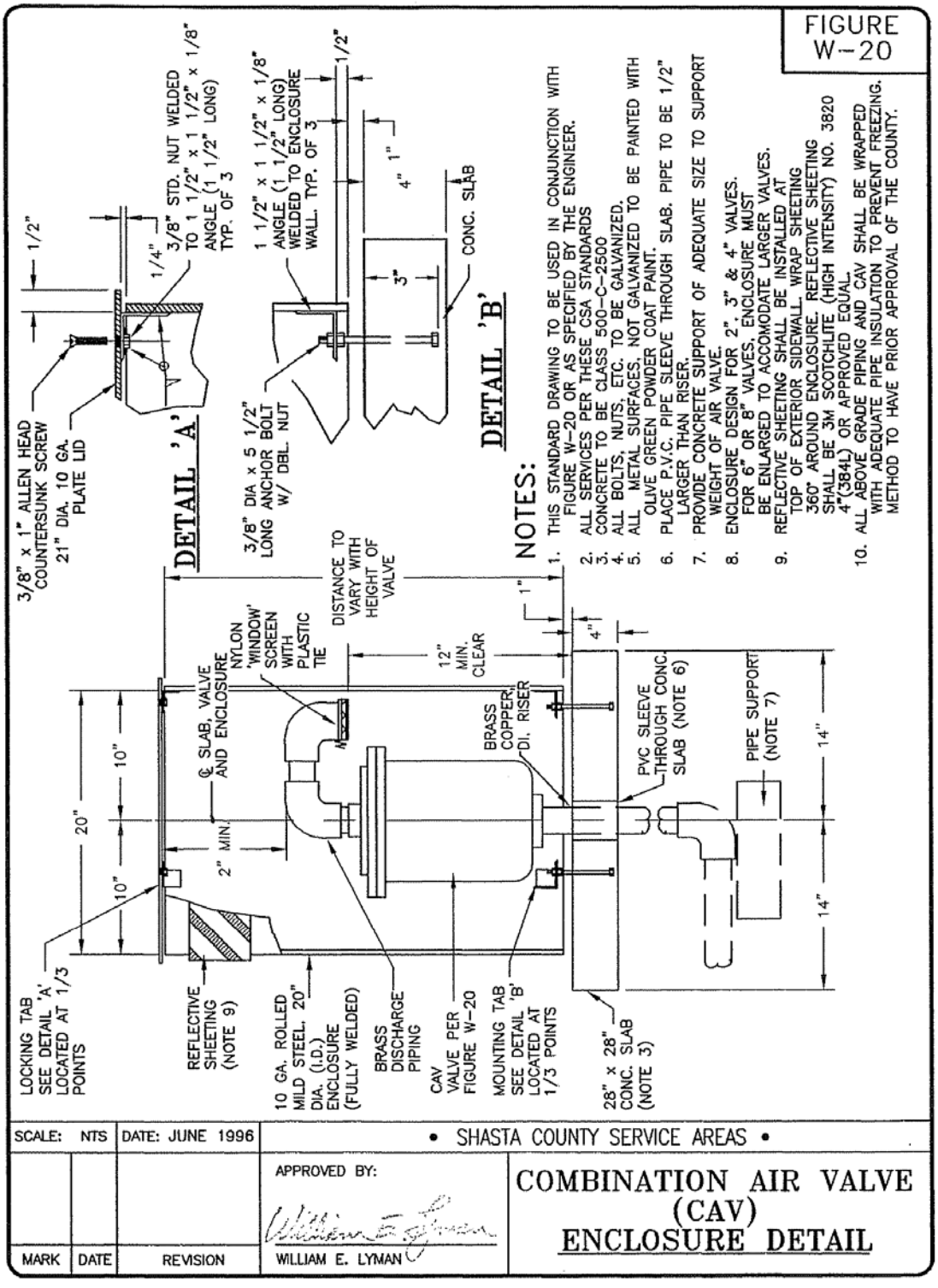


FIGURE W-20
DETAIL 'A'
DETAIL 'B'
NOTES:
1. THIS STANDARD DRAWING TO BE USED IN CONJUNCTION WITH FIGURE W-20 OR AS SPECIFIED BY THE ENGINEER.
2. ALL SERVICES PER THESE CSA STANDARDS
3. CONCRETE TO BE CLASS 500-C-2500
4. ALL BOLTS, NUTS, ETC. TO BE GALVANIZED.
5. ALL METAL SURFACES, NOT GALVANIZED TO BE PAINTED WITH OLIVE GREEN POWDER COAT PAINT.
6. PLACE P.V.C. PIPE SLEEVE THROUGH SLAB. PIPE TO BE 1/2" LARGER THAN RISER.
7. PROVIDE CONCRETE SUPPORT OF ADEQUATE SIZE TO SUPPORT WEIGHT OF AIR VALVE.
8. ENCLOSURE DESIGN FOR 2", 3" & 4" VALVES. FOR 6" OR 8" VALVES, ENCLOSURE MUST BE ENLARGED TO ACCOMODATE LARGER VALVES.
9. REFLECTIVE SHEETING SHALL BE INSTALLED AT TOP OF EXTERIOR SIDEWALL. WRAP SHEETING 360° AROUND ENCLOSURE. REFLECTIVE SHEETING SHALL BE 3M SCOTCHLITE (HIGH INTENSITY) NO. 3820 4"(384L) OR APPROVED EQUAL.
10. ALL ABOVE GRADE PIPING AND CAV SHALL BE WRAPPED WITH ADEQUATE PIPE INSULATION TO PREVENT FREEZING. METHOD TO HAVE PRIOR APPROVAL OF THE COUNTY.
3/8" x 1" ALLEN HEAD COUNTERSUNK SCREW
21" DIA. 10 GA. PLATE LID
1/2"
1/4"
3/8" STD. NUT WELDED TO 1 1/2" x 1 1/2" x 1/8" ANGLE (1 1/2" LONG) TYP. OF 3
1 1/2" x 1 1/2" x 1/8" ANGLE (1 1/2" LONG) WELDED TO ENCLOSURE WALL. TYP. OF 3
3/8" DIA x 5 1/2" LONG ANCHOR BOLT W/ DBL. NUT
3"
4"
1"
CONC. SLAB
DISTANCE TO VARY WITH HEIGHT OF VALVE
NYLON 'WINDOW' SCREEN WITH PLASTIC TIE
℄ SLAB, VALVE AND ENCLOSURE
12" MIN. CLEAR
1"
4"
20"
10"
10"
2" MIN.
BRASS COPPER Di. RISER
PVC SLEEVE THROUGH CONC. SLAB (NOTE 6)
PIPE SUPPORT (NOTE 7)
14"
14"
LOCKING TAB SEE DETAIL 'A' LOCATED AT 1/3 POINTS
REFLECTIVE SHEETING (NOTE 9)
10 GA. ROLLED MILD STEEL 20" DIA. (I.D.) ENCLOSURE (FULLY WELDED)
BRASS DISCHARGE PIPING
CAV VALVE PER FIGURE W-20
MOUNTING TAB SEE DETAIL 'B' LOCATED AT 1/3 POINTS
28" x 28" CONC. SLAB (NOTE 3)
SCALE: NTS
DATE: JUNE 1996
• SHASTA COUNTY SERVICE AREAS •
APPROVED BY:
WILLIAM E. LYMAN
MARK
DATE
REVISION
COMBINATION AIR VALVE (CAV) ENCLOSURE DETAIL

SHASTA COUNTY
SERVICE AREA NO. 8
PALO CEDRO

1991 MASTER SEWER PLAN
FOR THE
SEWAGE COLLECTION AND
TREATMENT FACILITIES

January 1992

Job No. 35.19

Prepared by:

PACE ENGINEERING

PACE Engineering
1730 South Street, Redding, CA 96001
916/244-0202

PACE ENGINEERING
Professional Associated Consulting Engineers Incorporated

January 16, 1992

35.19

Rec'd. 1/17/92

Shasta County
County Service Area No. 8 -
Palo Cedro
1670 Market Street, Suite 242
Redding, CA 96001

Attention: Randy O'Hern, Manager

Gentlemen:

Subject: 1991 Master Sewer Plan

We are pleased to present our engineering report entitled:

SHASTA COUNTY SERVICE AREA NO. 8 - PALO CEDRO
1991 MASTER SEWER PLAN
FOR THE
SEWAGE COLLECTION AND TREATMENT FACILITIES

The report contains the results of our investigation of the sewage collection system, including gravity sewers and lift station facilities, and also the wastewater treatment and disposal facilities. It includes preliminary plans, staging, and cost estimates for the major capital improvements that will be necessary for the service area to reach its currently planned ultimate development. Special emphasis has been placed on the planning and staging of improvements necessary to allow continued growth in the system. A summary of the report, including our recommendations, follows the Table of Contents.

PACE Engineering is very pleased to have participated in this project, and we wish to express our appreciation for the courtesy and assistance we received from the County staff in preparing this report. We will be pleased to meet with you, at your convenience, to discuss this master plan in detail.

Very truly yours,

Samuel L Smith

Samuel L. Smith
Principal Engineer

WP-A/SLS/kbu

1730 SOUTH STREET • REDDING, CA 96001 • (916) 244-0202 • FAX (916) 244-1978

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SUMMARY AND RECOMMENDATIONS

Shasta County Service Area No. 8 - Palo Cedro (CSA No. 8) currently serves development equal to approximately 175 household equivalents (HE's). The ultimate sewage flow from the service area shown on Figure 2 is projected to be equal to about 1,585 HE's. (Note: All figures are located at the end of this report.) Thus, the ultimate development (pursuant to the current County land use plan) is approximately nine times the present development. This updated ultimate development is also about two times the ultimate development of the initial service area as shown on Figure 1.

The main gravity sewage collection system that was installed in 1985 appears to be in good condition with no excessive infiltration/inflow (I/I) problems. Although the majority of the existing sewer system appears to be adequately sized for ultimate development needs, the reach of 8-inch sewer from Point 4 to Point 2 as shown on Figure 2 will eventually become overloaded and some parallel relief sewers will be needed. It will also be necessary to make significant improvements to the central pump station and the approximately 3 miles of force main that transports the raw sewage to the treatment and disposal facilities.

The existing 60,000 GPD treatment and disposal facilities will need to be expanded to about 317,000 GPD in order to accommodate the ultimate development. This degree of expansion cannot be accomplished on the existing 160 acre site and additional land will need to be acquired. If the proposed Foothill High School is connected to the CSA No. 8 sewer system it will be necessary to proceed immediately with expansion of the treatment and disposal facilities.

A staged improvement program has been developed in order to reduce the cash flow demands for needed future sewer system and

treatment and disposal improvements. Improvements have been recommended in the following three stages:

STAGE 1

Stage 1 improvements need to be accomplished prior to completion of the proposed Foothill High School or when the average dry weather flow reaches about 45,000 GPD, whichever occurs first. 75-2.1 The recommended improvements include acquisition of the additional property needed for ultimate expansion; increasing the central pump station capacity by paralleling about 6,100 feet of the existing force main; and expansion of the treatment, effluent storage, and irrigation facilities by 100,000 GPD capacity as shown on Figure 4.

It is estimated that these Stage 1 improvements will add approximately 500 HE's of capacity for a total of 800 HE's of capacity. The connected loading with the existing development and the projected initial Foothill High School flows would be about 275 HE's.

STAGE 2

Stage 2 improvements would continue expansion of the central pump station capacity by upgrading the central pump station itself; and add another 100,000 GPD in capacity to the treatment, effluent storage and irrigation facilities as shown on Figure 4. Stage 2 improvements will add approximately 500 HE's of capacity to the sewer system and timing of these improvements will depend upon the actual rate of future growth.

STAGE 3

Stage 3 improvements would be needed to serve the ultimate development of approximately 1,585 HE's. Due to the inherent head-capacity limitations on raw sewage pumps, expansion of the central pump station to meet the ultimate flow conditions will require either construction of about 6,700 feet of parallel force main or construction of a booster pump station near the location of the existing air injection station. The capital cost of both options is about the same and they should be analyzed in greater detail in the future. Stage 3 improvements will also add 57,000 GPD of treatment, effluent storage, and irrigation capacity as shown on Figure 4. Stage 3 improvements will add approximately 285 HE's of capacity to serve the ultimate development of 1,585 HE's.

A summary of the staged improvements and the related additional capacity in HE's are as follows:

Stage		Total Estimated Cost	Approximate Total HE Capacity	Additional HE's Served	Cost per HE
1	Sewer System, Treatment, and Disposal Improvements and Land Acquisition	$1,981,000	800	500	$3,962
2	Sewer System, Treatment, and Disposal Improvements	$1,618,000	1,300	500	$3,236
3	Sewer System, Treatment, and Disposal Improvements	$ 891,000	1,585	285	$3,126

As an alternative to the Stage 1 improvements outlined above it would be possible to construct the 57,000 GPD treatment and disposal expansion first on the existing 160 acre treatment site. This alternative referred to as Stage 1A would cost approximately $1,214,000 including the land acquisition needed for future improvements. Based on an increased capacity of 57,000 GPD or

285 HE's, the estimated incremental cost for Stage 1A would be about $4,260 per HE.

Because of the potential for environmentally sensitive conditions surrounding the existing treatment site it is recommended that CSA No. 8 conduct preliminary environmental studies and a preliminary soils investigation prior to purchasing any additional lands for expansion of the treatment and disposal facilities. Otherwise it will not be known whether the land is suitable for its intended use when needed.

The City of Redding is currently preparing a Master Sewer Plan for the future construction of a trunk sewer down Stillwater Creek. Since the existing CSA No. 8 treatment and disposal system is located in the Stillwater drainage it would be possible to gravity flow the CSA No. 8 raw sewage from the existing air release facility to the future Stillwater Interceptor Sewer. (Note: As shown on Figure 3 only a portion of the existing treatment site is within the City of Redding Sphere of Influence.) Although construction of the Stillwater Interceptor Sewer is only in the initial planning stage it is recommended that CSA No. 8 contact the City regarding possible future connection to the City's regional facility in lieu of future Stage 2 and 3 expansions of CSA No. 8's treatment and disposal facilities. Since it is not known at this time whether connection to the City system is politically feasible, no effort has been made to evaluate the costs involved in such an approach.

INTRODUCTION

GENERAL

The initial 1985 service area boundary for Shasta County Service No. 8 - Palo Cedro (CSA No. 8) is shown on Figure 1 at the end of this report. All of the existing development is provided sewer service by CSA No. 8 via a conventional gravity sewer system and raw sewage pump stations. The initial sewer system together with the associated treatment and disposal facilities were constructed in 1985-86 under the EPA and State Clean Water Grant Program. The sewer system began operation in August 1986.

Although the collection system was designed and constructed to serve the ultimate development of the initial service area, the treatment and disposal facilities were only constructed for a first stage design flow of 60,000 GPD (gallons per day). The ultimate development flow for the initial service area boundary was estimated at about 150,000 GPD in the 1983 Amended Project Report that was prepared for the Palo Cedro Sewage Disposal Project by PACE Engineering.

Since the system began operation CSA No. 8 has expanded its boundaries to include some adjacent private property and is considering service to the new Foothill High School that is proposed to be constructed to the north of the existing service area boundary. CSA No. 8 has also agreed to provide sewer service to the proposed 48 unit Palo Cedro Estates located approximately 3.5 miles south of Highway 44 on Deschutes Road.

In view of the desire to expand the service area of the sewer system and the need to adequately describe the future improvements needed to handle the resultant ultimate sewage flows CSA No. 8 retained PACE Engineering to prepare this Master Sewer Plan. This Master Sewer Plan outlines the pending system

improvements and provides order of magnitude estimates of costs for those improvements.

ABBREVIATIONS

Certain terms have been abbreviated in the following report as follows:

Abbreviation	Term	Description
ADWF	Average Dry Weather Flow	This is usually the average sewage flow during summer months when little I/I is present.
AWWF	Average Wet Weather Flow	This is usually the average sewer system flow during winter months when I/I is present.
GPAD		Gallons per acre per day.
GPM		Gallons per minute.
HE	Household Equivalent	Usually refers to the average flow or organic loading from the average residential unit. Commercial usage is often rated in household equivalents. In this study, 1 HE equals 200 gallons per day.
HP		Horsepower
I/I	Infiltration and Inflow	Leakage of groundwater and surface water inflow into the sewer system.
MGD	Million Gallons per Day	A rate of hydraulic flow.
PWWF	Peak Wet Weather Flow	Maximum flow during worst wet weather conditions.

SEWAGE COLLECTION SYSTEM

HISTORICAL USAGE

The new Palo Cedro Sewage Disposal System was placed into service in August 1986 and by August 1987 when most of the existing development had been connected the average daily flow was about 24,000 GPD. At an estimated flow of 200 GPD per household equivalent (HE) this represented about 120 HE's. A household equivalent (HE) is defined as the average dry weather sewage flow into the treatment plant from one single family residential dwelling. During the summer of 1991 the average dry weather flow was about 35,000 GPD or approximately 175 HE's. (Note: For the simplicities sake, the flow per HE has been rounded off from the 195 GPD per HE used in the initial Clean Water Grant Project to 200 GPD per HE.)

SEWER SERVICE AREA

A master plan of future sewer system improvements has been developed herein which would provide sewer service to potentially sewerable areas within the study area boundary. Figure 2 illustrates the study area and a few areas around the perimeter of the main study area that were designated as non-sewered. These areas were excluded from the future sewered area because including the additional sewage flows from those areas would significantly increase the cost of the future improvements that would be needed for both the collection and treatment facilities.

In 1987 and 1988 a Phase I and Phase II Pollution Study was conducted on the Mel Mar residential area to the south of the Palo Cedro commercial area. Although there were some indications of past problems with failing leach fields during wet weather conditions, the lack of normal winter rainfall during the pollution study period resulted in inconclusive test results

regarding water pollution and/or health hazards in that area due to failing septic systems. Therefore, the area did not qualify for Clean Water Grant funding for correction of the past wet weather problems. At this time no effort is being made to sewer the Mel Mar area and it was not included in this Master Sewer Plan.

The existing sewer service area and potential future sewer service area in the central Palo Cedro area was divided into nine sub-service areas, excluding the non-sewered areas. The Palo Cedro Estates service area approximately 3.5 miles south of Highway 44 was considered as a separate sub-service area. The limits of each of these are shown on Figure 2. Each sub-service area represents a tributary area within the sewer service area with a discharge point to an existing or future sewer at its lower extremity. As the flow in the main trunk sewers proceeds to the central pump station, more service areas are added and the flow in the sewers is increased. By separating the service areas in this manner, the flow characteristics for each sub-area can be analyzed separately for both present and future conditions. The flows can then be added using appropriate peaking factors such that peak flows can be estimated in every main sewer, both current and ultimate. Existing 1991 sewage flows for each sub-service area were determined by estimating the existing HE's for each parcel within the sub-service area. Ultimate sewage flows for each sub-service area were estimated by determining the area of each current zoning classification within the various sub-service areas and using the following household equivalent factors for ultimate sewage flows, except special determinations were made for the Junction School, Country Christian School, and the proposed Foothill High School sites. Special determinations

were also made for planned developments (PD) that have been approved by County Planning.

Current Zoning Designations	Household Equivalents per Acre
R-R	1/2 HE/acre
R-1-BA	3 HE/acre
R-R-BA-5 C-2 & C-2-DR	5.4 HE/acre
C-O-DR	5.4 HE/acre
C-M-DR	5.4 HE/acre
PF	Estimated based on proposed use
PD	Estimated based on proposed use

Average daily sewage flows from schools were estimated based on 0.08 HE (16 GPD) for elementary school students and 0.10 HE (20 GPD) for high school students. Based upon a 1991 enrollment of about 546 students, Junction School represents approximately 44 HE's. Under their projected ultimate enrollment of 1,000 students, the ultimate Junction School sewage flow was estimated at 80 HE's. A similar determination for the Country Christian School resulted in 1991 sewage flows of 26.5 HE's for their enrollment of 331 elementary and preschool students and an ultimate projection of 119 HE's based on their master plan of 550 elementary students and 750 high school students. The proposed Foothill High School, if constructed at the Palo Cedro site, would discharge flows equal to about 100 HE's with the initial 1,000 students and about 180 HE's with the ultimate enrollment of 1,800 students.

