TOWN OF PARADISE
WASTEWATER MANAGEMENT STUDY
PHASE I REPORT

May 1983

JAMES M. MONTGOMERY CONSULTING ENGINEERS, INC.

2255 Ygnacio Valley Road, Suite C, Walnut Creek, California 94598 / (415) 933-2250

May 3, 1983

Town Council
Town of Paradise
5555 Skyway
Paradise, California 95969

Members of the Town Council:

This report presents the results of our Phase I Wastewater Manangement Study for the Town of Paradise. The overall objective of this study has been to evaluate the cumulative impacts of existing wastewater management practices in the study area and to identify existing and potential water quality or public health problems associated with the continued use of on-site wastewater treatment systems. Based upon an evaluation of water quality data, soil characteristics, groundwater hydrology, topography, and septic system performance, it appears that septic systems in major portions of Paradise are providing adequate wastewater treatment. Through careful planning, proper maintenance, and repair of failing systems, the need for centralized facilities in these areas may be postponed or avoided. In Upper and Middle Honey Run Basins and portions of Lower Skyway Basin, however, septic system effluent appears to have caused surface water quality degradation and potential public health hazards. It is recommended that centralized wastewater management facilities be considered for these basins.

To minimize further degradation of water quality and to eliminate the potential health hazard to area residents, it is recommended that the Town proceed with Phase II of this facilities planning study to evaluate alternatives for meeting wastewater management needs. To better define the extent and magnitude of water quality degradation within Upper and Middle Honey Run Basins and portions of Lower Skyway Basin, an intensive bacteriological sampling and septic system reconnaissance program has been recommended. A suggested implementation plan for this work is presented in Chapter 2 of this report, along with a summary of recommendations.

During the course of our study, we have worked closely with individuals, interest groups, and public agencies affected by wastewater management planning in the study area. It is anticipated that public participation will continue to be an important part of the subsequent phases of this project. Comments received at public meetings and at meetings with Town staff and regulatory agencies have been incorporated into this report.

Very truly yours,

JAMES M. MONTGOMERY,
CONSULTING ENGINEERS, INC.

Patrick L. Burke

Patrick L. Burke
Project Engineer

Gwendolyn M. Buchholz

Gwendolyn M. Buchholz
Project Manager

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

CHAPTER 1

CHAPTER 1

INTRODUCTION

GENERAL

This report presents the results of the Phase I wastewater facilities planning study for the Town of Paradise. The primary objectives of this study have been to evaluate the cumulative impacts resulting from the continued use of septic systems in the Town and to determine whether or not existing wastewater disposal methods have caused a water quality or potential public health problem. The Phase I study, therefore, consists of an analysis of the "No Project" wastewater management alternative for the study area. Phase II of the facilities planning process includes a detailed evaluation of other wastewater management alternatives to solve existing problems and to meet the future needs of the study area. The study has been completed under Section 201 of the Federal Water Pollution Control Act, and in accordance with the requirements of the California Clean Water Grant Program.

BACKGROUND

The Water Quality Management Plan for Paradise and Magalia (208 Report), completed in January 1979, concluded that although much of Paradise was suitable for the continued use of septic systems, centralized wastewater management facilities should be constructed to serve the Central Skyway area. The study also indicated that additional water quality data were necessary to fully assess the operation of septic systems in Paradise. To perform the recommended water quality monitoring and more fully evaluate the operation of septic systems, the Town initiated the facilities planning process. The study has received financial assistance under the Clean Water Grant Program, administered in California by the State Water Resources Control Board.

AUTHORIZATION

This report has been completed in accordance with an agreement between the Town of Paradise and James M. Montgomery, Consulting Engineers, Inc., dated September 15, 1980.

STUDY AREA BOUNDARIES

The study area encompasses the Town of Paradise, as incorporated on November 21, 1979. The study area boundaries are shown in Figure 1-1. Measuring approximately 11,500 acres, Paradise is the largest incorporated, unsewered community in California.

SCOPE OF STUDY

To complete the assessment of septic systems operation in the Town of Paradise, the following major tasks were included in the study:

- Review of all previously completed reports for the Paradise area containing information pertinent to on-site treatment and disposal of wastewater.
- Monitoring of bacterial and chemical indicators of water quality at selected stations during both dry weather and wet weather conditions.
- Evaluation of geology, hydrology, and hydrogeology of the Paradise area and their effects on septic systems operation.
- Preparation of water and chemical balances for the study area, to be used in assessment of septic systems operation.
- Assessment of cumulative impact of continued use of septic systems in Paradise.

PUBLIC PARTICIPATION

Public participation is an important element in the wastewater facilities planning process. In July 1982, a public workshop was held to inform Paradise residents about the study and to gather public input on the issue of wastewater management. Following completion of the draft Phase I report, a second public workshop will be held to present the results of the study and receive further public comment.

Numerous individuals and agencies have provided valuable consultation and review during the Paradise Facilities Planning Study. A list of contributors to the study is presented below:

Butte County Health Department

Lynn Vanhart
Henry Martin
Vern Basden (Retired)

California State University, Chico

Jerold Behnke, Ph.D.

Paradise Irrigation District

Phil Kelly

State of California, Department of Water Resources

Phil Lorenz

State of California, Regional Water Quality Control
Board, Central Valley Region

Joseph Henao
Tony Landis

Town of Paradise, Planning Commission

Town of Paradise

George Irving
Steve Smith

ABBREVIATIONS

In order to conserve space and improve readability, the following abbreviations have been utilized throughout this report.

acre-ft	acre-feet
ADWF	Average Dry Weather Flow
Basin Plan	Central Valley Basin Water Quality Control Plan
BOD	5-Day Biochemical Oxygen Demand
County	Butte County
Cl	Chloride
du/ac	dwelling units per acre
^oF	degrees Fahrenheit
FC/FS	Fecal Coliform to Fecal Streptococcus ratio
ft	feet
gal	gallons
gpad	gallons per acre per day
gpcd	gallons per capita per day
gpd	gallons per day
gpm	gallons per minute
hr	hour
in	inch
lbs/day	pounds per day
mg	million gallons
mgd	million gallons per day

mg/l	milligrams per liter
min	minutes
ml	milliliters
MPN/100 ml	Most Probable Number per 100 milliliters
MSL	mean sea level
N	Nitrogen
NO_3	Nitrate
NSF	National Sanitation Foundation
PDWF	Peak Dry Weather Flow
PID	Paradise Irrigation District
ppcd	pounds per capita per day
PWWF	Peak Wet Weather Flow
RWQCB	California Regional Water Quality Control Board, Central Valley Region
SCS	U.S. Soil Conservation Service
sq ft	square feet
State Board	State Water Resources Control Board
TDS	Total Dissolved Solids
Town	Town of Paradise
TSS	Total Suspended Solids
umhos/cm	micromhos per centimeter
u/ac	units per acre
yr	year

CHAPTER 2

CHAPTER 2

SUMMARY

BACKGROUND

The Water Quality Management Plan for Paradise and Magalia, completed in January 1979, concluded that although much of Paradise was suitable for the continued use of septic systems, centralized wastewater management facilities should be constructed to serve the Central Skyway area. The study also indicated that additional water quality data were necessary to fully assess the operation of septic systems in Paradise. To perform the recommended water quality monitoring and more fully evaluate the operation of septic systems, the Town initiated the facilities planning process. The study has received financial assistance under the Clean Water Grant Program, administered in California by the State Water Resources Control Board.

STUDY AREA BOUNDARIES

The study area encompasses the Town of Paradise, as incorporated on November 21, 1979. The study area boundaries are shown in Figure 1-1. Measuring approximately 11,500 acres, Paradise is the largest incorporated, unsewered community in California.

STUDY AREA CHARACTERISTICS

Lying on Eden Ridge, Paradise is generally characterized by mild terrain of less than 30 percent slopes. The geology of the Paradise area has been influenced by activity of both the Sierra Nevada and Cascade geologic provinces, and has developed a layered structure. The subsurface geologic units have varying characteristics with respect to groundwater yield; however, the Tuscan Formation and auriferous channels are known to produce useable quantities of groundwater. Hydrologic basins associated with surface water drainage are shown in Figure 3-2.

Paradise has experienced tremendous growth since 1960. Present population is estimated at 24,000, with a projected population of 35,000 by the year 2002.

EXISTING AND PROJECTED WATER AND WASTEWATER CHARACTERISTICS

The study area is served by the Paradise Irrigation District (PID), established in 1916 to provide water to homes and orchards in the Paradise area. The PID system utilizes surface water from Paradise and Magalia Reservoirs, located to the north of the study area. The water is chlorinated prior to distribution. Existing and projected wasteloads are developed and presented in Chapter 4.

ANALYSIS OF EXISTING WASTEWATER TREATMENT FACILITIES

As discussed in Chapter 1, Paradise is the largest unsewered, incorporated community in California. Wastewater treatment facilities within the Town consist wholly of individual privately owned septic tanks and soil absorption systems, known as leach fields. To assess the operation of septic systems in Paradise, site characteristics were reviewed and mapped and a water quality monitoring program was established. Due to shallow or impermeable soils, seasonally high groundwater, or steep slopes, portions of Paradise are unsuitable for conventional septic systems. Site characteristics that may adversely impact septic system operation are shown in Plate 1.

The water quality monitoring network is presented in Figure 5-2. Seven samplings of the surface water network were performed between July 1981 and September 1982 to establish whether inadequately treated septic system effluent was contaminating streams and drainage courses. On the initial sampling, water was examined at over 20 locations for a variety of bacteria and chemical parameters. The remaining sampling efforts concentrated on measurements of bacterial quality over a reduced network. Stations in the reduced sampling network were selected based on their potential to identify areas with septic system problems. Samples were collected during both wet weather and dry weather conditions, and all analyses were performed by a state-certified water quality laboratory. To determine whether septic systems have adversely impacted groundwater beneath Paradise, several wells and springs were also sampled. The locations of the groundwater sampling stations are indicated in Figure 5-2.

Recommendations

The analysis of on-site wastewater treatment systems operation has indicated that water quality degradation and potential public health hazards have resulted from the use of septic systems in portions of Paradise. Areas experiencing septic system problems are characterized by high wastewater application rates and/or conditions unsuitable for on-site wastewater disposal. The most severe water quality degradation has occured in the Upper and Middle Honey Run and Lower Skyway Basins, which encompass approximately 1,000 acres of dense commercial and residential development. Centralized wastewater management facilities should be considered for these areas.

In the remaining 10,500 acres of Paradise, existing septic systems appear to be providing adequate wastewater treatment; however, the continuation of dense development will accelerate the need for centralized wastewater management facilities. Through careful planning, proper maintenance, and repair of failing systems in these areas, the need for centralized facilities may be postponed or avoided.

While the water quality data did indicate the presence of sewage related pollution in surface water and shallow seepage, the limited groundwater analyses suggested that the deeper Tuscan Formation aquifer has not been adversely affected by septic systems operation. However, portions of the Tuscan Formation could become polluted by improper well sealing and failing septic systems.

Summary

The recommendations presented in Chapter 5 are summarized in the following sections:

Adopt Preventative Planning Measures. To minimize further water quality degradation from septic systems, it is recommended that preventative planning measures be adopted. Suggested minimum useable area requirements for septic system installation have been developed based on a modified version of the Butte County Subdivision Ordinance, and are presented in Appendix C. Where the soil depth above winter groundwater or impermeable strata is less than 7 feet, mound systems designed in accordance with the State Water Resources Control Board, "Guidelines for Mound Systems," have been recommended, with development limited to uses which generate 300 gpd or less wastewater. In addition, it is recommended that mound systems be used as a replacement for failed conventional leach fields in areas of shallow soils or high groundwater whenever adequate space is available. Alternatives to Appendix C which provide an equal level of control over the density of development based on site characteristics would also be acceptable.

Continue Water Quality Monitoring and Consider Centralized Wastewater Management Facilities in Upper and Middle Honey Run Basins and Lower Skyway Basin. As previously discussed, high septic system density has resulted in wastewater application rates which appear to have exceeded the assimilative capacity of the soil mantle and have caused water quality degradation and potential public health hazards. Thus, it is recommended that centralized wastewater management facilities be considered for these basins, as shown in Figure 5-7. An alternative analysis of wastewater management options should be completed during the Phase II portion of the facilities planning study. Until centralized facilities are completed, proposals for new development using septic systems should be carefully examined and septic systems designed in accordance with Appendix C. It is also recommended that no new septic systems be installed within 200 feet of any stream in these basins.

Since the construction of centralized facilities would be costly, the Town may want to consider an intensive water quality monitoring and septic system survey program to better define the extent and magnitude of water quality degradation. To provide for completion of Step I work within the framework of grant funding deadlines, and to examine septic system performance under both spring runoff and dry weather conditions, the following program is recommended:

During May and June 1983, a bacteriological sampling and septic system reconnaissance program would be undertaken. Phase II of Step I would begin on August 1, 1983. During September 1983, further bacterial sampling and septic system reconnaissance would be performed, to assess septic system operation under dry weather conditions, when the highest surface water bacterial concentrations are typically encountered. If the findings of the two sampling and reconnaissance programs indicate that septic systems are functioning adequately, Phase II work related to centralized facilities would be halted. However, work related to non-structural management alternatives, such as an on-site maintenance district, could be completed to conclude the Step I project. All sampling and reconnaissance programs undertaken should be fully coordinated with the Regional Water Quality Control Board and Butte County Health Department.

Within Lower Skyway Basin, water quality degradation has been caused by septic systems sited in areas with high groundwater in the vicinity of Filbert Street and Sunburst Drive. Thus, it is recommended that this area be included in the centralized facility planning and intensive water quality monitoring and survey programs recommended for Upper and Middle Honey Run Basins. Throughout the remainder of Lower Skyway Basin, development can continue to rely upon septic systems, using the criteria presented in Appendix C.

Continue Water Quality Monitoring Throughout the Remainder of Paradise. To monitor the operation of septic systems in areas not proposed for centralized facilities, additional water quality data should continue to be gathered. A recommended surface water monitoring network is presented in Figure 5-8.

Particular attention should be given to sampling drainage from the Upper Roe Basin, where high-density development is suspected of causing water quality degradation. Samples should be taken on a bi-monthly basis and analyzed for fecal coliform bacteria. If fecal coliform levels exceeding 1,000 MPN/100 ml are consistently detected in a basin, centralized wastewater management facilities should be considered.

As discussed in Chapter 3, it is estimated that there are approximately 300 private wells in Paradise. Older wells may not have been constructed in accordance with existing public health ordinances. Poorly constructed or improperly sealed wells could become contaminated by septic systems, especially in areas of dense development. Incorrectly sealed wells may also provide a conduit through which septic system effluent can enter and pollute deeper aquifer zones. To monitor groundwater quality, it is recommended that wells within the more densely developed portions of Town be analyzed for nitrate and fecal coliform bacteria. An ongoing groundwater monitoring network should be established and sampled on a semi-annual basis for nitrate and fecal coliform bacteria analyses. Contaminated wells should be abandoned to prevent the spread of pollution and an ordinance adopted to ensure proper abandonment procedures. Proposals for new wells should be carefully examined, and close attention given to proper sealing practices.

Perform Septic System Reconnaissance Along Selected Streams in Other Basins. In some basins, it may be possible to improve water quality by repairing or re-siting failing leach fields. To identify failing systems, it is recommended that a reconnaissance program be conducted along soil/bedrock contacts in Neal Basin, along Upper Little Dry Creek in Pearson Basin, and along Dry Creek in Upper and Lower Pentz Basins. Areas recommended for the reconnaissance program are shown in Figure 5-7.

Consider a Septic System Maintenance District and Public Education. To encourage proper operation and maintenance of septic systems, a public education program should be considered. Through public information meetings and brochures, residents could be advised how water conservation measures and other domestic practices can enhance the operation and longevity of on-site systems. In addition, an on-site maintenance district could be established to perform periodic inspections of septic systems and ensure that septic tanks are pumped at proper intervals. The maintenance district could assume responsibility for conducting water quality monitoring programs and administrating repairs of failing systems. Plans for implementing both a public education program and an on-site maintenance district could be developed during the Phase II portion of the facilities planning study.

SUGGESTED IMPLEMENTATION PLAN

1. Develop new septic system ordinance (Appendix C or the equivalent).

2. Initiate intensive water quality monitoring and septic system survey programs in Upper and Middle Honey Run Basins and portions of Lower Skyway Basin, and begin Phase II Study.

   a. May and June, 1983 - Bacteriological sampling and septic system reconnaissance.

   b. August 1, 1983 - Begin Phase II Study.

   c. September, 1983 - Additional bacteriological sampling and septic system reconnaissance.

   d. At conclusion of September sampling/reconnaissance, make decision whether to continue with Phase II centralized facilities alternative analysis.

3. Water quality monitoring and septic system reconnaissance in remaining basins.

   a. Bi-monthly analyses of surface water for fecal coliform bacteria (see Figure 5-8).

   b. Septic system reconnaissance along selected streams (see Figure 5-7).

   c. Semi-annual analyses of groundwater for fecal coliform bacteria and nitrate.

CHAPTER 3

CHAPTER 3

STUDY AREA CHARACTERISTICS

GENERAL

A wide variety of study area characteristics may impact the wastewater facilities planning process. This chapter provides a description of geography, population, and land use within the Town of Paradise.

STUDY AREA GEOGRAPHY

Evaluation of the effectiveness of on-site wastewater treatment requires an understanding of the various geographic factors which influence septic system operation. The topography, geology, hydrogeology, hydrology, soils, and climate of the Paradise area are discussed in the following sections.

Topography

Lying on Eden Ridge, Paradise is generally characterized by mild terrain of less than 30 percent slopes. The east and west boundaries of the Town lie along the steep West Branch Feather River and Butte Creek Canyons, respectively. Within the Town, slopes exceeding 30 percent are found primarily along the ravines associated with Dry, Clear, and Honey Run Creeks. Elevations range from about 650 feet above sea level in the southwest portion of the study area to about 2,300 feet at the northern boundary.

Geology

Paradise lies in an intermediate geologic province between the northern Sierra Nevada and Southern Cascade Ranges. Thus, geologic formations associated with both mountain ranges underlie the study area. A generalized geologic cross-section of the Southern Paradise area is presented in Figure 3-1.

As shown in the cross-section, the uppermost geologic unit is the Tuscan Formation. The Tuscan Formation is associated with the Cascade Range geologic province and consists of volcanic debris such as tuff breccias, mud flows, and lava flows. Beneath Paradise, the Tuscan Formation varies in thickness up to several hundred feet, and appears to dip at a mild but constant slope toward the west. Isolated pockets of post-Tuscan basalt and Chico Formation interrupt the Tuscan Formation at several locations in Paradise.

Underlying the Tuscan Formation is the Metamorphic Basement Complex associated with the Sierra Nevada geologic province. The basement complex consists of meta-sedimentary rocks and metagabbro, and is exposed along the West Branch Feather River Canyon. Ancient streams eroded channels into the upper portions of the basement complex which were later covered by the Tuscan Formation. The stream activity deposited coarse, gold-bearing colluvial materials into the channels. Known as auriferous channels, these deposits have been extensively mined for their gold content.

Hydrogeology

The layered geology beneath Paradise has led to the formation of several aquifer zones. Depending on local conditions of permeability, weathering, and fracturing, the aquifers may have some hydraulic continuity. Beneath Paradise, groundwater movement is generally in a north to south direction, although some flow does occur toward Butte Creek and West Branch Feather River Canyons. It is estimated that there are approximately 300 privately owned wells in Paradise which supply water for irrigation and domestic uses. Most wells penetrate into the Tuscan Formation and generally are less than 200 feet in depth.

Aquifers are generally classified as either unconfined or confined. Unconfined aquifers are characterized as having a free water table, influenced by local recharge, discharge, and well withdrawal. In contrast, confined aquifers contain water under pressure, which is entrapped by two or more relatively impermeable strata. Recharge of confined aquifers may occur when one of the confining layers contacts the ground surface or another water body.

The most shallow groundwater body consists of perched water lying atop the Tuscan Formation. Influenced by seasonal precipitation and local recharge from on-site wastewater disposal systems, this perched, unconfined groundwater does not produce dependable yields of useable quantity. The underlying Tuscan Formation, however, does have weathered and permeable zones which yield significant quantities of groundwater. Based on a review of well logs for the Paradise area, the Tuscan formation typically yields usable water at depths of less than 200 feet. Much of the water is under pressure, indicating at least partial confinement of some of the water-bearing zones. The upper portions of the Tuscan Formation may hold unconfined water which receives recharge from the Paradise area and could be subject to contamination by septic systems.

Beneath the Tuscan Formation lie the auriferous channel aquifers, which contain large quantities of high-quality water. Since the auriferous channels occur at substantial depths and underlie only limited portions of Paradise, they remain relatively untapped. Due to their depth and apparent confinement, the auriferous channels do not appear to receive significant recharge from surface water or septic systems in Paradise.

The Metamorphic Basement Complex is generally well consolidated, with few weathered or fractured zones, and thus is not expected to yield large quantities of water. Only the deepest wells in Paradise appear to penetrate this formation. Like the auriferous channels, the basement complex lies well beneath septic systems and should not be subject to contamination from on-site wastewater disposal.

Hydrology

Several streams originate within Paradise, including Dry, Little Dry, Clear, and Honey Run Creeks. The hydrologic basins associated with the major streams are shown in Figure 3-2. For planning and data analysis purposes, many of the major hydrologic basins have been further divided into sub-basin units.

During the wet weather season, stream flows are sustained by snow melt, surface runoff, and seepage. During dry months, base stream flows are maintained only by irrigation runoff and seepage from groundwater, which includes septic system leachate. In the late summer and early fall, base flows are at their lowest level, and some smaller streams may dry up completely. Since shallow seepage is a major component of stream flow throughout much of the year, there exists a high potential for stream pollution by septic systems.

Soils

Soils in Paradise are primarily clay-loams of the Aiken-Cohasset association. The soils are generally reddish brown, cobbly, and granular, with percolation rates ranging between 10 and 60 minutes per inch. Isolated pockets of tight clay soils with low permeability occur at several areas in Paradise, as shown in Plate 1.

Soil depths typically range from five to 20 feet over bedrock within central Paradise. Shallow soils of less than five feet in depth occur in the south and west portions of the study area. These areas of shallow soils have numerous bedrock soil contacts which may be inundated by seepage during wet weather months.

Climate

Paradise is characterized by warm, dry summers and moist, cool winters with little snowfall. As shown in Table 3-1, long-term records indicate an average annual precipitation of nearly 52 inches for central Paradise. Due to local variations in geography and topography, annual precipitation may differ by over 15 inches between the northern and southern study area boundaries. Pan evaporation has been estimated at about 53 inches for central Paradise.

TABLE 3-1

ANNUAL PRECIPITATION DATA
PARADISE WEATHER STATION

Year	Total Precipitation (inches)
1958	56.10
1959	30.73
1960	51.54
1961	40.37
1962	61.14
1963	48.91
1964	47.82
1965	44.63
1966	45.00
1967	51.76
1968	52.59
1969	76.43
1970	71.43
1971	27.61
1972	41.01
1973	82.84
1974	59.11
1975	50.84
1976	18.47
1977	35.09
1978	63.78
1979	62.81
1980	52.54
1981	71.05
Average, 24 Years of Record =	51.82

Measurements recorded at Paradise Fire Station, elevation 1,750 feet.

