FACILITIES PLANNING STUDY

FOR

TOWN OF NEW CASTLE

GARFIELD COUNTY, COLORADO

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SECTION 1. SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

1.1 GENERAL INFORMATION

The New Castle Facility Planning Area encompasses approximately 7200 acres in the vicinity of the confluence of Elk Creek and the Colorado River, in Garfield County, about 12 miles west of Glenwood Springs. In addition to the Town of New Castle, which owns and operates a municipal wastewater collection and treatment system, the Facility Plan has identified and evaluated a number of privately-owned community wastewater treatment facilities (WWTF) and individual wastewater disposal systems (ISDS) in the planning area. The planning area with surface discharges are the Mountain Shadows/Apple Tree Park lagoon and the Riverbend lagoon. The other community facilities in the planning area have subsurface disposal. They include the KOA Campground and Camp Christian, as well as a number of individual homes. Although the Town serves as the focal point of the study, present and potential water pollution problems and related solutions associated with the private developments have also been considered.

The Town is an incorporated statutory town with a mayor-trustees form of government. Due to a dramatic increase in population in the last five years, the Town of New Castle WWTF will soon be operating at capacity. A Facility Plan therefore, is being written to determine the need for a new WWTF. The Town has grown because of lower priced housing and because of population shifting from urban to rural areas. The town now serves as a small, rapidly growing residential center for the surrounding agricultural and resort communities. Some tourist business comes from adjacent I-70. There is still some potential for growth from on-going energy developments in the region, but the actual current growth in population and housing in the study area is due to growth of the nearby large resort/recreation communities. Present (1996) population of the town is about 1620, up from 679 as declared by the 1990 U.S. Census.

Mountain Shadows Subdivision/Apple Tree Mobile Home Park (locally known as Talbott's) is a privately developed and platted subdivision located on the opposite (south) side of the Colorado River from New Castle. There are 381 single-family dwelling units in the subdivision/park with a present estimated population of 1056, and has potential room for expansion by about 20% to 1260 (ie., 455 units).

Riverbend Subdivision, also located on the opposite side of the Colorado River, is for most purposes fully developed. It currently has 45 units with 20 more platted in the future.

The commercial campground (KOA) has 60 sites; the church camp (Camp Christian) has facilities for 150 participants.

There are about 60 existing units in the Elk Creek Subdivision, 14 platted units in the 3-Elk Run Subdivision, 10 platted units in the Cedars P.U.D. Subdivision and 6 units in the Hidden Valley portions of the planning area. There are also 20 to 25 other single-family residential units (existing) throughout the remainder of the study area.

1.2 STATUS OF EXISTING SYSTEM.

New Castle has an existing gravity collection system constructed in the 1950's. Recent development activities beginning in the early 1980's have added new lines into the Town's

gravity collection system. These new lines have all been constructed of PVC pipe and have underwent extensive low air pressure testing on the lines themselves, as well as vacuum and hydraulic testing on manholes. Therefore, the infiltration and inflow to the plant from these lines is non-existent.

For the portions of the collection system installed prior to the early 1980's, the system has remained unchanged (to be conservative) for Section 2 of the March, 1980 Facilities Planning Study (i.e., beginning on Page 2-1) for the Town of New Castle, discussion regarding the remiander of the collection system is found. Additionally, Section IV of the New Castle Discharge Permit #CO-0040479 discusses that *"No infiltation problems have been documented in the service area. All of the older lines in Town were recently video taped and necessary repairs were made. New manholes have also been added to reduce long lengths between existing manholes in some of the lines".*

The treatment facility is an extended aeration activated sludge plant with secondary clarification. Disinfection is by gas chlorination; chlorine contact time is achieved before discharge to Elk Creek. Sludge is disposed of by land application of liquid sludge on nearby agricultural fields after undergoing aerobic digestion. The most recent upgrade to the plant occurred in the fall of 1995. Effluent quality has been in conformance with CDOH discharge permit requirements. The plant currently operates between 50% and 80% of capacity.

Talbott's and Riverbend Subdivision both have community collection systems and treatment lagoons. The all-gravity collection systems have a low I&I and are in good condition. Both treatment systems are of the lagoon type and also appear to be in good conditions, and operation appears satisfactory.

The KOA Campground has an extended aeration plant with subsurface disposal for the communal bath house, which is the only wastewater discharge at that site. The plant has adequate capacity for existing and future growth, and is operating satisfactorily.

Camp Christian uses a collection of septic tank/leach field systems for each of its buildings. Operation and capacity are also satisfactory.

All rural homes use individual septic tank/leach field disposal systems. There are no problems at this time with existing systems.

SECTION 2. INTRODUCTION

2.1 STUDY, PURPOSE AND SCOPE.

The study of the WWTF in the New Castle Planning Area is authorized under Section 201 of (PL) 92-500, the Water Pollution Control Act of 1972. The purpose of compiling a facilities plan is to:

a. Develop and evaluate alternative approaches to wastewater treatment,
b. Choose a plan which will best solve the problems, and
c. Prepare preliminary designs and cost estimates for that plan.

In addition to the municipal collection and treatment system in the Town of New Castle, the plan has identified several other WWTF's. The largest of these, are Riverbend and Talbott's. Both are privately owned developments located on the south side of the Colorado River. In addition, there are several smaller developments and rural homes to the north of New Castle, including a KOA Campground, Camp Christian, a church owned summer camp, and a few subdivisions consisting of residences and mobile homes on Elk Creek and several smaller clusters of homes on East Elk Creek.

The Town of New Castle has an existing central collection system and secondary treatment system with surface discharge to Elk Creek. The gravity collection system was constructed in the early 1950's of 6, 8 and 10 inch vitrified clay pipe. Recent development activity has introduced the use of 8" and 12" PVC collection lines into the sytsems. The older clay piping has infiltration and inflow (I&I) problems as discussed in the 1980 Facilities Planning Study for the Town of New Castle. These discussions are found in Sections 4.2.2.1 and 4.2.2.6 of the 1980 study. Recent tsting associated with the construction of the new PVC lines has been centered around the elimination of I&I into the collection system. Therefore, no additional I&I analysis has been peformed beyond htose peformed and referenced in the 1980 study. Although it is referenced in the 1980 study of the old section of collection lines havng I&I problems, the New Castle discharge permit, dated in 1995, Section IV states, *"No infiltration and inflow problems hve been documented in the service ara. All of the older lines in Town were recently video-taped and the necessary repairs were made. New manholes have also been added to reduce long lengths between exisign manholes in some of the lines."*

The plant facility is of a mechanical type, consisting of velocity controlled grit chambers, bar screens, extended aeration type secondary treatment, secondary clarifier, chlorination, dechlorination and aerobic digester. The effluent has consistently met discharge permit effluent limitations.

Talbott's has a privately owned collection system and a two cell lagoon system, while Riverbend Subdivision has a newly constructed three cell lagoon system. Both systems are operating in accordance with discharge permit standards. The KOA Campground and Camp Christian have on-site treatment systems with subsurface disposal and are operating satisfactorily. All dwelling units at subdivisions located outside of the Town area and at the other individual rural homesites have on-site disposal systems, generally septic tanks with leaching fields. There are no significant problems presently with these systems.

2.2 PLANNING AREA.

The Town of New Castle is located in Garfield County on the Colorado River at its confluence with Elk Creek, adjacent to Interstate 70 and approximately midway between Glenwood Springs and Rifle. The planning area encompasses approximately 7200 acres, including the entire Town of New Castle, Talbott's, Riverbend Subdivision, and substantial portions of the lower Elk Creek, West Elk Creek, Main Elk Creek and East Elk Creek valleys. It was established by projecting out the existing town boundary three miles. This projection was then trimmed to reveal only suitable areas of potential growth. Map 1 shows the planning area boundaries together with wastewater service areas.

The Town of New Castle serves as the community and trade center for the surrounding area. It is the oldest population center in the planning area, being incorporated in 1888 in response to the development of nearby coal mines, most of which are now inoperative. Present population is about 1460 people (Nov, 1995).

Talbott's is a privately owned mobile home park and platted subdivision and is one of the largest population centers in the planning area. It was developed in the early 1960's by the original land owners at the site of an old apple orchard, of which are now incorporated in the mobile home park. It is locally known as Talbott Farms or Talbott's, and this name is used interchangeably with Mountain Shadows Subdivision/Apple Tree Park. It is mainly a residential area with an estimated population of 1260 (Nov.,1995). However, some small commercial and park development exists to complement the residential units.

Riverbend Subdivision is privately owned. It is located on the south side of the Colorado River and upstream of New Castle. The existing subdivision consists of 45 single family units with a population of approximately 125 persons. Recent development activities, in conjunction with the construction of the new wastewater treatment facilities, have platted lots for an additional 20 units. Thus, the total number of units in Riverbend will build out at 65 units or 180 persons.

Elk Creek Subdivision is an existing subdivision consisting of 60 units. It is located upstream of New Castle in the foothills of the valley, near the confluence of Main Elk Creek and East Elk Creek. Adjoining Elk Creek Subdivision on the east is 3-Elk Run Subdivsion. This subdivsion is platted for 14 single family residences. Adjoining 3-Elk Run Subdivsion to the south and east is a 10 lot subdivsion known as The Cedars. These lots are also platted for single family residences. Finally, adjoining both The Cedars and 3-Elk Run along the east sides, between these aforementioned subdivisions is approximately ten single-family units on what is locally known as Hidden Valley.

Rural homesites are located primarily in the valleys of West Elk Creek, Main Elk Creek and East Elk Creek and consist of working ranches of several hundred acres to seasonal homes on one-half acre tracts.

Most of the land within the planning area is privately owned; the only exceptions are 500 acres of Federal land administered by the Bureau of Land Management and small tracts owned by Town and County agencies.

SECTION 3. EFFLUENT LIMITATIONS

3.1 EFFLUENT LIMITATIONS FOR THE NEW CASTLE PLANNING AREA.

The Colorado Department of Health (CDOH) and the Environmental Protection Agency (EPA) are the two main regulatory agencies overseeing the wastewater treatment facilities within the planning area. Effluent standards for specified pollutants are outlined in discharge permits issued by the CDOH. The following discharge permits within the Planning Area are:

A) The Town of New Castle has a municipal discharge permit with limitations shown in Table 1, effective through August 31, 2000. The major change from the previous permit, which expired December 31, 1983, is the addition of an ammonia limitation.

B) Talbott's has a discharge permit with effluent limits shown in Table 2. This permit is good through June 30, 2001.

C) Riverbend Subdivision on the south side of the Colorado River is a lagoon facility and follows the effluent regulations set forth in Table 3.

D) Burning Mountain Subdivision, as of September 26, 1994, has been approved to discharge its wastewater flow, via lift station and force main, to the Town of New Castle.

TABLE 1

EFFLUENT DISCHARGE LIMITATIONS
TOWN OF NEW CASTLE

EFFLUENT PARAMETER	DISCHARGE LIMITATIONS MAXIMUM CONCENTRATIONS		
	30-Day Avg.	7-Day Avg.	Daily Max.
Flow, MGD	0.20 a/	N/A/	Report e/
5-day Biochemical Oxygen			
Demand (BOD_5), mg/l	30 a/	45 b/	N/A
Total Suspended Solids (TSS), mg/l	30 a/	45 b/	N/A
Total Ammonia as N, mg/l			
December-February and May	Report a/	N/A	N/A
March	23 a/	N/A	Report e/
April	19 a/	N/A	Report e/
June	3.0 a/	N/A	Report e/
July	2.7 a/	N/A	Report e/
August	2.9 a/	N/A	Report e/
September	3.1 a/	N/A	Report e/
October	4.0 a/	N/A	Report e/
November	6.5 a/	N/A	Report e/
Fecal Coliform Bacteria, Number/100 ml	6000 c/	12,000 c/	N/A/
Total Residual Chlorine, mg/l	N/A	N/A	0.025 d/
pH, su (minimum/maximum)	N/A	N/A	(6.5-9.0) d/
Oil and Grease, mg/l	N/A	N/A	10 d

TABLE 2

EFFLUENT DISCHARGE LIMITATIONS
MOUNTAIN SHADOWS SUBDIVISION/APPLE TREE PARK

EFFLUENT PARAMETER	LIMIT	RATIONALE
Flow, MGD	0.15[a]	Design Capacity
BOD_5, mg/l	30/45[b]	State Effluent Regulations
Total Suspended Solids (TSS), mg/l	75/110[b]	State Effluent Regulations
Fecal Coliform Bacteria, Number/100 ml	6000/12,000[e]	State Effluent Regulations
Total Residual Chlorine, mg/l	0.5[c]	State Effluent Regulations
pH, su (minimum-maximum)	10[c]	State Effluent Regulations
Oil and Grease, mg/l	Report	Discharge Permit Regulations

a 30-day avg.
b 30-day avg/7-day avg.
c Daily maximum
d Minimum-maximum
e 30-day geometric mean/7-day geometric mean

TABLE 3

EFFLUENT DISCHARGE LIMITATIONS
RIVERBEND SUBDIVISION

EFFLUENT PARAMETER	LIMIT	RATIONALE
Flow, MGD	0.01995[a]	Design Capacity
BOD_5, mg/l	30/45[b]	State Effluent Regulations
Total Suspended Solids (TSS), mg/l	75/110[b]	State Effluent Regulations
Total Ammonia	N/A	Water Quality Standards
Fecal Coliform Bacteria, Number/100 ml	6000/12,000[e]	State Effluent Regulations
Total Residual Chlorine, mg/l	0.5[c]	State Effluent Regulations
pH, su (minimum-maximum)	6.5-9[c]	State Effluent Regulations
Oil and Grease, mg/l	10[c]	Discharge Permit Regulations

a 30-day avg.
b 30-day avg/7-day avg.
c Daily maximum
d Minimum-maximum
e 30-day geometric mean/7-day geometric mean

SECTION 4. CURRENT SITUATION

SECTION 4.1 CONDITIONS IN PLANNING AREA

4.1.1 Planning Area Description. The New Castle planning area lies within the semi-arid, rugged mesa country of Western Colorado. The Colorado River and a minor tributary, Elk Creek, flow through the planning area. Interstate 70, Highway 6 and the Southern Pacific Railroad parallel the Colorado River on its north bank.

Most of Western Colorado lies within two major physiogeographic provinces: The Southern Rocky Mountain Province, characterized by rugged mountains and deep V-shaped valleys, and the Colorado Plateau Province, best described as a land of high mesa and plateau dissected by deep canyons and wide valleys. A description of New Castle's environmental setting is complicated by its location at the borderline between the two physiogeographic provinces of Western Colorado. This factor and the deep erosion by the Colorado River have resulted in a complexity of geology, topography, soils, climate, and flora and fauna, which is a mixture of the two provinces.

4.1.1.1 Geology. Geologically speaking, the New Castle area lies along the southern flank of the White River Plateau, an uplift of horizontal Paleozoic sedimentary rocks. The rock formations of the White River Plateau fold down sharply along its southern and western edges; and erosion has revealed a mosaic of rock formations. The most notable geological feature resulting from these processes is the long, monoclinal ridge known as the Grand Hogback, which borders the western and southern boundaries of the planning area. The Grand Hogback separates Rocky Mountain Province to the east from the Colorado Plateau to the west. The Grand Hogback is comprised of harder, more erosion resistant formations, the most significant of which is the Mesa Verde sandstone. The Mesa Verde group outcrops just south of the course of the Colorado River and east of New Castle. This formation contains what has been productive coal deposits; however, area mines have been hindered by steeply dipping beds and numerous coal fires. Rock formations that have been exposed northwesterly of the Grand Hogback include Mancos Shale, Dakota Sandstone, Morrison formation and two undivided formations of Triassic and Jurassic origin.

4.1.1.2 Topography. General topography of the area is characterized by steep, rocky mesas and narrow alluvial valleys. Most of the New Castle 201 planning area is situated within the valley floors or ancient flood terraces of the Colorado River and Elk Creek. The Talbott Farms development is built on an outwash fan of Alkali Creek adjacent to the Colorado River. The surrounding hillsides are too steep and rocky for development. Elevations range from 5500 feet on the Colorado River and 5900 on the upper part of East Elk Creek to 6500 feet on the Grand Hogback.

4.1.1.3 Soils. Soils in the planning area are representative of the geology, topography and climate. The soils found along main drainage ways have been washed into place and the majority are alluvial and alluvial-colluvial in nature. They are derived from a variety of parent material, only a small proportion have formed in place. Texture ranges from sandy to clay loam; pH is typically alkaline. The Soil Conservation Service has mapped the soils in the planning area and detailed descriptions and maps are available from that agency.

4.1.1.4 Climate. The climate of New Castle is typical of that of the Colorado Plateau of Western Colorado, which could be termed a high-land climate of a continental location.

Characteristic features are low relative humidity, abundant sunshine, light rainfall, moderate to high wind movement and large daily range of temperatures. Information from the two closest weather stations, Glenwood Springs (Table 4) which is 12 miles east, and Rifle (Table 5) which is 14 miles west, was used to approximate the average annual precipitation and temperature ranges. Annual precipitation averages to be 14.31 inches, of which about 1/3 is snow. Monthly average temperatures range from 23.3°F in January to 69.8°F in July.

TABLE 4
GLENWOOD SPRINGS

	Temperature (degrees F.)	Precipitation (inches)	
	Average	Average	Avg. Ttl. Snowfall
January	23.8	1.46	18.1
February	29.4	1.31	12.2
March	37.5	1.37	7.2
April	46.3	1.62	2.0
May	55.0	1.39	0.3
June	63.1	1.12	0.0
July	69.3	1.28	0.0
August	67.6	1.53	0.0
September	59.8	1.51	0.0
October	49.1	1.44	1.2
November	35.9	1.12	14.9
December	25.6	1.30	14.9
TOTAL	---	16.55	61.5

Average number of days per year with at least 1" of snow on the ground: 28

TABLE 5
RIFLE

	Temperature* (degrees F.)	Precipitation* (inches)	
	Average	Average	Avg. Ttl. Snowfall
January	22.7	0.90	13.5
February	29.2	0.73	8.5
March	37.4	0.70	4.6
April	46.4	0.83	1.8
May	55.8	0.82	0.0
June	63.7	0.88	0.0
July	70.1	0.82	0.0
August	68.1	1.32	0.0
September	59.9	1.03	0.3
October	49.0	1.27	0.8
November	35.9	0.85	5.9
December	24.7	1.10	14.5
TOTAL	46.9	11.25	49.9

* Recorded in the period 1951-1974 at Rifle, Colorado.

4.1.1.5 Hydrology. Hydrology of the area is concerned primarily with flow in the Colorado River, its tributary to the north -- Elk Creek (and its tributary -- East Elk Creek), and a second tributary creek across the river to the south, Alkali Creek.

The Colorado River at New Castle (below Elk Creek) has a drainage area of 6,300 square miles. The flow is derived primarily from mountain snowmelt with some input from summer and fall rainstorms. Flow records are available for the Colorado River from USGS recording stations at Glenwood Springs, Cameo and New Castle. Average flow of the Colorado River at New Castle, based on record from 1968 through 1972, is 3500 cfs. The Water Quality Management Plan for the Colorado River has calculated the 7-day, 10-year low flow at New Castle as 1365 cfs.

Elk Creek is a perennial stream with a drainage area of 177 square miles. Stream gauging stations in Elk Creek were operated from April 1922, to September 1924, and from October

1954, to September 1960. The maximum recorded discharge of 1770 cfs occurred on June 10, 1957. Flows of less than 5 cfs were often recorded in late summer and fall seasons. There were several upstream municipal and irrigation diversions which contribute to the low flows. Elk Creek drains the southern escarpment of the White River Plateau and derives much of its water from snowmelt.

Alkali Creek, which flows through Talbott's on the southern side of the Colorado River, has a drainage area of 15 square miles. It is an intermittent stream which drains the lower lying mesas and derives its water from summer rainstorms and spring snowmelt. The 100-year discharge for this creek is approximately 1290 cfs.

The 100-year flood flows on the Colorado River and Elk Creek are estimated to be 41,000 cfs and 4000 cfs, respectively. Flood studies are discussed in more detail in paragraph 4.1.5.7.

4.1.2 Organizational Context. The private developments which are within the study area, but outside the Town limits (including Mountain Shadows Subdivision/Apple Tree Park, Riverbend Subdivision, Elk Creek Village, Camp Christian, KOA Campgrounds and individual homes along Elk Creek and East Elk Creek) are presently assuming responsibility for planning, financing and operation of their own treatment works. All of the private developments must operate within the framework of applicable requirements of the pertinent regulatory agencies, which include Garfield County and the State of Colorado.

4.1.3 Economic, Demographic, and Land Use Data.

4.1.3.1 New Castle. New Castle's early economy was based on coal mines which are now inoperative, thus leaving the Town with no major industry. It has subsisted since as a small trade center for the surrounding agriculture community; and prior to construction of Interstate I-70, obtained trade from tourist traffic on old Highway 6. However within the last five years shifting demographics has transformed New Castle into a home for many who work in the wealthier communities of Aspen, Glenwood, and Vail. In addition to this, because of its rural location, relatively mild climate and proximity to the Colorado mountains, New Castle has received a small influx of former urban dwellers seeking a simpler lifestyle.

A new elementary school is being constructed within the Town limits in the Castle Valley Ranch Subdivision. The building will have the capacity for approximately 470 students in grades Kindergarten through 3. Students in grades K through 8 are currently attending the other elementary school located on the western side of Elk Creek inside the Town limits; its capacity is approximately 800 students. Upon completion of the elementary school being constructed, a total of 1270 student capacity will be available with the two buildings combined. High school students meanwhile, are bused to Rifle.

The population and financial impact on New Castle to date has been substantial. Population within the Town area grew from an estimated 698 in 1990 to 1460 in 1995 (Special Field Count, Nov.,1995). Prior to 1990 the population was fairly stable at about 560 (June, 1979). Students attending the New Castle schools that are bussed in from outside Town have been considered in on ultimate population figures and wastewater flows.

With respect to community financial obligations, the Town of New Castle is in relatively good shape compared to other small Western Colorado Communities. As of January, 1996 the Town has two small loans totaling approximately $77K, and is current on all payments.

However, the growing economy of New Castle's commercial sector and it's broadening tax base should provide New Castle with the means necessary to partially fund a plant upgrading.

Town residents currently pay $16/month for water, and $14/month for sewer.
At this time, the Town follows a comprehensive land use plan. A zoning ordinance is in effect, which provides guidelines for the development types as follows:

LAND USE POTENTIAL - FUTURE (Draft) Nov. 1995	
LAND USE PLAN DESIGNATIONS	
AR	Agriculture-Resource: 1 du/10-Acre lot; Uses: Agriculture, mining, outdoor recreation.
OSAR	Open Space Agricultural-Residential: 1 du/2-5 Ac. lot; Uses, w/Open Space areas: agriculture, outdoor recreation.
OSRR	Open Space Rural Residential; 1 du/1-2 Ac. lot; Uses, w/Open Space areas: limited agriculture.
CLDR	Cluster Low Density Residential: 1 du/Ac. Density Rate; Uses: Clusters of 5-10 w/Open Space and Parks around.
CMDR	Cluster Medium Density Residential: 1 du/Acre density rate; Uses: Cluster of 5-10 w/Open Space or pasture around.
CR	Commercial Recreation: Lodges, campgrounds, golf driving range.
C	Commercial: business, retail, service.

Further Designations are shown on the Land Use map Figure 2.

The original Town has developed in a series of rectangular blocks in spite of the topographic definition of the area. The result is that blocks dead end at the bluff to the north or at the highways and railroad tracks to the south. More recently, development has extended into the Elk Creek valley area to the northwest and to the north of the old town. The majority of new homes have been constructed in subdivisions throughout the Town. This has nearly completed the development of the original community; and the number of vacant, undeveloped housing sites which do not have topographic problems are becoming limited.

4.1.3.2 Rural Areas -- Subdivisions, Camps and Individual Homes.

Mountain Shadows Subdivision/Apple Tree Park has 284 mobile home spaces which include an 85 unit PUD approved in 1977. Mountain Shadows, to date, has been fully built out. All spaces in Apple Tree Park are rented, although a few remain to be occupied. The present number of dwelling units at Talbott's is about 370 (Nov. 1995 Count). Future growth on 10 acres to teh north could be possible, supporitng multi-family housing with densities upwards of eight to ten D.U./Acre or 80 to 100 D.U.

Elk Creek Subdivision has 81 platted lots, with 65 developed sites. For all intents and purposes, Elk Creek Subdivision is built out.

Riverbend Subdivision has approximately 45 units built with another 20 units planned to be constructed.

The Cedars PUD has 10 platted lots. 3-Elk Run Subdivision has 14 platted lots.

The KOA Campground has 60 campsites. Camp Christian has accommodations for about 150 children. Both camps are in use only seasonally.

The estimated present population for the rural areas of the planning area are as follows: (Nov, 1995).

TABLE 7
POPULATION OF RURAL AREAS

AREA	DWELLING UNITS	PERSONS PER DWELLING UNIT	POPULATION
Mountain Shadows/Apple Tree	284	2.77	786
Elk Creek Subdivision	65	2.77	180
Riverbend Subdivision	65	2.77	180
Cedars Subdivision	10	2.77	28
3 Elk Run Subdivision	14	2.77	39
Rural Homes	47	2.77	130
TOTAL	485	2.77	1343

Garfield County has developed a comprehensive land use plan for the rural areas of the County. With the aforementioned platted subdivisions, and federal lands, all the land within the planning area outside the incorporated limits of New Castle is zoned A/R/RD (Agriculture/Residential/Rural Density). This zoning allows agriculture uses and residential dwellings in minimum lot sizes of two acres. Other uses are allowed by conditional and special uses.

Significant portions of the undeveloped rural land is presently in agriculture production, generally in tracts of 10 acres or larger. On East Elk Creek, several of the larger tracts were subdivided into smaller tracts of approximately ½ acre in the early 1950's prior to the more stringent subdivision regulations. Many tracts are still undeveloped.

4.1.4 Water Usage and Quality. Water usage, existing water quality and stream classification and water flows are all of major importance in analysis of a facilities plan.

Major beneficial uses made of Elk Creek, East Elk Creek and the Colorado River within the New Castle 201 planning area are summarized as follows:

TABLE 8
WATER USES

DESCRIPTION	Colorado River	Elk Creek	East Elk Creek
Municipal and Industrial	O	X	X
Crop-Irrigation	X	X	X
Livestock and Dairy	X	X	X
Recreation (No Contact)	X	X	X
Recreation (Primary Contact)	O	O	O
Warm Water Fish	X	O	O
Cold Water Fish	X	X	X
Aquatic Habitats	X	X	X
Migration	X	O	O

Because of intermittent flow and poor water quality, no beneficial uses have been assigned to Alkali Creek, the only other drainage in the area.

A public water system supplied by surface flows from East Elk Creek services the Town. Treatment is by pressure filtration and chlorination. In 1995, considering all uses and committed taps, demand on the water supply is at 761 EQR. An EQR, in New Castle, is defined as 525 gallons per single-family residence unit per day. Water quality is generally excellent.

Mountain Shadows Subdivision/Apple Tree Park and Riverbend Subdivision on the southern side of the Colorado River are served by private water systems which includes wells, treatment and distribution systems. The other private developments in the study area have tied onto New Castle's water system (e.g., Elk Creek Village, 3-Elk Run, The Cedars and Hidden Valley). The nearest intake for a municipal water supply downstream is at Silt, seven miles downstream on the Colorado River.

To aid in management of water quality, the Colorado Water Quality Control Commission has classified surface waters into four categories according to use: A1, A_2, B_1 and B_2. Table 9 summarizes the standards established for each category. The Colorado River in the vicinity of New Castle and East and Main Elk Creek are all classified B_1.

TABLE 9

COLORADO WATER QUALITY STANDARDS SUMMARY				
	A_1	B_2	B_1	B_2
	Suitable for all Uses Including Primary Contact Recreation		Suitable for all Uses Except Primary Contract Recreation	
Dissolved Oxygen	6 mg/l minimum	5 mg/l minimum	6 mg/l minimum	5 mg/l minimum
pH	6.5 - 8.5	6.5 - 8.5	6.0 - 9.0	6.0 - 9.0
Temperature	68°F maximum Maximum change 2°F	90°F maximum Maximum change: Streams, 5°F; lakes 3°F	68°F maximum Maximum change 2°F	90°F max. Max. change: streams 5°F, lakes 3°F
Oil & Grease	Cause a film or other discoloration	Cause a film or other discoloration	Cause a film or other discoloration	Cause a film or other discoloration
Fecal Coliform	200/100 ml	200/100 ml	1000/100 ml	1000/100 ml
Fecal Streptococcus	20/100 ml	20/100 ml	---	---
Turbidity	No increase 10 JTU	No increase 10 JTU	No increase 10 JTU	No increase 10 JTU
Radioactive Material*	Radium - 226 (3 micro microcures per liter) Strontium - 90 (10 micro microcures per liter)			
Toxic Materials	Free from	Free from	Free from	Free from
* Drinking Water Standards				

Information on existing water quality in the Colorado River and Elk Creek was obtained from various sources, including the Colorado Department of Health and the EPA. A knowledge of present water quality is important in defining existing problems, locating sources of pollution over a selected segment of river or stream, and monitoring changes. Although both the Colorado River and Elk Creek have a high quality of water at the headwaters, a gradual downstream degradation occurs on both water courses. Water quality varies seasonally with snowmelt; during spring runoff (or following general rains) turbidity is high and salinity is low; in late fall, as the river drops, the reverse situation occurs.

Water quality parameters which are most useful for monitoring purposes are those which can generally be attributed to municipal wastewater discharges and/or directly affect stream biota; these include nitrates, phosphates, ammonia, fecal coliform, BOD, dissolved oxygen and pH.

The Colorado River Water Quality Management Plan developed wasteload allocation of critical parameters for the Colorado River. Computer modeling revealed that ammonia toxicity is the controlling factor for determining wasteload allocations for the stream segments an that allowable summer NH_3-N concentrations are well above those predicted to result from development along the Colorado River.

4.1.5 Other Existing Environmental Conditions. The purpose of this section is to provide background information on general ecology: wetlands, floodplains and other environmentally sensitive areas such as air quality, noise levels, energy production and consumption, and historic and archaeological sites. Specific impacts, if any, will be discussed during evaluation and selection of the final plan.

Information on general ecology of the planning area was obtained primarily from governmental agencies administering the public resources of the region (notably Bureau of Land Management and Division of Wildlife) and from previous, more comprehensive Environmental Impact Statements prepared by others. This information was supplemented by review of the technical literature and field reconnaissance. Much of the information is not specific to New Castle; however, it does apply to the general biome or life zone and physiogeographic province. Most of the data has been summarized below; more complete information can be found in listed references.

4.1.5.1 Vegetation. The New Castle planning area falls within both the Desert-Sierozem and Lower Montane life zones. Natural vegetation has been greatly altered by grazing and other man-related activities. Large portions of the bottomlands have been cultivated and seeded with alfalfa, pasture grasses and legumes. Other areas have experienced an earlier disturbance and are in varying stages of succession. The five major plant associations that naturally occur in the region are Flatbrush, Cottonwood, Big Sagebrush, Greasewood and Pinyon Juniper. Ecosystem dynamic of the natural communities have been affected by several invader species, the most prevalent being cheatgrass, tamarisk, sweet clover and Russian Olive. No known rare or endangered plants are known to occur within the immediate planning area.

4.1.5.2 Terrestrial Wildlife. Because of the wide range of topography and elevation, the New Castle planning area provides suitable habitat for a diverse group of wildlife. The BLM office in Glenwood Springs has prepared a list of animal species found in the general region. It should be emphasized that although most of these species are adapted to living in the planning area, disturbances by man and releatively high human population density have changed natural distributions of the animals, and population densities for many of the species would tend to be reduced locally. Many of the animal species are found seasonally or intermittently only. A list of known animal species is given in the references. The planning area contains no known endangered spcies; however, blackfooted ferret and peregrine falcon are known to occur in habitats similar to those found in the planning area.

4.1.5.3 Aquatic Wildlife. The Colorado River adjacent to the planning area, although classified as a 'cold-water fishery' (B_1), is not considered to be an important sport fishery. This is primarily due to its heavy silt load an degraded habitat. The fish species known to occur, or thought to occur, in the Colorado River in Western Colorado are listed in the references. Two threatened species, the humpback chub Colorado squawfish, and one endangered species, the humpback sucker, are thought to inhabit the Lower Colorado River. The bony-tail chub is extremely rare in this region and may be classified 'endangered'.

Elk Creek and East Elk Creek are classified as cold water fisheries and the upper regions are know to contain rainbow trout, brook trout, cutthroat trout and brown trout. Lower sections of Elk Creek have been adversely affected by stream diversions and manmade disturbances. State authorities have been contacted on these subjects and correspondence is included in the Appendix.

The Colorado Department of Health has prepared an inventory of invertebrate biota of the Colorado River from Glenwood Springs downstream to the state line. It indicated that a diverse group of invertebrates occur within this segment, with the predominant types being those invertebrates adapted to slow moving waters and fine sediments.

4.1.5.4 Historical and Archaeological Sites. No unique archaeological or historical sites of significance are known to be located in the planning area. State authorities have been contacted on these subjects and correspondence is included in the Appendix.

4.1.5.5 Air Quality and Noise. Occasional inversions are known to occur in the immediate vicinity. The only present sources of air pollution are from vehicular traffic, with the most noticeable being dust generated by traffic on unpaved roads, or farm machinery in newly-tilled fields. Air pollution is not considered a significant problem in the study area.

There are no town or county noise ordinances. Excessive noise is not considered a significant problem in the study area, the most noticeable being generated by traffic passing through on I-70 and the railroad.

4.1.5.6 Environmentally Sensitive Areas. There are no environmentally sensitive areas, such as wetlands or wildlife breeding grounds at the existing treatment plant site. However, because the current planning area contains serveral square miles and has a major river flowing through it, there are known to be some areas of wetlands, fisheries and certain wildlife habitat.

4.1.5.7 Floodplains. In July 1986, a Flood Plain Management Study for the Colorado River Tributaries was published as prepared and conducted by the U.S. Department of Agriculture, Soil Conservation Service of Denver, Colorado. This study had been prepared in cooperation with the Colorado Water conservation Board, Town of New Castle and Garfield County, Colorado. This study is more commonly, and herein after referred to, as the "SCS Study". Additionally, in January 1986, the Federal Emergency Management Agency (FEMA) published the Flood Insurance Study for Garfield County, Colorado, Unincorporated Areas. This study is more commonly, and herein after referred to, as the "FEMA Study". Flood boundary maps have been prepared for the study area in both studies.

From the FEMA study, the 100-year flow at New Castle, for the Colorado River, has been estimated to be 41,000 cfs. The 50-year flood was projected to be 34,800 cfs. Put another way, there is one percent (1%) chance that a flow of 41,000 cfs will be equaled or exceeded in any given year, and a two (2%) chance for a flow of 34,800 cfs or greater will be equaled or exceeded in any given year.