Table 1, Service Area Tabulation, (located at the end of this report), is a listing of the estimated HE's in each sub-service area and is categorized into single family residences and commercial units. An estimate of the number of units in each

category in each sub-service area is shown for the existing (1991) and ultimate condition. The average dry weather flow (ADWF) for each sub-service area (in the next to last column in Table 1) has been computed from the total HE's times 200 which is the estimated ADWF in gallons per day per HE. The totals at the end of Table 1 indicate the tributary load to the treatment plant is currently about 175 HE's increasing to approximately 1,585 HE's with ultimate buildout pursuant to the current general plan. Using these estimates, the current sewered development in the CSA No. 8 potential service area is about 11 percent of the possible ultimate development.

INFILTRATION/INFLOW

Infiltration/Inflow (I/I) is defined as extraneous water that enters the sewer system either by the leakage of groundwater into the sewers and manholes or by direct inflow via illegal connects of roof drains or damaged sewer manholes or cleanouts. A review of the monthly sewage flows for the last three years as shown in Table 2 indicates there is very little increase in treatment plant flows during the winter months. The higher than normal flows indicated in March and April 1989 were related to a clean water sump drainage flow that was subsequently diverted to a storm drain.

Although there is currently very little I/I contributed to the sewer system it must be remembered that the rainfall during the last three years has been significantly less than normal and the sewer system is still relatively new. There is little doubt that some I/I will develop over the years so we have estimated the peak I/I flow at 1,000 gallons per acre of sewered area per day (GPAD) under ultimate conditions. The I/I component is an important factor in determining the peak wet flows to be used in determining sewer main and pump station design capacities.

FUTURE SEWER REQUIREMENTS

The existing sewer system serving the central Palo Cedro commercial area is shown on Figure 2. This collection system has been expanded into areas that were not within the original service area (see Figure 1) and may even be expanded further to serve the proposed Foothill High School facility.

The entire sewage collection system was analyzed with a computer using the previously described ultimate sewage and I/I flow projections. Slopes of sewers used in this analysis were obtained from record drawings of the initial construction project.

Table 3 (located at end of report) is a compilation of the sewer sizing. The reach end points are shown on Figure 2. Only the main collector sewers where flow capacity could be a problem were included in the table and analyzed.

The analysis indicates that most of the existing sewers are adequate for the 1991 conditions. However, under ultimate conditions the section of 8-inch sewer main from the intersection of Deschutes Road and Cedro Lane (Point 4 on Figure 2) to the beginning of the 10-inch sewer main located south of Highway 44 (Point 2) will be overloaded. The sewer reach from Point 4 to Point 3 could surcharge by as much as 1.4 feet under ultimate peak wet weather flow conditions. In order to minimize this potential surcharging it is recommended that the sewage flow from a portion of service area A5 that is located east of Cedro Lane be routed through service area A10 and thus bypass most of the Point 4 to Point 3 reach. This would reduce the potential surcharging from about 1.4 feet to approximately 0.7 feet.

The ultimate sewage flow from Point 3 to Point 2 will also exceed the capacity of the existing 8-inch main and could cause surcharging in excess of 3.5 feet and probable sewage overflows. Therefore, it is recommended that a parallel 8-inch relief sewer

eventually be constructed from the south side of Highway 44 to Point 2 as shown on Figure 2. The limited capacity of the existing 8-inch main across Highway 44 could result in surcharging of about 1-foot.

A combined surcharge of 1.7 feet above Point 4 would not be a problem for the sewer running to the north up Deschutes Road to Point 6 due to an abrupt grade change immediately upstream of Point 4. However, it could create problems in the Cedro Lane sewer because it is laid at the minimum grade for an 8-inch sewer from Point 4 to Point 5 on Old Highway 44. Depending upon the ultimate development and actual I/I flows, it might be necessary to parallel the reach of sewer from Point 4 to Point 2. At this point it does not appear that it will be necessary to upgrade the Highway 44 crossing from an 8-inch to a 10-inch, but this should be re-evaluated as the actual flows approach the sewer capacity.

The estimated ultimate PWWF of 0.759 MGD downstream of Point 2 exceeds the 0.737 MGD design capacity of the 10-inch sewer but it would only result in about 0.2 feet of surcharge, which should not be a problem.

Since the actual ultimate sewage flows will depend on the actual development that occurs and the I/I that results, it will be important to periodically update the master plan flow projections to verify if and when the sewer reach from Point 4 to 3 needs to be paralleled.

For the purpose of this master plan it was assumed that the entire sewer reach from Point 4 to Point 2, except for the Highway 44 crossing, will require paralleling with an 8-inch sewer under ultimate conditions.

CENTRAL PUMP STATION AND FORCE MAIN

The existing central pump station and 16,000 feet of 8-inch force main to the treatment plant have an effective capacity of 350 GPM or 0.50 MGD. The estimated existing PWWF is about 0.2 MGD or 155 GPM and the estimate ultimate PWWF is approximately 1.03 MGD or 720 GPM. Due to the excessive length of the force main the total dynamic head on the pumps increases dramatically as the flows increase. Therefore, because of the limitations on the pump head capabilities of raw sewage pumps in general it will be necessary to make a combination of pump station and parallel force main improvements in order to achieve the desired ultimate flow rate of 720 GPM.

After analyzing the various options it is recommended that the pump station capacity be increased in the following stages:

Stage I - Increase the central pump station capacity from 350 GPM to 420 GPM by installing 6,100 feet of 10-inch parallel force main from the existing air injection facility to the existing air release facility. Also increase the capacity of the air injection facility from 8 CFM to 18 CFM.

Stage II - Increase the central pump station capacity from 420 GPM to 550 GPM by replacing the existing 50 horsepower (HP) pumps with 100 HP pumps, replacing the existing 100 KW generator with a 160 KW generator and upgrading the pump station electrical. Construct 1,200 feet of parallel 10-inch gravity sewer from the air release facility to the plant headworks.

Stage III - Either construct a booster pump station adjacent to the existing air injection station with 100 feet of total dynamic lift at 720 GPM or construct an additional 6,700 feet of parallel

10-inch force main from the air injection station north to about 200 feet north of Mel Mar Avenue.

Prior to constructing any of the parallel force main improvements, consideration should be given to increasing the parallel force main from a 10-inch diameter to a 12-inch diameter. Since a 12-inch force main would have the same capacity as the 8-inch and 10-inch combination it would be possible to pump all of the sewage flow from the central pump station through the new 12-inch force main and use the 8-inch force main for future sewering of the Mel Mar area.

TREATMENT AND DISPOSAL

EXISTING FACILITIES

Construction of the existing treatment plant was completed in August 1986. It was designed to handle an ADWF of 60,000 gallons per day. The plant has been well maintained and the treatment technology (aerated lagoon treatment followed by land application) is still a common method of treatment for smaller systems where irrigation land is readily available. The plant is fully capable of meeting the current waste discharge requirements. However, during the summer of 1991 the effluent from the storage reservoir exceeded the BOD limitations for a short time. The high BOD's (greater than 40 mg/ℓ) are believed to be due to the high algae concentration and the numerous mosquito fish and aquatic bugs in the reservoir. The BOD's were reduced to an acceptable level by chlorinating the effluent at the irrigation pump station prior to being discharged into the sprinkler irrigation system.

The plant consists of the following treatment elements:

1. Headworks with a normal medium barscreen and bypass coarse barscreen.

2. Aeration basin with 20 day detention time at 60,000 and three 3-HP (horsepower) direct drive aeration units.

3. Two effluent storage reservoirs for wintertime effluent storage and summertime regulating storage for the land application system.

4. Land application system which consists of an irrigation pump station, 21 acre sprinkler system, and runoff collection facilities.

The main components of the existing treatment and disposal system together with the existing adjacent land uses are shown on Figure 3.

The primary factors which affect the treatment plant are ADWF and BOD. Table 2 indicates the raw sewage flow BOD and suspended solids data for the last four years. The 1991 ADWF is estimated at 35,000 gallons per day or 58 percent of the existing design capacity. The BOD varies from 54 to 174 mg/ℓ with an average of about 111 mg/ℓ in 1991 which is below the original design value of 250 mg/ℓ. It should be noted that the average BOD for 1988 and 1989 was about 165 mg/ℓ.

The effluent storage and land application facilities were designed to handle a 100 year annual rainfall of 60 inches and a 25 percent increase in flows during the four wet weather months due to I/I entering the sewer system. Due to the past 5 years of drought these design parameters have not been tested to a significant degree. However, a hydraulic balance based on the available flow, rainfall and reservoir level data during 1986-1987 did tend to verify the computer model that was used during design.

FUTURE EXPANSION

Land application of treated sewage effluent with zero discharge to any water body is very land intensive. The existing 160 acre site was purchased with the concept of handling the ultimate development of the initial sewer service area which had an ultimate ADWF of about 150,000 GPD. However, with the expansion of the service area that has already occurred and the planned future expansion it will be necessary to acquire more land to handle the projected ultimate ADWF of 317,000 GPD from the potential service area shown on Figure 2.

Expansion of the treatment facilities from 60,000 GPD to 317,000 GPD can be accomplished in many different ways. Since the proposed Foothill High School could discharge up to 20,000 GPD initially and about 36,000 GPD ultimately it appears that the first treatment plant expansion increment should be about 100,000 GPD. This would provide capacity for the high school as well as capacity for further residential and commercial development in the service area.

For the purpose of preparing this report we have assumed that the entire treatment and disposal facilities would be expanding in three stages of 100,000, 100,000, and 57,000 GPD each. Table 4 is a preliminary hydraulic analysis for estimating of the effluent storage reservoir capacity and irrigation area requirements for the ultimate ADWF of 317,000 GPD. This analysis is based on a 100-year rainfall condition of 60 inches per year; an irrigation rate of 1.3 times the difference between the evapotransporation rate and precipitation; winter flows of 1.25 times summer flows; and allowances for evaporation and percolation from the storage reservoirs. As one can see from this analysis it is estimated that approximately 326 AC-FT of effluent storage capacity and 110 acres of irrigation area would be needed under ultimate flow conditions. Design criteria for a three staged expansion of the treatment and land disposal facilities is shown in Table 5.

Figure 3 is a map of the existing 160 acre treatment site together with an indication of the current agricultural use of the neighboring property to south and west. Although the 160 acres immediately west of the existing site would make a convenient site for expansion there is a major drainage through the middle of that parcel and a fairly large low area in the northwest quadrant which would probably be classified as wetlands. The topography and soils in the south half of this parcel also indicate that it might be subject to vernal pools. Both wetlands and vernal pools are considered environmentally

sensitive areas and extensive and costly mitigation measures would be needed to utilize those types of area.

The range land immediately south of the existing treatment site is also a suspected vernal pool area. There are two areas of cultivated farmland indicated further to the west and southwest that could possibly be used for land application. As also shown on Figure 3 the City of Redding Sphere of Influence Boundary passes through a western edge of the existing treatment site and includes most of the potential expansion areas. It is not feasible to expand to the north or east because of the topography and the existing development.

Figure 4 indicates a preliminary layout of the future treatment and disposal facilities including three additional treatment basins, three future storage reservoirs, 52 acres of additional irrigation area on the existing treatment site and 37 acres of additional irrigation area on Alternative A, B, C, and D sites. The current 300 feet buffer between the edge of the sprinkler irrigation area and the property line would be maintained and a 50-foot buffer would be provided between the edge of surface irrigation area and the property line. Only a 50-foot buffer is needed in the surface irrigation areas because there would not be any potential for aerosol drift. In order to use surface irrigation the land would have to be terraced and irrigated with gated pipe.

Future Reservoir Nos. 3 and 4 are indicated to be constructed along the sloping hillside to the west of the existing irrigation area. This location was selected so that the reservoirs can be constructed in a cut and fill situation where the reservoirs would not be subject to partially filling with the natural perched water table. A french drain groundwater cutoff trench would be constructed along the north and east perimeters similar to the existing reservoirs. This preliminary location for Reservoir Nos. 3 and 4 is based on the 10-foot contours shown the

USGS quadrangle and is subject to change pending more detailed design mapping and a detailed soils investigation.

Based on the indicated preliminary layout of the existing and future irrigation areas it appears that about 73 acres of the ultimate 110 acres of irrigation area can be developed on the existing 160 acre site. Because of potential problems with vernal pools and other environmental issues four potential sites have been indicated for developing the remaining 37 acres of irrigation area. Alternative Irrigation Areas A and B are currently undeveloped range land with potential vernal pools while Alternative Irrigation Areas C and D are on currently cultivated agricultural lands. Obviously, either sites A or B would be the most desirable because they are contiguous to the existing site and they would result in the most confined operation. However, final selection and actual purchase of the land for the future reservoirs and irrigation areas should not be done until a preliminary environmental review has been completed of all sites. The issue of potential vernal pools and wetlands must be addressed in order to assure that the property can be used as intended. It would also be prudent to undertake a preliminary soils investigation similar to the one that was performed prior to purchase of the existing site.

RECOMMENDED STAGED IMPROVEMENTS

GENERAL

The existing base sewer system infrastructure was funded under the initial Clean Water Grant and sewer assessment district project. For the basis of this report it is assumed that all new sewer lines in undeveloped areas and offsite improvements needed to reach the base sewer system will be funded directly by the developers, including but not limited to the pump station and force main from service area S1. Therefore, the improvements outlined herein are only those needed to increase the capacity of the existing infrastructure to meet the potential new demands.

In order to reduce the cash flow demands for needed future improvements, it is desirable to develop a staged improvement program. Such a staged improvement program should provide significant increments of additional capacity that will meet the increased demands for a reasonable length of time as well as represent cost effective stages of construction.

The proposed staged sewer system improvements are shown on Figure 2, and the proposed staged treatment and disposal improvements are shown on Figure 4. A description and estimated cost of each stage follows:

STAGE 1 IMPROVEMENTS

These recommended Stage 1 improvements will be needed as soon as the Foothill High School begins holding classes at its proposed high school site. If Foothill High School is not developed at the proposed site then construction of the Stage 1 improvements should begin when the plant flow reaches about 45,000 GPD or 75 percent of the existing capacity. This stage will allow expansion from the current 300 HE's to approximately 800 HE's or

160,000 GPD. Stage 1 improvements and their costs are described as follows:

1.	Sewer System Improvements	
	a. Increase the central pump station capacity from 350 GPM to 420 GPM by installing 6,100 feet of parallel 10-inch force main from the existing air injection facility to the existing air release facility	$ 180,000
	b. Increase the capacity of the air injection facility from 8 CFM to 18 CFM	20,000
	SUBTOTAL	$ 200,000
2.	Treatment and Disposal Improvements	
	a. Add a new 100,000 GPD treatment basin with three 7.5-HP aerators	$ 157,000
	b. Add a new 110-AC-FT effluent storage reservoir	617,000
	c. Add a new irrigation pump station at the new reservoir	98,000
	d. Add 34 acres of new irrigation area on existing treatment site	183,000
	e. Plant electrical & controls	50,000
	SUBTOTAL	$1,105,000
3.	Land Acquisition	
	a. Purchase an additional 80± acres of land for two future 110-AC-FT effluent storage reservoirs and an addition 60± acres for 37 additional acres of irrigation	$ 280,000
	TOTAL ESTIMATED CONSTRUCTION & LAND COST	$1,585,000
	INDIRECT COSTS, ENGINEERING AND CONTINGENCIES @ 25%	$ 396,000
	TOTAL STAGE 1 IMPROVEMENT COST	$1,981,000

STAGE 2 IMPROVEMENTS

These improvements would be needed when the ADWF approaches 160,000 GPD. However, the central pump station improvements will probably be needed sooner, because the wet weather infiltration/ inflow component tends to increase somewhat as soon as the sewer mains are constructed and is not entirely dependent upon construction of the residences and structures which contribute the ADWF component. The Stage 2 facilities are described as follows:

1.	Sewer System Improvements	
	a. Increase the central pump station capacity from 420 GPM to 550 GPM by replacing the existing 50-HP pumps with 100-HP pumps, replacing the existing 100 KW generator with a 160 KW generator and upgrading the pump station electrical.	$ 134,000
	b. Construct 1,200 feet of parallel 10-inch gravity sewer from the air release facility to the plant headworks	26,000
	SUBTOTAL	$ 160,000
2.	Treatment and Disposal Improvements	
	a. Add a new 100,000 GPD treatment basin with three 7.5-HP aerators	$ 175,000
	b. Add a new 110-AC-FT effluent storage reservoir	551,000
	c. Add 34 acres of new irrigation area (Based on Irrigation Sites C or D)	378,000
	d. Plant electrical and controls	30,000
	SUBTOTAL	$1,134,000
	TOTAL ESTIMATED CONSTRUCTION COST	$1,294,000
	INDIRECT COST, ENGINEERING AND CONTINGENCIES @ 25%	$ 324,000
	TOTAL STAGE 2 IMPROVEMENT COST	$1,618,000

STAGE 3 IMPROVEMENTS

These improvements would be needed when the ADWF approaches 260,000 GPD. However, the central pump station improvements will probably be needed sooner because the wet weather infiltration/ inflow component tends to increase somewhat as soon as the sewer mains are constructed and is not entirely dependent upon construction of the residences and structures which contribute the ADWF component. The Stage 3 facilities are described as follows:

1.	Sewer System Improvements	
	a. Increase the central pump station capacity from 550 GPM to 720 GPM by either constructing a booster pump station adjacent to the existing air injection station with 100 feet of total dynamic lift at 720 GPM or construct an additional 6,700 feet of parallel 10-inch force main from the air injection station north to about 200 feet north of Mel Mar Avenue	$ 210,000
	b. Parallel sewer from Point 4 to Point 3	57,000
	c. Parallel sewer from south of Highway 44 to Point 2	54,000
	SUBTOTAL	$ 321,000
2.	Treatment and Disposal Improvements	
	a. Add a new 57,000 GPD treatment basin with three 3-HP aerators	$ 107,000
	b. Add a new 38-AC-FT effluent storage reservoir	141,000
	c. Add 21 acres of new irrigation area	124,000
	d. Plant electrical and controls	20,000
	SUBTOTAL	$ 392,000
	TOTAL ESTIMATED CONSTRUCTION COST	$ 713,000
	INDIRECT COST, ENGINEERING AND CONTINGENCIES @ 25%	$ 178,000
	TOTAL STAGE 3 IMPROVEMENT COST	$ 891,000

SUMMARY OF FUTURE IMPROVEMENT COSTS

A summary of the staged improvements and the related additional capacity in HE's are as follows:

Stage		Total Estimated Cost	Approximate Total HE Capacity	Additional HE's Served	Cost per HE
1	Sewer System, Treatment, and Disposal Improvements and Land Acquisition	$1,981,000	800	500	$3,962
2	Sewer System, Treatment, and Disposal Improvements	$1,618,000	1,300	500	$3,236
3	Sewer System, Treatment, and Disposal Improvements	$ 891,000	1,585	285	$3,126

As an alternative to the Stage 1 Improvements outlined hereinbefore it would be possible to construct the 57,000 GPD expansion first by constructing Treatment Basin No. 4 and Reservoir No. 5 shown on Figure 4 along with constructing the outer dikes of future Treatment Basin Nos. 2 and 3 as an extension of Reservoir No. 5. Thus the interim expanded capacity of Reservoir No. 5 would be about 55 AC-FT. The interior dikes of treatment basins Nos. 2 and 3 could be constructed at future stages when the additional storage reservoirs are constructed. This alternative plan is referred to as Stage 1A and the needed facilities are described as follows:

1. Sewer System Improvements

a.	Increase the central pump station capacity from 350 GPM to 420 GPM by installing 6,100 feet of parallel 10-inch force main from the existing air injection facility to the existing air release facility	$ 180,000
b.	Increase the capacity of the air injection facility from 8 CFM to 18 CFM	20,000
	SUBTOTAL	$ 200,000

2.	Treatment and Disposal Improvements	
	a. Add a new 57,000 GPD treatment basin with three 3 HP aerators	$ 113,000
	b. Add a new 55 AC-FT effluent storage reservoir	243,000
	c. Add 21 acres of new irrigation area	110,000
	d. Plant electrical and controls	25,000
	SUBTOTAL	$ 491,000
3.	Land Acquisition	
	a. Purchase an additional 80± acres for two future 110-AC-FT effluent storage reservoirs and an additional 60± acres for 37 additional acres of irrigation	$ 280,000
	TOTAL ESTIMATED CONSTRUCTION COST	$ 971,000
	INDIRECT COST, ENGINEERING AND CONTINGENCIES @ 25%	243,000
	TOTAL STAGE 1A IMPROVEMENT COST	$1,214,000

Based on an increased capacity of 57,000 GPD or 285 HE's, the estimated incremental cost for Stage 1A would be about $4,260 per HE.