POPULATION

With a present population of approximately 24,000 persons, Paradise has experienced tremendous growth since 1960. A population estimate for the study area, utilizing data developed by the Town of Paradise, is presented in Table 3-2 below:

TABLE 3-2

STUDY AREA POPULATION DATA

Year	Projected Population
1982	24,000
1992	29,000
2002	35,000

Ultimate build-out may be affected by constraints related to wastewater treatment and disposal capabilities, water supply, erosion hazards, and storm water runoff. If development occurred on all parcels within the Town, an estimated ultimate population of approximately 45,000 could be attained.

As with many other communities, household population is on a downward trend in Paradise. The average household is currently estimated to have 2.31 persons. For purposes of population estimates, a household size of 2.30 persons has been assumed.

LAND USE

The recently completed Paradise General Plan included an in-depth study of land use within the Town. The General Plan land use map is presented in Figure 3-3. Within Paradise, dense Town Commercial and Multi-Family Residential development occurs primarily in corridors along Skyway, Clark Road, and Pearson Road. Lower density Agricultural Residential and Open Space land uses are concentrated in the less developed portions of Town and along creeks.

CHAPTER 4

CHAPTER 4

EXISTING AND PROJECTED WATER AND WASTEWATER CHARACTERISTICS

GENERAL

Septic system performance is influenced by both the hydraulic loading rate and wastewater composition. This chapter develops wastewater flows and strengths for the study area using water consumption data and projected wastewater characteristics.

WATER SUPPLY

The study area is served by the Paradise Irrigation District (PID), founded in 1916 to provide water to homes and orchards in the Paradise area. The PID system utilizes surface water from Paradise and Magalia Reservoirs, located to the north of the study area. The water is chlorinated prior to distribution; no other treatment is currently provided.

PID maintains water meters on all connections. The billing structure is based on a minimum service charge which varies according to the diameter of the connection and quantity charge derived from the amount of water used. The current PID billing schedule is presented in Table 4-1.

An estimated 300 residences in the study area use individual wells to replace or supplement PID service. The wells are used to provide water for both domestic and irrigation uses. In accordance with State of California, Department of Health Services regulations, PID has installed backflow preventers on connections which are plumbed into private wells. The backflow preventers ensure that untreated well water will not enter into the PID distribution system if system pressure drops.

TABLE 4-1

PARADISE IRRIGATION DISTRICT BILLING SCHEDULE

Bi-Monthly Service Charge		Quantity Charge	
Meter Size	Charge	Service	Charge
5/8", 3/4"	$ 4.10	Residential Motel/Hotel Residential Business	$0.18/100 cf
1"	10.25		
1-1/2"	20.50		
2"	32.80	Mobile Home Park Business (all other)	$0.17/100 cf
3"	71.75		
4"	123.00	Irrigation Residential Irrigation	$0.07/100 cf

EXISTING AND PROJECTED WASTELOADS

The typical septic system in Paradise is designed to treat approximately 300 gpd of wastewater. Based on an average household population of 2.3 persons, the resultant wastewater generation rate is 130 gpcd. Current Clean Water Grant Guidelines stipulate that a wastewater generation rate of 70 gpcd be used in calculating wasteloads for unsewered communities. Thus, if grant funded wastewater management facilities are constructed in Paradise, a water conservation program will be required.

Existing and Projected Water and Wastewater Characteristics

Wastewater Quality

Since analyses of wastewater are not available for Paradise, wastewater loadings have been projected using data developed for other unsewered communities. Two measurements typically used in determining wasteloads are biochemical oxygen demand and total suspended solids, as discussed in the following sections.

Biochemical Oxygen Demand. Wastewater contains organic matter from human wastes, food wastes, and industrial by-products. To quantify the organic strength of a wastewater, a measurement of biochemical oxygen demand (BOD) may be performed. BOD is the amount of oxygen used by microorganisms during the degradation and stabilization of wastewater organics. If wastewater containing significant BOD is allowed to contaminate a lake or stream, dissolved oxygen may be depleted, harming aquatic life and releasing noxious odors. Using data developed for similar unsewered communities, the per capita BOD loading has been estimated at 0.14 lb/day.

Total Suspended Solids. As with BOD, total suspended solids (TSS) are added to wastewater during domestic and commerical use. The amount of suspended matter in a wastewater is typically measured using the TSS test. Suspended solids contribute to the formation of sludge or septage during wastewater treatment. If excessive amounts of suspended solids are carried into a leach field, clogging and consequent failure will result. As with BOD loadings, TSS contributions have been calculated using data developed for similar unsewered communities. The per capita TSS loading has been estimated at 0.17 lb/day.

Wasteload Projections

Using the data developed in previous sections, study area wasteloads have been projected, and are presented in Table 4-2. Average dry weather flows are based on the 70 gpcd wastewater generation rate mandated under Clean Water Grant Guidelines. Peak wet weather flows are projected including allowances for diurnal flow variations and infiltration/inflow.

TABLE 4-2

PROJECTED WASTELOADS FOR THE STUDY AREA

Quantity	Year 1982	1992	2002
Population	24,000	29,000	35,000
Average Dry Weather Flow (mgd)	1.68	2.03	2.45
Peak Wet Weather Flow (mgd)	4.20	5.08	6.12
BOD loading (lb/day)	3,360	4,060	4,900
TSS loading (lb/day)	4,080	4,930	5,950

CHAPTER 5

CHAPTER 5

ANALYSIS OF EXISTING WASTEWATER TREATMENT FACILITIES

GENERAL

As discussed in Chapter 1, Paradise is the largest unsewered, incorporated community in California. Wastewater treatment facilities within the Town consist wholly of individual privately owned septic tanks and soil absorption systems, known as leach fields. In anticipation of an eventual need for centralized wastewater management facilities, portions of a future sanitary sewer system have been constructed along Skyway; however, there are no existing connections to the system. Businesses and residences in the vicinity of the future sewer system continue to rely on septic systems for wastewater treatment and disposal.

ON-SITE WASTEWATER TREATMENT AND DISPOSAL

The typical septic system installation in Paradise consists of a two-chambered septic tank, measuring approximately 1,000 gallons in volume, connected to about 150 feet of leach field piping. A representative septic system is shown in Figure 5-1. Within the septic tank, heavy solids settle and decompose, leading to the formation of a sludge blanket which must be periodically removed. Grease and other floatables are trapped in a scum layer which forms behind the baffles. In a properly designed, well maintained septic tank, 40 to 75 percent of the TSS and 25 to 60 percent of the BOD are removed; however, septic tank effluent still contains large quantities of pathogenic microorganisms and nutrients. Effluent from the septic tank enters the leach field where physical, chemical, and biological processes within the soil provide further treatment of the wastewater. The role of the soil mantle in the treatment of septic tank effluent is discussed in the following sections.

Physical and Chemical Filtration

The soil matrix consists of soil particles separated by irregular, interconnected void spaces. The texture of a soil affects the relative size and distribution of the voids which in turn impacts the ability of the soil to transmit and filter wastewater. Fine textured soils, such as clays, are characterized by relatively small voids and thus low permeability. Coarser materials, such as sands, contain large void spaces and are highly permeable.

As septic tank effluent percolates through the soil absorption system, it is physically filtered by the soil matrix. Bacteria and suspended solids are trapped within the soil voids. Large growths of microorganisms occur in the soil absorption system, leading to the formation of a slime layer which further enhances filtration and treatment. If the slime layer becomes too dense, however, clogging will occur and the absorption system will fail.

In addition to providing physical filtration, soil acts as a chemical filter. The soil absorption system is the site of numerous chemical reactions such as ion exchange, adsorption, and precipitation, which tend to immobilize certain nutrients and heavy metals within the soil matrix and thus improve leachate quality.

Biological Filtration

The upper portion of the soil mantle contains large quantities of microorganisms which perform important functions in the renovation of wastewater. These miroorganisms include bacteria, fungi, and actinomycetes, and may reach concentrations exceeding one billion organisms per gram of soil. The primary role of the microorganisms in the treatment of septic tank effluent is degradation and ultimately stabilization of nutrients and organic matter. As microorganisms utilize the nutrient and organic components of a wastewater, new cells are produced and eventually trapped within the soil voids. Microorganisms also perform important processes in the nitrogen and phosphorus cycles, converting these nutrients into plant available forms.

INSTALLATION AND MAINTENANCE OF ON-SITE WASTEWATER TREATMENT AND DISPOSAL SYSTEMS

Within Paradise, the installation of on-site wastewater systems is administered by the Butte County Health Department. In addition, the Regional Water Quality Control Board, Central Valley Region (RWQCB) has taken an active role in local wastewater management. The Butte County regulations pertaining to on-site wastewater treatment systems, along with guidelines recommended by the RWQCB, are presented in Appendix A. A detailed comparison and analysis of the Butte County regulations and RWQCB recommendations was presented in the 208 Report previously completed.

The maintenance of an installed septic system is the responsibility of the homeowner. As a minimum, septic tanks should be pumped on a regular basis at three- to five-year intervals to prevent solids carryover into the leach field. Neglect of septic tank pumping is one of the more common causes of leach field failure. A properly installed and maintained leach field should last between 15 and 20 years. Eventually, all leach fields require rejuvenation or replacement to reduce the accumulated slime buildup.

SITE CONDITIONS INFLUENCING ON-SITE WASTEWATER TREATMENT AND DISPOSAL

The geographical characteristics of an area have a strong influence on the performance of on-site wastewater treatment and disposal systems. In evaluating the suitability of a parcel for septic system installation, the combined effects of soil conditions, topography, and groundwater depth must be considered. A system installed in deep soils will not provide adequate wastewater treatment if the percolation rate is insufficient, shallow groundwater conditions exist, or topography is unfavorable. Areas with site conditions adverse to septic system operation are presented in Plate I.

Soils

To ensure that proper physical, chemical, and biological filtration of wastewater will occur, septic systems must be situated on soils of proper depth and permeability. For siting of septic systems, the Regional Water Quality Control Board, Central Valley Region recommends that a minimum of 5 feet of soil lie between the bottom of the leaching trench and high groundwater or bedrock. Data presented in the literature suggests that soil depths of less than 4 to 5 feet below the leach field cannot provide adequate treatment of septic tank effluent. Since 2 to 3 feet of soil are required for installation of the leach field piping, a minimum soil depth of approximately 7 feet is required to ensure proper operation of the leach field. In areas with shallow soils, modified absorption field designs such as mounded systems may be required.

Soil depths have been mapped using data presented in the 208 Report, modified by field observations and data supplied by the Butte County Health Department. Although much of Paradise is underlain by soils exceeding 7 feet in depth, the southern portion of the Town and steep canyon areas are characterized by very shallow soils, as indicated on Plate 1. Siting of conventional septic systems on these shallow soils may allow inadequately treated wastewater to collect above or enter the Tuscan Formation, which could result in pollution of groundwater and surface water.

Soil percolation rates also influence the performance of the soil absorption system. Soil percolation is measured by flooding a hole bored in the soil mantle and recording the rate of fall of the water surface. The percolation rate is expressed in units of time per distance of water surface drop, typically as minutes per inch (min/in). Since the units of the percolation rate are the inverse of velocity, a rate of 1 min/in indicates more rapid percolation than a rate of 10 min/in.

Highly permeable soils with percolation rates faster than 5 min/in may allow wastewater to pass through the soil too rapidly, and contact bedrock or groundwater prior to receiving adequate treatment. Percolation rates of slower than 60 min/in may provide insufficient absorption capacity, ultimately leading to clogged or saturated leach fields. With proper conservative design criteria, however, leach fields may be designed to operate in soils with percolation rates up to 120 min/in. Percolation rates between 5 and 60 min/in, as recommended by the RWQCB, generally ensure sufficient treatment of septic tank effluent, providing that soil depth, groundwater depth, and topographic conditions are favorable.

As shown in Plate 1, the Aiken-Cohasset soils of the Paradise area generally exhibit excellent percolation characteristics well suited for the installation of septic systems. Percolation rates have been mapped using data presented in the 208 Report, modified by data collected by the Butte County Health Department. Rapid percolation exceeding 5 min/in, which might allow inadequately treated leachate to contaminate groundwater, is not evident within the study area. Within the Town, poor percolation is confined to isolated areas of heavy clay soils, as shown in Plate 1. Leach fields installed in these areas of inadequate percolation may be subject to rapid clogging and subsequent failure.

Groundwater

If seasonally high groundwater inundates portions of the leach field, it may become contaminated by partially treated wastewater. Under conditions of extremely high groundwater, septic system leachate may actually rise to the ground surface, causing a potential health hazard. In addition, high groundwater and saturated soil conditions enhance bacterial travel and may lead to contamination of both surface water and groundwater. Data presented in the literature indicate that a minimum of 5 feet of unsaturated soil is necessary beneath the leach field to provide adequate removal of bacteria from wastewater. Thus, conventional septic systems should not be constructed in areas where groundwater occurs within 7 feet of the ground surface. In Paradise, high groundwater is most prevalent during the wet weather months, and is concentrated along drainage courses, swales, and in the vicinity of springs.

In evaluating the suitability of a parcel for installation of a septic system, it is recommended that the depth of groundwater be measured under winter conditions. Areas identified as having seasonally high groundwater are indicated in Plate 1. The mapping of groundwater was completed using data gathered by the Butte County Health Department and supplemented by field investigations.

Topography

To ensure that inadequately treated wastewater does not surface downslope of a leach field, both the RWQCB and Butte County Health Department recommend that septic systems not be constructed on slopes which exceed 30 percent. As shown in Plate 1, Paradise is generally characterized by gentle topography, suitable for on-site wastewater treatment and disposal. Steep slopes are concentrated along the north-south trending ravines and canyons which intersect the study area.

Protection of Public Health and Water Resources

When leach fields are installed in areas with poor soils, steep slopes, shallow bedrock or shallow groundwater, blatant failures frequently occur. Such failures are typified by clogged leach lines, surface ponding of effluent, and noxious odors, and many constitute a serious public health hazard due to the potential contact of people and animals with partially treated wastewater. Other more discrete forms of failure may go unnoticed by the owner of the septic system. These discrete failures may occur when groundwater levels rise to saturate the lower portions of the leach field, or when leachate seeps into surface water or groundwater prior to receiving adequate treatment. Though difficult to detect, discrete failures may pose a serious threat to both water quality and public health.

In addition to failures of individual septic systems, the cumulative impact of septic systems operation can also degrade water quality and create potential public health hazards. High density development utilizing septic systems may result in a wastewater application rate which exceeds the assimilative capacity of the soil mantle. Under extremely dense development, leach fields may actually cause locally high groundwater conditions. Overburdening of the soil's ability to renovate wastewater may result in high bacterial levels in springs, seeps, and surface water, and high nitrate levels in groundwater.

Failures of individual septic systems may be largely prevented by proper design, siting, and construction practices, as discussed in the previous sections. To prevent water quality degradation due to the cumulative impacts of septic systems operation, however, wastewater application rates should be based on the assimilative capacity of the soil, considering the affects of site conditions on septic system operation. Based on the soils, groundwater, and topographic conditions in Paradise, and the analysis of septic systems operation, minimum usable areas for septic system installation have been developed using a modified version of the Butte County Subdivision Ordinance, as presented in Appendix C. The site characteristics through which usable areas are determined should represent the average conditions for the parcel. Where the soil depth above winter groundwater or impermeable strata is less than 7 feet, mound systems designed in accordance with the State Water Resources Control Board, "Guidelines for Mound Systems," have been recommended, with development limited to uses which generate less than 300 gpd wastewater. In addition, it is recommended that mound systems be used as a replacement for failed conventional leach fields in areas of shallow soils or groundwater, whenever adequate space is availabe. Alternatives to Appendix C, which provide an equal level of control over the density of development based on site characteristics, would also be acceptable.

WATER QUALITY MONITORING PROGRAM

To assess the operation of septic systems in Paradise, a water quality monitoring network was established, as shown in Figure 5-2. Many of the stations included in the sampling network had been used for prior water quality monitoring by the Butte County Health Department. The results of previously completed water quality analyses are discussed in detail in the 208 Report. Seven samplings of the surface water network were performed between July 1981 and September 1982 to establish whether inadequately treated septic system effluent was contaminating streams and drainage courses. On the initial sampling, water was examined at over 20 locations for a variety of bacteria and chemical parameters. The remaining sampling efforts concentrated on measurements of bacterial quality over a reduced network. Stations in the reduced sampling network were selected based on their potential to identify areas with septic system problems. Samples were collected during both wet weather and dry weather conditions. All analyses performed during the monitoring program were completed by a state-certified water quality laboratory.

To determine whether septic systems have adversely impacted groundwater beneath Paradise, a number of wells and springs were also sampled. The locations of the groundwater sampling stations are indicated in Figure 5-2.

WATER QUALITY PARAMETERS

Through the analysis of surface water and groundwater, an assessment of septic systems operation was performed. A discussion of key water quality indicators is presented in the following sections.

Bacteria

A wide variety of pathogenic bacteria are present in untreated wastewater. Since it is infeasible to analyze for all strains of pathogens, tests are generally performed to detect bacteria only from the coliform group. If coliform bacteria are present, it is likely that the water will also contain more harmful pathogenic bacteria. Thus, coliform bacteria are used as a general indicator of the microbial quality of water.

Bacterial measurements are generally based on statistical approximations, expressed as the most probable number of bacteria per 100 milliliters

(MPN/100 ml) of solution. The State of California, Department of Health Services stipulates that drinking water shall contain less than 2.2 MPN/100 ml total coliform bacteria. Since the total coliform test may measure nonpathogenic coliform strains which occur in many natural waters, it not a good indicator of septic system performance. Further tests may be performed to confirm the presence of fecal coliform bacteria, which originate only in the intestines of humans and other warm-blooded animals.

Determining whether the fecal coliform bacteria in a water sample originate from humans or other animals is difficult. The most commonly employed method requires the measurement of fecal streptococcus bacteria so that a ratio of fecal coliforms to fecal streptococci (FC/FS) may be calculated. Interpretation of the FC/FS ratio is based on the fact that in animal wastes, the FC/FS ratio is typically 0.6 or less, while in human wastes, the ratio is approximately 4.4. Thus, relatively low FC/FS ratios are indicative of animal-caused contamination, while higher ratios are indicative of pollution of a human origin. Intermediate ratios are generally considered indicative of aging fecal contamination by humans.

In rural areas, such as Paradise, non-human fecal streptococcus sources introduce large numbers of fecal streptococcus bacteria into surface waters. Major contributors of fecal streptococcus bacteria include wild and domestic mammals and water fowl. These high background levels of fecal streptococcus bacteria complicate the interpretation of the FC/FS ratio, and mask bacterial pollution by septic systems. In analyzing the results of the water quality monitoring program, samples displaying a FC/FS ratio of 3.0 or above, or a fecal coliform count in excess of 1,000 MPN/100 ml were categorized as indicators of septic system problems.

Nitrogen. Nitrogen in septic tank effluent exists primarily in the form of ammonia and organic nitrogen. Oxidized nitrogen is seldom found in septic tank effluent due to the anaerobic environment in the septic tank. In the aerobic zone of the soil, bacteria rapidly convert the ammonia nitrogen to nitrate.

Nitrate is highly mobile and is readily leached into shallow groundwater and streams. Organic nitrogen is transformed into ammonia and ultimately nitrate; however, this process proceeds at a relatively slow rate. Both nitrate and ammonia nitrogen are utilized as nutrients by plants. Elevated nitrate levels in streams and groundwater may be an indicator of contamination by septic systems.

The State of California, Department of Health Services has set a maximum contaminant level of 45 mg/l nitrate expressed as nitrate (10 mg/l nitrate expressed as nitrogen) for domestic water supplies. This standard has been adopted in order to prevent a health disorder known as methemoglobinemia, associated with high nitrate intake in infants. Elevated nitrate levels in surface waters may cause algal blooms which can seriously alter the character of a stream. Algae impart undesirable odors and taste to water, which can be very costly to remove.

Chloride. Chloride is introduced into wastewater through washing, cooking, and human excretory products. Like nitrate, chloride is highly mobile and is prone to leaching from disposal fields into streams and groundwater. Chloride is a conservative chemical species which is not readily taken up by vegetation or adsorbed to soil particles. Thus, where natural sources of chloride are not present, high chloride levels in groundwater and streams may be indicative of pollution by septic systems.

Chloride itself is not of major concern to public health; however, high chloride levels may cause undesirable taste in drinking water. The recommended limit for chloride in domestic water supplies is 250 mg/l, proposed by the State of California, Department of Health Services. In addition, it is recommended that upper limit and short-term exposure levels not exceed 500 and 600 mg/l, respectively.

Specific Conductance. Specific conductance is an electrical equivalent measurement of the dissolved mineral content of water. Dissolved minerals, which include chloride and nitrate, enter wastewater through washing, cooking, and human excretory products. In areas such as Paradise, with good background water quality, increasing specific conductance may be associated with pollution by septic systems.

Waters with high specific conductance frequently have poor aesthetic characteristics and a potential for causing corrosion of plumbing and associated appliances. The State of California, Department of Health Services, has recommended that specific conductance of drinking waters not exceed 900 µmhos/cm, with upper limit and short-term exposure levels of 1,600 and 2,200 µmhos/cm, respectively.

Water Quality Data

The data collected during the water quality monitoring program are presented in Table 5-1. Data which indicate the presence of inadequately treated wastewater, based on an interpretation of bacterial analyses are denoted by underlining. The water quality analyses are discussed in detail in the following sections.

