DRAFT REPORT

Wastewater Treatment

ALTERNATIVES STUDY

PAHRUMP REGIONAL PLANNING DISTRICT PUBLIC FACILITIES

PREPARED FOR:
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Wastewater Treatment Alternative Study

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INTRODUCTION

This study with regard to Public Facilities Planning contains the review of sanitary sewage wastewater treatment and trunk line alternatives for the Pahrump Regional Planning District. This report is the first of two sections. The second section studies the proposed trunk line alignments and possible treatment facility sites selected for future use in a valley wide wastewater treatment. The Town of Pahrump comprises approximately 90 square miles and has a current residential population close to 32,000 people. The population within the Pahrump Regional Planning District is projected to ultimately be nearly 150,000 people. This population will most likely never be completely served by the master sewer infrastructure, but the existing independent systems are not progressing in an orderly fashion to facilitate growth projected in the near term. The accelerated growth in the valley will apply stress on the existing sewage systems, expansions and the timing of same. This population projection is conservative but will prevent costly replacement and/or paralleling of undersized trunk lines.

In order to serve new development in Pahrump, expansion, modifications and integration of new and existing sewer facilities will be required. In addition, it is advantageous to consolidate the various operations of the multiple sanitary sewage system into a single regional sanitary sewage system to ensure continuity in system design, operation, and for providing quality assurance, controlled use, environmental protection, and funding purposes; and service to the entire town. The previously completed Sanitary Sewage System Master Plan is intended to provide Nye County with an overall picture of what a master valley wide system would preliminary look like and establish some ground work for the eventual future system.

The report builds on the Master Plan and evaluates sanitary sewage wastewater treatment alternatives and compiles the information needed to utilizing existing treatment facilities, development of new treatment facilities, and will ultimately reduce the number of major wastewater treatment plants and the smaller individual septic systems that may be constructed in Pahrump. This plan will be flexible enough to absorb some changes in planning and development patterns.

Periodic review with updates showing the relationship of construction of facilities to future planning is required. Without proper planning, phasing and management of the sanitary sewage systems on a regional scale, contamination of groundwater and the environment is a distinct possibility.

A. PROJECT BACKGROUND

A.1. Project Study Area

The study area includes the central portion of the Pahrump Valley centered on the Town of Pahrump located in the southern portion of Nye County, Nevada, approximately 50 miles west of Las Vegas and bordering the State line with California is about 60 miles east of Death Valley. Pahrump is located only 75 miles from the Nevada Test Site, and Yucca Mountain, a potential nuclear waste repository. Pahrump is the largest town in Nye County and the seat is located in Tonopah, 165 miles north of Pahrump. Carson City, Nevada's capital is located 391 miles to the northeast.

The study area is located within the Pahrump Valley and encompasses about 135 square miles or about 50 percent of the Pahrump Regional Planning District that is about 26 miles long and 10 miles wide. Formerly the valley was devoted primarily to agriculture for cotton farming dating back to the 1930's. More recently Pahrump has experienced an explosion of population growth along with much of southern Nevada. The Pahrump Valley with elevations ranging from 2,500 to 2,750 feet above sea level is surrounded on two sides by mountains and sits at the base of Mount Charleston.

A.2. Study Area Demographics

Estimated population for Pahrump at the end of 2004 is about 31,000. The US Census data for the year 2000 shows the median age in Pahrump of 45 years, which is higher than the 35 years median age for the State of Nevada, indicating a sizable population of retirees in the community. Between 1990 and 2000 the population of Pahrump went from 7,424 to more than 25,000 people, representing an average annual growth rate of 12.7%. In recent years the population growth rate has ranged from 5% to 8% annually. Much of Pahrump's growth is attributed to in-migration, particularly from retirees (snowbirds) seeking a reprieve from the harsh winters in other parts of the Country or those seeking a more rural environment than the cities they lived in previously.

In terms of employment opportunities in Pahrump, mid and high-level paying jobs are limited resulting in a "bedroom" community to Las Vegas. It has been estimated that the number of commuters from Nye County has increased three-fold over the last 10 years. Nevada Department of Transportation data indicates that 22,000 vehicles per day are traveling State Highway 160 between Pahrump and Las Vegas.

Population and land use projections to the year 2015 were adopted as part of the Capital Improvements Plan and Impact Fees Study. Projections to the year 2025 were developed during the process, but not officially adopted. An estimate of land use allocations in the future is made by applying the proportioning of land use categories shown for the year 2025 to the ultimate population projection of 150,000 people. Table B-1 below presents a summary of the population and land use projections prepare for the CIP for years 2005, 2015, and 2025 with an estimated allocation of land uses for the ultimate population.

Table A-1 PROJECTED POPULATION AND LAND USE ALLOCATIONS

Category	Year 2005	Year 2015	Year 2025	Ultimate
Population	33,017	54,879	63,901	150,000
Single Family Units	13,489	22,118	25,314	59,400
Multi-Family Units	199	325	372	870
No. of Jobs	6,062	10,426	12,312	29,900
Commercial (KSF)	2,367	4,117	4,874	11,400
Office (KSF)	502	873	1,033	2,400
Industrial (KSF)	1,395	2,427	2,873	6,700

A.3. Study Area Soils and Hydrology

A.3.1. Geology and Soils Conditions

The Pahrump Valley is bounded by the Spring Mountains to the northeast, the Montgomery Mountains to the northwest, the Nopah Range to the west, the Kingston Range to the southwest, and Mesquite Valley to the southeast. Pahrump Valley extends in a roughly northwest-southeast direction up to 10 miles wide and 30 miles long. Coalescing alluvial fans extend outward into the valley from the bordering mountains. A geologic description of the superficial soils in the lower portions of the valley include Quaternary-age paleo-spring, lakebed, playa, stream, and eolian (wind-blown) deposits. Tertiary-age volcanic tuff and Tertiary-age to Pre-Cambrian-age bedrock composed predominantly of sedimentary, igneous, and metamorphic rocks underlie the valley sediments.

The northeast portion of the study area is underlain by the Pahrump Fan, which is one of several coalescing alluvial fans that extend outward into Pahrump Valley from the base of the Spring Mountains range to the northeast. The relatively unconsolidated alluvial fan deposits are predominantly derived from bedrock sources in the adjacent mountains. The upper portion of the Pahrump Fan is composed generally of coarse-grained material, such as sand, gravel, cobbles, and boulders, while the lower portion is typically comprised of silt, sand, gravel, and small cobbles. Several moderately incised ephemeral (generally dry) washes are located on the Pahrump Fan. Stream deposits in these washes are typically composed of unconsolidated fine- to coarse-grained sediments.

The southwest portion of the study area, which is located in the lower portion of Pahrump Valley, is underlain primarily by stream, paleo-spring, and lakebed deposits. Dry lakebed (playa), sand dune, and marsh deposits are also present in localized areas of the lower valley. The soil deposits in the southwest portion of the study area are composed primarily of unconsolidated clay, silt, and sand, which sometimes contain expansive and settlement-prone soils, and potentially deleterious minerals, such as salt and gypsum.

Layers of moderately hard to very hard, moderately to strongly cemented soils (caliche) are present in subsurface soils in portions of Pahrump Valley, both on the alluvial fans and in the lower valley areas. Caliche, a naturally occurring cemented soil with rock-like characteristics, is typically encountered in dry desert environments. Caliche generally occurs in layers, a few inches to several feet thick, and the layers typically vary significantly in thickness and hardness over short distances. The cemented soil varies in composition from primarily fine-grained material to primarily coarse-grained material. Depending primarily on degree of cementation, hardness, and layer thickness, significant difficulties in excavation of caliche can occur.

A geotechnical evaluation was performed by Ninyo & Moore, Geotechnical Consultants was completed in January 2004 as part of the Pahrump Master Plan Update. Some of the findings from are listed under the following headings below:

- Moisture-Sensitive Soil
- Leach Field Issues
- Geologic Concerns

A.3.1.1. Moisture-Sensitive Soil

The following provides findings and preliminary conclusions regarding moisture-sensitive soils in the study area.

- Moisture-sensitive soils in the Pahrump Valley are typically comprised of clay, silt, sand, and/or deleterious minerals such as certain types of salt and gypsum.

- The more moisture-sensitive soils are typically present in the lower elevation areas of the valley, rather than on the alluvial fans that extend outward from the mountain ranges. Native soils on alluvial fans are composed predominantly of sand and gravel and, due to their grain-size, are not prone to significant soil movement.

- Alternating layers of expansive soils, settlement-prone soils, and relatively competent materials are present in some areas of the valley.

- Moisture infiltration generally induces the subsurface soil movement. Typical sources for the moisture include irrigation, rainfall, and plumbing and pool leaks. Water infiltration from leach field lines has contributed to subsurface soil movement in some areas of the valley.

- Movement of subsurface soils has caused significant damage to buildings and exterior site improvements in some areas of the valley. This damage has included tilting and cracking of building foundations, floor slabs, and retaining walls; cracks and separations in concrete flatwork, such as driveways, walkways, and patio slabs; and cracks and potholes in roadway pavement.

A.3.1.2. Leach Field Issues

The following provides findings and preliminary conclusions regarding individual sewage disposal systems (ISDS) issues in the study area.

- Water and moist soil has been reported on the ground surface above the leach lines at some of the residential properties in the study area. These conditions indicate that leach field soils may be related to decreased soil permeability and that disposal water in the leach fields is not sufficiently percolating into the subsurface soils.

- At some residential properties in the study area, water and moist soil conditions above leach fields reportedly extend laterally for several feet toward exterior site improvements and near the residential foundation.

In some areas, infiltration of water from the leach field has induced subsurface soil movement.

- Leach field testing, such as percolation tests, may not have been properly performed prior to construction of the ISDS in some instances. Leach fields in localized areas may not have been designed adequately based on percolation test rates.

- Design and construction-related factors may have contributed to some of the ISDS problems. Some of these factors may include inadequate depth and size of the leach field, the absence of sufficient drain gravel, and inadequate placement of percolation pipes.

- ISDS problems generally occurred at residences that were constructed after late-1999/early 2000, rather than at homes that constructed prior to late-1999 in the same areas.

- Interviews with homeowners in the study area indicate that there is a particularly low incidence of ISDS problems in the higher elevation alluvial fan areas of the Pahrump Valley.

A.3.1.3. Geologic Concerns

The following provides findings and preliminary conclusions regarding our evaluation of geologic concerns in the study area.

- Numerous active and in-active faults and fault zones are present within and near the Pahrump Valley.

- Ground fissure zones have been previously mapped in localized portions of the study area. Some residential distress, which has not been evaluated, has occurred in some of the ground fissure areas.

- Seismic activity resulting from an earthquake can cause significant damage to structures in the Pahrump Valley.

- Liquefaction, the fluid-like movement of near-surficial soils during seismic shaking, is a potential hazard that may occur in localized areas of the valley that are underlain by a shallow groundwater and where loose, granular soils are present.

