INTERIM REPORT — ENGINEERING/FINANCIAL

TIMNATH, COLORADO

PLAN FOR WASTEWATER TREATMENT WORKS

Water Quality Management Plan

LARIMER-WELD REGIONAL COUNCIL OF GOVERNMENTS
LOVELAND, COLORADO

8

PREPARED BY BRISCOE, MAPHIS, MURRAY & LAMONT, INC.
BOULDER, COLORADO
AND TOUPS CORPORATION
LOVELAND, COLORADO MAY, 1977

208 AREAWIDE WATER QUALITY MANAGEMENT PLAN

TECHNICAL PLANNING REPORT
WASTEWATER TREATMENT WORKS
TIMNATH, COLORADO

Prepared For

Larimer-Weld Regional
Council of Governments

201 East Fourth Street
Loveland, Colorado 80537

F. A. Eidsness, Jr., 208 Program Director
Terrence L. Trembly, Assistant Director

Technical Planning By:

W. Tom Pitts, P.E., Project Director
W. R. Everest, P.E., Project Manager
W. B. Heller, P.E., Project Engineer

TOUPS CORPORATION
Loveland, Colorado

Financial Planning By:

James Murray, Ph.D.
E. W. Lewan, P.E.

BRISCOE, MAPHIS, MURRAY, AND LAMONT, INC.
Boulder, Colorado

May 1977

The preparation of this report was financed in part through a Water Quality Management Technical Assistance Planning Grant from the Environmental Protection Agency under the provisions of Section 208 of the Federal <u>Water Pollution Control Act Amendments of 1972</u> (PL 92-500).

TABLE OF CONTENTS

TABLE OF CONTENTS (Cont.)

LIST OF TABLES

LIST OF FIGURES

1.0 SUMMARY AND RECOMMENDATIONS

1.1 TECHNICAL PLANNING SUMMARY

As long as Timnath has a slow growth policy, the septic tanks currently being used are sufficient for resident's needs. However, if the community should adopt a growth policy which encourages growth, these septic tanks should be eliminated and sewerage facilities installed.

Several wastewater treatment alternatives available to Timnath are evaluated in this report. It is recommended that when the town is sewered, treatment should be by an aerated stabilization pond system. Project costs for this system are shown for various populations up to 3,000. At today's prices, the collection facilities to serve only the existing residents would cost about $225,000.

If this project proceeds, financial possibilities should be investigated. This report analyzes present sources of financing; although if this project proceeds in the future, some of these programs will probably change. There are significant differences in the local cost of this project, depending on the method of financing.

1.2 FINANCIAL PLANNING SUMMARY

Timnath's financial capabilities are small in comparison to the $335,000 of proposed collection and treatment system capital improvements. The Town's small and stable population, and low tax base give it little capability to finance programs and services to meet significant community needs. Substantial outside assistance will be required.

Problems that will arise as the Town attempts to garner the necessary financing for its wastewater system will demand much attention from the existing residents. However, care should be exercised not to overlook the broader problem at hand which is how a central wastewater system should be managed in the best long-run interests of the citizens. Management policies regarding the utility service area, extensions, and utility operation are equally as important, and closely related to, financial policies on new hookup and service charges. Policies in these areas should be discussed early to gain citizen understanding and to set the stage for the purely financial decisions. To assist in these areas, the Town should refer to a copy of the Utility Management Handbook (1977) provided by the LWRCOG.

The most critical financial variable is the Town's success in securing hookups from among the existing residents. A maximum of 80 taps is potentially possible. Because this group of system users will bear most of the costs (over that which can be charged to new growth, or is subsidized out of general tax revenues), a maximum number agreeing to hookup initially will lower the individual burden to each. For this reason, incentives (or advance agreement) to hookup immediately are highly desirable. This suggests the PIF charged to the existing residents should be lower than what might be charged to new growth.

The Town should not have difficulty in affording the system operating costs. At $4,000 per year, these should be manageable with a reasonable number of hookups (we suggest 30 to 40 at least from among the 80 potential).