General Trends in Water Quality. During the collection and analysis of water quality data, various trends in bacterial occurrence were observed. A comparison of precipitation versus mean fecal coliform bacterial levels for the reduced sampling network is presented in Figure 5-3. The highest mean bacterial levels occured during September, when stream flows were at or near their lowest levels, largely maintained by seepage from septic systems. After September, bacterial levels decreased as dilution of septic system effluent increased. The anticipated flushing of bacteria from leach fields following the first heavy precipitation in October and November, 1981 did not result in high mean fecal coliform levels. The failure to observe a flushing phenomenon may be due to the near-record precipitation received during the study, which resulted in increased winter and spring runoff and hence diluted bacterial concentrations in surface water. Thus, in a year of normal precipitation, substantially increased fecal

FIGURE 5-3

PRECIPITATION VERSUS MEAN
FECAL COLIFORM BACTERIA

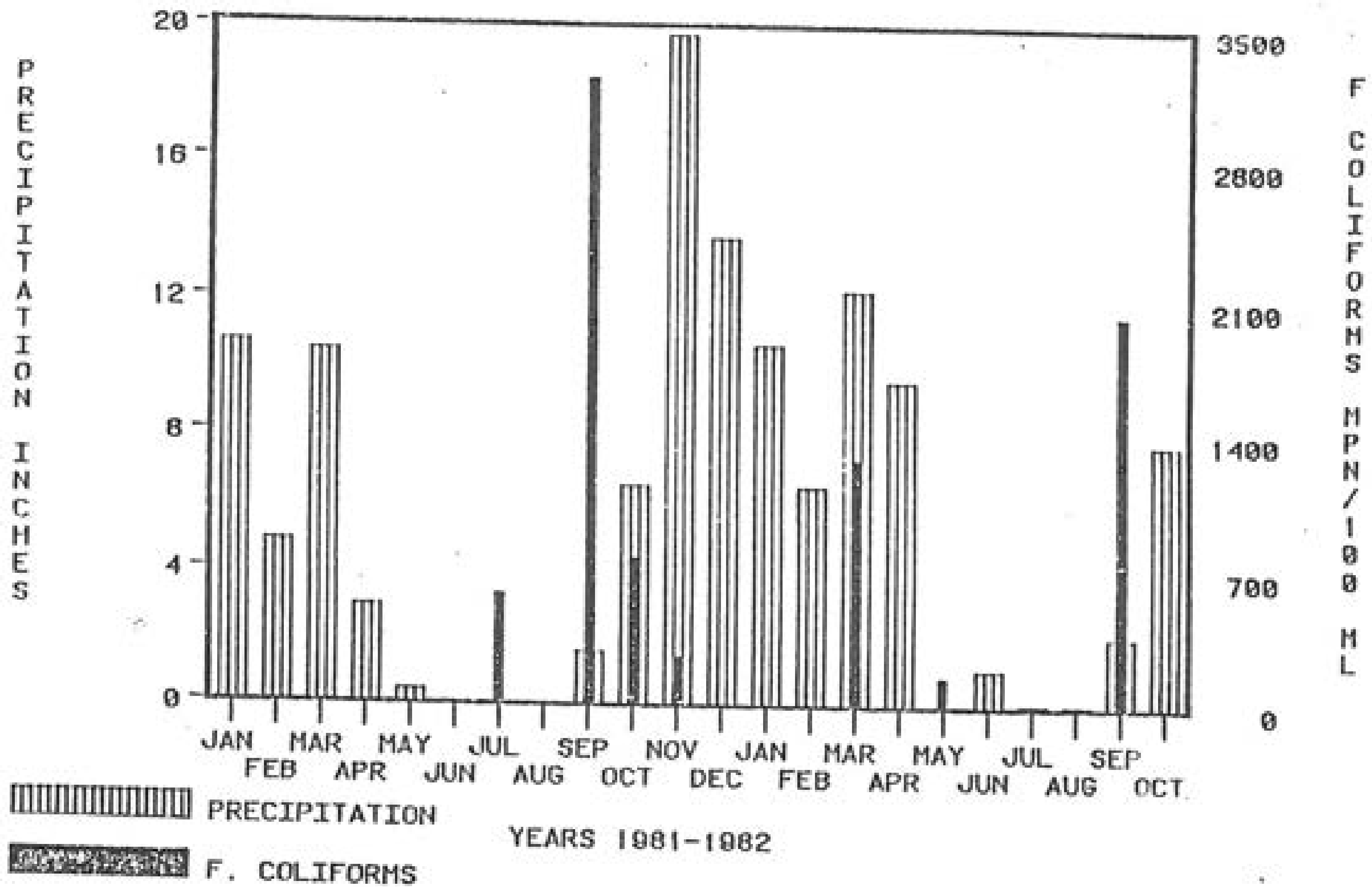


TABLE 5-1

RESULTS OF WATER QUALITY MONITORING

Station	Basin	Sample Day	Bacterial Measurement, MPN/100 ml: Total Coliform	Fecal Coliform	Fecal Streptococcus	FC/FS Ratio	Chloride (Cl, mg/l)	Nitrate (NO_3, mg/l)	Specific Conductance (umhos/cm)
1	Little Butte	8 Jul 1981	23	23	230	0.1	4	1.0	75
2	Valley View/Tranquil	8 Jul 1981	230	230	310	0.7	6	0.8	75
3	Valley View/Tranquil	8 Jul 1981	81	23	790	<0.1	7	1.7	105
4	Middle Honey Run	8 Jul 1981	1,300	20	790	<0.1	4	0.1	65
		21 Sep 1981	NS						
		5 Oct 1981	NS						
		9 Nov 1981	790	20	270	<0.1			55
		11 Mar 1982	2,800	790	1,100	0.7			35
		24 May 1982	5,400	1,300	2,200	0.6			60
		1 Sep 1982	490	50	1,300	<0.1			63
5	Middle Honey Run	8 Jul 1981	2,200	1,100	1,300	0.8	5	1.2	65
		21 Sep 1981	5,400	790	16,000	<0.1			80
		5 Oct 1981	11,000	1,300	16,000	<0.1			50
		9 Nov 1981	2,200	490	230	2.1			30
		11 Mar 1982	9,200	790	2,800	0.3			45
		24 May 1982	80	50	490	0.1			67
		1 Sep 1982	1,300	790	700	1.1			76

NS = No sample taken.

TABLE 5-1 (continued)

Station	Basin	Sample Day	Bacterial Measurement, MPN/100 ml: Total Coliform	Fecal Coliform	Fecal Streptococcus	FC/FS Ratio	Chloride (Cl, mg/l)	Nitrate (NO_3, mg/l)	Specific Conductance (umbos/cm)
6	Middle Honey Run	8 Jul 1981	2,200	330	490	0.7	6	0.9	60
		21 Sep 1981	9,200	9,200	2,200	4.2			55
		5 Oct 1981	5,400	790	1,800	0.4			55
		9 Nov 1981	1,700	330	3,500	<0.1			70
		11 Mar 1982	24,000	9,200	220	42.0			55
		24 May 1982	5,400	20	490	<0.1			103
		1 Sep 1982	3,500	40	80	0.5			100
7	Neal	8 Jul 1981	NS						
		5 Oct 1981	NS						
		9 Nov 1981	5,400	230	1,400	0.2			80
		11 Mar 1982	490	50	490	0.1			50
		24 May 1982	210	20	1,300	<0.1			81
8	Lower Skyway	8 Jul 1981	5,400	1,100	2,400	0.5	6	0.7	100
		21 Sep 1981	9,200	5,400	5,400	1.0			90
		5 Oct 1981	5,400	2,400	3,500	0.7			70
		9 Nov 1981	490	490	2,200	0.2			43
		11 Mar 1982	16,000	490	1,800	0.3			55
		24 May 1982	470	110	1,700	<0.1			96
		1 Sep 1982	9,200	1,400	630	2.2			111
9	Lower Skyway	8 Jul 1981	NS						
		21 Sep 1981	NS						
		5 Oct 1981	330	50	790	<0.1			85
		9 Nov 1981	220	80	230	0.3			68
		11 Mar 1982	2,200	790	16,000	<0.1			0
		24 May 982	220	20	490	<0.1			94
		1 Sep 1982	2,400	80	2,400	<0.1			121

NS = No sample taken.

TABLE 5-1 (continued)

Station	Basin	Sample Day	Bacterial Measurement, MPN/100 ml Total Coliform	Fecal Coliform	Fecal Streptococcus	FC/FS Ratio	Chloride (Cl, mg/l)	Nitrate (NO_3, mg/l)	Specific Conductance (umhos/cm)
10	Upper Roe	8 Jul 1981	5,400	790	2,400	0.3	2	0.9	65
11	Lower Roe	8 Jul 1981	1,300	110	490	0.2	5	0.3	85
12	Pearson	8 Jul 1982	1,700	330	5,400	<0.1	5	1.8	90
		21 Sep 1981	17,000	5,400	3,500	1.5			63
		5 Oct 1981	9,200	1,300	1,700	0.8			70
		9 Nov 1981	1,300	330	1,700	0.2			53
		11 Mar 1982	24,000	790	1,100	0.7			55
		24 May 1982	220	20	790	<0.1			86
		1 Sep 1982	490	330	1,400	0.2			98
13	Upper Pearson/ Little Dry Creek	8 Jul 1981	700	700	1,300	0.5	6	0.6	45
		21 Sep 1981	5,400	490	3,500	0.1			53
		5 Oct 1981	1,400	310	16,000	<0.1			40
		9 Nov 1981	700	330	50	6.6			30
		11 Mar 1982	490	80	3,500	<0.1			0
		24 May 1982	170	20	50	0.4			57
		1 Sep 1982	13,000	20	1,700	<0.1			70
14	Lower Pearson/ Little Dry Creek	8 Jul 1981	70,000	790	79,000	<0.1	4	0.5	45
		21 Sep 1981	3,500	790	3,500	0.2			45
		5 Oct 1981	3,500	330	5,400	<0.1			40
		9 Nov 1981	1,700	220	700	0.3			40
		11 Mar 1982	490	80	1,300	<0.1			40
		24 May 1982	170	50	330	0.2			48
		1 Sep 1982	1,700	80	790	0.1			74

NS = No sample taken.

TABLE 5-1 (continued)

Station	Basin	Sample Day	Bacterial Measurement, MPN/100 ml: Total Coliform	Fecal Coliform	Fecal Streptococcus	FC/FS Ratio	Chloride (Cl, mg/l)	Nitrate (NO_3, mg/l)	Specific Conductance (umhos/cm)
15	Lower Pearson/ Little Dry Creek	9 Nov 1981	790	70	490	0.1			120
		11 Mar 1982	9,200	430	1,800	0.2			90
		24 May 1982	170	20	9,200	<0.1			66
		1 Sep 1982	5,400	110	270	0.4			88
16	Lower Clark	8 Jul 1981	3,500	40	1,100	<0.1	4	0.8	35
17	Lower Sawmill	8 Jul 1981	940	170	790	0.3	4	0.8	45
18	Upper Pentz	8 Jul 1981	27	5	80	<0.1	4	0.1	75
		1 Sep 1982	92,000	18,000	35,000	0.5			86
19	Upper Pentz	8 Jul 1981	790	40	330	0.1	4	0.7	45
		21 Sep 1981	5,400	3,500	620	5.6			57
		5 Oct 81	5,400	400	2,400	0.2			40
		9 Nov 1981	700	170	490	0.3			43
		11 Mar 1982	2,200	50	460	<0.1			40
		24 May 1982	130	50	310	0.2			57
		1 Sep 1982	490	20	50	0.4			59
20	Lower Pentz	8 Jul 1981	2,400	790	1,700	0.5	3	0.8	70

NS = No sample taken.

TABLE 5-1 (continued)

Station	Basin	Sample Day	Bacterial Measurement, MPN/100 ml: Total Coliform	Fecal Coliform	Fecal Streptococcus	FC/FS Ratio	Chloride (Cl, mg/l)	Nitrate (NO_3, mg/l)	Specific Conductance (umhos/cm)
20	Lower Pentz	21 Sep 1981	490	330	2,400	0.1			70
		5 Oct 1981	460	50	5,400	<0.1			50
		9 Nov 1981	1,300	230	70	3.3			47
		11 Mar 1982	2,400	490	790	0.6			40
		24 May 1982	110	20	490	<0.1			64
		1 Sep 1982	9,200	3,500	2,400	1.5			73
21	West Branch	8 Jul 1981	2,400	230	330	0.7	4	0.9	45
22	West Branch	8 Jul 1981	1,300	170	700	0.2	4	0.2	50
S-1	Neal	21 Sep 1981	16,000	1,300	2,200	0.6			180
		1 Sep 1982	24,000	20	9,200	<0.1			172
		29 Sep 1982		20				27.0	
S-2	Lower Skyway	29 Sep 1982		140				2.5	
S-3	Lower Skyway	29 Sep 1982		170				4.9	
S-4	Middle Honey Run	29 Sep 1982		170				2.8	
S-5	Upper Pearson Little Dry Creek	29 Sep 1982	40	<20	70	<0.3			49

NS = No sample taken.

TABLE 5-1 (continued)

Station	Basin	Sample Day	Bacterial Measurement, MPN/100 ml: Total Coliform	Fecal Coliform	Fecal Streptococcus	FC/FS Ratio	Chloride (Cl, mg/l)	Nitrate (NO_3, mg/l)	Specific Conductance (umhos/cm)
S-6	Upper Clark	29 Sep 1982		20				3.4	
S-7	Upper Clark	29 Sep 1982		<20				3.2	
S-8	West Branch	29 Sep 1982		170				4.9	
W-1	Middle Honey Run	29 Sep 1982		<2				1.3	
W-2	Neal	29 Sep 1982		<2				0.6	
W-3	West Branch	29 Sep 1982		<2				2.7	
W-4	West Branch	29 Sep 1982		<2				3.2	

NS = No sample taken.

coliform levels would be expected. The isolated spike of mean fecal coliform bacteria during March, 1982 was primarily the result of elevated fecal coliforms at a single sampling station.

Historical water quality analyses revealed high bacterial levels at many of the sampling stations included in this study. However, previous testing was limited primarily to total coliform bacteria and therefore the data could not be easily correlated with analyses completed during this study.

Little Butte Basin. Due to the limited quantity and remote location of surface water in this basin, only one water sampling was performed. The analyses indicated that the water was of high quality, with low concentrations of bacteria and chemical indicators of septic system failure. Therefore, pollution by septic systems does not appear to be significant.

Valley View/Tranquil Basin. Like Little Butte Basin, stations within the Valley View/Tranquil Basin were sampled on one occasion. Fecal coliform levels at Stations 2 and 3 were low, indicating that inadequately treated wastewater was not entering surface water.

Upper and Middle Honey Run Basins. Located in Central Paradise, Upper and Middle Honey Run Basins receive drainage from the densely developed Skyway area. Since previously completed studies and water quality monitoring programs had identified much of this area as unsuitable for continued use of septic systems, these basins received particular attention during the sampling program. Three surface water sampling stations were located along Honey Run Creek and its tributaries. Two groundwater sampling stations were utilized to determine the quality of subsurface water.

The surface water sampling stations yielded fecal coliform measurements exceeding 1,000 MPN/100 ml on five occasions, attributable to inadequately treated wastewater entering Honey Run Creek and its tributaries. During a year of normal precipitation, dilution effects would be reduced and more consistent bacterial data would be expected. Mean fecal coliform counts at Stations 4, 5, and 6 were 436, 759, and 2,844 MPN/100 ml, respectively. As shown in Figure 5-4, Station 6 yielded two samples measuring 9,200 MPN/100 ml fecal coliform bacteria, indicating that substantial quantities of septic tank effluent from the Skyway/Elliot Road area are periodically reaching surface water prior to receiving proper treatment. As indicated in Figure 5-5, fecal coliform levels often increased between Stations 4 and 5, demonstrating a general degradation of water quality along the stream due to the cumulative impacts of septic system operation.

The highest bacterial concentrations were recorded during summer and fall months when dilution of septic system leachate is at its lowest level, and during late spring runoff conditions when leach fields are being flushed but dilution effects are not extreme. During the wet weather season, bacterial concentrations were diluted, but the total number of pathogenic microorganisms flushed from leach fields actually increased. The bacterial contamination of surface water creates a potential health hazard and is strongly suggestive of serious septic system problems in Upper and Middle Honey Run Basins.

The limited testing for chemical constituents did not reveal significant trends in water quality. Total coliform measurements, however, generally exceeded 2,000 MPN/100 ml and increased with downstream travel, further supporting the conclusion that septic tank operation is adversely impacting water quality in the Middle Honey Run Basin.

In addition to the surface water monitoring program, two groundwater samples were collected in the Middle Honey Run Basin. Station W1 was an artesian well near Bowles Boulevard penetrating confined, pressurized strata of the Tuscan Formation. The analyses revealed the well water to be of high quality, with less than 2 MPN/100 ml fecal coliform bacteria, and nitrate of 1.3 mg/l NO_3. The low bacteria and nitrate levels indicate that the confined portions of the Tuscan Formation beneath Middle Honey Run Basin are fairly isolated from the effects of septic systems. Another sampling of groundwater was taken from seepage

FIGURE 5-4

FECAL COLIFORM BACTERIA - STATION 6

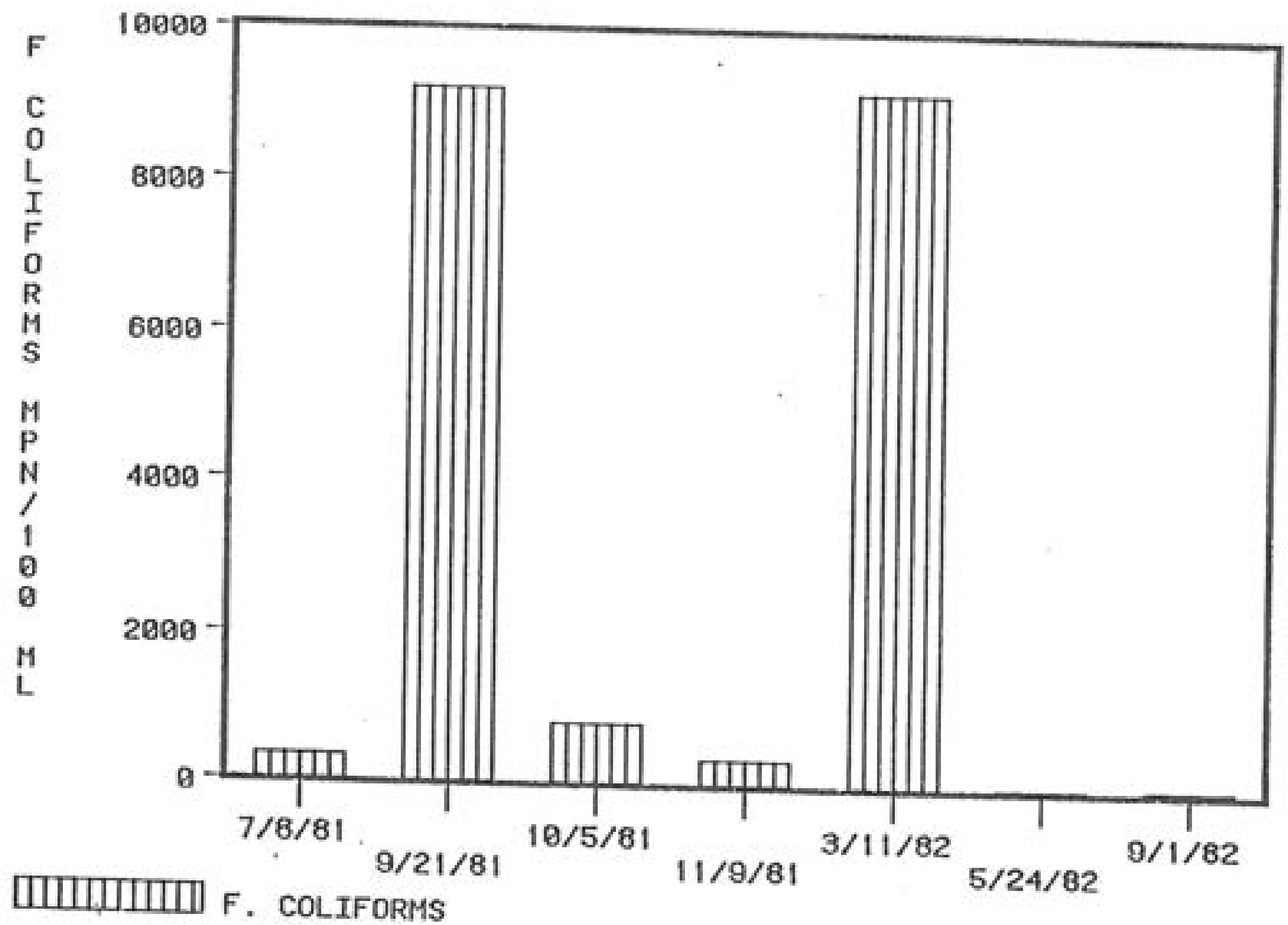
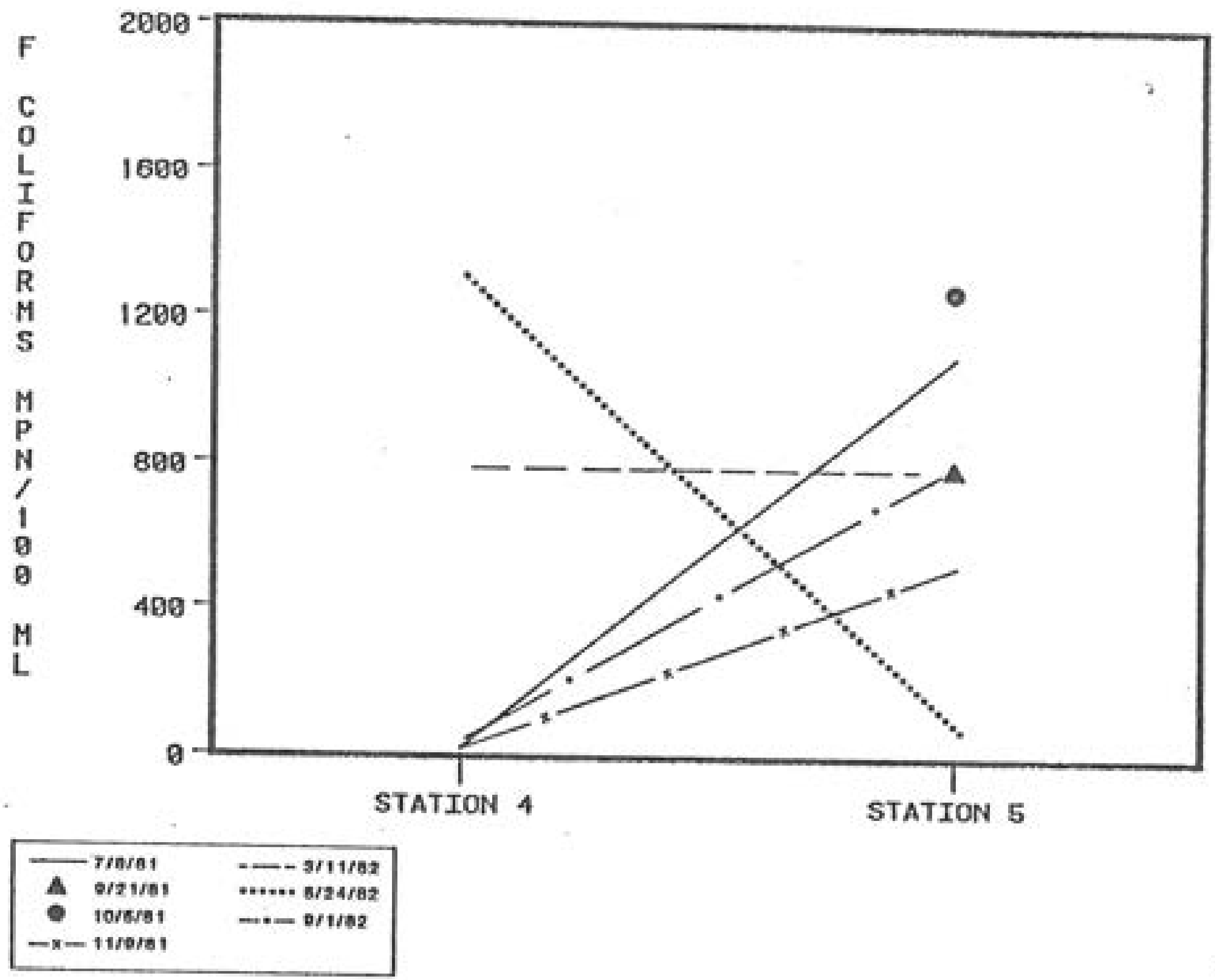


FIGURE 5-5

FECAL COLIFORM BACTERIA - HONEY RUN CREEK



along Beechwood Drive. The sample yielded relatively low levels of fecal coliform bacteria and nitrate, and may have been composed primarily of landscape irrigation runoff rather than septic system effluent.