A.3.2. Groundwater Conditions

In general, the geologic unit supplying groundwater to the Pahrump Valley is derived from the valley-fill deposits, comprising mixtures of gravel, sand, silt and

clay that include the alluvial and playa deposits. The ability of the alluvial aquifer system to supply water to wells depends on the type of deposits and textural characteristics. Typically in productive areas, the alluvial materials beneath the surface are comprised of coarse-grained gravels and sand deposits. The low yielding areas for wells are typically associated with playa areas where the deposits are characterized as predominantly silt and clay. Groundwater in the Pahrump Valley is derived primarily from precipitation that falls over the Spring Mountains. Recharge derived from precipitation over the upland areas replenishes the groundwater reservoir each year. Groundwater recharge from precipitation is nominal in the valley areas due to infrequent rainfall and a high rate of evaporation ranging from 51 to 72 inches per year. On an annual basis, it is estimated that only 5 to 10 percent of the rainfall in the valley ever reaches the groundwater regime.

Groundwater flows from the upland areas toward the valley floor. Historically there was a shallow water table with springs and flowing wells in the Pahrump Valley due to the abundance of groundwater. In recent times however, groundwater levels are declining throughout most of the valley due to groundwater pumping. Some portion of the groundwater continues flow west and the underflow crosses the State line into Inyo County. Depth to water for wells in the valley is typically between 50 and 70 feet below land surface. There are approximately 8,300 domestic water wells in the Pahrump Valley where typically a homeowner with an acre or more of land has their own well water and a septic tank with a leach field for sewage. The potential for groundwater contamination due to the proliferation of septic systems is a concern. There are ten sections where the density of septic systems exceeds 200 per square mile. The U.S. EPA has suggested that densities of conventional septic drain fields > 40 per square mile (i.e., section) may result in groundwater contamination (U.S. EPA 1977).

A.3.3. Temperature

Pahrump Valley has a typical low-latitude desert climate with hot summers, moderate winters, and arid conditions. The mean monthly temperature for the Pahrump Valley ranges from highs of 57° to 101° F and lows from 26° to 67° F. In general the summers are moderately long with some hot spells and the winters short and mild. Long periods of extremely cold weather are rare, primarily because the mountains to the east and north act as a barrier to the intensely cold continental arctic air masses. However, on occasion, a cold air mass spills over these barriers and produces prolonged cold waves.

There is strong surface heating during the day and rapid nighttime cooling because of the dry air, resulting in wide daily ranges in temperature. Even after the hottest days, the nights are usually cool. The average range between the

highest and the lowest daily temperatures is about 30 to 35 degrees. Daily ranges are larger in summer than the winter. Extreme temperatures have ranged from 105° F to 10° F.

Summer temperatures above 100° F occur rather frequently. Humidity is usually low so that the higher temperatures are less disagreeable in Nevada than in more humid climates. During the warmer season of the year, air conditioning is used in a large percentage of the commercial establishments and in many homes. Owing to the dryness of the air, evaporative coolers operate very efficiently. Freezes begin late in the autumn and continue until early in the spring. The average annual freeze-free season lasts about 280 days contributing to a long growing season.

A.3.4. Precipitation

Pahrump Valley lies on the eastern, lee side of the Sierra Nevada Range, a massive mountain barrier that markedly influences the climate. The prevailing winds are from the west, and as the warm moist air from the Pacific Ocean ascend the western slopes of the Sierra Range, the air cools, condensation takes place and most of the moisture falls as precipitation. As the air descends the eastern slope, it is warmed by compression, and very little precipitation occurs. The effects of this mountain barrier are felt not only in the Pahrump Valley but throughout the State, with the result that the lowlands of Nevada are largely desert or steppes.

The average annual precipitation for the Pahrump Valley is 4.76 inches, which has a bi-modal distribution with most precipitation during either the winter rainy season or during late summer months. During the winter months, high pressure conditions predominate resulting in west-to-east trending winds and precipitation patterns. During the summer months, low pressure conditions predominate, resulting in southwest-to-northwest trending precipitation patterns. Winter storm events tent to last longer and produce more precipitation than the summer events which tend to produce widely scattered showers of short duration. Drought is common and expected, where dry spells of more than 100 days duration can occur. Due to moderate winter climate snowfall is a rarity in Pahrump. Average monthly temperatures and precipitation are shown on Table B-2 below.

Table A-2 AVERAGE MONTHLY TEMPERATURE AND PRECIPITATION
PAHRUMP, NEVADA (265890)
Period of Record Monthly Climate Summary
Period of Record: 10/1/1948 to 12/31/2004

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average Max. Temperature (F)	57.5	62.4	68.0	75.6	85.0	95.1	101.2	99.8	92.4	81.7	67.1	58.1	78.7
Average Min. Temperature (F)	27.1	32.1	37.1	43.3	52.1	60.2	67.1	65.7	56.7	45.0	33.9	26.5	45.6
Average Total Precipitation (in.)	0.62	0.86	0.57	0.31	0.22	0.08	0.33	0.34	0.30	0.21	0.43	0.47	4.76

Western Regional Climate Center, wrcc@dri.edu

A.4. EXISTING SEWER COLLECTION SYSTEMS

Currently there is no sewage system master plan for the Planning District. Existing subdivisions either construct/operate their own system or the subdivision consists of large lots capable of supporting an individual septic system. The master plan area currently has four existing utility service areas serving existing/future developments. The four service areas are:

- Desert Utilities Inc. (Desert Trails)
- Pahrump Utility Company (Hafen Ranch)
- Mountain Falls Subdivision Area (Mountain Falls)
- Public Utilities Inc. (Calvada)

Each having their respective service areas and existing utility infrastructure that provide sewer service. [See Sewer Figure 1- EXISTING PRIVATE UTILITY COMPANIES SERVICE AREA MAP]

The Nye County Water Resources Plan estimates that as many as 20,000 additional individual septic systems might be installed in the Planning District in the next 50 years. The potential for groundwater contamination is greatly increased as the number of individual septic systems multiplies. Groundwater is the sole source of potable water for the Planning District and contamination of that source is detrimental to the preservation of the environment, resident lifestyles, and economic well being of all residents.

B. ENGINEERING AND PLANNING CRITERIA

Nye County does not have an adopted engineering and planning criteria for design and construction of wastewater facilities. Nevada Department of Environmental Quality (NDEP) has published some engineering criteria related to wastewater effluent reuse and disposal. The following design manuals and reference sources were used as guidelines in performing the planning and conceptual design for wastewater facilities for this report:

- Recommended Standards for Wastewater Facilities (Ten States Standards), 1997 Edition
- ASCE: Design of Municipal Wastewater Treatment Plants (Volumes I & II)
- Metcalf & Eddy: Wastewater Engineering
- NDEP: WTS – 1A Design Criteria for Reclaimed Water Irrigation
- NDEP: WTS – 1B Design Criteria for Preparing an Effluent Management Plan
- NDEP WTS – 3 Guidance Document for an Application for Rapid Infiltration Basins
- Arizona Department of Environmental Quality: Engineering Bulletin No. 11 – Minimum Requirements for Design and Specifications for Sewage Works

A 20 year planning horizon is selected for determining the projected demands for wastewater collection and treatment facilities. In some cases a longer range view of future population and sewage generation needs may be taken when

considering the ultimate capacity needs for trunk line sewers. When recommending equipment and materials of construction for wastewater facilities the expected service life mechanical and electrical equipment, including pumps, aeration equipment, controls, etc. is 20 years. The expected service life for buried piping and valves, manholes, and other concrete structures is 50 years.

C. WASTEWATER FLOWS AND CHARACTERISTICS

C.1. Existing and Future Wastewater Flows

Based on the information collected for the year 2004 regarding existing wastewater flows and number of connections it was estimated that for the year 2005 there would be 2,400 single family homes and 200 multi-family homes connected to sewer collection and treatment systems. The project population and land use allocations taken from Table B-1 in this report were use to develop future wastewater flow projections. For existing and future flow projections a per capita wastewater discharge of 100 gallons per day with 2.5 persons per household for single family residence and 1.9 persons per household for a multi-family residence was assumed. It was assumed that 85 percent of the new single family homes and 100% of the new multi-family homes will be connected to a sewer. For new growth it is assumed that 15 percent of the new single family homes will not be connected to a sewer system because of the continuing build-out of existing and future developments where the large lot sizes allow septic tanks or on-site treatment systems.

All existing and new non-residential uses including commercial, office and industrial are assumed to be connected to a sewer. The unit discharge rates for non-residential flow were estimated based on projections of floor area required for each category, the number of employees required, and a daily rate of wastewater discharge per employee. For instance, assuming 533 square feet (SF) per employee required for commercial development and a per employee discharge of 55 gallons per day (GPM) results in 533 GPM per KSF of commercial development. With these assumptions the unit discharge for office space is 90 GPD per KSF and for industrial space is 32 GPD per KSF.

Table C-1 PROJECTED WASTEWATER FLOWS

Category	Year 2005 (MGD)	Year 2015 (MGD)	Year 2025 (MGD)	Ultimate (MGD)

Single Family Units	0.60	2.43	3.11	10.36
Multi-Family Units	0.04	0.06	0.07	0.17
Commercial (KSF)	0.24	0.42	0.50	1.17
Office (KSF)	0.05	0.08	0.09	0.22
Industrial (KSF)	0.02	0.03	0.03	0.08
TOTALS	0.94	3.03	3.81	11.99

Assumptions:

In 2005, 2,400 single family and 199 multi-family units have sewer service. In the future 85% of new single family and 100% of multi-family homes will require sewer service.

Single Family: 2.5 PPH at 100 GPCD = 250 GPD per household

Multi Family: 1.9 PPH at 100 GPCD = 190 GPD per household

Commercial: 533 SF/employee at 55 GPED = 103 GPD per KSF

Office: 609 SF/employee at 55 GPED = 90 GPD per KSF

Industrial: 1,750 SF/employee at 55 GPED = 32 GPD per KSF

C.2. Sewage Influent Characteristics

Copies of the discharge monitor reports (DMR) submitted quarterly to Nevada Department of Environmental Quality (NDEP) for each of the four existing wastewater treatment plants were collected for the year 2004. In addition, daily flow records were obtained from the private utilities companies for each plant, where available. These data provide a basis for selecting the design parameters to be used for design of a proposed wastewater treatment plant. In reviewing the data from the existing plants it became apparent that the sewage flows to the largest plant (UICN Plant No. 3) indicated more stable flow rates and a stronger effluent, probably due to the higher concentration of commercial dischargers to that plant. The typical reported values from the DMR at the existing plants along with the assumed characteristics of the wastewater for design purposes is shown below in Table D-1.

Table C-2 INFLUENT WASTEWATER CHARACTERISTICS

Parameter	Minimum	Maximum	Average Daily	Design
Flow (Avg. Daily by Mo.) % of monthly average	90%	110%	100%	120% (max. month)
Flow (Daily Max) % of monthly average	110%	180%	130%	200% (peak hour)
Biochemical Oxygen Demand (BOD_5) mg/l	170	310	230	240
Total Suspended Solids (TSS) mg/l	130	260	190	240
Total Kjeldahl Nitrogen (TKN) mg/l	N/A	N/A	N/A	*40*

These wastewater characteristics are typical of a medium-strength domestic wastewater according to Medcalf & Eddy, Inc., Wastewater Engineering reference book. The criteria for design of the proposed wastewater treatment plant will be based on the anticipated maximum month average daily flow (120% of average) for process design and the peak hourly flow (200% of average) for

design of hydraulic capacity for process structures. Organic loadings are based on the concentration of the constituent at the maximum monthly flow.