TABLES

TABLE 1
SERVICE AREA TABULATION
Project: PALO CEDRO MASTER SEWER PLAN

OUTPUT
File Name: 35-19SA4
Date: 10/30/91
Manning N = 0.013
Exist. I&I= 1000 GPAD
New I&I = 1000 GPAD

First Year 1991
Second Year Ultimate
Assumed Flow (ADWF) Per Household Equivalent (gpcd) 200

SERVICE AREA NO.	YEAR	HOUSEHOLD EQUIVALENTS (H.E.s) S.F.Res. (Units)	Multi. Fam. (Units)	Comm./Ind. (Units)	Total (H.E.s)	Service AREA (Acres)	EXIST. AREA (Acres)	NEW AREA (Acres)	EXIST AREA I&I RATE (gpad)	NEW AREA I&I RATE (gpad)	ADWF (MGD)	I&I FLOW (MGD)
A_1	1991	0		0	0.0	0	0	0	1000	1000	0.000	0.000
	Ultimate	0		0	0.0		0	0	1000	1000	0.000	0.000
	0				0.0				1000	1000	0.000	0.000
A_2	1991	3		58	61.0	127	50	0	1000	1000	0.012	0.050
	Ultimate	69		320	389.0		50	23	1000	1000	0.078	0.073
	0				0.0				1000	1000	0.000	0.000
A_3	1991	0		0	0.0	107	0	0	1000	1000	0.000	0.000
	Ultimate	0		180	180.0		0	12	1000	1000	0.036	0.012
	0				0.0				1000	1000	0.000	0.000
A_4	1991	7		0	7.0	62	11	0	1000	1000	0.001	0.011
	Ultimate	26		26	52.0		11	13	1000	1000	0.010	0.024
	0				0.0				1000	1000	0.000	0.000
A_5	1991	2		10	12.0	70	20	0	1000	1000	0.002	0.020
	Ultimate	27		124	119.0		20	15	1000	1000	0.024	0.035
	0				0.0				1000	1000	0.000	0.000
A_6	1991	0		0	0.0	81	12	0	1000	1000	0.000	0.012
	Ultimate	49		0	49.0		12	6	1000	1000	0.010	0.018
	0				0.0				1000	1000	0.000	0.000
A_7	1991	6		15	21.0	103	10	0	1000	1000	0.004	0.010
	Ultimate	17		346	363.0		10	65	1000	1000	0.073	0.075
	0				0.0				1000	1000	0.000	0.000
A_8	1991	4		25	29.0	53	9	0	1000	1000	0.006	0.009
	Ultimate	44		209	253.0		9	44	1000	1000	0.051	0.053
	0				0.0				1000	1000	0.000	0.000
A_9	1991	0		44	44.0	21	8	0	1000	1000	0.009	0.008
	Ultimate	10		80	80.0		8	2	1000	1000	0.016	0.010
	0				0.0				1000	1000	0.000	0.000
S_1	1991	0		0	0.0	170	0	0	1000	1000	0.000	0.000
	Ultimate	49		0	49.0		0	56	1000	1000	0.010	0.056
	0				0.0				1000	1000	0.000	0.000
A_10	1991	0		1	1.0	66	2	0	1000	1000	0.000	0.002
	Ultimate	32		19	51.0		2	22	1000	1000	0.010	0.024
	0				0.0				1000	1000	0.000	0.000
TOTALS	1991	22	0	153	175		122	0			0.035	0.122
TOTALS	Ultimate	323	0	1304	1585		122	258			0.317	0.380

Date: 1/2/92
File: 35-19FLO

TABLE 2

PALO CEDRO MASTER SEWER PLAN
SUMMARY OF PLANT SEWAGE LOADINGS

1991

MONTH	FLOW MG/month	FLOW GPD	BOD mg/l	S.S. mg/l
JAN	0.946	30500	76	120
FEB	0.852	27490	174	156
MAR	1.061	34235	140	196
APR	1.010	32581	136	256
MAY	1.040	33548	54	88
JUN	0.845	27242	105	508
JUL	0.970	31290	110	28
AUG	1.053	33961	3*	40
SEP	0.997	32171	79	92
OCT	1.074	34632	34*	380
NOV	0.921	29706	91	92
DEC	1.005	32413	140	240
TOTAL	11.773		1142	2196
AVG			111**	183

*Questionable test results
**Average BOD excludes questionable data

1990

MONTH	FLOW MG/month	FLOW GPD	BOD mg/l	S.S. mg/l
JAN	0.000	0	73	100
FEB	0.894	28839	103	96
MAR	0.981	31645	116	84
APR	0.855	27581	137	240
MAY	0.940	30323	164	240
JUN	0.994	32065	118	164
JUL	0.971	31323	129	188
AUG	0.835	26935	173	108
SEP	0.826	26645	124	120
OCT	0.873	28161	140	164
NOV	0.901	29065	56	68
DEC	1.000	32258	41	180
TOTAL	10.070		1374	1752
AVG			115	146

1989

MONTH	FLOW MG/month	FLOW GPD	BOD mg/l	S.S. mg/l
JAN	0.870	28065	165	92
FEB	0.883	28484	121	96
MAR	1.297	41839	404	128
APR	1.037	33452	190	224
MAY	0.937	30226	220	84
JUN	0.850	27419	158	164
JUL	0.928	29935	110	176
AUG	0.935	30161	173	76
SEP	1.117	36032	137	144
OCT	0.917	29581	99	48
NOV	0.813	26226	76	300
DEC	0.736	23742	152	300
TOTAL	11.320		2005	1832
AVG			167	153

1988

MONTH	FLOW MG/month	FLOW GPD	BOD mg/l	S.S. mg/l
JAN				
FEB	0.700	22581	300	318
MAR	0.840	27097	115	130
APR	0.859	27710	155	124
MAY	0.880	28387	34	132
JUN	0.737	23774	134	205
JUL	0.830	26774	110	112
AUG	0.834	26903	326	500
SEP	0.884	28516	250	273
OCT	0.884	28516	117	132
NOV	0.794	25613	108	168
DEC	0.791	25516	107	160
TOTAL	9.033		1756	2254
AVG			160	205

TABLE 3
SEWER FLOW & SIZING TABULATION
Project: PALO CEDRO MASTER SEWER PLAN Date: 10/30/91 File Name: 35-19SA4

REACH BELOW PT. NO.	TRIBUTARY SERVICE AREAS or REACHES						YEAR	FLOW ADWF (MGD)	FLOW I&I (MGD)	FLOW PWWF (MGD)	CRITICAL DOWNSTREAM SLOPE	EXIST. SEWER DIAMETER (INCHES)	EXIST. SEWER CAPACITY (MGD)	REQD.PARALLEL SEWER SIZE (INCHES)	REPLACEMENT SEWER SIZE (INCHES)	COMMENTS
6	A_2	A_3					1991	0.012	0.050	0.081	0.0036	8	0.470	0.0	4.1	
							Ultimate	0.114	0.085	0.369	0.0036	8	0.470	0.0	7.3	
							0	0.000	0.000	0.000	0.0036		0.000	0.0	0.0	
5	A_4	A_5					1991	0.004	0.031	0.041	0.0033	8	0.450	0.0	3.2	
							Ultimate	0.034	0.059	0.145	0.0033	8	0.450	0.0	5.2	
							0	0.000	0.000	0.000	0.0033		0.000	0.0	0.0	
4	6	5					1991	0.016	0.081	0.112	0.0033	8	0.450	0.0	4.7	
							Ultimate	0.148	0.144	0.514	0.0033	8	0.450	3.9	8.4	Parallel sewer
							0	0.000	0.000	0.000	0.0033		0.000	0.0	0.0	required
3	4	A_10	A_6				1991	0.016	0.095	0.126	0.004	8	0.495	0.0	4.8	
							Ultimate	0.168	0.186	0.606	0.004	8	0.495	4.6	8.6	Parallel sewer
							0	0.000	0.000	0.000	0.004		0.000	0.0	0.0	required
2	3	A_8					1991	0.022	0.104	0.159	0.0027	10	0.737	0.0	5.6	
							Ultimate	0.218	0.239	0.759	0.0027	10	0.737	2.7	10.1	Minor
							0	0.000	0.000	0.000	0.0027		0.000	0.0	0.0	surcharge
8	A_7						1991	0.004	0.010	0.021	0.0035	8	0.463	0.0	2.5	
							Ultimate	0.073	0.075	0.257	0.0035	8	0.463	0.0	6.4	
							0	0.000	0.000	0.000	0.0035		0.000	0.0	0.0	
7	8	A_9					1991	0.013	0.018	0.051	0.012	8	0.857	0.0	2.8	
							Ultimate	0.089	0.085	0.307	0.012	8	0.857	0.0	5.4	
							0	0.000	0.000	0.000	0.012		0.000	0.0	0.0	
1	2	7					1991	0.035	0.122	0.210	0	0	0.000	N/A	N/A	Central
							Ultimate	0.307	0.324	1.030	0	0	0.000	N/A	N/A	Pump
							0	0.000	0.000	0.000	0		0.000	N/A	N/A	Station
0	S_1	1					1991	0.035	0.122	0.210	0	0	0.000	N/A	N/A	Treatment
							Ultimate	0.317	0.380	1.109	0	0	0.000	N/A	N/A	Plant
							0	0.000	0.000	0.000	0		0.000	N/A	N/A	

Date: 11/11/91
File: 35-19HYD

TABLE 4

PALO CEDRO MASTER SEWER PLAN
PRELIMINARY LAND DISPOSAL FACILITIES SIZING FOR ULTIMATE FLOW
ESTIMATED 100-YEAR RAINFALL HYDRAULIC LOADING AND STORAGE REQUIREMENTS

MONTH ENDING	100- YEAR RAINFALL inch/mo.	POTENTIAL ET RATE inch/mo.	EVAP. inch/mo.	IRRIG. RATE inch/mo.	SEWAGE TO STOR. ac-ft/mo.	RAINFALL ON STORAGE ac-ft/mo.	EVAP. FROM STOR. ac-ft/mo.	IRRIGATION ac-ft/mo.	STORAGE POND PERC. ac-ft/mo.	CHANGE IN STORAGE ac-ft.	ESTIMATED TOTAL IN STORAGE ac-ft.
OCT	13.20	0.00	3.50	0.00	29.58	36.30	7.58	0.00	1.98	56.33	56.33
NOV	4.50	0.00	2.00	0.00	29.58	12.38	4.33	0.00	2.96	34.66	90.99
DEC	15.10	0.00	1.30	0.00	36.98	41.53	2.82	0.00	3.95	71.74	162.73
JAN	9.50	0.00	1.20	0.00	36.98	26.13	2.60	0.00	5.93	54.58	217.30
FEB	6.00	0.00	1.40	0.00	36.98	16.50	3.03	0.00	7.90	42.54	259.85
MAR	6.90	0.00	2.40	0.00	36.98	18.98	5.20	0.00	8.89	41.86	301.71
APR	2.80	0.00	3.80	0.00	29.58	7.70	8.23	0.00	9.88	19.17	320.88
MAY	2.00	6.20	5.00	5.46	29.58	5.50	10.83	50.05	8.89	-34.69	286.19
JUN	0.00	7.60	6.80	9.88	29.58	0.00	14.73	90.57	5.93	-81.64	204.55
JUL	0.00	8.00	8.60	10.40	29.58	0.00	18.63	95.33	3.95	-88.33	116.22
AUG	0.00	6.70	7.40	8.71	29.58	0.00	16.03	79.84	2.96	-69.25	46.96
SEP	0.00	5.40	5.60	7.02	29.58	0.00	12.13	64.35	1.98	-48.87	-1.91
TOTAL	60.00	33.90	49.00	41.47	384.60	165.00	106.17	380.14	65.21	-1.91	

CONSTANTS

Storage pond runoff area (acres):	A	33
Average storage pond water surf.(acres):	B	26
Irrigation area (acres):	C	110
Storage pond percolation rate @ 12 ft WL (in/day):	D	0.15
Design ADWF (mgd):	E	0.317

NOTES:
1. 100 year precip. based on 1890 rainfall in Redding prorated to Palo Cedro area in proportion to average rainfall.
2. Potential ET based on 21 years on data for irrigated pasture in Gerber, California.
3. All of effluent is applied directly during May-September. Application rate = ET - Precipitation * 1.30
4. Evaporation estimated using Shasta Dam pan evaporation x 0.70 pan coefficient.
5. Winter sewage flows equal to 1.25 times Summer flows.

Active Storage (ac-ft.) =	320.9
Dead Storage (ac-ft.) =	5.0
TOTAL STORAGE (ac-ft.) =	325.9