Thus, the Town's major concern will be in locating sources to assist with a large share of the $335,000 in capital costs. The financial analysis suggests that even with 80 hookups by existing residents, no more than $50,000 to $100,000 can be safely borrowed by the Town itself. If the PIF charged initial hookups is low, then grant assistance of something in the area of $250,000 will be required. Potentially helpful sources are listed in the text.

Of utmost importance is that Timnath is sure of its residents' desire for a central system, and their understanding of, and willingness to bear the associated costs. If there is agreement to proceed, the management policies should be discussed and sources for outside financial assistance contacted.

2.0 INTRODUCTION

2.1 AREAWIDE WATER QUALITY MANAGEMENT PLANNING PROCESS

This Technical Planning Report has been prepared as part of an overall Areawide Water Quality Management Plan (208) for the Larimer-Weld region being developed by Toups Corporation and Briscoe, Maphis, Murray, and Lamont, Inc., for the Larimer-Weld Regional Council of Governments (LWRCOG). The purpose of the Technical Planning component of the 208 plan is to assist various communities in the Larimer-Weld region in solving a particular wastewater management problems by developing the best alternative project for waste treatment and disposal.

This Technical Planning report has been prepared to provide near-term guidance for the Town of Timnath. This report (along with appropriate modifications) will be incorporated into the LWRCOG Areawide Waste Treatment Management Plan following review and approval by all governmental agencies involved.

2.2 PURPOSE AND SCOPE OF TECHNICAL PLAN

The residents of Timnath currently use septic tanks for wastewater disposal. These systems have performed satisfactorily over the years, and as long as Timnath maintains a normal growth rate, these systems should continue to be adequate. However, this growth rate is an unknown quantity.

Timnath and the surrounding area are under tremendous growth pressure. Whether or not this growth takes place in Timnath is largely Timnath's decision. Should the Town adopt a favorable growth policy, it could easily double or triple in size. If significant growth does occur, it is recommended that community wastewater service be provided.

2.2.1 Purpose

To give Timnath relevant information to use in making a growth policy, this Technical Plan is being prepared to analyze wastewater treatment and disposal options. To this end it will be assumed that growth is going to occur so this can be compared to the present slow growth situation. If the decision is made to encourage growth, this report will assist the Town in project development, from assistance in obtaining governmental grants, to recommending a best treatment technique.

2.2.2 Scope

The scope of this Technical Plan includes the following phases:

- Describe the planning area characteristics;
- Determine wastewater characteristics;
- Analyze waste treatment and discharge requirements;
- Analyze existing facilities;
- Develop, analyze, and screen alternative plans;
- Prepare a detailed description of the best alternative project, including engineering, financial and institutional programs;
- Prepare a Technical Planning Report presenting all data, and outlining a wastewater management program for the 20-year planning period;
- Assessment of current financial capabilities;
- Development of a procedure for establishing a financial program;
- Analysis of the ability (and risks involved) in financing the proposed wastewater treatment program.

3.0 PLANNING AREA CHARACTERISTICS

Timnath is located in eastern Larimer County, approximately six miles southeast of Fort Collins. The location of Timnath is shown on Figure 3.0.A. This incorporated town is predominately a residential community, although there is some commercial activity.

3.1 EXISTING AND PROJECTED POPULATION

Timnath has an estimated population of about 175 people. The school in town has about 265 students bussed in, so the total present population equivalent is about 268 people.

As stated in the Introduction, the future population of this town will be greatly affected by policy decisions made by the community leaders. The population is dependent on the amount of land annexed and on the housing density of those areas. Solutions suggested in this report will be flexible enough so they can be fitted to the policy adopted by the town. To accomplish this, alternatives will be developed for future populations of 750, 1500, and 2000 people. Finally, costs will be shown graphically so the cost for any reasonable population can be quickly determined.