D. EXISTING WASTEWATER FACILITIES

Within the Pahrump Regional Planning District there are three private utilities that provide wastewater collection and treatment services. Basic information regarding each of the utilities is tabulated below for the year 2004 in Table F-1 and Figure F-1 depicts the service areas and the location of treatment facilities and trunk line sewers. Each of these utilities companies also provide delivery of potable water to customers in their respective service areas, Therefore most, but not all, customers receiving sewerage services also receive potable water delivery services.

Table D-1 SUMMARY OF PAHRUMP WASTEWATER UTILITIES DATA

Utility Name	Service Area	Sewer Connections & Avg. Flow (number/flow)	Treatment Facilities (name/capacity /year const.)	Trunk Line Sewers (total length)
Desert Utilities, Inc.	3.1 sq. mi.	96 35,000 GPD	Desert Trails 0.175 MGD 1996	38,000 LF
Pahrump Utilities, Inc.	1.2 sq. mi.	226 70,000 GPD	Artesia WWTP 0.20 MGD 2003	64,000 LF
Utilities Inc. of Central Nevada	41.0 sq. mi.	Central 1,857 530,000 GPD North 48 4,800 GPD	Central WWTP (Plant 3) 0.60 MGD North WWTP (Plant F) 0.010 MGD	140,000 LF

D.1. Desert Utilities

Desert Utilities, Inc. was created primarily to service the sewage collection and treatment needs for the Desert Trails housing development and nearby commercial development. As of October 2004 there were 89 residences and five commercial users. The commercial users include the Rosemary Clark Middle School (1,150 students & 55 teachers), convenience store, apartment complex (21 units), church and the Evergreen at Pahrump extended care home (120 beds). The service area covers approximately three square miles located primarily south of Harris Farms Road and north of Bella Vista Avenue and east of Linda Street as shown on Figure F-1.

Desert Utilities, Inc. authorized their engineer, Pacific Coast Civil, to provide detailed drawings of their wastewater collection and treatment facilities in electronic format. Information from these drawings has been provided a wealth of information regarding the existing facilities. Information provided by Desert Utilities, Inc, and Nevada Department of Environmental Quality has been used to describe sewage flows,

D.1.1. Collection System

The collection system consists of 8-inch to 18-inch gravity pipelines constructed of PVC sewer pipe with manholes typically spaced at minimum 600 foot intervals. The main lift station located at the headworks pumps all of the influent from the collection system into the plant. There are two sewage lift stations proposed to serve the BEC Estates and BEC II subdivisions in the future with 3,430 LF of 6-inch force main that runs to the plant. An inventory of the wastewater collection facilities at the end of 2004 is shown below on Table F-2.

Table D-2 DESERT UTLITIES COLLECTION SYSTEM

Description	Length of pipe (LF) or Number
6-inch Gravity Sewer Pipe	2,240 LF
8-inch Gravity Sewer Pipe	27,740 LF
10-inch Gravity Sewer Pipe	9,870 LF
12-inch Gravity Sewer Pipe	4,340 LF
18-inch Gravity Sewer Pipe	4,900
Manholes	281
Sewage Lift Stations	1 (main plant only)

Infiltration during storm events has been a problem in some areas where the sewer lines were constructed within the public rights-of-way adjacent to the roadway approximately in line with the drainage ditch. Because the manholes are typically located at low points along the roadways where storm water collects, water ponds over the manhole lids, which are not water-tight. In addition, it has been reported that in some cases poorly constructed manholes providing openings below grade have contributed to the infiltration problems. Desert Utilities workers have been pursuing an aggressive manhole reconstruction program to provide water-tight manholes in order to reduce the amount of infiltration.

D.1.2. Treatment Facilities

The treatment facilities are located on an 11 acre site near the northeast corner of Simkins Road and Linda Street. The current wastewater treatment facility is a Mar-Wood package plant with a Phase 2 expansion completed in the year 2000. This conventional activated sludge treatment plant with extended aeration provides a secondary treated denitrified effluent with an existing treatment capacity of 0.175 MGD. The treatment process includes a lift station followed by a coarse bar screen discharging into an anoxic basin followed by an aeration basin for de-nitrification followed by a clarifier to produce the finish effluent. Aeration is provided by electric powered blowers. An aerobic sludge digester is used to produce sludge that is transported to another facility for dewatering and disposal. The treatment process design parameters are listed below:

- Average Design Flow.....175,000 gal/day
- Peak Design Flow (250% of Avg.) .....437,800 gal/day
- Influent Biological Oxygen Demand (BOD)..... 220 mg/l
- Influent Total Kjeldahl Nitrogen (TKN) ..... 40 mg/l
- Effluent Biological Oxygen Demand (BOD) ..... 30 mg/l
- Effluent Total Suspended Solids (TSS) ..... 30 mg/l
- Effluent Total Nitrogen as N..... 10 mg/l

The design goal is to produce a finish effluent that meets the secondary standards of 30 mg/l BOD and TSS; and less than 10 mg/l Total Nitrogen suitable for disposal by rapid infiltration basins and restricted access irrigation onsite.

D.1.3. Disposal & Monitoring Facilities

There are five rapid infiltration basins with a bottom area of approximately 0.55 acres each. One of the basins has two infiltration trenches 3 ft wide by 20 ft long by 20 ft deep filled with drain rock that are being tested to determine their ability to increase the infiltration capacity of the basin. Two more infiltration trenches will be constructed in this basin in the near term. If successful, infiltration trenches may be constructed in other existing basins. This facility is also permitted for reuse of effluent for landscape irrigation on site. There are three monitoring wells located around the periphery of the site for routine collection of groundwater samples for laboratory testing. Depth to water in this vicinity is about 74 feet.

D.1.4. Regulatory Permit & Reporting

The Desert Utilities WWTP operates under Nevada Division of Environmental Protection (NDEP) authorization to discharge permit no. NEV91044 effective August 31, 2000 and due to expire on August 31, 2005. The permit limits and reported values for selected permit sewage effluent quantity and water quality parameters for year 2004 are summarized in the table below.

Table D-3 DESERT UTILITIES SEWAGE EFFLUENT NDEP DATA, Year 2004

PARAMETER	PERMIT REQ'MTS (reported quarterly)	1st QUARTER		2ND QUARTER		3RD QUARTER		4TH QUARTER	
		AVG.	MAX.	AVG.	MAX.	AVG.	MAX.	AVG.	MAX.
Flow	0.175 MGD	0.043	0.097	0.028	0.040	0.024	0.032	0.032	0.070
Effluent BOD	30 mg/l Avg. 45 mg/l Max.	<6	<6	27	27	<6	<6	<6	<6
Effluent TSS	30 mg/l Avg. 45 mg/l Max.	11	11	<10	<10	19	19	39*	39
Nitrate as N	10 mg/l Max.	2.8	2.8	1.2	1.2	<0.5	<0.5	7.1	7.1

* Reason for exceedances is unknown, but appears to be isolated incidents.

NDEP reporting data for the monitoring wells was only available for the fourth quarter of 2004. Selected NDEP report data for the three monitoring wells is tabulated in Table F-4 below.

Table D-4 DESERT UTLITIES MONITOR WELL NDEP DATA, 4th QTR 2004

MONITORING WELLS		No. 1 down gradient	No. 2 down gradient	No. 3 up gradient
Nitrate as N	10 mg/l Max.	<0.5	0.74	<0.5
Total N as N	M & R mg/l	8.3	1.94	1.3
TDS	M & R mg/l	698	432	236
Chloride	M & R mg/l	62	57	<10
Depth to Water	M & R feet	74	73	73

D.1.5. Operations History

Operations staff reports that there has never been a notice of violation served by NDEP for either the collection system or treatment plant. The treatment plant performance is satisfactory and maintenance needs have been limited primarily to the lift station and air blowers. The rotation through the five infiltration basins has worked well in the past, but it is believed that as flow continues to increase the enhanced infiltration capacity created by the infiltration trenches will be needed.

D.2. Pahrump Utilities

Pahrump Utilities, Inc. was created primarily to service the sewage collection and treatment needs for the Artesia and Cottonwoods housing developments. Mountain Falls-North subdivision is currently connected to the system via a lift station and force main, but will have its own treatment system in the future. In addition, Terrible's Lakeside RV Resort is connected to the treatment plant via a lift station and force main. As of October 2004 there were 226 connections to the collection system. The service area covers more than one square mile located primarily south of Thousandaire Boulevard and north of Kellogg Road and east of Jane Avenue and west of Hafen Ranch Road as shown on Figure F-1.

Pahrump Utilities, Inc. authorized their engineer, Pacific Coast Civil, to provide detailed drawings of their wastewater collection and treatment facilities in electronic format. Information from these drawings has been provided a wealth of information regarding the existing facilities. Information provided by Pahrump Utilities, Inc, and Nevada Department of Environmental Quality has been used to describe sewage flows,

D.2.1. Collection System

The collection system consists of 8-inch gravity pipelines constructed of PVC sewer pipe with manholes typically spaced at minimum 600 foot intervals. The main lift station located at the headworks pumps all of the influent from the collection system into the plant. There are two sewage lift stations currently in use to pump sewage from Mountain Falls-North subdivision and Terrible's Lakeside RV Resort through 4,990 LF of 6-inch force main that runs to the plant. An inventory of the wastewater collection facilities at the end of 2004 is shown below on Table F-5.

Table D-5 PAHRUMP UTLITIES COLLECTION SYSTEM

Description	Length or Number
6-inch Force Main Pipe	4,990
8-inch Gravity Sewer Pipe	73,750
Manholes	309
Sewage Lift Stations	3

Infiltration during storm events has been a problem in some areas where the sewer lines were constructed within the public rights-of-way adjacent to the roadway approximately in line with the drainage ditch. Because the manholes are typically located at low points along the roadways where storm water collects, water ponds over the manhole lids, which are not water-tight. Maintenance crews are taking steps to correct the infiltration problems.

D.2.2. Treatment Facilities

The treatment facilities are located on an 11 acre site near the northeast corner of Simkins Road and Linda Street. The current wastewater treatment facility is a Mar-Wood package plant with a Phase 2 expansion completed in the year 2000. This conventional activated sludge treatment plant with extended aeration

provides a secondary treated denitrified effluent with an existing treatment capacity of 0.175 MGD. The treatment process includes a lift station followed by a coarse bar screen discharging into an anoxic basin followed by an aeration basin for de-nitrification followed by a clarifier to produce the finish effluent. Aeration is provided by electric powered blowers. An aerobic sludge digester is used to produce sludge that is transported to another facility for dewatering and disposal. The treatment process design parameters are listed below:

- Average Design Flow.....200,000 gal/day
- Peak Design Flow (250% of Avg.) .....500,000 gal/day
- Influent Biological Oxygen Demand (BOD)..... 220 mg/l
- Influent Total Kjeldahl Nitrogen (TKN) ..... 40 mg/l
- Effluent Biological Oxygen Demand (BOD) ..... 30 mg/l
- Effluent Total Suspended Solids (TSS) ..... 30 mg/l
- Effluent Total Nitrogen as N..... 10 mg/l
- Fecal Cloriform 200 cfu/100ml

The design goal is to produce a finish effluent that meets the secondary standards of 30 mg/l BOD and TSS; and less than 10 mg/l Total Nitrogen suitable for disposal by land application via surface irrigation of forage crops on land located nearby.