From the SCS study, the 100-year flow at the mouth of Elk Creek in New Castle, for Elk Creek, has been estimated to be 5,200 cfs. The 50-year flood was projected to be 4,200 cfs.

The 100-year flow on Alkali Creek, which has a drainage area of 14.4 square miles, was estimated to be 1290 cfs and 1090 cfs for the 50-year flow. Both figures were obtained from the SCS study.

The present New Castle wastewater treatment plant site is potentially subject to flooding from both the Colorado River and Elk Creek. For most of the river within the study area, the

embankment for I-70 provides an effective barrier between the Town and the 100-year floods on the Colorado River; however, flood crests will back up under the I-70 bridge over Elk Creek and into the treatment plant site during the 100-year flood. The SCS Study has estimated that backwater flooding will reach a flood crest of 5535 feet at the plant site during the 100-year flood; this crest will inundate the treatment plant site during the 100-year flood; this crest will inundate the treatment plant site to a depth of approximately three feet. It is estimated that the 100-year flood on Elk Creek will result in a flood crest of 5333 feet at the plant site. Flood depths from Elk Creek are calculated on the assumption that debris will not block the bridge on I-70. The Wright Water Engineers' report of 1996, indicated that the two highway bridges and the railroad bridge are not significant flood flow constraints for Elk Creek. There are no other utilities, facilities, or buildings that will be subject to flood inundation or damage during the 100-year floods on the Elk Creek or the Colorado River in the New Castle vicinity.

Neither the SCS STudy nor the FEMA Study consdiered simultaneous effects of flooding from both Elk Creek and the Colorado River. It is highly improbable that peak crests would occur together on the two water courses; however, we have assumed, as a safety factor, that Elk Creek will contribute to another one foot rise in backwater flood levels during flooding on the Colorado River. This would put the crest at 5536.0, about four feet over the top of the concrete walls on the plant.

Flooding potential at the Talbott lagoon site was based on an analysis of estimated 100-year flood profiles at that site and the estimated height of the present lagoon berm. From this analysis, it appears that the embankments are above the 100-year flood crest; however, flood velocities at this site are estimated to be high enough that erosion damage could occur to the embankments unless they are protected by riprap. No damage to buildings or utilities' facilities are expected from the 100-year flood on Alkali Creek.

4.2 FACILITIES EVALUATION

EXISTING SYSTEMS AND WASTEWATER FLOWS

Three systems within the planning area discharge effluent to a surface water source. Each of these is required therefore by the state to follow guidelines set in a discharge permit. A discharge permit provides a great deal of information about these three wastewater treatment systems. Following the information given in the most recent discharge permits and where acceptable changes not reflected in these permits has been provided below for existing treatment systems and wastewater flows. (Complete discharge permits for these individual systems can be found in Appendix 1.)

4.2.1 NEW CASTLE

4.2.1.1 *Lift Stations:* Burning Mountain Subdivision owns a lift station which pumps 0.115 MGD at peak daily flow to the Town's treatment facility.

The RE-2 School District owns one lift station that pumps wastewater to the collection system from the New Castle Elementary School which is just west of Town. This station has a pump capacity of 30 gpm (43,200 gpd) and is operating at a daily average flow of 11,000 gpd.

4.2.1.2 *Treatment Facility:* The wastewater collection system for the Town of New Castle was constructed in 1952 and consisted of vitrified clay pipe. The facility consists of a mechanical type wastewater treatment facility consisting of velocity controlled grit chambers, manually cleaned bar screens, extended aeration type secondary treatment, secondary clarifier, chlorination, dechlorination, aerobic digester and sludge drying beds. Figure 1 shows a layout of the existing facilities.

The capacity of the treatment facility is summarized in Table 10.

TABLE 10
EVALUATION OF TREATMENT FACILITY
NEW CASTLE, COLORADO, 1996

Unit Process	Unit Process Features/Description	Capacity Hydraulic/Organic
Grit Removal	Two parallel channels 45' x 12" with Parshall flumes at outlet ends to control the had and thus the velocity.	0.5 MGD (Peak Flow)
Influent Flow Measuring	Two 3" Parshall flumes with recorders	0.018 to 0.5 MGD each Recommended Range
Bar Screen	One course and one fine bar screen in a 24" channel with course screen	0.5 MGD (Peak Flow)
Aeration Basin Capacity	30' x 30' x 15' depth, Volume = 101,000 gallons, Minimum t_d = 18 hours for the extended aeration mode.	0/135 MGD
Aeration	Fixed surface aerator, 15 HP motor, FTR = 23.4 lbs. O_2/hr, 1.2 lbs. O_2/lb BOD_5 applied in the extended aeration mode.	465 lbs. BOD_5/day
Clarifier	25' diameter, 10' SWD, 4' diameter center well Volume = 37,000 gallons, Minimum t_d = 3 hours, Average Daily SOR = gpd/ft^2 (limiting factor)	0.285 MGD
Chlorination	150 lb. gas cylinders, 0 to 10 lb/day regulator, Dosage = 6 mg/l 180 lbs O_2/day	0.20 MGD
Chlorine Contact Chamber	Old Imhoff tank, Volume = 16,400 gallons, t_d = 30 minutes	0.8 MGD (Peak Flow)
Effluent Flow Measuring Device and Recorder	45° V-notch weir, Height = 8.5"	0.012 to 0.28 MGD Recommended Range
Dechlorination	150 lob SO_2 gas cylinders, 0 to 10 lb/day regulator	0.20 MGD

4.2.2 MOUNTAIN SHADOWS SUBDIVISION/APPLE TREE PARK

4.2.2.1 *Infiltration/Inflow (I/I):* No infiltration/inflow problems have been documented in the service area.

4.2.2.1 *Lift Stations:* There is one small lift station located at the upper end of the service area which serves three houses. Two ½ HP pumps, rated at 27 gpm each, pump from a 580-gallon wet well. Since flows have not been measured at the lift station, an assessment of the station's available capacity cannot be made.

4.2.2.3 *Treatment Facility:*

History and Description of Existing Treatment Facility: An existing history of the facility was listed in the rationale for the previous permit and that document should be referred to for background information.

A flow diagram of the existing facility is shown in Figure 3 of the permit. The facility consists of an influent Palmer-Bowlus flume, two aerated lagoons with surface aerators, hypochlorination, a chlorine contact chamber, and an effluent V-notch weir prior to discharge to the Colorado River.

Capacity Evaluation: The Division's evaluation of the capacity of the treatment facility is on file and is summarized in Table 11.

TABLE 11
EVALUATION OF TREATMENT FACILITY
TALBOTT'S

Unit Process	Unit Process Features/Description	Capacity Hydraulic/Organic
Influent Flow Measuring	8" Palmer-Bowlus flume with recorder	0.005 to 0.445 MGD Recommended Range
Lagoon #1	Volume = 1,700,000 gallons Depth = 5'- 8', t_d = 11 days	0.15 MGD
Aeration	1-3 HP and 1-10 HP surface units FTR = 1.5 lbs./O_2/ HP-hr	235 lbs. BOD_5/day
Lagoon #2	Volume = 1,500,000 gallons, Depth = 5', t_d = 10 days	0.15 MGD
Aeration	1-3 HP surface unit, FTR = 1.5 lbs./O_2/ HP-hr	55 lbs. BOD_5/day
Polishing Pond	A quiescent area is provided at the outlet end of the second lagoon	N/A
Chlorination	0.3 gph solution feed pump	0.15 MGD
Chlorine Contact Chamber	4' diameter pipe, 31' long Volume = 2,900 gallons t_d = 28 minutes	0.15 MGD
Effluent Flow Measuring	90° V-notch weir	0.029 to 0.35 MGD Recommended Range

Discussion of Capacity: Site Application #1705 for this facility was approved on July 16, 1974, for a hydraulic capacity of 0.15 MGD, but no organic capacity was specified. The initial design review was completed on November 17, 1976. An evaluation completed on conjunction with the previous permit renewal in 1989 showed that 0.15 MGD with an organic loading of 315 lbs. BOD_5/day could be adequately treated. These respective values will also be used as the hydraulic and organic capacities for this renewal.

4.2.3 RIVERBEND SUBDIVISION

4.2.3.1 *Infiltration/Inflow (I/I):* No infiltration/inflow problems have been documented in the service area.

4.2.3.2 *Lift Stations:* There are no lift stations in the service area.

4.2.3.3 *Treatment Facility:*

Background and History: The new WWTF is to replace an existing 2-cell lagoon system which had no surface discharge and was not permitted. The existing facility does not have sufficient capacity to treat wastewater for all of the platted lots in the subdivision.

On May 23, 1994, Riverbend was granted site approval for a lined 3-cell lagoon with chlorination.

Capacity Evaluation: The Division's evaluation of the capacity of the treatment facility is on file and is summarized in Table 12.

(See next page for Table 12)

TABLE 12
EVALUATION OF TREATMENT FACILITY
RIVERBEND SUBDIVISION

Unit Process	Unit Process Features/Description	Capacity Hydraulic/Organic
Influent Flow Measuring Device and Recorder	2" Parshall flume with recorder	0.005 to 0.303 MGD
Aeration Basins		
Cell #1	Volume = 178,720 gallons t_d = 9 days 25.4 lbs. BOD_5/day Removed	
Cell #2	Volume = 178,720 gallons, t_d = 9 days 5.8 lbs. BOD_5/day Removed	0.01995 MGD 36 lbs. BOD_5/day (combined)
Aeration		
Cell #1	2-3 HP "Tornado" aerators 180 lbs O^2/day	
Cell #2	2-3 HP "Tornado" aerators 180 lbs O^2/day	240 lbs BOD_5/day (combined)
Clarifier	Volume = 50,365 gallons t_d = 2.5 days	
Chlorine Contact Chamber	Volume = 667.3 gallons t_d = 48.2 minutes	0.0321 MGD
Effluent Flow Measuring Device and Recorder	2" Parshall flume	0.005 - 0.303 MGD

4.2.4. KOA CAMPGROUND

4.2.4.1 Sewage Collection System. There is no collection system at the KOA Campground since there are not individual hookups at the different campsites. The campground has a central bathhouse which contains five water closets, one urinal, eight lavatory sinks and six showers. All sewage from the bathhouse flows to the treatment plant located about 10 feet away. The treatment consists of an extended aeration plant with subsurface disposal. Information from an old design drawing indicated that the plant includes two concrete tanks placed in a series. The first tank, part of an original septic tank system, has a 4000 gallon aeration compartment; the second concrete tank has a 3400 gallon aeration compartment followed by a settling compartment with a hopper bottom and plan dimensions of 10 ' x 7.5'. Aeration is by diffused air.

Effluent is to a subsurface dry well and seepage bed installed in 1975. The drywell serves as an additional settling tank and observation manhole prior to discharge to the seepage bed. A Garfield County permit issued in 1976, indicates the seepage bed has dimensions of 12' x 75' x 3'. The campsite had a dump station for recreational vehicles but wastes from this are hauled by the Owner to a disposal site near Rifle.

4.2.4.2 Wastewater Characteristics. No information is available on actual wastewater flows or wastewater characteristics. The campground has 60 campsites. According to state ISDS regulations, and a typical wastewater discharge for campgrounds of 50 gallons per camp site, maximum flow would be 4500 gpd. Two on-site caretakers would add 120 gpd. The campground is filled only on weekends and operates from approximately April or May to September or October, depending on weather.

4.2.4.3 Plant Performance. With estimated peak flows on weekends of 4500 gpd, the detention in the aeration tank is 32 hours. The settling tank was calculated to have an overflow rate of 360 gpd/ft^2 during the maximum hour on the maximum day. No information is available on performance or operation of this plant. However, it appears to have more than sufficient capacity (approximately 50% greater than needed) and should be capable of performing satisfactorily under the present loading. No modifications or improvements are recommended for this particular plant. The operator is licensed and appears to be doing a conscientious job of operation. The treatment system is approved by the County, and the County Sanitarian has stated that the system is operating as expected and is not creating any health problems. The Owner does not anticipate any expansion of the campground. There is sufficient area in the campground site to expand the leaching field if necessary.

4.2.5 Camp Christian

4.2.5.1 Sewage Collection System and Wastewater Flows. The Camp Christian treatment system consists of several septic tanks and leaching fields serving the different buildings which include a main dining hall and lodge, a boys' bathhouse, a girls' bathhouse and a caretaker's cabin. No information is available on size and capacity of the septic tanks and leaching fields. The caretaker and owners were unaware of sizes and locations and there are no engineering drawings. Since 1977, leaching fields for the dining room and girls' bathroom have been replaced in accordance with County requirements and the septic tanks have been pumped. No information is available on wastewater flows. The camp includes 10 lavatory sinks, 16 toilets, 16 bathing facilities and one washing machine. Estimated annual usage is 150 children from mid-June to mid-July; and 100 children a week or two in late July.

4.2.5.2 Plant Performance. No information is available on the treatment capacity or performance of the septic tank/leaching field system at Camp Christian. The County closely monitors this operations and considers it to be satisfactory. The owners of the camp have demonstrated a willingness to cooperate fully with the County on all their health problems and have sufficient land area to remedy any problems.

4.2.6 Individual Septic Tanks.

4.2.6.1 Sewage Collection System. Individual on-site septic tanks and leaching fields or seepage pits are used for disposal in the Elk Creek Development Subdivision, and at the rural homes located along Elk Creek and East Elk Creek. Most of these installations were put in before Garfield County required permits and there is very little information on the sizes and types of the systems. Almost al the individual homes are located on the alluvial valley of Elk Creek and East Elk Creek and are quite widely spaced. Typical lots in Elk Creek Development Subdivision have dimension of about 110' x 65' (although there is considerable variation). This development is located on a hillside above the Elk Creek Valley.

4.2.6.2 Plant Performance. The County Sanitarian thought that all septic tanks serving rural homes were operating properly. Roadside observation indicated most rural homes have sufficient lot size and suitable terrain for leaching fields. However, he indicated that problems may develop in the relatively high density Elk Creek Subdivision, and particularly in that area where the trailer homes are constructed. Lots here tend to be smaller and if any of the leaching fields do fail, there may not be room to expand. Information on percolation tests was available for only one or two homes in the area. The Sanitarian thought that percolation tests generally ranged from about one inch in 3 minutes to 1 inch in 45 minutes.

A review of Soil Conservation Services detailed soils maps for the planning area indicates that conditions are quite variable with respect to soil permeability, rock depth, groundwater and slope. This is due to the considerable variations in topography and elevation crated by the erosive forces of Elk Creek and the Colorado River and large number of different rock formations in the area. No general conclusions can be made concerning feasibility of on-site disposal systems; each system must be evaluated separately.

4.2.7 Summary of Existing Flows. A summary of estimated present hydraulic and organic loading for the treatment system along with the theoretical plant capacity has been compiled and is shown in Table 13. It should be noted that the figures are not exact replicas of the wastewater flows and wastewater characteristics that have been measured and reported. Some of the data available is limited and, thus, is unlikely to exactly represent actual values; therefore, the measured values have been modified to reflect not only actual flow, but also the engineer's prior experience and knowledge of flows from typical small communities. Generally speaking, this results in a more conservative analysis. The values shown were used to evaluate theoretical capacity of existing treatment units and as a basis for projecting future waste loads.

Per capita flows in New Castle are relatively high because of infiltration and fixture "flow through"; however, BOD_5 concentrations are low because of infiltration and because of a high proportion of older, lower income people with fewer water-using appliances and equipment. At Talbott's low infiltration and absence of an on-site school are probable bases for lower per capita flow. Day-to-day flow variations are expected to be negligible in both communities and in rural residential areas.

In the absence of sufficient flow data to determine actual figures, maximum day was estimated as 1.1 times average day. In New Castle, maximum hour to average hour ratios were estimated at 1.75:1; in Talbott.s and other rural areas, which have a higher percentage of working people on fixed schedules, a ratio of 2:1 was used.

TABLE 13

EXISTING WASTEWATER LOADS								
Area	Avg. GPCPD	Avg. GPD	Max. GPD	Max. Hr. GPH	BOD_5		Population Equivalent***	Estimated Existing Capacity
					#/cap/d	#/day		
New Castle	.105 (45)*	63,000	70,000**	4,600	. 0.14	84.8	606	103,000 gpd
Talbott's	55 (45)*	58,000	64,000	5,300	0.27	174.0	1,056	70,000 gpd ***
KOA Campground	30	2,750	5,520**	570	0.08	15.0	184	7,400 gpd
Camp Christian	35	5,250	5,250**	660	0.12	18.0	150	----
Ind. Homes	65	220	300**	50	0.17	0.6	249 (total)	----

( )* Indicates estimated amount of total flow that is wastewater.

** June, 1979

*** Assumes no aerators in second cell.

SECTION 5. FUTURE SITUATION

5.1 DEMOGRAPHIC AND ECONOMIC PROJECTIONS

The facility planning period has been extended 20 years beyond the date when the planned facilities could be scheduled to begin operation (approximately 1997). Proposed improvements are based on potential future population values. It also is based upon the incorporation with New Castle, of privately owned community treatment systems.

Population growth in Western Colorado is directly tied to growth of the region's economy. The major basic industries in Garfield County are construction, tourism and agriculture. The force which has the greatest potential for stimulating the economy and population of the New Castle area is affordable land and housing located along the I-70 corridor.

Selecting accurate population projections is one of the most difficult, yet essential, aspects of a facility plan. In preparing the facilities plan two key resources were utilized. The first being U.S. Census data taken from a housing count in 1990. The second, and one in which data for population projections was used, was obtained the from New Castle Town Planning Office.

Potential land use maps were modified to include 18 service areas. These were chosen according to their land use designations as well as for their potential for future population expansion. Following along with Table 14 below, ultimate values of population were found for each respective service area.

TABLE 14

ULTIMATE POPULATION BY SUB-AREA

PLANNING SUB-AREA	ACREAGE (Total)	ACREAGE (Existing Rd)	ACREAGE (Open Space)	ACREAGE (Developable)	ACREAGE (Future Roads)	ACREAGE (For Future Units)	POTENTIAL FUTURE POP. 2015 (Persons)
WEST ELK	215.62	14.56	17.10	183.96	18	166 0.1 DU/AC	46
UPPER MAIN ELK	170	8	22	140	14	126 0.1 DU/AC	35
MAIN	402	22	36	344	34	310 0.33 DU/AC	282
UPPER EAST ELK	468	20	64	384	38	346 0.33 DU/AC	314
EAST ELK	413	15	417	351	35	316 0.667 DU/AC	579
ELK CREEK	314	17	206	289	29	108 0.333 DU/AC	99
EXISTING TOWN	1121	280	217	624	79	545 4 DU/AC	7501
WEST FAAS	726	5	---	721	72	649 2 DU/AC	3595
EAST FAAS	875	---	30	845	85	760 2 DU/AC	4210
UPPER COLORADO	290	73	40	177	18	159 0.133 DU/AC	144
UPPER NCIG	84	5	1	78	8	70 1 DU/AC	193
RIVERBEND	86	7	11	68	7	61 1 DU/AC	168
NCIG	232	12	30	190	19	171 1 DU/AC	470
BURNING MOUNTAIN	82	11	20	51	5	46 1 DU/AC	127
THE FARM	1243	166	62	1015	102	913 4 DU/AC	10,116
INDUSTRIAL PARK	133	57	24	30	3	27 1 DU/AC	75
DELANEY	182	53	11	82	9	71 1 DU/AC	196
MTN. SHADOWS SUBDIVISION/ APPLE TREE PARK	163	81.5	70.5	11	1	10 8.5 DU/AC	1260

Ultimate population in the case of the facility plan, serves as a design reference. It is noted that although ultimate population may be reached it is unlikely to all occur within the 20 year planning period. The ultimate population was chosen due to the fact that recent population growth has been somewhat erratic and much more difficult to predict. In the years from 1980 to 1990 the Town experienced very little growth (2% a year). While in the years following 1990, population growth reached as high as 11% a year. Therefore, ultimate population was selected since it provides a more accurate means of predicting future growth values. In the determining of ultimate population there are significant topographical constraints which will limit and shape New Castle's growth.

The facility plan can be modified in the near future to accommodate faster growth if it is apparent it will in fact take place, but in the meantime, the community is not burdened with the costs of an unreasonable, oversized facility. The Town will continuously need to monitor growth phenomena and respond quickly should circumstances so dictate.

5.2 LAND USE

The use of land and ownership patterns in the area have been inventoried, analyzed and mapped. The patterns are greatly influenced by topography, soils, access by roads, the location of a railroad, I-70 and the wide Colorado River. In a review of land ownership in the areas extending three miles from Town, about 48% of the land is owned and managed by public (government) agencies as public land reserves and road rights-of-way.

The three-mile area around Town (approximately 59 square miles) was initially considered because the Colorado Statutes allow municipalities some authority to make land use plans within that area, and the study was used to more accurately determine the areas that could/should be reasonably served by the town sewage treatment facility. That area for service has been significantly reduced in size, contracted closer to the present Town, and divided into 12 sub-areas as illustrated by the potential service area maps. By comparison, the previous Facility Plan (March 1980) encompassed about eight square miles in the vicinity of the present treatment plant.

The majority of private land is situated in the more usable and accessible stream valleys and on the "flatter" mesas above steep slopes; an exception is private ownership of the Grand Hogbacks -- very steep, linear and high ridges owned originally for their coal deposits and mining operations.

The land has been used for agriculture for the past 120 years, with the arid uplands for livestock grazing and the lower valley lands irrigated for orchard, pasture, hay and grain crops. However, within the past 30 years, three coincidental forces have begun to change agriculture and the pattern of land use and ownership.

The development of I-70 (the Main Street of the Nation) through the area has brought greater access, more people and more interest; the development and expansion of major ski-recreation resorts in the nearby region has brought in more people and demands for services and land; the general decline of the agricultural economy; and less demand for extensive agricultural lands.

Thus, a demand for rural homesites was created with the influx of newcomers, and was readily provided for by the economically suffering agricultural community. Some rural lands

were (and are currently) being divided into 40-acre parcels, with many lots of ten, five and two acres, with most having individual on-site, domestic water supply and sewage disposal systems. The resultant proliferation of these individual facilities has raised concern about the quality of ground and surface waters by health and land use officials and the general citizenry.

It should be noted that growth has not been unanticipated, however, from a different source; the previous Facility Plan was prepared at the height of the most recent energy/oil shale development activity, so that it anticipated a large amount of growth to be served by enlarged treatment facilities in the town. The energy development ended abruptly, almost completely in 1982, and the anticipated related growth did not materialize. Curiously, the plan estimated a population for the planning area of 831 persons in 1980, and 1471 persons in 1995; population estimates for the similar planning area in this current study as of December 1995, are 1460 persons. The population increase is known to more recently result from resort area services workers residing in the area.

5.2.1 Current Land Uses.

The Facility Planning Area, including the town, is estimated to contain 3440 acres of land suitable for development; that is the total area less steep land (< 30% slopes), hazard areas, water bodies, public lands, road rights-of-way and another 25% for roads and other future public uses. Of those 3440 acres, approximately 460 acres are presently developed, leaving a net amount of 2980 acres for potential development in the area; of the potential development area, approximately 1800 acres are irrigated (mostly for hay and pasture, with some grains and orchards), and 1100 acres are improved range land for livestock.

LAND USE TABLE

BUILT LAND USES AS OF DECEMBER 1995
TOWN OF NEW CASTLE 201 PLAN AREA 1996

USES	IN TOWN	OUT OF TOWN	TOTAL AREA
Dwelling units	527	536	1063
Commercial	30	13	43
Industrial	5	6	11
PUBLIC			
Administration	1	0	1
Park	3	1	4
Library	1	0	1
School	1	0	1
Utility	2	2	4
Other	9	2	11
Church	5	1	6
Recreation	0	2	2

LAND AREA/USES	ACRES NORTH OF RIVER	ACRES SOUTH OF RIVER	ACRES TOTAL AREA
Town treatment plant service	920	0	920
Urbanized/developed area	1280	250	1530
Agriculture, Irrigated	1150	690	1840
Agriculture, Range	900	200	1100
Public road, highways	0	0	500
Water bodies	40	0	240
Steep slopes, 30% +			

The abundant open space and ownership of land, nearly one-half the area, by the public (government) agencies have greatly influenced land use in the area. Long established uses have been resource based, including livestock grazing, mining for coal, stone and gravel, drilling for oil and gas, harvesting and processing wood products, and recreation including big game hunting, fishing, camping and small woods resorts. After the 1960's decade, the land uses of resource extraction and agriculture were beginning to be overtaken by tourist related, outdoor recreation and rural homesite development as significant land uses.

Land area within the current treatment service area/town boundaries is almost entirely developed or approved for specific development. The older (pre 1980) part of town is developed with the standard grid design of blocks and lots, mostly single-family residences on separate small lots, with a three-block long commercial center fronting on one (Main) street; there are approximately 306 total dwelling units in the old town, with potentially six vacant lots for single-family dwellings. The area that is, and will continue to provide space for future housing in the town is the large Castle Valley Ranch Planned Unit Development Subdivision, planned, zoned and approved in 1982, for development in the new north part of town. The subdivision contains approximately 640 acres and was approved to develop 983 single-family and 1493 multi-family residential units, with agreements to make improvements to the town water supply and treatment facilities and wastewater treatment facilities as and when needed by the town. For reasons due much to regional economic conditions developing at the time, the subdivision was not developed until about 1991, and has grown rapidly since then. As of December 1995, there were 186 completed/occupied single-family dwelling units and eight multi-family dwellings occupied in the subdivision; 60 to 70 dwelling units were constructed in each of 1994 and 1995 years. Also within the subdivision, a new public elementary school for 470 students is currently being constructed on a 30-acre site.

In 1995 and 1996, the town approved two commercial-residential projects now under development at the east edge of town. The combined projects will have 80,000 square feet of commercial space and 130 residential units.

The industrial area of the town is located south of the river, across from the current wastewater treatment plant. The area is about 30 acres in size, has six enterprises of the service-assembly classification which do not generate appreciable demands for water or waste treatments; each has a separate water well and sewage disposal system on site.

Current land uses in the planning area extending approximately three miles out from the town and containing 59 square miles, have been identified by actual field review and by

review of available property maps and aerial photographs. A generalized current Land Use Map and tabulation of land uses provides further illustration for the planning area. Although the potential service planning area is found to be smaller in area, the three-mile area study served to identify the potential service area and to more focus the planning efforts.

5.2.2 Population and Economic Factors. The human population of the town has remained nearly constant for the past several decades, hovering at nearly 600 people, according to the U.S. Censuses. There have been, however, significant changes in the number of people in the town for short periods of time between census periods due to rapid energy resource development and construction activities. The generally constant level of population in the town can be attributed to the generally constant level (or lack) of economic and employment opportunities, and housing, in the town. It is notable and significant then, that the recent growth in population numbers can be attributed to economic growth and employment outside, and at several miles from, the town.

5.2.3 Population. Population data from the various sources has been reviewed and is illustrated in tables and appendices. Most of the data has been taken from the U.S. Census directly or further extrapolated from it by other agencies, including the State Demographer and the Garfield County Planning Office.

The U.S. Census lists the town population for 1980 at 563, and for 1990 at 679; these numbers are considered by the state, the county and town governments to be consistently and significantly low. Nevertheless, the state and county agencies use the federal census numbers as a base upon which to make projections of future populations, as well as other data; consequently, all the agencies' projections are found to be lower than actual.

In order to know the most accurate number of persons in the town and in the planning area, the Town Planning Office performed a physical count and location of all dwelling units in the area as of December 1995. The number of town utility accounts and amount of water usage was analyzed and the number of persons per dwelling unit was determined to be 2.77. The actual number of dwelling units in town (the current treatment plant service area) was found to be 527, which multiplied by 2.77 persons, yields a population of 1,460, and the number of dwelling units outside the town in the three-mile planning area, 636, multiplied by 2.77 yields 1,762 persons. Below is a summary comparison of the state, county and town estimates and projections of population for New Castle.

POPULATION PROJECTIONS, NEW CASTLE

Estimated by	1990	1992	1994	1996	1998	2000	2005	2010	2015
State	679	701	713	724	735	747	---	---	---
County	679	707	737	767	799	833	---	---	---
Town	698	1280	1239	1620*	1952*	2285*	3106*	3927*	4748*

* At 60 new dwelling units per year.

Based on the above comparisons, the state and county estimates are some 50 to 60 percent of the town's actual counts and estimates; the town projections indicate the wastewater treatment plant will reach its population design capacity of 0.2 MGD, far ahead of the time estimated by the state and county. It is significant to note that the state makes projections at the rate of annual growth (increase) from 1980 to 1990, as listed by the U.S. Census, which includes total Garfield County increase at 2.9%, unincorporated county at 2.2%, incorporated towns at 4.1%, New Castle at 1.9%. The state uses the annual rate of 1.9% to project future population growth for New Castle, which produces a very low figure when compared to the more actual annual rate as determined by the town to be 10.4% from 1990 to 1995 (incl.), based on actual counts of dwelling units per those five years.

Population estimates in the planning area outside the town are based on a count of 526 dwelling units, at a rate of 2.77 persons per dwelling equal 1,485 persons. Projected populations, based on a rate of 20 new dwelling units per year would yield the following:

POPULATION PROJECTIONS - NEW CASTLE AREA

POPULATION/YEAR	1995	1996	1998	2000	2005	2010	2015
Outside Town	1485	1500	1661	1772	2049	2326	2593
Inside Town	1460	1620	1952	2285	3106	3927	4748
Total Projections	2945	3160	3613	4057	5145	6263	7341

Development and population growth in the unincorporated area out of town will be affected by Garfield County regulation of land use (zoning), subdivision of lots, sewage disposal and building permits, and state regulation of water supplies. The county has and currently does allow most of the private land to be divided into two-acre, single-family lots where no hazards exist and if sewage disposal, water supply and safe access can be provided. Currently, and in the foreseeable future (10-20 years hence), growth could be limited by the lack of raw water and treated water supply, and the continued shortage of employment opportunities in the planning area.

5.2.4 Economy and Employment. Employment opportunities --jobs-- in a community attract people, and they will prefer to reside there if services and housing are available and affordable to them.

The economy of the area has recently begun evolving from a resource extraction and agriculture base to one of commercial, retail, service and construction trending toward tourism and recreation. A major portion of the New Castle residents are in the tourist/resort communities of Aspen, Snowmass and Vail -- all out of Garfield County and 50-70 miles from New Castle -- and in the larger support communities of Glenwood Springs and Rifle situated much closer.

A review of data from the 1990 census, the Colorado Department of Labor and Employment, and the Garfield County Comprehensive Plan indicate the following employment trends for Garfield County-based employment:

- Total employed persons, 1993 = 6.3%, 1995 = 19,159;

- Unemployment rate, 1993 = 16,346, 1995 = 4.1%;
- Total jobs increased from 9528 in 1985 to 12,895 in 1993 to 14,997 in 1995;
- Selected wages and salaries, 1995:
  - Jobs in agriculture/forestry increased from 0.6% to 1.96% of total jobs.
  - Jobs in mining decreased from 8.5% to 0.71% of total jobs.
  - Jobs in services increased from 24% to 25.1% of total jobs.
  - Jobs in government decreased from 21% to 18.1% of total jobs.

Average wage decreased from $19,897 in 1990, to $19,447 in 1993. In 1993, 79.7% of the total jobs were in the employment sectors of:

- Construction 9.5%
- Retail trade 24.7%
- Services 25.9%
- Government 19.6%

Because official data is not readily available for small communities, the Town Planning Office made a survey of known businesses, employers and self-employed service contractors within the town in April, 1996, to estimate the number of persons working in or based in town.

Estimated no. of Employers	49	No. of Employees	199
Construction	15		27
Retail Trade	17		39
Services	8		28
Government	4		39
Other	5		66

Jobs/Employees as percent of town population = (199 ÷ 1480) = 13.5%

5.2.5 Income and Value. A brief review and example of the financial situation of the town is derived from information available from the Town and the Colorado Department of Local Affairs. Excerpts from the years 1993 and 1995 are presented as follows:

	1993	1995
- Property assessed value	$3,444,460	$6,440,610
- Mill levy rate	6.906	6.906
- Property tax revenue	$ 23,784	$ 41,744
- Retail sales	$4,671,014	$8,024,958
- Sales tax rate	3.00%	3.00%
- Sales tax revenues	$ 140,220	
- General operating expenditures	$ 258,548	
- Public enterprise revenues	$ 227,469	
- Operating expenditures	$ 146,003	

(The town also receives other fees and government transfers)

In comparison, revenues from retail sales were obtained from the years (in millions of dollars):

1990	1991	1992	1993	1994	1995
3.44	3.81	4.40	4.67	7.39	8.01

Assessed property values: (in millions of dollars)

1980	1990	1991	1992	1993	1994	1995	1996
0.9		2.6	3.3	3.4	3.9	4.4	8.1

Sales tax revenues have been increasing modestly since 1990, and in late 1994, began to increase significantly with the opening of two new retail establishments. Increased property tax revenues are a reflection of recent higher prices (values) of land and buildings, increased numbers of higher priced and large single family dwellings now being constructed in town.

Up to this current time, the town has managed to provide a modest level of services with a very limited income. Funds for adequate maintenance, expanded services and significant capital improvements have not been available to the town. The growth in town revenues offers the potential to generally keep up with growth of population and provide adequate services and operations for the expanding town.

A review of the increases in new dwelling units and population in the past five years, and the more recent increase in retail sales and the low number of employment opportunities in town indicate that people are moving into New Castle for reasons other than employment. The jobs are found in locations some 10 to 70 miles distant in high cost resort communities where housing is in limited supply because of limited land area in narrow valleys, very high cost of land and rents. As a result, workers are forced to live in alternative communities and some are now finding that New Castle offers an abundant choice of land and housing at more affordable prices. Thus, it can be inferred from the existing employment and housing situations in the general area, that the employment areas are forcing employees to live in communities like New Castle; and while the town in not promoting growth, it is attempting to make itself an attractive, safe and affordable town in which to reside and enjoy adequate services.

5.2.6 Future Land Use.

A. The Draft Future Land Use Plan prepared for this project incorporates the following principles.

1. The most intensive growth and development should be contained within one mile of the present town.

2. Most new development should be limited to residential uses (outside the primary growth area) but with appropriate convenience commercial services sites.

3. Residential developments should be well designed to fit the character of the land/site, and planned to fit the overall community of New Castle.

4. Development should utilize the concept of "clustering" lots and building sites in a smaller area of the property to allow for more efficient use of streets and utilities and to provide more open space or agricultural use on the same property.