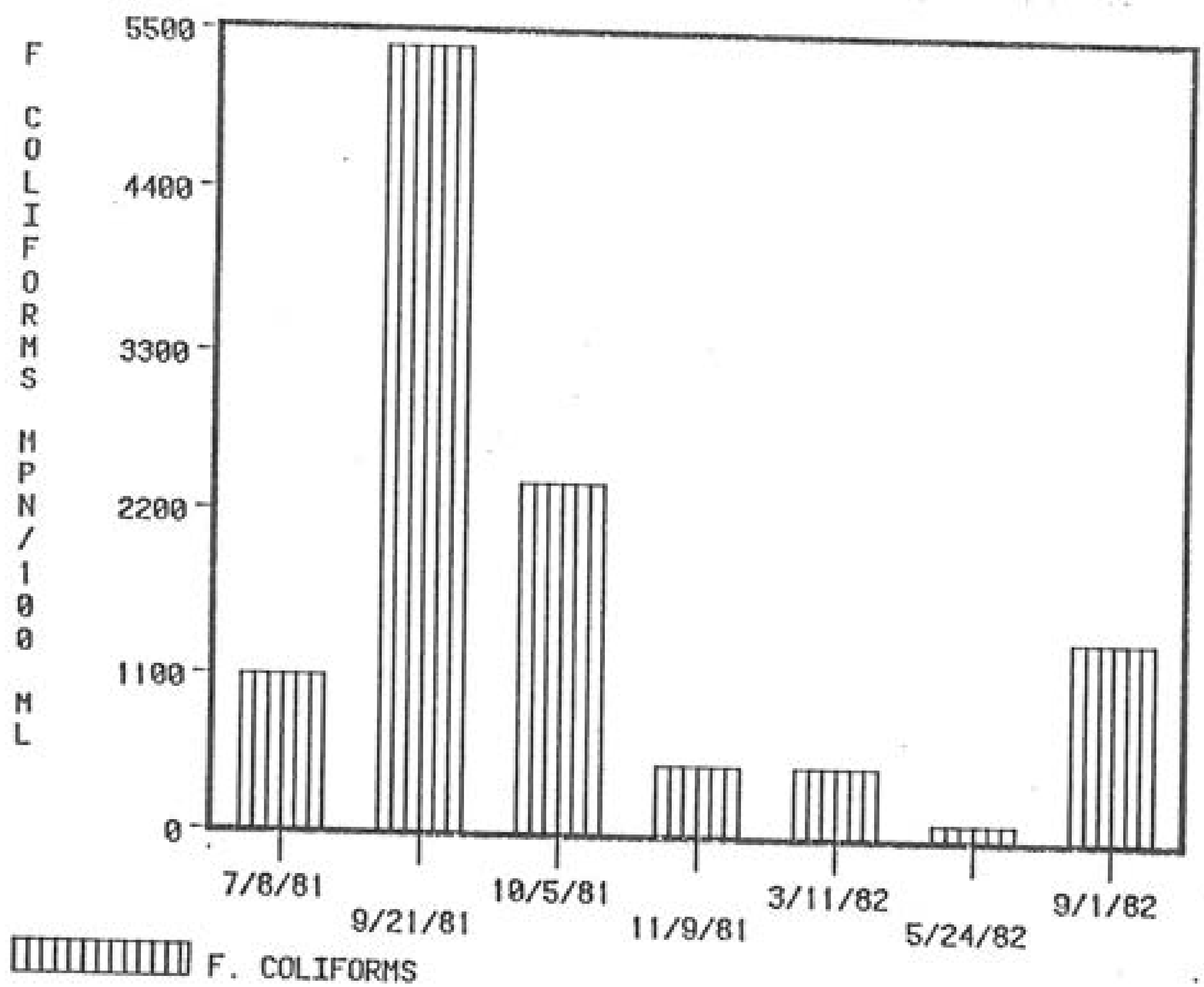
Neal Basin. Sampling points within Neal Basin consisted of Station 7, located along an intermittent stream fed by shallow springs and seeps, and Station S-1, located in a seepage area along a Tuscan Formation/soil contact. Samples taken at Station 7 displayed consistently low fecal coliform measurements. Thus, it appears that septic systems upstream of Station 7 are functioning properly and providing adequate wastewater treatment. Data from Station S-1 demonstrated varying water quality, with fecal coliform bacteria ranging from 20 to 1,300 MPN/100 ml and nitrate measuring 27.0 mg/l NO_3. The high bacterial and nitrate measurements appear to be caused by localized, periodic surfacing of partially treated effluent from septic systems located on very shallow soils. Septic systems upgradient of Station S-1 do not appear to have caused significant degradation of groundwater; however, monitoring for both fecal coliform bacteria and nitrate should be continued in the area.

Lower Skyway Basin. Surface water within the Skyway Basin arises from a series of springs located northeast of Filbert Street, draining southward into Hamlin Canyon. Two surface water and three groundwater sampling stations were located in the basin, as shown in Figure 5-2. Samples from Station 8 displayed consistently high bacterial levels, as illustrated in Figure 5-6, indicating the presence of inadequately treated wastewater. During the study, fecal coliform bacteria at Station 8 averaged over 1,600 MPN/100 ml. The bacterial levels were highest during dry weather months when the effects of dilution were not significant. Sampling of Stations S-2 and S-3, the springs from which the surface water originates, revealed low bacterial levels. Therefore, the bacterial contamination at Station 8 appears attributable to seepage from septic systems in the vicinity of Filbert Street and Sunburst Drive.

Bacterial measurements from Station 9 generally show that surface water quality is improved during the 1.7-mile travel to Wayland Road. Fecal coliform levels indicative of septic system failure were not recorded for Station 9.

FIGURE 5-6

FECAL COLIFORM BACTERIA - STATION 8



The sample collected from W-2, a well which penetrates deeply into the Tuscan Formation, yielded high-quality water. Thus, it does not appear that septic systems in the vicinity of Wayland Road and Neal Road have adversely affected confined groundwater within the Tuscan Formation.

Upper and Lower Roe Basins. Lying parallel to Skyway, Upper Roe Basin receives drainage from some of the most heavily developed portions of Paradise, including multi-family developments. Surface water flows southward through Lower Roe Basin, eventually entering Hamlin Canyon. A single sampling of Stations 10 and 11 during dry weather conditions did not reveal contamination by inadequately treated wastewater; however, dense development upstream of Station 10 is suspected of causing water quality degradation.

Pearson Basin. Runoff and seepage from the Pearson Basin feeds Little Dry Creek which ultimately drains to the Central Valley. One surface water sampling point, Station 12, was located along Little Dry Creek near Roe Road. On two successive samplings, the data showed signs of septic system failure, with fecal coliform bacteria measuring 5,400 and 1,300 MPN/100 ml. In addition, the station displayed several high total coliform counts. The contamination appears to emanate from septic systems located in close proximity to Little Dry Creek, upstream of Roe Road.

Upper and Lower Pearson/Little Dry Creek Basins. Tributary to the Little Dry Creek drainage, these basins extend nearly the full length of the study area. Three surface water and one groundwater sampling stations were located within the basins. Only one analysis, a relatively low 330 MPN/100 ml fecal coliform associated with a FC/FS ratio of 6.6, revealed any sign of sewage-related pollution. The remaining bacterial and chemical analyses indicated that septic systems throughout these basins were providing adequate wastewater treatment and not adversely affecting surface waters.

Upper and Lower Clark Basins. The Upper and Lower Clark Basins, which drain to Clear Creek, were the site of only limited water sampling. Surface water from Station 16 revealed low fecal coliform levels with no indication of septic system failure. Likewise, samples of groundwater from seeps at Station S-6 and an old mine shaft at Station S-7 were characterized by good water quality. Based on the sparse data, it appears that septic systems in the Clark Basins are functioning properly; however, it is recommended that additional data be gathered to fully assess the impact of septic systems on water quality.

Upper and Lower Sawmill Basins. A single surface water sample was taken from the Sawmill Basins, which gave no indication of septic system problems. As with the Clark Basins, additional data should be collected to complete the appraisal of water quality.

Upper and Lower Pentz Basins. Draining to Dry Creek, the Upper and Lower Pentz Basins span the complete length of the study area. Surface water monitoring stations revealed four samples indicative of septic system problems. Based on field observations, the single occurrence of 18,000 MPN/100 ml fecal coliform bacteria at Station 18 during September 1982 was most likely due to an isolated failing septic system, and water quality was renovated prior to reaching Station 19. The 3,500 MPN/100 ml and 230 MPN/100 ml, FC/FS = 3.3 analyses from Stations 19 and 20 may result from septic systems located along the banks of Clear Creek, in areas of heavy seepage.

West Branch Basin. Surface waters in the West Branch Basin flow into the Feather River and ultimately into Lake Oroville. Two surface water and three groundwater samples were collected in the basin, with no data indicative of wastewater-related contamination. Thus, it appears that the relatively low-density development within the West Branch Basin has not adversely affected water quality.

WATER AND NITROGEN BALANCE

To assist in the assessment of septic system operation, a water and nitrogen balance was performed on each hydrologic basin with in Paradise. The water and nitrogen balance considered effects of precipitation, runoff, evapotranspiration, vegetative uptake, and other assimilative processes on leachate quality.

The water and nitrogen balance concluded that in several basins, perched groundwater above the the Tuscan Formation may be approaching the allowable upper limit of 45 mg/l NO_3 for nitrate in drinking water. Nitrate levels exceeding 40 mg/l NO_3 have been predicted for the Little Butte Basin, Valley View/Tranquil Basin, Middle Honey Run Basin, and Upper Roe Basin.

To confirm the results of the water balance, it is recommended that a groundwater monitoring program be developed. Samples should be taken from the Upper Tuscan Formation and overlying perched groundwater, using existing wells with shallow perforations, or a series of monitoring wells. If groundwater nitrate or fecal coliform levels exceed drinking water standards, the effected wells should be abandoned. Sampling should continue on a semiannual basis to identify any increasing trends in nitrate levels.

ASSESSMENT OF SEPTIC SYSTEMS OPERATION

Based on the preceeding review of site characteristics, water quality data, and the water/nitrogen balance, the cumulative impact of septic system operation within each hydrologic basin has been assessed. Existing wastewater application rates for each basin are presented in Table 5-2. A tabulation of adverse site characteristics which may impact septic system operation is presented in Table 5-3.

As seen in the data, average basin-wide wastewater application rates range from approximately 100 gpad in the less-developed portions of the study area, to over 900 gpad in Middle Honey Run Basin. In the most densely developed portions of Upper Honey Run Basin, Middle Honey Run Basin, and Upper Roe Basin, wastewater application rates exceed 1,000 gpad. In general, septic system problems have been most prevalent in areas with high wastewater application rates, adverse site characteristics, or a combination of these factors.

TABLE 5-2

EXISTING WASTEWATER APPLICATION RATES

Basin	Area (Acres)	Average Wastewater Application Rate (gpad)
Butte Creek Tributary	480	230
Little Butte	300	240
Valley View/Tranquil	490	240
Upper Honey Run	390	780
Middle Honey Run	600	910
Lower Honey Run	440	90
Neal	320	150
Lower Skyway	390	160
Upper Roe	370	710
Lower Roe	330	90
Pearson	460	160
Upper Pearson/Little Dry Creek	700	340
Lower Pearson/Little Dry Creek	610	100
Upper Clark	860	500
Lower Clark	920	110
Upper Sawmill	340	330
Lower Sawmill	700	110
Upper Pentz	1,120	290
Lower Pentz	620	140
West Branch	1,060	190
Total	11,500	

TABLE 5-3

SITE CHARACTERISTICS INFLUENCING SEPTIC SYSTEM OPERATION

Basin	Percent of Basin with Adverse Characteristics: Slow Percolation 60 min/in +	Shallow Soils Less than 7 ft deep	Seasonally High Groundwater Within 7 feet of Ground Surface	Steep Slopes Exceeding 30%
Butte Creek Tributary	15	10		15
Little Butte		20		15
Valley View/Tranquil	5	45	5	10
Upper Honey Run	20		5	
Middle Honey Run		10	5	2
Lower Honey Run		85	5	75
Neal	2	50	2	
Lower Skyway		5	5	
Upper Roe	2		10	
Lower Roe		30		2
Pearson	2	15	5	3
Upper Pearson/Little Dry Creek	15	2	5	
Lower Pearson/Little Dry Creek	2	45	5	2
Upper Clark	2		2	
Lower Clark	2	55	1	20
Upper Sawmill	1		2	
Lower Sawmill	1	50		2
Upper Pentz	1	2	5	1
Lower Pentz	2	35		25
West Branch	1	20	10	25

Butte Creek Tributary Basin

Development in the Butte Creek Tributary Basin consists primarily of single-family dwellings, averaging approximately 1.3 acres per unit. Portions of the basin may be unsuitable for conventional septic systems due to steep slopes, shallow soils, and poor percolation. Despite the potentially adverse site characteristics, septic systems in the basin appear to be functioning well, due in part to the low wastewater application rate. The water/nitrogen balance did not predict water quality problems under the present density of development.

Existing vacant parcels within the basin fall primarily under Agricultural Residential and Town Residential land use designations. Continued development using septic systems may continue on suitable parcels, providing that new development is planned in accordance with Appendix C.

Little Butte Basin

Existing development in the Little Butte Basin consists almost exclusively of single-family dwellings under Town Residential and Agricultural Residential zoning. Portions of the basin have steep slopes and shallow soils, and appear unsuitable for continued development using septic systems. The water/nitrogen balance predicted potential water quality degradation from septic system operation and lack of dilution; however, no significant contamination was evidenced in water analyses from the area. Thus, it appears that septic systems can continue to be used in accordance with the requirements of Appendix C.

Valley View/Tranquil Basin

Similar to Little Butte Basin, the Valley View/Tranquil Basin is composed of single-family residences with an average density of about 1.2 acres per dwelling unit. Much of the basin is characterized by steep slopes, shallow soils, poor percolation, or seasonally high groundwater. Though the water balance predicted water quality degradation in the basin, sewage-related contamination was not serious potential public health hazards, centralized wastewater management facilities should be considered for these basins. Until the centralized facilities are completed, proposals for further unsewered development should be examined with caution, and designed in accordance with Appendix C. In addition, it is recommmended that no new leach fields be installed within 200 feet of any stream in Upper and Middle Honey Run Basins.

Lower Honey Run Basin

Unlike the upstream portions of the Honey Run drainage, Lower Honey Run Basin has not experienced substantial amounts of dense development, due in part to its rugged terrain and shallow soils. Presently, much of the basin falls under Open Space and Agricultural Residential land use designations, which should provide sufficient density control to assist in the protection of water quality. Designs for new septic systems should be based on Appendix C.

Neal Basin

Adjacent to Lower Honey Run Basin, Neal Basin has experienced relatively low density development averaging 2.0 ac/u, with an accompanying wastewater application rate of about 150 gpad. Existing land use designations consist primarily of Agricultural Residential, Open Space, and Town Residential, with small pockets of Multi-Family Residential and Town Commercial. Large portions of the basin are underlain by very shallow soils, and numerous seeps occur along soil/bedrock contacts.

The data from the surface water monitoring program indicated that septic systems upstream of Station 7 appear to be providing adequate wastewater treatment. The groundwater monitoring data revealed potential contamination of seepage along soil/bedrock contacts, however, care should be exercised in siting of septic systems in areas near shallow bedrock. Future development can continue to rely on septic systems, providing that systems are installed only in suitable areas using the criteria presented in Appendix C.

support this conclusion. It is recommended that continued water quality monitoring be conducted, analyzing surface water for fecal coliform bacteria and groundwater for fecal coliform bacteria and nitrate. If fecal coliform bacteria are consistently detected in excess of 1,000 MPN/100 ml, centralized wastewater management facilities should be considered for this basin.

Lower Roe Basin

Categorized mainly under Agricultural Residential and Open Space land use designations, Lower Roe Basin is the site of low-density development, with an average wastewater application rate of 90 gpad. Existing septic systems appear to be providing adequate treatment of wastewater, and no groundwater problems were predicted in the water/nitrogen balance. As long as future development avoids areas of shallow soils and other adverse site characteristics, the use of septic systems may continue. As with other basins, it is recommended that new development using septic system be in accordance with Appendix C.

Pearson Basin

Pearson Basin has received low to moderate density development consisting primarily of single family dwellings. Water quality problems within the basin appear to be limited to Little Dry Creek north of Roe Road. Septic systems located in close proximity to the creek may not be providing adequate wastewater treatment; therefore, it is recommended that a reconnaissance be performed to locate any failing systems. Providing that new development does not occur in areas unsuitable for on-site systems, there does not appear to be a need for centralized wastewater management facilities in the basin. Future development should be governed by the criteria presented in Appendix C.

Upper and Lower Pearson/Little Dry Creek, Upper and Lower Clark, and Upper and Lower Sawmill Basins

Existing development within these basins has generally been of low to moderate density, under a wide variety of land use designations. The most dense development is centered in the Pearson and Clark Road areas, where numerous Multi-Family Residential and Town Commercial units have been constructed. Although septic systems within existing development appear to be providing adequate wastewater treatment, continued infilling on small lots could adversely impact water quality. Therefore, it appears that future development on suitable lots can continue to rely on septic systems, designed in accordance with Appendix C.

Upper and Lower Pentz Basins

The Upper and Lower Pentz Basins have large areas unsuitable for conventional septic systems due to seasonally high groundwater and shallow soils. Due primarily to the moderate level of development, the water/nitrogen balance did not predict water quality degradation within the Pentz Basins. Based on field observations, it appears that the periodically high fecal coliform levels detected along Dry Creek are the result of isolated failing septic systems, rather than a degradation caused by cumulative impacts of on-site wastewater disposal. Thus, it may be possible to improve water quality by conducting a stream survey or reconnaissance program to identify and repair individual failing systems.

Since water quality problems within the basin appear to result from isolated failures rather than a general degradation of water quality, it appears feasible to allow continued development using septic systems. Building should be permitted only on suitable parcels, properly set back from drainage courses and designed in accordance with Appendix C.

West Branch Basin

Septic systems within the West Branch Basin appear to be providing adequate wastewater treatment. Future development can continue to rely on septic systems providing that unsuitable areas with steep slopes, shallow soils, and seasonally high groundwater are avoided. As with other basins, septic system installations should meet the requirements of Appendix C.

SUMMARY AND RECOMMENDATIONS

The analysis of on-site wastewater treatment systems operation has indicated that water quality degradation and potential public health hazards have resulted from the use of septic systems in portions of Paradise. Areas experiencing septic system problems are characterized by high wastewater application rates and/or conditions unsuitable for on-site wastewater disposal. The most severe water quality degradation has occured in the Upper and Middle Honey Run and Lower Skyway Basins, which encompass approximately 1,000 acres of dense commercial and residential development. Centralized wastewater management facilities should be considered for these areas.

In the remaining 10,500 acres of Paradise, existing septic systems appear to be providing adequate wastewater treatment; however, the continuation of dense development will accelerate the need for centralized wastewater management facilities. Through careful planning, proper maintenance, and repair of failing systems in these areas, the need for centralized facilities may be postponed or avoided.

While the water quality data did indicate the presence of sewage related pollution in surface water and shallow seepage, the limited groundwater analyses suggested that the deeper Tuscan Formation aquifer has not been adversely affected by septic systems operation. However, portions of the Tuscan Formation could become polluted by improper well sealing and failing septic systems.

Upper and Middle Honey Run Basins

As previously discussed, high septic system density has resulted in wastewater application rates which appear to have exceeded the assimilative capacity of the soil mantle and have caused water quality degradation and potential public health hazards. Thus, it is recommended that centralized wastewater management facilities be considered for these basins, as shown in Figure 5-7. An alternative analysis of wastewater management options should be completed during the Phase II portion of the facilities planning study. Until centralized facilities are completed, proposals for new development using septic systems should be carefully examined and septic systems designed in accordance with Appendix C. It is also recommended that no new septic systems be installed within 200 feet of any stream in these basins.

Since the construction of centralized facilities would be costly, the Town may want to consider an intensive water quality monitoring and septic system survey program to better define the extent and magnitude of water quality degradation. To provide for completion of Step I work within the framework of grant funding deadlines, and to examine septic system performance under both spring runoff and dry weather conditions, the following program is recommended:

During May and June 1983, a bacteriological sampling and septic system reconnaissance program would be undertaken. Phase II of Step I would begin on August 1, 1983. During September 1983, further bacterial sampling and septic system reconnaissance would be performed, to assess septic system operation under dry weather conditions, when the highest surface water bacterial concentrations are typically encountered. If the findings of the two sampling and reconnaissance programs indicate that septic systems are functioning adequately, Phase II work related to centralized facilities would be halted. However, work related to non-structural management alternatives, such as an on-site maintenance district, could be completed to conclude the Step I project. All sampling and reconnaissance programs undertaken should be fully coordinated with the Regional Water Quality Control Board and Butte County Health Department.

Lower Skyway Basin

Within Lower Skyway Basin, water quality degradation has been caused by septic systems sited in areas with high groundwater in the vicinity of Filbert Street and Sunburst Drive. Thus, it is recommended that this area be included in the centralized facility planning and intensive water quality monitoring and reconnaissance programs recommended for upper and Middle Honey Run Basins. Throughout the remainder of Lower Skyway Basin, development can continue to rely upon septic systems, using the criteria presented in Appendix C.

Remaining Basins

Septic system problems within the other basins generally appear to be caused by localized failures of poorly sited systems. To minimize further water quality degradation related to on-site wastewater treatment and disposal, preventative planning measures such as Appendix C should be implemented. As previously discussed, winter groundwater levels should be checked prior to the design and construction of septic systems. Through careful planning, continued water quality degradation may be reduced without centralized wastewater management facilities.

In some basins, it may be possible to improve water quality by repairing or re-siting failing leach fields. To identify failing systems, it is recommended that a reconnaissance program be conducted along soil/bedrock contacts in Neal Basin, along Upper Little Dry Creek in Pearson Basin, and along Dry Creek in Upper and Lower Pentz Basins. Areas recommended for the reconnaissance program are shown in Figure 5-7.

Continued Water Quality Monitoring in Other Basins

To monitor the operation of septic systems in areas not proposed for centralized facilities, additional water quality data should be gathered. A recommended surface water monitoring network is presented in Figure 5-8. Particular attention should be given to sampling drainage from the Upper Roe Basin, where high-density development is suspected of causing water quality degradation. Samples should be taken on a bi-monthly basis and analyzed for fecal coliform bacteria. If fecal coliform levels exceeding 1,000 MPN/100 ml are consistently detected in a basin, and cannot be reduced through the repair of failing systems, centralized wastewater management facilities should be considered.

As discussed in Chapter 3, it is estimated that there are approximately 300 private wells in Paradise. Older wells may not have been constructed in accordance with existing public health ordinances. Poorly constructed or improperly sealed wells could become contaminated by septic systems, especially in areas of dense development. Incorrectly sealed wells may also provide a conduit through which septic system effluent can enter and pollute deeper aquifer zones. To monitor groundwater quality, it is recommended that wells within the more densely developed portions of Town be analyzed for nitrate and fecal coliform bacteria. An ongoing groundwater monitoring network should be established and sampled on a semiannual basis for nitrate and fecal coliform bacteria analyses. Contaminated wells should be abandoned to prevent the spread of pollution and an ordinance adopted to ensure proper abandonment procedures. Proposals for new wells should be carefully examined, and close attention given to proper sealing practices.

Septic System Maintenance and Public Education

To encourage proper operation and maintenance of septic systems, a public education program should be considered. Through public information meetings and brochures, residents could be advised how water conservation measures and other domestic practices can enhance the operation and longevity of on-site systems. In addition, an on-site maintenance district could be established to perform periodic inspections of septic systems and ensure that septic tanks are pumped at proper intervals. The maintenance district could assume responsibility for conducting water quality monitoring programs and administrating repairs of failing systems. Plans for implementing both a public education program and an on-site maintenance district could be developed during the Phase II portion of the facilities planning study.