Adjacent to the WWTP site VBL Environmental Services operates a sludge dewatering facility. This facility accepts sludge from the Pahrump Utilities WWTP as well as the other three WWTPs operating in the Pahrump Valley. The sludge is dewatered on site and then hauled to a landfill for ultimate disposal.

D.2.3. Disposal & Monitoring Facilities

Treated effluent is discharged for forage crop irrigation on private property associated with the Hafen Ranch (also affiliated with Pahrump Utilities Company, Inc.). An Effluent Management Plan (EMP), dated March 10, 2000, is approved and held on record by NDEP. Currently 15 acres are used for land application of the effluent via surface irrigation using furrows with potential for expanding up to 41.8 acres. At a loading rate of 5.4 AF/YR the full 41.8 acres can accept the permitted discharge capacity of 200,000 GPD. Tail-water from the furrow irrigation is collected in two ponds and pumped back to the head end of the system. Tail-water pond no. 1 covers 2 acres with six feet maximum depth and pond no. 2 covers 0.5 acre at 4 feet depth. Runoff from the site during storm

events is prohibited and a 1-foot high bearm is constructed along the westerly side to prevent runoff leaving the site. Forage crops grown on the site include a mixture of alfalfa, clover, and fescue, grown intermittently on a year-round cycle. Based on the 5.4 AF/AC loading rate, crop uptake of nitrogen and phosphorus is expected to improve water quality as it percolates to groundwater.

Groundwater in the vicinity of the land application site is about 60 feet below land surface and follows a flow direction that varies from east-southeast to west-southwest. Characteristics of the natural groundwater in the area includes elevated nitrate concentrations reported between 100 to 300 mg/l as N, and high total dissolved solids (TDS) in the range of 1,000 to 2,400 mg/l, rending the shallow groundwater of relatively poor quality. The elevated nitrate concentrations have been observed at scattered locations in the vicinity of the site, and appear to be indigenous to the area. Although fertilizer use on croplands in the area may be a contributing factor, such high concentration of nitrate is attributed to natural organic matter decomposition or other natural processes. Applying a denitrified effluent to the land for irrigation of crops whose uptake of nutrients further reduces the discharge of nitrogen to groundwater in not expected to exacerbate existing conditions.

There are thirteen existing residential wells located within 500 feet of the westerly and southerly boundaries of the effluent disposal site. Groundwater monitoring is required to assess groundwater conditions on a regular basis and confirm that drinking water standards are not being violated. A single monitoring well is currently installed and operating. A second monitoring well is proposed for installation at a location to the southwest of the existing well required as a condition of the NDEP permit renewal. When the effluent discharge rate reaches 150,000 GAL/DAY a third monitoring well is called for in the effluent management plan.

D.2.4. Regulatory Permit & Reporting

The Pahrump Utilities WWTP operates under Nevada Division of Environmental Protection (NDEP) authorization to discharge permit no. NEV91004 effective January 13, 2003 and due to expire on January 13, 2008. The permit limits and reported values for selected permit sewage effluent quantity and water quality parameters for year 2004 are summarized in the table below. Although values are reported monthly the averages shown are computed quarterly to simplify presentation of the data.

Table D-6 DESERT UTILITIES SEWAGE EFFLUENT NDEP DATA, Year 2004

PARAMETER	PERMIT REQ'MTS	1st	2ND QUARTER	3RD	4TH

	(reported monthly)	QUARTER				QUARTER		QUARTER	
		AVG.	MAX.	AVG.	MAX.	AVG.	MAX.	AVG.	MAX.
Flow	0.200 MGD	0.061	0.082	0.063	0.076	0.066	0.110	0.079	0.176
Effluent $CBOD_5$	30 mg/l Avg. 45 mg/l Max.	4	<6	<6	<6	<6	<6	<6	<6
Effluent TSS	30 mg/l Avg. 45 mg/l Max.	<10	<10	<10	<10	<10	<10	<10	<10
Nitrate as N	M & R mg/l	5.0	7.9	5.5	5.5	6.4	6.8	9.1	12.9
Total Nitrogen as N	10 mg/l Max.	7.8	12.2	8.0	9.6	7.3	8.6	11.2	15.5*
Fecal Cloriform	200 cfu/100 ml Avg. 400 cfu/100 ml Max.	10	23	16	1600*	<2	<2	9	23

* Reason for accidences is unknown, but appears to be isolated incidents.

An annual water balance report is required to verify that the annual application rate (AF/AC) of effluent applied to the land application site does not exceed the maximum loading rate specified in the Effluent Management Plan considering infiltration, precipitation, plant uptake with a leaching fraction, and nitrogen loading, whichever governs. Groundwater monitoring is required quarterly. Results of laboratory testing of groundwater samples collected quarterly from a single monitoring well were reported to NDEP during 2004. Selected NDEP report data for Monitoring Well No. 1 is tabulated in Table F-7 below.

Table D-7 PAHRUMP UTLITIES MONITORING WELL, NDEP DATA, Year 2004

MONITORING WELL No. 1		1st QUARTER	2ND QUARTER	3RD QUARTER	4TH QUARTER
Nitrate as N	M & R mg/l	1.8	2.1	1.6	2.3
Total N as N	10 mg/l Max.	1.8	2.1	1.6	4.9
TDS	M & R mg/l	1308	1210	1260	1190
Chloride	M & R mg/l	17	32	21	20
Depth to Water	M & R feet	60.5	61	61	61

The sludge dewatering facility operated by VBL Environmental Services, Inc. operates under permit no. NEV 2000508 issued by NDEP. An annual monitoring report is required for this sludge dewatering facility.

D.2.5. Operations History

Operations staff reports that there has never been a notice of violation served by NDEP for either the collection system or treatment plant. The treatment plant performance is satisfactory and maintenance needs have been limited primarily to the lift station and air blowers. Using the effluent to provide year-round forage crops on the land application site has worked satisfactorily.

D.3. Utilities Inc. of Central Nevada

The initial wastewater collection and treatment system was constructed in the early 1970's by the private utilities company under the name of Central Nevada Utilities Company, presumed to be wholly owned by the predominant developer Calvada. Later the company was taken over by Preferred Equity. In the mid-1990's the Town of Pahrump entered into negotiations for a buyout of the utilities, but ultimately the Town Board rejected the idea of taking over the water and sewer utilities. In the year 2002 Utilities Inc. purchased both the water and sewer utilities giving the subsidiary company a new name.

Utilities Inc of Central Nevada is a subsidiary company of Utilities, Inc., an Illinois based holding company founded in 1965 with approximately 90 subsidiary operating companies providing water and/or wastewater services to 280,000 customers in 17 states. The parent company represents that it is the largest

privately-owned water utility in the United States on the basis of customers served, and the net market capitalization value. The growth strategy for the parent company includes acquisition of attractively valued utilities companies with long-term profit potential. They view themselves as the solution to non-compliant and inefficient stand-alone utilities with the ability to better serve new development through efficiency gained with economies of scale and by maintaining strong working relationships with the regulatory agencies.

It is the largest of the three water/wastewater utilities companies in Pahrump covering about 41 square miles extending as far north as Parque Avenue and south to Gamebird Road as shown of Figure F-1. A recent agreement with William Lyon Homes will include Mountain Falls – North in the service area extending service further south to Manse Road. Currently there are two wastewater treatment plants (WWTP) with the largest near Central Pahrump and a much smaller plant located further to the north. As of October 2004 there were 1,857 sewer connections to the Central Plant 3 WWTP and 48 sewer connections to the Northern Plant F WWTP.

Utilities Inc. of Central Nevada has not authorized their engineer, Pacific Coast Civil, to provide detailed drawings of their wastewater collection and treatment facilities in electronic format. Information obtained from a few design drawings provided during the land use master planning study along with compliance reports filed with Nevada Department of Environmental Quality have been used to describe the wastewater system and sewage flow data,

D.3.1. Collection System

The collection system consists primarily of 8-inch gravity pipelines constructed mostly of PVC sewer pipe with manholes typically spaced at minimum 600 foot intervals. Although initial construction of the system began in the early 1970's, most of the current collection system has been constructed during the growth that has occurred during the last 10 to 15 years.

There is main lift station located at the headworks for each plant that pumps all of the influent from the collection system into the plant. The northern Plant F has an additional lift station for a small subdivision and the central Plant 3 has eight lift stations pumping from trailer parks, commercial establishments, and small subdivisions. A complete inventory of the wastewater collection facilities was not possible due to the lack of reliable drawings, however, estimates based available drawings and information provided by operations personnel are shown below on Table F-8.

Table D-8 UTILITIES, INC. OF CENTRAL NEVADA COLLECTION SYSTEM

`	Length or Number
Various Pipe Sizes from 6-inch to 18-inch diameter	140,000 est.
Manholes	500 est.
Sewage Lift Stations	10 est.

In the early days the majority of new roads were graveled and thus roadway maintenance crews did not want to deal with grading a graveled road with manholes every 600 feet. Infiltration during storm events has been a problem in some areas where the sewer lines were constructed within the public rights-of-way adjacent to the roadway approximately in line with the drainage ditch. Because the manholes are typically located at low points along the roadways where storm water collects, water ponds over the manhole lids, which are not water-tight. Wastewater maintenance crews are taking steps to correct the infiltration problems.

Since the earliest construction for this collection system began in the early 1970's one would expect that maintenance requirements would be correspondingly more frequent due to the age and the types of materials used that were available for sewer construction during that era.

D.3.2. Treatment Facilities

The two WWTPs operated by Utilities Inc of Central Nevada include the Central Plant No. 3 just north of Calvada Boulevard west of Blagg Road and the Northern Plant No. F located east of Leslie Street north of Harris Farm Road and Linda Street. Both plants are Marwood package plant facilities with conventional activated sludge treatment augmented by extended aeration to provide a secondary treated denitrified effluent. The treatment process includes a lift station followed by a coarse bar screen discharging into an anoxic basin followed by an aeration basin for de-nitrification followed by a clarifier to produce the finish effluent. Aeration is provided by electric powered blowers. Central Plant No. 3 provides tertiary treatment with sand filters followed by U.V. light and chlorination facilities to provide a filtered, disinfected effluent suitable for unrestricted access reuse applications. North Plant No. F has chlorination facilities to provide a disinfected effluent. Both plants have an aerobic sludge digester is used to produce sludge that is transported to another facility for dewatering and disposal.