5. Attain pedestrian access from public streets to stream banks, ridges and public lands.

6. Plan for open space, trails and parks prior to private developments.

7. Seek additional water rights for future town supply.

8. Plan locations for extensions of water and sewer main lines.

9. Plan locations for extension of Town streets.

B. The Draft Land Use Plan map illustrates the following land use patterns for future growth:

1. The primary urban service area:

   a. Suburban-type residential development should occur in the immediate adjacent areas to the town boundary at a medium density of four dwelling units (d.u.) per acre.

   b. The 1700-acres former Brown Ranch (Faas) property northeast of town should be planned as a mixed use/open space development with commercial and multi-family uses along Castle Valley Boulevard, medium density (4 d.u./ac.) cluster development in the central property, low density (1 d.u./ac.) in the upper (outer) area, connecting thru-streets from west to east, provide for expansion of town cemetery property, potential site for elementary school, open space and trails along drainages and ridges connecting with other spaces, residential areas and public lands.

c. Highway and retail commercial uses are planned to begin development at the I-70 Highway interchange and Highway 6 as designated in the 1982 Land Use Plan.

d. The flat irrigated lands to the east of town between County Road 240 and Highway 6 should remain in agricultural reserve as long as possible, but they do present land well suited and situated for future growth and community needs, including a large community park and ball fields, high school, retirement/senior care facility, and a long-range development mixed use planned community at an overall density of 4 d.u./acre.

e. The Lower Elk Creek Valley northwest of town, a length of about one mile, is very scenic and a joy to view by residents of the area, but it also has a good road access, a town water supply line and is situated directly upstream from the town wastewater treatment plant. There are easy building sites on the valley bottom (away from the creek), and the extension of a main sewerline could be done easily throughout the area to provide service to new dwellings. The plan indicates that a medium-density of 4 d.u./acre, with higher densities allowed for cluster development and public open spaces could be developed there. Because of close proximity to the creek, sewage disposal leach fields should be allowed only on individual lots of 4 acres or more, regardless of potable water supply.

f. The Elk Creek Subdivision northwest of town is included in this sub-planning area because there are 70-80 small residential lots, each with individual sewage disposal systems, in a concentrated area (and most are already tapped onto the town water supply system), and there are other lots planned in the area. Therefore, from the standpoint of public health and cost efficiency, the subdivision should be planned to be served by all town facilities (along with the rest of the area) as soon as practicable and annexed to the town.

g. The area south of town, between the Colorado River and County Road 335, is currently designated for industrial uses and is mostly in that type of use. There may be more service commercial uses, especially in

conjunction with the present RV park location, but there is little space remaining in the area without very steep slopes. The area may well serve as the industrial/service area of the town, but because it is openly visible from the town and I-70 areas, and has heavy residential traffic passing through it, all activities should be reasonably well landscaped, screened from view, neatly organized and maintained to avoid clutter, blight and disharmonious visual effects on the area and the town.

h. Since they are located a mile or more from existing town commercial areas, the western area of Castle Valley Subdivision and the Elk Creek Subdivision (at or near the intersection of the Main Elk and East Elk Creek Roads) could properly be served by small neighborhood commercial areas of 2-4 acres, for the convenience and safety of the area residents.

2. The Outer-Rural-Agricultural Areas (approximately 1 mile beyond the town):

a. The properties should remain in agricultural uses as long as practicable.

b. Development should occur on non-arable areas out of the way of agriculture, at densities of no greater than 1 d.u./10 ac.

c. Development should be in small clusters of building sites to conserve agricultural land and avoid disturbance of large areas.

d. New special district areas should not be created without existing critical need or without agreement to join town facilities.

e. New roads should be extended from existing town streets and bear the same street names, where practicable.

5.2.7 Summary The old town is essentially "built out" and should not accommodate new development that changes the character of the area.

The Castle Valley Ranch Subdivision will house about 2600 persons when completed, with adequate commercial areas.

The Three-Mile Area could potentially accommodate 30,000-40,000 persons on present buildable private property, given all other facilities are available, particularly a potable water supply.

The plan can be designed to accommodate all anticipated growth, a limited amount of future growth, a particular type of future growth, and the pace at which growth may occur. The choices will be significantly determined by the plans and policies for sewer and water facilities as adopted by the town.

The plan should be designed with real and attainable goals and can best be accomplished with direct cooperation and partnerships between the town government, property owners and other government agencies.

5.3 FORECASTS OF FLOW AND WASTELOADS

Future wastewater flows at the service areas within the planning area depend upon a number of variables: number of people; proportion of residential, commercial, and industrial development; age, income, lifestyle and family size; and infiltration control. Ultimate population numbers and per capita and total wasteload contributions for each of the service areas is presented in Table 15.

TABLE 15

ESTIMATED FUTURE WASTELOADS
NEW CASTLE PLANNING AREA

SERVICE AREA	POTENTIAL POPULATION	ULTIMATE FLOW (GPD)	ULTIMATE NO. (# BOD_5/Day)
WEST ELK	46	3,450	8.64
UPPER MAIN ELK	35	2,625	6.57
MAIN	282	21,150	52.95
UPPER EAST ELK	314	23,550	58.96
EAST ELK	579	43,425	108.72
ELK CREEK	99	7,425	18.59
EXISTING TOWN	7501	562,575	1408.46
WEST FAAS	3595	269,625	675.12
EAST FAAS	4210	315,750	790.62
UPPER COLORADO	144	10,800	27.04
UPPER NCIG	193	14,475	36.24
RIVERBEND	168	12,600	31.54
NCIG	470	35,250	88.25
BURNING MOUNTAIN	127	9,525	23.85
THE FARM	10,116	758,700	1199.74
INDUSTRIAL PARK	75	5,625	14.08
DELANEY	196	14,700	36.8
MTN. SHADOWS SUBD/ APPLE TREE PARK	1260	94,500	236.59

Standards of 75 GPD and 300 mg BOD/L were used in the determination of the above table.

In the planning area, it was estimated that per capita flow will remain the same in the foreseeable future (75 gpd). The influence of commercial and industrial flows, as well as flows from, students attending New Castle Schools, on the overall flow rate was felt to be minimal, thus, considered to be included. Expansion and contributions of wastewater in the future of these service areas is limited by available land. No changes in per capita flows are predicted for the campground areas; rural homes connecting to the proposed system are also considered to have a 75 gpd per capita flow.

5.4 FUTURE ENVIRONMENT OF THE PLANNING AREA WITHOUT THE PROJECT

The New Castle planning area contains regions that are presently serviced by separate wastewater treatment facilities. Each entity and new development area will likely develop its own wastewater treatment facilities if a comprehensive wastewater management plan is not adopted.

Mountain Shadows Subdivision-Apple Tree Park and Riverbend Subdivision are the only developments located on the south side of the Colorado River and each has a limited growth potential. Their present treatment systems appear to have adequate capacity to meet secondary effluent standards. Both are privately owned and financed and the present owners appear to have financial capability to upgrade the plants as needed.

On the north side of the River, New Castle is the largest population center with a surface discharge plant. As of November 1995, the New Castle plant is operating at 80% capacity and, therefore, in accordance with Colorado Law, C.R.S. 25-8-501(5 d & e) is required to initiate engineering and financial planning for expansion of its domestic wastewater treatment works. Burning Mountain Subdivision is currently in agreement with the Town of New Castle to pump its wastewater into New Castle's system. Both KOA and Camp Christian have adequate capacity at present, and growth potential is limited. All of the rural residential areas have individual disposal systems which are operating satisfactorily. As long as growth occurs in a controlled orderly manner, no unusual problems with waste disposal systems are expected in the rural areas. However, if the New Castle or other developed areas in the planning area are unable to absorb new population entering the area, then growth pressures will be forced into the rural areas and water pollution problems could possibly occur.

There are three scenarios, or combinations thereof, that can be expected to occur in the planning area if a no-action plan is followed. They are:

a. Continued growth will result in the additional loading of the New Castle facility, thereby exceeding 95% capacity. At which time the issuance of building permits within the service area will cease until the construction of the necessary plant expansions is commenced.

b. Plant operation at a level of 95% or above, may result in the deterioration of effluent. This would affect the integrity of the receiving stream (Elk Creek) but since Elk Creek enters the Colorado River within a short distance (100 yds.), only a short (but possibly critical) section is affected.

c. If growth is curtailed due to the issuance of building permits, major population increases and growth would take place outside Town limits. New

developments would be forced to provide their own wastewater disposal systems, which would be either individual disposal systems or small community systems with discharges to Elk Creek and East Elk Creek. There is considerable potential for contamination of New Castle's water supply if unrestrained growth occurs upstream.

Almost all effects of a "no-action" plan would be adverse and environmentally deleterious. It would be unlikely that growth would be limited or curtailed; it would merely be dislocated and more scattered. Service costs would tend to be higher and energy and environmental impacts would be greater because of longer service lines and placement of people over a larger area of rural land. Control would probably be less stringent with a potential for health problems resulting from wastewater leach field effluent surfacing, and groundwater-surface water contamination.

A "no-action" plan would replace a planned development of wastewater facilities with an unplanned haphazard development.

SECTION 6. ALTERNATIVES

SECTION 6.1 ALTERNATIVES TO BE CONSIDERED. In accordance with EPA regulations, a cost effective analysis to determine the appropriate wastewater treatment management system for the New Castle planning area was made. The purpose of the analysis is to select the system which will provide for application of best practicable waste treatment technology for the various entities in the planning area. As defined earlier, a treatment and disposal system is "best practicable" if it meets federal and state effluent requirements and is cost effective (i.e., results in minimum total resource cost over time).

The planning process requires evaluation and comparison of a variety of alternative waste management systems, including non-conventional and non-structural solutions. The major categories of alternatives, with options available under each, are outlined below:

A. Regional Solutions: Feasibility of interconnection with other nearby towns and communities was explored. Intra-regional connections of the various entities were evaluated in detail. Also under this category, the ability of each of the various entities to continue to collect and treat wastewater from its service area (present and future) is evaluated.

B. Non-structural and/or Non-conventional Systems: The following options were considered as alternatives or supplements to construction of new facilities:

   i) Implications of a "no action" plan,

   ii) Possibilities for increasing capacity and effluent quality through a more optimum operation of existing facilities,

   iii) Feasibility and effects of a flow reduction program, and

   iv) Feasibility of on-site and similar non-conventional systems (versus central collection and treatment).

C. Alternative Waste Management Systems: Under this category, the practicability of various methods for effluent utilization is considered, plus an evaluation and comparison of appropriate treatment technologies are made. The three alternative was management systems which must be looked at are:

   i) Treatment and discharge to a receiving stream;

   ii) Land application techniques, and

   iii) Reuse potential for effluent.

   Other factors which must be considered in evaluating each alternative are:

   i) Methods for sludge disposal,

   ii) Feasibility and need for "staging" treatment works (i.e., building increments of the plant in proportion to population increase,

iii) Potential for revenue generating capacity, and

iv) Suitability of plant location.

Each alternative and option should not be considered to be mutually exclusive of the others. Various combinations of each may be most cost effective. The procedure will be to have an initial screening of each option and alternative to determine those which are reasonably feasible; a more detailed analysis will be made of those alternatives which appear to have cost effective potential and practicable application to the New Castle planning area.

6.1.1 Methods of Ranking Alternatives. Alternatives selected for detailed analysis will be ranked on the basis of cost and with respect to selected non-economic factors. The most cost effective alternative will be that system with the lowest per unit cost, unless non-monetary (non-economic) costs are found to be overriding.

Monetary ranking is determined by calculating both capital construction costs and operating costs for each alternative method. For comparative purposes, all costs were converted to per unit costs. All cost estimates for the comparative analysis will be based on "built-out" conditions. Non-economic factors that were considered for each alternative included effectiveness, reliability, flexibility, environmental impact, energy use, public acceptance, and implementation capacity. Each non-economic factor was judged against a set of criteria (given in the Appendix), and a ranking from 1 to 15 was assigned each non-economic factor for each alternative. Since the selection process is subjective, the value assigned each alternative must be considered approximate. A more detailed description of the selection process is given in the Appendix.

To present the relative values assigned in the non-economic evaluation of alternatives, a simplified decision matrix format was adopted (i.e., alternatives being evaluated are placed in columns, and each is aligned against criteria factors, which are placed in rows). This arrangement is referred to as a Qualitative Evaluation Matrix.

SECTION 6.2 REGIONAL SOLUTION. Two schemes for regionalization of wastewater treatment plants were investigated:

A. Connection of the wastewater treatment plants in the New Castle planning area to a regional wastewater treatment plant located downstream at Rifle.

B. Various interconnections of the wastewater treatment plants within the planning area, with the discharge points being either within the planning area or immediately adjacent to it.

Regional or joint management of facilities was also considered for both options. The following factors were considered when evaluating regional solutions:

A. Effects of interceptor location on land use within and between urban areas, particularly where land is undeveloped.

B. Effects of alternative combinations on streamflows in the regions.

C. Possible limitations on future expansion due to unavailability of land.

D. Differences in reliability, operation, and maintenance of facilities.

E. Environmental and economic costs of delays likely to be associated with efforts to achieve a regional solution.

In the New Castle planning area, facilities planning is complicated by the mixture of types and ownership of wastewater systems; present wastewater treatment facilities include both a public-owned (municipal) collection and treatment system and a privately-owned collection and treatment system, plus privately-owned communal and individual systems. A regional solution must not only evaluate various physical interconnections of the different systems, but also address potential management plans and problems. The initial analysis will be based on a monetary comparison; if it appears cost effective to interconnect private and public systems, the political and legal aspects of this arrangement will be investigated.

6.2.1 Alternative A -- Inter-regional Wastewater Collection and Treatment. The Water Quality Management Plan for the Colorado River Basin in Colorado (Colorado Department of Health, 1975) evaluated various inter-regional systems for the communities along the Colorado River from New Castle to Rifle. Based on cumulative scores in an evaluation matrix, the conclusion was to reject the alternative for connecting the wastewater treatment plants in New Castle with those at Silt and Rifle. Reasons given for rejecting this plan were:

A. It would tend to encourage strip growth along the sewerline,

B. It would concentrate waste flows at one location on the Colorado River,

C. It would greatly increase the potential for infiltration -- operation and maintenance on the sewerline would be high (although the operation and maintenance of one central plant would probably be less), and

D. The factors of distance, topography and sparse population would indicate that this plan would be cost effective.

6.2.2 Alternative B – Intra-planning Area Regional Systems. Five major possiblities for regionalization within the New Castle planning area (Intra-Regional Systems) were evaluated. They are as follows:

B-1. -- Extension of service intercept lines into the town's current service area as graphically described in Map #2 (in appendix). A written description of this service area is that area, inclusive of the existing town, which has been committed by the town to serve through the local land use process. In essence, it is not only those current areas of town which have service, but also those areas which have been "platted" but not developed. The wastewater treatment plant would be expanded to accommodate the future growth or "build out" of this service area.

B-2. -- Extension of service intercept lines into the secondary growth areas of the planning area as graphically described in Map #3 (in appendix). A written description of this alternative provides for service to the secondary growth areas, both north/west of town into the Elk Creek drainages and east of town toward Riverbend and Canyon Creek areas. Note that Alternative B-2 does not include tying the existing "built out" developments onto the town's system, but does provide for modification in plant capacity and service laterals such that future growth can be accommodated.

B-3 -- Extension of service intercept lines, not only into the secondary growth areas of the planning area, but also tying those areas which are "built out" onto the town's system. Treatment of wastewater would then be at a single location for all areas within the town's secondary growth areas. This alternative and service boundary is graphically shown on Map #4 in the appendix.

B-4 -- Connection of the New Castle and Mountain Shadows/Apple Tree Park wastewater systems together with treatment occuring at the New Castle wastewater treatment plant location. This alternative and service boundary is graphically shown on Map #5 in the appendix.

B-5 -- Connection of the New Castle and Mountain Shadows/Apple Tree Park wastewater systems together with treatment occuring at a new location down river from both New Castle and Apple Tree. This alternative models this new plant location on the Delany property located west of, and downstream of Apple Tree. This alternative and service boundary is graphically shown on Map #6 in the appendix.

6.2.2.1 Intra-regional Alternative B-1. This plan would involve extensions and/or upsizing of collector lines into the current service area for the Town. As an example, the collector line serving the Coryell Town and Castle Valley Ranch portions of the service area are undersized for being able to serve the potential buildout of these two areas. As a result, the existing sewer interceptor line serving this area (which is an 8" PVC sewer main) will need to be upsized to an 18" PVC line. The line would start at the sewer plant and would proceed north to these areas. Approximately 4300 L.F. of sewerline would be constructed. Also, this plan considers the replacement of an old 12" clay intercept line (which is in disrepair) with a competent PVC line of same diameter. Approximately 2700 L.F. of clay line would be replaced. Finally, an 8" PVC line would be extended to the western portions of the service area (ie., town limits) west of Elk Creek. Approximately 2488 L.F. of 8" PVC would be constructed to serve this portion of the existing service area. Map #2 (in appendix) defines the extensions and replacements

discussed above. Detailed cost estimates of the work are also found in the appendix. Finally, the total existing and future loadings on the town's wastewater treatment plant are as follows:

Existing conditions:

Existing number of units= 527 units
Existing population= 1460 persons
Existing design flow to plant= 109,484 GPD
Associated cost to treat flow at plant (plant costs)= $448,884.40

Future conditions:

Future number of units= 2180 units
Future population= 6039 persons
Future design flow to plant= 452,895 GPD
Associated cost to treat flow at plant (plant costs)= $1,856,869.50

A summary of work activities and associated costs in Intra-regional Alternative B-1 are as follows:

1. Sewer intercept to western service area.		$138,724.80
2. Sewer intercept to Castle Valley Ranch.		$271,573.20
3. Clay line replacement with PVC.		$177,266.40
4. Upgrade WWTP to 0.5 MGD capacity.		$1,230,000.00
	Total:	$1,817,564.40

Unit cost of Alternative B-1: (6039 persons) = $300.97 per person
(2180 units) = $833.75 per unit

(Note: Item 4. above, reflects an expansion of 0.3 MGD to the 0.2 MGD current capacity.)

6.2.2.2 Intra-regional Alternative B-2. This plan would involve extensions of collector lines into the town's secondary service or growth areas. The secondary service or growth areas are those areas that could be served by the Town's wastewater treatment plant under chiefly gravity flow. It should be noted, however, that those areas of higher density, built out and which have existing adequate facilities for wastewater treatment, such as Elk Creek Subdivision, 3-Elk Run, Cedars Subdivision and Riverbend are not considered for service under Intra-regional Alternative B-2. In Intra-regional Alternative B-2, some pumping would be required (as in the case of those areas south of the river). The service areas in Intra-regional Alternative B-2 are also bounded by the 3-mile planning area for the town. Future densities and therefore, flows, have been determined given review and consideration of the Town's comprehensive plan. The specific service areas as shown on Map #1 (appendix) that are served are listed as follows, and are further graphically represented on Map #3 (appendix).

Table B-2-1
Service Areas in Alternative B-2

Service Area I.D.	Existing units	Proposed units	Population
West Elk	6	11	47
Upper Main Elk	3	10	36
Main Elk	8	94	283
Upper East Elk	20	94	316
East Elk	9	202	584
West Faas	1	2595	7191
East Faas	2	758	2105
Upper Colorado	3	50	147
Upper NCIG	0	70	194
NCIG	2	169	474
The Farm	8	905	2529
Industrial Park	5	22	75

Map #3 (appendix) defines the extensions necessary to serve those areas discussed above. Detailed cost estimates of the work are provided in the appendix.

Table B-2-2 identifies the anticipated flows to the New Castle W.W.T.P. from each of the service areas as well as associated costs.

Tables B-2-3 through B-2-5 summarize, in various forms, the costs to extend service to the various service areas in Intra-regional Alternative B-2.

Table B-2-6 summarizes the total costs for extensions and treatment of waste for the various service areas.

Table B-2-7 defines the costs from a per unit standpoint.

Table B-2-2
Associated Wastewater Treatment Costs by
Service Area in Alternative B-2

Service Area I.D.	Population (persons)	Flow to WWTP (gpd)	Associated Cost (at WWTP)
West Elk	47	3525	$14,452.50
Upper Main Elk	36	2700	$11,070.00
Main Elk	283	21,225	$87,022.50
Upper East Elk	316	23,700	$97,170.00
East Elk	584	43,800	$179,580.00
West Faas	7191	539,325	$2,211,232.50
East Faas	2105	157,875	$647,287.50
Upper Colorado	147	11,025	$45,202.50
Upper NCIG	194	14,550	$59,655.00
NCIG	474	35,550	$145,755.00

Table B-2-2-continued
Associated Wastewater Treatment Costs by
Service Area in Alternative B-2

The Farm	2529	189,675	$777,667.50
Industrial Park	75	5,625	$23,062.50
Totals:	**13,981**	**1,048,575**	**$4,299,157.50**

Table B-2-3
Work Activities Summary in
Intra-regional Alternative B-2

Work Activity	Associated Cost
School Lateral	$85,734.00
Lower Elk Creek Lateral	$214,398.00
Lower Main Elk Creek Lateral	$194,011.20
Main Elk Lateral	$435,556.80
Upper Main Elk Lateral	$295,464.00
West Elk Lateral	$391,195.20
Lower East Elk Lateral	$194,664.00
Upper East Elk Lateral	$549,370.80
Pepsi Lateral	$534,974.40
The Farm Lateral	$377,329.20
Upper Farm Lateral	$206,155.20
Upper Colorado Lateral	$323,329.20
Upper NCIG Lateral	$93,260.40
Lower Farm Lateral	$102,368.40
NCIG Lateral	$81,504.00
West Faas Lateral	$200,598.60
East Faas Lateral	$259,070.40
Industrial Park Lateral	$210,013.20

Table B-2-4
Work Activities/Service Areas Benefitted in
Intra-regional Alternative B-2

Work Activity	Associated Cost	Service Areas Benefited
School Lateral	$85,734.00	East Elk,Main Elk,West Elk Upper Main Elk, Upper East Elk (1032 units served)
Lower Elk Creek Lateral	$214,398.00	East Elk,Main Elk,West Elk Upper Main Elk, Upper East Elk (1032 units served)
Lower Main Elk Creek Lateral	$194,011.20	25% of East Elk,Main Elk West Elk, Upper Main Elk (185 units served)

Table B-2-4-continued
Work Activities/Service Areas Benefitted in
Intra-regional Alternative B-2

Work Activity	Associated Cost	Service Areas Bene
Main Elk Lateral	$435,556.80	Main Elk, West Elk Upper Main Elk (132 units served)
Upper Main Elk Lateral	$295,464.00	Upper Main Elk (13 units served)
West Elk Lateral	$391,195.20	West Elk Lateral (17 units served)
Lower East Elk Lateral	$194,664.00	25% of East Elk Upper East Elk (167 units served)
Upper East Elk Lateral	$549,370.80	Upper East Elk (114 units served)
Pepsi Lateral	$534,974.40	West Faas, East Faas, The Farm, Upper Colorado, Upper NCIG, NGIG (4563 units served)
The Farm Lateral	$377,329.20	The Farm, Upper Colorado, Upper NCIG, NCIG (1207 units served)
Upper Farm Lateral	$206,155.20	33% The Farm, Upper Colorado, Upper NCIG (424 units served)
Upper Colorado Lateral	$323,329.20	Upper Colorado, Upper NCIG (123 units served)
Upper NCIG Lateral	$93,260.40	Upper NCIG (70 units served)
Lower Farm Lateral	$102,368.40	33% The Farm, NCIG (472 units served)
NCIG Lateral	$81,504.00	NCIG (171 units served)
West Faas Lateral	$200,598.60	West Faas, East Faas (3356 units served)
East Faas Lateral	$259,070.40	East Faas (760 units served)
Industrial Park Lateral	$210,013.20	Industrial Park (27 units served)

Table B-2-5
Combined Costs per Service Area in
Intra-regional Alternative B-2

Service Area I.D.	Percent of Work Activity	Associated Activity Cost	Total Costs (Extensions)
West Elk	1.6% School Lat.	$1,371.74	
	1.6% of Lower Elk Creek Lat.	$3,430.37	
	9.2% of Lower Main Elk Creek Lat.	$17,849.03	
	12.9% of Main Elk Lat.	$56,186.83	
	100% of West Elk Lat.	$391,195.20	**$470,033.17**
Upper Main Elk	1.3% of School Lat.	$1,114.54	
	1.3% of Lower Elk Creek Lat.	$2,787.17	
	7% of Lower Main Elk Creek Lat.	$13,580.78	
	9.9% of Main Elk Lat.	$42,895.75	
	100% of Upper Main Elk Lat.	$295,464.00	**$355,842.24**
Main Elk	12.8% of School Lat.	$10,965.98	
	12.8% of Lower Elk Creek Lat.	$27,421.50	
	71.4% of Lower Main Elk Creek Lat.	$138,429.61	
	100% of Main Elk Lat.	$435,556.80	**$612,373.89**
Upper East Elk	11.1% of School Lat.	$9,516.47	
	11.1% of Lower Elk Creek Lat.	$23,798.18	
	68.3% of Lower East Elk Creek Lat.	$132,955.51	
	100% of Upper East Elk Lat.	$549,370.80	**$715,640.96**
East Elk	20.5% School Lat.	$17,575.47	
	20.5% of Lower Elk Creek Lat.	$43,951.59	
	28.7% of Lower Main Elk Creek Lat.	$55,681.21	
	31.7% of Lower East Elk Lat.	$61,708.49	**$178,916.76**
West Faas	56.9% of Pepsi Lat.	$304,400.43	
	77.4% of West Faas Lat.	$155,263.32	**$459,663.75**
East Faas	16.7% of Pepsi Lat.	$89,340.72	
	22.6% of West Faas Lat.	$45,335.28	
	100% of East Faas Lat.	$259,070.40	**$393,746.40**
Upper Colorado	1.2% of Pepsi Lat.	$6,419.69	
	4.4% of The Farm Lat.	$16,602.48	
	12.5% of Upper Farm Lat.	$25,769.40	
	43.1% of Upper Colorado Lat.	$139,354.89	**$188,146.46**

Table B-2-5-continued
Combined Costs per Service Area in
Intra-regional Alternative B-2

Service Area I.D.	Percent of Work Activity	Associated Activity Cost	Total Costs (Extensions)
Upper NCIG	1.5% of Pepsi Lat.	$8,024.62	
	5.8% of The Farm Lat.	$21,885.09	
	16.5% of Upper Farm Lat.	$34,015.61	
	56.9% of Upper Colorado Lat.	$192,704.20	
	100% of Upper NCIG Lat.	$93,260.40	**$349,889.92**
NCIG	3.8% of Pepsi Lat.	$20,329.03	
	14.2% of The Farm Lat.	$53,580.75	
	36.2% of Lower Farm Lat.	$37,057.36	
	100% of NCIG Lat.	$81,504.00	**$192,471.14**
The Farm	20% of Pepsi Lat.	$106,994.88	
	75.6% of The Farm Lat.	$285,260.88	
	71% of Upper Farm Lat.	$146,370.19	
	63.8% of Lower Farm Lat.	$65,311.04	**$603,936.99**
Industrial Park	100% of Industrial Park Lat.	$210,013.20	**$210,013.20**

Table B-2-6
Total Cost per Service Area in
Intra-regional Alternative B-2

Service Area I.D.	Extension Costs (Table B-2-5)	W.W.T.P. Costs (Table B-2-2)	Total Costs per Service Area
West Elk	$470,033.17	$14,452.50	$484,485.67
Upper Main Elk	$355,842.24	$11,070.00	$366,912.24
Main Elk	$612,373.89	$87,022.50	$699,396.39
Upper East Elk	$715,640.96	$97,170.00	$812,810.96
East Elk	$178,916.76	$179,580.00	$358,496.76
West Faas	$459,663.75	$2,211,232.50	$2,670,896.25
East Faas	$393,746.40	$647,287.50	$1,041,033.90
Upper Colorado	$188,146.46	$45,202.50	$233,348.96
Upper NCIG	$349,889.92	$59,665.00	$409,554.92
NCIG	$192,471.14	$145,755.00	$338,226.14
The Farm	$603,936.99	$777,667.50	$1,381,604.49
Industrial Park	$210,013.20	$23,062.50	$233,075.70
Totals:	**$4,730,674**	**$4,299,168**	**$9,029,842**

Table B-2-7
Total Cost per Unit per Service Area in
Intra-regional Alternative B-2

Service Area I.D.	Total Cost per Service Area	Number of Units In Service Area	Total Costs per Unit in Service Area
West Elk	$484,485.67	17	$28,499.16
Upper Main Elk	$366,912.24	13	$28,224.02
Main Elk	$699,396.39	102	$6,856.83
Upper East Elk	$812,810.96	114	$7,129.92
East Elk	$358,496.76	211	$1,699.04
West Faas	$2,670,896.25	2596	$1,028.85
East Faas	$1,041,033.90	760	$1,369.78
Upper Colorado	$233,348.96	53	$4,402.81
Upper NCIG	$409,554.92	70	$5,850.78
NCIG	$338,226.14	171	$1,977.93
The Farm	$1,381,604.49	913	$1,513.26
Industrial Park	$233,075.70	27	$8,632.43
Totals:	**$9,029,842**	**5,047**	**$1,789.15**

Table B-2-8
Total Cost per Person per Service Area in
Intra-regional Alternative B-2

Service Area I.D.	Total Cost per Service Area	Number of Persons In Service Area	Total Costs per Unit in Service Area
West Elk	$484,485.67	47	$10,308.21
Upper Main Elk	$366,912.24	36	$10,192.01
Main Elk	$699,396.39	283	$2,471.37
Upper East Elk	$812,810.96	316	$2,572.19
East Elk	$358,496.76	584	$613.86
West Faas	$2,670,896.25	7191	$371.42
East Faas	$1,041,033.90	2105	$494.55
Upper Colorado	$233,348.96	147	$1,587.41
Upper NCIG	$409,554.92	194	$2,111.11
NCIG	$338,226.14	474	$713.56
The Farm	$1,381,604.49	2529	$546.30
Industrial Park	$233,075.70	75	$3,107.68
Totals:	**$9,029,842**	**13,981**	**$645.87**

6.2.2.3 Intra-regional Alternative B-3. This plan would build further upon Intra-regional Alternative B-2 by extending service into those areas of higher density, built out and which currently have existing adequate facilities for wastewater treatment. These areas are specifically Elk Creek Subdivision, 3-Elk Run, Cedars Subdivision, Riverbend and Burning

Mountain R.V. Park. It would be the intent of this plan to consolidate all of the wastewater flows generated in the town's secondary service or growth areas and provide a single point of treatment.. In Intra-regional Alternative B-3, pumping would be required to provide service to the existing Burning Mountain R.V. Park. Riverbend would be served with an extension of a lateral which would tie into the NCIG lateral defined in Intra-regional Alternative B-2. Service to the Elk Creek service area (ie., Elk Creek Subdivision, 3-Elk Run and Cedars) would be provided with extensions of laterals which would tie into the town's existing northern limits and into the Lower East Elk Creek lateral defined in Intra-regional Alternative B-2. As with Intra-regional Alternative B-2 the service areas in Intra-regional Alternative B-3 are bounded by the 3-mile planning area for the town. Future densities and therefore, flows, have been determined given review and consideration of the Town's comprehensive plan. The specific service areas as shown on Map #1 (appendix) that are served are listed as follows, and are further graphically represented on Map #4 in the appendix.

Table B-3-1
Service Areas in Alternative B-3

Service Area I.D.	Existing units	Proposed units	Population
West Elk	6	11	47
Upper Main Elk	3	10	36
Main Elk	8	94	283
Upper East Elk	20	94	316
East Elk	0	202	584
West Faas	1	2595	7191
East Faas	2	758	2106
Upper Colorado	3	50	147
Upper NCIG	0	70	194
NCIG	2	169	474
The Farm	8	905	2529
Industrial Park	5	22	75
Riverbend	60	1	169
Burning Mountain	1	45	46
Elk Creek	94	0	94

Map #4 defines the extensions necessary to serve those areas discussed above. Detailed cost estimates of the work identified are in the appendix.

Table B-3-2 identifies the anticipated flows to the New Castle W.W.T.P. from each of the service areas as well as associated costs.

Tables B-3-3 through B-3-5 summarize, in various forms, the costs to extend service to the various service areas in Intra-regional Alternatives B-2 and B-3.

Table B-3-6 summarizes the total costs for extensions and treatment of waste for the various service areas.

Table B-3-7 defines the costs from a per unit basis.