SUGGESTED IMPLEMENTATION PLAN

1. Develop new septic system ordinance (Appendix C or the equivalent).

2. Initiate intensive water quality monitoring and septic system survey programs in Upper and Middle Honey Run Basins and portions of Lower Skyway Basin, and begin Phase II Study.

   a. May and June, 1983 - Bacteriological sampling and septic system reconnaissance.

   b. August 1, 1983 - Begin Phase II Study.

   c. September, 1983 - Additional bacteriological sampling and septic system reconnaissance.

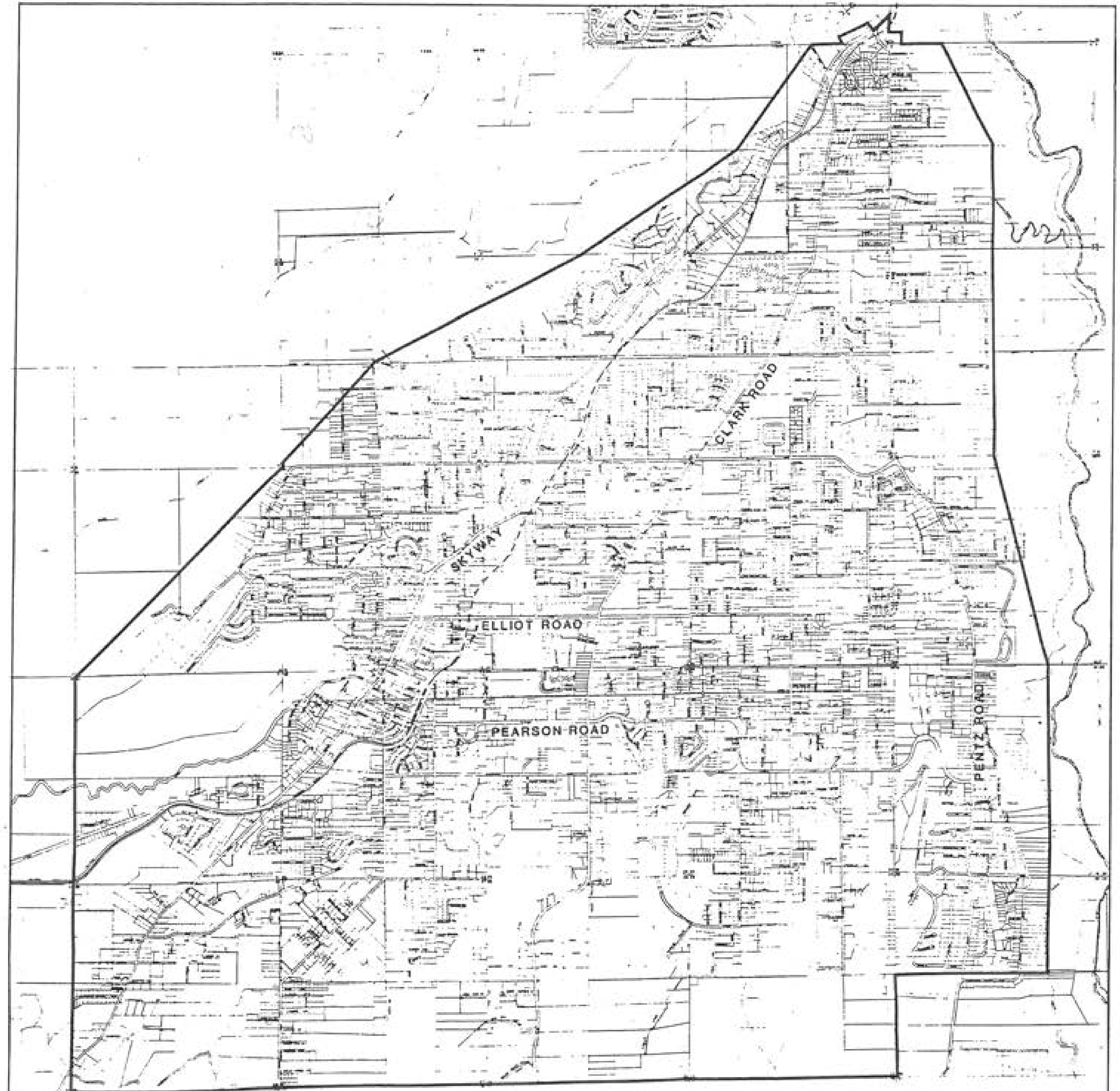
   d. At conclusion of September sampling/reconnaissance, make decision whether to continue with Phase II centralized facilities alternative analysis.

3. Water quality monitoring and septic system reconnaissance in remaining basins.

   a. Bi-monthly analyses of surface water for fecal coliform bacteria (see Figure 5-8).

b. Septic system reconnaissance along selected streams (see Figure 5-7).

c. Semi-annual analyses of groundwater for fecal coliform bacteria and nitrate.



LEGEND

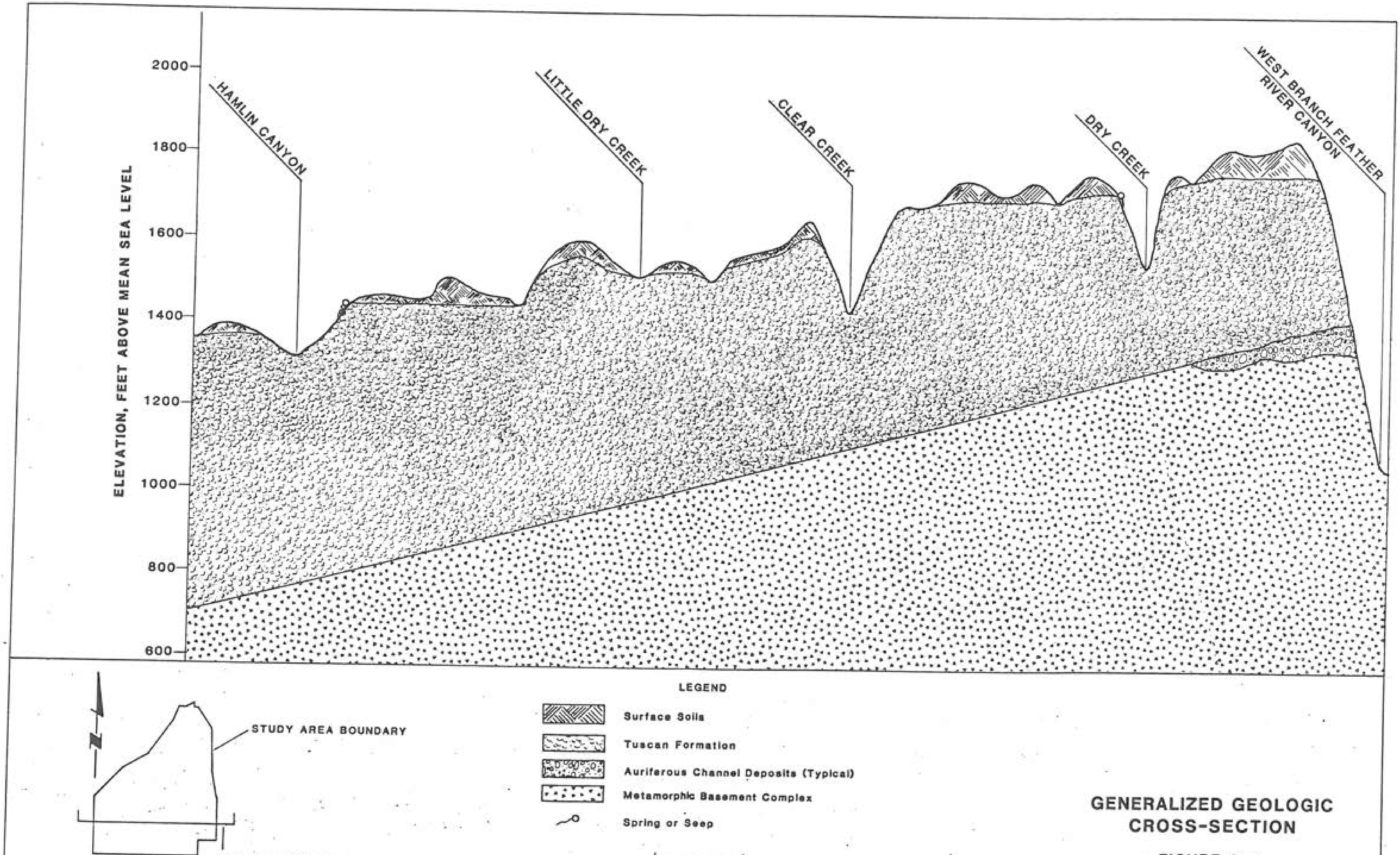
STUDY AREA BOUNDARY

2000 0 2000

SCALE IN FEET

STUDY AREA BOUNDARY

FIGURE 1-1



LEGEND

Surface Soils

Tuscan Formation

Auriferous Channel Deposits (Typical)

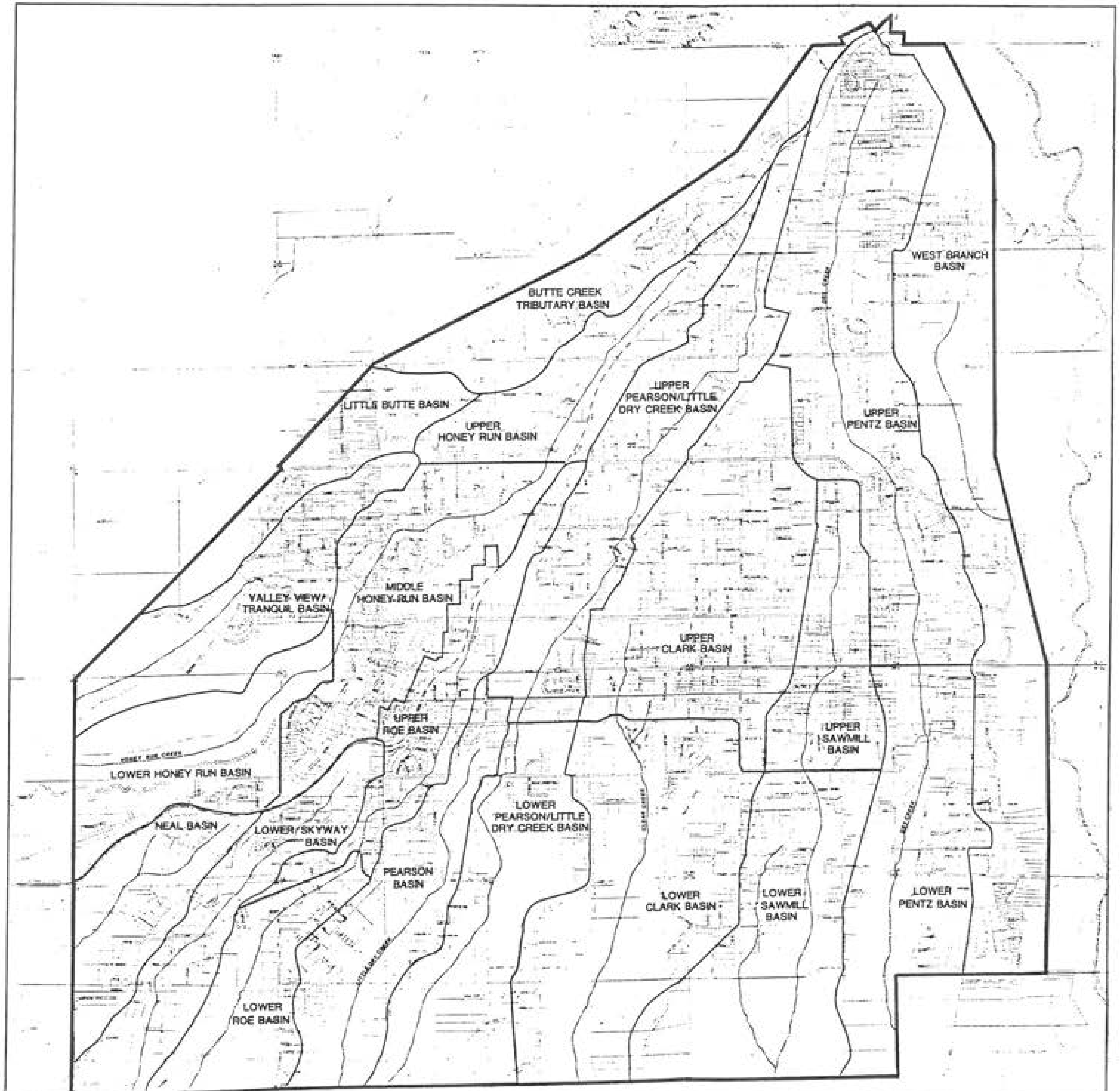
Metamorphic Basement Complex

Spring or Seep

0 2000
SCALE IN FEET

GENERALIZED GEOLOGIC CROSS-SECTION

FIGURE 3-1



LEGEND

HYDROLOGIC BASIN BOUNDARY

HYDROLOGIC SUBBASIN BOUNDARY

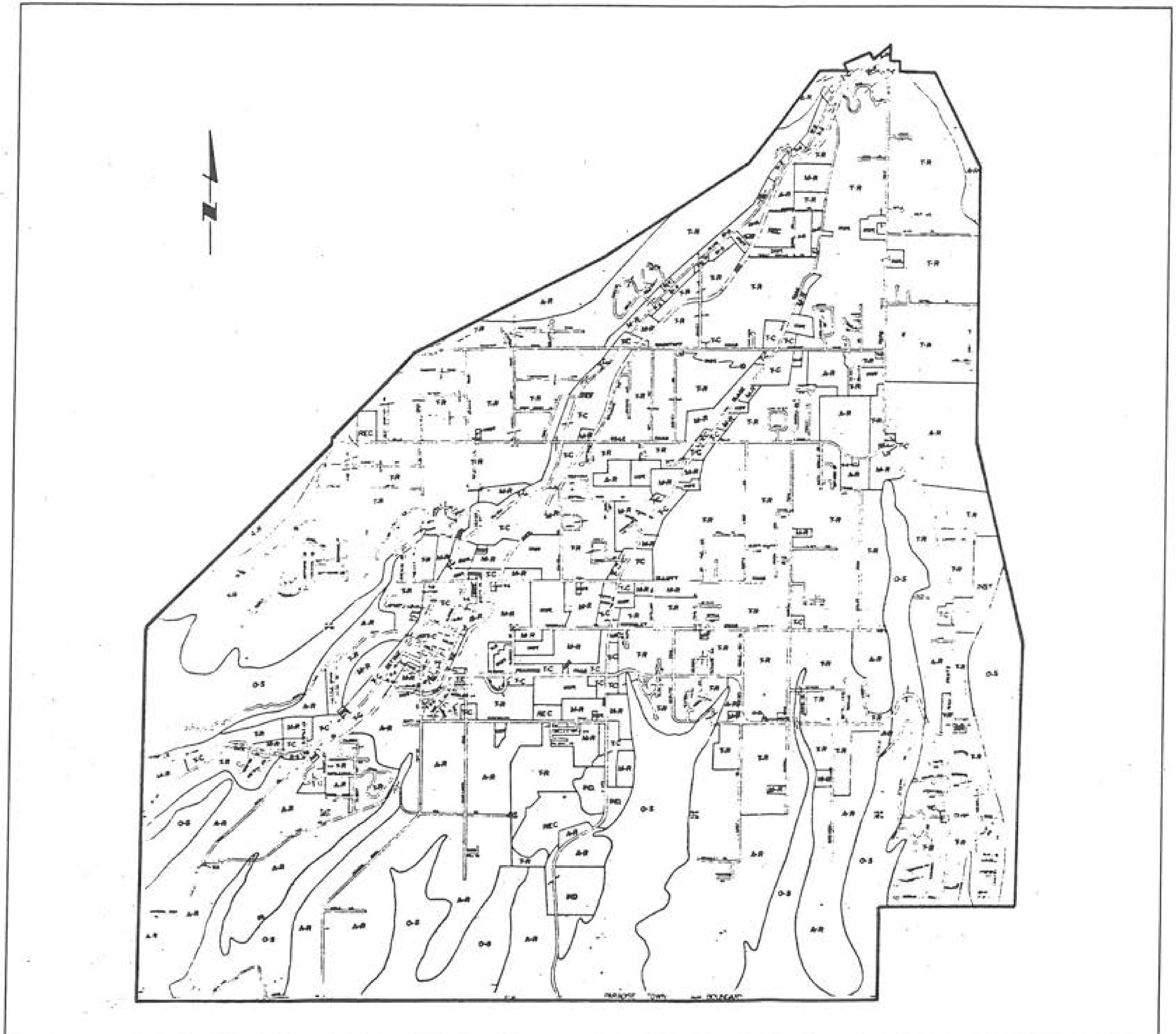
CREEK

2000 0 2000

SCALE IN FEET

SURFACE WATER HYDROLOGY

FIGURE 3-2



LEGEND

TOWN LAND USE DESIGNATIONS:

A-R = AGRICULTURAL RESIDENTIAL 1.5 D/U PER ACRE

M-R = MULTI-FAMILY RESIDENTIAL 5-10 D/U PER ACRE

T-C = TOWN COMMERCIAL

T-R = TOWN RESIDENTIAL 1-4 D/U PER ACRE

INST. = INSTITUTIONAL

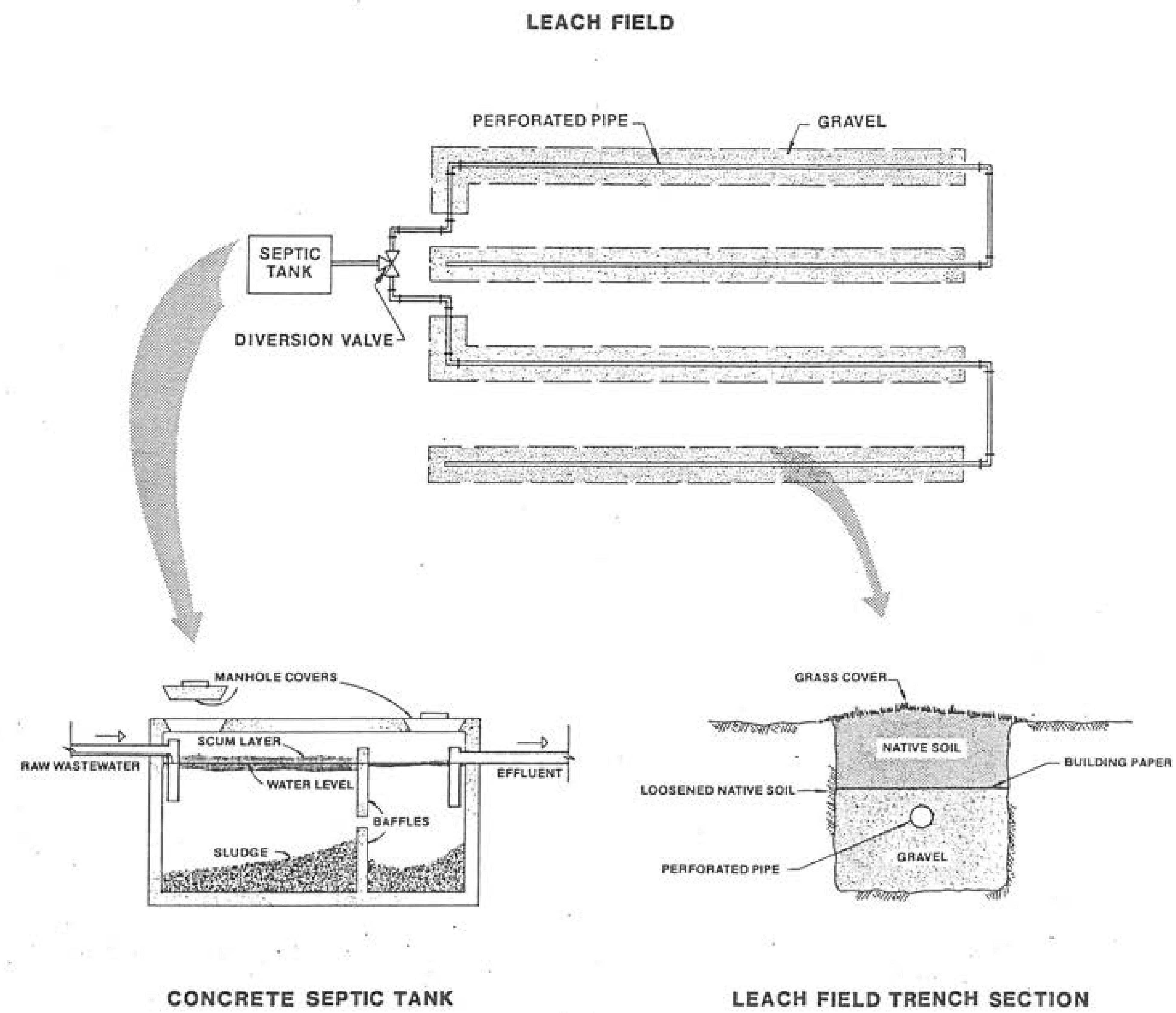
IND. = INDUSTRIAL

REC. = RECREATIONAL

O-S = OPEN SPACE

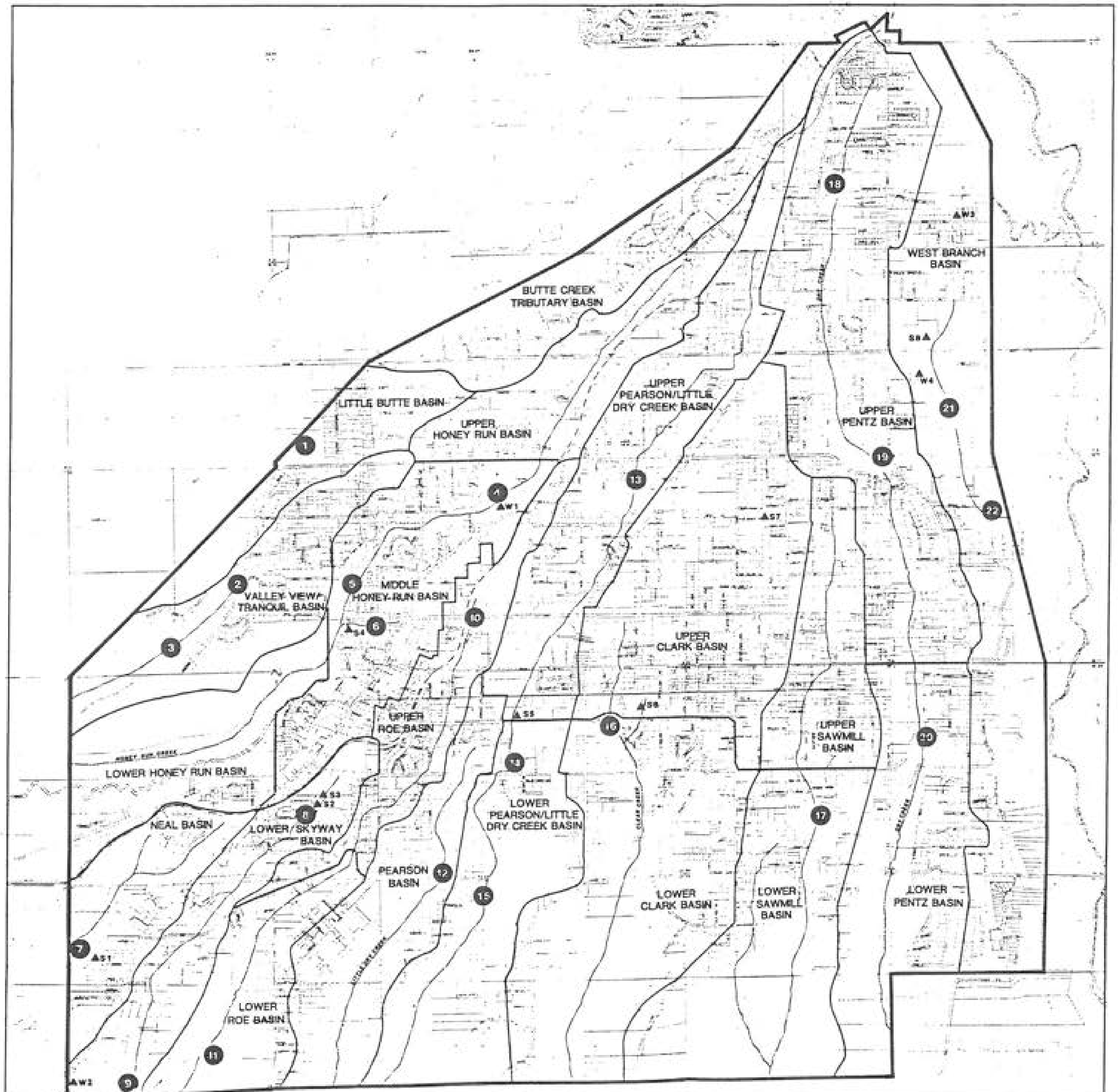
PARADISE GENERAL PLAN LAND USE MAP

FIGURE 3-3



TYPICAL SEPTIC SYSTEM

FIGURE 5-1



LEGEND

● SURFACE WATER SAMPLING STATION

▲W1 WELL SAMPLING STATION

▲S1 SPRING OR SEEPAGE SAMPLING STATION

HYDROLOGIC BASIN BOUNDARY

HYDROLOGIC SUBBASIN BOUNDARY

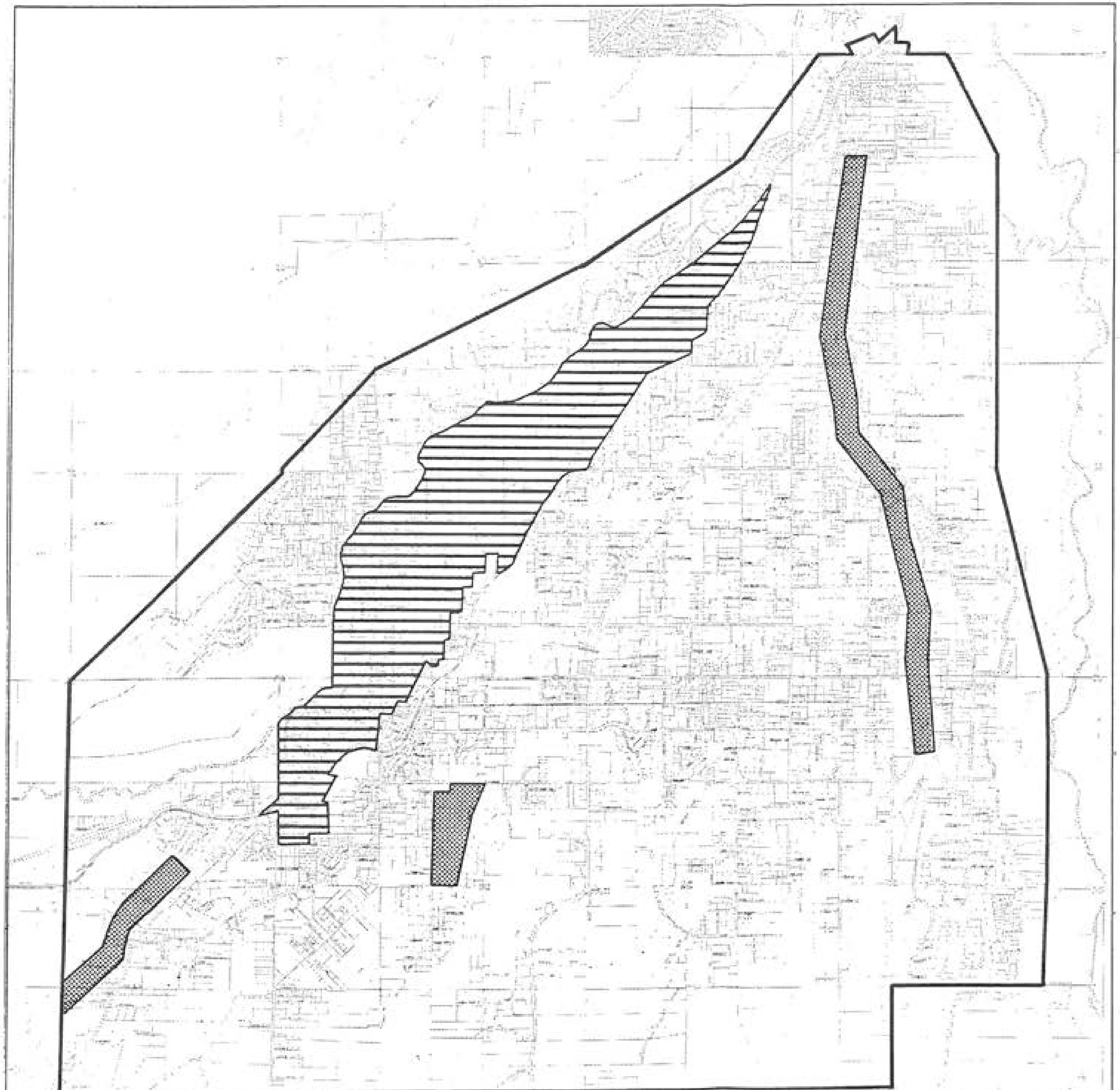
CREEK

2000 0 2000

SCALE IN FEET

WATER QUALITY MONITORING NETWORK

FIGURE 5-2



LEGEND

AREAS FOR SEPTIC SYSTEM RECONNAISSANCE

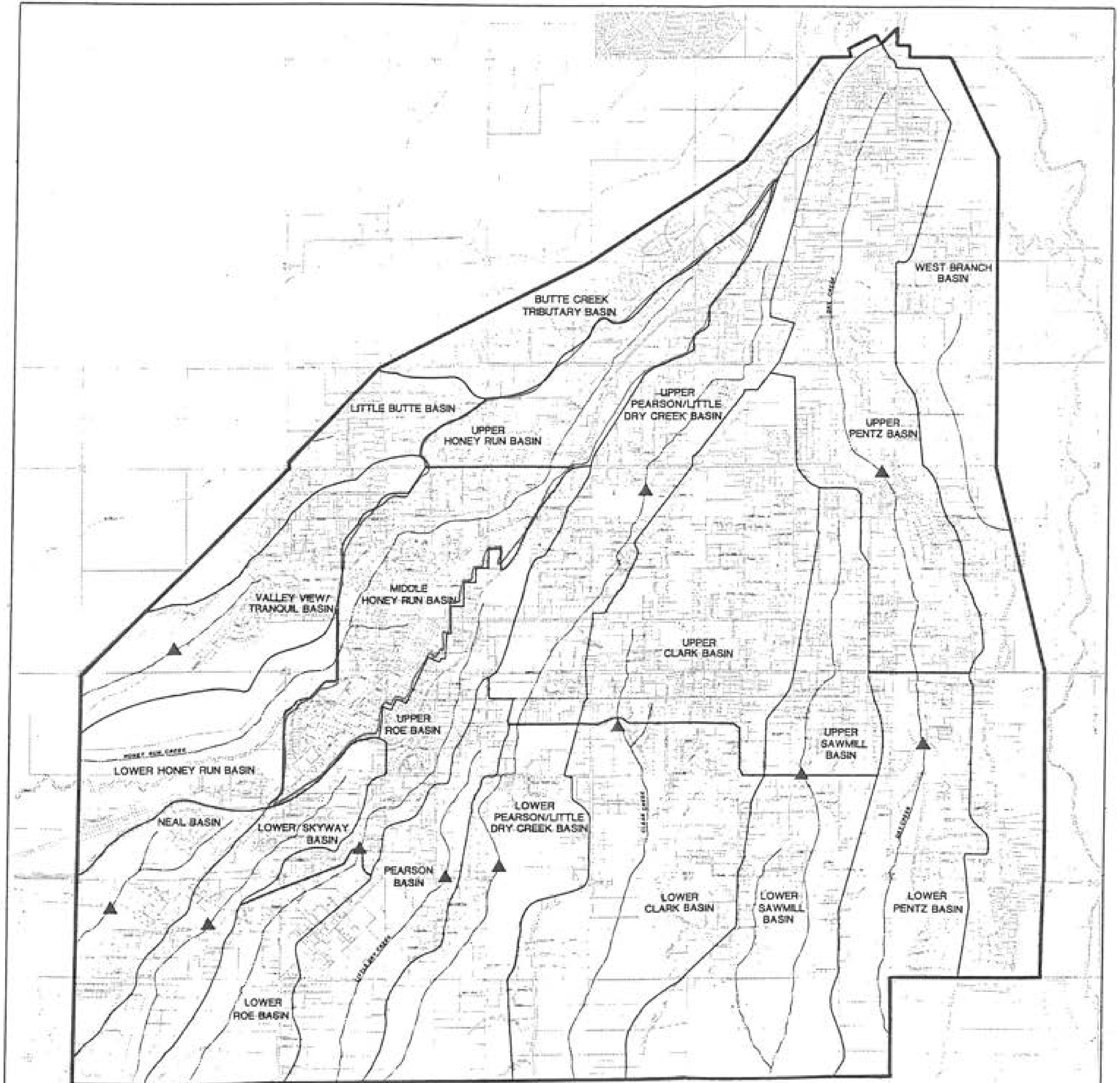
AREAS TO BE CONSIDERED FOR CENTRALIZED FACILITIES

2000 0 2000

SCALE IN FEET

RECOMMENDED PLAN

FIGURE 5-7



LEGEND

▲ SAMPLING STATION

——— HYDROLOGIC BASIN BOUNDARY

.... HYDROLOGIC SUBBASIN BOUNDARY

---- CREEK

2000 0 2000

SCALE IN FEET

RECOMMENDED SURFACE WATER QUALITY MONITORING NETWORK

FIGURE 5-8

APPENDIX A

APPENDIX A

POLICIES AND REGULATIONS

1. Guidelines for Waste Disposal from Land Developments, RWQCB, Central Valley Region.

2. Correspondence from SWRCB concerning septic system installations in Paradise.

3. Butte County Code, Chapter 19.

4. Subdivision Ordinance, Butte County.

5. Policies for Septic System Installation, Butte County.

GUIDELINES FOR WASTE DISPOSAL FROM LAND DEVELOPMENTS
TABLE 5-6

In its June 1971 Interim Water Quality Control Plan the Board included Guidelines for Land Development Planning. These Guidelines were substantially modified on 15 December 1972 and retitled Guidelines for Waste Disposal From Land Developments. The Guidelines that follow are substantially the same as those adopted in 1972 but contain changes based upon experience gained from working closely with local governmental agencies in the development of individual waste disposal ordinances.

Section 13260 of the Porter-Cologne Water Quality Control Act requires any person discharging waste or proposing to discharge waste to file a report of the discharge containing such information as may be required by the Board. In the early 1950's, the Board waived the filing of reports for discharges from individual sewage disposal systems in those counties having satisfactory ordinances or regulations. Traditionally, these individual discharges have been treated by septic tank — leaching systems.

The Water Quality Control Act requires local governmental agencies to notify the Board of the filing of tentative subdivision maps or applications for building permits involving six or more family units except where the waste is discharged to a community sewer system.

The Board believes that control of individual waste treatment and disposal systems can best be accomplished by local county environmental health departments if these departments are strictly enforcing an ordinance that is designed to provide complete protection to ground and surface waters and to the public health.

The following principles and policies will be applied by the Board in review of water quality factors related to land developments and waste disposal from septic tank — leaching systems:

- There are great differences in the geology, hydrology, geography, and meteorology of the 40 counties which lie partially or wholly within the Central Valley. The criteria contained herein are considered to be applicable to the Central Valley and pertain to: (a) all tentative maps filed after 15 December 1972, (b) all divisions of land made after 15 December 1972, and (c) all final maps for which tentative maps were filed prior to 15 December 1971. Local agencies and the Board may adopt and enforce more stringent regulations which recognize particular local conditions that may be limiting to wastewater treatment and disposal.
- The Board does not intend to preempt local authority and will support local authority to the fullest extent possible. Where local authority demonstrates the inability or unwillingness to adopt an ordinance compatible with these guidelines, the Board intends to withdraw its waiver concerning waste disposal from individual systems and will require each and every party proposing to discharge waste within that county to submit a report of waste discharge as required by Section 13260 of the Porter-Cologne Water Quality Act.
- Evaluation of the capability of individual waste treatment systems to achieve continuous safe disposal of wastes requires detailed local knowledge of the area involved. The experience and recommendations of local agencies will, therefore, be an important input to the information upon which the Board will base its decision.
- There are many areas within the Central Valley that are not conducive to individual waste treatment and disposal systems. In these areas, connection to an adequate community sewerage system is the most satisfactory method of disposing of sewage. The Board believes that individual disposal systems should not be used where community systems are available and that every effort should be made to secure public sewer extensions, particularly in urban areas. Where connection to a public sewer is not feasible and a number of residences are to be served, due consideration should be given to construction of a community sewage treatment and disposal system.

- The installation of individual disposal systems, especially in large numbers, creates discrete discharges which must be considered on an individual basis. The life of such disposal systems may be quite limited. Failures, once they begin in an area, generally will occur on an areawide basis. Further, regular maintenance is important to successful operation of individual disposal systems. To assure continued protection of water quality, to prevent water pollution and to avoid the creation of public health hazards and nuisance conditions, a public entity* shall be formed with powers and responsibilities defined herein for all subdivisions having 100 lots or more. Subdivisions with less than 100 lots which threaten to cause water quality or public health problems will also be required to form a public entity.

CRITERIA FOR SEPTIC TANK – LEACHING SYSTEMS

The following criteria will be applied to assure continued preservation and enhancement of state waters for all present and anticipated beneficial uses, prevention of water pollution, health hazards, and nuisance conditions. These criteria prescribe conditions for waste disposal from septic tank – leaching systems for single family residential units or the equivalent and do not preclude the establishment of more stringent criteria by local agencies or the Board. The Board may prohibit the discharge from septic tank – leaching systems which do not conform to these criteria. Systems which cannot meet the following criteria may be allowed in selected areas if they are individually designed. The criteria may not be applicable in all cases to commercial or industrial developments.

The septic tank, absorption systems, and disposal area requirements for other than single family residential units shall be based upon the current edition of the "Manual of Septic Tank Practice" or in accordance with methods approved by the Executive Officer. An adequate replacement area equivalent to at least the initial disposal area shall be required at the time of design of the initial installation and incompatible uses of the replacement area shall be prohibited.

* Public Entity – A local agency, as defined in the State of California Government Code Section 53090 et seq., which is empowered to plan, design, finance, construct, operate, maintain, and to abandon, if necessary, any sewerage system or the expansion of any sewerage system and sewage treatment facilities serving a land development. In addition, the entity shall be empowered to provide permits and to have supervision over the location, design, construction, operation, maintenance, and abandonment of individual sewage disposal systems within a land development, and shall be empowered to design, finance, construct, operate, and maintain any facilities necessary for the disposal of wastes pumped from individual sewage disposal systems and to conduct any monitoring or surveillance programs required for water quality control purposes. (Unless there is an existing public entity performing these tasks.)

TABLE 5-6 (Continued)

Minimum Distances

The Board has determined the following minimum distances should be followed in order to provide protection to water quality and/or public health:

Facility	Distance in Feet						
	Domestic Well	Public Well	Flowing Stream(1)	Drainage Course or Ephemeral Stream(2)	Cut or Fill Band(3)	Property Line(4)	Lake or Reservoir(5)
Septic Tank or Sewer Line	50	100	50	25	10	25	50
Leaching Field	100	100	100	50	4h	50	200
Seepage Pit	150	150	100	50	4h	75	200

(1) As measured from the line which defines the limit of a 10-year frequency flood.

(2) As measured from the edge of the drainage course or stream.

(3) Distance in feet equals four times the vertical height of the cut or fill bank. Distance is measured from the top edge of the bank.

(4) This distance shall be maintained when individual wells are to be installed and the minimum distance between waste disposal and wells cannot be assured.

(5) As measured from the highwater line.

Minimum Criteria

- The percolation rate* in the disposal area shall not be slower than 60 minutes per inch, or not slower than 30 minutes per inch if seepage pits are proposed. The percolation rate shall not be faster than 5 minutes per inch unless it can be shown that a sufficient distance of soil is available to assure proper filtration.
- Soil depth below the bottom of a leaching trench shall not be less than 5 feet, nor less than 10 feet below bottom of a seepage pit.
- Depth to anticipated highest level of groundwater below the bottom of a leaching trench shall not be less than 5 feet, nor less than 10 feet below bottom of seepage pit. Greater depths are required if soils do not provide adequate filtration.
- Ground slope in the disposal area shall not be greater than 30 percent.

* Determined in accordance with procedures contained in current U.S. Department of Health, Education, and Welfare "Manual of Septic Tank Practice" or a method approved by the Executive Officer.

- The minimum disposal area shall conform to the following:

Percolation Rate (minutes/inch)	Minimum Usable Disposal Area (sq ft)
41-60	12,000
21-40	10,000
11-20	8,000
Less than 10	6,000

- Areas that are within the minimum distances which are necessary to provide protection to water quality and/or public health shall not be used for waste disposal. The following areas are also considered unsuitable for the location of disposal systems or replacement area:

  - Areas within any easement which is dedicated for surface or subsurface improvement.
  - Paved areas.
  - Areas not owned or controlled by property owners unless said area is dedicated for waste disposal purposes.
  - Areas occupied or to be occupied by structures.

Implementation

- The Board will review local ordinances for the control of individual waste disposal systems and will request local agencies to adopt criteria which are compatible with or more stringent than these guidelines.
- In those counties which have adopted an ordinance compatible with these guidelines, the Board will pursue the following course of action for discharges from individual septic tank – leaching systems.
  - Land developments consisting of less than 100 lots will be processed entirely by the county. Tentative maps for subdivisions involving six or more family units shall be transmitted to the Board along with sufficient information* to clearly determine that the proposed development will meet the approved county ordinance. The Board or the appropriate local authority may require a public entity if potential water quality or public health problems are anticipated.
  - Tentative maps for land developments containing 100 lots or more shall be transmitted to the Board. The map shall be accompanied by a report of waste discharge and sufficient information to clearly demonstrate that the proposed development will meet these guidelines or the approved county ordinance. A public entity is required prior to any discharge of waste.
- The Board will prohibit the discharge of wastes from land developments which threaten to cause water pollution, quality degradation, or the creation of health hazards or nuisance conditions. These guidelines will be used to evaluate potential water quality or health problems. In certain locations and under special circumstances the Board's Executive Officer may waive individual criteria or he may waive the formation of a public entity. Land developers are to be aware that a waiver by the Executive Officer is not binding on any local entity.

* The Board's staff has developed a document entitled "Information Needs for Waste Disposal from Land Developments." This document discusses the necessary reports, maps, etc., that must be submitted in order to evaluate proposed land developments.

TABLE 5-6 (Continued)

Examples of these special circumstances would be:

- Short time, interim use of individual septic tank — leaching systems may be acceptable in areas which do not meet these guidelines if sufficient, dependable funding of community collection, treatment, and disposal is demonstrated and a plan and time schedule for implementation is being followed.
- A failure to meet the minimum criteria could be negated by other favorable conditions. For example, the installation of individual septic tank — leaching systems may be allowed in areas which cannot meet the minimum criteria in these guidelines if the disposal area is increased sufficiently to allow for special design systems* that have been shown to be effective in similar areas.

- Severe impact on water quality has resulted from improper storm drainage and erosion control. Land developers must provide plans for the control of such runoff from initial construction up to complete build-out of the development.
- The disposal of solid waste can have an impact on water quality and public health. Land developers must submit a plan which conforms to the regional or county master plan and contains adequate provisions for solid waste disposal for complete build-out of the development.
- The disposal of septic tank sludge is an important part of any areawide master plan for waste disposal. Land developers must submit a plan which conforms to the regional or county master plan and contains adequate provisions for septic tank sludge disposal for complete build-out of the development.
- The responsibility for the timely submittal of information necessary for the Board or the appropriate local authority to determine compliance with these guidelines rests with persons submitting proposals for development or discharge. For those developments which are to be submitted to the Board, the Porter-Cologne Water Quality Control Act provides that no person shall initiate any new discharges of wastes prior to filing a report of waste discharge and prior to (1) issuance of waste discharge requirements, (2) the expiration of 120 days after submittal of an adequate report of waste discharge, or (3) the issuance of a waiver by the Regional Board.
- A report of waste discharge which does not provide the information required by these guidelines is an inadequate report. The 120-day time period does not begin until an adequate report has been submitted. Thus, to avoid extensive delay, every effort should be made to comply with these guidelines at the earliest possible date during formulation of proposals.

* Special design systems will be accepted for review from registered engineers, geologists, or sanitarians who are knowledgeable and experienced in the field of septic tank — leaching system design and installation. These systems will include at least a 100 percent replacement disposal area. These systems shall be installed under the supervision of the designer, the public entity responsible, and the local health department.

STATE OF CALIFORNIA—THE RESOURCES AGENCY

RONALD REAGAN, Governor

STATE WATER RESOURCES CONTROL BOARD
DIVISION OF WATER RIGHTS
ROOM 1015, RESOURCES BUILDING
1416 NINTH STREET • SACRAMENTO 95814

SEP 6 1973

Paradise Irrigation District
P. O. Box 128
Paradise, California 95969

Gentlemen:

Permits 271, 3678, 9079 and 16040
(Applications 476, 6204, 14185 and 22061)
Little Butte Creek, Long Ravine and West
Branch of North Fork Feather River in
Butte County

Enclosed is a copy of "Order Denying Request for Single Enterprise and Unit, Revoking Permits Establishing New Development Schedules and Amending Permits, and Approving in Part Petitions to Change Character of Use" for the above permits.

The reasons for these actions are contained in the order.

Sincerely,

K. L. Woodward

K. L. Woodward, Chief
Division of Water Rights

Enclosure

see p.2 for copies

and public health, the permits on which extensions are granted should be further revised to include standard terms not required at the time the permits were issued, but which are now required by Board regulations.

NOW, THEREFORE, IT IS ORDERED:

1. Application of water to beneficial use pursuant to Permit 271 shall be completed on or before December 1, 1977.

2. The development schedule pursuant to Permit 16040 shall be as follows:

Proof of financial ability to proceed with construction of the project shall be submitted on or before July 1, 1974.

Construction work shall commence on or before June 1, 1979.

Construction work shall be completed on or before December 1, 1981.

Application of water to beneficial use shall be completed on or before December 1, 1985.

3. Permit 271 is amended to include the following condition and Condition 11 of Permit 16040 is amended to read as follows:

All rights and privileges under this permit and under any license issued pursuant thereto, including method of diversion, method of use, and quantity of water diverted, are subject to the continuing authority of the State Water Resources Control Board in accordance with law and in the interest of the public welfare to prevent waste, unreasonable use, unreasonable method of use, or unreasonable method of diversion of said water.