The treatment process design parameters for each plant are listed below in Table F-9:

Table D-9 UTILITIES INC. TREATMENT PROCESS DESIGN PARAMETERS

DESIGN PARAMETER	UNITS	CENTRAL PLANT 3	NORTH PLANT F
Average Design Flow	gal/day	600,000	10,000
Peak Design Flow	gal/day	1,800,000	26,000
Influent Biological Oxygen Demand (BOD)	mg/l	240	20 0
Influent Total Kjeldahl Nitrogen (TKN)	mg/l	45	40
Effluent Biological Oxygen Demand (BOD)	mg/l	<10	30
Effluent Total Suspended Solids (TSS)	mg/l	<10	30
Effluent Total Nitrogen as N	mg/l	<10	10
Fecal Chloroform	cfu/100ml	2.2	2.2

The design goal is to produce a finish effluent that meets the secondary standards of 30 mg/l BOD and TSS; and less than 10 mg/l Total Nitrogen suitable for reuse on nearby golf courses and landscaped areas.

Plans are underway to expand the treatment capacity at both plants in the near future. The central Plant 3 will be expanded to 1.5 MGD capacity by constructing a new sequenced batch reactor treatment facility. The North Plant F capacity is designed and permitted for an expansion from 10,000 GPD to 35,000 GPD by additions to the Marwood facilities. However, the feasibility of expanding the capacity of the plant to 100,000 GPD by constructing a completely new treatment system is under investigation.

D.3.3. Disposal & Monitoring Facilities

Central Plant No. 3

Effluent from the Central Plant No. 3 wastewater treatment facility is pumped to lakes for storage and reuse by irrigation on the nearby 18-hole Championship Willow Creek Golf Course and the 18-hole Executive Lakeview Golf Course. Groundwater is blended with the effluent in the storage lakes to provide sufficient water for irrigation. After the plant upgrades to 1.5 MGD of treatment capacity are completed, it is anticipated that the combined irrigation demand for the two golf courses will consume all of the effluent produced by the new facility.

The permit issued by NDEP specifies that the spray (sprinkler) irrigation on the reuse areas shall be performed in such a manner as to reduce standing water to a minimum and no runoff from the site is allowed. During irrigation with treated effluent over-spray or drift from the sprinklers outside the designed reuse area is prohibited. NDEP requires an Effluent Management Plan (EMP) for the golf course reuse areas and that a water balance report is submitted annually before January 28th of each year. The EMP specifies a maximum annual loading rate of irrigation water considering plant uptake with a leaching fraction, precipitation and any groundwater additions, nitrogen loading, and deep percolation losses. The EMP also specifies the buffer zones that must be maintained around the periphery of the reuse areas in accordance with NAC 445A.276.

Three monitoring wells are constructed near the golf course lakes for regulatory monitoring purposes. Groundwater in the vicinity of these wells is about 40 feet below land surface. Within the fact sheet and permit text provided by NDEP there is no mention of private wells in the vicinity of the golf courses where the effluent is applied for irrigation.

North Plant No. F

Effluent from the North Plant No. F wastewater treatment facility is used onsite for irrigation of poplar trees and turf grasses. In addition, there are two lined basins onsite for emergency overflow and wintertime storage purposes. The onsite reuse of the effluent has work well to date, but the effluent reuse requirements beyond the permitted 35,000 GPD have not as yet been determined.

The permit issued by NDEP specifies that the spray (sprinkler) irrigation on the reuse areas shall be performed in such a manner as to reduce standing water to a minimum and no runoff from the site is allowed. During irrigation with treated effluent over-spray or drift from the sprinklers outside the designed reuse area is prohibited. NDEP requires an Effluent Management Plan (EMP) for the reuse

areas and that a water balance report is submitted annually before January 28th of each year. The EMP specifies a maximum annual loading rate of irrigation water be established based on water balance or nitrogen loading, whichever governs. The water balance takes into account the plant uptake with a leaching fraction, precipitation, any groundwater additions to the irrigation water and deep percolation losses. The EMP also specifies the buffer zones that must be maintained around the periphery of the reuse areas in accordance with NAC 445A.276.

One monitoring well in constructed at the reuse site for regulatory monitoring purposes. Groundwater in the vicinity of these wells is about 90 feet below land surface. Within the fact sheet and permit text provided by NDEP there is no mention of private wells in the vicinity of the reuse site where the effluent is applied for irrigation.

D.3.4. Regulatory Permit & Reporting

The Central Plant No. 3 wastewater facility operates under Nevada Division of Environmental Protection (NDEP) authorization to discharge permit no. NEV97016 effective May 20th, 2003 and due to expire on May 20th, 2008.

The North Plant No. F wastewater facility operates under Nevada Division of Environmental Protection (NDEP) authorization to discharge permit no. NEV89063 effective May 20th, 2003 and due to expire on May 20th, 2008.

Both permits issued by NDEP specify that the spray (sprinkler) irrigation on the reuse areas shall be performed in such a manner as to reduce standing water to a minimum and no runoff from the site is allowed. During irrigation with treated effluent over-spray or drift from the sprinklers outside the designed reuse area is prohibited. NDEP requires an Effluent Management Plan (EMP) for the reuse areas and that a water balance report to be submitted annually before January 28th of each year. The EMP specifies a maximum annual loading rate of irrigation water be established based on water balance or nitrogen loading, whichever governs. The water balance takes into account the plant uptake with a leaching fraction, precipitation, any groundwater additions to the irrigation water and deep percolation losses. The EMP also specifies the buffer zones that must be maintained around the periphery of the reuse areas in accordance with NAC 445A.276.

The permit limits and reported values for selected permit sewage effluent quantity and water quality parameters for year 2004 are summarized in the tables below for both plants. Although values are reported monthly the averages shown are computed quarterly to simplify presentation of the data.

Table D-10 UICN CENTRAL PLANT No. 3 SEWAGE EFFLUENT, NDEP DATA, Year 2004

PARAMETER	PERMIT REQ'MTS (reported monthly)	1st QUARTER		2ND QUARTER		3RD QUARTER		4TH QUARTER	
		AVG.	MAX.	AVG.	MAX.	AVG.	MAX.	AVG.	MAX.
Flow	0.600 MGD	0.500	0.587	0.540	0.620	0.530	0.740	0.570	1.060
Effluent $CBOD_5$	10 mg/l Avg. 15 mg/l Max.	<2	<2	4	8	<2	<2	<2	<2
Effluent TSS	10 mg/l Avg. 15 mg/l Max.	<2	9	<2	<2	<2	<2	<2	<2
Nitrate as N	M & R mg/l	5.8	8.0	3.5	5.8	3.6	4.7	2.6	3.8
Total Nitrogen as N	10 mg/l Max.	6.7	8.9	4.3	6.6	4.2	5.3	3.3	4.3
Fecal Chloroform	2.2 cfu/100 ml Avg. 23 cfu/100 ml Max.	<2	<2	<2	15	<2	<2	<2	3

* Reason for accidences is unknown, but appears to be isolated incidents.

Table D-11 UICN NORTH PLANT No. F SEWAGE EFFLUENT, NDEP DATA, Year 2004

PARAMETER	PERMIT REQ'MTS (reported monthly)	1st QUARTER		2ND QUARTER		3RD QUARTER		4TH QUARTER	
		AVG.	MAX.	AVG.	MAX.	AVG.	MAX.	AVG.	MAX.
Flow	0.010 MGD	0.005	0.020	0.004	0.110	0.006	0.009	0.009	0.073
Effluent $CBOD_5$	30 mg/l Avg. 45 mg/l Max.	<2	4.3	<2	4.4	<2	34	13.7	29
Effluent TSS	30 mg/l Avg. 45 mg/l Max.	20.3	36.4	<2	<2	<2	14	14.7	27
Nitrate as N	M & R mg/l	35	41	30	34	29	42	8.9	22
Total Nitrogen as N	20 mg/l Max.	36	42	31	35	35	43	28	34
Fecal Chloroform	2.2 cfu/100 ml Avg. 23 cfu/100 ml Max.	<2	23	<2	3	<2	8	<2	<2

At the Central Plant No. 3 facility three are three monitoring wells and at the North Plant No. F there is only one monitoring well. Quarterly sampling of groundwater taken from the monitoring wells at both plant sites AND were reported to NDEP during 2004. Selected NDEP report data for the monitoring wells are tabulated in the tables below.

Table D-12 UICN CENTRAL PLANT No. 3 MONITORING WELLS, NDEP DATA,Year 2004

MONITORING WELL		1st QUARTER	2ND QUARTER	3RD QUARTER	4TH QUARTER
Monitoring Well No. 1					
Nitrate as N	M & R mg/l	2.1	2.1	2	1.8
Total N as N	10 mg/l Max.	2.8	2.3	2.2	2
TDS	M & R mg/l	524	664	640	562
Chloride	M & R mg/l	100	120	120	120
Depth to Water	M & R feet	N/A	38	38	38
Monitoring Well No. 2					
Nitrate as N	M & R mg/l	N/A	7.2	4.2	6.9
Total N as N	10 mg/l Max.	N/A	12*	7.6	7.5
TDS	M & R mg/l	N/A	603	1,090	560
Chloride	M & R mg/l	N/A	40	43	39
Depth to Water	M & R feet	N/A	39	39	39
Monitoring Well No. 3					
Nitrate as N	M & R mg/l	N/A	5.9	5.3	5.5
Total N as N	10 mg/l Max.	N/A	6.4	5.4	5.6
TDS	M & R mg/l	N/A	1,250	1,210	1,230
Chloride	M & R mg/l	N/A	36	34	29
Depth to Water	M & R feet	N/A	39	39	39

* Reason for excedance is unknown, but appears to be isolated incidents.

Table D-13 UICN NORTH PLANT No. F MONITORING WELLS, NDEP DATA, Year 2004

MONITORING WELL		1st QUARTER	2ND QUARTER	3RD QUARTER	4TH QUARTER
Monitoring Well No. 1					
Nitrate as N	M & R mg/l	N/A	3.6	3.5	4.3
Total N as N	10 mg/l Max.	N/A	4.4	4.2	4.7
TDS	M & R mg/l	N/A	972	946	838
Chloride	M & R mg/l	N/A	200	210	230
Depth to Water	M & R feet	N/A	89	89	89

D.3.5. Operations History

At the North Plant No. F operations staff reports that there has never been a notice of violation served by NDEP for either the collection system or treatment plant. The treatment plant performance is satisfactory and maintenance needs have been limited primarily to the lift station and air blowers. When high flows have occurred due to storm water infiltration into the collection system, the overflow basins have provided the necessary storage. Using the effluent to irrigate trees and turf at the plant site has worked well.

At Central Plant No. 3 heavy rains during the fall of 2004 resulted in a plant upset due to high influent flows. A letter regarding the upset was sent to NDEP on October 25, 2004, which contained the following information about the upset:

- An upset to the plant occurred at 1:15 pm on October 20, 2004 due to heavier than normal rainfall in the Pahrump Valley and surrounding mountain areas during the night before. The final filters became overloaded and were bypassed. The aeration tank blowers were de-energized to prevent solids washout. The chlorination dosage was increased to maintain a residual of 0.3 mg/l. By 1:00 am on October 21st the high flows has subsided and the plant was returned to normal operation.