Table B-3-2
Associated Wastewater Treatment Costs by
Service Area in Alternatives B-2 and B-3

Service Area I.D.	Population (persons)	Flow to WWTP (gpd)	Associated Cost (at WWTP)
West Elk	47	3525	$14,452.50
Upper Main Elk	36	2700	$11,070.00
Main Elk	283	21,225	$87,022.50
Upper East Elk	316	23,700	$97,170.00
East Elk	584	43,800	$179,580.00
West Faas	7191	539,325	$2,211,232.50
East Faas	2105	157,875	$647,287.50
Upper Colorado	147	11,025	$45,202.50
Upper NCIG	194	14,550	$59,655.00
NCIG	474	35,550	$145,755.00
The Farm	2529	189,675	$777,667.50
Industrial Park	75	5,625	$23,062.50
Riverbend	169	12,675	$51,967.50
Burning Mountain	127	9,525	$39,052.50
Elk Creek	260	19,500	$79,950.00
Totals:	**14,537**	**1,090,275**	**$4,470,127.50**

Table B-3-3
Work Activities Summary in
Intra-regional Alternatives B-2 and B-3

Work Activity	Associated Cost
School Lateral	$85,734.00
Lower Elk Creek Lateral	$214,398.00
Lower Main Elk Creek Lateral	$194,011.20
Main Elk Lateral	$435,556.80
Upper Main Elk Lateral	$295,464.00
West Elk Lateral	$391,195.20
Lower East Elk Lateral	$194,664.00
Upper East Elk Lateral	$549,370.80
Pepsi Lateral	$534,974.40
The Farm Lateral	$377,329.20
Upper Farm Lateral	$206,155.20
Upper Colorado Lateral	$323,329.20
Upper NCIG Lateral	$93,260.40
Lower Farm Lateral	$102,368.40
NCIG Lateral	$81,504.00
West Faas Lateral	$200,596.60
East Faas Lateral	$259,070.40

Table B-3-3-continued
Work Activities Summary in
Intra-regional Alternatives B-2 and B-3

Work Activity	Associated Cost
Industrial Park Lateral	$210,013.20
Riverbend Lateral	$193,742.40
Burning Mountain Lateral	$149,116.80
West Elk Creek Subd. Lateral	$132,955.20
East Elk Creek Subd. Lateral	$164,896.80
3-Elk Run Lateral	$142,800.00
The Cedars Lateral	$155,678.40
Hidden Valley Lateral	$178,603.20
Co. Rd. 245 Lateral	$219,866.40

Table B-3-4
Work Activities/Service Areas Benefitted in
Intra-regional Alternatives B-2 and B-3

Work Activity	Associated Cost	Service Areas Benefited
School Lateral	$85,734.00	East Elk,Main Elk,West Elk Upper Main Elk, Upper East Elk 50% Elk Creek (1079 units served)
Lower Elk Creek Lateral	$214,398.00	East Elk,Main Elk,West Elk Upper Main Elk, Upper East Elk 50% Elk Creek (1079 units served)
Lower Main Elk Creek Lateral	$194,011.20	25% of East Elk,Main Elk West Elk, Upper Main Elk (185 units served)
Main Elk Lateral	$435,556.80	Main Elk, West Elk Upper Main Elk (132 units served)
Upper Main Elk Lateral	$295,464.00	Upper Main Elk (13 units served)
West Elk Lateral	$391,195.20	West Elk Lateral (17 units served)
Lower East Elk Lateral	$194,664.00	25% of East Elk, Upper East Elk 50% Elk Creek (214 units served)
Upper East Elk Lateral	$549,370.80	Upper East Elk (114 units served)
Pepsi Lateral	$534,974.40	West Faas, East Faas, The Farm, Upper Colorado, Upper NCIG, NCIG Riverbend, Burning Mountain (4670 units served)

Table B-3-4 - Continued
Work Activities/Service Areas Benefitted in
Intra-regional Alternatives B-2and B-3

Work Activity	Associated Cost	Service Areas Benefited
The Farm Lateral	$377,329.20	The Farm, Upper Colorado, Upper NCIG, NCIG Riverbend (1268 units served)
Upper Farm Lateral	$206,155.20	33% The Farm, Upper Colorado, Upper NCIG (424 units served)
Upper Colorado Lateral	$323,329.20	Upper Colorado, Upper NCIG (123 units served)
Upper NCIG Lateral	$93,260.40	Upper NCIG (70 units served)
Lower Farm Lateral	$102,368.40	33% The Farm, NCIG Riverbend (533 units served)
NCIG Lateral	$81,504.00	NCIG Riverbend (232 units served)
West Faas Lateral	$200,598.60	West Faas, East Faas (3356 units served)
East Faas Lateral	$259,070.40	East Faas (760 units served)
Industrial Park Lateral	$210,013.20	Industrial Park (27 units served)
Riverbend Lateral	$193,742.40	Riverbend (61 units served)
Burning Mountain Lateral	$149,116.80	Burning Mountain (46 units served)
West Elk Creek Subd. Lateral	$132,955.20	75% Elk Creek (47 units served)
East Elk Creek Subd. Lateral	$164,896.80	75% Elk Creek (47 units served)
3-Elk Run Lateral	$142,800.00	75% Elk Creek (14 units served)
The Cedars Lateral	$155,678.40	75% Elk Creek (10 units served)
Hidden Valley Lateral	$178,603.20	75% Elk Creek (10 units served)
Co. Rd. 245 Lateral	$219,866.40	75% Elk Creek (71 units served)

Table B-3-5
Combined Costs per Service Area in
Intra-regional Alternatives B-2 and B-3

Service Area I.D.	Percent of Work Activity	Associated Activity Cost	Total Costs (Extensions)
West Elk	1.6% School Lat.	$1,371.74	
	1.6% of Lower Elk Creek Lat.	$3,430.37	
	9.2% of Lower Main Elk Creek Lat.	$17,849.03	
	12.9% of Main Elk Lat.	$56,186.83	
	100% of West Elk Lat.	$391,195.20	**$470,033.17**
Upper Main Elk	1.2% of School Lat.	$1,028.80	
	1.2% of Lower Elk Creek Lat.	$2,572.78	
	7% of Lower Main Elk Creek Lat.	$13,580.78	
	9.9% of Main Elk Lat.	$42,895.75	
	100% of Upper Main Elk Lat.	$295,464.00	**$355,542.11**
Main Elk	9.5% of School Lat.	$8,144.73	
	9.5% of Lower Elk Creek Lat.	$20,367.81	
	71.4% of Lower Main Elk Creek Lat.	$138,429.61	
	100% of Main Elk Lat.	$435,556.80	**$602,498.95**
Upper East Elk	10.6% of School Lat.	$9,087.80	
	10.6% of Lower Elk Creek Lat.	$22,726.19	
	53.3% of Lower East Elk Creek Lat.	$103,755.91	
	100% of Upper East Elk Lat.	$549,370.80	**$684,940.70**
East Elk	19.6% School Lat.	$16,803.86	
	19.6% of Lower Elk Creek Lat.	$42,022.01	
	28.7% of Lower Main Elk Creek Lat.	$55,681.21	
	24.8% of Lower East Elk Lat.	$48,276.67	**$162,783.75**
West Faas	55.6% of Pepsi Lat.	$297,445.77	
	77.4% of West Faas Lat.	$155,263.32	**$452,709.09**
East Faas	16.3% of Pepsi Lat.	$87,200.83	
	22.6% of West Faas Lat.	$45,335.28	
	100% of East Faas Lat.	$259,070.40	**$391,606.51**
Upper Colorado	1.1% of Pepsi Lat.	$5,884.72	
	4.2% of The Farm Lat.	$15,847.83	
	12.5% of Upper Farm Lat.	$25,769.40	
	43.1% of Upper Colorado Lat.	$139,354.89	**$186,856.84**

Table B-3-5 -Continued
Combined Costs per Service Area in
Intra-regional Alternatives B-2 and B-3

Service Area I.D.	Percent of Work Activity	Associated Activity Cost	Total Costs (Extensions)
Upper NCIG	1.5% of Pepsi Lat.	$8,024.62	
	5.5% of The Farm Lat.	$20,753.11	
	16.5% of Upper Farm Lat.	$34,015.61	
	56.9% of Upper Colorado Lat.	$192,704.20	
	100% of Upper NCIG Lat.	$93,260.40	**$348,757.94**
NCIG	3.7% of Pepsi Lat.	$19,794.05	
	13.5% of The Farm Lat.	$50,939.45	
	32.0% of Lower Farm Lat.	$32,757.89	
	73.7% of NCIG Lat.	$60,068.45	**$163,559.84**
The Farm	19.6% of Pepsi Lat.	$104,854.98	
	72.0% of The Farm Lat.	$271,677.03	
	71% of Upper Farm Lat.	$146,370.19	
	57.0% of Lower Farm Lat.	$58,349.99	**$581,252.19**
Industrial Park	100% of Industrial Park Lat.	$210,013.20	**$210,013.20**
Riverbend	1.3% of Pepsi Lat.	$6,954.67	
	4.8% of The Farm Lat.	$18,111.80	
	11.4% of Lower Farm Lat.	$11,670.00	
	26.3% of NCIG Lat.	$21,435.55	
	100% of Riverbend Lat.	$193,742.40	**$251,914.42**
Burning Mountain	1% of Pepsi Lat.	$5,349.74	
	100% of Burning Mnt. Lat.	$149,116.80	**$154,466.54**
Elk Creek	4.4% of School Lat.	$3,772.30	
	4.4% of Lower Elk Creek Lat.	$9,433.51	
	22% of Lower East Elk Lat.	$42,826.08	
	West Elk Creek Subd. Lat.	$132,955.20	
	East Elk Creek Subd. Lat.	$164,896.80	
	3-Elk Run Lat.	$142,800.00	
	The Cedars Lat.	$155,678.40	
	Hidden Valley Lat.	$178,603.20	
	Co. Rd. 245 Lat.	$219,866.40	**$1,050,831.89**

Table B-3-6
Total Cost per Service Area in
Intra-regional Alternatives B-2 and B-3

Service Area I.D.	Extension Costs (Table B-3-5)	W.W.T.P. Costs (Table B-3-2)	Total Costs per Service Area
West Elk	$470,033.17	$14,452.50	$484,486
Upper Main Elk	$355,542.11	$11,070.00	$366,612
Main Elk	$602,498.95	$87,022.50	$689,521
Upper East Elk	$684,940.70	$97,170.00	$782,111
East Elk	$162,783.75	$179,580.00	$342,364
West Faas	$452,709.09	$2,211,232.50	$2,663,942
East Faas	$391,606.51	$647,287.50	$1,038,894
Upper Colorado	$186,856.84	$45,202.50	$232,059
Upper NCIG	$348,757.94	$59,665.00	$408,423
NCIG	$163,559.84	$145,755.00	$309,315
The Farm	$581,252.19	$777,667.50	$1,358,920
Industrial Park	$210,013.20	$23,062.50	$233,076
Riverbend	$251,914.42	$51,967.50	$303,882
Burning Mountain	$154,466.54	$39,052.50	$193,519
Elk Creek	$1,050,831.89	$79,950.00	$1,130,782
Totals:	**$6,067,767**	**$4,470,138**	**$10,537,905**

Table B-3-7
Total Cost per Unit per Service Area in
Intra-regional Alternatives B-2 and B-3

Service Area I.D.	Total Cost per Service Area	Number of Units In Service Area	Total Costs per Unit in Service Area
West Elk	$484,486	17	$28,499.16
Upper Main Elk	$366,612	13	$28,224.02
Main Elk	$689,521	102	$6,856.83
Upper East Elk	$782,111	114	$7,129.92
East Elk	$342,364	211	$1,699.04
West Faas	$2,663,942	2596	$1,028.85
East Faas	$1,038,894	760	$1,369.78
Upper Colorado	$232,059	53	$4,402.81
Upper NCIG	$408,423	70	$5,850.78
NCIG	$309,315	171	$1,977.93
The Farm	$1,358,920	913	$1,513.26
Industrial Park	$233,076	27	$8,632.43
Riverbend	$303,882	61	$4,981.67
Burning Mountain	$193,519	46	$4,206.93
Elk Creek	$1,130,782	94	$12,029.60
Totals:	**$10,537,905**	**5,248**	**$2,007.98**

Table B-3-8
Total Cost per Person per Service Area in
Intra-regional Alternatives B-2 and B-3

Service Area I.D.	Total Cost per Service Area	Number of Persons In Service Area	Total Costs per Unit in Service Area
West Elk	$484,486	47	$10,308.21
Upper Main Elk	$366,612	36	$10,183.67
Main Elk	$689,521	283	$2,436.47
Upper East Elk	$782,111	316	$2,475.03
East Elk	$342,364	584	$586.24
West Faas	$2,663,942	7191	$370.46
East Faas	$1,038,894	2105	$493.54
Upper Colorado	$232,059	147	$1,578.63
Upper NCIG	$408,423	194	$2,105.27
NCIG	$309,315	474	$652.56
The Farm	$1,358,920	2529	$537.33
Industrial Park	$233,076	75	$3,107.68
Riverbend	$303,882	169	$1,798.12
Burning Mountain	$193,519	127	$1,523.77
Elk Creek	$1,130,782	260	$4,349.16
Totals:	**$10,537,905**	**14,537**	**$724.90**

6.2.2.4 Intra-regional Alternative B-4. This plan involves the construction of facilities necessary to combine the New Castle and Mountain Shadows/Apple Tree wastewater flows and treat them at one single location. The plan, as shown on Map #5, proposes the collection of wastewater flows at the current location of the Mountain Shadows/Apple Tree W.W.T.P. into a pump station. Once at the pump station, wastewater would then be pumped back to the New Castle W.W.T.P. through a 6" PVC main where it will combine with the New Castle flows and be treated at a central location. Combining the Mountain Shadows/Apple Tree flows with the New Castle flows can be independant of any of the other alternatives previously listed. A number of tables follow which identify costs and loadings anticipated given this alternative alone and in combination with the other alternatives.

Existing Conditions at Mountain Shadows/Apple Tree W.W.T.P.

Existing number of units= 455 units
Existing population= 1260 persons
Existing design flow to plant= 0.150 MGD
Associated cost to treat flow at plant (plant costs)= $615,000

Future Condition #4-a. (Combined with existing conditions of Alternative #1)

Specified Item as Listed below:	Mnt. Shadows/Apple Tree W.W.T.P.	New Castle W.W.T.P.	Combined W.W.T.P.
Number of units	455	527	982
Population	1260	1460	2720
Design flow to plant	0.15MGD	0.20MGD	0.35MGD
Cost to treat flow	$615,000	$820,000	$1,435,000
Infrastructure costs	$377,040	-0-	$377,040
Per unit costs	$2,180.31	$1,555.98	$1,845.25

Future Condition #4-b. (Combined with future conditions of Alternative #1)

Specified Item as Listed below:	Mnt. Shadows/Apple Tree W.W.T.P.	New Castle W.W.T.P.	Combined W.W.T.P.
Number of units	455	2180	2635
Population	1260	6039	7299
Design flow to plant	0.15MGD	0.45MGD	0.60MGD
Cost to treat flow	$615,000	$1,845,000	$2,460,000
Infrastructure costs	$377,040	$587,564	$964,604
Per unit costs	$2,180.31	$1,076.68	$1,299.66

Future Condition #4-c. (Combined with future conditions of Alternative #2)

Specified Item as Listed below:	Mnt. Shadows/Apple Tree W.W.T.P.	New Castle W.W.T.P.	Combined W.W.T.P.
Number of units	455	7227	7682
Population	1260	20019	21279
Design flow to plant	0.15MGD	1.50MGD	1.65MGD
Cost to treat flow	$615,000	$6,150,000	$6,765,000
Infrastructure costs	$377,040	$4,730,674	$5,107,714
Per unit costs	$2,180.31	$1,090.45	$1,545.52

Future Condition #4-d. (Combined with future conditions of Alternative #3)

Specified Item as Listed below:	Mnt. Shadows/Apple Tree W.W.T.P.	New Castle W.W.T.P.	Combined W.W.T.P.
Number of units	455	7428	7883
Population	1260	20576	21836
Design flow to plant	0.15MGD	1.54MGD	1.69MGD
Cost to treat flow	$615,000	$6,314,000	$6,929,000
Infrastructure costs	$377,040	$6,067,767	$6,444,807
Per unit costs	$2,180.31	$1,666.90	$1,696.54

Map #5 in the appendix defines the extensions necessary to serve those areas discussed above. Detailed cost estimates of the work identified can be found in the appendix.

6.2.2.5 Intra-regional Alternative B-5. This plan also involves the construction of facilities necessary to combine the New Castle and Mountain Shadows/Apple Tree wastewater flows and treat them at one single location. The plan, as shown on Map #6 (appendix), proposes the collection of wastewater flows at the current location of the Mountain Shadows/Apple Tree W.W.T.P. into a pump station. Once at the pump station, wastewater would then be pumped to a new plant location downstream along the Colorado River. For estimating purposes, this plant location has been shown in the vicinity of the Delany Property. The New Castle wastewater flows would be collected at the existing W.W.T.P. and then transported to the new plant location through a 42" PVC main where it would combine with the Mountain Shadows/Apple Tree flows and be treated at a central location. Again, combining the Mountain Shadows/Apple Tree flows with the New Castle flows, along with construction of a new plant can be independant of any of the other alternatives previously listed. A number of tables follow which identify costs and loadings anticipated given this alternative alone and in combination with the other alternatives.

Existing Conditions at Mountain Shadows/Apple Tree W.W.T.P.

Existing number of units= 455 units
Existing population= 1260 persons
Existing design flow to plant= 0.150 MGD
Associated cost to treat flow at plant (plant costs)= $615,000

Future Condition #5-a. (Combined with existing conditions of Alternative #1)

Specified Item as Listed below:	Mnt. Shadows/Apple Tree W.W.T.P.	New Castle W.W.T.P.	Combined W.W.T.P.
Number of units	455	598	1053
Population	1260	1656	2916
Design flow to plant	0.15MGD	0.20MGD	0.35MGD
Cost to treat flow	$615,000	$820,000	$1,435,000
Infrastructure costs	$90,000	$779,965	$869,965
Per unit costs	$1,549.45	$2,675.53	$2,188.95

Future Condition #5-b. (Combined with future conditions of Alternative #1)

Specified Item as Listed below:	Mnt. Shadows/Apple Tree W.W.T.P.	New Castle W.W.T.P.	Combined W.W.T.P.
Number of units	455	2251	2706
Existing population	1260	6235	7495
Design flow to plant	0.15MGD	0.47MGD	0.62MGD
Cost to treat flow	$615,000	$1,927,000	$2,542,000
Infrastructure costs	$90,000	$1,367,529	$1,457,529
Per unit costs	$1,549.45	$1,463.58	$1,478.02

Future Condition #5-c. (Combined with future conditions of Alternative #2)

Specified Item as Listed below:	Mnt. Shadows/Apple Tree W.W.T.P.	New Castle W.W.T.P.	Combined W.W.T.P.
Number of units	455	7298	7753
Population	1260	20215	21475
Design flow to plant	0.15MGD	1.52MGD	1.67MGD
Cost to treat flow	$615,000	$6,232,000	$6,847,000
Infrastructure costs	$90,000	$5,510,639	$5,600,639
Per unit costs	$1,549.45	$1,609.02	$1,605.53

Future Condition #5-d. (Combined with future conditions of Alternative #3)

Specified Item as Listed below:	Mnt. Shadows/Apple Tree W.W.T.P.	New Castle W.W.T.P.	Combined W.W.T.P.
Number of units	455	7499	7954
Population	1260	20772	22033
Design flow to plant	0.15MGD	1.56MGD	1.71MGD
Cost to treat flow	$615,000	$6,396,000	$7,011,000
Infrastructure costs	$90,000	$6,847,732	$6,937,732
Per unit costs	$1,549.45	$1,766.07	$1,753.68

Map #6 in the appendix defines the extensions necessary to serve those areas discussed above. Detailed cost estimates of the work identified can be found in the appendix.

6.2.2.6 Weeding of Alternatives for Cost Considerations: Upon preparation and review of the specific cost estimates for each of the alternatives evaluated, weeding of the alternatives considered for extensions into various service areas can be considered. Each of the cost evaluations broke the costs down to a 'per unit' basis. By doing this, one can then determine whether the extension is cost effective in comparison to the current methods of disposal being individual sewage disposal systems which chiefly consist of a septic tank, piping and a distribution field (ie, leach field). Generally, those areas identified in the comprehensive plan which have densities lower than 1 dwelling unit per acre are not cost effective and can be withdrawn from the service area. These densities are low enough, however, that the various developable areas can still support the existing system of individual sewage disposal system construction. To 'weed' the various areas out of the service area, an average cost to construct an individual sewage disposal system of $4000 per unit was used. For those areas or improvements identified with costs in excess of $4000 per unit, the improvement was not considered, and therefore, the service area for which the improvement was to serve was eliminated. The following series of tables, builds upon those tables prepared for the various alternatives to allow the reader to follow which areas remain in the service area and which areas are eliminated.

For Intra-region Alternative B-1. This alternative reflected per unit costs of less than $4000, thus this alternative still remains for consideration.

For Intra-regional Alternative B-2. This plan involves extensions of collector lines into the town's secondary service or growth areas. Those areas which remain in the alternative are supported with pertinent information. Those areas being eliminated are identified.

Table B-6-1
Service Areas in Alternative B-2

Service Area I.D.	Existing units	Proposed units	Population	
West Elk	-	-	-	OUT
Upper Main Elk	-	-	-	OUT
Main Elk	-	-	-	OUT
Upper East Elk	-	-	-	OUT
East Elk	9	202	584	
West Faas	1	2595	7191	
East Faas	2	758	2105	
Upper Colorado	-	-	-	OUT
Upper NCIG	-	-	-	OUT
NCIG	2	169	474	
The Farm	8	905	2529	
Industrial Park	-	-	-	OUT

Table B-6-2 identifies the anticipated flows to the New Castle W.W.T.P. from each of the service areas as well as associated costs.

Tables B-6-3 through B-6-5 summarize, in various forms, the costs to extend service to the various service areas in Intra-regional Alternative B-2.

Table B-6-6 summarizes the total costs for extensions and treatment of waste for the various service areas.

Table B-6-7 defines the costs from a per unit basis.

Table B-6-2
Associated Wastewater Treatment Costs by
Service Area in Alternative B-2

Service Area I.D.	Population (persons)	Flow to WWTP (gpd)	Associated Cost (at WWTP)
~~West Elk~~	~~47~~	~~3525~~	~~$14,452.50~~
~~Upper Main Elk~~	~~36~~	~~2700~~	~~$11,070.00~~
~~Main Elk~~	~~283~~	~~21,225~~	~~$87,022.50~~
~~Upper East Elk~~	~~316~~	~~23,700~~	~~$97,170.00~~
East Elk	584	43,800	$179,580.00
West Faas	7191	539,325	$2,211,232.50
East Faas	2105	157,875	$647,287.50

Table B-6-2-continued

Associated Wastewater Treatment Costs by Service Area in Alternative B-2

Service Area I.D.	Population (persons)	Flow to WWTP (gpd)	Associated Cost (at WWTP)
~~Upper Colorado~~	~~147~~	~~11,025~~	~~$45,202.50~~
~~Upper NCIG~~	~~194~~	~~14,550~~	~~$59,655.00~~
NCIG	474	35,550	$145,755.00
The Farm	2529	189,675	$777,667.50
~~Industrial Park~~	~~75~~	~~5,625~~	~~$23,062.50~~
Totals:	~~**13,981**~~	~~**1,048,575**~~	~~**$4,299,157.50**~~
	12,883	**966,225**	**$3,961,522.50**

Table B-6-3
Work Activities Summary in Intra-regional Alternative B-2

Work Activity	Associated Cost
School Lateral	$85,734.00
Lower Elk Creek Lateral	$214,398.00
~~Lower Main Elk Creek Lateral~~	~~$194,011.20~~
~~Main Elk Lateral~~	~~$435,556.80~~
~~Upper Main Elk Lateral~~	~~$295,464.00~~
~~West Elk Lateral~~	~~$391,195.20~~
Lower East Elk Lateral	$194,664.00
~~Upper East Elk Lateral~~	~~$549,370.80~~
Pepsi Lateral	$534,974.40
The Farm Lateral	$377,329.20
Upper Farm Lateral	$206,155.20
~~Upper Colorado Lateral~~	~~$323,329.20~~
~~Upper NCIG Lateral~~	~~$93,260.40~~
Lower Farm Lateral	$102,368.40
NCIG Lateral	$81,504.00
West Faas Lateral	$200,598.60
East Faas Lateral	$259,070.40
~~Industrial Park Lateral~~	~~$210,013.20~~

Table B-6-4
Work Activities/Service Areas Benefitted in Intra-regional Alternative B-2

Work Activity	Associated Cost	Service Areas Benefited
School Lateral	$85,734.00	East Elk~~,Main Elk,West Elk Upper Main Elk, Upper East Elk (1032 units served)~~

Table B-6-4-continued

Work Activities/Service Areas Benefitted in Intra-regional Alternative B-2

Work Activity	Associated Cost	Service Areas Benefited
Lower Elk Creek Lateral	$214,398.00	East Elk,~~Main Elk,West Elk~~ ~~Upper Main Elk, Upper East Elk~~ ~~(1032 units served)~~
~~Lower Main Elk Creek Lateral~~	~~$194,011.20~~	~~25% of East Elk,Main Elk West Elk, Upper Main Elk~~ ~~(185 units served)~~
~~Main Elk Lateral~~	~~$435,556.80~~	~~Main Elk, West Elk Upper Main Elk~~ ~~(132 units served)~~
~~Upper Main Elk Lateral~~	~~$295,464.00~~	~~Upper Main Elk~~ ~~(13 units served)~~
~~West Elk Lateral~~	~~$391,195.20~~	~~West Elk Lateral~~ ~~(17 units served)~~
Lower East Elk Lateral	$194,664.00	100% of East Elk
~~Upper East Elk Lateral~~	~~$549,370.80~~	~~Upper East Elk~~ ~~(167 units served)~~ ~~Upper East Elk~~ ~~(114 units served)~~
Pepsi Lateral	$534,974.40	West Faas, East Faas, The Farm, ~~Upper Colorado, Upper NCIG~~, NGIG (4440 units served)
The Farm Lateral	$377,329.20	The Farm, ~~Upper Colorado, Upper NCIG~~, NCIG (1084 units served)
Upper Farm Lateral	$206,155.20	33% The Farm, ~~Upper Colorado, Upper NCIG~~ (301 units served)
~~Upper Colorado Lateral~~	~~$323,329.20~~	~~Upper Colorado, Upper NCIG~~ ~~(123 units served)~~
~~Upper NCIG Lateral~~	~~$93,260.40~~	~~Upper NCIG~~ ~~(70 units served)~~
Lower Farm Lateral	$102,368.40	33% The Farm, NCIG (472 units served)
NCIG Lateral	$81,504.00	NCIG (171 units served)
West Faas Lateral	$200,598.60	West Faas, East Faas (3356 units served)
East Faas Lateral	$259,070.40	East Faas (760 units served)
~~Industrial Park Lateral~~	~~$210,013.20~~	~~Industrial Park~~ ~~(27 units served)~~

Table B-6-5
Combined Costs per Service Area in
Intra-regional Alternative B-2

Service Area I.D.	Percent of Work Activity	Associated Activity Cost	Total Costs (Extensions)
~~West Elk~~	~~1.6% School Lat.~~	~~$1,371.74~~	
	~~1.6% of Lower Elk Creek Lat.~~	~~$3,430.37~~	
	~~9.2% of Lower Main Elk Creek Lat.~~	~~$17,849.03~~	
	~~12.9% of Main Elk Lat.~~	~~$56,186.83~~	
	~~100% of West Elk Lat.~~	~~$391,195.20~~	~~**$470,033.17**~~
~~Upper Main Elk~~	~~1.3% of School Lat.~~	~~$1,114.54~~	
	~~1.3% of Lower Elk Creek Lat.~~	~~$2,787.17~~	
	~~7% of Lower Main Elk Creek Lat.~~	~~$13,580.78~~	
	~~9.9% of Main Elk Lat.~~	~~$42,895.75~~	
	~~100% of Upper Main Elk Lat.~~	~~$295,464.00~~	~~**$355,842.24**~~
~~Main Elk~~	~~12.8% of School Lat.~~	~~$10,965.98~~	
	~~12.8% of Lower Elk Creek Lat.~~	~~$27,421.50~~	
	~~71.4% of Lower Main Elk Creek Lat.~~	~~$138,429.61~~	
	~~100% of Main Elk Lat.~~	~~$435,556.80~~	~~**$612,373.89**~~
~~Upper East Elk~~	~~11.1% of School Lat.~~	~~$9,516.47~~	
	~~11.1% of Lower Elk Creek Lat.~~	~~$23,798.18~~	
	~~68.3% of Lower East Elk Creek Lat.~~	~~$132,955.51~~	
	~~100% of Upper East Elk Lat.~~	~~$549,370.80~~	~~**$715,640.96**~~
~~East Elk~~	~~20.5% School Lat.~~	~~$17,575.47~~	
	~~20.5% of Lower Elk Creek Lat.~~	~~$43,951.59~~	
	~~28.7% of Lower Main Elk Creek Lat.~~	~~$55,681.21~~	
	~~31.7% of Lower East Elk Lat.~~	~~$61,708.49~~	~~**$178,916.76**~~
West Faas	58.5%of Pepsi Lat.	$312,960.02	
	77.4% of West Faas Lat.	$155,263.32	**$468,223.34**
East Faas	17.1% of Pepsi Lat.	$91,480.62	
	22.6% of West Faas Lat.	$45,335.28	
	100% of East Faas Lat.	$259,070.40	**$395,886.30**
~~Upper Colorado~~	~~1.2% of Pepsi Lat.~~	~~$6,419.69~~	
	~~4.4% of The Farm Lat.~~	~~$16,602.48~~	
	~~12.5% of Upper Farm Lat.~~	~~$25,769.40~~	
	~~43.1% of Upper Colorado Lat.~~	~~$139,354.89~~	~~**$188,146.46**~~

Table B-6-5-continued
Combined Costs per Service Area in
Intra-regional Alternative B-2

Service Area I.D.	Percent of Work Activity	Associated Activity Cost	Total Costs (Extensions)
~~Upper NCIG~~	~~1.5% of Pepsi Lat.~~	~~$8,024.62~~	
	~~5.8% of The Farm Lat.~~	~~$21,885.09~~	
	~~16.5% of Upper Farm Lat.~~	~~$34,015.61~~	
	~~56.9% of Upper Colorado Lat.~~	~~$192,704.20~~	
	~~100% of Upper NCIG Lat.~~	~~$93,260.40~~	~~**$349,889.92**~~
NCIG	3.8% of Pepsi Lat.	$20,329.03	
	15.8% of The Farm Lat.	$59,618.01	
	36.2% of Lower Farm Lat.	$37,057.36	
	100% of NCIG Lat.	$81,504.00	**$198,508.40**
The Farm	20.6% of Pepsi Lat.	$110,204.72	
	100% of The Farm Lat.	$377,329.20	
	100% of Upper Farm Lat.	$206,155.20	
	63.8% of Lower Farm Lat.	$65,311.04	**$759,000.16**
~~Industrial Park~~	~~100% of Industrial Park Lat.~~	~~$210,013.20~~	~~**$210,013.20**~~

Table B-6-6
Total Cost per Service Area in
Intra-regional Alternative B-2

Service Area I.D.	Extension Costs (Table B-2-5)	W.W.T.P. Costs (Table B-2-2)	Total Costs per Service Area
~~West Elk~~	~~$470,033.17~~	~~$14,452.50~~	~~$484,485.67~~
~~Upper Main Elk~~	~~$355,842.24~~	~~$11,070.00~~	~~$366,912.24~~
~~Main Elk~~	~~$612,373.89~~	~~$87,022.50~~	~~$699,396.39~~
~~Upper East Elk~~	~~$715,640.96~~	~~$97,170.00~~	~~$812,810.96~~
East Elk	$494,796.00	$179,580.00	$674,376.00
West Faas	$468,233.34	$2,211,232.50	$2,679,455.84
East Faas	$395,886.30	$647,287.50	$1,043,173.8
~~Upper Colorado~~	~~$188,146.46~~	~~$45,202.50~~	~~$233,348.96~~
~~Upper NCIG~~	~~$349,889.92~~	~~$59,665.00~~	~~$409,554.92~~
NCIG	$198,508.40	$145,755.00	$344,263.40
The Farm	$759,000.16	$777,667.50	$1,536,667.66
~~Industrial Park~~	~~$210,013.20~~	~~$23,062.50~~	~~$233,075.70~~
Totals:	~~$4,730,674~~	~~$4,299,168~~	~~$9,029,842~~
	$2,316,424	**$3,961,522**	**$6,277,946**

Table B-6-7
Total Cost per Unit per Service Area in
Intra-regional Alternative B-2

Service Area I.D.	Total Cost per Service Area	Number of Units In Service Area	Total Costs per Unit in Service Area
~~West Elk~~	~~$484,485.67~~	~~17~~	~~$28,499.16~~
~~Upper Main Elk~~	~~$366,912.24~~	~~13~~	~~$28,224.02~~
~~Main Elk~~	~~$699,396.39~~	~~102~~	~~$6,856.83~~
~~Upper East Elk~~	~~$812,810.96~~	~~114~~	~~$7,129.92~~
East Elk	$674,376.00	211	$3,196.09
West Faas	$2,679,455.84	2596	$1,032.15
East Faas	$1,043,173.80	760	$1,372.60
~~Upper Colorado~~	~~$233,348.96~~	~~53~~	~~$4,402.81~~
~~Upper NCIG~~	~~$409,554.92~~	~~70~~	~~$5,850.78~~
NCIG	$344,263.40	171	$2,013.24
The Farm	$1,536,667.66	913	$1,683.10
~~Industrial Park~~	~~$233,075.70~~	~~27~~	~~$8,632.43~~
Totals:	**$6,277,936.70**	**4651**	**$1,349.80**

For Intra-region Alternative B-3. All of the additional alternatives considered with Alternative B-3 reflected per unit costs greater than $4000, thus this alternative was eliminated in it's entirety from consideration.

For Intra-regional Alternative B-4. This plan remains valid in the consideration of alternatives process from the standpoint that it can work financially alone or in combination with Alternatives B-1 or B-2. Modifications to per unit costs as modified in Alternative B-2 are shown as follows:

Existing Conditions at Mountain Shadows/Apple Tree W.W.T.P.

Existing number of units= 455 units
Existing population= 1260 persons
Existing design flow to plant= 0.150 MGD
Associated cost to treat flow at plant (plant costs)= $615,000

Future Condition #4-a. (Combined with existing conditions of Alternative #1)

Specified Item as Listed below:	Mnt. Shadows/Apple Tree W.W.T.P.	New Castle W.W.T.P.	Combined W.W.T.P.
Number of units	455	527	982
Population	1260	1460	2720
Design flow to plant	0.15MGD	0.20MGD	0.35MGD
Cost to treat flow	$615,000	$820,000	$1,435,000
Infrastructure costs	$377,040	-0-	$377,040

Per unit costs	$2,180.31	$1,555.98	$1,845.25

Future Condition #4-b. (Combined with future conditions of Alternative #1)

Specified Item as Listed below:	Mnt. Shadows/Apple Tree W.W.T.P.	New Castle W.W.T.P.	Combined W.W.T.P.
Number of units	455	2180	2635
Population	1260	6039	7299
Design flow to plant	0.15MGD	0.45MGD	0.60MGD
Cost to treat flow	$615,000	$1,845,000	$2,460,000
Infrastructure costs	$377,040	$587,564	$964,604
Per unit costs	$2,180.31	$1,076.68	$1,299.66

Future Condition #4-c. (Combined with future conditions of Alternative #2)

Specified Item as Listed below:	Mnt. Shadows/Apple Tree W.W.T.P.	New Castle W.W.T.P.	Combined W.W.T.P.
Number of units	455	6831	7286
Population	1260	18922	20182
Design flow to plant	0.15MGD	1.42MGD	1.57MGD
Cost to treat flow	$615,000	$5,822,000	$6,437,000
Infrastructure costs	$377,040	$2,316,424	$2,693,464
Per unit costs	$2,180.31	$1,191.39	$1,253.15

For Intra-regional Alternative B-5. This plan remains valid in the consideration of alternatives process from the standpoint that it can work financially alone or in combination with Alternatives B-1 or B-2. Modifications to per unit costs as modified in Alternative B-2 are shown as follows:

Existing Conditions at Mountain Shadows/Apple Tree W.W.T.P.

Existing number of units= 455 units
Existing population= 1260 persons
Existing design flow to plant= 0.150 MGD
Associated cost to treat flow at plant (plant costs)= $615,000

Future Condition #5-a. (Combined with existing conditions of Alternative #1)

Specified Item as Listed below:	Mnt. Shadows/Apple Tree W.W.T.P.	New Castle W.W.T.P.	Combined W.W.T.P.
Number of units	455	598	1053
Population	1260	1656	2916
Design flow to plant	0.15MGD	0.20MGD	0.35MGD
Cost to treat flow	$615,000	$820,000	$1,435,000
Infrastructure costs	$90,000	$779,965	$869,965
Per unit costs	$1,549.45	$2,675.53	$2,188.95

Future Condition #5-b. (Combined with future conditions of Alternative #1)

Specified Item as Listed below:	Mnt. Shadows/Apple Tree W.W.T.P.	New Castle W.W.T.P.	Combined W.W.T.P.
Number of units	455	2251	2706
Existing population	1260	6235	7495
Design flow to plant	0.15MGD	0.47MGD	0.62MGD
Cost to treat flow	$615,000	$1,927,000	$2,542,000
Infrastructure costs	$90,000	$1,367,529	$1,457,529
Per unit costs	$1,549.45	$1,463.58	$1,478.02

Future Condition #5-c. (Combined with future conditions of Alternative #2)

Specified Item as Listed below:	Mnt. Shadows/Apple Tree W.W.T.P.	New Castle W.W.T.P.	Combined W.W.T.P.
Number of units	455	6902	7357
Population	1260	19119	20379
Design flow to plant	0.15MGD	1.43MGD	1.58MGD
Cost to treat flow	$615,000	$5,863,000	$6,478,000
Infrastructure costs	$90,000	$3,096,389	$3,186,389
Per unit costs	$1,549.45	$1,298.09	$1,313.63

6.2.2.7 Consideration of Cluster or Mound Systems. In making a preliminary evaluation of the feasibility of utilizing cluster or mound systems alternatives, the following factors were considered:

a. Physical constraints such as depth to bedrock and ground water.
b. Lot sizes and density of units.
c. Land availability.
d. Annual overall costs for each system.
e. Soil permeability.
f. Legal implications such as zoning.