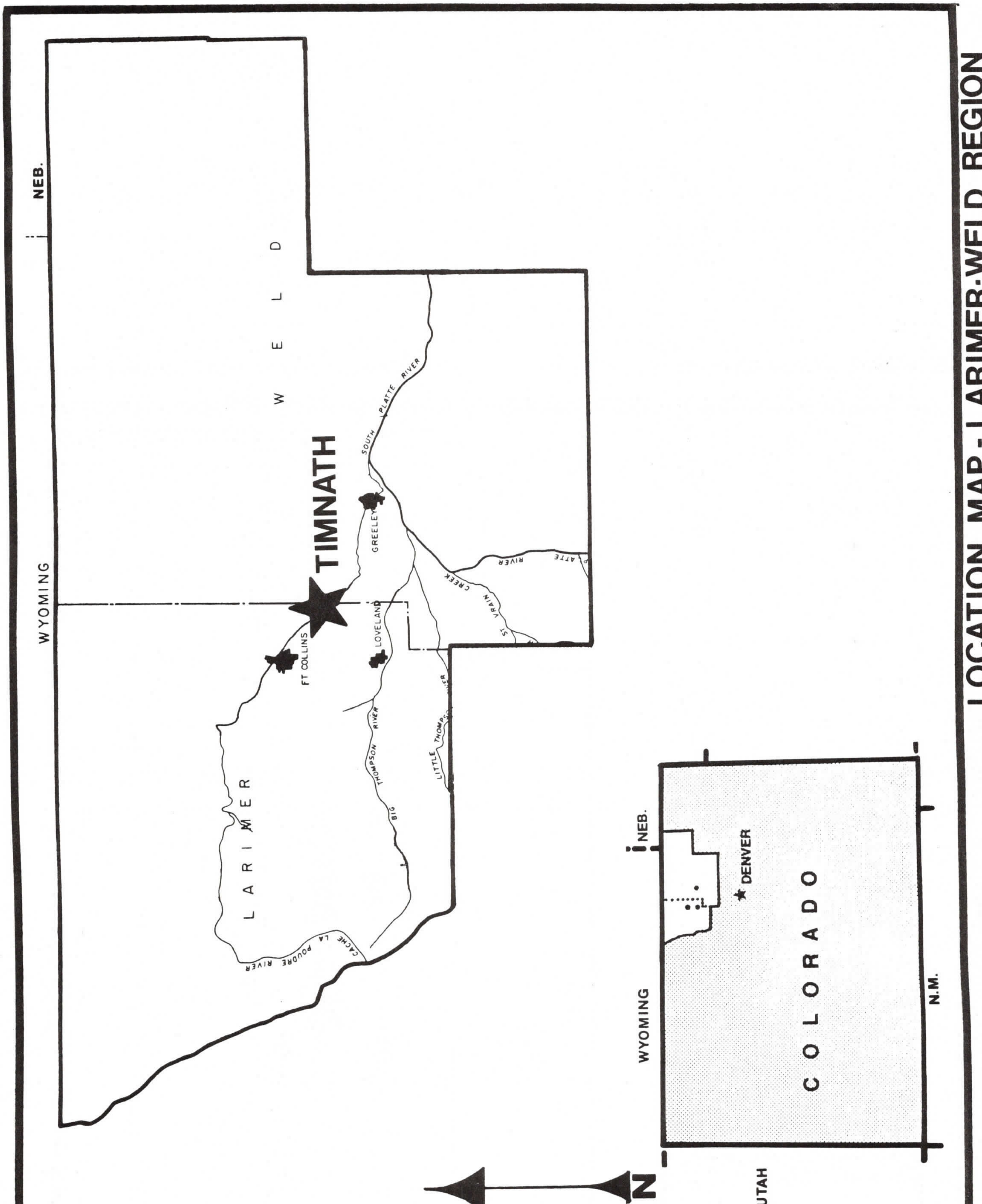

Figure 3.0-A. LOCATION OF TOWN OF TIMNATH

4.0 WASTEWATER CHARACTERISTICS

Because no treatment system presently exists in Timnath, wastewater characteristics will be estimated based on historical data, results of a regional wastewater quality sampling program recently conducted by Toups Corporation, and on recommended design criteria published by the Colorado Department of Health (CDH). Wasteload projections will be developed based on waste characteristics and population projections.