- The infiltration of storm water runoff into the collection system was believed to occur due to submergence of manholes located in low areas adjacent to roadways. UICN continues to implement a manhole sealing program (approximately 20% complete) and mandate that all new manhole covers have pick-less holes and rubber gaskets to seal out potential infiltration of storm water.

Since September 2004, Utilities Inc. of Central Nevada has been locked in a battle with builders and local developers regarding the inability to provide sewer hookups in the area served by Central Plant No. 3. Since the influent flows to the treatment plant are greater than 90 percent of the permitted capacity, NDEP has mandated a moratorium on new sewer hookups until the treatment capacity is expanded. According to UICN the plan is to complete a $5.5 million expansion of the treatment plant during the year 2005 to increase the capacity from 0.6 MGD to 1.5 MGD.

An arrangement to allow septic tanks or onsite wastewater treatment systems as an interim solution is being explored between the County, UICN, NDEP and the Public Utilities Commission.

D.4. Governmental Regulation

State governmental regulation of these private utilities falls under the jurisdiction of two entities: 1) the Nevada Public Utilities Commission (PUC) that primarily regulates the cost of services provided to consumers in a manner similar to the regulation of electricity, gas and telephone utility rates, and 2) the Division of Environmental Protection under the Nevada Department of Natural Resources that is primarily responsible for protecting public health through environmental permitting and monitoring requirements.

E. EVALUATION OF WASTEWATER TREATMENT ALTERNATIVES

E.1. Evaluation Criteria

Since the turn of the century, biological wastewater treatment systems have been the standard means of treating municipal wastewater. Typical conventional treatment plants are often referred to as “secondary” treatment plants because the biological stage usually follows a primary settling stage. Secondary

treatment has been further defined as a treatment facility capable of producing an effluent quality of 30 mg/l BOD and 30 mg/l suspended solids.

Biological treatment systems can be divided into two broad categories: "attached growth" systems and "suspended growth" systems. "Activated Sludge" is another name given to suspended growth systems. The existing modular treatment units used by existing private wastewater utilities in the Pahrump Valley are a suspended growth system because the microorganisms which remove the dissolved pollutants from the wastewater are "suspended" in the wastewater by mixing and agitating the liquid until it is desired to settle out the resulting biomass in the clarifier. Attached growth systems, on the other hand, remove the dissolved pollutants from the wastewater with microorganisms that are "attached" to a median filter. Conventional attached growth treatment, known as the trickling filter process, is not considered in this study due to its susceptibility to shock loads and limited expandability and flexibility when compared to suspended growth systems.

In evaluating the biological treatment alternatives for meeting stringent effluent limits for disposal to groundwater and reuse, significant attention and consideration were given to the requirement for total nitrogen reduction.

The nitrogen removal process is categorized as an advanced treatment process beyond and in addition to the required secondary treatment process. Total biological nitrogen reduction from wastewater is a two-step process that requires nitrification in an aerobic environment, followed by de-nitrification in an anoxic environment. Nitrification oxidizes ammonium to nitrite nitrogen, and then to nitrate nitrogen. To achieve total nitrogen reduction, biological de-nitrification must take place to reduce nitrate nitrogen to nitrogen gas.

The biological processes considered in this evaluation are those which fall within the boundaries of the above considerations, and could meet the following conditions:

- Process should be reliable in secondary and advanced nutrient removal to meet required effluent limits
- Process should be simple to operate
- Process should be relatively free of odor
- Process should provide for future expansion to meet the projected and possible accelerated growth needs of the Town
- Process should have economical capital and O & M costs

E.2. Wastewater Treatment System Alternatives

The following wastewater treatment processes were selected as viable treatment alternatives, which meet the above criteria.

- Conventional Activated Sludge with Biological Nutrient Removal
- Oxidation Ditch
- Sequencing Batch Reactor (SBR)

E.2.1. Conventional Activated Sludge with Biological Nutrient Removal

E.2.2. Oxidation Ditch

The Oxidation Ditch (OD) process is an extended aeration type of activated sludge that has an aeration basin shaped like a racetrack in which wastewater and mixed liquor are continuously reticulating. The oxidation ditch aeration basin is a single channel or multiple interconnected channels. A single channel OD with oval configuration is the most common. Mechanical aerators are commonly used for mixing, oxygen supply, and for circulating of mixed liquor. Figure 5.2.3a shows a flow diagram of the oxidation ditch process proposed for the Patagonia treatment plant. The most common aeration equipment used with oxidation ditches is horizontal brush, cage, or disc-type aerators. The aerators normally span the width of the channel and may be installed in one or more locations around the channel. Minimums of two aerators are recommended so that at least partial aeration can be provided when problems occur. If the first aerator isn't efficient enough the second airbrush aerator runs also. Secondary clarification is required with the oxidation ditch processes to separate the bacteria (sludge) from the MLSS. The design of the final clarifier is consistent with other activated sludge processes. A surface overflow rate of 400 to 500 GPD/sq. ft is recommended for average daily flows and 1000 to 1200 GPD/sq. ft at peak flows. Clarifiers with 12 to 14 feet depth are recommended as they provide greater process reliability than shallower ones.

Velocity of the flow in the oxidation ditch remains constant and is maintained by the aerators and the mixing equipment (>1.0 fps). Raw wastewater is delivered to the ditch where it is slowly mixed by the aerators. Oxidation ditches typically operate in an extended aeration mode with long HRT (24 hours) and SRT (20 to 30 days). Depending on the relative location of the wastewater input and

removal, sludge return, and the aeration equipment, oxidation ditches can achieve nitrification and de-nitrification. The region just downstream of the aerators is aerobic so nitrification occurs. As the liquor travels downstream and the oxygen is consumed, an anaerobic zone is formed. By routing a small portion of the raw sewage influent (as a carbon source) to this zone, de-nitrification occurs. The mixed liquor then contacts another aerator so that the organic nitrogen produced by the denitrifying bacteria is oxidized. The number of anaerobic zones and aerators required is a design parameter that depends on the capacity and loading of the plant.

The aeration of the ditch is controlled over a DO Sensor (DO=dissolved oxygen). The sensors will pick up as soon as there is sufficient oxygen in the basin liquid, and the aerator will then be turned off. It's also possible to run the whole process over a PLC/SCADA monitoring system to assist the operator in the process operation control.

After treatment, the sewage is then pumped to a settling tank where the sludge and the water are allowed to separate. This is a separate circular outside tank with a slowly revolving scraper arm at the bottom that scrapes the sludge to a center well from where it is pumped back to the treatment basin and to the sludge digester.

From here wastewater goes on to the disinfection treatment process. The sludge that has accumulated on the bottom of the settling tank is then removed and a portion of it is returned to the ditch to facilitate microbial activity in the next batch of sewage to be treated. With proper design and careful operation, 80% nitrogen removal can be achieved in a single channel oxidation ditch plant.

Nitrogen removal is achieved by producing both aerobic and anoxic zones within the same channel. Controlling the aerator oxygen transfer rate so that mixed liquor dissolved oxygen is depleted within a portion of the aeration channel creates these zones.

The system's energy demands are moderate; however they tend to exceed SBR systems energy demands. They require a moderate amount of skill to operate and maintain, and they work well under most all weather conditions

Advantages of the Oxidation Ditch process include:

- Capable of consistently achieving high levels of BOD and TSS removals with minimum operation.

- High levels of nitrification and de-nitrifications (80%) are possible with proper operation; proper channel configuration design, tailoring position and intensity of aeration devices, and selecting sludge return points.

- The plants are easy to keep in service and can function for long periods of time with little operation attention and maintenance.
- Flexibility of operation.
- Simple to operate.
- Constant flow.
- Has long sludge retention time, which minimizes frequency of sludge wasting.
-

Disadvantages of the Oxidation Ditch process include:

- Limited in operation units redundancy.
- Aeration and mixing costs are 20-30% higher than for fine bubble activated sludge, similar to Alternatives 1 and 4.
- Requires a separate secondary clarifier unit.
- The system can be noisy and can also produce odors if not operated properly.
- Require large area of land when compared to SBR and Countercurrent Extended aeration systems.
- Expansion may require extensive improvements compared to SBR and D-Ditch systems.

E.2.3. Sequencing Batch Reactor (SBR)