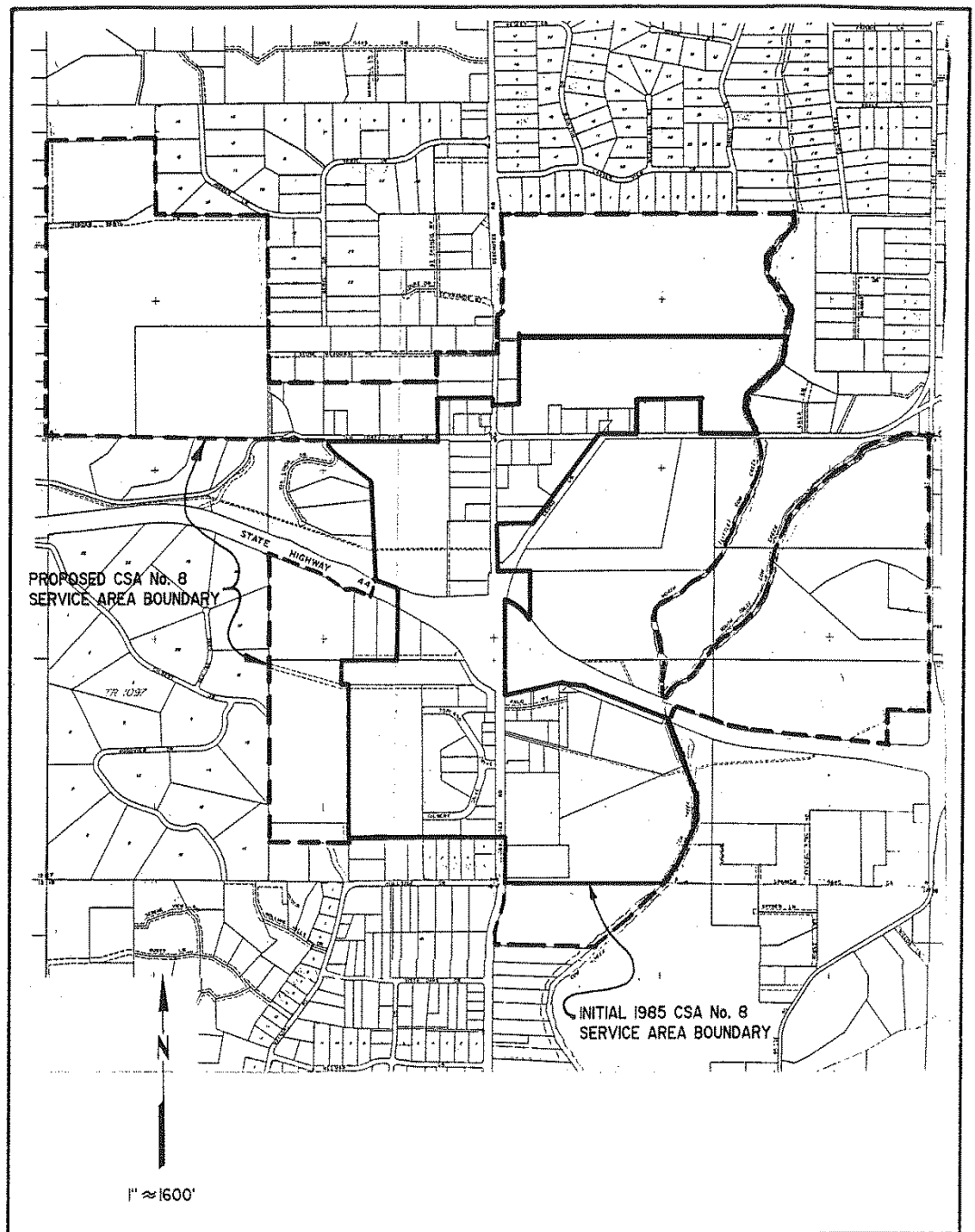
TABLE 5

TREATMENT AND DISPOSAL FACILITIES DESIGN CRITERIA

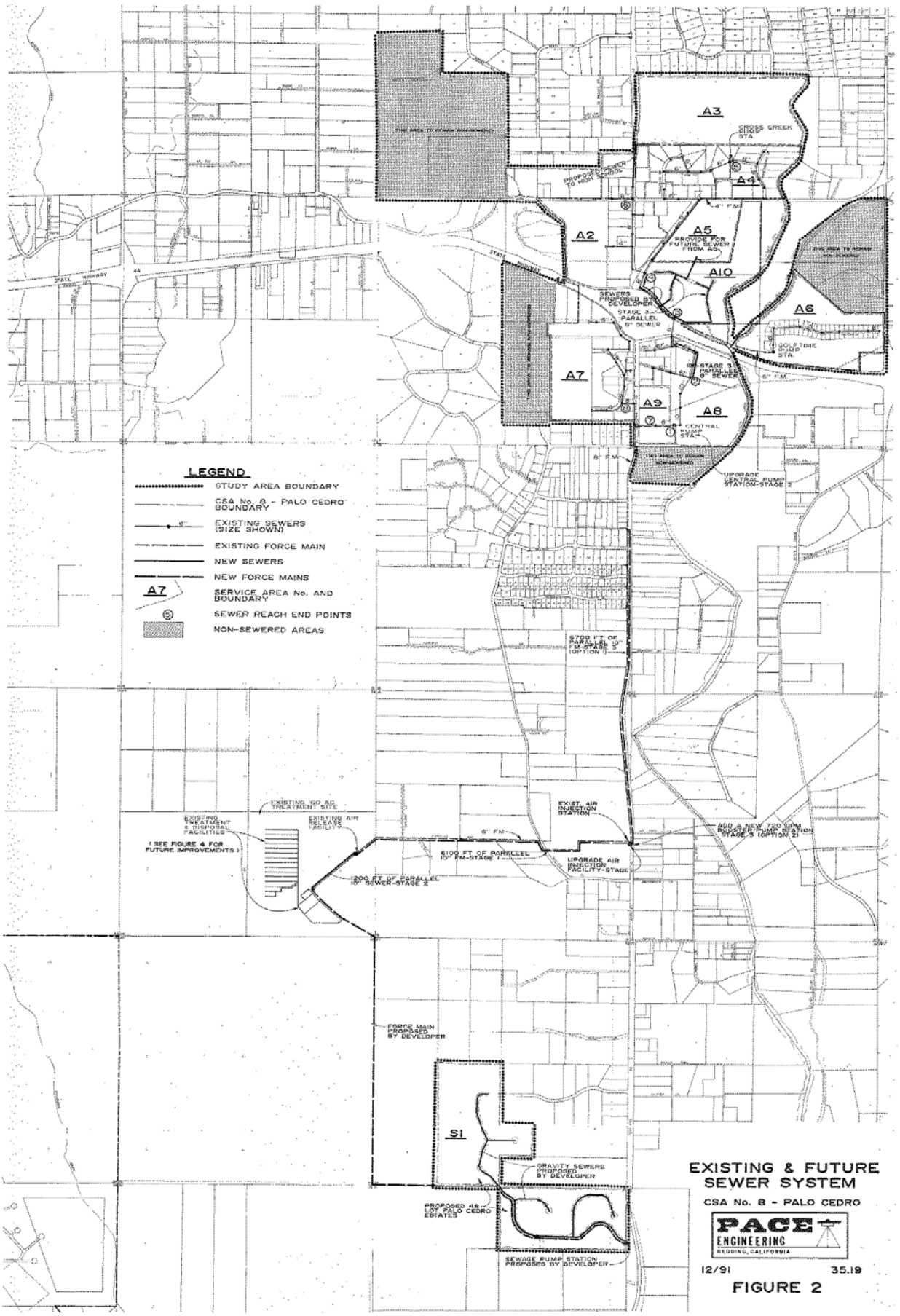
ITEM	EXISTING CAPACITY	STAGE 1 CAPACITY	STAGE 2 CAPACITY	ULTIMATE STAGE 3 CAPACITY
HOUSEHOLD EQUIVALENTS	300	800	1,300	1,585
FLOWS				
AVERAGE DRY WEATHER FLOW (ADWF) GPD	60,000	160,000	260,000	317,000
AVERAGE WET WEATHER FLOW (AWWF) GPD	75,000	200,000	325,000	396,000
PEAK WET WEATHER FLOW (PWWF) GPD	360,000	650,000	940,000	1,109,000
SEWAGE LOADING				
BIOCHEMICAL OXYGEN DEMAND (BOD_5)				
CONCENTRATION, mg/ℓ	< - - - - - - - - - - - 250 - - - - - - - - - - - >			
LB/DAY	125	334	542	661
TOTAL SUSPENDED SOLIDS				
CONCENTRATION, mg/ℓ	< - - - - - - - - - - - 250 - - - - - - - - - - - >			
LB/DAY	125	334	542	661
FIRST STAGE TREATMENT				
NUMBER OF AERATION CELLS	1	2	3	4
DETENTION TIME AT ADWF, DAYS	< - - - - - - - - - - - 20 - - - - - - - - - - - >			
CELL DEPTH, FEET	< - - - - - - - - - - - 10 to 12 - - - - - - - - - - >			
BOD LOADING, LB	125	334	542	661
AERATION HORSEPOWER	6	21	36	42
SECOND STAGE TREATMENT				
NUMBER OF AERATION CELLS	1	2	3	4
DETENTION TIME AT ADWF, DAYS	< - - - - - - - - - - - 20 - - - - - - - - - - - >			
CELL DEPTH, FEET	< - - - - - - - - - - - 10 to 12 - - - - - - - - - - >			
BOD LOADING, LB	63	167	271	331
AERATION HORSEPOWER	3	10.5	18	21
STORAGE RESERVOIRS				
NUMBER OF RESERVOIRS	2	3	4	5
TOTAL CAPACITY, AC-FT	68	178	288	326
DEPTH, FEET	< - - - - - - - - - - - 11.5 to 17.5 feet - - - - >			
ESTIMATED EFFLUENT QUALITY				
BOD_5, mg/ℓ	< - - - - - - - - - - - 40 - - - - - - - - - - - >			
TOTAL SUSPENDED SOLIDS, mg/ℓ	< - - - - - - - - - - - 40 to 100 - - - - - - - - - - >			
TOTAL NITROGEN, AS N, mg/ℓ	< - - - - - - - - - - - 20 - - - - - - - - - - - >			
TOTAL PHOSPHORUS, AS P, mg/ℓ	< - - - - - - - - - - - 8 - - - - - - - - - - - >			
LAND APPLICATION SYSTEM				
TOTAL VOLUME FOR LAND APPLICATION (100-YR RAINFALL) AC-FT	70	190	310	380
LAND APPLICATION RATE				
(NORMAL RAINFALL YEAR) AC-FT/AC	2.6	2.7	2.7	2.7
(100-YR RAINFALL) AC-FT/AC	3.3	3.5	3.5	3.5
IRRIGATED LAND AREA, ACRES	21	55	89	110
NITROGEN LOADING RATE LBS/AC/YR (20 mg/ℓ IN EFFLUENT)	141	147	147	147

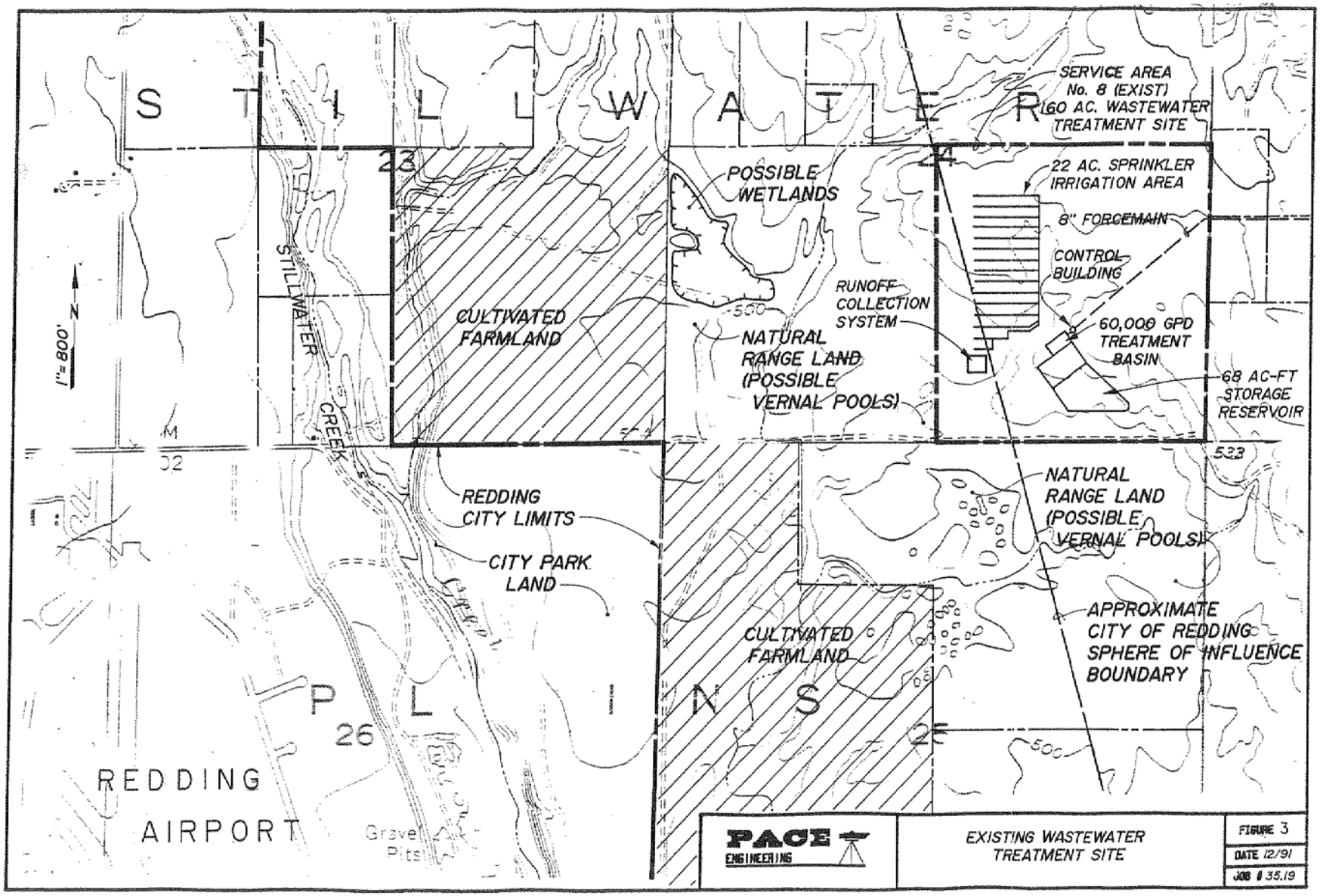
WP-3519.REP/TABLE.DES

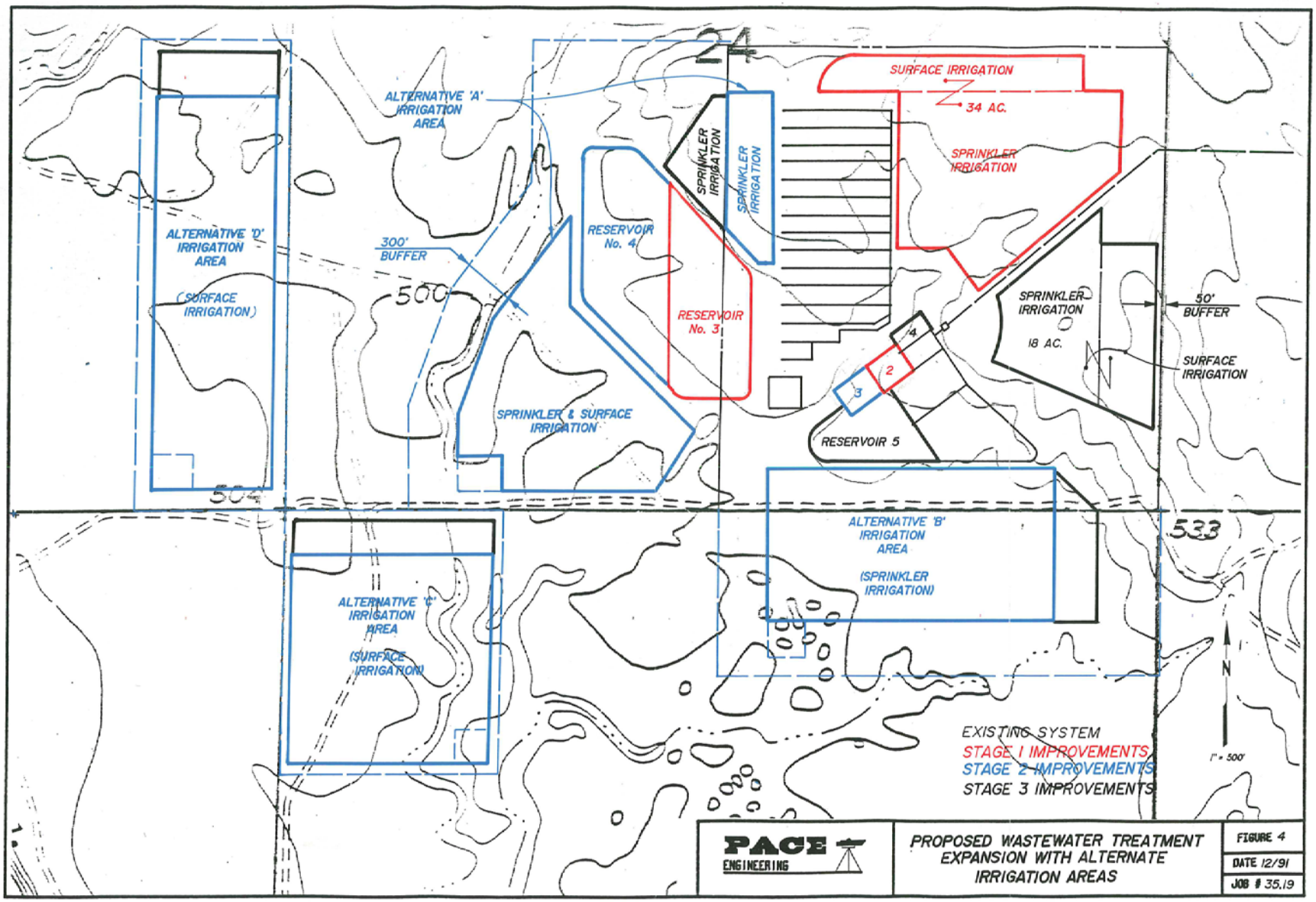
FIGURES



DATE			
12/91	PACE ENGINEERING 1730 S. ST., REDDING, CALIF.	PROJECT STUDY AREA	FIGURE 1 JOB NO. 35.19


LEGEND
STUDY AREA BOUNDARY
CSA No. 8 - PALO CEDRO BOUNDARY
EXISTING SEWERS (SIZE SHOWN)
EXISTING FORCE MAIN
NEW SEWERS
NEW FORCE MAINS
A7 SERVICE AREA No. AND BOUNDARY
SEWER REACH END POINTS
NON-SEWERED AREAS
A3
A4
A2
A5
A10
A6
A7
A9
A8
S1
EXISTING & FUTURE SEWER SYSTEM
CSA No. 8 - PALO CEDRO
PACE ENGINEERING
REDDING, CALIFORNIA
12/91
35.19
FIGURE 2


SERVICE AREA
No. 8 (EXIST)
160 AC. WASTEWATER
TREATMENT SITE
22 AC. SPRINKLER
IRRIGATION AREA
8" FORCEMAIN
CONTROL
BUILDING
RUNOFF
COLLECTION
SYSTEM
60,000 GPD
TREATMENT
BASIN
68 AC-FT
STORAGE
RESERVOIR
POSSIBLE
WETLANDS
CULTIVATED
FARMLAND
NATURAL
RANGE LAND
(POSSIBLE
VERNAL POOLS)
STILLWATER
CREEK
REDDING
CITY LIMITS
CITY PARK
LAND
NATURAL
RANGE LAND
(POSSIBLE
VERNAL POOLS)
CULTIVATED
FARMLAND
APPROXIMATE
CITY OF REDDING
SPHERE OF INFLUENCE
BOUNDARY
REDDING
AIRPORT
Gravel
Pits
1" = 800'
PACE
ENGINEERING
EXISTING WASTEWATER
TREATMENT SITE
FIGURE 3
DATE 12/91
JOB # 35.19


ALTERNATIVE 'A' IRRIGATION AREA
SURFACE IRRIGATION
34 AC.
SPRINKLER IRRIGATION
SPRINKLER IRRIGATION
SPRINKLER IRRIGATION
ALTERNATIVE 'D' IRRIGATION AREA
(SURFACE IRRIGATION)
300' BUFFER
500
RESERVOIR No. 4
RESERVOIR No. 3
SPRINKLER & SURFACE IRRIGATION
SPRINKLER IRRIGATION
18 AC.
50' BUFFER
SURFACE IRRIGATION
4
2
3
RESERVOIR 5
504
ALTERNATIVE 'B' IRRIGATION AREA
(SPRINKLER IRRIGATION)
533
ALTERNATIVE 'C' IRRIGATION AREA
(SURFACE IRRIGATION)
N
1" = 500'
EXISTING SYSTEM
STAGE 1 IMPROVEMENTS
STAGE 2 IMPROVEMENTS
STAGE 3 IMPROVEMENTS
PACE ENGINEERING
PROPOSED WASTEWATER TREATMENT EXPANSION WITH ALTERNATE IRRIGATION AREAS
FIGURE 4
DATE 12/91
JOB # 35.19

CSA #13—Alpine Meadows
System Report and
15-Year Maintenance Plan

Prepared by Shasta County
Department of Public Works
May 2007
Revised July 2007

Approved By:

Director of Public Works

Table of Contents

Background

CSA #13—Alpine Meadows is in the eastern area of Shasta County. The CSA is bisected by State Route 44 in the unincorporated area of Shingletown. CSA #13 provides water and sewer service to lots in the Whispering Woods subdivision north of State Route 44. Only sewer service is provided south of State Route 44 to the Alpine Meadows commercial subdivision. Alpine Meadows and Whispering Woods each have their own separate sewage collection and treatment systems.

The CSA was initially set up in 1982 when the Alpine Meadows commercial subdivision was developed. The sewer system was constructed by the developer of the commercial subdivision and accepted by the county for ongoing maintenance. The 1982 sewer system consists of a gravity collection system, storage tank, pressurized effluent line, and community leach field. The parcels along Alpine Meadows Road and Wilson Hill Road are served by a gravity sewer system. Much of the gravity collection system is in a meadow area not adjacent to the road system—see figure1. The gravity system feeds into a septic tank and pump system that pumps the sewage to a community leach field west of the subdivision.

In 1992, the developer of the Whispering Woods subdivision constructed a sewer and water system to service lots north of State Route 44. The Whispering Woods subdivision was annexed to CSA #13 in 1992. Whispering Woods Subdivision is served by a gravity sewer system, storage tank, pressurized effluent line, and community leach field. Water is supplied by a community well and storage tank. The sewer system collects sewage in a centralized storage tank. From the tank, it is pumped up to the community leach field just north of the subdivision.

In 2005, a four parcel subdivision was created immediately adjacent to the western leach field. This subdivision uses individual pumps to pump sewage to the common leach field area. Each lot has a separate leach field area assigned to it within the boundary of the common leach field.