4.1 ESTIMATED CHARACTERISTICS

In analyzing wastewater characteristics, it is necessary to investigate components affecting both the amount of wastewater and its strength and composition.

4.1.1 Flow

Since Timnath is predominately a residential community and will probably continue as such, a unit average flow of 100 gallons per capita per day (gcd) is a realistic value for design purposes and will be utilized in this report. This value represents typical domestic waste, including residential and normal commercial contributions, together with infiltration/inflow (I/I) expected even from well designed and constructed sewerage systems. Peak flow will be calculated based upon 250 percent of the average flow. These two values are also recommended by CDH.

4.1.2 Composition

Wastewater strength is generally measured in terms of biochemical oxygen demand (BOD_5) and suspended solids (SS). Evaluation of other constituents such as chemical oxygen demand (COD), ammonia (NH_3), temperature and pH are necessary in particular situations.

Based on past analyses of waste characteristics in the area, and the results of a sampling program conducted by Toups Corporation in the Larimer-Weld region as part of the Technical Planning component of the 208 Plan, the following unit values are appropriate for design purposes: 200 miligrams per liter (mg/l) BOD_5, 200 mg/l SS, and 15 mg/l ammonia. Based on a unit flow of 100 gcd, the unit strength of wastewater is 0.18 pounds per capita per day (pcd) BOD_5 and 0.18 pcd SS.

4.1.3 Design Factors

A summary of unit design factors for sizing various components of the wastewater system is presented in Table 4.1.3-A.

4.2 WASTELOAD PROJECTIONS

Wasteload projections have been developed by applying the unit design factors shown in Table 4.1.3-A to the projected populations of 750, 1500, and 2000. Resulting wasteload projections are summarized in Table 4.2-A.

TABLE 4.1.3-A

UNIT DESIGN FACTORS

ITEM	FACTOR
Wastewater Flow	
Average flow (gcd)	100 (a)
Peak flow (% of average)	250
Wastewater Composition	
BOD_5 (pcd)	0.18
SS (pcd)	0.18
Ammonia (mg/l)	15

gcd = gallons per capita per day.

pcd = pounds per capita per day.

(a) Includes minimum I/I contributions.

TABLE 4.2-A

WASTELOAD PROJECTIONS

CONSTITUENT	WASTELOAD 750	WASTELOAD 1500	WASTELOAD 2000
Flow (gpd)			
Average flow	75,000	150,000	200,000
Peak flow	187,500	375,000	500,000
Average Composition (lbs/day)			
BOD_5	135	270	360
SS	135	270	360
Ammonia	9.4	19	25

gpd = gallons per day.

5.0 DISCHARGE AND TREATMENT REQUIREMENTS

Wastewater must be disposed of in a manner which will protect the public health, maintain receiving water quality consistant with its beneficial uses, and prevent nuisance at the site of disposal. These conditions, along with economic considerations, determine the degree and type of wastewater treatment necessary prior to disposal or reuse. In this section, discharge standards are delineated, treatment requirements are outlined, and an overview of alternative treatment processes are presented.

5.1 WASTE DISCHARGE STANDARDS

Standards promulgated by the U.S. Environmental Protection Agency (EPA) and the Colorado Water Quality Control Commission (WQCC) for the discharge of wastes to receiving waters have been extensively discussed in the South Platte River Water Quality Management Plan [Toups - 1974]. Current standards have been refined, and further changes are presently being proposed.

5.1.1 Existing Requirements

As a minimum, planning of publically-owned wastewater treatment facilities must provide for secondary treatment by 1977 or as soon as possible thereafter, and for application of Best Practicable Waste Treatment Technology (BPWTT) prior to 1983. The levels of BPWTT and various waste management techniques available to meet those levels have been defined [EPA - 1975]. Secondary treatment and BPWTT requirements apply to all discharges to all surface waters of the State. The WQCC has ruled that these standards also apply to discharges to privately-owned irrigation supply waters. More stringent standards may be applied to discharges to water quality limited segments of State receiving waters. However, the volume from Timnath is low enough that no detrimental effect would be imposed on the Cache la Poudre River by the discharge of wastewater that meets State effluent standards. Table 5.1.1-A summarizes current EPA secondary treatment requirements as promulgated under the Federal Water Pollution Control Act Amendments (PL 92-500), together with current standards of the Colorado WQCC.