In all cases, excepting the recent platting of the units in the 3-Elk Run, Cedars P.U.D. and Hidden Valley service areas, as well as the outlying rural areas, it was not feasible to employ such an alternative. In the higher density developments such as Elk Creek Subdivision, the lots are too small, soil permeability problems exist, legal implications (ie., zoning) and no available land to situate new system installations exist. Therefore, further detailed evaluation of such alternatives were not performed.

6.2.2.8 Alternative Considering Use of Pressure/Vacuum Systems and Small Diameter Sewers. In the New Castle Planning Area, consideration of using non-conventional, innovative means of collection systems were evaluated. Particularly, for those existing, higher density developments, such as Elk Creek Subdivision, Riverbend, 3-Elk Run, Cedars PUD and Hidden Valley. This alternative is evaluated since the prior alternatives looked at providing service to these existing, higher density areas only when a gravity (i.e., conventional) system is

near the area's proximity so it is feasible to tie these particular service areas onto the collection system. In essence, the prior alternatives were evaluated on the basis of contiguous expansion from the core facilities in the New Castle planning area. Evaluation of this alternative attempts to provide service to those existing areas subject to nodal expansion.

The first area evaluated considers the use of a small diameter pressure (or forced) main from Riverbend to the east terminus of the existing collection system near the New Castle/I-70 interchange. This alternative ties into the Burning Mountain RV Park lateral which would eventually tie into the aforementioned existing sewer collector line at the Burning Mountain -Phase I Subdivision. Because this alternative is assumed to be constructed prior to the Town's growth extending out to Riverbend, the alignment of the force would follow the only right-of-way available, which would be County Road 335. Additionally, it would be sized to handle the Riverbend, NCIG and Burning Mountain service areas. These service areas would combine to ultimately require service for upwards of 276 units. All of these supported units would be located on the south side of the river.

In order to make an "apples to apples" comparison between the conventional gravity main sewer and the force main sewer, it is realized that the gravity sewer previously described in Alternatives B2 and B3 which would provide service to those areas east of the existing Town limits and to the north of the Colorado River would need to be constructed considering the absence of the Riverbend and NCIG service areas.

Because both the conventional and non-conventional alternatives tie into the Town's system located near the New Castle/I-70 interchange, the comparison is being made assuming that from this point to the New Castle wastewater treatment plant the alternatives would be equal.

In regards to the required improvements in Alternative B3, the following table illustrates the savings that could be realized in the capital expenditures for the construction of the required improvements as a result of the absence of Riverbend and NCIG service areas.

Percent Savings by Service Area to The Farm and Lower Farm Laterals Without Riverbend & NCIG Service Areas Serviced

Service Area Removed From Required Improvements	Savings in the Farm Lateral	Savings in the Lower Farm Lateral
Riverbend Service Area	1.4%	4.2%
NCIG Service Area	4.3%	11.8%
TOTAL	5.7%	16%

Once considering the savings realized in the Farm and Lower Farm laterals, then the direct comparison between the non-conventional and conventional alternative for service into the eastern service areas can be made. The following two tables list the required improvements and the associated present worth and equivalent annual costs for those improvements for each alternative:

Costs for Improvements
Non-Conventional (Forced Main)
Sewage Collection and Transport

Required Improvements	Project Present Worth	Project Equivalent Annual Cos
Riverbend Forced Main	$ 493,458.47	$ 50,259.83
Burning Mountain Lateral	$ 166,966.21	$ 17,005.88
The Farm Lateral	$ 386,862.16	$ 39,402.76
The Lower Farm Lateral	$ 153,678.60	$ 15,652.50
TOTAL	$1,200,965.44	$122,320.97

Costs for Improvements
Conventional (Gravity Main)
Sewage Collection and Transport

Required Improvements	Project Present Worth	Project Equivalent Annual Cos
Riverbend Lateral	$ 207,187.92	$ 21,102.55
NCIG Lateral	$ 80,830.23	$ 8,232.74
The Farm Lateral	$ 410,246.19	$ 41,784.48
The Lower Farm Lateral	$ 182,950.71	$ 18,633.93
Burning Mountain Lateral	$ 166,966.21	$ 17,005.88
TOTAL	$1,048,181.26	$106,759.58

Cost Comparisons Between Conventional
and Non-Conventional Sewage Collection
and Transport Systems

Collection Alternative	Alternative Present Worth	Alternative Equivalent Annual Cost
Non-conventional (forced main)	$1,200,965.44	$122,320.97
Conventional (gravity main)	$1,048,181.26	$106,759.58

Both alternatives considered above would provide service to ultimately 4131 units in those service areas east of the current Town limits of New Castle. Other factors that need to be considered in making comparisons are as follows:

1a. Primary Environmental Impacts. As with previous comparisons made throughout this report, the longer the interceptor or outfall sewer, the greater for disruption and impact. With the forced main alternative requiring (at full build-out) essentially two main collector lines (i.e., one on the north side of the river and one on the south side of the river), the forced main alternative will score lower than the conventional gravity main alternative. Although the gravity main alternative requires a river crossing, the forced main will add in excess of 12,000 lineal feet of environmental disruption over the conventional alternative.

1b.Secondary Environmental Impacts. With the construction of the Farm and the Lower Farm laterals, the ability to add more units onto the New Castle wastewater system would be realized. Therefore, when looking at both alternatives, both alternatives as presented will have an equal secondary environmental impact from the stance that they both will support upwards of 4131 units. The construction of the Riverbend forced main alone (without constructing the Farm or Lower Farm lateral) would encourage development into the undeveloped portions of the Burning Mountain service area as well as the NCIG service area. Construction of this lateral alone would encourage more stripped development along this lateral. As is referenced in Section 6.2.2.6.1 (page 6-20, paragraph 1.b.), "A system of utilizing existing plants would have the most positive effect in concentrating growth, and reducing secondary impacts".

2.Implementation Capacity. In comparing the two alternatives, the implementation capacity would virtually be the same under a "full build-out" condition. However, again, if one were to construct a forced main prior to allowing contiguous growth to occur, implementing the central governing and management entity for both the New Castle system and the Riverbend system would be made more difficult. The present owners of the Riverbend system aresatisfied to operate their system as a private utility, particularly since it is new and has excess capacity. Therefore, the conventional system of allowing planned contiguous expansion of New Castle to occur prior to construction of the forced main, is rated the easiest to implement.

3.Contribution to Objectives and Goals. The forced main alternative, utilizing the non-conventional collection and transport system would be rated the best in this category since this alternative is not necessarily time dependent as to "when" this forced main could be constructed and, thus, can, if implemented, immediately obtain the objective and goals of eliminating proliferation of wastewater treatment facilities.

4.Energy and Resource Use. In this category, because of the additional length of line that needs to be installed to accommodate the non-conventional system, the non-conventional system scores lowest. In both alternatives, a pump station would be required. However, the distinct difference between the two alternatives would be the length of line in the ground.

5.Reliability. Again, in comparing the two alternatives, the longer length of collection lines in the non-conventional alternative would be the major difference in evaluating the reliability between the two systems.

6.Flexibility. Because both alternatives require the installation of a gravity main from the existing eastern limits of the Town of New Castle into the Farm service area, the conventional (gravity main) alternative scores highest. In essence, although the sewerline would be able to handle excess capacity, a future decision to install a forced main from Riverbend to the New Castle interchange could still be made and implemented. The decision to install this forced main prematurely, removes the flexibility in land planning and, to a lesser extent, facility planning.

7.Public Acceptance. As was stated in the aforementioned section of the 1980 201 Facilities Plan for the Town of New Castle, the public generally tends to favor alternatives to provide for the retention of existing facilities. In addition, public comment to date continues to

reflect that the public's opinion has remained unchanged. Therefore, the alternative which would eliminate or delay the installation of a non-conventional system from Riverbend to the New Castle interchange would score lowest in this category.

It is important to note that this similar evaluation that was performed with the Riverbend lateral was also performed with the other outlying service areas, such as Elk Creek Subdivision, 3-Elk Run, Cedars PUD and Hidden Valley.

A similar analysis was done in the 1980 201 Facilities Plan. In Section 6.2.2.6 of the 1980 study, it was determined that it was not cost effective at that time to extend service into the aforementioned service areas when compared with the separate systems. However, as contiguous expansion of the New Castle town limits extends during the planning period, many of the cost issues affecting the feasibility of these extensions will be eliminated. The viability of connecting the subdivisions to New Castle must be re-evaluated as actual growth occursand as effluent limitations become more and more strict. Certainly, it is recommended that the 201 Facilities Planning Report be utilized as a document to assist in local land planning, not only from the Town of New Castle's standpoint, but from Garfield County's standpoint as well.

6.2.2.9 TRADE-OFF EVALUATION AND RANKING OF PROPOSALS

Following this particular discussion are a number of various tables (Table B-7-1 through Table B-7-10) which represent the method of comparison and evaluation of the various alternatives based upon the criteria listed as follows:

TABLE	CRITERIA
B-7-1	Costs per unit
B-7-2	Primary environmental effects
B-7-3	Secondary environmental effects
B-7-4	Implementation capability
B-7-5	Contribution to objectives and goals
B-7-6	Energy and resourse use
B-7-7	Reliability
B-7-8	Flexibility
B-7-9	Public acceptance
B-7-10	Matrix ranking

With each table listed and its associated criteria, each of the alternatives discussed in prior sections of this report has been evaluated and given a matrix ranking. Table B-7-10 summarizes Tables B-7-1 through B-7-9 into a single table which then provides for the ability to consider the final ranking of each of the alternatives selected. It should be noted that in each of the tables, a total of 15 alternatives are ranked. These 15 alternatives are, in one form or another, variations of the five original alternatives discussed in Section 6 of the 201 Study as well as diagrammatically discussed on Maps 2 through 7.

The attached tables represent the Town Engineers personal evaluation presented as an example and as a portion of the work and process presented to and participated with the Town of New Castle Planning and Zoning Commission. By presenting this information in this form to the planning commission and interested members of the public, the number of alternatives could be further narrowed down to the "best" four alternatives for further detailed evaluation. As each member of the planning commmission, town staff and interested public rank the alternatives individually, the final selection of the "best" four is chosen by averaging all of the scores from each participant. The four highest ranking alternatives are then considered the "best" to be considered for further detailed evaluation. The following discussion defines each of the alternatives as they appear in each of the major ranking tables.

ALTERNATIVE B-1-a. Alternative B-1-a is an Existing Conditions (or do nothing) alternative of Alternative B-1as discussed in Section 6.2.2 of this 201 Study. Under alternative B-1-a, the number of unitsserved is 527. The population served by the plant will be 1460 persons, while the existing design flow to the plant will be 109,484 gpd. The associated cost to treat flow at the plant under alternative B-1-a is $448,884.

ALTERNATIVE B-1-b. Alternative B-1-b is the Future Conditions alternative of B-2 as discussed in Section 6.2.2 of this 201 Study. Under Alternative B-2-b, the total future number of units to be served by the plant will be 2180 units while the future population combined with the existing is 6039 persons with a future design flow to the plant being 452,895 gpd. The associated cost to treat the flow at the plant will be $1,856,869.50. This total costs considers the construction with the future conditions in Alternative B-1-b of the sewer intercept line to the western service area, the sewer intercept line to Castle Valley Ranch, the clay line replacement with PVC in the main portions of town and the upgrade of the water and wastewater treatment plant from 0.2 MGD capacity to 0.5 MGD capacity.

ALTERNATIVE B-2-a. Alternative B-2-a considers a service area consisting of existing town limits as well as development into the secondary growth areas (i.e., 3-Mile planning area) as shown on Map 3 in the appendix. Section 6.2.2.2 discusses in more detail the work and costs associated with Alternative B-2-a. To summarize Alternative B-2-a, the number of units served by Alternative B-2-a is 7248. The total cost for Alternative B-2-a is $11,003,279. The total population served by Alternative B-2-a is 20,077 persons. The flow to the wastewater treatment plant for Alternative B-2-a is 1,505,775 gpd.

ALTERNATIVE B-3-a. Alternative B-3-a is the area which not only includes the existing town service area and the secondary growth areas of town but, also, considers tying those higher density developments within the 3-Mile planning area which already have adequate sewerage facilities available. In essence, Elk Creek Subdivision, Riverbend Subdivision, Cedars Subdivision, 3-Elk Run and Hidden Valley Subdivisions are all essentially built out and all have adequate sewerage facilities. However, Alternative B-3-a attempts to provide services onto the New Castle WWTF from these area such that a regional plant can be utilized to serve the entire service area. Therefore, the existing facilities which would service these areas would be disconnected and no longer used, thus, mitigating any future chances of groundwater pollution or associated treatment problems which may come about as a result of future strengthening regulations in surface water discharge. Alternative B-3-a is discussed in further detail under Section 6.2.2.3. Map 4 in the appendix further diagrammatically describes the work and service areas of Alternative B-3-a. With Alternative B-3-a, the total number of units served would be 7449. The total cost for Alternative B-3-a would be $12,513,016. The total

population that would be served by Alternative B-3-a would be 20,634 persons, while the estimated flow top the WWTF would be 1,547,530 gpd.

ALTERNATIVE B-4-a. Alternative B-4-a considers a service area which combines the existing conditions of the Town of New Castle with the Mountain Shadows/Apple Tree Mobile Home Park WWTF. No future growth is allowed in Alternative B-4-a. With this alternative, the total number of units served would be 982, the population would be 2720, while the design flow to the WWTFwould be 350,000 gpd. Finally, the total cost for Alternative B-4-a would be $1,812,040.

ALTERNATIVE B-4-b. Alternative B-4-b contains a service area which includes complete buildout of the existing service area for the Town of New Castle as well as the addition of the Mountain Shadows/Apple Tree Mobile Home Park. The total number of units for Alternative for B-4-b is 2635. The population that would be served by Alternative B-4-b would be 7299 persons. The design flow to the WWTF would be 600,000 gpd, while the total cost for Alternative B-4-b would be $3,424,604.

ALTERNATIVE B-4-c-1. Alternative B-4-c-1 can be described as the alternative which would serve a service area consisting of Mountain Shadows/Apple Tree Mobile Home Park combined with the existing service area for the Town of New Castle as well as the secondary service area (i.e., 3-Mile planning area). Alternative B-4-c-1 will service 9883 units, with a population of 27,395 persons. The design flow to the WWTF would be 2.05 MGD, while the total cost of Alternative B-4-c-1 would be $14,212,009.

ALTERNATIVE B-4-d. The service area for Alternative B-4-d would be the existing town service area, the secondary growth areas, Mountain Shadows/Apple Tree Mobile Home Park and tying on Riverbend, Elk Creek, 3-Elk Run, Cedars and Hidden Valley Subdivisions. Alternative B-4-d can support 10,084 units or 27,933 persons. The treatment plant location for Alternative B-4-d would be at the existing New Castle WWTF site. The total cost of the project for Alternative B-4-d would be $15,947,962, while the estimated flow to the WWTF would be 2.15 MGD.

ALTERNATIVE B-5-a. With Alternative B-5-a, the WWTF location would be downstream of Mountain Shadows/Apple Tree Mobile Home Park along the Colorado River. For purposes of this 201 Study, this site has been selected as the Delaney site. Alternative B-5-a considers the service area that would combine the New Castle and Apple Tree WWTF's with a new plant site at the Delaney site. The only additional service area that would be provided over the existing Town of New Castle Service area, as well the Apple Tree area would be the addition of the development that could be facilitated on the Delaney property itself. This would result in a total number of units for Alternative B-5-a of being 1053 with a population being 2916 persons. The design flow to the plant would be 350,000 gpd with a total alternative cost of $2,304,965.

ALTERNATIVE B-5-b. Alternative B-5-b also has a treatment plant being located on the Delaney property. The service area for Alternative B-5-b would include the existing service area for the Town of New Castle as built out. Also, the Apple Tree/Mountain Shadows service area would be added along with the Delaney property. The total units served for Alternative B-5-b would be 2706 units which relates to 7495 persons. The total flow to the plant would be 620,000 gpd with a total alternative cost being $3,999,529.

ALTERNATIVE B-5-c-1. Alternative B-5-c-1 would be an alternative that still keeps the new treatment plant site at the Delaney property. With the inclusion of the Apple Tree/Mountain Shadows service area and the Delaney service area, the New Castle service area would be expanded into its secondary growth areas. In essence, this alternative expands into the 3-Mile planning area. The total number of units served with Alternative B-5-c-1 would be 9954 units with a population of 27,573 persons. The design flow to the plant would be 2.12 MGD with a total cost of the alternative being $14,979,121.

ALTERNATIVE B-5-d. Alternative B-5-d considers a service area which includes Apple Tree/Mountain Shadows, Delaney, Town of New Castle with the 3-Mile planning area, Riverbend, Elk Creek Subdivision,3-Elk Run, Cedars Subdivision and Hidden Valley. This alternative can serve 10,155 units with a population of 28,129 persons, with an estimated design flow to the plant of 2.17 MGD. The total cost of Alternative B-5-d would be $16,522,887.

ALTERNATIVE B-2-b. The service area for Alternative B-2-b contains the existing service area for the Town of New Castle and provides for the limited expansion into the 3-Mile planning area, or secondary growth areas of New Castle. In essence, no expansion or growth into the Main Elk and West Elk corridors are considered with the alternative. Essentially, growth is limited to the area of the confluence of Main Elk Creek and East Elk Creek. To the east, the service area is limited to the eastern boundaries of The Farm and East Faas service areas as well as the NCIG property. A diagrammatical description of the service areas can be found on Map 7 in the Appendix. For Alternative B-2-b, the total cost is $8,175,341. The total number of units served would be 6852, with the population being 18,980 persons. The estimated flow to the treatment plant, which would be located at the existing New Castle WWTF would be 1,423,503 gpd.

ALTERNATIVE B-4-c-2. Alternative B-4-c-2 considers a service area which, like Alternative B-2-b, has limited expansion into the secondary growth areas or the 3-Mile planning area for the Town of New Castle. However, Alternative B-4-c-2 considers tying Apple Tree/Mountain Shadows into the New Castle plant. The total number of units that could be served by Alternative B-4-c-2 would be 9487 units, with a total population of 26,279 persons. The estimated flow to the plant would be 2.02 MGD with a total cost for Alternative B-4-c-2 being $11,585,903.

ALTERNATIVE B-5-c-2. With Alternative B-5-c-2, the plant has now been relocated to the Delaney site and with the limited service area in the secondary growth areas of the Town of New Castle, as well the addition of the Apple Tree/Mountain Shadows and the Delaney property, the total number of units served would be 9558 units. This would represent a total population of 26,476 persons with a design flow to the WWTF of being 2.04 MGD. The total cost of Alternative B-5-c-2 would be $12,160,828.

Table B-7-1
Matrix Ranking of Alternatives
Based Upon Costs/Unit

Alternative	Total Cost per Alternatvie	Number of Units served	Cost per Unit	Matrix Ranking
Alt. B-1-a (Existing conditions)	$448,884.40	527	$851.77	15
Alt. B-1-b (Future conditions)	$1,856,869.50	2180	$851.78	15
Alt. B-2-a (Un-weeded Service Areas)	$11,003,279	7248	$1,518.11	13
Alt. B-3-a (Un-weeded Service Areas)	$12,513,016	7449	$1,679.82	12
Alt. B-4-a	$1,812,040	982	$1,845.25	13
Alt. B-4-b	$3,424,604	2635	$1,299.66	14
Alt. B-4-c-1 (Un-weeded Service Areas)	$14,212,009	9883	$1,438.03	13
Alt. B-4-d	$15,947,962	10,084	$1,581.51	13
Alt. B-5-a	$2,304,965	1053	$2,188.95	11
Alt. B-5-b	$3,999,529	2706	$1,478.02	13
Alt. B-5-c-1 (Un-weeded Service Areas)	$14,979,121	9954	$1,504.83	13
Alt. B-5-d	$16,522,887	10,155	$1,627.07	13
Alt. B-2-b (Weeded Service Areas)	$8,175,341	6852	$1,193.13	14
Alt. B-4-c-2 (Weeded Service Areas)	$11,585,903	9487	$1,221.24	14
Alt. B-5-c-2	$12,160,828	9558	$1,272.32	14

Method of Ranking Based Upon Costs/Unit:

Because there are five principle alternatives, this discussion defines the method by which the alternatives can be ranked according to a scale denoting five different levels of costs/unit.

Difference in cost from most expensive alternative to least expensive: $1,337.18
$1,337.18/5= $267.44 per level of costs/unit

Range of Cost/unit	Associated Matrix Ranking
0-$1,119.21	15
$1,119.21 to $1,386.65	14
$1,386.65 to $1,654.09	13
$1,654.09 to $1,921.53	12
$1,921.53 to $2,188.97	11

Table B-7-2
Matrix Ranking of Alternatives
Based Upon Primary Environmental Effects

Alternative	Matrix Ranking	Comments
Alt. B-1-a (Existing conditions)	15	$0 Extension costs
Alt. B-1-b (Future conditions)	15	$0.59 M Extension costs
Alt. B-2-a (Un-weeded Service Areas)	12	$4.83 M Extension costs
Alt. B-3-a (Un-weeded Service Areas)	11	$6.17 M Extension Costs
Alt. B-4-a	15	$0.38 M Extension Costs
Alt. B-4-b	15	$0.96 M Extension Costs
Alt. B-4-c-1 (Un-weeded Service Areas)	12	$5.79 M Extension Costs
Alt. B-4-d	11	$7.13 M Extension Costs
Alt. B-5-a	15	$0.87 M Extension Costs
Alt. B-5-b	15	$1.46 M Extension Costs
Alt. B-5-c-1 (Un-weeded Service Areas)	11	$6.29 M Extension Costs
Alt. B-5-d	11	$7.63 M Extension Costs
Alt. B-2-b (Weeded Service Areas)	14	$2.34 M Extension Costs
Alt. B-4-c-2 (Weeded Service Areas)	13	$3.30 M Extension Costs
Alt. B-5-c-2	13	$3.80 M Extension Costs

Method of Ranking Based Upon Primary Environmental Effects:

In general, the more the costs of the extensions for a particular alternative, the more that alternative affects the environment. Therefore, the costs of an alternative's extension can be used as a guage of the primary environmental effects when considering one alternative against another.

Because there are five principle alternatives, this discussion defines the method by which the alternatives can be ranked according to a scale denoting five different levels of primary environmental effects.

Difference in cost from most expensive alternative to least expensive: $7.63 M
$7.63 M/5= $1.526 M per level of primary environmental effect

Range of Cost/unit	Associated Matrix Ranking
0-$1.526 M	15
$1.526 M to $3.052 M	14

$3.052 M to $4.578 M	13
$4.578 M to $6.104 M	12
$6.104 M to $7.630 M	11

Table B-7-3
Matrix Ranking of Alternatives
Based Upon Secondary Environmental Effects

Alternative	Matrix Ranking	Comments
Alt. B-1-a (Existing conditions)	15	No growth
Alt. B-1-b (Future conditions)	15	Adds 1653 units
Alt. B-2-a (Un-weeded Service Areas)	11	Adds 8374 units
Alt. B-3-a (Un-weeded Service Areas)	11	Adds 8575 units
Alt. B-4-a	15	No growth
Alt. B-4-b	15	Adds 1653 units
Alt. B-4-c-1 (Un-weeded Service Areas)	11	Adds 9356 units
Alt. B-4-d	11	Adds 9557 units
Alt. B-5-a	15	No growth
Alt. B-5-b	15	Adds 1653 units
Alt. B-5-c-1 (Un-weeded Service Areas)	11	Adds 9427 units
Alt. B-5-d	11	Adds 9628 units
Alt. B-2-b (Weeded Service Areas)	11	Adds 7978 units
Alt. B-4-c-2 (Weeded Service Areas)	11	Adds 8960 units
Alt. B-5-c-2	11	Adds 9031 units

Method of Ranking Based Upon Secondary Environmental Effects:

In general, the more future units that an alternative can support or serve for a particular alternative, the more that alternative affects the environment. Therefore, the number of future units served by a particular alternative can be used as a guage of the secondary environmental effects when considering one alternative against another.

Because there are five principle alternatives, this discussion defines the method by which the alternatives can be ranked according to a scale denoting five different levels of secondary environmental effects.

Difference in number of future units served from most to least: 9628
96284/5= 1925.6 future units per level of secondary environmental effect

Range of Cost/unit	Associated Matrix Ranking
0-1925.6	15
1925.6 to 3851.2	14
3851.2 to 5776.8	13
5776.8 to 7702.4	12
7702.4 to 9628.0	11

Table B-7-4
Matrix Ranking of Alternatives
Based Upon Implementation Capability

Alternative	Financial	Legal	Political	Score	Matrix Ranking
Alt. B-1-a (Existing conditions)	14	9	6	29	13
Alt. B-1-b (Future conditions)	13	13	15	41	15
Alt. B-2-a (Un-weeded Service Areas)	10	10	12	32	14
Alt. B-3-a (Un-weeded Service Areas)	8	8	6	22	12
Alt. B-4-a	13	8	6	22	12
Alt. B-4-b	12	8	6	26	12
Alt. B-4-c-1 (Un-weeded Service Areas)	10	7	6	23	12
Alt. B-4-d	7	6	6	19	11
Alt. B-5-a	12	7	6	25	12
Alt. B-5-b	10	7	6	23	12
Alt. B-5-c-1 (Un-weeded Service Areas)	6	6	6	18	11
Alt. B-5-d	6	5	6	17	11
Alt. B-2-b (Weeded Service Areas)	12	10	12	34	14
Alt. B-4-c-2 (Weeded Service Areas)	11	7	6	24	12
Alt. B-5-c-2	9	5	6	20	12

Method of Ranking Based Upon Implementation Capability:

Implementation potential is governed by financial, legal, and political considerations. Financial problems would be made complex by the magnitude of the project and the number of entities required to be involved for a particular alternative. Legal problems refer to the legislative, private and jurisdictional problems associated with regional systems and with water rights problems associated with reuse. Political considerations would encompass zoning, land ownership, easements, opposition because of proximity to habitation or interference with

development and similar items, and could be an important factor in selection of a site or alternative treatment process.

Financial Problem Scoring

Alternative Considered	Matrix Ranking from Total Cost	Number of Entities Involved with Financing Alternative
B-1-a	15	1
B-1-b	15	2
B-2-a	12	2
B-3-a	11	3
B-4-a	15	2
B-4-b	15	3
B-4-c-1	13	3
B-4-d	11	4
B-5-a	15	3
B-5-b	14	4
B-5-c-1	11	5
B-5-d	11	5
B-2-b	14	2
B-4-c-2	14	3
B-5-c-2	13	4

Those entities that could be involved in the financing of a particular alternative could be:

Federal level, State level, Local level (town), Private (inside the secondary growth area) and Private (outside the secondary growth area)

Upon scoring the three components of implementation capability, one can sum scores of the three catagories and provide an overall score, which once obtained, can be compared with the other various alternatives.

Because there are five principle alternatives, this discussion defines the method by which the alternatives can be ranked according to a scale denoting five different levels of Implementation Capability.

Difference in number of scored values from most to least: 24
24/5= 4.8 scored units per level of Implementation Capability

Range of Cost/unit	Associated Matrix Ranking
0-17	11
17 to 21.8	12
21.8 to 26.6	13
26.6 to 31.4	14
31.4 to 41.0	15

Table B-7-5
Matrix Ranking of Alternatives
Based Upon Contribution to Objectives and Goals

Alternative	Matrix Ranking	Comments
Alt. B-1-a (Existing conditions)	10	No change
Alt. B-1-b (Future conditions)	11	Upgrade plant
Alt. B-2-a (Un-weeded Service Areas)	12	Upgrade plant w/ comp. plan
Alt. B-3-a (Un-weeded Service Areas)	13	Upgrade plant w/ enlarged comp. plan
Alt. B-4-a	11	Upgrade plant and add Talbott's only
Alt. B-4-b	12	Upgrade plant, consider growth and Talbotts
Alt. B-4-c-1 (Un-weeded Service Areas)	13	Upgrade plant, comp. plan and Talbotts
Alt. B-4-d	14	Upgrade plant, enl. comp. plan and Talbotts
Alt. B-5-a	12	Delany plant w/ N.C. and Talbotts
Alt. B-5-b	13	Delany plant, N.C. growth and Talbotts
Alt. B-5-c-1 (Un-weeded Service Areas)	14	Delany plant, N.C., 2nd. growth, Talbotts
Alt. B-5-d	15	Delany plant, N.C., Ult. growth, Talbotts
Alt. B-2-b (Weeded Service Areas)	11	Upgrade plant w/comp. plan
Alt. B-4-c-2 (Weeded Service Areas)	13	Upgrade plant, comp. plan and Talbotts
Alt. B-5-c-2	14	Delany plant, N.C., 2nd. growth, Talbotts

Discussion of Matrix Ranking for Contribution to Objectives and Goals:

As all the alternative plans would have to comply with effluent regulations, all would be rated equally in this respect. Treatment plants that can be easily modified to produce a higher quality effluent would receive a higher rating, however. In addition, the treatment plant that has the capability of producing a higher quality effluent (or ease of) would be one which has the capability of treating all of the flow within the service area. In essence, it would be more difficult to coordinate and make several treatment facilities meet higher standards than it would to coordinate with and make one facility meet the same higher standard. Therefore, this

criteria has considered location and number of facilities as well as amount of service area served. The following list summarizes various components considered in the evaluation:

No change
Upgrade existing plant
Upgrade existing plant with comprehensive plan population
Upgrade existing plant with enlarged comprehensive plan population
Upgrade existing plant with Talbott's
Upgrade existing plant with Talbott's and various stages of comprehensive plan populations
Move plant location to Delany considering the various stages of population

Table B-7-6
Matrix Ranking of Alternatives
Based Upon Energy and Resource Use

Alternative	Matrix Ranking	Comments
Alt. B-1-a (Existing conditions)	15	Energy level 1
Alt. B-1-b (Future conditions)	14	Energy level 2
Alt. B-2-a (Un-weeded Service Areas)	13	Energy level 3
Alt. B-3-a (Un-weeded Service Areas)	12	Energy level 4
Alt. B-4-a	13	Energy level 3
Alt. B-4-b	12	Energy level 4
Alt. B-4-c-1 (Un-weeded Service Areas)	11	Energy level 5
Alt. B-4-d	10	Energy level 6
Alt. B-5-a	12	Energy level 4
Alt. B-5-b	11	Energy level 5
Alt. B-5-c-1 (Un-weeded Service Areas)	10	Energy level 6
Alt. B-5-d	9	Energy level 7
Alt. B-2-b (Weeded Service Areas)	13	Energy level 3
Alt. B-4-c-2 (Weeded Service Areas)	11	Energy level 5
Alt. B-5-c-2	10	Energy level 6

The energy and resources necessary to acquire and prepare a building site and to construct the treatment plant and sewer lines and finally to operate and maintain them are all important criteria in the selection of a recommended facility plan.

In this evaluation, the level of energy required to meet a particular alternative has been identified. Obviously, the "no action" alternative (ie., Alt. B-1-a) has the lowest energy level

requirement while the new plant at the Delany site (ie., Alt. B-5-d) has the highest energy level requirement.

Table B-7-7
Matrix Ranking of Alternatives
Based Upon Reliability

Alternative	Matrix Ranking	Comments
Alt. B-1-a (Existing conditions)	14	Reliability level 2.
Alt. B-1-b (Future conditions)	15	Reliability level 1.
Alt. B-2-a (Un-weeded Service Areas)	14	Reliability level 2.
Alt. B-3-a (Un-weeded Service Areas)	13	Reliability level 3.
Alt. B-4-a	13	Reliability level 3.
Alt. B-4-b	13	Reliability level 3.
Alt. B-4-c-1 (Un-weeded Service Areas)	12	Reliability level 4.
Alt. B-4-d	11	Reliability level 5.
Alt. B-5-a	12	Reliability level 4.
Alt. B-5-b	12	Reliability level 4.
Alt. B-5-c-1 (Un-weeded Service Areas)	11	Reliability level 5.
Alt. B-5-d	10	Reliability level 6.
Alt. B-2-b (Weeded Service Areas)	14	Reliability level 2.
Alt. B-4-c-2 (Weeded Service Areas)	12	Reliability level 4.
Alt. B-5-c-2	11	Reliability level 5.

Reliability of any alternative relates to the capacity of that system to provide continuous transport and treatment of wastewater consistent with water quality goals. Factors affecting the reliability include the type of equipment (maintenance requirements), in-plant susceptibility to vaiations in quantity and quality of wastes, ability of the treatment process to handle variable flows, complexity of treatment process (operator skills), and potential of system malfunctions or natural disasters (floods, etc.), to disrupt transport or treatment of wastewater. Reliability also applies when comparing a regional plant with several small regional plants. The lengths, layout and type of sewer ines neede to serve the facility planning area are important considerations in reliability of the system.

In this evaluation, the level of reliability has been listed based upon an initial (or best) situation considering a new plant, competent sewerage transmission facilities and utilization of existing operation and maintenance resources. The more complex the facilities become, the less reliable.

Table B-7-8
Matrix Ranking of Alternatives
Based Upon Flexibility

Alternative	Matrix Ranking	Comments
Alt. B-1-a (Existing conditions)	14	Existing plant site.
Alt. B-1-b (Future conditions)	14	Existing plant site.
Alt. B-2-a (Un-weeded Service Areas)	14	Existing plant site.
Alt. B-3-a (Un-weeded Service Areas)	14	Existing plant site.
Alt. B-4-a	14	Existing plant site.
Alt. B-4-b	14	Existing plant site.
Alt. B-4-c-1 (Un-weeded Service Areas)	14	Existing plant site.
Alt. B-4-d	14	Existing plant site.
Alt. B-5-a	15	New plant site.
Alt. B-5-b	15	New plant site.
Alt. B-5-c-1 (Un-weeded Service Areas)	15	New plant site.
Alt. B-5-d	15	New plant site.
Alt. B-2-b (Weeded Service Areas)	14	Existing plant site.
Alt. B-4-c-2 (Weeded Service Areas)	14	Existing plant site.
Alt. B-5-c-2	15	New plant site.