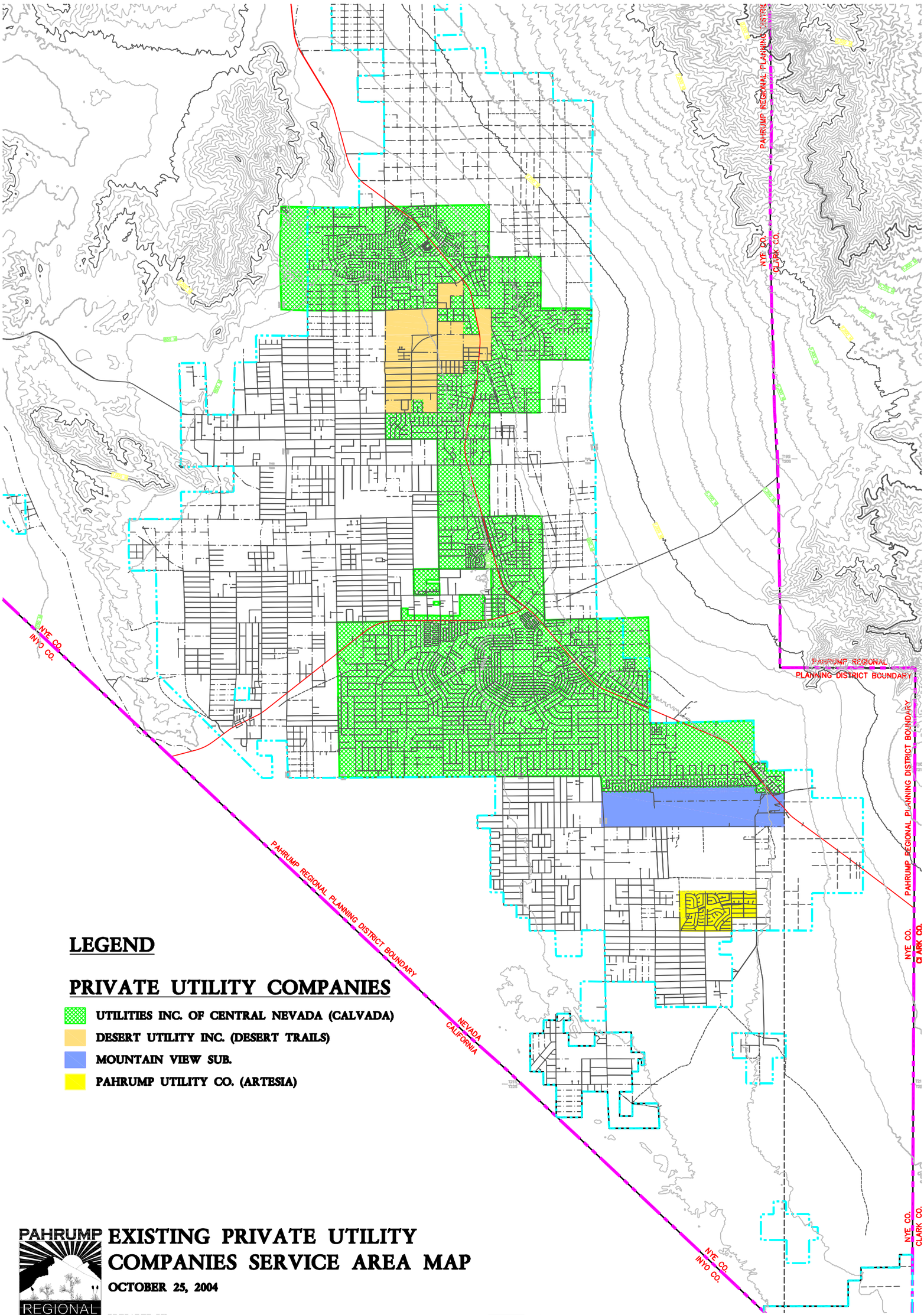
F. RECOMMENDED TREATMENT ALTERNATIVE

F.1. Recommendation and Justification

F.2. Description of Recommended Alternative

F.3. Proposed Treatment Works

F.4. Effluent Disposal



LEGEND

PRIVATE UTILITY COMPANIES

- UTILITIES INC. OF CENTRAL NEVADA (CALVADA)
- DESERT UTILITY INC. (DESERT TRAILS)
- MOUNTAIN VIEW SUB.
- PAHRUMP UTILITY CO. (ARTESIA)

PAHRUMP REGIONAL PLANNING DISTRICT MASTER PLAN UPDATE

EXISTING PRIVATE UTILITY COMPANIES SERVICE AREA MAP

OCTOBER 25, 2004

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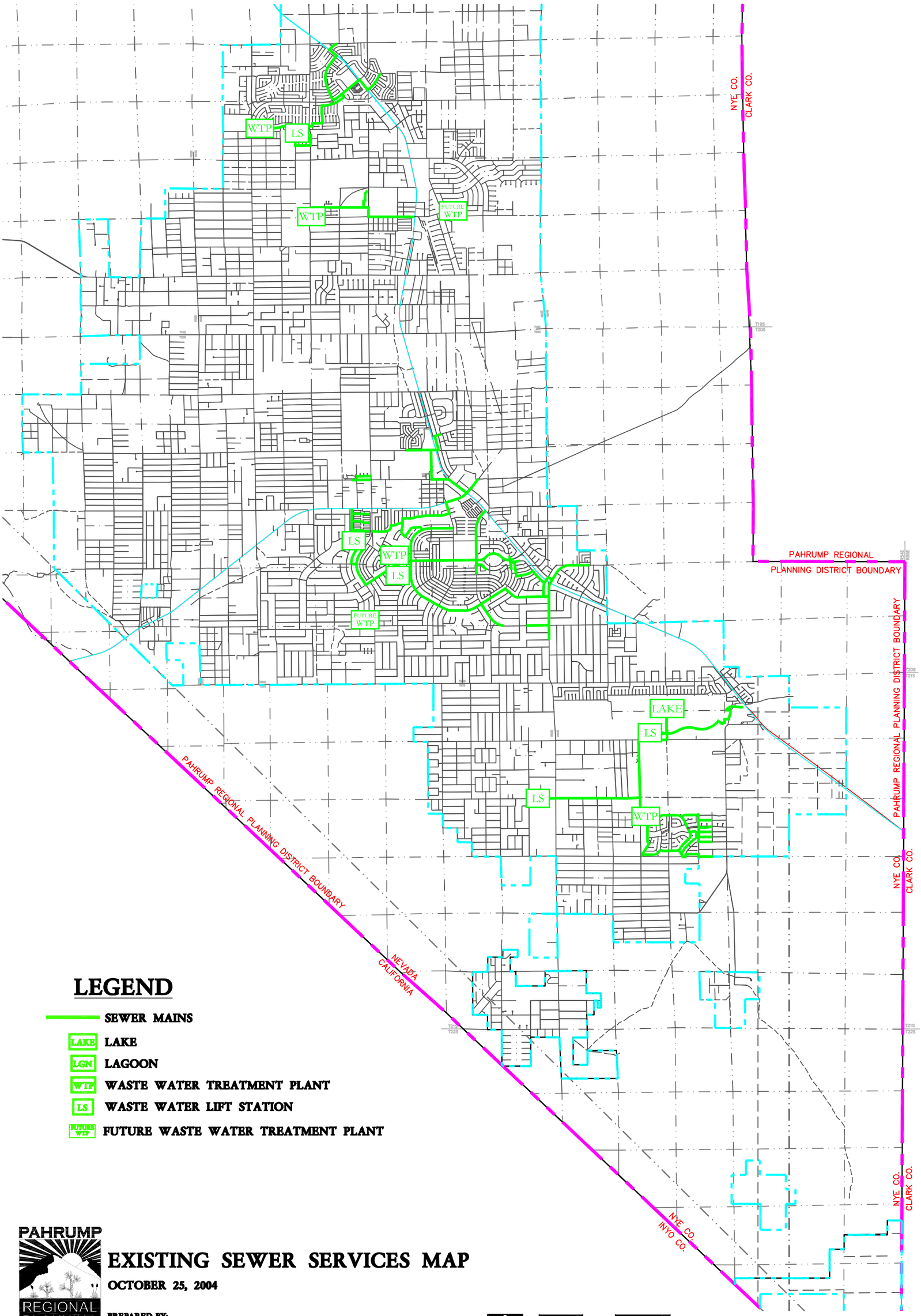
NORTH 0 4,000' 7,000' 12,000'

PAHRUMP REGIONAL PLANNING DISTRICT MASTER PLAN UPDATE

NYE COUNTY, NEVADA

Sewer Figure 1



LEGEND

- SEWER MAINS
- LAKE — LAKE
- LGN — LAGOON
- WTP — WASTE WATER TREATMENT PLANT
- LS — WASTE WATER LIFT STATION
- FUTURE WTP — FUTURE WASTE WATER TREATMENT PLANT

PAHRUMP REGIONAL PLANNING DISTRICT MASTER PLAN UPDATE

EXISTING SEWER SERVICES MAP

OCTOBER 25, 2004

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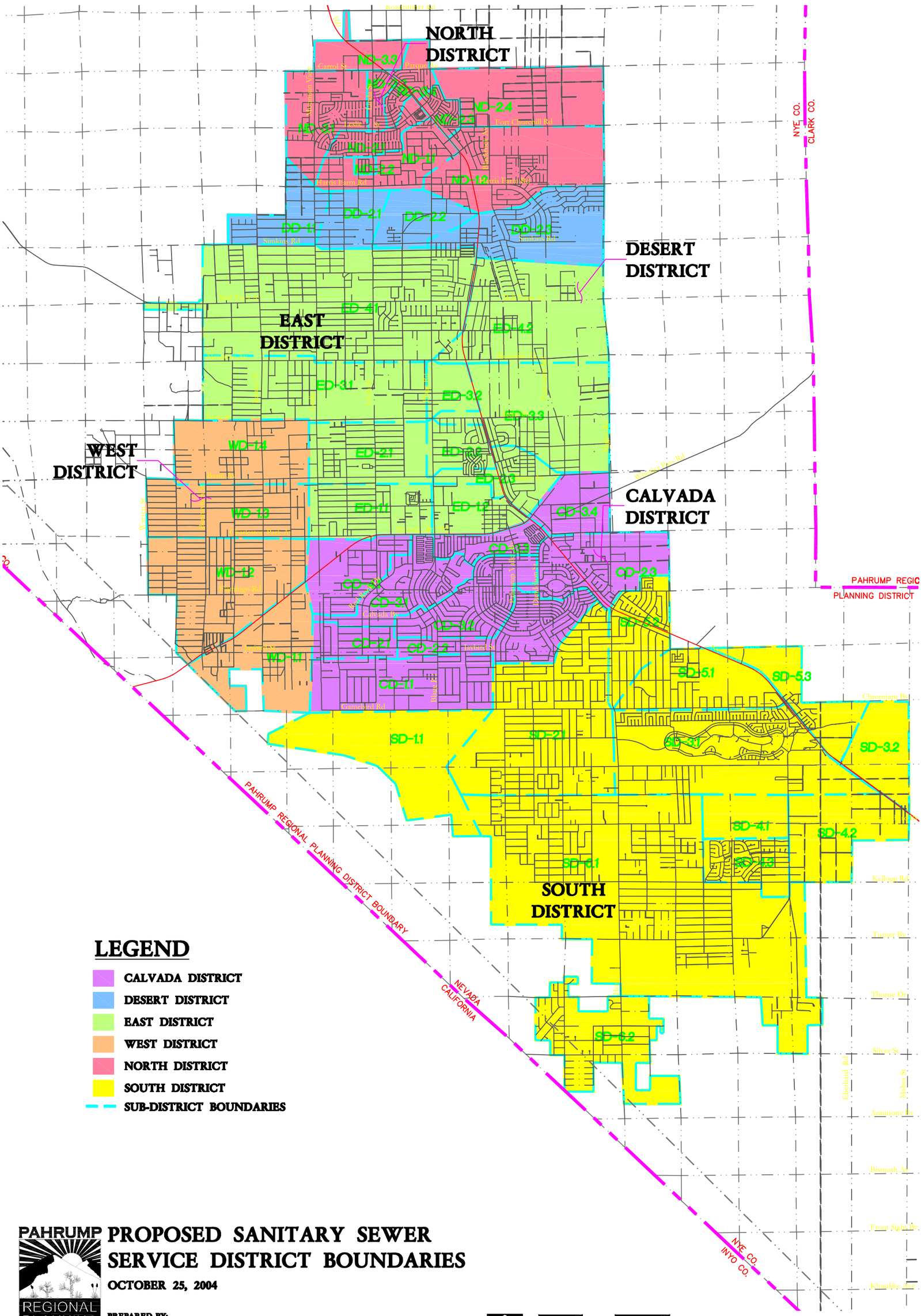
PAHRUMP REGIONAL PLANNING DISTRICT MASTER PLAN UPDATE