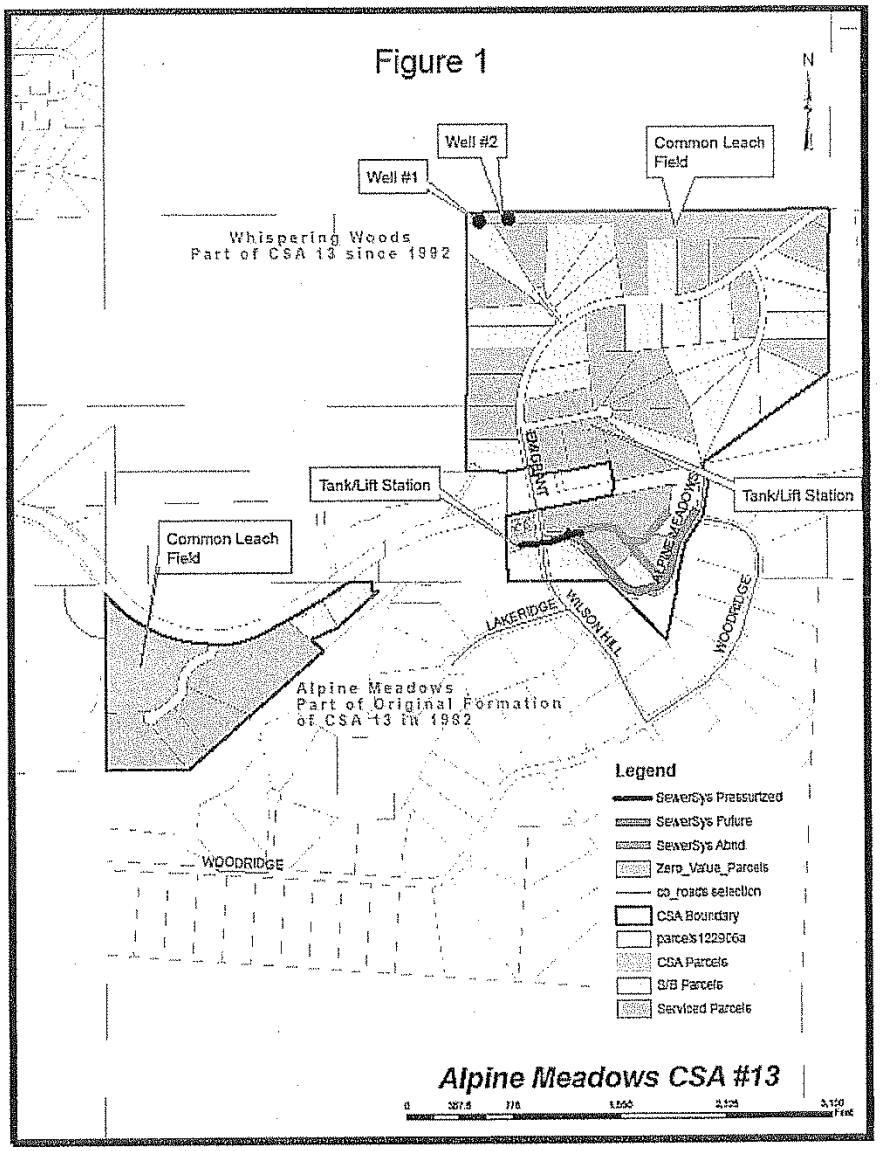


Figure 1
N
Well #2
Well #1
Common Leach Field
Whispering Woods
Part of CSA 13 since 1992
Tank/Lift Station
Tank/Lift Station
Common Leach Field
EMERALD
ALPINE MEADOWS
LAKERIDGE
WILSON HILL
WOODRIDGE
WOODRIDGE
Alpine Meadows
Part of Original Formation
of CSA 13 in 1982
Legend
SewerSys Pressurized
SewerSys Future
SewerSys Abnd
Zero_Value_Parcels
co_roads selection
CSA Boundary
parcels122906a
CSA Parcels
S/B Parcels
Serviced Parcels
Alpine Meadows CSA #13

Regulatory Issues

Much of the Alpine Meadows collection system is located within a designated wetland area. Current environmental regulation by the Army Corps of Engineers (ACOE) would prohibit any construction within the wetland areas. Construction would include excavation of the existing sewer system in order to make repairs. In 1982, when the system was constructed, the ACOE did not claim any regulatory control over the meadow area. Any modification to the system in the meadow will require ACOE permits and possibly a wetland mitigation plan.

The water system is regulated by the Shasta County Department of Resource Management--Environmental Health Division.

Waste Discharge Requirements

Sewer systems are regulated by the State Regional Water Quality Control Board (SRWQCB). A copy of the Waste Discharge Requirements are attached in Appendix C. High inflow/infiltration (rain and ground water getting in the sewer) could potentially overload the community leach field systems. The SRWQCB has mandated that the Inflow/Infiltration be limited.

System Deficiencies

The collection system south of State Route 44 is experiencing excessive inflow and infiltration. The "as-built" plans for the system show tight radius curvature of the collection system pipes. The curves are made of straight lengths of pipe angled at each joint. The PVC pipes are connected by rubber gasket friction fittings. The bends in the pipe at the joints would have a tendency to overstress pipe joints. This would over time cause the gaskets to fail allowing groundwater to enter the collection system. The majority of the southern collection system is in a designated wetland. During the wet season the collection system, with open pipe joints, acts as an underground drain in the inundated meadow area.

The septic tank and pump station south of State Route 44 was inspected in November 2004. The tank was pumped out. The interior was inspected. No cracks were noted. The tank access cover was modified to make it more watertight. This inspection documented that the tank was not a significant contribution to the inflow/infiltration problem.

The system north of State Route 44 is also having excessive inflow/infiltration problems. Spot inspections have revealed at least one illegal connection. The illegal connection involved a resident piping a basement sump pump into the sewer system. This one violation does not explain the whole problem. Video inspection and smoke testing would help quantify leaking pipes and illegal connections.

Well #1 for the water supply of the Whispering Woods subdivision has tested positive for bacteriological contamination. As a result only Well #2 is used to supply water--see figure 1 for well locations. Having only one well to supply potable water provides no redundancy. The subdivision does have a storage tank. If an interruption of the supply from well #2 occurs, water stored in the tank would supply the subdivision for a day or more depending on water demand. An emergency temporary rationing notice could also be sent such that demand could be cut back further. Storage and conservation would allow a few days to fix any anticipated problems with the well. Given these mitigation measures, no immediate work is planned at the well sites. A long term solution would be to raise water rates and build up a fund balance. The funds would be used to drill a second well to provide a truly redundant water supply system.

Proposed Solutions

Because CSA #13 has been mandated by the SRWQCB to remedy the sewer system infiltration/inflow problems, the following solutions only address sewer problems. In order to remedy the infiltration/inflow problems in the meadow south of State Route 44, the gravity sewer system will be abandoned in place. All existing customers would be served with a Storage Tank Effluent Pump (STEP) system. The Library and Health Clinic would be converted to a STEP system immediately. The STEP system has a small storage tank and pump/grinder system that would pump the sewage to the existing centralized holding tank. The commercial center could still be served without a STEP system. Vacant lots could be served as development is permitted south of State Route 44 within the CSA.

The STEP system's pressurized lines would be threaded through the existing collection system to avoid excavations in the wetland areas. This method will save considerable time and money by avoiding any excavation at all. Future development within the southern system could be served by STEP systems with lines threaded through the existing gravity system or placed along road right-of-ways. The existing gravity system will then be sealed off from the central collection tank. The STEP system would be financed by a no interest loan from the Shasta County Water Agency over 15 years. The total estimated cost for the STEP system is $50,000. The cost estimate for this work is in Appendix B

The sewer system north of State Route 44 would remain a gravity system feeding the existing storage tank and pump. Smoke testing will be used to find illegal storm water drainage connections to the system. Video inspection will locate broken or leaking sewer pipes. A small amount of money will be set aside annually ($5,000 per annum) to replace bad sections of sewer pipe. Both the north and south systems require that the sewage pumps be replaced. Existing cash on hand in the CSA will be used for this purpose. Remaining cash on hand will be used to start the inspection process in northern part of the CSA. Financial details are shown in Appendix A.

Financing

The improvements would be funded by a combination of a no interest loan over 15 years and rate increase within the CSA. The rate increase will cover, in addition to the loan, long term replacement/maintenance of the mechanical systems used to provide sewer service. Additional monies have been programmed for inspection and maintenance of the gravity sewage collection system. Appendix A provides details for each item.

Appendix A

15 Year Operation Plan for CSA 13 Based on Household Equivalents (HE's)

Loan Amortization Alpine Meadows Repair/Replace Leaking Pipes (Standby's excluded from increase)
Install Storage Tank and Effluent Pump (STEP) System for Existing Customers

Improvement Type	Cost	No. of HE's Benefited	Loan Principal	Annual Payment	Annual Cost Per HE	
				0% interest for 10 years, Shasta County Water Agency Loan		Refi Amount in Five Years
Fix Exist. Connections (first 5 years)	$ 35,000.00	30	$ 30,000.00	($3,000.00)	($100.00)	($17,500.00)
			Exist loan princ. + new loan	0% interest for 10 years, Shasta County Water Agency Loan		
Allow For Future Connections (5 years out)	$ 15,000.00	30	$30,000.00	($3,000.00)	($100.00)	
				Average Annual Loan Cost per HE.	$100.00	

Cost Breakdown Operations, Equipment Replacement, Inflow/Inflitration Program

Operations

	No. of HE's		Annual Cost	Annual Cost Per HE	
2005/2006 Costs	30		$ 13,305.00	$ 443.50	
2006/2007 three quarters data last quarter projected	30		$ 13,920.00	$ 464.00	No extraordinary maint. In 05/06 and 06/07
			Average Cost Per HE=	$ 453.75	
Standby Charges	20	Sewer only	($2,400.00)	($120.00)	S/B helps offset usage rates
			Subtotal:	$ 333.75	

Pump Replacement

	No. of HE's	Total Cost	Annual Cost	Annual Cost Per HE	
STEP system (10 year life) 2 pumps@500 ea.	30	$ 1,000.00	$ 100.00	$ 3.33	
Main pump station (20 year)[1] 2 pumps @1500 ea.	30	$ 3,000.00	$ 150.00	$ 5.00	
Whispering Woods pumps (20 year)[2] 2 pumps @1500 ea.	30	$ 3,000.00	$ 150.00	$ 5.00	

Remedy Other Sources of Infiltration [3]

	No. of HE's	Total Cost	Annual Cost	Annual Cost Per HE	
Video Inspection (every five years)	30	$ 2,000.00	$ 400.00	$ 13.33	
Hydro-clean collection system (every three yrs)	30	$ 2,010.00	$ 670.00	$ 22.33	
Pipe Replacement annualized	30		$ 4,000.00	$ 133.33	Whispering Woods only
Smoke Test (every five years)	30	$ 1,000.00	$ 200.00	$ 6.67	
			Subtotal	$ 189.00	

Cash on hand as of 3/31/07: $9,550.00

[1] Existing pumps will be replaced with loan funds

[2] These pumps also need replacement will use cash on hand in FY 06/07

[3] any remaining cash on hand will go towards I/I issues

Annual Grand Total per HE: $ 622.75
Bi-monthly Sewer Bill: $ 103.79

Appendix B

CSA #13 - Alpine Meadows
Meadow Area Step System Estimate

Materials

Item	Item Description	Unit	Qty	Unit Price	Price
1	500 Gal. Polyethylene Sewage Pump Tank	Ea	3	$437.50	$1,312.50
2	1 HP Zoeller 270 Wastemade Sump Pump (220V)	Ea	3	$465.28	$1,395.84
3	Cast Iron Check Valve & Misc. Fittings	Ea	3	$100.00	$300.00
4	Audible Alarm With Light	Ea	3	$109.86	$329.58
5	Wiring To Each Unit	Ea	3	$1,000.00	$3,000.00
6	2-inch Polyethylene Line (3-300ft Rolls & 1-100ft Roll)	Ft	1000	$0.79	$790.00
7	Zoeller Pump @ 6,009 Gal Tank (50gpm @ 50' Head)	Ea	1	$746.00	$746.00
				Subtotal =	$7,873.92
				Tx (7.25%)	$570.86
				Total =	**$8,444.78**

Labor

Employee	Rate	Hours	Total
Equipment Operator III W/ Backhoe	$81.05	60	$4,863.00
Randy Gillichbauer	$77.34	40	$3,093.60
Rusty Swayne	$65.35	60	$3,921.00
Tom Stephens	$62.97	60	$3,778.20
Bob Hawkins*	$65.00	80	$5,200.00
		Labor =	**$20,855.80**

* - Need to Verify Hourly Rate With Facilities

Total Project Costs = $29,300.58

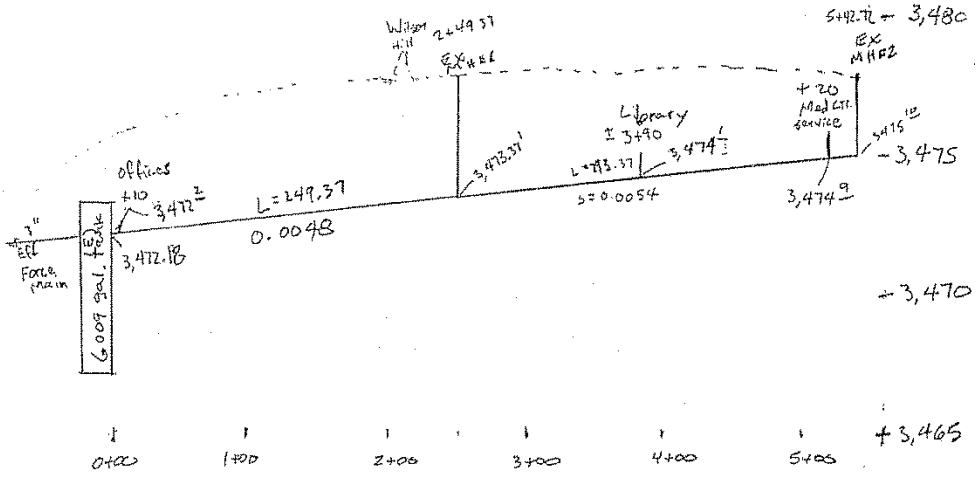
COUNTY OF SHASTA
DEPARTMENT OF PUBLIC WORKS

W.O. NO. _____ SHEET _____ OF _____

PROJECT _____ CALC. BY SP DATE _____

ITEM _____ CHECKED BY _____ DATE _____

STEP System Model



option: - provide 500gal sewage pump tank w/ sump sewage pump tank @ each of 3 connections.
- Connect each via 2" ϕ polyethylene pipe to existing 6,000 gallon tank
- place New pump @ tank to feed into existing Force Main

1) Service Equipment
Quote per JW Woods
500 gal. polyethylene pump tank @ $437.50 ea.
1hp Zoeller 270 Watermaster Sump Pump 220V @ $465.28 ea
Cast iron Check Valve & Misc. Fittings @ $100 ea.
audible alarm w/ light @ 109.86 ea
$1,112.64

2) 2" poly Line
3-300 ft Rolls @ $0.79/ft = $711.00
1-100ft Roll @ $0.79/ft = $79.00
$790.00

3) New Sewage Sump Pump @ 6,000 gallon tank
Zoeller 50gpm @ 50-ft of head = $746.00

Total Cost of Parts = $4,873.92
+ 7.25% TX
$5,227.28

COUNTY OF SHASTA
DEPARTMENT OF PUBLIC WORKS

W.O. NO. _____ SHEET _____ OF _____

PROJECT _____ CALC. BY SP DATE _____

ITEM _____ CHECKED BY _____ DATE _____

Man Hours

Equipment operator w/ Equipment @ 60 hrs = 60 x $81.05 = $4,863

2 Flaggers @ 40 hrs = 40 x $26.49 = $1,059.20

Randy @ 40 hrs = 40 x $77.34 = $3,093.60

Rusty @ 80 hrs = 80 x $65.35 = $5,228

Bob Hawkins @ 80 hrs = 80 x $65 = $5,200

Tom Stephens @ 80 hrs = 80 x $62.97 = $5,037

Labor = $24,480.80

WATERWORKS ENGINEERS

S_2-J_2 ENGINEERING
WEST COTTONWOOD SEWER CAPACITY ANALYSIS
Sewer Capacity Analysis Technical Memorandum

Date: November 9, 2007
Prepared By: Andrew Borgic, E.I.T.
Sami Kader, P.E.

TABLE OF CONTENTS

Introduction and Purpose

Cottonwood Hills is a proposed residential development in Shasta County, just west of Cottonwood, CA. The proposed Cottonwood Hills development will consist of approximately 690 single family residential lots. This proposed development will be provided sewer service by the Cottonwood Sewage Disposal System (Shasta County CSA #17). The purpose of this report is as follows:

1) to assess the capacity of the current Cottonwood Sewage Disposal System (CSDS) to accommodate currently constructed residences and define any existing system deficiencies.
2) to determine the sewer upgrades that would be required to the existing CSDS to accommodate the ultimate build-out of the existing CSA #17
3) to determine the sewer upgrades that would be required to the existing CSDS to accommodate the ultimate build-out of the existing CSA #17 with the addition of the Cottonwood Hills subdivision.
4) to determine the sewer upgrades that would be required to the existing CSDS to accommodate the ultimate build-out of the existing CSA #17 with the addition of the Cottonwood Hills subdivision and other vacant lands that are adjacent to CSA #17, and likely to be developed in the future.

Only the portions of CSA #17 which feeds the Cottonwood Pump Station (West Cottonwood and portions of East Cottonwood) were examined in this analysis. Further analysis of the East Cottonwood area as well as the Cottonwood Pump Station and Cottonwood WWTP are recommended.

Proposed Cottonwood Hills Development Description

The proposed development is located outside of the existing CSA #17, approximately 1 mile west of the Gas Point Road – Interstate 5 overpass in Cottonwood. The proposed Cottonwood Hills development consists of 690 single family residential lots.

Existing Wastewater Collection System Operation

Existing Service Area

The existing CSA #17 collects wastewater from approximately 1,352 active housing equivalents (HEs) in the town of Cottonwood. The existing CSA #17 boundary is shown in Figure 1.

CSA #17 contains both active and standby HE sewer connections. The active HEs are currently connected to and contributing flow to the wastewater collection system. Standby HEs have been granted the right to connect to the wastewater collection system, but are not currently contributing flow to the wastewater collection system. The number of active and standby HE sewer connections for the West and East Cottonwood areas were estimated using data obtained from Shasta County Department of Public Works and are presented in Table 1.

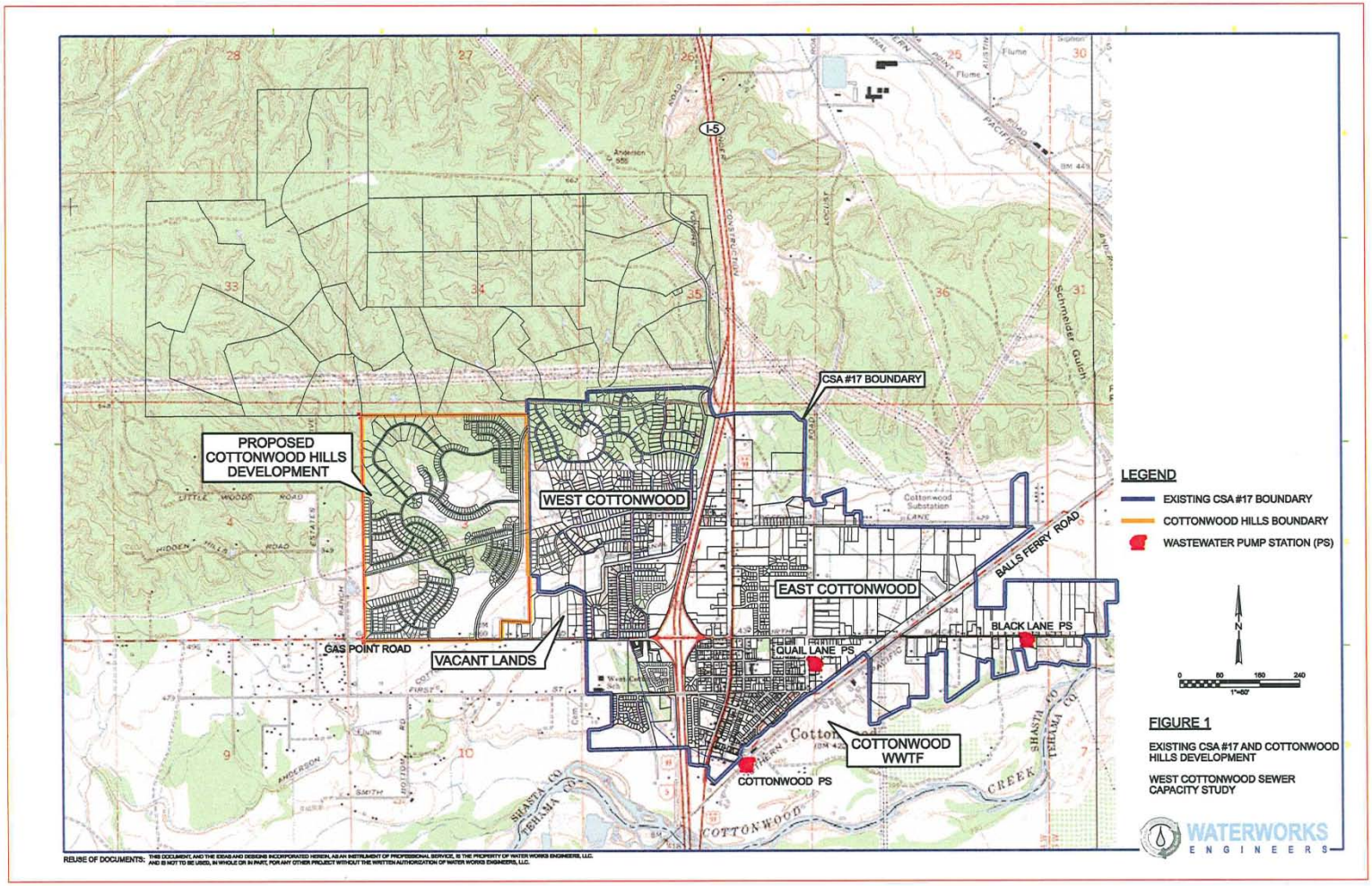

PROPOSED COTTONWOOD HILLS DEVELOPMENT
WEST COTTONWOOD
CSA #17 BOUNDARY
EAST COTTONWOOD
BALLS FERRY ROAD
BLACK LANE PS
QUAIL LANE PS
GAS POINT ROAD
VACANT LANDS
COTTONWOOD WWTF
COTTONWOOD PS
I-5
LEGEND
EXISTING CSA #17 BOUNDARY
COTTONWOOD HILLS BOUNDARY
WASTEWATER PUMP STATION (PS)
N
0 80 160 240
1"=80'
FIGURE 1
EXISTING CSA #17 AND COTTONWOOD HILLS DEVELOPMENT
WEST COTTONWOOD SEWER CAPACITY STUDY
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Table 1 – CSA #17 Current and Potential HE Connections

Region	Area	Active	Standby (Potential)	Total
West Cottonwood				
CSA #17				
	Existing	533		533
	Approved Subdivision		375	375
	Vacant Land Allocations		192	192
	Subtotal:	533	567	1,100
Outside CSA #17				
	Cottonwood Hills		690	690
	Vacant Lands North of Gas Point Rd.		72	72
	Subtotal:		762	762
	Total:	533	1,329	1,862
East Cottonwood				
CSA #17				
	Existing (pumped by Cottonwood PS)	730	326	1,056
	Existing (Pumped by Black Lane PS)	89	171	260
	Total:	819	497	1,316
Cottonwood				
	Grand Total:	1,352	1,826	3,178

Existing Wastewater Collection System

The existing sewer collection system of CSA #17 consists of 6" to 12" gravity sewer (reported to be vitrified clay pipe), and approximately 9,000 feet of sewer force main (reported to be ductile iron pipe) that conveys the sewage to the Cottonwood Wastewater Treatment Facility (CWWTF).

four

The collection system has three pump stations (PSs), including Black Lane PS #1, Quail Lane PS and Cottonwood PS as shown in Figure 1. The Black Lane PS pumps sewage that is collected from the east side of CSA #17 through a 6" force main to the CWWTF. The Quail Lane PS pumps sewage that is collected from a small area near the center of the service area through a 3" force main to an 8" gravity sewer at manhole C21-4 at Locust and Third Street. The Cottonwood PS is the most significant and largest lift station in the system, it pumps sewage from the west and east side of CSA #17 to the CWWTF through a 10" force main.