This continuing authority of the Board may be exercised by imposing specific requirements over and above those contained in this permit with a view to minimizing waste of water and to meeting the reasonable water requirements of permittee without unreasonable draft on the source. Permittee may be required to implement such programs as (1) reusing or reclaiming the water allocated; (2) restricting diversions so as to eliminate agricultural tailwater or to reduce return flow; (3) suppressing evaporation losses from water surfaces; (4) controlling phreatophytic growth; and (5) installing, maintaining, and operating efficient water measuring devices to assure compliance with the quantity limitations of this permit and to determine accurately water use as against reasonable water requirements for the authorized project. No action will be taken pursuant to this paragraph unless the Board determines, after notice to affected parties and opportunity for hearing, that such specific requirements are physically and financially feasible and are appropriate to the particular situation.

4. Permits 271 and 16040 are amended to include the following conditions:

Until such time as a community wastewater disposal project is in operation, service shall not be extended to new connections for delivery of water under this permit to commercial, industrial, or mobile home park developments, or to residential services involving more than three living units on a single lot unless the disposal of wastewater conforms to policy guidelines of the Central Valley Regional Water Quality Control Board. Adequacy of said facilities shall be certified to the State Water Resources Control Board by the Executive Officer of the Central Valley Regional Water Quality Control Board or his designated representative. Continued service of water to such connections shall be contingent upon continued compliance with said policy guidelines and with any waste discharge requirements of the Central Valley Regional Water Quality Control Board.

Permittee shall submit to the State Water Resources Control Board, not later than July 1, 1974, a study of the effects of water rate changes made in May 1973 on water deliveries within the District and the Board reserves the jurisdiction to make such additional order as may be appropriate as a result of the study in order to prevent unreasonable or wasteful use of water.

5. Permit 271 is amended to include the following conditions:

The amount authorized for appropriation may be reduced in the license if investigation warrants.

Progress reports shall be submitted promptly by permittee when requested by the State Water Resources Control Board until license is issued.

Permittee shall allow representatives of the State Water Resources Control Board and other parties, as may be authorized from time to time by said Board, reasonable access to project works to determine compliance with the terms of this permit.

The quantity of water diverted under this permit and under any license issued pursuant thereto is subject to modification by the State Water Resources Control Board, if, after notice to the permittee and an opportunity for hearing, the Board finds that such modification is necessary to meet water quality objectives in water quality control plans which have been or hereafter may be established or modified pursuant to Division 7 of the Water Code. No action will be taken pursuant to this paragraph unless the Board finds that (1) adequate waste discharge requirements have been prescribed and are in effect with respect to all waste discharges which have any substantial effect upon water quality in the area involved, and (2) the water quality objectives cannot be achieved solely through the control of waste discharges.

6. Permit 16040 is amended to include the following condition:

In order to prevent degradation of the quality of water during and after construction of the project, prior to commencement of construction permittee shall file a report pursuant to Water Code Section 13260 and shall comply with any waste discharge requirements imposed by the California Regional Water Quality Control Board, Central Valley Region, or by the State Water Resources Control Board.

MEMORANDUM

TO: Office Staff
FROM: Manager
SUBJECT: New Procedure - Water Meter Applications
DATE: October 31, 1973

As you are aware, the recently received water rights decision contained a condition which requires that certain waste water disposal systems meet State guidelines before new water meters are installed to serve the property involved.

A procedure involving the Butte County Health Department and Paradise Irrigation District has been developed to satisfy this condition.

Beginning Thursday, November 1, 1973, the following procedure is in effect and should be applied to ALL applications for new water meters:

I. Complete the meter order form as usual with exception of signature and collecting fee.

II. Determine what use the meter application is being made for.

III. Write in the intended use just below signature line, e.g., Residential, Ag, Comm., Ind., M.H. Park, 4-plex or larger, and have signed.

IV. 1) If the intended use is for:

a) Commercial (business)
b) Industrial
c) Mobile Home Park
d) Four plex or larger on a single lot,

request the special approval form which is to be prepared by the Health Department indicating the associated waste disposal system meets State guidelines. (Copy of form attached)

2) If the applicant does not have such approval, refer him to the Paradise office of the Health Department where the form can be obtained. (Vern Basden - 877-3435 - Office Hours: 8:30 to 12:00 and 1PM to 5PM Monday - Friday. Sanitarian in office 1-2PM each week day.

3) When approval form is presented, attach to meter order, collect appropriate fee, and proceed as usual.

V. If intended use is for other than Comm.,Ind., M.H.Park, or 4-plex or larger, collect fee and proceed as usual.

GUIDELINES FOR WASTE DISPOSAL FROM LAND DEVELOPMENTS

Section 13260 of the Porter-Cologne Water Quality Control Act requires any person discharging waste or proposing to discharge waste to file a report of the discharge containing such information as may be required by the Board. In the early 1950's, the Board waived the filing of reports for discharges from individual sewage disposal systems in those counties having satisfactory ordinances or regulations. Traditionally, these individual discharges have been treated by septic tank - leaching systems.

The Board has recently reviewed the septic tank - leaching system ordinances and regulations of many of the counties within the Central Valley. Most of the counties have adopted satisfactory ordinances or are currently considering the adoption of more restrictive ordinances.

The Water Quality Control Act requires local governmental agencies to notify the Board of the filing of tentative subdivision maps or applications for building permits involving six or more family units except where the waste is discharged to a community sewer system.

The Board believes that control of individual waste treatment and disposal systems can best be accomplished by Local County Environmental Health Departments if these departments are strictly enforcing an ordinance that is designed to provide complete protection to ground and surface waters and to the public health.

The following principles and policies will be applied by the Board in review of water quality factors related to land developments and waste disposal from septic tank - leaching systems:

1. There are great differences in the geology, hydrology, geography and meteorology of the 40 counties which lie partially or wholly within the Central Valley. The criteria

contained herein are considered to be minimally applicable to the Central Valley and pertain to: (a) all new tentative maps, (b) all new divisions of land, and (c) all final maps for which new tentative maps were not filed after December 15, 1971. Local agencies and the Board may adopt and enforce more stringent regulations which recognize particular local conditions that may be limiting to wastewater treatment and disposal.

2. The Board does not intend to preempt local authority and will support local authority to the fullest extent possible. Where local authority demonstrates the inability or unwillingness to meet or exceed the provisions of these guidelines, the Board intends to withdraw its waiver concerning waste disposal from individual systems and will require each and every party proposing to discharge waste to submit a report of waste discharge as required by Section 13260 of the Porter-Cologne Water Quality Act.

3. Evaluation of the capability of individual waste treatment systems to achieve continuous safe disposal of wastes requires detailed local knowledge of the area involved. The experience and recommendations of local agencies will, therefore, be an important input to the information upon which the Board will base its decision.

4. There are many areas within the Central Valley that are not conducive to individual waste treatment and disposal systems. In these areas, connection to an adequate community sewerage system is the most satisfactory method of disposing of sewage. The Board believes that individual disposal systems should not be used where community systems are available and that every effort should be made to secure public sewer extensions, particularly in urban areas. Where connection to a public sewer is not feasible and a number of residences are to be served, due consideration should be given to construction of a community sewage treatment and disposal system.

5. The installation of individual disposal systems, especially in large numbers, creates discrete discharges which must be considered on an individual basis. The life of such disposal system may be quite limited. Failures, once they begin in

an area, generally will occur on an areawide basis. Further, regular maintenance is important to successful operation of individual disposal systems. To assure continued protection of water quality, to prevent water pollution and to avoid the creation of public health hazards and nuisance conditions, a public entity 1/ must be formed with powers and responsibilities defined herein for all subdivisions having 100 lots or more. Subdivisions with less than 100 lots which threaten to cause water quality or public health problems will also be required to form a public entity.

CRITERIA FOR SEPTIC TANK - LEACHING SYSTEMS

The following criteria will be applied to assure continued preservation and enhancement of State waters for all present and anticipated beneficial uses, prevention of water pollution, health hazards and nuisance conditions. These criteria prescribe minimum conditions for waste disposal from septic tank - leaching systems for single family residential units or the equivalent and do not preclude the establishment of more stringent criteria by local agencies or the Board. The Board will prohibit the discharge from septic tank - leaching systems which do not conform to these criteria.

Minimum Distances

The Board has determined the following minimum distances are necessary to provide protection to water quality and/or public health.

1/ Public Entity - A local agency, as defined in the State of California Government Code Section 53090 et seq., which is empowered to plan, design, finance, construct, operate, maintain, and to abandon, if necessary, any sewerage system or the expansion of any sewerage system and sewage treatment facilities serving a land development. In addition, the entity shall be empowered to provide permits and to have supervision over the location, design, construction, operation, maintenance, and abandonment of individual sewage disposal systems within a land development, and shall be empowered to design, finance, construct, operate, and maintain any facilities necessary for the disposal of wastes pumped from individual sewage disposal systems and to conduct any monitoring or surveillance programs required for water quality control purposes. (Unless there is an existing public entity performing these tasks.)

DISTANCE IN FEET

Facility	Domestic Well	Public Well	Flowing Stream 1	Drainage Course Or Ephemeral Stream 2	Cut Or Fill Bank3	Property Line 4	Lake or Reservoir5
Septic tank or sewer line	50	100	50	25	10	25	50
Leaching field	100	100	100	50	4h	50	200
Seepage pit	150	150	100	50	4h	75	200

1. As measured from the line which defines the limit of a 100-year frequency flood.

2. As measured from the edge of the channel.

3. Distance in feet equals four times the vertical height of the cut or fill bank. Distance is measured from the top edge of the bank.

4. When individual wells are used.

5. As measured from the high water line.

Minimum Criteria

1. The percolation rate in the disposal area shall not be greater than 60 minutes per inch, OR not greater than 30 minutes per inch if seepage pits are proposed.

2. Soil depth below the bottom of the leaching trench or seepage pit shall not be less than 5 feet.

3. Depth to ground water below the bottom of the leaching trench or seepage pit shall not be less than 5 feet. Greater depths are required if soils do not provide adequate filtration.

4. Ground slope in the disposal area shall not be greater than 30 percent.

5. The minimum disposal area shall conform to the following:

Percolation Rate (minutes/inch)*	Minimum Usable Disposal Area (ft^2)**
41-60	12,000
21-40	10,000
11-20	8,000
Less than 10	6,000

* Determined in accordance with procedures contained in current U. S. Department of Health, Education and Welfare "Manual of Septic Tank Practice" or a method approved by the Executive Officer.

**Areas that are within the minimum distances which are necessary to provide protection to water quality and/or public health shall not be used for waste disposal. The following areas are also considered unsuitable for the location of disposal systems or expansion area:

a. Areas within any easement which is dedicated for surface or subsurface improvement.
b. Paved areas.
c. Areas not owned or controlled by property owners unless said area is dedicated for waste disposal purposes.
d. Areas occupied or to be occupied by structures.

Evaluation Procedures

A number of factors affect the capability of individual septic tank - leaching systems to provide safe continuous disposal of wastes. Those factors which come within the purview of the Board, in that the Board may specify conditions or areas where the discharge of waste will not be permitted, are soil absorption capability, soil depth, depth to ground water, and slope.

Any one of these factors may in itself limit the system capability; however, the general case is that system capability is affected by all factors acting simultaneously. The preceeding minimum criteria establish conditions which will eliminate undue influence of a single factor upon system reliability but do not recognize the interplay among all factors. Compliance with only minimum criteria, therefore, will not necessarily result in an acceptable system.

The following procedure has been formulated to recognize the interplay among the factors listed above. The procedure utilizes the minimum criteria contained herein as a base, and credits those factors which are in excess of the minimum criteria. Compliance with the following point system should minimize problems which occur due to concentrating large quantities of waste in limited areas.

Point allowances are calculated for each factor. The sum of the point allowances establishes the suitability of the system. A suitable disposal area for a septic tank - leaching system from a single family residence must total a minimum of 45 points.

I. Soil Absorption Capacity

Percolation Rate (minutes per inch)	Minimum Usable Disposal Area (ft^2)	Point Allowance for Expansion Area
41-60	12,000	2/1,000 ft^2 over 12,000 ft^2
21-40	10,000	2/1,000 ft^2 over 10,000 ft^2
11-20	8,000	2/1,000 ft^2 over 8,000 ft^2
Less than 10	6,000	2/1,000 ft^2 over 6,000 ft^2

II. Depth of Soil or Ground Water, whichever is more restrictive

Depth in feet*	Point Allowance
5-10	5
11-15	15
16-20	20
Greater than 20	25

III. Slope in Disposal Area

Slope, %	Point Allowance
21-30	0
11-20	15
10 or Less	30

* Depth below the bottom of the leaching trench or seepage pit to water, rock or first impervious layer.

Implementation

1. The Board will review local ordinances for the control of individual waste disposal systems and will request local agencies to adopt criteria which are compatible with or more stringent than these guidelines.

2. In those counties which have implemented the guidelines, the Board will pursue the following course of action for discharges from individual septic tank - leaching systems.

   a. Land developments consisting of five or less family units will be processed entirely by the county.

b. Tentative maps for land developments containing less than 100 lots shall be transmitted to the Board along with sufficient information[1/] to clearly determine that the proposed development will meet these guidelines. The Board may require a public entity if potential water quality or public health problems are anticipated.

c. Tentative maps for land developments containing 100 lots or more shall be transmitted to the Board. The map shall be accompanied by a report of waste discharge and sufficient information to clearly determine that the proposed development will meet these guidelines. A public entity is required prior to any discharge of waste.

3. The Board will prohibit the discharge of wastes from land developments which treaten to cause water pollution, quality degradation, or the creation of health hazards or nuisance conditions. These guidelines will be used to evaluate potential water quality or health problems. In certain locations and under special circumstances the Board's Executive Officer may waive individual criteria or he may waive the formation of a public entity. Land developers are to be aware that a waiver by the Executive Officer is not binding on any local entity.

Examples of these special circumstances would be:

a. Short time, interim use of individual septic tank - leaching systems may be acceptable if sufficient, dependable funding of community collection, treatment and disposal is demonstrated.

b. A failure to meet the minimum criteria could be negated by other favorable conditions. For example, the installation of individual septic tank - leaching system may be allowed in areas steeper than 30% if percolation rates are good, soil is deep and available disposal areas are large.

4. Severe impact on water quality has resulted from improper storm drainage and erosion control. Land developers must provide plans for the control of such runoff from initial construction up to complete buildout of the development.

5. The disposal of solid waste can have an impact on water quality and public health. Land developers must submit a plan which conforms to the regional or county master plan and contains adequate provisions for solid waste disposal for complete buildout of the development.

1/ The Board's staff will develop guidelines pertaining to the necessary reports, maps, etc., that must be submitted in order to evaluate proposed land developments. These guidelines will be circulated to local agencies, developers, and consulting engineers.

6. The disposal of septic tank sludge is an important part of any area-wide master plan for waste disposal. Land developers must submit a plan which conforms to the regional or county master plan and contains adequate provisions for septic tank sludge disposal for complete build-out of the development.

7. The responsibility for the timely submittal of information necessary for the Board to determine compliance with these guidelines rests with persons submitting proposals for development or discharge. The Porter-Cologne Water Quality Control Act provides that no person shall initiation any new discharges of wastes prior to filing a report of waste discharge and prior to (1) issuance of waste discharge requirements, (2) the expiration of 120 days after submittal of an adequate report of waste discharge, or (3) the issuance of a waiver by the Regional Board.

8. A report of waste discharge which does not provide the information required by these guidelines is an inadequate report. The 120 day time period does not begin until an adequate report has been submitted. Thus, to avoid extensive delay, every effort should be made to comply with these guidelines at the earliest possible date during formulation of proposals.

21 December 1972

CHAPTER 19.

SEWAGE DISPOSAL.[1]

Sec. 19-1. Definitions.

For the purposes of this chapter, the following words and phrases shall have the meanings respectively ascribed to them by this section:

Building shall mean any residence, place of business, or other building where persons reside, congregate, or are employed, and which is not to be connected to a public or community sanitary sewer system.

Sewage shall include any and all waste substance, liquid or solid, associated with human habitation, or which contains or may be contaminated with human or animal excreta or excrement, offal or any feculant matter.

Sewage disposal system. Sewage disposal system shall include privy, chemical toilet, cesspool, septic tank, drainfield, seepage pit, and any other structure or system used for the treatment, discharge, or disposal of sewage. (Ord. No. 699, § 1.)

Sec. 19-2. Application of chapter; exception as to certain agricultural areas; waiver of provisions of chapter.

This chapter shall apply to all unincorporated territory within the county; provided, however, that the health officer may waive the permit and inspection requirements contained herein with respect to buildings constructed on a lot or parcel of land under one ownership which is five or more acres in area and used primarily for agricultural purposes, and which building is not closer than five hundred feet to the nearest neighboring building. The health officer shall waive the permit and inspec-

1. For state law as to sewerage generally, see H. & S. C., § 4600 et seq. As to sewerage systems and sewerage disposal pipes for counties, see Gov., C. § 25825. For state law as to sanitation and sewer systems generally, see H. & S. C., § 5470 et seq.

tion requirements contained in this chapter when the provisions of this chapter are superseded by any state law or regulation and there is compliance therewith as, for example, trailer parks. (Ord. No. 699, § 2; Ord. No. 743, § 1.)

Sec. 19-3. Sanitary sewage disposal system required.

It shall be unlawful for any person to maintain, occupy or use any building not provided with a sewage disposal system which disposes of sewage in a sanitary manner. (Ord. No. 699, § 3.)

Sec. 19-4. Unlawful disposal methods.

It shall be unlawful for any person to construct, maintain or use any sewage disposal system which results in any of the following:

a. Sewage overflowing any lands whatever.

b. Sewage emptying, flowing, seeping or draining into any stream, spring, river, lake or other waters within the county.

c. Sewage being accessible to rodents, insects or humans. It is provided, however, that when sewage is treated and disposed of in such manner that it does not constitute a hazard to the public health or does not create a nuisance, and that adequate requirements for such disposal are set by the regional water pollution control board pursuant to Division 7, Department 4, Article 2, of the state Water Code, the health officer may by special permit allow such variation from this section as will prevent unnecessary hardship or injustice and at the same time most nearly accomplish the general purpose and intent hereof. (Ord. No. 699, § 4.)

Sec. 19-5. Permits—Required.

a. No person shall begin or cause to have begun construction of any building or any other sewage disposal system without first submitting plans of the means of sewage disposal to the health officer and obtaining a permit therefor from the health officer.

b. No person shall construct an auxiliary sewage disposal system for a building persently served by a sewage disposal system without first submitting plans of the proposed means of sewage disposal to the health officer and obtaining a permit therefor from the health officer.

c. No person shall extensively alter, repair, relocate, add to or replace any existing sewage disposal system without first securing a permit therefor from the health officer. (Ord. No. 699, § 5.)

Sec. 19-6. Same—Fees.

Every applicant for a permit required by section 19 5 shall pay a fee of five dollars at the time of issuance for each permit issued; provided, however, that no fee shall be charged for a permit to reconstruct, alter or repair an existing sewage disposal system.

If the foundation of any building is laid or any building structure is erected or if construction of an auxiliary sewage disposal system for an existing building shall be begun prior to obtaining the required permit, the permit fee above specified shall be doubled, but shall not relieve any persons from fully complying with the requirements of this chapter nor from any other penalties prescribed herein. (Ord. No. 699, § 6.)

Sec. 19-7. Inspections—Required; certificate of inspection.

No person shall back-fill or cover with earth, or put into use any sewage disposal system constructed under provisions of this chapter until an inspection of the sewage disposal system has been made by the health officer and a certificate of inspection has been issued by the health officer. (Ord. No. 699, § 7.)

Sec. 19-8. Same—Failure of health officer to inspect after request.

Failure of the health officer to inspect any sewage disposal system within five days after he has received a written request to inspect such system shall constitute a waiver by the health officer of the inspection and the certificate of inspection. (Ord. No. 699, § 7.)

Sec. 19-9. Septic tanks—Generally.

a. SPECIFICATIONS. Septic tank shall be of two compartment construction and shall be of the size and type constructed in accordance with the recommendations of the county health officer. The septic tank and all inlets and outlets thereto shall be water-tight.

(1) *Size.* The minimum liquid capacity of the septic tank shall be seven hundred and fifty gallons.

(2) *Materials.* The septic tank shall be constructed of concrete, heart grade redwood, or other equally durable material satisfactory to the county health officer.

b. DRAINAGE FIELD. The effluent from the septic tank shall be discharged into an absorption field of the size and type constructed in accordance with the recommendations of the county health officer.

The effluent line shall be laid at a grade not to exceed four inches per one hundred feet; provided, however, that where topography is flat and the soil is porous and well drained, he may approve grades exceeding the above. Effluent lines shall be installed in a trench not less than eighteen inches wide on the bottom of which has been placed a six inch layer of one-half to two and one-half inch loose clean rock. Effluent lines shall be covered with a layer of one-half inch to two and one-half inch rock at least two inches thick. A minimum of one hundred fifty square feet of leaching area shall be provided in the trench bottom. When conditions are such that an absorption field cannot reasonably be expected to function, the health officer shall allow other means of underground effluent disposal, provided that such other means of disposal do not violate the laws of the state, or do not endanger the public health, or create a nuisance.

With respect to the construction of an additional or auxiliary system to serve an existing building presently served by an adequate septic tank system, the health officer may allow such lesser size septic tank and drainage field as will accomplish the general purpose and intent of this chapter. (Ord. No. 699, § 8.)

Sec. 19-9.1. Exceptions where community sewers are proposed.

In any area of the county where a public entity has proposed community sewers and has obtained all required approval and funding for such community sewers, and has established a plan and time schedule for the installation of community sewers, the health officer may allow such standards and equipment for a temporary septic tank and effluent disposal system as the health officer shall determine is adequate to serve any building or dwelling or mobile home on a temporary basis until the scheduled community sewers are available.

Health officer may revoke his permission to utilize such temporary systems if at any time he determines such temporary systems are a detriment to the public health.

Any property owner seeking permission to utilize a temporary sewage disposal system under the provisions of this section shall present to the health officer an agreement in a form suitable for recording to connect to community sewers as soon as they are available to the property. (Ord. No. 1597, § 1, 8-5-75.)

Sec. 19-10. Same—Buildings under different ownership.

No permit shall be issued for a septic tank system where the buildings it is to serve are under different ownership, nor for buildings proposed to go under separate ownership. (Ord. No. 699, § 11; Ord. No. 1302, § 1, 11-13-72.)

Sec. 19-11. Location of systems.

Any sewage disposal system constructed under the provision of this chapter shall be located in accordance with the recommendations of the county health officer. The minimum distances allowed are set forth in Table I below.

Table I

	Public Water Well	*Pvt. Water Well*	*Perennial Stream*	*Lake or Reservoir*	*Drainage Channel*	*Building Foundation*	*Property Line*
Septic tank	100′	50′	50′	50′	25′	5′	5′
Leach field	100′	100′	100′	200′	50′	5′	5′
Seepage pit	150′	150′	100′	200′	50′	5′	5′

Except that sewage disposal systems constructed on parcels created prior to April 4, 1974, and upon which the health officer has determined that there is inadequate area to obtain the distances required in Table I above, shall be located in accordance with the minimum distances set forth in Table II below.

Table II
Minimum Separation Distances in Feet

	Water Well	*Perennial Stream*	*Lake or Reservoir*	*Building Foundation*	*Property Line*
Septic tank	50′	50′	50′	5′	5′
Leach field	50′	50′	50′	5′	5′
Seepage pit	100′	50′	50′	5′	5′

Separation distance requirements from drainage channels for Table II shall be set on an individual basis by the health officer not to exceed the requirements in Table I.