NYE COUNTY, NEVADA

Sewer Figure 2



PAHRUMP REGIONAL PLANNING DISTRICT MASTER PLAN UPDATE

PROPOSED SANITARY SEWER SERVICE DISTRICT BOUNDARIES

OCTOBER 25, 2004

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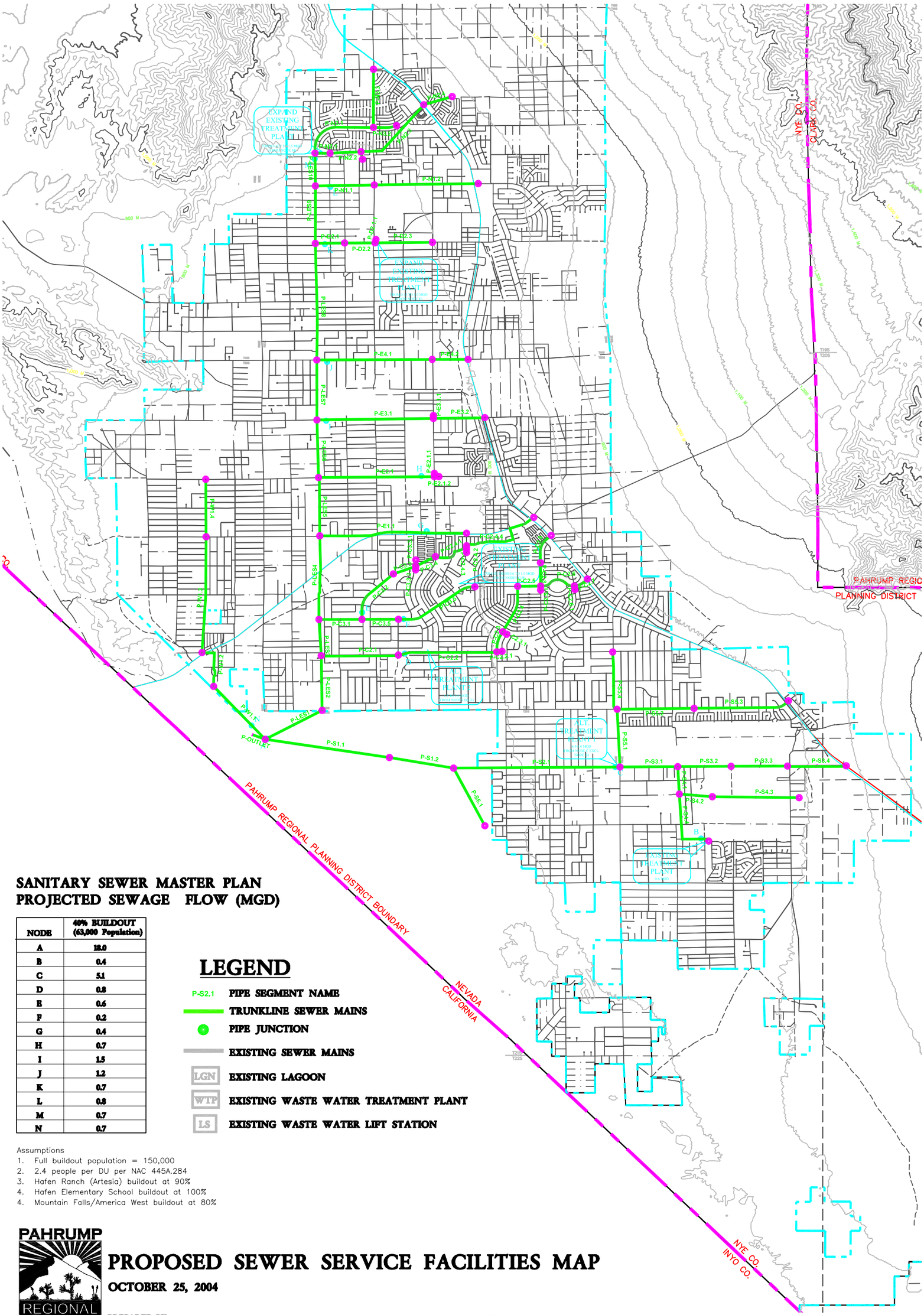
PAHRUMP REGIONAL PLANNING DISTRICT MASTER PLAN UPDATE

NYE COUNTY, NEVADA

Sewer Figure 3



SANITARY SEWER MASTER PLAN
PROJECTED SEWAGE FLOW (MGD)

NODE	40% BUILDOUT (63,000 Population)
A	18.0
B	0.4
C	5.1
D	0.8
E	0.6
F	0.2
G	0.4
H	0.7
I	1.5
J	1.2
K	0.7
L	0.8
M	0.7
N	0.7

LEGEND

- P-S2.1 PIPE SEGMENT NAME
- TRUNKLINE SEWER MAINS
- PIPE JUNCTION
- EXISTING SEWER MAINS
- LGN EXISTING LAGOON
- WTP EXISTING WASTE WATER TREATMENT PLANT
- LS EXISTING WASTE WATER LIFT STATION

Assumptions
1. Full buildout population = 150,000
2. 2.4 people per DU per NAC 445A.284
3. Hafen Ranch (Artesia) buildout at 90%
4. Hafen Elementary School buildout at 100%
4. Mountain Falls/America West buildout at 80%

PAHRUMP REGIONAL PLANNING DISTRICT MASTER PLAN UPDATE

PROPOSED SEWER SERVICE FACILITIES MAP

OCTOBER 25, 2004

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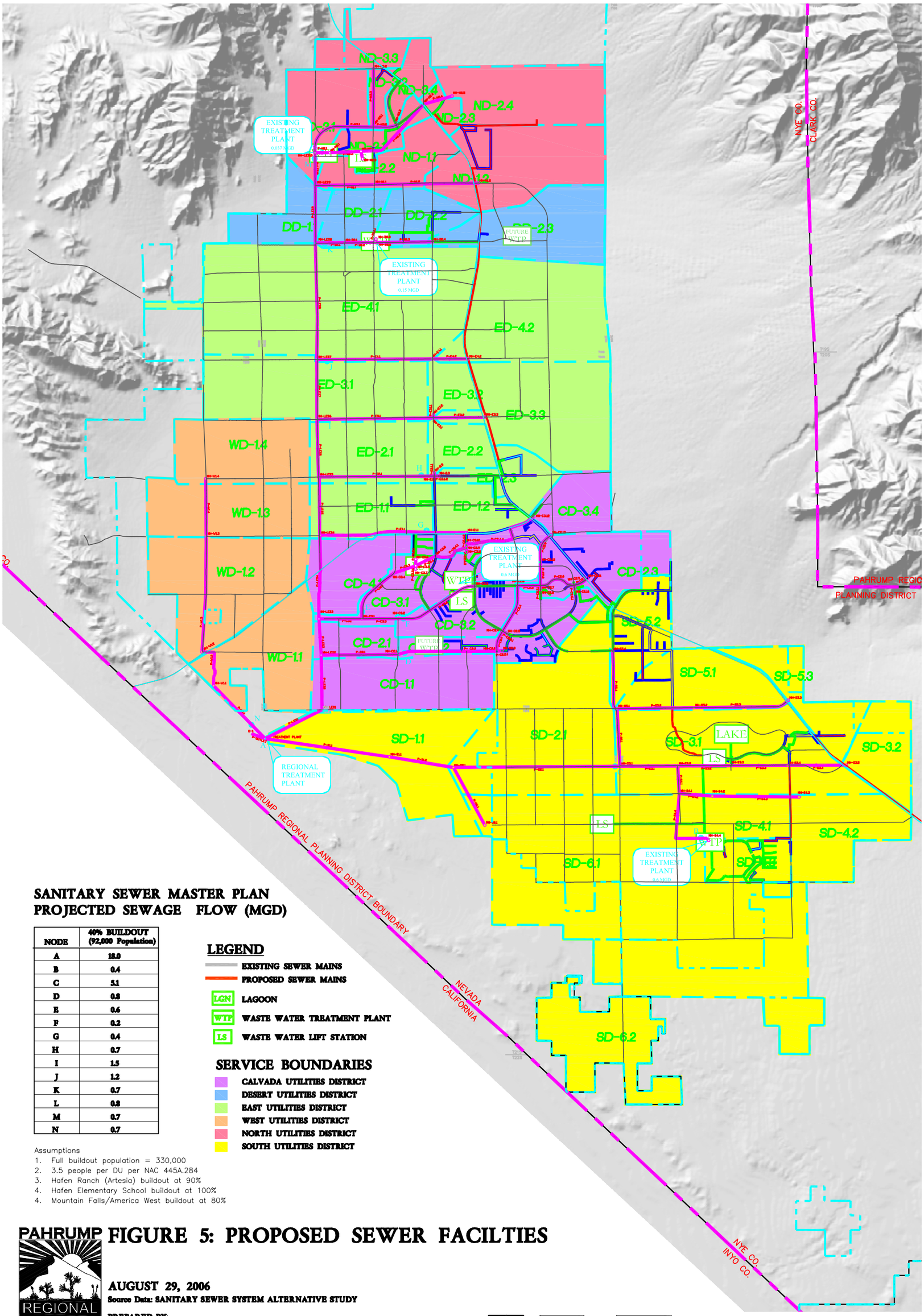
PAHRUMP REGIONAL PLANNING DISTRICT MASTER PLAN UPDATE
NYE COUNTY, NEVADA

Sewer Figure 4



SANITARY SEWER MASTER PLAN PROJECTED SEWAGE FLOW (MGD)

NODE	40% BUILDOUT (92,000 Population)
A	18.0
B	0.4
C	5.1
D	0.8
E	0.6
F	0.2
G	0.4
H	0.7
I	1.5
J	1.2
K	0.7
L	0.8
M	0.7
N	0.7

Assumptions
1. Full buildout population = 330,000
2. 3.5 people per DU per NAC 445A.284
3. Hafen Ranch (Artesia) buildout at 90%
4. Hafen Elementary School buildout at 100%
4. Mountain Falls/America West buildout at 80%

LEGEND

- EXISTING SEWER MAINS
- PROPOSED SEWER MAINS
- LGN LAGOON
- WTP WASTE WATER TREATMENT PLANT
- LS WASTE WATER LIFT STATION

SERVICE BOUNDARIES

- CALVADA UTILITIES DISTRICT
- DESERT UTILITIES DISTRICT
- EAST UTILITIES DISTRICT
- WEST UTILITIES DISTRICT
- NORTH UTILITIES DISTRICT
- SOUTH UTILITIES DISTRICT

PAHRUMP REGIONAL PLANNING DISTRICT MASTER PLAN UPDATE

FIGURE 5: PROPOSED SEWER FACILTIES

AUGUST 29, 2006

Source Data: SANITARY SEWER SYSTEM ALTERNATIVE STUDY

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PAHRUMP REGIONAL PLANNING DISTRICT MASTER PLAN UPDATE
NYE COUNTY, NEVADA

Sewer Figure 5

Prepared by:
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TYPICAL COSTS FOR SEWER TRUNK LINES

October, 2004

Size (Inches)	Construction Cost* (Per linear foot)
8	$55
10	$70
12	$85
15	$120
18	$135
21	$165
24	$195
27	$220
30	$240
36	$285
42	$330
48	$375

* - Prices duplicated from Town of Gilbert Waterwater Master Plan - 2005

- Includes manholes, pipe, administration, engineering, and contingency costs

- Price adj. by 68.7% of National Average of Means For Installations Costs

PRECAST CONCRETE MANHOLE-T-LOK LINED

5' ID DEPTH-'	UNIT ($)
10	$4,086
12	$4,613
14	$5,139
16	$5,665
18	$6,191
20	$6,718
22	$7,244
24	$7,770
26	$8,297
28	$8,823
30	$9,349
32	$9,875

Sewer Figure 6

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