TABLE 5.1.1-A

CURRENT WASTE DISCHARGE REQUIREMENTS

Parameter	Federal PL 92-500		State WQCC		
	30-day Average	7-day Average	30-day Average	7-day Average	Single Sample
BOD_5 (mg/l)	30(a)	45	ns	ns	ns
SS (mg/l)	30(a,d)	45(d)	ns	ns	ns
pH	ns	ns	ns	ns	(b)
Total Residual Chlorine (mg/l)	ns	ns	ns	ns	0.5
Fecal Coliform (MPN/100 ml)	ns	ns	6,000	12,000	ns
Oil and Grease (mg/l)	ns	ns	ns	ns	10(c)

ns = none specified.

(a) Shall not exceed 15 percent of 30-day average influent concentration.

(b) Within the limits of 6.0 to 9.0 unless it can be demonstrated that: (1) inorganic chemicals are not added to the waste stream as part of the treatment process; and (2) contributions from individual sources do not cause the pH to exceed the 6.0 to 9.0 limits (EPA requirements).

(c) Nor shall there be a visible sheen.

(d) Conditional relaxation of these standards now proposed by EPA for communities utilizing stabilization ponds systems with a design capacity of 1 mgd or less.

5.1.2 Proposed Requirements

EPA has recently proposed a relaxation of suspended solids limitations in discharge standards of communities which utilize stabilization pond systems.
The proposed standards recognize the need to retain pond systems for many smaller communities because of their inherent economical and functional advantages. Adoption of the regulations would allow the EPA Regional Administrator or state agency to grant a variance with respect to

suspended solids limitations of secondary treatment requirements defined in NPDES permits, providing the community can show that: (1) waste stabilization ponds are used as the process for secondary treatment; (2) the treatment facilities have a design capacity of 1 mgd or less; and (3) performance data indicates that the facilities cannot comply with present suspended solids limitations, even if properly operated, without the addition of treatment systems not historically considered as secondary treatment (i.e., filtration systems for algae removal).

Pond systems would still be required to meet an effluent quality achievable by "best waste stabilization pond technology" (BWSPT). BWSPT is defined as a suspended solids value which is equal to the effluent concentration achieved 90 percent of the time within a state or appropriate contiguous geographical area, by waste stabilization ponds that are achieving the levels of effluent quality established for BOD (30/45 mg/l).

5.2 OVERVIEW OF ALTERNATIVE DISPOSAL OPTIONS

There are three general classes of disposal options available today: treatment and discharge, treatment and reuse (land treatment), and land disposal. The first two alternatives will be discussed in detail while the third--land disposal--will be discussed in general.

5.2.1 Treatment and Discharge

There are many methods of treating municipal wastewater to a quality at which it can be discharged. As indicated previously, the discharge levels must only comply with secondary treatment and BPWTT requirements of EPA. A thorough analysis of the numerous treatment processes available to meet these standards is presented in a later section of this report.

5.2.2 Treatment and Reuse

Four factors prerequisite to wastewater reclamation for reuse of treated wastewater are: 1) the availability of a wastewater reuser (industry or irrigation operation located in close proximity to source of reclaimed water); 2) storage facilities or alternate disposal site for wastewater during periods of non-reuse; 3) capability of producing reclaimed water of required quality; and 4) legal ownership of the wastewater by the municipality.

The State of Colorado currently does not have water quality standards for reuse of wastewater for irrigation purposes. Assuming that the applicable standards will be no less stringent than the existing recommended Federal standards, it will be necessary for the plant to produce secondary effluent. Since this standard is identical with the quality requirements for discharge, no additional treatment facilities would be required for irrigation reuse than if the water were discharged directly to a receiving water. An exception is probable higher levels of disinfection to insure the protection of public health at the reuse site. An identical discharge standard also eliminates the requirement for effluent storage during non-irrigation periods. If it is desired to maximize the amount of wastewater reuse, a reservoir would be required for seasonal storage of reclaimed water. This alternative will be further discussed later in the report.