The treatment plant and collection system should be planned to meet unforeseen expansion of the service area, and the system selected should have this capability. There should be sufficient land area at the treatment plant site to allow for expansion and its location should be such that it would not interfere with planned development. Phased development of the treatment alternitives, treatment process alternatives, and effluent disposal alternatives.

In this evaluation, the existing plant expansion potential has been scored lower than the alternatives which consider the location of a new plant on the Delany parcel. It is anticipated that sufficient land could be considered in the planning of a new plant at the Delany parcel which would allow for future expansions. The existing plant has limited room to expand due to the existing, surrounding features that would limit expansion.

Table B-7-9
Matrix Ranking of Alternatives
Based Upon Public Acceptance

Alternative	Matrix Ranking	Comments
Alt. B-1-a (Existing conditions)	14	No change.
Alt. B-1-b (Future conditions)	15	Accommodates change.
Alt. B-2-a (Un-weeded Service Areas)	15	Accommodates change.
Alt. B-3-a (Un-weeded Service Areas)	14	Change level 1.
Alt. B-4-a	12	Change level 3.
Alt. B-4-b	13	Change level 2.
Alt. B-4-c-1 (Un-weeded Service Areas)	13	Change level 2.
Alt. B-4-d	12	Change level 3.
Alt. B-5-a	11	Change level 4.
Alt. B-5-b	12	Change level 3.
Alt. B-5-c-1 (Un-weeded Service Areas)	12	Change level 3.
Alt. B-5-d	11	Change level 4.
Alt. B-2-b (Weeded Service Areas)	15	Accommodates change.
Alt. B-4-c-2 (Weeded Service Areas)	13	Change level 2.
Alt. B-5-c-2	11	Change level 4.

The public tends to favor use of existing facilities and lower cost facilities that can accomplish the necessary goals. Aesthetics and environmental impact are also important factors.

In this evaluation, various levels of change have been identified of which the public would have to accept given a particular alternative. The "best" alternative in this regard is scored at being the one which "accommodates change" and allows for development at a regulated pace as well as not "stopping growth". The level of change (or scoring) adjusts accordingly to the intensity of change foreseen with a particular alternative.

Table B-7-10
Matrix Ranking of Alternatives
All Criteria Considered

Alter-native	Table B-7-1	Table B-7-2	Table B-7-3	Table B-7-4	Table B-7-5	Table B-7-6	Table B-7-7	Table B-7-8	Table B-7-9	Total Score
B-1-a	15	15	15	13	10	15	14	14	14	***125***
B-1-b	15	15	15	15	11	14	15	14	15	***129***
B-2-a	13	12	11	14	12	13	14	14	15	***118***
B-3-a	12	11	11	12	13	12	13	14	14	***112***
B-4-a	13	15	15	12	11	13	13	14	12	***118***
B-4-b	14	15	15	12	12	12	13	14	13	***120***
B-4-c-1	13	12	11	12	13	11	12	14	13	***111***
B-4-d	13	11	11	11	14	10	11	14	12	***107***
B-5-a	11	15	15	12	12	12	12	15	11	***115***
B-5-b	13	15	15	12	13	11	12	15	12	***118***
B-5-c-1	13	11	11	11	14	10	11	15	12	***108***
B-5-d	13	11	11	11	15	9	10	15	11	***106***
B-2-b	14	14	11	14	11	13	14	14	15	***120***
B-4-c-2	14	13	11	12	13	11	12	14	13	***113***
B-5-c-2	14	13	11	12	14	10	11	15	11	***111***

Discussion of Matrix Ranking Results

As was previously discussed, each individual of the planning commission, town staff and interested members of the public ranked the alternatives as just discussed and presented above. Table B-7-10 as shown above is the Town Engineers personal ranking of the alternatives.

The next step in determining the "best" four alternatives was to average the total scores prepared by each participant and then select the top four scores as the "best" four alternatives, to be further evaluated by the town council, planning commission, town staff and the public through the public review process.

The "best" four alternatives are presented, with their final scoring in Table B-7-11.

Table B-7-11
Matrix Ranking of Alternatives
(After P&Z Review and Selection)

Alternative	*Averaged Total Score*	*Preliminary Ranking*	*Final Ranking*
B-2-b	111	1	1
B-1-a	111	2	out
B-1-b	109	3	2
B-2-a	106	4	3
B-3-a	100	5	4
B-4-c-2	90	6	5
B-4-a	88	7	6
B-4-b	87	8	7
B-5-a	85	9	8
B-5-b	85	10	9
B-5-c-2	83	11	10
B-4-c-1	83	12	11
B-5-c-1	83	13	12
B-4-d	83	14	13
B-5-d	81	15	14

(Note that Alternative B-1-a is rejected because it is the "do nothing" alternative.)

6.2.2.9 Discussion of Matrix Ranking Results (Post P&Z review and selection)

As can be seen above, the alternatives selected as the "best" four for further evaluation are as follows: B-2-b, B-1-b, B-2-a and B-3-a

Alternative B-2-b considers limited growth into the secondary growth area. Alternative B-1-b allows final buildout of the town as it is currently platted or planned for development. Alternative B-2-a considers growth into the secondary growth area up to and including those undeveloped areas within the 3-Mile planning area. Finally, alternative B-3-a considers the secondary growth areas in B-2-a, but also adds in those higher density, self sustaining developments such as 3-Elk Run, Riverbend and Cedars Subdivision.

As a final note to the review and selection process performed by the planning and zoning commission, very strong feelings regarding the various alternatives were expressed and, because of their political, economical and jurisdictional influence on land use planning in the service area, are noted as follows:

"We cannot entertain the "do nothing" alternative."
"We do not want to pump sewer across the river."

"We do not want our service area South of the river."

"Development should pay for it's own way, but, the Town should be ready for development."

"We should be in a position to tie Elk Creek Village onto our system, if need be."

"Plant expansion should be properly planned and phased in as growth in our service area warrants."

Based upon these discussions with the planning and zoning commission, it was determined, prior to ranking the alternatives, that an alternative should be considered which would compare very closely to alternative B-2-b that would include Elk Creek Village only, and eliminate service capability to NCIG. It was explained and understood that alternative B-2-b, from a population and cost standpoint, could function as that desired alternative.

6.2.3. Discussion of Final Service Area and Regional Plan Selection. In December, 1996, the Planning Commission, Town Board of Trustees, Town Staff and interested members of the general public participated in a noticed public hearing to determine the final service area selected for the New Castle 201 Study. The aforementioned "best four" alternatives were discussed. However, a modified version of the alternative identified as the "Limited Secondary Growth Alternative" was chosen. This final service area boundary contains the existing service area for the Town of New Castle, provides for limited contiguous expansion into the 3-mile planning area (or secondary growth areas) and ties Riverbend, Cedars P.U.D., Elk Creek and Hidden Valley subdivisions into the boundary. The final service area is identified on Map #8 entitled "New Castle Final 201 Service Area".

Table B-7-12 identifies the service areas with existing and proposed units, along with population projections, in the final 201 service area. Table B-7-13 identifies the associated wastewater treatment plant costs and flows. Table B-7-14 identifies the work activities in the service area. Table B-7-15 identifies the total costs in the service area.

The selected regional plan would utilize the New Castle WWTP as the "Regional Plant", ultimately providing service to the affomentioned service area. The plan encourages the sustenance of smaller existing systems with compact collection systems, until which time, future developement into the outlying service areas allows economically feasible ties onto the collection system. In essence, those outlying service areas such as Elk Creek, Cedars P.U.D., 3-Elk Run, Hidden Valley and Riverbend subdivisions would sustain the existing system of operating as individual sewage disposal systems (I.S.D.S.) or plants until which time development has placed a collector line adjacent to the subdivisions or the existing methods of disposal are no longer effective and/or legal from a regulatory standpoint. However, sizing and construction phasing of the New Castle WWTP would consider plans with which these subdivisions would be tied on. This plan is predicated on the assumption that all the different plants and/or I.S.D.S.'s, operating separately, will be able to comply with future effluent standards and viable alternatives can be found where problems (present or future) exist.

The treatment systems at Talbott's continues to operate according to design and remains well operated and maintained. Analysis continue to show that it theoretically has adequate

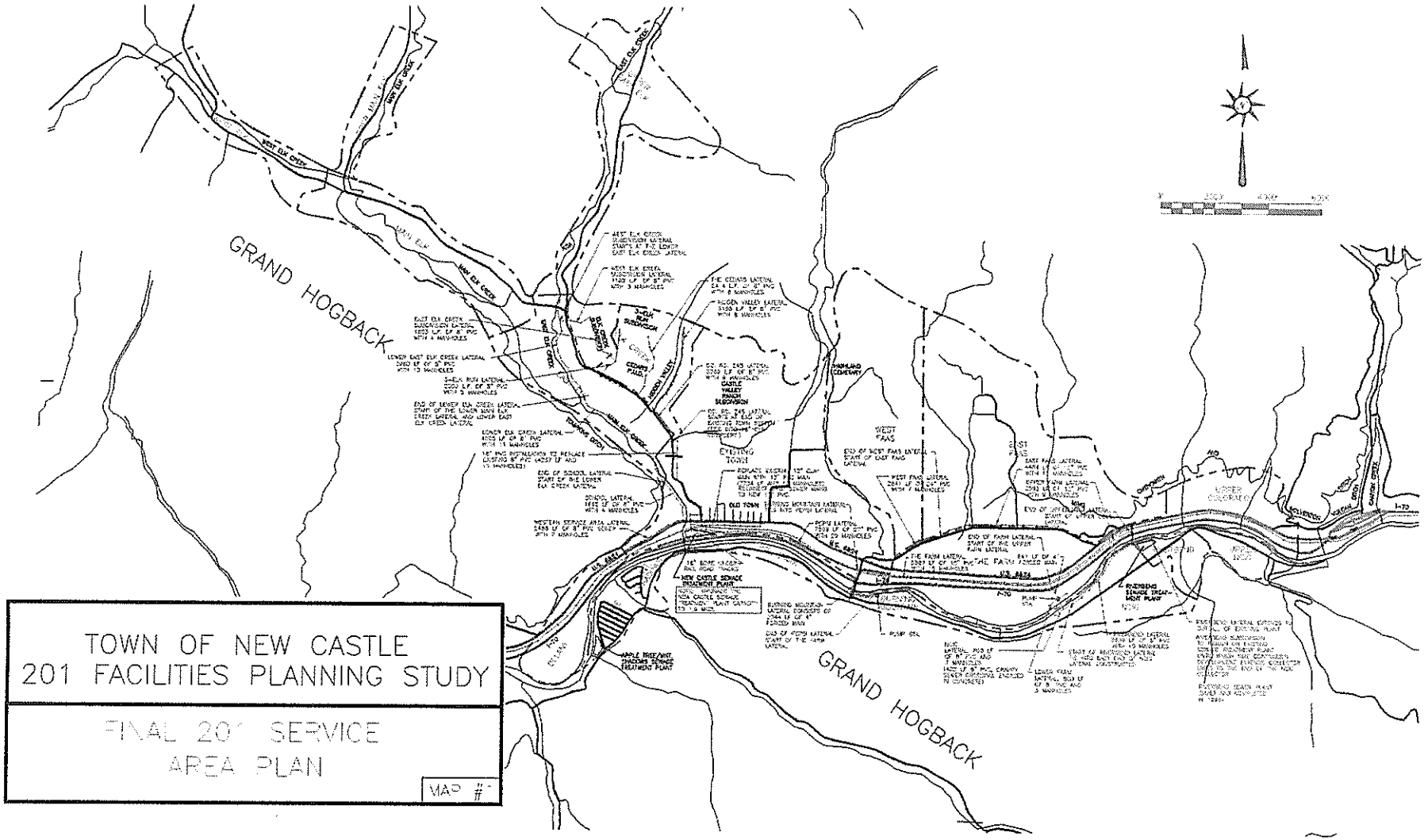
treatment capacity (with minor modifications) for projected ultimate development on the proviate land in this area. The present ownership of the plant remains committed to have the financial and administrative capabilities to make improvements as the need occurs. For those outlying service areas, (Elk Creek, 3-Elk Run, Cedars P.U.D., Hidden Valley and Riverbend) they will continue to operate under their present organizational context, with each entity (being private homeowners, districts or associations) responsible for the legal, financial and administration matters. At which time it becomes viable for these areas to tie onto the New Castle treatment system, then their individual systems would be properly abandoned or modified as necessary and they would join the organizational structure of New Castle.

Table B-7-12
Service Areas in New Castle 201 Plan

Service Area I.D.	Existing units	Proposed units	Population
East Elk	9	202	584
West Faas	1	1297	3595
East Faas	2	1518	4210
NCIG	2	169	474
The Farm	8	3644	10116
Riverbend	60	1	169
Existing Town	527	1653	6039
Elk Creek	94	0	94
Totals	703	8484	25,447

Table B-7-13
Associated Wastewater Treatment Costs by
Service Area in New Castle 201 Plan

Service Area I.D.	Population (persons)	Flow to WWTP (gpd)	Associated Cost (at WWTP)
East Elk	584	43,800	$179,580.00
West Faas	3595	269,625	$1,105,463
East Faas	4210	315,750	$1,294,575
NCIG	474	35,550	$145,755.00
The Farm	10116	758,700	$3,110,670
Riverbend	169	12,675	$51,967.50
Existing Town	6039	452,925	$1,856,993
Elk Creek	260	19,500	$79,950.00
Totals:	**25,447**	**1,908,525**	**$7,824,953**


GRAND HOGBACK
GRAND HOGBACK
TOWN OF NEW CASTLE
201 FACILITIES PLANNING STUDY
FINAL 20[illegible] SERVICE
AREA PLAN
MAP #

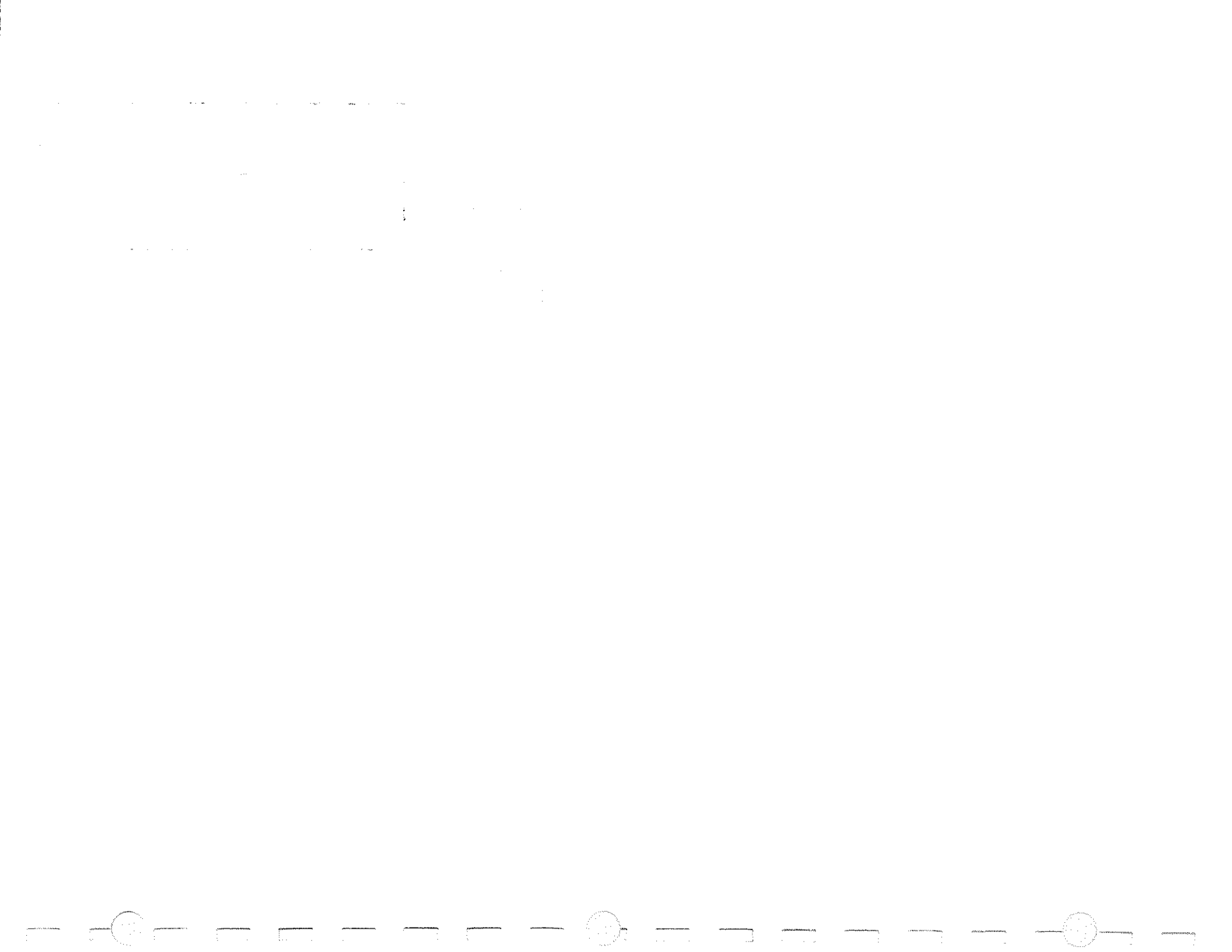


Table B-7-14
Work Activities Summary in
New Castle 201 Plan

Work Activity	Associated Cost
School Lateral	$85,734.00
Lower Elk Creek Lateral	$214,398.00
Lower East Elk Lateral	$194,664.00
Pepsi Lateral	$534,974.40
The Farm Lateral	$377,329.20
Upper Farm Lateral	$206,155.20
Lower Farm Lateral	$102,368.40
NCIG Lateral	$81,504.00
West Faas Lateral	$200,598.60
East Faas Lateral	$259,070.40
Riverbend Lateral	$193,742.40
Burning Mountain Lateral	$149,116.80
West Elk Creek Subd. Lateral	$132,955.20
East Elk Creek Subd. Lateral	$164,896.80
3-Elk Run Lateral	$142,800.00
The Cedars Lateral	$155,678.40
Hidden Valley Lateral	$178,603.20
Co. Rd. 245 Lateral	$219,866.40
Castle Valley Lateral	$271,573.20
In Town Lateral	$177,266.40
Western Lateral	$138,724.80
Totals:	$4,132,576.20

Table B-7-15
Total Costs in
New Castle 201 Plan

Work Activity	Associated Cost
Extension costs	$4,132,576.20
Wastewater Plant Costs	$7,824,953.00
Totals:	$11,957,529.20

6.2.4. Procedure for Continued Evaluation of Alternatives. *Reference is hereby given to the 1980 Facilities Planning Study for the Town of New Castle, Section 6.24.*

6.3. NONSTRUCTURAL AND/OR NONCONVENTIONAL SYSTEM

6.3.1 Optimum Operation of Existing Facilities. The Town of New Castle is growing at a rapid rate resulting in flows to the WWTF that are approaching the capacity of the WWTF. In December of 1994, Schmueser Gordon Meyer, Inc., prepared a "Wastewater Treatment Facility Analysis" for the Town of New Castle. In that analysis, the town staff and town council were updated on the condition of the Town's WWTF, providing them with a better understanding of the capacity, existing and projected flows, and improvements necessary for the WWTF. Reference to this report is given, as the report is found in the appendix.

6.3.2 Flow Reduction. Opportunities continue to exist in the Town of New Castle to reduce flow to the WWTF. However, the 1980 Facilities Planning Study outlined the most apparent, at that time being related to controlling infiltration and "flow through". Since the 1980 study, the Town has video taped the existing mains, made the appropriate repairs and renovated the Town's water system. The Town continues to educate it's citizens on water usage as well as has began implementing a metering program. Low use fixtures are the norm in new construction and remodels.

Aside from frequent inspections, monitoring and maintenance, no other means to reduce flows to the plant currently exist. As was stated in the 1980 study, "Because of the Town's small size and restrictions imposed by terrain, there are few options for configuration of sewers and interceptors, and probably none that will affect amount or variability of flow into the New Castle treatment plant."

6.3.3 Central Collection and Treatment -vs- On-site Systems. Reference is hereby given to the 1980 Facilities Planning Study for the Town of New Castle, Section 6.3.3.

6.3.4 No Action Plan. Reference is hereby given to the 1980 Facilities Planning Study for the Town of New Castle, Section 6.3.4.

6.4 ALTERNATIVE WASTEWATER TREATMENT MANAGEMENT SYSTEMS. Reference is hereby given to the 1980 Facilities Planning Study for the Town of New Castle, Section 6.4.

6.4.1 Treatment and Reuse. Reference is hereby given to the 1980 Facilities Planning Study for the Town of New Castle, Section 6.4.1. Also reference to Section 6.7 of this Facilities Planning Study is given.

6.4.2 Treatment and Land Application. Reference is hereby given to the 1980 Facilities Planning Study for the Town of New Castle, Section 6.4.2.

6.4.3 Treatment and Discharge. Reference is hereby given to the 1980 Facilities Planning Study for the Town of New Castle, Section 6.4.3.

6.5 RESULTS OF PRELIMINARY EVALUATION. Reference is hereby given to the 1980 Facilities Planning Study for the Town of New Castle, Section 6.5.

6.6 TREATMENT AND DISCHARGE – NEW CASTLE PLANT

6.6.1 General. Reference is hereby given to the 1980 Facilities Planning Study for the Town of New Castle, Section 6.6.1.

6.6.2 Sludge. Reference is hereby given to the 1980 Facilities Planning Study for the Town of New Castle, Section 6.6.2.

6.6.3 Staging. Reference is hereby given to the 1980 Facilities Planning Study for the Town of New Castle, Section 6.6.3.

6.6.4 Site Selection. In the 1980 Facilities Planning Study for the Town of New Castle, Section 6.6.4 discusses and investigates three alternative sites for the treatment plant. The conclusions reached in this section agree favorably with prior evaluations of alternatives investigated with this 201 study. The site selected in the 1980 study as well as with this study, is the location of the existing treatment facility for mechanical treatment processes. Site #3S was previously selected for lagoon systems analysis in the 1980 study, but, land development that has occurred since the 1980 study eliminates Site #3S. Therefore, Site #2S, as discusssed in the 1980 study is selected for lagoon systems analysis. Reference is hereby given to the 1980 Facilities Planning Study for the Town of New Castle, Section 6.6.4.

6.6.5 Feasibility of Using Existing Plant. Reference is hereby given to the 1980 Facilities Planning Study for the Town of New Castle, Section 6.6.5.

6.6.6 Evaluation of Treatment Processes. Reference is hereby given to the 1980 Facilities Planning Study for the Town of New Castle, Section 6.6.6., and modified as follows:

Based on a preliminary analysis of the many possible options, the following systems were considered to have the greatest potential for providing a cost-effective biological treatment method and were selected for detailed evaluation:

A. Expand existing extended aeration system (at existing site).

B. Convert existing plant to conventional activated sludge (at existing site).

C. Provide rotating biological media (RBM), convert existing system to primary treatment (at existing site).

D. Construct a 3-cell aerated lagoon at Site #2S (ie., Delany property).

The esitmated future flow for New Castle is 1,908,525 gallons per day (average day). For evaluation purposes, a design flow of 1,900,000 gallons per day on the maximum day was used for mechanical plant alternatives and 1,900,000 (average day) for lagoon systems.

6.6.6.1 Alternative A. Expansion of Existing Extended Aeration Plant. This alternative calls for expanding the existing aeration plant in phases, taking advantage of the existing facilities for treatment of waste water at the existing plant site. The initial phase (phase 1) would convert the existing digestor into additional aeration basin capacity, add a digestor and

a clarifier and provide the associated facilities needed to properly operate the expanded aeration basin and digestor. The next phase (phase 2) would then construct new pre-treatment facilities including a bar screen, aerated grit chamber and flow equalization structure. In addition, a new digestor, aeration basin, clarifier, chlorination basin and a new outfall to the Colorado River would be provided. Subsequent phases (phases 3 through 6) would add aeration basins, digestors and clarifiers as needed to compensate for expansion of the town into the service area up to the point where the ultimate "build out" of the service area would be complete. The cost estimate for this system is shown in Table B-7-16.

6.6.6.2 Alternative B. Conversion of Existing Plant to Conventional Activated Sludge. By converting to conventional activated sludge, the aeration tank detention time can be reduced from 24 hours to 8 hours. Additional capacity in the existing plant can be gained by this conversion. However, additional facililtes as discussed above in Alternative A would eventually be required. Specific operational requirements (from a manpower standpoint) for the plant would be required. The cost estimate for this system is shown in Table B-7-17.

6.6.6.3 Alternative C. Provision of Rotating Biological Media (RBM) with Primary Treatment. The basic treatment component of this system would include headworks and primary settling, followed by the RBM modules, which would be placed in parallel. Parallel placement of the RBM modules will allow for flexibility in phasing and operation. Secondary clarification and chlorination systems will be required. Sludge from the primary treatment process will go to aerobic digestors as will sludge from the secondary clarifiers. The existing facilites would be utilized as part of the volume requirements for primary settling. The cost estimate for this system is shown in Table B-7-18.

6.6.6.4 Alternative D. Construction of a 3-cell Aerated Lagoon. This system was previously discussed in the 1980 Facilities Planning Study for the Town of New Castle. Therefore, reference is hereby given to section 6.6.6.4 of that study. The cost estimate for this system is shown in Table B-7-19.

A summary of caparative monetary costs for the four alternatives is given in Table B-7-20, and comparative non-monetary rankings are shown in Table B-7-21.

6.6.7 Explanation of Qualitative Evaluation Matrix Rankings. Reference is hereby given to section 6.6.7 of the prior 1980 Facilities Planning Study for the Town of New Castle. Modifications to the discussions contained therein are as follows:

Under Contribution to Objectives and Goals, all alternatives discharge to the Colorado River.

6.6.7.1 Summary. The alternative for expansion of the existing extended aeration treatment plant rated highest in the qualitative evaluation matrix and is also the most cost effective. The alternative (A) will be recommended for inclusion in the New Castle Facility Plan.

6.6.8. Sludge Disposal. The long detention time in the aerobic digestors will result in a well stabilized, digested sludge which can be placed directly on adjacent farm lands (as is the current situation) which comply with the 503 "biosolids" regulations. The current practice of land application of the digested sludge on property north of the current town limits is proposed. However, continued search of properties in the service area which comply with the 503

"biosolids" regulations shall be proposed as an on-going exercise so as to not to rely on one individual site for land application of digested sludge.

Attached in the appendix is a copy of the 1987 Letter of Intent to apply digested sludge to land as prepared by the Town's plant operator at that time. The lands identified in that letter are still those lands which are utilized today for land application of sludge. As contiguous expansion of the Town of New Castle progresses, the availability of those lands will continue to shrink. Lands both to the south (Division of Wildlife) and to the west (private farm/ranch land) appear to have the potential of meeting the physical requirements of the biosolids regulations. As part of this facility planning study it will be proposed to contractually and physically establish alternative sludge land application sites which are accessable "year round" and meet the biosolids regulations.

In the event that land becomes difficult to utilize for sludge application, sludge thickeners can be provided to greatly lessen the land application requirements from a "gross volume" of sludge applied standpoint. This will especially be a critical concept to remember in the plan as the growth into the service area expands and plant flows increase. The anticipated sludge produced from the plant per phase is noted as follows:

Phase	Sludge, dry (#/day)	Sludge (gallons/day)
1	273.2	3275.4
2	708.2	9491.7
3	708.2	9491.7
4	708.2	9491.7
5	708.2	9491.7
6	708.2	9491.7
Totals:	3814.2	50,733.9

Since the Town hauls the sludge to the land application site, it is anticipated that this practice will continue as long as the Town will be able to respond with providing needed hauling equipment and personnel as plant flows increase. It is anticipated that a sludge thickener will ultimately be desired after Phase 2 or additional equipment and/or personnel will be required to haul sludge.

Sludge quality anticipated from the digestors will be a Class B sludge. Quality monitoring and testing will need to be performed as outlined in the procedures and requirements set forth in the Town of New Castle Site Application, attached in the appendix.

6.7 LAND APPLICATION TECHNIQUES.

6.7.1 General. The prior 1980 Facilities Planning Study for the Town of New Castle indicated that in the preliminary analysis, land application techniques may be cost effective. However, given the flows projected in the new planning period, development patterns, available lands for land application, winter time storage requirements and acreage of land with associated costs, the land applications are not further evaluated as an alternative.

Table B-7-16

Alternative A- Expand Extended Aeration Plant
New Castle Wastewater Treatment Plant

COMMENTS: INTEREST RATE= 8 PERCENT
PLANNING PERIOD= 20 YEARS

ITEM	COST	LIFE (YEARS)	SALVAGE VALUE
Phase 1 Buildings, conc., etc...	$526,000.00	30	$175,333.33
Phase 1 Equipment, piping, etc...	$247,745.00	20	$0.00
Phase 2 Buildings, conc. etc..	$1,529,328.00	30	$509,776.00
Phase 2 Equipment, piping, etc...	$428,451.00	20	$0.00
Phase 3 Buildings, conc., etc...	$718,700.00	30	$239,566.67
Phase 3 Equipment, piping, etc...	$349,645.00	20	$0.00
Phase 4 Buildings, conc., etc...	$718,700.00	30	$239,566.67
Phase 4 Equipment, piping, etc...	$351,755.00	20	$0.00
Phase 5 Buildings, conc., etc...	$718,700.00	30	$239,566.67
Phase 5 Equipment, piping, etc...	$363,645.00	20	$0.00
Phase 6 Buildings, conc., etc...	$718,700.00	30	$239,566.67
Phase 6 Equipment, piping, etc...	$245,570.00	20	$0.00
TOTAL CONSTRUCTION COSTS	**$6,916,939.00**		**$1,643,376.00**
SITES AND EASEMENTS	$0.00		
DESIGN AND ADMINISTRATION (5%)	$345,846.95		
CONTENGENCY (15%)	$1,037,540.85		
PROJECT TOTAL	$8,300,326.80		

CALCULATION OF O&M COSTS

ASSUME 5.00% OF PROJECT FOR O&M
THEREFORE, O&M COSTS= $345,846.95

OVER THE 20 YEAR PERIOD, O&M PRESENT VALUE= $3,395,576.34

TOTAL PRESENT WORTH= $10,052,527.14 **EQUIVALENT ANNUAL COST=** $1,023,872.09

WORKSHEET FILE NAME: TABALTA.WK3

Table B-7-17

Alternative B- Convert Existing Plant to Conventional Activated Sludge
New Castle Wastewater Treatment Plant

COMMENTS:

INTEREST RATE= 8 PERCENT
PLANNING PERIOD= 20 YEARS

ITEM	COST	LIFE (YEARS)	SALVAGE VALUE
Phase 1 Buildings, conc., etc...	$478,660.00	30	$159,553.33
Phase 1 Equipment, piping, etc...	$279,951.85	20	$0.00
Phase 2 Buildings, conc. etc..	$1,391,688.48	30	$463,896.16
Phase 2 Equipment, piping, etc...	$484,149.63	20	$0.00
Phase 3 Buildings, conc., etc...	$654,017.00	30	$218,005.67
Phase 3 Equipment, piping, etc...	$395,098.85	20	$0.00
Phase 4 Buildings, conc., etc...	$654,017.00	30	$218,005.67
Phase 4 Equipment, piping, etc...	$397,483.15	20	$0.00
Phase 5 Buildings, conc., etc...	$654,017.00	30	$218,005.67
Phase 5 Equipment, piping, etc...	$410,918.85	20	$0.00
Phase 6 Buildings, conc., etc...	$654,017.00	30	$218,005.67
Phase 6 Equipment, piping, etc...	$277,494.10	20	$0.00
TOTAL CONSTRUCTION COSTS	**$6,731,512.91**		**$1,495,472.16**
SITES AND EASEMENTS	$0.00		
DESIGN AND ADMINISTRATION (5%)	$336,575.65		
CONTENGENCY (15%)	$1,009,726.94		
PROJECT TOTAL	$8,077,815.49		

CALCULATION OF O&M COSTS

ASSUME 6.00% OF PROJECT FOR O&M
THEREFORE, O&M COSTS= $403,890.77

OVER THE 20 YEAR PERIOD, O&M PRESENT VALUE= $3,965,459.16

TOTAL PRESENT WORTH= $10,547,802.49 **EQUIVALENT ANNUAL COST=** $1,074,316.98

WORKSHEET FILE NAME: TABALTA.WK3

Table B-7-18

Alternative C- Rotating Biological Media (RBM) with Primary Treatment
New Castle Wastewater Treatment Plant

COMMENTS: INTEREST RATE= 8 PERCENT
PLANNING PERIOD= 20 YEARS

ITEM	COST	LIFE (YEARS)	SALVAGE VALUE
Phase 1 Buildings, conc., etc...	$497,806.40	30	$165,935.47
Phase 1 Equipment, piping, etc...	$291,149.92	20	$0.00
Phase 2 Buildings, conc. etc..	$1,447,356.02	30	$482,452.01
Phase 2 Equipment, piping, etc...	$503,515.62	20	$0.00
Phase 3 Buildings, conc., etc...	$680,177.68	30	$226,725.89
Phase 3 Equipment, piping, etc...	$410,902.80	20	$0.00
Phase 4 Buildings, conc., etc...	$680,177.68	30	$226,725.89
Phase 4 Equipment, piping, etc...	$413,382.48	20	$0.00
Phase 5 Buildings, conc., etc...	$680,177.68	30	$226,725.89
Phase 5 Equipment, piping, etc...	$427,355.60	20	$0.00
Phase 6 Buildings, conc., etc...	$680,177.68	30	$226,725.89
Phase 6 Equipment, piping, etc...	$288,593.86	20	$0.00
TOTAL CONSTRUCTION COSTS	**$7,000,773.43**		**$1,555,291.05**
SITES AND EASEMENTS	$0.00		
DESIGN AND ADMINISTRATION (5%)	$350,038.67		
CONTENGENCY (15%)	$1,050,116.01		
PROJECT TOTAL	$8,400,928.11		

CALCULATION OF O&M COSTS

ASSUME 6.00% OF PROJECT FOR O&M
THEREFORE, O&M COSTS= $420,046.41

OVER THE 20 YEAR PERIOD, O&M PRESENT VALUE= $4,124,077.53

TOTAL PRESENT WORTH= $10,969,714.59 **EQUIVALENT ANNUAL COST=** $1,117,289.66

WORKSHEET FILE NAME: TABALTC WK3

Table B-7-19

Alternative D- 3 Cell Aerated Lagoon at Delany Site
New Castle Wastewater Treatment Plant

COMMENTS:

INTEREST RATE= 8 PERCENT
PLANNING PERIOD= 20 YEARS

ITEM	COST	LIFE (YEARS)	SALVAGE VALUE
Mobilization	$100,000.00	30	$33,333.33
Clear and Grub	$10,000.00	40	$5,000.00
Strip Topsoil	$60,000.00	40	$30,000.00
Excavation and Embankment	$1,200,000.00	40	$600,000.00
Hypalon Liner	$460,000.00	20	$0.00
Sand Bedding	$380,000.00	20	$0.00
Yard Piping	$110,000.00	20	$0.00
Valving and Control Structures	$100,000.00	20	$0.00
Chlorine Building	$55,000.00	30	$18,333.33
Aerators	$200,000.00	20	$0.00
Electric Service and Distribution	$100,000.00	30	$33,333.33
Surface Restoration and Seeding	$50,000.00	40	$25,000.00
Delany Intercept	$780,000.00	20	$0.00
New Castle WWTP Demolition	$150,000.00	40	$75,000.00
New Castle Plant Modifications	$75,000.00	30	$25,000.00
Floodproof Site	$175,000.00	40	$87,500.00
TOTAL CONSTRUCTION COSTS	**$4,005,000.00**		**$932,500.00**
SITES AND EASEMENTS	$2,500,000.00		
DESIGN AND ADMINISTRATION (8%)	$520,400.00		
CONTENGENCY (15%)	$975,750.00		
PROJECT TOTAL	$8,001,150.00		

CALCULATION OF O&M COSTS

ASSUME 8.00% OF PROJECT FOR O&M
THEREFORE, O&M COSTS= $320,400.00

OVER THE 20 YEAR PERIOD, O&M PRESENT VALUE= $3,145,734.43

TOTAL PRESENT WORTH= $10,214,384.43 **EQUIVALENT ANNUAL COST=** $1,040,357.62

WORKSHEET FILE NAME: TABALTD.WK3

Table B-7-20
Cost Comparisons of Alternatives
Secondary Treatment
New Castle Wastewater Treatment Plant

Item	Extended Aeration	Activated Sludge	R.B.M.'s	Aerated Lagoon
Capitol Costs	8,300,326	8,077,815	8,400,928	8,001,150
Salvage Value	1,643,376	1,495,472	1,555,291	932,500
Operation and Maintenance	345,847	403,891	420,046	320,400
Present Worth	10,052,527	10,547,802	10,969,714	10,214,384
Total Equivalent Annual Cost	1,023,872	1,074,317	1,117,289	1,040,357

Table B-7-21
Qualitative Evaluation Matrix
Ranking of Final Alternative Proposals
Town of New Castle
Wastewater Treatment Systems

Item	Alt A	Alt B	Alt C	Alt D
Primary Environmental Effects	4	4	4	2
Secondary Environmental Effects	4	4	4	4
Contributions to Objectives and Goals	3	3	3	4
Energy and Resource Use	3	3	3	2
Reliability	4	3	3	3
Flexibility	4	3	3	3
Public Acceptance	4	3	3	1
Sub-Total of Non-Economic Composite Rating	**26**	**23**	**23**	**19**
Monetary	4	2	1	3
Total Composite Rating	**30**	**25**	**24**	**22**

Alternative A- Expansion of existing Extended Aeration Plant
Alternative B- Conversion to Conventional Activated Sudge
Alternative C- Provision of Rotating Biological Media
Alternative D- Construction of a 3-cell Aerated Lagoon

SECTION 7. PLAN SELECTION

7.1 VIEWS OF PUBLIC AND CONCERNED PARTIES ON ALTERNATIVES. The initial draft copy of the Facilities Plan was reviewed by the Public and results of discussions are presented in Section 6.2.2.8 of this plan. Comments have been solicited from the public and various agencies. Copies of correspondence received to date are attached in the appendix. A public hearing was held in December, 1996 and it is anticipated that a final public hearing will be held in March of 1997. Copies of the draft Facilities Plan have been sent to the following agencies;

1. Colorado Department of Health
   Water Quality Control Division
   4300 Cherry Creek Drive South
   Denver CO 80220

2. Colorado Department of Health
   Water Quality Control Division
   125 North 8th
   Grand Junction CO 81501

3. Mr. Ross Talbott
   Mtn. Shadows Subdivision-
   Apple Tree Park
   5033 County Road 335
   New Castle CO 81647

4. Colorado West Area
   Council of Governments
   1400 Access Road
   Rifle CO 81650

5. State Archaeological
   and Historical Societies
   1300 Broadway
   Denver CO 80203

6. Garfield County Commissioners
   Garfield County Courthouse
   109 8th Street
   Glenwood Springs CO 81601

7. Garfield County Planning Commission
   Garfield County Courthouse
   109 8th Street
   Glenwood Springs CO 81601

8. Army Corps of Engineers
   400 Rood Avenue, Suite 142
   Grand Junction CO 81501

9. Division of Wildlife
Ecological Services
606 Broadway
Denver CO 80216

10. Division of Wildlife
Ecological Services
711 Independence
Grand Junction CO 81501

11. Department of Local Affairs
Planning Division
1313 Sherman Street
Denver CO 80203

12. EPA
Office of Grants
8W-OG
1860 Lincoln Street, Suite 103
Denver CO 80295

13. Town of New Castle
P.O. Box 166
New Castle CO 81647

This final draft plan is being provided to the Colorado Department of Health and Town of New Castle for a final review. This final draft plan will be available to other interested parties on request. Affirmation of the selected final plan, modifications and/or evaluation of different alternatives will be dependent, in part, upon the public's input to the final draft 201 Plan.