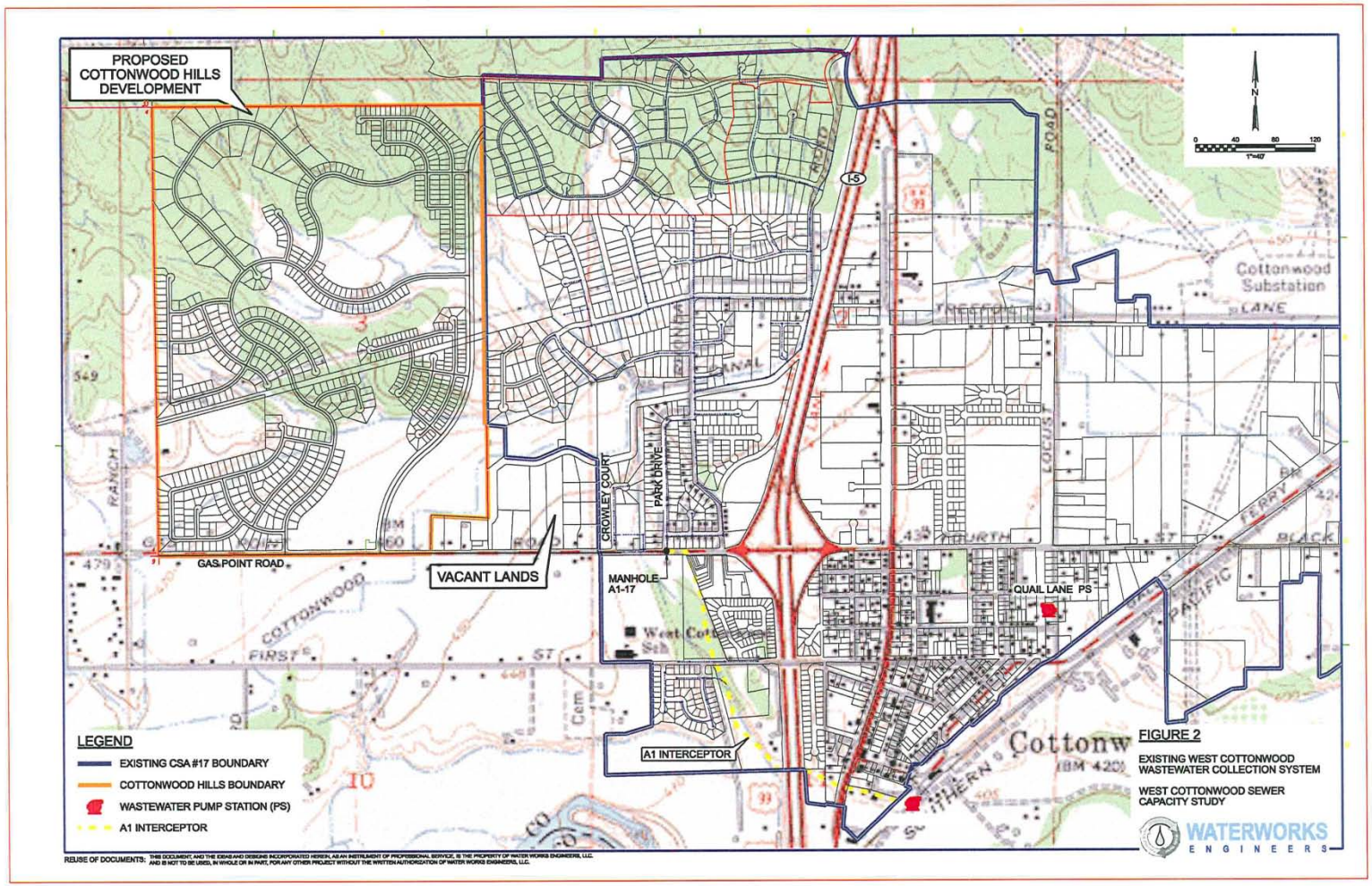
Crowley Creek

The proposed development's wastewater collection system will likely tie into the existing sewer system on Gas Point Road near Crowley Court and Park Drive at manhole A1-17. This manhole is at the top end of the existing A1 gravity interceptor (A1 Interceptor) that conveys

wastewater from manhole A1-17 (intersection Gas Point Road and Park Drive) to the Cottonwood PS. The A1 interceptor is the primary sewage collector main for the West side of Cottonwood. The plan of the A1 interceptor is shown in Figures 2 and 3. The A1 Interceptor's existing layout per span is shown in Table 2.

Table 2 – Collection System Layout: A1 Interceptor

Span	Upstream Manhole ID	Pipe Diameter (in.)	Length (feet)	Slope (feet/feet)
1	A1-17	8	205	0.0060
2	A1-16		320	0.0072
3	A1-15		300	
4	A1-14		375	0.0152
5	A1-13		385	0.0060
6	A1-12		305	0.0218
7	A1-11		200	0.0070
8	A1-10		360	
9	A1-9		355	0.0098
10	A1-8	10	335	0.0030
11	A1-7		280	
12	A1-6		245	0.0081
13	A1-5		210	0.0030
14	A1-4		115	
15	A1-3		280	
16	A1-2		320	
17	A1-1	12	110	


PROPOSED COTTONWOOD HILLS DEVELOPMENT
VACANT LANDS
GAS POINT ROAD
MANHOLE A1-17
QUAIL LANE PS
A1 INTERCEPTOR
I-5
Cottonwood Substation
CROWLEY COURT
PARK DRIVE
RANCH
COTTONWOOD
FIRST ST
FOURTH ST
PACIFIC
FERRY
BLACK
LEGEND
EXISTING CSA #17 BOUNDARY
COTTONWOOD HILLS BOUNDARY
WASTEWATER PUMP STATION (PS)
A1 INTERCEPTOR
FIGURE 2
EXISTING WEST COTTONWOOD WASTEWATER COLLECTION SYSTEM
WEST COTTONWOOD SEWER CAPACITY STUDY
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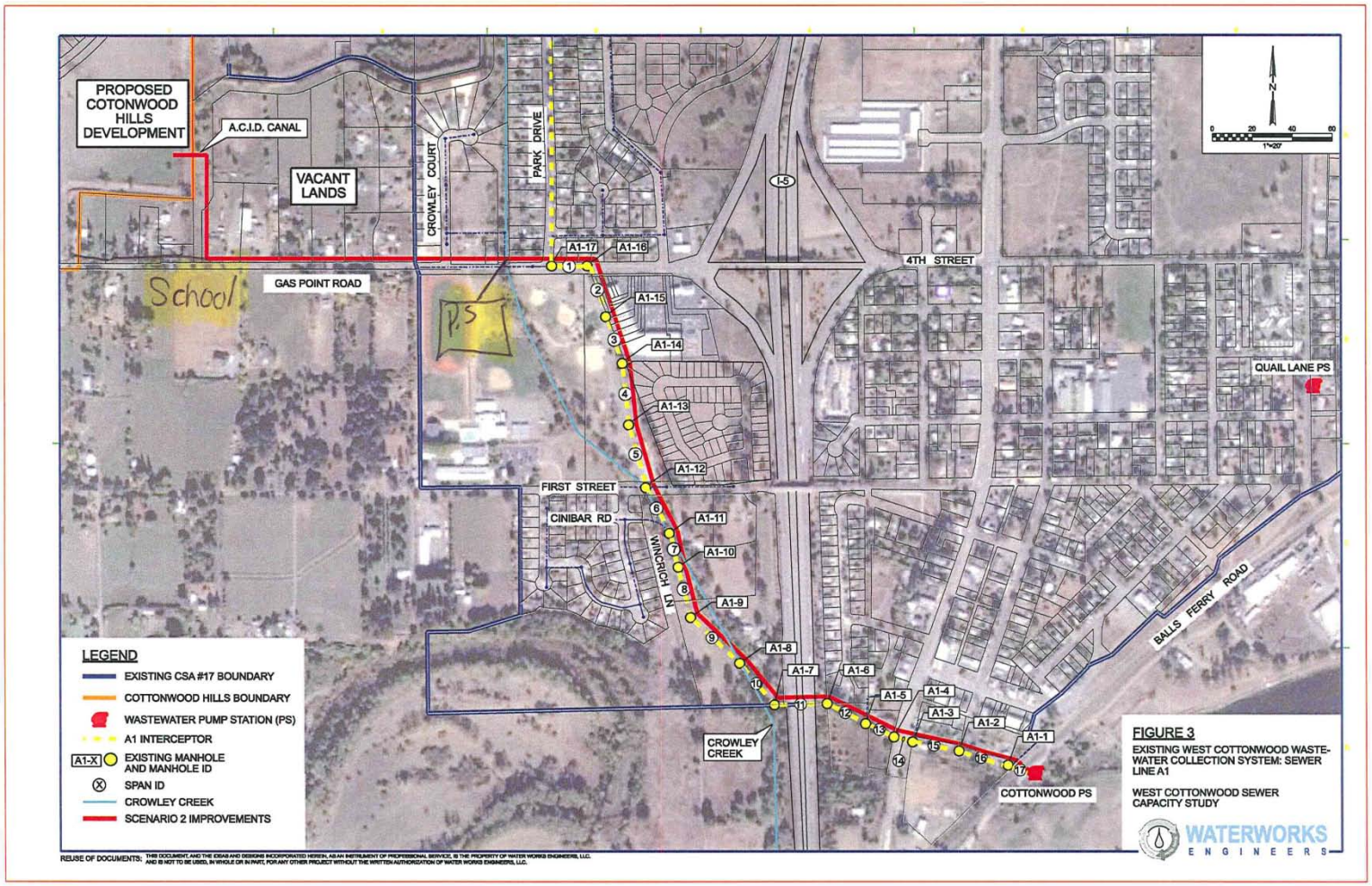
PROPOSED COTONWOOD HILLS DEVELOPMENT
A.C.I.D. CANAL
VACANT LANDS
CROWLEY COURT
PARK DRIVE
I-5
4TH STREET
GAS POINT ROAD
School
P.S
QUAIL LANE PS
FIRST STREET
CINIBAR RD
WINCHCH LN
BALLS FERRY ROAD
CROWLEY CREEK
COTTONWOOD PS
A1-17
A1-16
A1-15
A1-14
A1-13
A1-12
A1-11
A1-10
A1-9
A1-8
A1-7
A1-6
A1-5
A1-4
A1-3
A1-2
A1-1
LEGEND
EXISTING CSA #17 BOUNDARY
COTTONWOOD HILLS BOUNDARY
WASTEWATER PUMP STATION (PS)
A1 INTERCEPTOR
A1-X EXISTING MANHOLE AND MANHOLE ID
SPAN ID
CROWLEY CREEK
SCENARIO 2 IMPROVEMENTS
FIGURE 3
EXISTING WEST COTTONWOOD WASTE-WATER COLLECTION SYSTEM: SEWER LINE A1
WEST COTTONWOOD SEWER CAPACITY STUDY
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Current Wastewater Flowrates

Influent wastewater flowrate data recorded at the CWWTF were used to calculate the current wastewater flowrates from CSA #17. Influent wastewater flow data (January 2004 to December 2006) and the current number of active HEs connected to the CSA #17 collection system were used to approximate the current wastewater production per HE in units of gallons per day (gpd). The following wastewater flow measures are used to quantify observed variation in wastewater flowrates for this study (Metcalf & Eddy, 2003):

- Average Annual Flow (AAF) – Average flowrate occurring over a 24-hour period based on annual flowrate data.
- Average Dry Weather Flow (ADWF) – Average of the daily flows during the dry weather period from May 1st to October 31st.
- Peak Day Flow (PDF) – Average of the peak flows sustained for a period of 1 day.
- Peak Instantaneous Flow (PIF) – Highest record flowrate consistent with the recording equipment.

CSA #17 currently has 1,352 active HEs and 1,064 standby HEs (Shasta County Department of Public Works). The calculation of the current wastewater flows and wastewater flows per HE are shown in Appendix A and are summarized in Table 3.

Table 3 – Current CSA #17 Wastewater Flowrates[a]

Wastewater Flows	Flowrate (mgd)	Flowrate/HE[b] (gpd/HE)	Peaking Factor[c]
Average Annual Flow (AAF)	0.30	220	1.1
Average Dry Weather Flow (ADWF)	0.27	200	1.0
Peak Day Flow (PDF)	0.64	480	2.4
Peak Instantaneous Flow (PIF)	1.33	990	4.9

[a]Average 2004 – 2006 CWWTF influent flowrates
[b]Based on 1,352 active HEs within CSA #17
[c]Peaking factor based on the average 2004-2006 ADWF

The average annual flow and average dry weather flow are both well within the expected range for wastewater production per HE. The peak day and peak instantaneous peaking factors are similar to peaking factors found in other communities similar in size to Cottonwood.

A1 Interceptor Flowrates

The current wastewater flows that the A1 Interceptor conveys were estimated using the current active HEs connected to the interceptor and a PIF of 990 gpd/HE developed in Table 4. The A1 Interceptor conveys wastewater from West and East Cottonwood to the Cottonwood PS. A portion of the wastewater collected from East Cottonwood flows into the A1 Interceptor at manhole A1-5, A1-3 and A1-1 prior to entering the Cottonwood PS. East Cottonwood HEs currently contributes approximately 58% of the total wastewater that is conveyed to the Cottonwood PS. The remaining 42% of the wastewater comes from West Cottonwood HEs.

Table 4 –Current Wastewater Flowrates: A1 Interceptor

Span	Upstream Manhole ID	Pipe Diameter (in.)	Housing Equivalents	PIF (mgd)
1	A1-17	8	405	0.40
2	A1-16		405	0.40
3	A1-15		405	0.40
4	A1-14		441	0.43
5	A1-13		442	0.44
6	A1-12		474	0.47
7	A1-11		531	0.52
8	A1-10		533	0.53
9	A1-9		533	0.53
10	A1-8	10	533	0.53
11	A1-7		533	0.53
12	A1-6		533	0.53
13	A1-5		665	0.66
14	A1-4		665	0.66
15	A1-3		667	0.66
16	A1-2		667	0.66
17	A1-1	12	1,263	1.25

Existing Sewer Collection System Capacity

To assess the impacts of the proposed development's wastewater flows on the existing CSA #17 gravity wastewater collection system, a hydraulic capacity analysis was performed. The hydraulic capacity analysis included the A1 Interceptor as shown in Figure 2.

The hydraulic capacity of the A1 Interceptor was calculated using the Manning's equation and the following assumptions:

- Manning's 'n' (roughness coefficient) of 0.013 for vitrified clay pipe
- Maximum capacity is defined as a full pipe with no surcharge
- HE capacity based on a PIF of 990 gpd/HE

The detailed results of the hydraulic capacity analysis are attached in Appendix B and summarized for each span of Section 1 in Table 5.

Table 5 – Hydraulic Capacity: A1 Interceptor

Span	Upstream Manhole ID	Pipe Diameter (in.)	Maximum Hydraulic Capacity[a]		Flow Velocity	Current Active HEs	Over Capacity?
			(mgd)	(HEs)	(fps)	(HEs)	(Yes/No)
1	A1-17	8	0.61	614	2.69	405	No
2	A1-16		0.66	673	2.95	405	No
3	A1-15		0.66	673	2.95	405	No
4	A1-14		0.96	977	4.28	441	No
5	A1-13		0.61	614	2.69	442	No
6	A1-12		1.15	1,170	5.13	474	No
7	A1-11		0.65	663	2.90	531	No
8	A1-10		0.65	663	2.90	533	No
9	A1-9		0.77	785	3.44	533	No
10	A1-8	10	0.78	787	2.21	533	No
11	A1-7		0.78	787	2.21	533	No
12	A1-6		1.28	1,293	3.63	533	No
13	A1-5		0.78	787	2.21	665	No
14	A1-4		0.78	787	2.21	665	No
15	A1-3		0.78	787	2.21	667	No
16	A1-2		0.78	787	2.21	667	No
17	A1-1	12	1.26	1,280	2.49	1,263	No

[a]Full pipe, no surcharge

According to this analysis, the A1 Interceptor is capable of conveying the wastewater flows from the current active HEs during peak instantaneous flows of 990 gpd/HE. The flow velocities at the maximum hydraulic capacity range from 2.21 to 5.13 fps. The recommended minimum mean flow velocity for gravity sewer pipe at a full pipe condition is 2 fps. Span 17 has a remaining capacity of approximately 17 HEs during peak instantaneous flows.

Future Wastewater Collection System Operation

Future Service Area Description

The future CSA #17 wastewater flows from West and East Cottonwood are unknown. Two scenarios have been developed to approximate the wastewater flowrates that the A1 Interceptor will likely need to convey to the Cottonwood PS in the future. A description of the two scenarios is included below and summarized in Table 6.