5.2.3 Land Disposal

Percolation of wastewater through the soil provides additional treatment of the applied wastewater. Suspended solids, bacteria, BOD and phosphorous are all effectively removed by filtering and straining action of the soil [EPA-1975]. Nitrogen removal, however, is poor. In addition, EPA requirements for secondary treatment do not apply to this alternative. However, to control such things as odors, prudent engineering judgement requires that, as a minimum, secondary treatment as defined by EPA be achieved prior to land disposal.

If a crop is grown in conjunction with a land disposal operation, the project is effectively one of agricultural reuse. The factors which affect the cost of such a system most directly is the area of land required for the design flowrate of the community. Both the size of the application equipment and the land capital costs are directly related to the required area which is determined by the allowable hydraulic loading rate. The allowable hydraulic loading rate for a high-rate irrigation process is dependent only upon the soils' capacity for transmitting water and not on crop irrigation requirements. The maximum hydraulic loading rate is the sum of soil moisture depletion plus the quantity which can be transmitted through the root zone. The soil moisture depletion for the local climatic conditions is approximately 12 inches for the season while the soil transmission rate can range between 10 and 600 inches per year depending on soil type and surficial geology. Total hydraulic loading rates can therefore range between 22 and 612 inches per year which correspond to area requirements of 610 acres/million gallons and 20 acres/million gallons, respectively.

The suspended solids concentration of the water also affects the hydraulic loading rate by clogging the soil. The rates discussed above must be considered maximum. There is also a "buffer area" requirement which increases the necessary amount of land.

5.3 POTENTIAL FOR WASTEWATER RECLAMATION

Analysis indicates that irrigation is essentially the only potential method of reclamation within the Timnath area. Wastewater from the town treatment facility is indirectly reused for agricultural irrigation through downstream diversions. Agricultural interests in the general vicinity of the town plant may find it to their advantage to consider irrigation with reclaimed water. One restraint on any wastewater reclamation project in Colorado is the impact of such a program on water rights.

The District Engineer indicates that if Timnath were to use this water for irrigation, about 60 percent of the total volume would have to be replaced because this amount would be consumptively used. [Dugan Wilkinson-1976].

If Timnath would like to have a park near the site of treatment plant, irrigating with this wastewater may prove to be a very viable alternative. It is doubtful that the community would find it to its advantage to grow a crop.

On the other hand, a nearby farmer could be very interested in using this water. If this is the case, it is recommended that the farmer be given the water, but any expenses incurred would be his responsibility.

6.0 ALTERNATIVE PLANS FOR TREATMENT AND DISPOSAL

This section includes a discussion of process selection criteria and a discussion of alternative treatment processes.

6.1 PROCESS SELECTION CRITERIA

The selection of the optimum process for an individual community should not be based exclusively on the economics of the individual processes capable of satisfying discharge requirements. Many of the technical and social factors should be considered in evaluation of viable alternatives. Community characteristics such as growth rate, land cost and availability, proximity of treatment facilities to residential or commercial areas, available operator capabilities, and treatment facility aesthetics affects (visual and odor) on the community, all have a bearing on the treatment facilities best suited for a given community.

There are a great number of alternative treatment processes capable of satisfying BOD_5 and suspended solids (SS) discharge requirements. The alternatives discussed in the following sections are those which have been found suitable for small communities. Processes requiring extremely sophisticated operator capabilities generally unavailable in small communities, such as continuous operator monitoring, are not considered in this report.

There are two major treatment plant classifications: biological and physical/chemical. Both types of processes have the same objective--removal of dissolved and particulate organic material. Biological treatment processes, some of which have been used since the turn of the century, depend on microorganisms to convert putrescible substances to less noxious chemical forms which are compatible with environment. Controlled biological processes are those such as activated sludge or biofilters in which the biological growth conditions are artificially controlled; stabilization ponds or aerated lagoons are considered uncontrolled biological processes. Although the biofiltration process will produce a relatively high degree of treatment, it is difficult to produce biofilter effluent which consistently meets the 30 mg/l suspended solids limitation of the secondary treatment requirement.