7.2 RECOMMENDATIONS FOR TALBOTT'S WASTEWATER TREATMENT PLANT. Reference is hereby given to discussions in Section 6.2.3 of this report.

7.3 RECOMMENDATIONS FOR INDIVIDUAL DISPOSAL SYSTEMS. Reference is hereby given to discussions in Section 6.2.3 of this report.

7.4 SELECTED PLAN. Reference is hereby given to discussions in Section 6.2.3 of this report.

7.5 ENVIRONMENTAL EFFECTS OF SELECTED PLAN. Reference is hereby given to discussions in Section 7.7 of the 1980 Facilities Planning Study for the Town of New Castle. Modifications to the discussion contained therein are as follows:

1. Discharge is proposed to be in the Colorado River instead of Elk Creek
2. No aeration lagoons are proposed, however, similar impacts noted will exist.

SECTION 8. PRELIMINARY DESIGN AND COST ESTIMATE.

8.1 DESCRIPTION OF PROJECT — NEW CASTLE. The proposed project will involve expansion and upgrading of the Town's existing treatment plant. In addition, numerous improvements to and expansions of the Town's collection system are identified in the 201 Plan. Construction of a new outfall from the wastewater treatment facility to the Colorado River is proposed. Aside from replacement of the Town's existing clay sewer mains, it is anticipated that development will monetarily and physically provide the expansions and/or replacements of the Town's collection system.

The recommended treatment process is by the extended aeration process now being used. This will be followed by chlorination. The plan calls for expansion of the existing process to be conducted in phases wherein the first phase of the expansion will fully utilize the existing facilities. The first phase expansion will combine the existing digester and aeration basin into an operationally equivalent single aeration basin. A new digestor, sized to complement the modified aeration basin capacity will be provided. Finally, a new clarifier will be provided to allow the plant operator the opportunity to perform long awaited maintenance on the existing clarifier. Associated piping improvements, aeration equipment and pumping needs would be provided to properly operate the phase 1 expansion.

Phase 2 expansion would provide new pretreatment and outlet works as well as provide additional aeration basin, clarifier and digestor capacity. The new pretreatment works would have a new diversion and flume with bar screen, aerated grit chamber and a classifier/degritter. The pretreatment works would be designed for the ultimate 1.9 M.G.D. capacity. The additional aeration basin, clarifier and digestor being added would each be designed to a capacity of 0.35 M.G.D. Associated flow equalization vaults required to proportion flow to the "phased" plant components would also be provided. Finally, the chlorination building which would include a chlorine contact chamber would be provided, having been designed for the ultimate 1.9 M.G.D. capacity. With the new aeration basin and digesters, a new blower building would be required. This building would be built and designed in conjunction with the office/laboratory facilities as well as with the public works shop which would be removed as a result of the digestor construction. As with phase 1, associated piping improvements, aeration equipment and pumping needs would be provided to properly operate the phase 2 expansion with the prior phase improvements.

Subsequent phased expansion would provide the addition of an aeration basin, digestor and a clarifer. Each component being designed for an incremental 0.35 M.G.D. capacity. This level of expansion would occur for Phases 3 through 6. At the end of Phase 6 expansion, the service area would be "built-out" and thus the plant would be at the maximum capacity of 1.9 M.G.D.

It is anticipated that with phase 3 construction, it may be desired to install sludge thickening as part of the process. Sludge thickening would greatly reduce the amount of sludge hauling and land application required for the plant. However, for the purposes of planning and cost estimates, it is assumed that the additional digestor capacity required, when not considering sludge thickening, would offset siting and costs of the sludge thickening and thus the plan remains flexible for the future modifications.

The expanded plant will continue to be connected to the Town's existing gravity outfall at the

completion of Phase 1. However, prior to the requirement of Phase 2 expansions, the Town's outfall line coming into the plant will need to be up sized to accommodate future flows to the plant. Floodproofing of the plant site will need to be maintained by assuring the continued existence and proper maintenance of the berm parallel and adjacent to Elk Creek between the I-70 and railroad embankments. A more complete description of the system follows and a flow diagram of the plant is shown in Figure 8-1.

8.1.2 Design Data. Flow rate, loading rate, climatic data, and environmental parameters used as a basis for the design of the system are as follows:

Design Data Item	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 6
Population Equivalent	2000	6667	11333	16000	20667	25333
Avg. Annual Flow (MGD)	0.15	0.50	0.85	1.20	1.55	1.90
Daily B.O.D. (#/day)	375	1251	2127	3003	3879	4755

Wastewater Temperature (deg C)

Influent:	Winter	5 (deg C)
	Summer	15 (deg C)
In-plant:	Winter	3 (deg C)
	Summer	16 (deg C)

Elevation at Site: 5560 feet

Prevailing winds: Westerly

8.1.3 Plant Layout and Piping. A plant layout is shown in Figure 8-2. The following unit operations are included in the plant:

Process Unit	Function
Pretreatment	
Parshall Flume	Flow Measurement
Bar Screen	Removal of rags and large objects
Aerated Grit Chamber	Grit Removal
Classifier/degritter	Removal of grit
Aeration Basins	Biological Treatment
Secondary Clarifiers	Sedimentation, Sludge separation
Digesters	Stabilize waste sludge solids
Chlorine Contact Tank	Dissinfection, dissipation of chlorine

As is the existing condition, a hydraulic profile of the plant indicates that gravity flow continues to be possible for all units.

8.1.4 Pretreatment. The existing pretreatment works have adequate capacity for the Phase 1 expansion, however, at the onset of the Phase 2 expansion, new pretreatment facilities will be provided. A new diversion structure would be provided at the outfall of the Town's existing main. The construction of this diversion structure would be most likely a 6 foot diameter pre-fabricated manhole. From this new diversion structure, an energy dissipation structure would be provided to switch from circular open channel flow to rectangular open channel flow. Next, a bar screen would be provided ahead of the Parshall flume. Having passed through the Parshall flume, effluent would then discharge into a new Aerated Grit Chamber where a Classifier/degritter would be provided to remove the larger objects in the effluent. A building would be provided over the pretreatment facilities from the energy dissipation structure to the aerated grit chamber. From the aerated grit chamber effluent would move the the first of three flow equalization boxes. At the flow equalization boxes, effluent would be equally distributed to each of the six aeration basins (at full buildout). The flow equalization boxes would be constructed during phase 2 expansion.

8.1.5 Aeration basins. During phase 1 expansion, the existing digester would be converted to additional volume for aeration. New fine bubble diffusers would be provided and fed air from a new blower building installed with the phase 1 improvements. In the following phases of expansion, new aeration basins, sized to complement a phasing flow of 0.35 M.G.D. would be provided. All of the associated piping to and from the aeration basins would be provided with that associated phase of expansion. During phase 2 expansion, a new blower building would be provided in association with a new shop and office building. This blower building would supply air to phase 2 through 6 aeration basin and digester expansions. Each aeration basin would be housed in a building which would be constructed to be "added onto" with each subsequent phase of expansion.

8.1.6 Clarifiers. During phase 1 expansion, clarifier #2 would be constructed to allow a "back up" to the existing clarifier. Flow would be directed to clarifier #2, in phase 1, directly from the expanded aeration basin. However, in subsequent phases, piping modifications would be necessary to feed clarifier #2 from the flow equalization vault #2. Accordingly in phase 1, effluent piping would utilize the existing facilities. However, phase #2 construction would require modifications to the clarifier piping to send the effluent to the final flow equalization vault (#3). In subsequent phases of expansion, a clarifier would be added to the plant, sized to complement the phasing flows of 0.35 M.G.D. In the sixth phase, no clarifier would be added since the fifth phase of plant expansion would have placed the sixth clarifier on line. Each clarifier would be fitted with a cover.

8.1.7 Digesters. During phase 1 expansion, a new digestor, sized to complement the existing plant capacity would be provided. In subsequent phases of expansions, additional digesters would be placed on line to complement the other plant expansions. Each digester would be provided with an enclosure. Sludge pumps would be provided to pump effluent to trucks ready for haul to land application sites. The supernatent line from the digesters would be piped to the "front end" of the plant at flow equalization vault #1.

8.1.8 Sludge Disposal. Sludge disposal will continue to be land applied on adjacent sites which meet the 503 "biosolids" regulations. Section 6.6.8 of this report discusses in further detail the issues needing to be dealt with for sludge disposal.

8.1.9 Chlorination. The existing chlorination facilities will suffice for the phase 1 expansion.

However, in phase 2, new facilities will be required. These facilities would be provided for the ultimate plant size of 1.9 M.G.D. Chlorination will be with a cylinder-mounted gas chlorinator using a recirculating pump to create a vacuum. Contact time will be greater than 30 minutes at the anticipated 20 year flow.

8.1.10 Outfall to Colorado River. Subsequent to the phase 1 expansion, it is anticipated that the ammonia requirements will not be met with the wastewater treatment plant outfall occuring into Elk Creek. Therefore, it is proposed that the outfall be relocated to discharge to the Colorado River subsequent to the phase 1 expansions. The outfall will be sized for ultimate plant flows.

8.1.11 Blower/Office/Shop Building. As was previously stated, a new blower building would be required in the phase 2 expansion to provide air to the digester, grit chamber and aeration basin. This blower building can be jointly used with the office, shop and laboratory needs for the wastewater treatment plant. With the addition of digester #2, the existing shop facilities will be eliminated.

8.1.12 Site Work. Other than needed access ways for sludge hauling and public work activities on the site, the entire site should be seeded in pasture grass. An underground sprinkler is recommended. Reference is given to Section 8.1.11 of the 1980 Facilities Planning Study for the Town of New Castle for further recommendations.

8.1.13 Floodproofing. Reference is given to Section 8.1.12 of the 1980 Facilities Planning Study for the Town of New Castle.

8.1.14 Sewer Line Replacement. The prior analysis of the sewer collection system indicated that the majority of the Town's existing collection system is constructed of vitrified clay. Problems exist on the existing clay line to the extent that the existing clay line needs replaced. It is anticipated that 2734 L.F. of 12" line needs replaced. In addition, the existing 10" line from the main stem the the Town's collection system into the plant will need replaced. Because of current residential growth, the existing 10" line will need to be replaced with an 18" line which would complement the "approved" subdivisions needing to access and use this line. It is anticipated that 4267 L.F. of 18" line would be required. All other lines identified to serve the New Castle service area are anticipated to be provided by "developers" on an as needed basis and in accordance to guidance from the Town.

8.1.15 Summary of Cost Estimates.

8.1.15.1 Wastewater Treatment Plant Costs. The project development cost estimates for the wastewater treatment plant construction program are shown in Tables 8-1 through 8-7. The tables identify the costs for the expansion based upon phasing of the plant. Tables 8-1 through 8-6 represent those costs for Phase 1 through Phase 6, respectfully. Table 8-7 provides a summary of costs for the previous 6 tables. Total project costs for expansion throughout the 20 year planning period are estimated at $7,954,480.

8.1.15.2 Sewer Line Replacement. The project development costs for replacement of the sewer lines discussed in Section 8.1.14 previously are shown on Tables 8-8 and 8-9. Total costs for sewer line replacement are anticipated to be $448,839.60.

8.1.16 Operation and Maintenance Costs. The estimated annual costs for operation and maintenance of the wastewater treatment system are as follows:

Item or Phase of Construction	Operation and Maintenance Costs
Phase 1 Expansion	$44,490.34
Phase 2 Expanson	$157,062.63
Phase 3 Expansion	$218,492.47
Phase 4 Expansion	$280,043.63
Phase 5 Expansion	$342,278.47
Phase 6 Expansion	$397,723.99

The estimated operation and maintenance costs for each proposed intercept line or existing collector line that is proposed to be replaced are shown on the associated cost estimate. These cost estimates are found in the appendix. Accompanying mapping in the appendix, graphically identifies the collector or intercept line location with respect to the service area.

8.1.17 Staging of Facilities. The previous sections in chapter 8 of this report discuss the proposed staging of facilities for the New Castle wastewater treatment plant.

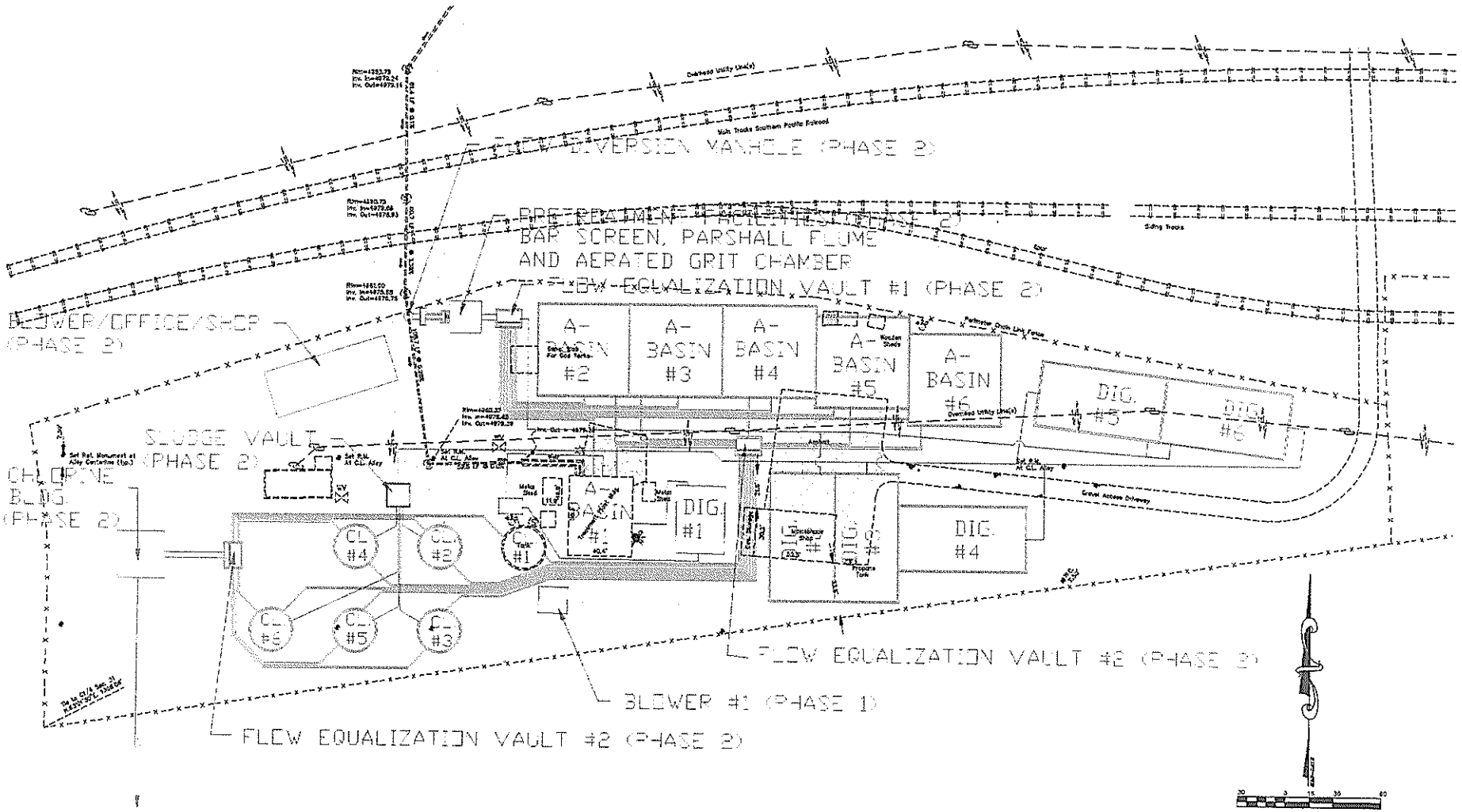

DIVERSION MANHOLE (PHASE 2)
PRETREATMENT FACILITIES (PHASE 2)
BAR SCREEN, PARSHALL FLUME
AND AERATED GRIT CHAMBER
FLOW EQUALIZATION VAULT #1 (PHASE 2)
BLOWER/OFFICE/SHOP
(PHASE 2)
SLUDGE VAULT
(PHASE 2)
CHLORINE
BLDG.
(PHASE 2)
A-
BASIN
#2
A-
BASIN
#3
A-
BASIN
#4
A-
BASIN
#5
A-
BASIN
#6
DIG.
#5
DIG.
#6
A-
BASIN
#1
DIG.
#1
DIG.
#4
CL
#4
CL
#2
CL
#5
CL
#3
FLOW EQUALIZATION VAULT #2 (PHASE 2)
BLOWER #1 (PHASE 1)
FLOW EQUALIZATION VAULT #2 (PHASE 2)
OUTFALL TO
COLORADO RIVER

Table 8-1-a
Estimated Project Costs
Town of New Castle Wastewater Treatment Plant
Phase 1

Item for Consideration	Unit Price	Unit	Quantity	Cost
Digester Construction				
Mobilization	LS	50,000.00	1.00	50,000.00
Excavation	Cy	8.00	1,000.00	8,000.00
Dewatering	LS	5,000.00	1.00	5,000.00
Concrete	CY	400.00	220.00	88,000.00
Flatwork	SF	3.60	700.00	2,520.00
Sludge Piping	LF	20.00	220.00	4,400.00
Air Piping	LF	20.00	140.00	2,800.00
Misc. Sludge Fittings	EA	250.00	15.00	3,750.00
Misc. Air Fittings	EA	250.00	18.00	4,500.00
Sludge Valves	EA	500.00	16.00	8,000.00
Air Valves, 6"	EA	500.00	2.00	1,000.00
Air Valves, 3"	EA	250.00	6.00	1,500.00
Submersible Sludge Pumps	EA	10,000.00	2.00	20,000.00
Supernatant Pump	EA	15,000.00	1.00	15,000.00
Coarse Bubble Aerators	LS	20,000.00	1.00	20,000.00
Handrailing	LF	65.00	230.00	14,950.00
Grating	LS	2,000.00	1.00	2,000.00
MCC Panel	LS	20,000.00	1.00	20,000.00
Blowers	EA	25,000.00	2.00	50,000.00
Blower Building	SF	100.00	300.00	30,000.00
Blower Crane	EA	9,000.00	1.00	9,000.00
Remove Drying Beds	LS	2,000.00	1.00	2,000.00
Move Exist Lab Shed	LS	2,000.00	1.00	2,000.00
Electric Service and Distribution	LS	85,000.00	1.00	85,000.00
Metal Building over Digester	SF	60.00	2,110.00	126,600.00
Sub-Total				576,020.00

Table 8-1-a (continued)
Estimated Project Costs
Town of New Castle Wastewater Treatment Plant
Phase 1

Item for Consideration	Unit Price	Unit	Quantity	Cost
Convert Digester to A-Basin				
Remove Existing Hardware	LS	2,000.00	1.00	2,000.00
Fine Bubble Aerators	LS	15,000.00	1.00	15,000.00
Grouting	LS	20,000.00	1.00	20,000.00
Air Piping	LF	20.00	25.00	500.00
Sub-Total				37,500.00
Sludge Pump Vault				
Sludge Lift Station	LS	15,000.00	1.00	15,000.00
Sludge Pumps	EA	15,000.00	2.00	30,000.00
Splitter Box Removal	LS	3,000.00	1.00	3,000.00
Sub-Total				48,000.00
Clarifier Construction				
Excavation	CY	370.00	7.50	2,775.00
Concrete	CY	70.00	500.00	35,000.00
Misc. Piping	LF	135.00	30.00	4,050.00
Sludge Coll. Equip. (Inc. rake, etc.)	LS	30,000.00	1.00	30,000.00
Electrical	LS	2,000.00	1.00	2,000.00
Enclosure	SF	960.00	40.00	38,400.00
Sub-Total				112,225.00

Table 8-1-b
Summary and Totals
Phase 1

Digester Construction	576,020.00
Digester to A-Basin Conversion	37,500.00
Sludge Pump Vault	48,000.00
Clarifier #2 Construction	112,225.00
Sub-Total	**773,745.00**
(15% Contingency)	116,061.75
Grand Total	**889,806.75**

Table 8-2-a
Estimated Project Costs
Town of New Castle Wastewater Treatment Plant
Phase 2

Item for Consideration	Unit	Unit Price	Quantity	Cost
Pretreatment/Headworks				
Mobilization (included in Phase 2 total)	LS	0.00	1.00	0.00
Excavation	CY	8.00	210.00	1,680.00
Dewatering	LS	1,500.00	1.00	1,500.00
Concrete	CY	400.00	34.00	13,600.00
Flatwork	SF	3.60	800.00	2,880.00
Diversion Manhole	EA	2,500.00	1.00	2,500.00
42" Piping	LF	45.00	20.00	900.00
Classifier/Degritter	EA	20,000.00	1.00	20,000.00
Bar Screen	EA	3,000.00	1.00	3,000.00
Plant Piping (air)	LF	20.00	80.00	1,600.00
Miscellaneous Baffles, Weirs, Etc.	LS	7,500.00	1.00	7,500.00
Building Construction	EA	80.00	943.00	75,440.00
Electrical	EA	7,500.00	1.00	7,500.00
HVAC	EA	7,500.00	1.00	7,500.00
Grating	SF	25.00	150.00	3,750.00
Sub-Total				149,350.00
Flow Equalization Vault #1				
Excavation	CY	8.00	43.00	344.00
Concrete	CY	400.00	30.00	12,000.00
Miscellaneous Baffles, Weirs, Etc.	LS	3,000.00	1.00	3,000.00
Piping to Aeration Basin	LF	30.00	110.00	3,300.00
Sub-Total				18,644.00

Table 8-2-a-continued
Estimated Project Costs
Town of New Castle Wastewater Treatment Plant
Phase 2

Item for Consideration	Unit	Unit Price	Quantity	Cost
Aeration Basin #2				
Mobilization (included in Phase 2 total)	LS	0.00	0.00	0.00
Excavation	CY	8.00	1,852.00	14,816.00
Dewatering	LS	5,000.00	1.00	5,000.00
Concrete	CY	400.00	374.00	149,600.00
Flatwork	SF	3.60	0.00	0.00
Influent Piping	LF	30.00	50.00	1,500.00
Effluent Piping	LF	30.00	87.00	2,610.00
Air Piping	LF	20.00	280.00	5,600.00
Misc. Inf/Eff Fittings	EA	250.00	16.00	4,000.00
Misc. Air Fittings	EA	250.00	22.00	5,500.00
Inf/Eff Valves	EA	500.00	5.00	2,500.00
Air Valves, 6"	EA	500.00	3.00	1,500.00
Air Valves, 3"	EA	250.00	6.00	1,500.00
Aerators	LS	45,000.00	1.00	45,000.00
Handrailing	LF	60.00	272.00	16,320.00
Exterior Stairs	EA	3.00	500.00	1,500.00
Electric Service and Distribution	LS	20,000.00	1.00	20,000.00
Building over A-Basin	SF	60.00	3,250.00	195,000.00
HVAC	LS	10,000.00	1.00	10,000.00
Sub-Total				481,946.00

Table 8-2-a (continued)
Estimated Project Costs
Town of New Castle Wastewater Treatment Plant
Phase 2

Item for Consideration	Unit	Unit Price	Quantity	Cost
Flow Equalization Vault #2				
Excavation	CY	8.00	43.00	344.00
Concrete	CY	400.00	30.00	12,000.00
Miscellaneous Baffles, Weirs, Etc.	LS	3,000.00	1.00	3,000.00
Piping to Clarifier	LF	30.00	275.00	8,250.00
Sub-Total				23,594.00
Clarifier #3				
Excavation	CY	370.00	7.50	2,775.00
Concrete	CY	70.00	500.00	35,000.00
Dewatering	LS	1,500.00	1.00	1,500.00
Misc. Piping (incl. piping to sluge pumps)	LF	135.00	30.00	4,050.00
Sludge Coll. Equip. (Inc. rake, etc.)	LS	30,000.00	1.00	30,000.00
Electrical	LS	2,000.00	1.00	2,000.00
Enclosure	SF	960.00	40.00	38,400.00
Piping to Flow Equalization Vault #3	LF	30.00	80.00	2,400.00
Sub-Total				116,125.00
Flow Equalization Vault #3				
Excavation	CY	8.00	43.00	344.00
Concrete	CY	400.00	30.00	12,000.00
Miscellaneous Baffles, Weirs, Etc...	LS	3,000.00	1.00	3,000.00
Piping to Chlorine Contact	LF	45.00	40.00	1,800.00
Sub-Total				17,144.00

Table 8-2-a (continued)
Estimated Project Costs
Town of New Castle Wastewater Treatment Plant
Phase 2

Item for Consideration	Unit	Unit Price	Quantity	Cost
Chlorination Building				
Mobilization (included in Phase 2 total)	LS	0.00	1.00	0.00
Excavation	CY	8.00	630.00	5,040.00
Dewatering	LS	1,500.00	1.00	1,500.00
Concrete	CY	400.00	99.00	39,600.00
Flatwork	SF	3.60	300.00	1,080.00
Plant Piping	LF	20.00	80.00	1,600.00
Miscellaneous Baffles, Weirs, Etc.	LS	7,500.00	1.00	7,500.00
Building Construction	SF	80.00	900.00	72,000.00
Electrical	LS	7,500.00	1.00	7,500.00
HVAC	LS	7,500.00	1.00	7,500.00
Sub-Total				143,320.00
Outfall to Colorado River				
Highway Bore	LF	100.00	300.00	30,000.00
Carrier Pipe	LF	80.00	300.00	24,000.00
Sewer Pipe	LF	45.00	300.00	13,500.00
Outfall Structure	EA	500.00	20.00	10,000.00
Flap Gate	EA	800.00	1.00	800.00
Sub-Total				77,500.00
Sludge Pump Vault				
Sludge Lift Station	LS	15,000.00	1.00	15,000.00
Sludge Pumps	EA	15,000.00	1.00	15,000.00
Concrete	CY	400.00	44.00	17,600.00
Excavation	CY	8.00	100.00	800.00
Dewatering	LS	1,500.00	1.00	1,500.00
Piping to Digesters	LF	30.00	300.00	9,000.00
Sub-Total				58,900.00

Table 8-2-a (continued)
Estimated Project Costs
Town of New Castle Wastewater Treatment Plant
Phase 2

Item for Consideration	Unit	Unit Price	Quantity	Cost
Office/Blower/Public Works Bldg.				
Mobilization (included in Phase 2 total)	LS	0.00	0.00	0.00
Excavation	CY	8.00	160.00	1,280.00
Dewatering	LS	1,500.00	0.00	0.00
Concrete	CY	400.00	50.00	20,000.00
Flatwork	SF	3.60	3,000.00	10,800.00
Piping to A-Basins,Digesters,Grit Chamber	LF	45.00	250.00	11,250.00
Blowers	EA	20,000.00	1.00	20,000.00
Plant Piping (air)	LF	20.00	80.00	1,600.00
Building Construction	SF	80.00	1,500.00	120,000.00
Electrical	LS	50,000.00	1.00	50,000.00
Shop Construction	SF	40.00	3,000.00	120,000.00
HVAC	LS	7,500.00	1.00	7,500.00
Sub-Total				362,430.00

Table 8-2-a (continued)
Estimated Project Costs
Town of New Castle Wastewater Treatment Plant
Phase 2

Item for Consideration	Unit	Unit Price	Quantity	Cost
Digester Construction				
Mobilization (in Phase 2 summary)	LS	0.00	0.00	0.00
Excavation	CY	8.00	1,917.00	15,336.00
Dewatering	LS	5,000.00	1.00	5,000.00
Concrete	CY	400.00	333.00	133,200.00
Flatwork	SF	3.60	0.00	0.00
Sludge Piping	LF	20.00	300.00	6,000.00
Air Piping	LF	20.00	200.00	4,000.00
Misc. Sludge Fittings	EA	250.00	15.00	3,750.00
Misc. Air Fittings	EA	250.00	18.00	4,500.00
Sludge Valves	EA	500.00	16.00	8,000.00
Air Valves, 6"	EA	500.00	2.00	1,000.00
Air Valves, 3"	EA	250.00	6.00	1,500.00
Submersible Sludge Pumps	EA	10,000.00	2.00	20,000.00
Supernatant Piping to Flow Equ. Vault #1	LF	30.00	260.00	7,800.00
Supernatant Pump	EA	15,000.00	1.00	15,000.00
Coarse Bubble Aerators	LS	30,000.00	1.00	30,000.00
Handrailing	LF	60.00	320.00	19,200.00
Grating/Walkways/Access	LS	2,000.00	1.00	2,000.00
HVAC	LS	2,000.00	1.00	2,000.00
Electric Service and Distribution	LS	15,000.00	1.00	15,000.00
FRP Cover over Digester	SF	35.00	3,444.00	120,540.00
Sub-Total				413,826.00

Table 8-2-b
Summary and Totals
Phase 2

Pretreatment/Headworks	149,350.00
Flow Equalization Vault #1	18,644.00
Aeration Basin #2	481,946.00
Flow Equalization Vault #2	23,594.00
Clarifier #3	116,125.00
Flow Equalization Vault #3	17,144.00
Chlorination Building	143,320.00
Outfall to Colorado River	77,500.00
Sludge Pump Vault	58,900.00
Office/Blower/Public Works Bldg.	362,430.00
Digester #2	413,826.00
Mobilization/Demobilization	75,000.00
Demo Obsolete Facilities	20,000.00
Sub-Total	**1,957,779.00**
(15% Contingency)	293,666.85
Grand Total	**2,251,445.85**

Table 8-3-a
Estimated Project Costs
Town of New Castle Wastewater Treatment Plant
Phase 3