Scenario 1 - Existing CSA #17 at Ultimate Build-out (UBO)

Under Scenario 1, it is assumed that the existing CSA #17 will not be modified and all of the HEs that are currently active and on standby will be active at ultimate build-out (UBO) and contributing wastewater to the A1 Interceptor. The total number of HEs that the A1 Interceptor can expect to serve under this scenario from West Cottonwood is assumed to be 1,100 HEs and 1,056 from East Cottonwood, totaling 2,156 HEs as shown in Table 1.

Scenario 2 – CSA #17 at UBO including the Proposed Cottonwood Hills Development and Vacant Lands

Under Scenario 2, it is assumed that the proposed Cottonwood Hills development (690 HEs) and the vacant lands (72 HEs) that lie adjacent to the proposed development (see Figure 1) will be annexed into CSA #17 and that all of the HEs that are currently active and on standby within the existing CSA #17 boundary will be active at UBO. The total number of HEs that the A1 Interceptor can expect to serve under this scenario from West Cottonwood is assumed to be 1,862 HEs and 1,056 HEs from East Cottonwood, totaling 2,918 HEs.

Table 6 – Future Service Area Scenarios: A1 Interceptor Contributing Housing Equivalents

Scenario	A1 Interceptor Contributing Housing Equivalents (HEs)			
	Existing CSA #17 at UBO	Proposed Development	Vacant Lands	Total
1	2,156	NA[a]	NA	2,156
2	2,156	690	72	2,918

[a]NA – Not Applicable

Projected Wastewater Flowrates

The projected sewer flowrates that the A1 Interceptor would serve in the future has been analyzed under Scenarios 1 and 2.

Scenario 1 – Existing CSA #17 at UBO

The A1 Interceptor is in need of improvements to convey the wastewater flows from the HEs that are currently active and on standby that fall within the existing CSA #17 boundary at UBO. The peak instantaneous flows within the existing CSA #17 boundary area under Scenario 1 are presented in Table 7.

Table 7 – Scenario 1: A1 Interceptor Wastewater Flowrates

Span	Upstream Manhole ID	Housing Equivalents			PIF[a] (mgd)
		Active	Standby	Total	
1	A1-17	405	473	878	0.87
2	A1-16	405	473	878	0.87
3	A1-15	405	473	878	0.87
4	A1-14	441	489	930	0.92
5	A1-13	442	493	935	0.92
6	A1-12	474	562	1,036	1.02
7	A1-11	531	562	1,093	1.08
8	A1-10	533	567	1,100	1.08
9	A1-9	533	567	1,100	1.08
10	A1-8	533	567	1,100	1.08
11	A1-7	533	567	1,100	1.08
12	A1-6	533	567	1,100	1.08
13	A1-5	665	582	1,247	1.23
14	A1-4	665	582	1,247	1.23
15	A1-3	667	582	1,249	1.23
16	A1-2	667	582	1,249	1.23
17	A1-1	1,263	907	2,156	2.13

[a]HE capacity based on a PIF of 990 gpd/HE

Scenario 2 – CSA #17 at UBO including the Proposed Cottonwood Hills Development and Vacant Lands

Under Scenario 2 there will be approximately 2,918 total contributing HEs to the interceptor. It is assumed that the 762 contributing HEs from the proposed development and the developed vacant lands will tie into the interceptor at manhole A1-17. The anticipated wastewater flows per span are shown in Table 8.

Table 8 – Scenario 2: A1 Interceptor Wastewater Flowrates

Span	Upstream Manhole ID	Housing Equivalents (HEs)				PIF[a] (mgd)
		CSA #17	Cottonwood Hills	Vacant Lands	Total	
1	A1-17	878	690	72	1,640	1.62
2	A1-16	878	690	72	1,640	1.62
3	A1-15	878	690	72	1,640	1.62
4	A1-14	930	690	72	1,692	1.67
5	A1-13	935	690	72	1,697	1.67
6	A1-12	1,036	690	72	1,798	1.77
7	A1-11	1,093	690	72	1,855	1.83
8	A1-10	1,100	690	72	1,862	1.84
9	A1-9	1,100	690	72	1,862	1.84
10	A1-8	1,100	690	72	1,862	1.84
11	A1-7	1,100	690	72	1,862	1.84
12	A1-6	1,100	690	72	1,862	1.84
13	A1-5	1,247	690	72	2,009	1.98
14	A1-4	1,247	690	72	2,009	1.98
15	A1-3	1,249	690	72	2,011	1.98
16	A1-2	1,249	690	72	2,011	1.98
17	A1-1	2,156	690	72	2,918	2.88

[a]HE capacity based on a PIF of 990 gpd/HE

Wastewater Collection System Improvements

The existing A1 Interceptor will need to be modified to convey the wastewater flows under Scenarios 1 and 2. Wastewater collection system modifications to convey the anticipated future flows under both scenarios are presented in the following sections.

Scenario 1 – Existing CSA #17 at UBO

To serve the existing HEs within the existing CSA #17 boundary at UBO, upgrades will need to be made to the A1 Interceptor. The entire A1 Interceptor will need to be replaced with larger pipe to avoid surcharging. The required pipe size to convey the PIF flows per span were calculated using the Manning's equation assuming the following design parameters:

- Existing pipe slopes to remain
- Minimum pipe velocity of approximately 2 fps

- Manning's 'n' (roughness coefficient) of 0.013 for PVC pipe
- Maximum capacity defined as a full pipe with no surcharge
- HE capacity based on a PIF of 990 gpd/HE

Under these assumptions the required pipe size, maximum hydraulic capacity and flow velocity for each span of the A1 Interceptor was calculated. These calculations are presented in Appendix C and summarized in Table 9.

Table 9 – A1 Interceptor Required Improvements for Scenario 1

Span	Upstream Manhole ID	Pipe Diameter (in.)	Maximum Hydraulic Capacity[a]		Flow Velocity
			(mgd)	(HEs)	(fps)
1	A1-17	10	1.10	1,113	3.12
2	A1-16		1.20	1,220	3.42
3	A1-15		1.20	1,220	3.42
4	A1-14		1.75	1,772	4.97
5	A1-13		1.10	1,113	3.12
6	A1-12		2.09	2,122	5.95
7	A1-11		1.19	1,202	3.37
8	A1-10		1.19	1,202	3.37
9	A1-9		1.40	1,423	3.99
10	A1-8	12	1.26	1,280	2.49
11	A1-7		1.26	1,280	2.49
12	A1-6		2.07	2,103	4.09
13	A1-5		1.26	1,280	2.49
14	A1-4		1.26	1,280	2.49
15	A1-3		1.26	1,280	2.49
16	A1-2		1.26	1,280	2.49
17	A1-1	16	2.72	2,757	3.02

Scenario 2 - CSA #17 at UBO including the Proposed Cottonwood Hills Development and Vacant Lands

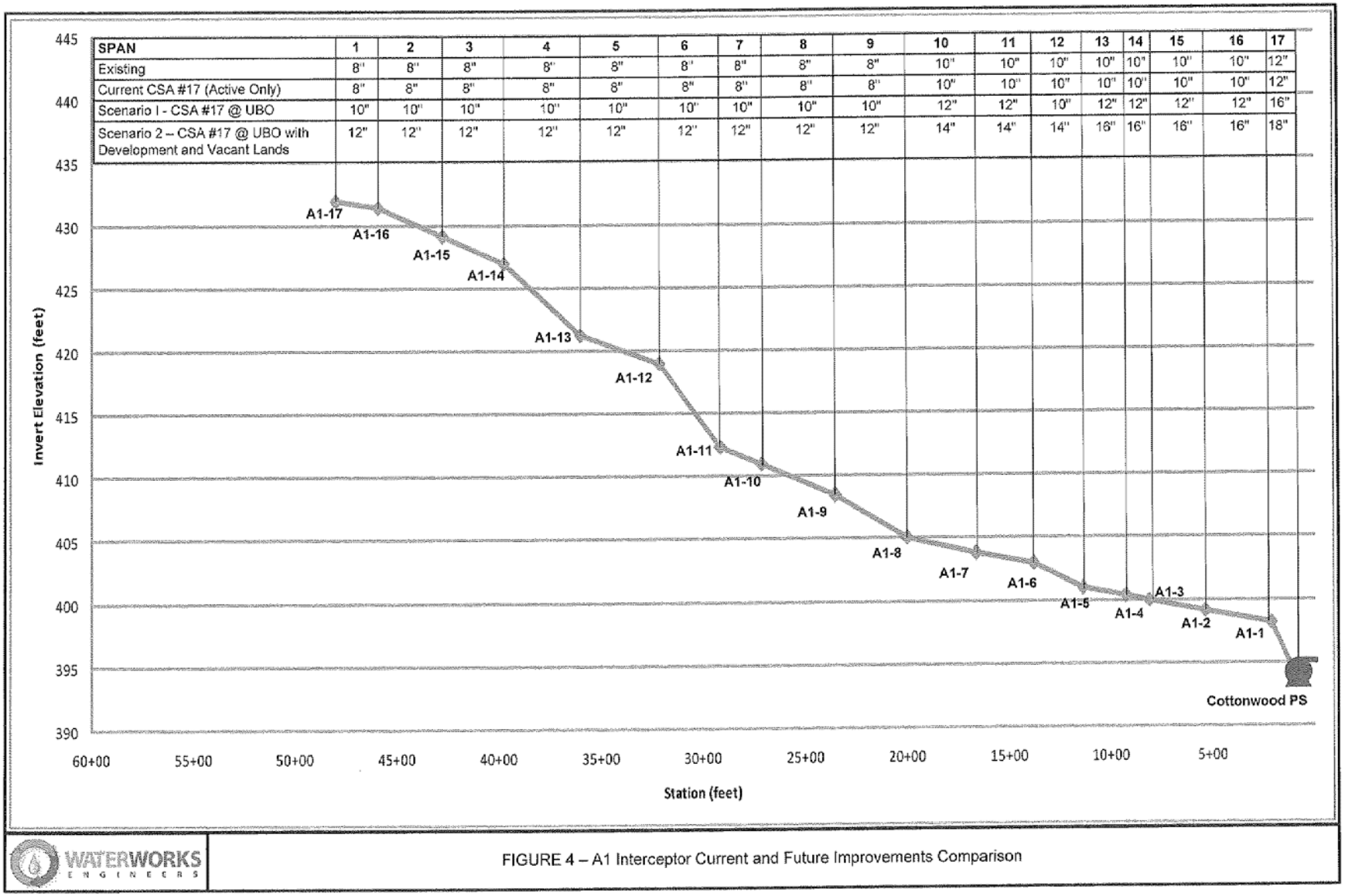
Scenario 2 improvements were developed to convey wastewater from the southeast area of the proposed development under Scenario 2 to the A1 Interceptor as shown in Figure 3. The same design parameters used in the Scenario 1 required pipe size calculations were used for the Scenario 2 pipe size calculations. A description of the required improvements is provided below. The hydraulic calculations, including the required pipe size per span, are attached in Appendix D.

Scenario 2 Improvements – Gravity Sewer Tie-in at Manhole A1-17 (new manhole A01-9 to A1-17)

Alternative 1 includes constructing a new gravity sewer from the southeast corner of the proposed subdivision, west along Gas Point Road, to the existing manhole, A1-17. The gravity sewer would likely consist of 2,800 feet of 10" PVC (SDR-35) with approximately 9 manholes, spaced 300 feet apart.

The existing gravity sewer from manhole A1-17 to the Cottonwood PS (approximately 4,700 feet) would need to be replaced with 12" to 18" PVC (SDR-35).

For comparison purposes, the required pipe sizes for each of the A1 Interceptor's spans under various scenarios presented in this technical memorandum are shown in Figure 4.



WATERWORKS ENGINEERS

FIGURE 4 – A1 Interceptor Current and Future Improvements Comparison

Preliminary Cost Estimates

Preliminary cost estimates were prepared for the wastewater collection system improvements under Scenario 1 and Scenario 2. Actual construction of the sewer upgrades may be accomplished through removal and replacement, pipe bursting, or other means. For the purposes of preliminary cost estimating, costs were calculated using $12/diameter inch/ft for sewer replacement costs. These cost estimates are presented in Appendix E and summarized in Table 10.

Table 10 – Preliminary Cost Estimates

Scenario	Interceptor	Span(s)	Improvement	Project Cost
1 – CSA #17 at UBO without Proposed Development	A1	1-9	10" – 2,805'	$1.0M
		10-16	12" - 1,785'	
		17	16" - 110'	
	Total		10" to 16" – 4,700'	
2 – CSA #17 at UBO with Proposed Development	A1	1-9	12" - 2,805'	$1.8M
		10-12	14" - 860'	
		13-16	16" - 925'	
		17	18" - 110'	
	New	1-10	10" - 2,800'	
	Total		10" to 18" – 7,500'	

Recommendations

The majority of the existing A1 Interceptor is currently over capacity at UBO of the existing CSA #17 boundary under Scenario 1. Modifications of the interceptor will need to be made to avoid sewer overflows during peak flow events.

The modifications to the A1 Interceptor that would be required to serve CSA #17 at UBO under Scenario 1 will cost approximately $0.98M. If the proposed development and vacant lands were to be annexed into CSA #17, additional capacity, above that required under Scenario 1, would be needed. The additional 2,800 feet of 10" gravity sewer and the additional capacity provided by larger sewer pipe and under Scenario 2, would approximately cost an additional $0.86M, at an approximate total project cost of $1.84M.

To apportion the project costs associated with the Scenario 2 improvements, the project improvements were divided into two project improvements sections as shown in Table 11. The improvement section costs were apportioned between the Standby HEs within the existing CSA #17 boundary at UBO (893 HEs) and the future HEs within the proposed development and the vacant lands (762 HEs), totaling 1,655 HEs.

Table 11 – Scenario 2 Improvements Cost Apportioning Basis

Improvement Section	Improvement Cost	Number of Contributing Housing Equivalents
Manhole A0-9 to A1-17	$670,000	762[a]
Manhole A1-17 to Cottonwood Pump Station	$1,175,000	1,655[b]
Total:	$1,845,000	NA

[a]Future proposed development and vacant land HEs.
[b]Includes the Current standby HEs (893) + Future proposed development and vacant land HEs (762) that will contribute to the A1 Interceptor

The project costs per HE for Scenarios 1 and 2 are presented in Appendix E and summarized in Table 12 for comparison purposes.

Table 12 – Project Costs per Housing Equivalent

Scenario	Manhole A0-9 to A1-17 (Cost/HE)	Manhole A1-17 to Cottonwood PS (Cost/HE)	Project Cost/HE (Cost/HE)
1 – CSA #17 at UBO (Active and Standby)			
CSA #17 at UBO (893 HEs)	NA	$1,101	$1,101
Development and Vacant Lands (762 HEs)	NA	NA	NA
2 – CSA #17 with Cottonwood Hills Development and Vacant Lands at UBO			
CSA #17 at UBO (893 HEs)	$710	$0	$710
Development and Vacant Lands (762 HEs)	$710	$879	$1,589

[a]Current standby HEs contributing to the A1 Interceptor located within the existing CSA #17 boundary
[b]Includes the Current standby HEs (893) + Future proposed development and vacant land HEs (762) that will contribute to the A1 Interceptor

To fully understand the wastewater collection and treatment impacts and costs associated with the proposed development, the Cottonwood PS capacity and the Cottonwood WWTF capacity, disposal and permitting issues which may be involved with expanding the wastewater flow going to the plant should be analyzed.

Sources

Metcalf & Eddy, Inc. (2003) *Wastewater Engineering, Treatment and Reuse,* 4th Ed., McGraw-Hill, New York, NY.

Appendix A – Current Wastewater Flow Calculations

Water Works Engineers
CALCULATIONS

Project: West Cottonwood Sewer Capacity Analysis
Work: **APPENDIX A - Cottonwood WWTF Influent Flowrates**
Date: 10/11/2007
By: AJB

Year	Month	Total (MG)	Max Total (mgd)	Max Max Rate (mgd)
2004	January	11.314	0.484	1.2
	February	12.113	0.523	1.4
	March	10.295	0.412	1.05
	April	7.766	0.387	1.06
	May	9.027	0.384	---
	June	7.65	0.294	1.0
	July	7.768	---	---
	August	8.08	0.308	1.24
	September	8.114	0.358	1.01
	October	9.208	0.345	---
	November	8.965	0.394	0.98
	December	10.637	0.79	1.4
		110.937		
2005	January	10.751	0.43	---
	February	7.851	0.319	---
	March	9.029	0.383	0.9
	April	8.91	0.312	1
	May	9.818	0.437	0.94
	June	7.614	0.287	0.94
	July	7.475	0.287	0.94
	August	7.469	0.278	0.94
	September	6.835	0.289	1.59
	October	7.741	0.288	0.9
	November	7.772	0.301	0.78
	December	11.6	0.514	1.6
		102.865		
2006	January	9.725	0.422	0.960
	February	7.642	0.349	0.800
	March	10.290	0.494	0.980
	April	10.390	0.524	0.920
	May	9.688	0.626	1.000
	June	8.621	0.569	0.820
	July	8.757	0.325	0.880
	August	8.661	0.315	1.600
	September	8.442	0.310	0.900
	October	9.058	0.323	0.940
	November	8.868	0.393	0.840
	December	10.070	0.502	0.780
		110.212		
2007	January	9.247	0.392	0.880
	February	9.788	0.422	1.200
	March	9.263	0.341	0.920
	April	9.668	0.397	0.820
	May	11.010	0.415	0.800
	June	9.556	0.377	1.290
	July	10.000	0.371	0.880
	August	---	---	---
	September	---	---	---
	October	---	---	---
	November	---	---	---
	December	---	---	---

Year	2004	2005	2006	Average	Peaking Factor
AAF (mgd)	0.304	0.282	0.302	0.296	1.09
ADWF (mgd)	0.271	0.255	0.289	0.272	1.00
PDF (mgd)	0.790	0.514	0.626	0.643	2.37
PIF (mgd)	1.400	1.600	1.000	1.333	4.91

Indicates Dry Weather Months
--- Indicates Missing Data
Indicates Outlier Data, Removed for analysis

Appendix B – Hydraulic Calculations: A1 Interceptor (Current Flows)

Water Works Engineers
CALCULATIONS

Project: West Cottonwood Sewer Capacity Analysis
Work: **APPENDIX B - Gravity Sewer Capacity Analysis**
Date: 10/12/2007
By: AJB

Assumptions:
Full Pipe, no surcharge
Manning's 'n' = *0.013 (Material: VCP)*
PIF (gpd/HE) = 986 *gpd*

Span #	Manhole ID	Diameter (in.)	Area (ft^2)	Length (feet)	Slope (ft/ft)	CAPACITY Maximum Capacity (cfs)	(mgd)	(HEs)	Velocity (fps)	ACTIVE Active (HEs)	(HEs)	PIF (mgd)	Capacity Exceeded? (Yes or No)
	A1-17									405			
1		8	0.35	205	0.0060	0.94	0.61	614	2.69		405	0.40	No
	A1-16									0			
2		8	0.35	320	0.0072	1.03	0.66	673	2.95		405	0.40	No
	A1-15									0			
3		8	0.35	300	0.0072	1.03	0.66	673	2.95		405	0.40	No
	A1-14									36			
4		8	0.35	375	0.0152	1.49	0.96	977	4.28		441	0.43	No
	A1-13									1			
5		8	0.35	385	0.0060	0.94	0.61	614	2.69		442	0.44	No
	A1-12									32			
6		8	0.35	305	0.0218	1.79	1.15	1,170	5.13		474	0.47	No
	A1-11									57			
7		8	0.35	200	0.0070	1.01	0.65	663	2.90		531	0.52	No
	A1-10									2			
8		8	0.35	360	0.0070	1.01	0.65	663	2.90		533	0.53	No
	A1-9									0			
9		8	0.35	355	0.0098	1.20	0.77	785	3.44		533	0.53	No
	A1-8									0			
10		10	0.55	335	0.0030	1.20	0.78	787	2.21		533	0.53	No
	A1-7									0			
11		10	0.55	280	0.0030	1.20	0.78	787	2.21		533	0.53	No
	A1-6									0			
12		10	0.55	245	0.0081	1.98	1.28	1,293	3.63		533	0.53	No
	A1-5									132			
13		10	0.55	210	0.0030	1.20	0.78	787	2.21		665	0.66	No
	A1-4									0			
14		10	0.55	115	0.0030	1.20	0.78	787	2.21		665	0.66	No
	A1-3									2			
15		10	0.55	280	0.0030	1.20	0.78	787	2.21		667	0.66	No
	A1-2									0			
16		10	0.55	320	0.0030	1.20	0.78	787	2.21		667	0.66	No
	A1-1									596			
17		12	0.79	110	0.0030	1.96	1.26	1,280	2.49		1,263	1.25	No
	Cottonwood PS												