With respect to the repair of existing sewage disposal systems, the health officer may allow such lesser distances as he shall determine are necessary to avoid undue hardship, but that will accomplish the general purpose and intent of this chapter. (Ord. No. 699, § 9; Ord. No. 1553, § 1, 3-11-75.)

Sec. 19-12. Lot size requirements.

a. Except as provided in subsections b and d hereof, no building used or intended for use as a single or multi-family residence in whole or part, shall hereafter be constructed, unless the following requirements, and each of them, are met:

1. The site for such building contains not less than eight thousand one hundred twenty-five square feet; and

2. No more than one residential building shall be constructed on the site; provided, however, that a guest house not to exceed two hundred square feet in area which is used in connection with a single-family dwelling, and which contains no kitchen facilities, may be built and occupied on the site containing such single-family dwellings; and

3. The site actually to be utilized for such residential building (and guest house, if any) is of sufficient area and dimensions to provide for the proper installation, maintenance and future expansion of a septic tank system of sufficient size and design to serve such building (and guest house, if any), and to prevent the development of a nuisance or any hazard to public health.

b. The provisions of subsection a, paragraph 1, relative to minimum building site, shall not apply to a residential site in any case where such site was held under separate ownership, of record, on or before November 10, 1955, and where such site contained on or before such date, less than the minimum area requirement of eight thousand one hundred twenty-five square feet; provided, however that the remaining provisions of subsection a shall apply in any case.

c. Except as provided in subsection d hereof, no building used or intended for use solely for commercial purposes shall hereafter be constructed, unless the following requirements, and each of them are met:

The site actually to be utilized for such building is sufficient in area and dimension to provide for the proper installation, maintenance and expansion of a septic tank system of sufficient size and design to serve such building, and to prevent the development of a nuisance or any hazard to public health. If more than one such commercial building is to be constructed, extended or expanded on any single site, then such site shall be sufficient in area and dimension to provide for the proper installation, maintenance and expansion of a septic tank system of sufficient size and design to serve all such buildings, and to prevent the development of a nuisance or any hazard to public health arising out of the use of any one or more of them.

d. The provisions of subsections a, b and c hereof shall not apply to any building which is to be connected prior to occupancy or use to a public sanitary sewer system or an approved community sanitary sewer system.

e. As used in this section, the term "site" shall mean, the plot, parcel or area of land which is used or intended to be used by the owner thereof as an appurtenance to the building or buildings thereon, including front yard, side yards, and back yard, and all areas used or to be used for a septic system. (Ord. No. 699, § 10.)

Sec. 19-13. Privies.

No person shall construct, maintain or use any pit privy, if the privy or the building which the privy serves is (1) within two hundred and fifty feet of a public sanitary sewer or if a proper septic tank system will provide sanitary sewage disposal, and (2) if the privy or the building which the privy serves is within two-hundred and fifty feet of an available water supply under pressure.

No person shall construct, maintain or use any privy permitted by the provisions of this chapter unless the following conditions are complied with:

a. The sewage deposited therein shall fall into a vault or pit in the ground, constructed especially for that purpose.

b. The privy building and privy vault shall be at all times inaccessible to rodents and insects.

c. The privy building and vault shall be constructed in such a manner as to prevent the entrance of rain water and surface water into said vault or pit.

d. All privy buildings shall be maintained in a clean and sanitary condition at all times. (Ord. No. 699, § 12.)

Sec. 19-14. Connection to sanitary sewers.

a. Every building which is to be constructed or which is served by an existing sewage disposal system creating an unsanitary condition shall be connected to a public sanitary sewer with a separate connection for each building if all the following conditions exist:

1. The lot or parcel of land upon which the building is to be or is located abuts a street or alley in which there is a public sanitary sewer and the building is within two-hundred and fifty feet of a public sanitary sewer.

2. A right of way can be obtained.

3. The necessary gradient is present.

4. The owner of the building may lawfully connect to the sanitary sewer upon proper application and payment of the required fees.

b. When a proposed subdivision is located within a reasonable distance of an existing public sanitary sewer system and it is practicable and feasible for the subdivision to be connected to and be served by the same, the health officer may require that the said subdivisions be provided with an adequate system of sewer lines and that the system of sewer lines be connected to the aforementioned public sanitary sewer system.

As used in this section, the word subdivision shall have the same meaning as in chapter 20, relating to subdivisions. (Ord. No. 699, § 13.)

Sec. 19-15. Farm labor camps.

Utility buildings situate to service seasonable farm labor camps which are under the jurisdiction of the state division of housing may, if approved by the state division of housing, have the septic tank located beneath the utility building in such a manner that toilets and other plumbing fixtures discharge directly to the septic tank. Construction of the septic tank shall be such as to prevent the escape of odors into the building and shall provide for easy access into the septic tank for maintenance purposes. (Ord. No. 699, § 14.)

Sec. 19-16. Enforcement of chapter.

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. (Ord. No. 699, § 15.)

Sec. 19-17. Liability of county.

This chapter shall not be construed as imposing upon the county any liability or responsibility for damage resulting from the defective construction of any sanitary disposal system, as herein provided: nor shall the county, or any official or employee thereof, be held as assuming any such liability or responsibility by reason of the inspection authorized thereunder. (Ord. No. 699, § 20.)

Sec. 19-18. Discharge of sewage to streams.

It shall be unlawful for any person or persons to directly discharge sewage, or sewage effluent, to Lake Oroville or to the streams on the watershed thereof, to that portion of the Feather River existing between the main Oroville Dam and the Thermalito Diversion Dam and tributaries thereto, the Forebay of the Oroville Dam, its tributary watercourses, the Afterbay of the Oroville Dam and its tributary watercourses, Big Chico Creek, and its watershed from its point of commencement within the county to The Esplanade in the City of Chico, Butte Creek and its watershed and tributaries thereto, from its commencement in the County of Butte to the Skyway Bridge crossing. (Ord. No. 851.)

Sec. 19-19. Variances.

A variance may be granted to any of the provisions of Sections 19-10 and 19-12 of this chapter by the board of supervisors. Anyone applying for variance to this chapter shall petition therefor directly to the board of supervisors, and said petition shall be accompanied by a fee of twenty-five dollars which is not returnable in the event the variance is not granted. Upon receipt of such a petition the board of supervisors shall set same for public hearing and shall advertise notice of such hearing pursuant to Government Code section 6061. And provided further, such hearing shall not be scheduled earlier than ten days from the date of publication.

Variances granted hereunder shall contain provisions which will accomplish the following:

(1) That the mobile home may be placed on the property without violating any of the setback requirements of the zones in which the property is located.

(2) That the mobile home shall only be allowed where the zone in which the property is situate allows for the placing and utilization of a mobile home; provided, however, that there shall be no requirement for an additional site for said mobile home as the term "site" is utilized in this chapter, or any other county ordinance or code provision, in that this allowed use is temporary in nature.

(3) That the mobile home to be placed on the property may only be utilized by a relative, either by marriage or by blood or close friend, of the owner of the property on which it is to be placed, and there may be no rent charged to the occupant of the mobile home. The mobile home may be owned by either the owner of land on which it is to be placed, or the relative or close friend who shall be residing therein.

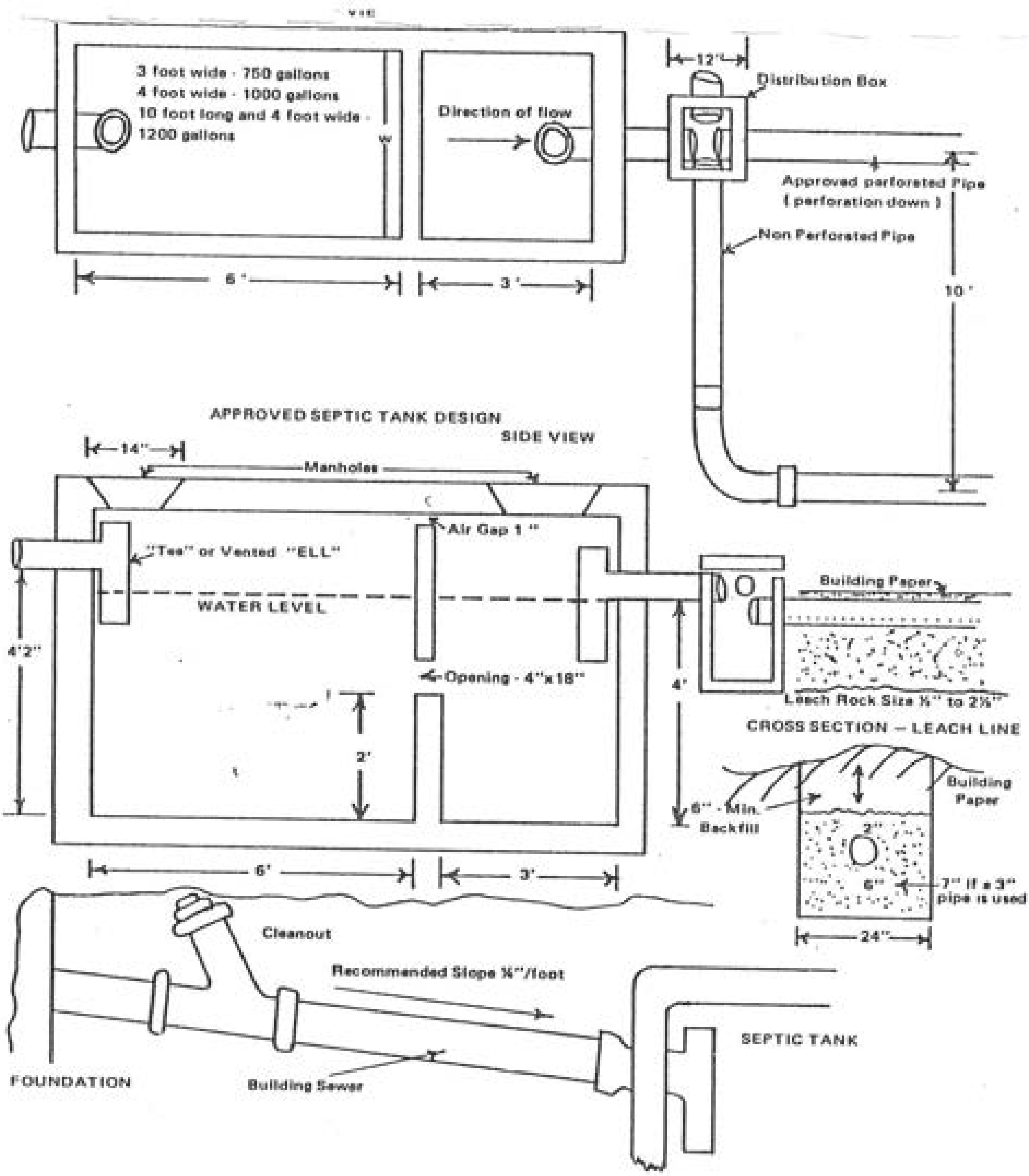
(4) The variance granted hereunder shall be for the term of one year. The board of supervisors, upon application of the property owner and without a public hearing, may grant an extension of such variance for periods

TABLE I

MINIMUM USEABLE AREAS

SOIL DEPTH ABOVE GROUNDWATER OR IMPERVIOUS STRATUM

SLOPE	PERC VALUE	7' OR GREATER	7' TO 6'	6' TO 5'	5' TO 4'	4' TO 3'	3' TO 2'
	0-10	6,000	16,000	21,000	31,000	76,340	5 acres
0	11-20	8,000	18,000	23,000	33,000	78,340	5 acres
to	21-40	10,000	20,000	25,000	35,000	80,340	5 acres
10%	41-60	12,000	22,000	27,000	37,000	82,340	5 acres
	61-80	27,000	32,000	37,000	47,000	2.0 acres	5 acres
	81-100	37,000	42,000	47,000	57,000	2.25 acres	5 acres
	101-120	57,000	62,000	67,000	77,000	2.75 acres	5 acres
	0-10	9,000	26,000	34,000	49,000	2.5 acres	5 acres
OVER	11-20	11,000	28,000	36,000	51,000	2.5 acres	5 acres
10%	21-40	13,000	30,000	38,000	53,000	2.5 acres	5 acres
to	41-60	15,000	32,000	40,000	55,000	2.5 acres	5 acres
20%	61-80	35,000	42,000	50,000	65,000	2.75 acres	5 acres
	81-100	45,000	52,000	60,000	75,000	3.0 acres	5 acres
	101-120	65,000	72,000	80,000	2.25 acres	3.5 acres	5 acres
	0-10	16,000	36,000	46,000	69,560	3.5 acres	10 acres
OVER	11-20	18,000	38,000	48,000	71,560	3.5 acres	10 acres
20%	21-40	20,000	40,000	50,000	73,560	3.75 acres	10 acres
to	41-60	22,000	42,000	52,000	75,560	3.75 acres	10 acres
30%	61-80	42,000	52,000	62,000	2.0 acres	4.0 acres	10 acres
	81-100	52,000	62,000	72,000	2.25 acres	4.25 acres	10 acres
	101-120	72,000	82,000	2.0 acres	2.75 acres	4.75 acres	10 acres



BUTTE COUNTY DEPARTMENT OF HEALTH
Division of Environmental Health

695 Oleander Avenue, Chico 343-4211 ext. 62
7 County Center Drive, Oroville 534-4281
747 Elliott Road, Paradise 877-0852

SEPTIC TANK REQUIREMENTS

1. A permit to construct or repair a septic tank system is required before any work is begun.
2. A permit fee is charged for all new work relating to the septic tank system and the building sewer.
3. Inspections are required before any work is covered or backfilled.

CONSTRUCTION NOTES

1. Minimum septic tank capacity is 750 gallons or larger, as required.
2. The septic tank is to be water—tight and constructed of durable materials.
3. Leach line requirements will depend on soil conditions.
4. On sloping land leach lines are to follow the contours or natural level of the land.
5. MAXIMUM grade in the leach lines is 4" per 100 feet. Maximum length is 100 feet.
6. Leach lines may be either 4" drain tile or approved perforated pipe.
7. On sloping land, leach lines are connected by a series of distribution boxes and tight line.

MINIMUM DISTANCES

	Septic Tank	Leach Field
1. Private Well	50′	100′
2. Public Well	100′	100′
3. Stream	50′	100′
4. Drainage Channel	25′	50′
5. Lake	50′	200′
6. Property Line	5′	5′
7. Structures	5′	5′

APPENDIX B

APPENDIX B

REFERENCES

1. American Public Health Association. Standard Methods for the Examination of Water and Wastewater, 14th ed., Washington, D.C., APHA, 1975.

2. Behnke, Jerold J. The Groundwater Potential Beneath Paradise Ridge. 1980

3. Butte County, Butte County Code and Subdivision Ordinance.

4. California Department of Water Resources, Paradise Irrigiation District, and Butte County, Magalia Reservoir Watershed, Limnology and Water Quality Study. April, 1973.

5. California Department of Water Resources, Butte County, and Paradise Irrigation District. Possible Future Sources of Water for Foothill Areas in Northern Butte County. December, 1973.

6. California Department of Water Resources. Sacramento Valley East Site Investigation, Bulletin No. 137. August, 1967.

7. California Regional Water Quality Control Board, Central Valley Region. Water Quality Control Plan Report, Central Valley Region (5). July, 1975.

8. Cook Associates, Engineering Consultants. Butte County General Plan, Public Facilities Element, Water and Sewer Plan. 1971.

9. Collins Planning and Resource Analysis. Paradise General Plan, 1982-1992.

10.. H. Esmaili and Associates. San Lorenzo Valley On-Site Wastewater Disposal Management Study, Draft Final Report. October, 1982.

11. James M. Montgomery, Consulting Engineers, Inc. Water Quality Management Plan for Paradise and Magalia. January, 1979.

12. Lydon, P.A. Geology of the Toscan Formation, Northern California. Geologic Society of America, Memoir 116.

13. Metcalf and Eddy, Inc. Wastewater Engineering. New York: McGraw-Hill Book Company, 1979.

14. Paradise Irrigation District. Environmental Impact Report, Enlargement of Paradise Reservoir. October, 1975.

15. Paradise Irrigation District. Feasibility Report on Enlarging Paradise Reservoir and Replacing Magaliz Dam Outlet Works. May, 1975.

16. Sanks, Robert L., and Asano, Takashi. Land Treatment of Municipal and Industrial Wastewter. Ann Arbor, Michigan: Ann Arbor Science, 1976.

17. Siegrist R., Michael Witt, and William C. Boyle, "Characteristics of Rural Household Wastewater," ASCE Journal of Environmental Engineering Divsion. June, 1976.

18. Sopper, William E., and Kardos, Louis T. Recycling Treated Municipal Wastewater and Sludge through Forest and Crop Land. University Park, Maryland: Pennsylvania State University Press, 1973.

19. United States Department of Agriculture, Bureau of Chemistry and Soils. Soil Survey of the Chico Area, California. 1925.

20. United States Department of Agriculture, Soil Conservation Service. Report and General Soil Map, Butte County, California. February, 1967.

21. United States Department of Health, Education, and Welfare. Manual of Septic Tank Practice. Public Health Service, 1972.

22. United States Department of Housing and Urban Development. Methods of Preventing Failure of Septic Tank Percolation Systems, Training Guide. November, 1974.

23. Virargahavan, Triruvenkatachari, "Septic Tank Efficiency," ASCE Journal of Environmental Engineering Division. April, 1976.

APPENDIX C

APPENDIX C

RECOMMENDED DESIGN CRITERIA - MINIMUM USEABLE AREAS FOR NEW DEVELOPMENT USING SEPTIC SYSTEMS

A. The following requirements are applicable to all new development using septic systems:

1. Where the average soil depth on the parcel exceeds 7 feet, useable areas shall be sized according to Table I. Septic systems shall be constructed in accordance with the Butte County Code.

2. Where the average soil depth on the parcel is less than 7 feet, mound systems shall be required, and development shall be limited to uses which generate 300 gpd or less wastewater. Mound systems shall be designed in accordance with the State Water Resources Control Board, "Guidelines for Mound Systems." Useable areas shall be determined according to Table I.

B. Useable area shall mean that portion of the parcel useable for installation of an individual sewage disposal system. Useable area shall not include areas contained in the following:

1. Building setbacks required by County Ordinance or the Butte County Code unless approved by the Health Department and Department of Public Works.

2. Easements dedicated or reserved for surface or underground improvements unless dedicated or reserved for sewage disposal purposes on the approved and recorded map.

3. Easements for access or roadway purposes.

4. Areas occupied by structures and within 5 feet of existing structures or to be occupied by structures. For purposes of single-family residential lots on which there are no existing structures, this area shall be deemed to be 2,500 square feet.

5. Areas within 5 feet of the property line.

6. Areas within the minimum separation distances shown in Table II.

7. Paved areas or areas proposed to be paved, where the percolation rate exceeds 60 min/in.

8. Areas with a slope in excess of 30 percent.

9. Areas where the percolation rate is in excess of 120 min/in.

10. Areas with less than 2 feet of soil above impervious stratum or winter groundwater.

C. Each parcel shall provide the minimum useable area for sewage disposal found in Table I attached. Areas shown in Table I up to and including 2.0 acres are minimum useable areas for sewage disposal as defined in B above. <u>Areas in Table I in excess of two acres are minimum gross parcel sizes provided, however, that such gross parcels shall contain not less than two acres of useable area as defined in B above.</u>

Note: The recommended design criteria and minimum usable areas presented in this appendix are based on the Butte County Subdivision Ordinance and Butte County Code. Recommended minimum usable areas which differ from those currently presented in the Butte County Subdivision Ordinance have been underlined.

T[illegible] 1

MINIMUM USEABLE AREAS BASED ON WASTEWATER GENERATION RATE OF 300 GALLONS PER DAY

AVERAGE SOIL DEPTH ABOVE WINTER GROUNDWATER OR IMPERVIOUS STRATUM

SLOPE	PERC VALUE	Conventional Septic Systems 7' OR GREATER	Mound Systems 7' TO 6'	6' TO 5'	5' TO 4'	4' TO 3'	3' TO 2'
	(min./in.)	(sq./ft.)					
0 to 10%	0-10	10,000	16,000	21,000	31,000	76,340	5 acres
	11-20	12,000	18,000	23,000	33,000	78,340	5 acres
	21-40	14,000	20,000	25,000	35,000	80,340	5 acres
	41-60	16,000	22,000	27,000	37,000	82,340	5 acres
	61-80	27,000	32,000	37,000	47,000	2.0 acres	5 acres
	81-100	37,000	42,000	47,000	57,000	2.25 acres	5 acres
	101-120	57,000	62,000	67,000	77,000	2.75 acres	5 acres
OVER 10% to 20%	0-10	12,000	26,000	34,000	49,000	2.5 acres	5 acres
	11-20	14,000	28,000	36,000	51,000	2.5 acres	5 acres
	21-40	16,000	30,000	38,000	53,000	2.5 acres	5 acres
	41-60	18,000	32,000	40,000	55,000	2.5 acres	5 acres
	61-80	35,000	42,000	50,000	65,000	2.75 acres	5 acres
	81-100	45,000	52,000	60,000	75,000	3.0 acres	5 acres
	101-120	65,000	72,000	80,000	2.25 acres	3.5 acres	5 acres
OVER 20% to 30%	0-10	16,000	36,000	46,000	69,560	3.5 acres	10 acres
	11-20	18,000	38,000	48,000	71,560	3.5 acres	10 acres
	21-40	20,000	40,000	50,000	73,560	3.75 acres	10 acres
	41-60	22,000	42,000	52,000	75,560	3.75 acres	10 acres
	61-80	42,000	52,000	62,000	2.0 acres	4.0 acres	10 acres
	81-100	52,000	62,000	72,000	2.25 acres	4.25 acres	10 acres
	101-120	72,000	82,000	2.0 acres	2.75 acres	4.75 acres	10 acres

EXPLANATORY NOTES - TABLE I

a. Useable areas are based on a wastewater generation rate of 300 gallons per day (gpd). Useable areas shall be adjusted proportionately using the following wastewater generation rates:

Type of Development	Wastewater Generation Rate, gpd
Residential	
Home, duplex, apartment, one bedroom	100
Home, duplex, apartment two bedroom	200
Home, duplex, apartment three bedroom	300
Each additional bedroom, add	100
Commercial, Industrial, Institutional	Wastewater generation rate to be determined by the Butte County Health Department based on water use records and published wastewater generation data.

b. An impervious stratum or layer is a bed or lens of a fine grained soil, rock, cemented material, or similar soil structure which retards the downward movement of water. A stratum, which has a percolation value in excess of 120 minutes per inch and/or in which six inches of water will not seep completely away in a 12-hour period, shall be deemed to be impervious.

c. Areas with less than two feet of soil, slopes in excess of 30 percent, or percolation values in excess of 120 min/inch are deemed unsuitable for on-site wastewater treatment and disposal.

d. In addition to the other requirements of these standards, sewage disposal areas must be of such a configuration that it is practicable to use them based upon standard practices for the installation of on-site wastewater treatment and disposal systems.

TABLE II

MINIMUM SEPARATION DISTANCES IN LINEAL FEET

Facility	Septic Tank or Sewer Line	Leach Field or Mound
a) Individual Domestic Well	50'	100'
b) Public Domestic Well	100'	100'
c) Stream or Drainage Course	50' (1)	100' (1) (2)
d) Cut or Fill Bank	10'	4 times the vertical height of the bank
e) Lake or Reservoir	50' (1)	200' (1)
f) Lot lines where individual wells used	25'	50'

(1) Distance from high-water line.

(2) 200' in Upper and Middle Honey Run Basins and portions of Lower Skyway Basin.