Item for Consideration	Unit	Unit Price	Quantity	Cost
Flow Equalization Vault #1				
Excavation	CY	8.00	0.00	0.00
Concrete	CY	400.00	0.00	0.00
Miscellaneous Baffles, Weirs, Etc.	LS	1,000.00	1.00	1,000.00
Piping to Aeration Basin	LF	30.00	163.00	4,890.00
Sub-Total				5,890.00
Aeration Basin #3				
Mobilization (included in Phase 2 total)	LS	0.00	0.00	0.00
Excavation	CY	8.00	1,540.00	12,320.00
Dewatering	LS	5,000.00	1.00	5,000.00
Concrete	CY	400.00	342.00	136,800.00
Flatwork	SF	3.60	0.00	0.00
Influent Piping	LF	30.00	50.00	1,500.00
Effluent Piping	LF	30.00	87.00	2,610.00
Air Piping	LF	20.00	280.00	5,600.00
Misc. Inf/Eff Fittings	EA	250.00	16.00	4,000.00
Misc. Air Fittings	EA	250.00	22.00	5,500.00
Inf/Eff Valves	EA	500.00	5.00	2,500.00
Air Valves, 6"	EA	500.00	3.00	1,500.00
Air Valves, 3"	EA	250.00	6.00	1,500.00
Aerators	LS	45,000.00	1.00	45,000.00
Handrailing	LF	60.00	272.00	16,320.00
Exterior Stairs	EA	2.00	500.00	1,000.00
Electric Service and Distribution	LS	15,000.00	1.00	15,000.00
Building over A-Basin	SF	60.00	3,250.00	195,000.00
HVAC	LS	10,000.00	1.00	10,000.00
Sub-Total				461,150.00

Table 8-3-a (continued)
Estimated Project Costs
Town of New Castle Wastewater Treatment Plant
Phase 3

Item for Consideration	Unit	Unit Price	Quantity	Cost
Flow Equalization Vault #2				
Excavation	CY	8.00	0.00	0.00
Concrete	CY	400.00	0.00	0.00
Miscellaneous Baffles, Weirs, Etc.	LS	1,000.00	1.00	1,000.00
Piping to Clarifier	LF	30.00	275.00	8,250.00
Sub-Total				9,250.00
Clarifier #4				
Excavation	CY	370.00	7.50	2,775.00
Concrete	CY	70.00	500.00	35,000.00
Dewatering	LS	1,500.00	1.00	1,500.00
Misc. Piping (incl. piping to sluge pumps)	LF	135.00	30.00	4,050.00
Sludge Coll. Equip. (Inc. rake, etc.)	LS	30,000.00	1.00	30,000.00
Electrical	LS	2,000.00	1.00	2,000.00
Enclosure	SF	960.00	40.00	38,400.00
Piping to Flow Equalization Vault #3	LF	30.00	80.00	2,400.00
Sub-Total				116,125.00
Office/Blower/Public Works Bldg.				
Piping to A-Basins,Digesters,Grit Chamber	LF	45.00	100.00	4,500.00
Blowers	EA	20,000.00	1.00	20,000.00
Plant Piping (air)	LF	20.00	40.00	800.00
Electrical	LS	5,000.00	1.00	5,000.00
HVAC	LS	2,500.00	1.00	2,500.00
Sub-Total				32,800.00

Table 8-3-a (continued)
Estimated Project Costs
Town of New Castle Wastewater Treatment Plant
Phase 3

Item for Consideration	Unit	Unit Price	Quantity	Cost
Digester Construction				
Mobilization (in Phase 2 summary)	LS	0.00	0.00	0.00
Excavation	CY	8.00	1,880.00	15,040.00
Dewatering	LS	5,000.00	1.00	5,000.00
Concrete	CY	400.00	282.00	112,800.00
Flatwork	SF	3.60	0.00	0.00
Sludge Piping	LF	20.00	300.00	6,000.00
Air Piping	LF	20.00	200.00	4,000.00
Misc. Sludge Fittings	EA	250.00	15.00	3,750.00
Misc. Air Fittings	EA	250.00	18.00	4,500.00
Sludge Valves	EA	500.00	16.00	8,000.00
Air Valves, 6"	EA	500.00	2.00	1,000.00
Air Valves, 3"	EA	250.00	6.00	1,500.00
Submersible Sludge Pumps	EA	10,000.00	2.00	20,000.00
Supernatant Piping to Flow Equ. Vault #1	LF	30.00	260.00	7,800.00
Supernatant Pump	EA	15,000.00	1.00	15,000.00
Coarse Bubble Aerators	LS	30,000.00	1.00	30,000.00
Handrailing	LF	60.00	320.00	19,200.00
Grating/Walkways/Access	LS	2,000.00	1.00	2,000.00
HVAC	LS	2,000.00	1.00	2,000.00
Electric Service and Distribution	LS	15,000.00	1.00	15,000.00
FRP Cover over Digester	SF	35.00	3,444.00	120,540.00
Sub-Total				393,130.00

Table 8-3-b
Summary and Totals
Phase 3

Flow Equalization Vault #1	5,890.00
Aeration Basin #3	461,150.00
Flow Equalization Vault #2	9,250.00
Clarifier #4	116,125.00
Office/Blower/Public Works Bldg.	32,800.00
Digester #3	393,130.00
Mobilization	50,000.00
Sub-Total	**1,068,345.00**
(15% Contingency)	160,251.75
Grand Total	**1,228,596.75**

Table 8-4-a
Estimated Project Costs
Town of New Castle Wastewater Treatment Plant
Phase 4

Item for Consideration	Unit	Unit Price	Quantity	Cost
Flow Equalization Vault #1				
Excavation	CY	8.00	0.00	0.00
Concrete	CY	400.00	0.00	0.00
Miscellaneous Baffles, Weirs, Etc.	LS	1,000.00	1.00	1,000.00
Piping to Aeration Basin	LF	30.00	210.00	6,300.00
Sub-Total				7,300.00
Aeration Basin #4				
Mobilization (included in Phase 2 total)	LS	0.00	0.00	0.00
Excavation	CY	8.00	1,540.00	12,320.00
Dewatering	LS	5,000.00	1.00	5,000.00
Concrete	CY	400.00	342.00	136,800.00
Flatwork	SF	3.60	0.00	0.00
Influent Piping	LF	30.00	150.00	4,500.00
Effluent Piping	LF	30.00	137.00	4,110.00
Air Piping	LF	20.00	280.00	5,600.00
Misc. Inf/Eff Fittings	EA	250.00	16.00	4,000.00
Misc. Air Fittings	EA	250.00	22.00	5,500.00
Inf/Eff Valves	EA	500.00	5.00	2,500.00
Air Valves, 6"	EA	500.00	3.00	1,500.00
Air Valves, 3"	EA	250.00	6.00	1,500.00
Aerators	LS	45,000.00	1.00	45,000.00
Handrailing	LF	60.00	272.00	16,320.00
Exterior Stairs	EA	2.00	500.00	1,000.00
Electric Service and Distribution	LS	15,000.00	1.00	15,000.00
Building over A-Basin	SF	60.00	3,250.00	195,000.00
HVAC	LS	10,000.00	1.00	10,000.00
Sub-Total				465,650.00

Table 8-4-a (continued)
Estimated Project Costs
Town of New Castle Wastewater Treatment Plant
Phase 4

Item for Consideration	Unit	Unit Price	Quantity	Cost
Flow Equalization Vault #2				
Excavation	CY	8.00	0.00	0.00
Concrete	CY	400.00	0.00	0.00
Miscellaneous Baffles, Weirs, Etc.	LS	1,000.00	1.00	1,000.00
Piping to Clarifier	LF	30.00	300.00	9,000.00
Sub-Total				10,000.00
Clarifier #5				
Excavation	CY	370.00	7.50	2,775.00
Concrete	CY	70.00	500.00	35,000.00
Dewatering	LS	1,500.00	1.00	1,500.00
Misc. Piping (incl. piping to sluge pumps)	LF	30.00	150.00	4,500.00
Sludge Coll. Equip. (Inc. rake, etc.)	LS	30,000.00	1.00	30,000.00
Electrical	LS	2,000.00	1.00	2,000.00
Enclosure	SF	960.00	40.00	38,400.00
Piping to Flow Equalization Vault #3	LF	30.00	80.00	2,400.00
Sub-Total				116,575.00
Office/Blower/Public Works Bldg.				
Piping to A-Basins,Digesters,Grit Chamber	LF	45.00	100.00	4,500.00
Blowers	EA	20,000.00	1.00	20,000.00
Plant Piping (air)	LF	20.00	40.00	800.00
Electrical	LS	5,000.00	1.00	5,000.00
HVAC	LS	2,500.00	1.00	2,500.00
Sub-Total				32,800.00

Table 8-4-a (continued)
Estimated Project Costs
Town of New Castle Wastewater Treatment Plant
Phase 4

Item for Consideration	Unit	Unit Price	Quantity	Cost
Digester Construction				
Mobilization (in Phase 2 summary)	LS	0.00	0.00	0.00
Excavation	CY	8.00	1,880.00	15,040.00
Dewatering	LS	5,000.00	1.00	5,000.00
Concrete	CY	400.00	282.00	112,800.00
Flatwork	SF	3.60	0.00	0.00
Sludge Piping	LF	20.00	50.00	1,000.00
Air Piping	LF	20.00	200.00	4,000.00
Misc. Sludge Fittings	EA	250.00	15.00	3,750.00
Misc. Air Fittings	EA	250.00	18.00	4,500.00
Sludge Valves	EA	500.00	16.00	8,000.00
Air Valves, 6"	EA	500.00	2.00	1,000.00
Air Valves, 3"	EA	250.00	6.00	1,500.00
Submersible Sludge Pumps	EA	10,000.00	2.00	20,000.00
Supernatant Piping to Flow Equ. Vault #1	LF	30.00	260.00	7,800.00
Supernatant Pump	EA	15,000.00	1.00	15,000.00
Coarse Bubble Aerators	LS	30,000.00	1.00	30,000.00
Handrailing	LF	60.00	320.00	19,200.00
Grating/Walkways/Access	LS	2,000.00	1.00	2,000.00
HVAC	LS	2,000.00	1.00	2,000.00
Electric Service and Distribution	LS	15,000.00	1.00	15,000.00
FRP Cover over Digester	SF	35.00	3,444.00	120,540.00
Sub-Total				388,130.00

Table 8-4-b
Summary and Totals
Phase 4

Flow Equalization Vault #1	7,300.00
Aeration Basin #4	465,650.00
Flow Equalization Vault #2	10,000.00
Clarifier #5	116,575.00
Office/Blower/Public Works Bldg.	32,800.00
Digester #4	388,130.00
Mobilization	50,000.00
Sub-Total	**1,070,455.00**
(15% Contingency)	160,568.25
Grand Total	**1,231,023.25**

Table 8-5-a
Estimated Project Costs
Town of New Castle Wastewater Treatment Plant
Phase 5

Item for Consideration	Unit	Unit Price	Quantity	Cost
Flow Equalization Vault #1				
Excavation	CY	8.00	0.00	0.00
Concrete	CY	400.00	0.00	0.00
Miscellaneous Baffles, Weirs, Etc.	LS	1,000.00	1.00	1,000.00
Piping to Aeration Basin	LF	30.00	270.00	8,100.00
Sub-Total				9,100.00
Aeration Basin #5				
Excavation	CY	8.00	1,540.00	12,320.00
Dewatering	LS	5,000.00	1.00	5,000.00
Concrete	CY	400.00	342.00	136,800.00
Flatwork	SF	3.60	0.00	0.00
Influent Piping	LF	30.00	150.00	4,500.00
Effluent Piping	LF	30.00	200.00	6,000.00
Air Piping	LF	20.00	280.00	5,600.00
Misc. Inf/Eff Fittings	EA	250.00	16.00	4,000.00
Misc. Air Fittings	EA	250.00	22.00	5,500.00
Inf/Eff Valves	EA	500.00	5.00	2,500.00
Air Valves, 6"	EA	500.00	3.00	1,500.00
Air Valves, 3"	EA	250.00	6.00	1,500.00
Aerators	LS	45,000.00	1.00	45,000.00
Handrailing	LF	60.00	272.00	16,320.00
Exterior Stairs	EA	2.00	500.00	1,000.00
Electric Service and Distribution	LS	15,000.00	1.00	15,000.00
Building over A-Basin	SF	60.00	3,250.00	195,000.00
HVAC	LS	10,000.00	1.00	10,000.00
Sub-Total				467,540.00

Table 8-5-a (continued)
Estimated Project Costs
Town of New Castle Wastewater Treatment Plant
Phase 5

Item for Consideration	Unit	Unit Price	Quantity	Cost
Flow Equalization Vault #2				
Excavation	CY	8.00	0.00	0.00
Concrete	CY	400.00	0.00	0.00
Miscellaneous Baffles, Weirs, Etc.	LS	1,000.00	1.00	1,000.00
Piping to Clarifier	LF	30.00	350.00	10,500.00
Sub-Total				11,500.00
Clarifier #6				
Excavation	CY	370.00	7.50	2,775.00
Concrete	CY	70.00	500.00	35,000.00
Dewatering	LS	1,500.00	1.00	1,500.00
Misc. Piping (incl. piping to sluge pumps)	LF	30.00	150.00	4,500.00
Sludge Coll. Equip. (Inc. rake, etc.)	LS	30,000.00	1.00	30,000.00
Electrical	LS	2,000.00	1.00	2,000.00
Enclosure	SF	960.00	40.00	38,400.00
Piping to Flow Equalization Vault #3	LF	30.00	130.00	3,900.00
Sub-Total				118,075.00
Office/Blower/Public Works Bldg.				
Piping to A-Basins,Digesters,Grit Chamber	LF	45.00	160.00	7,200.00
Blowers	EA	20,000.00	1.00	20,000.00
Plant Piping (air)	LF	20.00	40.00	800.00
Electrical	LS	5,000.00	1.00	5,000.00
HVAC	LS	2,500.00	1.00	2,500.00
Sub-Total				35,500.00

Table 8-5-a (continued)
Estimated Project Costs
Town of New Castle Wastewater Treatment Plant
Phase 5

Item for Consideration	Unit	Unit Price	Quantity	Cost
Digester Construction				
Excavation	CY	8.00	1,880.00	15,040.00
Dewatering	LS	5,000.00	1.00	5,000.00
Concrete	CY	400.00	282.00	112,800.00
Flatwork	SF	3.60	0.00	0.00
Sludge Piping	LF	20.00	100.00	2,000.00
Air Piping	LF	20.00	200.00	4,000.00
Misc. Sludge Fittings	EA	250.00	15.00	3,750.00
Misc. Air Fittings	EA	250.00	18.00	4,500.00
Sludge Valves	EA	500.00	16.00	8,000.00
Air Valves, 6"	EA	500.00	2.00	1,000.00
Air Valves, 3"	EA	250.00	6.00	1,500.00
Submersible Sludge Pumps	EA	10,000.00	2.00	20,000.00
Supernatant Piping to Flow Equ. Vault #1	LF	30.00	310.00	9,300.00
Supernatant Pump	EA	15,000.00	1.00	15,000.00
Coarse Bubble Aerators	LS	30,000.00	1.00	30,000.00
Handrailing	LF	60.00	320.00	19,200.00
Grating/Walkways/Access	LS	2,000.00	1.00	2,000.00
HVAC	LS	2,000.00	1.00	2,000.00
Electric Service and Distribution	LS	15,000.00	1.00	15,000.00
FRP Cover over Digester	SF	35.00	3,444.00	120,540.00
Sub-Total				390,630.00

Table 8-5-b
Summary and Totals
Phase 5

Flow Equalization Vault #1	9,100.00
Aeration Basin #5	467,540.00
Flow Equalization Vault #2	11,500.00
Clarifier #6	118,075.00
Office/Blower/Public Works Bldg.	35,500.00
Digester #5	390,630.00
Mobilization	50,000.00
Sub-Total	**1,082,345.00**
(15% Contingency)	162,351.75
Grand Total	**1,244,696.75**

Table 8-6-a
Estimated Project Costs
Town of New Castle Wastewater Treatment Plant
Phase 6

Item for Consideration	Unit	Unit Price	Quantity	Cost
Flow Equalization Vault #1				
Excavation	CY	8.00	0.00	0.00
Concrete	CY	400.00	0.00	0.00
Miscellaneous Baffles, Weirs, Etc.	LS	1,000.00	1.00	1,000.00
Piping to Aeration Basin	LF	30.00	320.00	9,600.00
Sub-Total				10,600.00
Aeration Basin #6				
Excavation	CY	8.00	1,540.00	12,320.00
Dewatering	LS	5,000.00	1.00	5,000.00
Concrete	CY	400.00	342.00	136,800.00
Flatwork	SF	3.60	0.00	0.00
Influent Piping	LF	30.00	150.00	4,500.00
Effluent Piping	LF	30.00	260.00	7,800.00
Air Piping	LF	20.00	280.00	5,600.00
Misc. Inf/Eff Fittings	EA	250.00	16.00	4,000.00
Misc. Air Fittings	EA	250.00	22.00	5,500.00
Inf/Eff Valves	EA	500.00	5.00	2,500.00
Air Valves, 6"	EA	500.00	3.00	1,500.00
Air Valves, 3"	EA	250.00	6.00	1,500.00
Aerators	LS	45,000.00	1.00	45,000.00
Handrailing	LF	60.00	272.00	16,320.00
Exterior Stairs	EA	2.00	500.00	1,000.00
Electric Service and Distribution	LS	15,000.00	1.00	15,000.00
Building over A-Basin	SF	60.00	3,250.00	195,000.00
HVAC	LS	10,000.00	1.00	10,000.00
Sub-Total				469,340.00

Table 8-6-a (continued)
Estimated Project Costs
Town of New Castle Wastewater Treatment Plant
Phase 6

Item for Consideration	Unit	Unit Price	Quantity	Cost
Flow Equalization Vault #2				
Excavation	CY	8.00	0.00	0.00
Concrete	CY	400.00	0.00	0.00
Miscellaneous Baffles, Weirs, Etc.	LS	1,000.00	1.00	1,000.00
Piping to Clarifier	LF	30.00	410.00	12,300.00
Sub-Total				13,300.00
Office/Blower/Public Works Bldg.				
Piping to A-Basins,Digesters,Grit Chamber	LF	45.00	210.00	9,450.00
Blowers	EA	20,000.00	1.00	20,000.00
Plant Piping (air)	LF	20.00	40.00	800.00
Electrical	LS	5,000.00	1.00	5,000.00
HVAC	LS	2,500.00	1.00	2,500.00
Sub-Total				37,750.00

Table 8-6-a (continued)
Estimated Project Costs
Town of New Castle Wastewater Treatment Plant
Phase 6

Item for Consideration	Unit	Unit Price	Quantity	Cost
Digester Construction				
Excavation	CY	8.00	1,880.00	15,040.00
Dewatering	LS	5,000.00	1.00	5,000.00
Concrete	CY	400.00	282.00	112,800.00
Flatwork	SF	3.60	0.00	0.00
Sludge Piping	LF	20.00	150.00	3,000.00
Air Piping	LF	20.00	200.00	4,000.00
Misc. Sludge Fittings	EA	250.00	15.00	3,750.00
Misc. Air Fittings	EA	250.00	18.00	4,500.00
Sludge Valves	EA	500.00	16.00	8,000.00
Air Valves, 6"	EA	500.00	2.00	1,000.00
Air Valves, 3"	EA	250.00	6.00	1,500.00
Submersible Sludge Pumps	EA	10,000.00	2.00	20,000.00
Supernatant Piping to Flow Equ. Vault #1	LF	30.00	370.00	11,100.00
Supernatant Pump	EA	15,000.00	1.00	15,000.00
Coarse Bubble Aerators	LS	30,000.00	1.00	30,000.00
Handrailing	LF	60.00	320.00	19,200.00
Grating/Walkways/Access	LS	2,000.00	1.00	2,000.00
HVAC	LS	2,000.00	1.00	2,000.00
Electric Service and Distribution	LS	15,000.00	1.00	15,000.00
FRP Cover over Digester	SF	35.00	3,444.00	120,540.00
Sub-Total				393,430.00

Table 8-6-b
Summary and Totals
Phase 6

Flow Equalization Vault #1	9,100.00
Aeration Basin #6	467,540.00
Flow Equalization Vault #2	11,500.00
Clarifier #6	0.00
Office/Blower/Public Works Bldg.	35,500.00
Digester #6	390,630.00
Mobilization	50,000.00
Sub-Total	**964,270.00**
(15% Contingency)	144,640.50
Grand Total	**1,108,910.50**

Table 8-7
Estimated Project Costs
Town of New Castle Wastewater Treatment Plant
Phases 1 through 6

Phase 1	889,806.75
Phase 2	2,251,445.85
Phase 3	1,228,596.75
Phase 4	1,231,023.25
Phase 5	1,244,696.75
Phase 6	1,108,910.50
Grand Total	**7,954,479.85**

Table 8-8

PRELIMINARY COST ESTIMATE

PROJECT NAME: NEW CASTLE 201 STUDY
ALTERNATIVE #1
REPLACE EXISTING 12" CLAY WITH 12" PVC

PREVIOUS TASKS REQUIRED TO COMPLETE: NONE

COMMENTS: INTEREST RATE= 8 PERCENT
PLANNING PERIOD= 20 YEARS

P.V. FACT= 0.21454821

ITEM	QUANT.	UNIT	U. PRICE	SUB TOTAL	DESIGN LIFE	SALVAGE VALUE	PRESENT WORTH
MOBILIZATION	1	LS	5000	$5,000.00	50	$3,000.00	$643.64
TRAFFIC CONTROL	1	LS	4000	$4,000.00	50	$2,400.00	$514.92
TIE INTO EXISTING SYSTEM	1	EA	2000	$2,000.00	50	$1,200.00	$257.46
12" SEWERLINE CONSTRUCTION	2734	LF	30	$82,020.00	50	$49,212.00	$10,558.35
MANHOLE CONSTRUCTION	10	EA	2500	$25,000.00	50	$15,000.00	$3,218.22
RECONNECT MAINS TO NEW	8	EA	500	$4,000.00	50	$2,400.00	$514.92
SERVICE RECONNECTS	30	EA	500	$15,000.00	50	$9,000.00	$1,930.93
FINISH GRADE RESTORATION	2734	LF	3	$8,202.00	50	$4,921.20	$1,055.83
DEMOBILIZATION	1	LS	2500	$2,500.00	50	$1,500.00	$321.82
TOTAL FOR IMPROVEMENTS				**$147,722.00**			
DESIGN AND ADMINISTRATION (5%)				$7,386.10	50	$4,431.66	$950.80
CONTENGENCY (15%)				$22,158.30	50	$13,294.98	$2,852.41
PROJECT TOTAL				**$177,266.40**		$106,359.84	$22,819.31

CALCULATION OF O&M COSTS

ASSUME $1.25 PER FOOT OF GRAVITY MAIN
THEREFORE, O&M COSTS= $3,417.50

OVER THE 20 YEAR PERIOD, O&M PRESENT VALUE= $33,553.52

TOTAL PRESENT WORTH= $188,000.61 **EQUIVALENT ANNUAL COST=** $19,148.28

WORKSHEET FILE NAME: PWNC1C

Table 8-9

PRELIMINARY COST ESTIMATE

PROJECT NAME: NEW CASTLE 201 STUDY
ALTERNATIVE #1
SEWER INTERCEPT TO CASTLE VALLEY RANCH

PREVIOUS TASKS REQUIRED TO COMPLETE: NONE

COMMENTS: INTEREST RATE= 8 PERCENT
PLANNING PERIOD= 20 YEARS

P.V. FACT= 0.21454821

ITEM	QUANT.	UNIT	U. PRICE	SUB TOTAL	DESIGN LIFE	SALVAGE VALUE	PRESENT WORTH
MOBILIZATION	1	LS	10000	$10,000.00	50	$6,000.00	$1,287.29
TRAFFIC CONTROL	1	LS	6000	$6,000.00	50	$3,600.00	$772.37
TIE INTO EXISTING SYSTEM	1	EA	2000	$2,000.00	50	$1,200.00	$257.46
18" SEWERLINE CONSTRUCTION	4267	LF	30	$128,010.00	50	$76,806.00	$16,478.59
MANHOLE CONSTRUCTION	15	EA	2500	$37,500.00	50	$22,500.00	$4,827.33
RAILROAD BORE	1	LS	10000	$10,000.00	50	$6,000.00	$1,287.29
SERVICE RECONNECTS	30	EA	500	$15,000.00	50	$9,000.00	$1,930.93
FINISH GRADE RESTORATION	4267	LF	3	$12,801.00	50	$7,680.60	$1,647.86
DEMOBILIZATION	1	LS	5000	$5,000.00	50	$3,000.00	$643.64
TOTAL FOR IMPROVEMENTS				**$226,311.00**			
DESIGN AND ADMINISTRATION (5%)				$11,315.55	50	$6,789.33	$1,456.64
CONTENGENCY (15%)				$33,946.65	50	$20,367.99	$4,369.92
PROJECT TOTAL				**$271,573.20**		$162,943.92	$34,959.33

CALCULATION OF O&M COSTS

ASSUME $1.25 PER FOOT OF GRAVITY MAIN
THEREFORE, O&M COSTS= $5,333.75

OVER THE 20 YEAR PERIOD, O&M PRESENT VALUE= $52,367.54

TOTAL PRESENT WORTH= $288,981.42 **EQUIVALENT ANNUAL COST=** $29,433.40

WORKSHEET FILE NAME: PWNC1B

SECTION 9. ARRANGEMENTS FOR IMPLEMENTATION

Section 9.1 Institutional Responsibilities. The Town of New Castle which operates the existing sewerage system, has the legal authority and financial capability to construct and operate the proposed facility. A copy of the resolution of intent of the Town Board to construct and operate the proposed facility will be included in the final draft of this report as an addendum to the appendix.

9.2 Implementation Steps. The recommended implementation and construction schedule follows:

A. Submittal of Facility Plan

1. Submit draft copy of Facility Planning Report to the State Health Department, and other required or interested agencies as required by October 15, 1996.

2. Submit request for sewer evaluation to the State by November 1, 1996.

3. Hold public hearing on draft Facility Plan in November and December of 1996.

4. Review (and revise as needed) draft Facility Plan by State by January 1, 1997.

5. Incorporate comments, letters and revisions into Facility Plan. Submit final Facility Plan to EPA and State by March 11, 1997.

6. Town to arrange methods for financing its portion by June 1, 1997.

7. Receive authorization for engineering design of proposed facilities by June 1, 1997.

8. Submit completed plans and specifications to the State along with applications for all necessary permits for Phase 1 construction to appropriate agencies by August 15,1997.

9. Obtain state, federal and other agency approval for Phase 1 construction by August 31, 1997.

10. Advertise for construction bids, award contract and commence Phase 1 construction by September 21, 1997.

9.3 Schedule for Preparation of Construction Drawings and Specifications for Construction. The proposed schedule for preparation of Phase 1 construction documents and for Phase 1 construction is as follows:

A. Receive authorization for engineering and design and specifications by June 1, 1997.

B. Prepare topographic map of site, make soils tests, and conduct detailed investigation of existing system by June 15, 1997.

C. Complete Phase 1 design, construction drawings and specifications by August 15, 1997.

D. Meet formally with Colorado Department of Health to discuss proposed Phase 1 designs, specifications and phasing by August 15, 1997.

E. Make any recommended changes to Phase 1 design, specifications and phasing and complete engineering plans and specifications to the state by August 31, 1997.

9.4 Operation and Maintenance. A Plan of Operation and Maintenance will be prepared providing staffing, management, training, sampling, and analysis for effective operation of the facility. An operator with Class B State Certification will be needed on a part time basis for the Phase 1 expansion and on a full time basis in subsequent expansions.

The Plan of Operation and Maintenance will be prepared concurrently with the preparation of engineering drawings and specifications and will be submitted no later than October 15, 1997.

9.5 Financial Requirements. The Town must have or develop, if necessary, a sound fiscal program which will assure adequate funds for annual operation and maintenance costs, plus debt services. In the past, the Town has relied on two major sources of revenue for upkeep and improvement of its sewer system:

1. Service charges, and
2. Government grants and low interest loans.

Revenue from these sources go directly into the Enterprise Fund, which, along with water and trash services fund the Town's services. The Town also obtains revenue from Al Valorem property taxes, and various revenue sharing programs. Funds from these sources go into the General fund, and can be used to supplement water and sewer expenditures, if necessary.

Service charges are the primary basis for funds for daily operation and maintenance costs. Service charges fall into two categories:

1. Tap fees, and
2. Monthly water and sewer fees.

Existing tap fees are $1750 for the sewer taps, of which, included in this fee are all labor and materials for making connections to the mains. Service fees are $14.00 per month for residences and small businesses. There are no industrial users. There are presently 527 (1995 count) users or sewer connections in Town.

Capital expenditures for expansion and upgrading of facilities have been financed primarily by grants and low interest loans which are available from several government agencies. The most important sources of grants are EPA (federal) and the Colorado Departments of Health and Local Affairs and the Oil Shale Trust Fund (state). Other agencies which provide

assistance are Farmer's Home Administration and Four Corners Commission. The Town also has a special savings account established for capital improvements. Surplus funds from water and sewer revenues are put into the fund.

In 1995, the financial statement for the sewer fund was as follows:

Revenues:

Monthly Service Charges	$80,541.00
Tap Fees	$206,206.00
Total:	$286,747.00

Expenditures:

Systems Operation and Maint.	$90,668.00--- (see note below)
Administration	$5470.00
Total:	$96,138.00

(note: The operation and maintenance number identified above is an extrapolated value from the O & M costs reported in 1993. The figure identified in 1995 was skewed by capital improvements.)

9.5.1 Phase 1, Immediate Expenditures. The Town's share for upgrading the existing treatment plant and collection system is $669,323.00 for Phase 1 expansion. The analysis of future revenue will be based on the assumption that one-half of this amount can be obtained in the form of a grant, and the remainder in the form of a low interest loan. Operation and maintenance expenses for the proposed system are shown below:

A. Treatment Plant	$121,618.00
B. Collection System	$8752.00
C. General Administration	$5,690.00
Total:	$136,060.00

Table 9-1
Summary of Operation and Maintenance
Revenue and Expenses

Year	Est. Taps	Est. Annual Inc.	Est. O & M Costs	O&M Costs/tap
'1980	230	16,560	14,500	5.25
'1995	527	80,541	90,668	14.34
'2001	667	112,056	121,618	15.19

TABLE 9-2
CASH FLOW ANALYSIS, CAPITOL PLANT IMPROVEMENTS

YEAR	UNIT COUNT	CUMMULATIVE REVENUE FROM TAPS @$1750/UNIT	CUMMULATIVE REVENUE FROM TAPS @$2250/UNIT	CUMMULATIVE REVENUE FROM TAPS @$2500/UNIT	GRANTS (50% OF PROJ.)		PROJECT EXPENSE	TOWN'S CASH	CASH FLOW ($1750/UNIT)	CASH FLOW ($2250/UNIT)	CASH FLOW ($2500/UNIT)
1997	645	$105,000.00	$135,000.00	$150,000.00	$669,323.18	PHASE 1 EXP.	$1,338,646.35	$400,000.00	($164,323.17)	($134,323.17)	($119,323.17)
1998	705	$210,000.00	$270,000.00	$300,000.00					($59,323.17)	$676.83	$30,676.83
1999	765	$315,000.00	$405,000.00	$450,000.00					$45,676.83	$135,676.83	$180,676.83
2000	825	$420,000.00	$540,000.00	$600,000.00					$150,676.83	$270,676.83	$330,676.83
2001	885	$525,000.00	$675,000.00	$750,000.00					$255,676.83	$405,676.83	$480,676.83
2002	945	$630,000.00	$810,000.00	$900,000.00					$360,676.83	$540,676.83	$630,676.83
2003	1005	$735,000.00	$945,000.00	$1,050,000.00	$1,125,723.00	PHASE 2 EXP.	$2,251,446.00		($660,046.17)	($450,046.17)	($345,046.17)
2004	1065	$840,000.00	$1,080,000.00	$1,200,000.00					($555,046.17)	($315,046.17)	($195,046.17)
2005	1125	$945,000.00	$1,215,000.00	$1,350,000.00					($450,046.17)	($180,046.17)	($45,046.17)
2006	1185	$1,050,000.00	$1,350,000.00	$1,500,000.00					($345,046.17)	($45,046.17)	$104,953.83
2007	1245	$1,155,000.00	$1,485,000.00	$1,650,000.00					($240,046.17)	$89,953.83	$254,953.83
2008	1305	$1,260,000.00	$1,620,000.00	$1,800,000.00					($135,046.17)	$224,953.83	$404,953.83
2009	1365	$1,365,000.00	$1,755,000.00	$1,950,000.00					($30,046.17)	$359,953.83	$554,953.83
2010	1425	$1,470,000.00	$1,890,000.00	$2,100,000.00					$74,953.83	$494,953.83	$704,953.83
2011	1485	$1,575,000.00	$2,025,000.00	$2,250,000.00					$179,953.83	$629,953.83	$854,953.83
2012	1545	$1,680,000.00	$2,160,000.00	$2,400,000.00					$284,953.83	$764,953.83	$1,004,953.83
2013	1605	$1,785,000.00	$2,295,000.00	$2,550,000.00					$389,953.83	$899,953.83	$1,154,953.83
2014	1665	$1,890,000.00	$2,430,000.00	$2,700,000.00					$494,953.83	$1,034,953.83	$1,304,953.83
2015	1725	$1,995,000.00	$2,565,000.00	$2,850,000.00					$599,953.83	$1,169,953.83	$1,454,953.83
2016	1785	$2,100,000.00	$2,700,000.00	$3,000,000.00					$704,953.83	$1,304,953.83	$1,604,953.83
2017	1845	$2,205,000.00	$2,835,000.00	$3,150,000.00					$809,953.83	$1,439,953.83	$1,754,953.83

PHASE 2 EXPANSION LOCATED SUCH THAT, 200000 GPD/75 GPCD/2.77 PERSONS PER UNIT = UNIT COUNT (IE., 963 UNITS)

The present monthly service charge appears to be slightly inadequate to meet the operation and maintenance needs for the Town. A slight increase in the sewer service rate should be explored to compensate at least the operation and maintenance costs for year 2001. It is recommended that if an increase is desired, $16.00 per month per user or tap would be appropriate.

Table 9-2 identifies a cost comparison of capital costs (no interest considered) and potential revenues that may be generated from tap fees from future users on the system. It is noted that the current tap fee, does eventually recover those costs of the plant expansions. Two other tap fee options are provided to compare the timing of recovering costs for improvements. It should be noted that in all three cases, the tap fees still fall below the average for other communities in the area.

SECTION 10. SUMMARY OF ENVIRONMENTAL CONSIDERATIONS

10.1 EXISTING ENVIRONMENTAL CONDITIONS

Section 4.0 of this report describes the existing environmental conditions.

10.2 FUTURE ENVIRONMENT WITHOUT THE PROJECT

Section 5.4 of this report describes the future environment without the project or the "no action" plan.

10.3 EVALUATION OF ALTERNATIVES

The three categories of waste treatment management systems considered were:

A. Treatment and direct discharge to a receiving stream.
B. Treatment and land application.
C. Treatment and reuse.

Preliminary evaluation indicated only alternative A had potential feasibility. More detailed comparative evaluation within each category showed that an extended aeration process with chlorination was the most cost effective system in Category A.

Section 7.2 of this report describes in detail the evaluation of alternatives with respect to effluent requirements, environmental effects, operational considerations, and cost effectiveness.