Appendix C – Hydraulic Calculations: Scenario1

Water Works Engineers
CALCULATIONS

Project: West Cottonwood Sewer Capacity Analysis
Work: Existing Section 1 Improvements
Date: 10/12/2007
By: AJB

Assumptions:
Full Pipe, no surcharge
Manning's 'n' = *0.013* *(Material: PVC - SDR 35)*
PIF (gpd/HE) = 986 *gpd*

Span #	Manhole ID	Diameter (in.)	Area (ft^2)	Length (feet)	Slope (ft/ft)	CAPACITY Maximum Capacity (cfs)	(mgd)	(HEs)	Velocity (fps)	ACTIVE and STANDBY Active (HEs)	Standby (HEs)	Total (HEs)	(HEs)	PIF (mgd)	Capacity Exceeded? (Yes or No)
	A1-17									405		878			
1		10	0.55	205	0.0060	1.70	1.10	1,113	3.12		405	473	878	0.87	No
	A1-16									0		0			
2		10	0.55	320	0.0072	1.86	1.20	1,220	3.42		405	473	878	0.87	No
	A1-15									0		0			
3		10	0.55	300	0.0072	1.86	1.20	1,220	3.42		405	473	878	0.87	No
	A1-14									36		52			
4		**10**	0.55	375	0.0152	2.71	1.75	1,772	4.97		441	489	930	0.92	No
	A1-13									1		5			
5		10	0.55	385	0.0060	1.70	1.10	1,113	3.12		442	493	935	0.92	No
	A1-12									32		101			
6		**10**	0.55	305	0.0218	3.24	2.09	2,122	5.95		474	562	1,036	1.02	No
	A1-11									57		57			
7		10	0.55	200	0.0070	1.84	1.19	1,202	3.37		531	562	1,093	1.08	No
	A1-10									2		7			
8		10	0.55	360	0.0070	1.84	1.19	1,202	3.37		533	567	1,100	1.08	No
	A1-9									0		0			
9		10	0.55	355	0.0098	2.17	1.40	1,423	3.99		533	567	1,100	1.08	No
	A1-8									0		0			
10		12	0.79	335	0.0030	1.96	1.26	1,280	2.49		533	567	1,100	1.08	No
	A1-7									0		0			
11		12	0.79	280	0.0030	1.96	1.26	1,280	2.49		533	567	1,100	1.08	No
	A1-6									0		0			
12		**12**	0.79	245	0.0081	3.22	2.07	2,103	4.09		533	567	1,100	1.08	No
	A1-5									132		147			
13		12	0.79	210	0.0030	1.96	1.26	1,280	2.49		665	582	1,247	1.23	No
	A1-4									0		0			
14		12	0.79	115	0.0030	1.96	1.26	1,280	2.49		665	582	1,247	1.23	No
	A1-3									2		2			
15		12	0.79	280	0.0030	1.96	1.26	1,280	2.49		667	582	1,249	1.23	No
	A1-2									0		0			
16		12	0.79	320	0.0030	1.96	1.26	1,280	2.49		667	582	1,249	1.23	No
	A1-1									596		907			
17		16	1.40	110	0.0030	4.21	2.72	2,757	3.02		1,263	893	2,156	2.13	No
	Cottanwood PS														

Appendix D – Hydraulic Calculations: Scenario 2

Water Works Engineers
CIVIL ENGINEERS

Project: West Cottonwood Sewer Capacity Analysis
Work: APPENDIX D - Scenario 2
Date: 10/15/2007
By: AJE

Assumptions:
Full Pipe, no surcharge
Manning's "n" = 0.013 (Manual of Practice)
PF (gpd/HE) = 300 gpd

Span #	Manhole ID	Diameter (in.)	Area (ft^2)	Length (feet)	Slope (ft/ft)	Pipe INV EL (feet)	Rim EL (feet)	Cover (feet)	CAPACITY Maximum Capacity (cfs)	(mgd)	(HEs)	Velocity (fps)	ESA 917 (HEs)	(HEs)	CHR (HEs)	(HEs)	Vacant Lands (HEs)	(HEs)	Total (HEs)	PF (mgd)	Capacity Exceeded? (Yes or No)
	A1-17					432.00	440.5	7.5					878		640		72				
1		12	0.79	305	0.0080				2.77	1.79	1,810	3.52		878		690		72	1,640	1.63	No
	A1-16					431.47	440.0	7.5					0		0		0				
2		12	0.79	300	0.0072				3.13	1.90	1,903	3.86		878		690		72	1,640	1.63	No
	A1-15					429.16	436.0	5.0					0		0		0				
3		12	0.79	303	0.0073				3.28	1.75	1,993	3.96		878		690		72	1,640	1.63	No
	A1-14					427.00	434.0	6.0					52		0		0				
4		12	0.79	325	0.0152				4.45	2.84	2,001	5.53		930		690		72	1,692	1.67	No
	A1-13					421.81	426.0	3.7					5		0		0				
5		12	0.79	335	0.0080				2.77	1.79	1,810	3.52		935		690		72	1,697	1.67	No
	A1-12					421.00	425.0	5.0					101		0		0				
6		12	0.79	305	0.0238				5.77	3.40	3,451	6.72		1,036		690		72	1,798	1.77	No
	A1-11					413.40	418.0	4.6					97		0		0				
7		12	0.79	303	0.0070				2.59	1.55	1,695	3.41		1,133		690		72	1,895	1.83	No
	A1-10					411.00	417.5	5.5					7		0		0				
8		12	0.79	390	0.0140				2.99	1.93	1,925	3.81		1,140		690		72	1,902	1.84	No
	A1-9					409.40	415.0	5.5					0		0		0				
9		12	0.79	335	0.0088				3.54	2.29	2,314	4.50		1,140		690		72	1,902	1.84	No
	A1-8					405.08	412.0	5.8					0		0		0				
10		14	1.07	339	0.0053				2.85	1.82	1,901	2.76		1,140		690		72	1,902	1.84	No
	A1-7					401.92	410.5	7.5					0		0		0				
11		14	1.07	300	0.0033				2.95	1.91	1,931	2.76		1,140		690		72	1,902	1.84	No
	A1-6					401.98	410.0	7.0					0		0		0				
12		14	1.07	249	0.0151				4.85	3.13	3,170	4.54		1,140		690		72	1,902	1.84	No
	A1-5					401.00	405.5	3.2					187		0		0				
13		16	1.40	250	0.0033				4.21	2.72	2,757	3.02		1,327		690		72	2,089	1.88	No
	A1-4					400.37	406.0	4.8					0		0		0				
14		16	1.40	115	0.0033				4.21	2.72	2,757	3.02		1,327		690		72	2,089	1.88	No
	A1-3					400.00	406.0	4.8					2		0		0				
15		16	1.40	300	0.0033				4.21	2.72	2,757	3.02		1,329		690		72	2,091	1.88	No
	A1-2					399.19	406.0	5.5					0		0		0				
16		16	1.40	300	0.0033				4.21	2.72	2,757	3.02		1,329		690		72	2,091	1.88	No
	A1-1					398.74	406.0	6.3					917		0		0				
17		18	1.77	100	0.0033				5.77	3.73	3,774	3.26		2,156		690		72	2,918	1.88	No
	Cottonwood PS														0		0				

	(HEs)	% of Total
West Cottonwood	1,862	64%
East Cottonwood	1,056	36%
Cottonwood	2,918	100%

1B - New gravity main along Road with Bridge Crossing

Span #	Manhole ID	Diameter (in.)	Area (ft^2)	STA	Length (feet)	Slope (ft/ft)	Pipe INV EL (feet)	Manh EL (feet)	Cover (feet)	CAPACITY Maximum Capacity (cfs)	(mgd)	(HEs)	Velocity (fps)	
	A01-10			29+00			451.3	457	4.6					
1		10	0.55		300	0.0040				1.44	1.19	1,302	3.27	ACID Canal: D = 1
	A01-9			26+00			450.4	456	5.0					
2		10	0.55		300	0.0070				1.84	1.23	1,202	3.57	
	A01-8			25+00			448.3	455	5.4					
3		10	0.55		300	0.0040				1.44	1.19	1,302	3.27	
	A01-7			22+00			446.7	456	8.5					
4		10	0.55		300	0.0070				1.84	1.23	1,202	3.57	
	A01-6			19+00			444.2	454	8.8					
5		10	0.55		300	0.0040				1.44	1.19	1,302	3.27	
	A01-5			16+00			442.5	452	8.7					
6		10	0.55		300	0.0070				1.84	1.23	1,202	3.57	
	A01-4			13+00			440.4	450	8.8					
7		10	0.55		300	0.0040				1.44	1.19	1,302	3.27	
	A01-3			10+00			439.4	443	3.4					
8		10	0.55		300	0.0070				1.84	1.23	1,202	3.57	
	A01-2			7+00			438.3	446	7.0					
9		10	0.55		300	0.0040				1.44	1.19	1,302	3.27	
	A01-1			4+00			436.1	443	3.4					
10		10	0.55		300	0.0070				1.84	1.23	1,202	3.57	
	A1-17			1+00			432.0	440.5	7.7					
					2000									

Appendix E – Preliminary Cost Estimates

Water Works Engineers
PRELIMINARY COST OPINION

Project: West Cottonwood Sewer Capacity Analysis
Work: **Appendix E - Scenario 1 - Current CSA #17 at UBO**
Date: 11/9/2007
By: AJB

Item		A1-17 to Cottonwood PS Quantity	Total Quantity	Unit	Unit Cost	A1-17 to Cottonwood PS Cost	Total Cost
Site Work							
	Site Preparation			LS	$3,000		$0
	Excavation			cu.yd	$10		$0
	Backfill and Compact			cu.yd	$13		$0
	CMU Wall			sq. ft	$15		$0
	Asphalt Concrete			sq. ft	$6		$0
	Shoring			sq. ft	$85		$0
	Demolition			LS	$2,500		$0
	Mobilization			LS	$3,000		$0
	Site Grading			sq. ft	$1		$0
	Cut/Fill			cu.yd	$15		$0
	Retaining Wall			sq. ft	$35		$0
Major Structural							
Major Equipment							
Major Piping							
	10" (Gravity)	2705	2705	LF	$120	$324,600	$324,600
	10" (Gravity; Creek Crossing)	100	100	LF	$750	$75,000	$75,000
	12" (Gravity)	1785	1785	LF	$144	$257,040	$257,040
	14" (Gravity)			LF	$168	$0	$0
	15" (Gravity)			LF	$180	$0	$0
	16" (Gravity)	110	110	LF	$192	$21,120	$21,120
	18" (Gravity)			LF	$216	$0	$0
	21" (Gravity)			LF	$252	$0	$0
Electrical							
Installation							
Gravity Sewer	Labor			day	$1,920		$0
	Equipment Rental			day	$800		$0
SUBTOTAL						**$678,000**	**$678,000**
Contractor O&P and Bond					15.0%	$101,700	$101,700
Contingency					20.0%	$135,600	$135,600
Engineering/Design					10.0%	$67,800	$67,800
CONSTRUCTION COST						**$983,100**	**$983,100**
TOTAL COST						**$983,000**	**$983,000**

Water Works Engineers
PRELIMINARY COST OPINION

Project: West Cottonwood Sewer Capacity Analysis
Work: **APPENDIX E - Scenario 2**
Date: 11/9/2007
By: AJB

Item		A1-17 to Cottonwood PS Quantity	New A0-9 to A1-17 Quantity	Total Quantity	Unit	Unit Cost	A1-17 to Cottonwood PS Cost	New A0-9 to A1-17 Cost	Total Cost
Site Work									
	Site Preparation				LS	$3,000			$0
	Excavation				cu.yd	$10			$0
	Backfill and Compact				cu.yd	$13			$0
	CMU Wall				sq. ft	$15			$0
	Asphalt Concrete				sq. ft	$6			$0
	Shoring				sq. ft	$85			$0
	Demolition				LS	$2,500			$0
	Mobilization				LS	$3,000			$0
	Site Grading				sq. ft	$1			$0
	Cut/Fill				cu.yd	$15			$0
	Retaining Wall				sq. ft	$35			$0
Major Structural									
Major Equipment									
Major Piping									
	10" (Gravity)		2600	2600	LF	$120	$0	$312,000	$312,000
	10" (Gravity; ACID & Creek Crossing)		200	200	LF	$750	$0	$150,000	$150,000
	12" (Gravity)	2705		2705	LF	$144	$389,520	$0	$389,520
	12" (Gravity; Creek Crossing)	100		100	LF	$750	$75,000	$0	$75,000
	14" (Gravity)	860		860	LF	$168	$144,480	$0	$144,480
	15" (Gravity)				LF	$180	$0	$0	$0
	18" (Gravity)	925		925	LF	$192	$177,600	$0	$177,600
	18" (Gravity)	110		110	LF	$216	$23,760	$0	$23,760
	21" (Gravity)				LF	$252	$0	$0	$0
Electrical									
Installation									
Gravity Sewer	Labor				day	$1,920			$0
	Equipment Rental				day	$800			$0
SUBTOTAL							**$810,000**	**$462,000**	**$1,272,000**
Contractor O&P and Bond						15.0%	$121,500	$69,300	$190,800
Contingency						20.0%	$162,000	$92,400	$254,400
Engineering/Design						10.0%	$81,000	$46,200	$127,200
CONSTRUCTION COST							**$1,174,500**	**$669,900**	**$1,844,400**
TOTAL COST							**$1,175,000**	**$670,000**	**$1,845,000**

Water Works Engineers
CALCULATIONS

Project: West Cottonwood Sewer Capacity Analysis
Work: **Appendix E - Cost Apportioning**
Date: 11/9/2007
By: AJB

Scenario	A1-17 to Cottonwood PS ($)	New A0-9 to A1-17 ($)	Project Cost ($)
Current CSA #17 (Active only)	$ -	$ -	$ -
1 - CSA #17 @ UBO (Active and Standby)	$ 983,000	$ -	$ 983,000
2 - CSA #17 w/CHD and Vacant Lands @ UBO	$ 1,175,000	$ 670,000	$ 1,845,000

Scenario	Contributing Hes (HE)				
	West Cottonwood			East Cottonwood	Cottonwood
	West w/o CHD	CHD + Vacant Lands	Total		
Current CSA #17 (Active only)	533	0	533	730	1,263
1 - CSA #17 @ UBO (Active and Standby)	1,100	0	1,100	1,056	2,156
2 - CSA #17 w/CHD and Vacant Lands @ UBO	1,100	762	1,862	1,056	2,918

Scenario Current CSA #17 (Active only)	A1-17 to Cottonwood PS Cost/HE ($)	New A0-9 to A1-17 Cost/HE ($)	Project Cost Cost/HE ($)
HE Cost Share			
CSA #17 Active (1,263 Hes):	$ -	$ -	$ -
Total:	$ -	$ -	$ -

Scenario 1 - CSA #17 @ UBO (Active and Standby)	A1-17 to Cottonwood PS Cost/HE ($)	New A0-9 to A1-17 Cost/HE ($)	Project Cost Cost/HE ($)
HE Cost Share			
CSA #17 at UBO (893 Current Standby Hes):	$1,101	NA	$1,101
Development and Vacant Lands (762 Hes):	NA	NA	NA

Scenario 2 - CSA #17 w/CHD and Vacant Lands @ UBO	A1-17 to Cottonwood PS Cost/HE ($)	New A0-9 to A1-17 Cost/HE ($)	Project Cost Cost/HE ($)
HE Cost Share			
CSA #17 at UBO (893 Current Standby Hes):	$710	$0	$710
Development and Vacant Lands (762 Hes):	$710	$879	$1,589

Appendix D

Shasta County DPW CSA DIV.

Spill Notice for CSA # 8 Palo Cedro

Date : _____

Address _____ Cross Street _____

City Palo Cedro, Ca

Time Spill started _____

Time Spill stopped _____

Spill in GPM _____

Total Gals spilled _____

Description

_____

_____

_____

_____

_____

_____

Spilled from

Leach Field _____

Lateral Spill _____

Manhole over flow _____

Pump Station over flow _____

Spill contained to Spill site _____

Did spill leave site _____

Did spill reach a _____ River _____ Creek _____ Storm Drain _____

Picked up all debris from spill _____

Cleaned up area pressure washe _____

Sprayed area with 12% Chlorine _____

Report By: _____

Filled SSO Report with CIWQS Time _____ ciwqs.waterboard.ca.gov/ciwqs/sso

Sent FAX Time _____ (530) 225-5413 Environmental Health Dept.Shasta County
Sent FAX Time: _____ (530) 224-4857 Regional Water Quality Control Board Web Address
Called Time: _____ (916) 845-8911 OES Warning Center State of of Emergency Services
OES # _____

Shasta County DPW CSA DIV.

Spill Notice for CSA # 13 alpine Meadows / Whispering Woods

Date : _____

Address _____ Cross Street _____

City Shingletown , Ca

Time Spill started _____

Time Spill stopped _____

Spill in GPM _____

Total Gals spilled _____

Description

_____

_____

_____

_____

_____

_____

Spilled from

Leach Field _____

Lateral Spill _____

Manhole over flow _____

Pump Station over flow _____

Spill contained to Spill site _____

Did spill leave site _____

Did spill reach a _____ River _____ Creek _____ Storm Drain _____

Picked up all debris from spill _____

Cleaned up area pressure washe _____

Sprayed area with 12% Chlorine _____

Report By:_____

Filled SSO Report with CIWQS Time _____ ciwqs.waterboard.ca.gov/ciwqs/sso

Sent FAX Time _____(530) 225-5413 Environmental Health Dept.Shasta County
Sent FAX Time: _____(530) 224-4857 Regional Water Quality Control Board Web Address
Called Time: _____(916) 845-8911 OES Warning Center State of of Emergency Services
OES # _____

Shasta County DPW CSA DIV.

Spill Notice for CSA # 17 Cottonwood

Date : _____

Address _____ Cross Street _____

City Cottonwood ,Ca

Time Spill started _____

Time Spill stopped _____

Spill in GPM _____

Total Gals spilled _____

Description

_____

_____

_____

_____

_____

_____

Spilled from

Leach Field _____

Lateral Spill _____

Manhole over flow _____

Pump Station over flow _____

Spill contained to Spill site _____

Did spill leave site _____

Did spill reach a _____ River _____ Creek _____ Storm Drain _____

Picked up all debris from spill _____

Cleaned up area pressure washe_____

Sprayed area with 12% Chlorine_____

Report By:_____

Filled SSO Report with CIWQS Time _____ ciwqs.waterboard.ca.gov/ciwqs/sso

Sent FAX Time _____(530) 225-5413 Environmental Health Dept.Shasta County
Sent FAX Time: _____(530) 224-4857 Regional Water Quality Control Board Web Address
Called Time: _____(916) 845-8911 OES Warning Center State of of Emergency Services
OES # _____