Therefore, the biofiltration process will not be considered further in this report. Physical/chemical treatment consists of the addition of various chemicals to aggregate and to aid settling particulate matter and to oxidize organic substances. Depending on the particular effluent quality goals, physical/chemical plants may employ multimedia filtration, activated carbon adsorption, ozonation or any one of several other processes. While there are several small physical/chemical package plants currently on the market, none will be considered in view of their stringent operational requirements.

At Timnath, the wastewater treatment process chosen must have the flexibility of being operable at extremely low percentage loading rates. It must also be easily expandable. This capability is necessary as protection against an enormous but unexpected growth rate.

6.1.1 Alternate Treatment Processes

The treatment processes that will be considered as alternatives in this report are shown in Table 6.1.1-A. Each is described below.

TABLE 6.1.1-A

ALTERNATIVE TREATMENT PROCESSES

DESIGNATION	PROCESS
	Pond Systems
1	Unaerated Stabilization Ponds
2	Aerated Stabilization Lagoons
3	Aerated Stabilization Lagoons with Algae Removal
4	Total Evaporation System
	Mechanical Systems
5	Extended Aeration
6	Oxidation Ditch
7	Rotating Biological Contactor
8	Land Disposal
9	Septic Tank Systems

6.1.1.1 Pond Systems

According to the EPA, 25 percent of the wastewater treatment plants in this country are lagoons Nearly 90 percent of these wastewater treatment ponds serve communities of 5,000 population or less [ibid]. The reason they are so popular with small communities is because initial installation costs and operation and maintenance costs are relatively low. Because of the fairly long detention times in lagoons, they are less susceptible to shock loads or breakdown than are mechanical plants.

6.1.1.2 Unaerated Stabilization Ponds

Unaerated stabilization ponds are lagoons with no mechanical aeration or mixing. These ponds generally range in depth from 3 to about 7 feet. Algae growing in the ponds supply dissolved oxygen. Because oxygen is only produced when algae is active, the ponds normally are anaerobic (no dissolved oxygen) at night and during the winter months. Odors are produced during anaerobic conditions. These odors can be especially bad in the spring right after the ice melts off the ponds. Unless the ponds are located quite a distance from inhabited buildings, the aesthetic affects make them undesireable. Further, it is stated in Colorado's manual of design criteria that "It is very doubtful that unaerated waste stabilization ponds can meet the effluent standards for discharge." [Rozich-1973].

6.1.1.3 Aerated Stabilization Lagoons

The only difference between aerated and unaerated stabilization ponds is that one or more of these ponds are aerated and mixed mechanically. This virtually eliminates periods of zero dissolved oxygen, and therefore odors are controlled. Since the addition of energy is required, operation and maintenance (O&M) costs are higher than for unaerated stabilization ponds, but not as high as for mechanical plants. These plants are normally designed with two or more cells in series. The final cell must be a quiescent pond to settle heavy particles. The weight of algae is so close to the weight of water that it remains suspended in the water and will not settle. It is for this reason that EPA is considering changing the suspended solids standards for lagoons.

6.1.1.4 Aerated Stabilization Lagoons with Algae Removal

Many processes have recently been tested which could be added to lagoons to remove algae. These include rapid sand filters, intermittent sand filters, rock filters, air flotation, and chemical addition which aids settling. Chemical costs and/or operational costs for several of these processes are so high that the advantages of using lagoons are eliminated. Rock filters showed a great deal of promise. Several have been installed in Colorado recently. Evaluation of these indicates that about 50 percent of the algae is removed. Unfortunately, suspended solids concentrations due to algae frequently exceeds 90 mg/l in the summer, indicating the 30 mg/l effluent standard cannot be consistently met. The other process which has low O & M costs is the intermittent sand filter. Sand beds are installed with underdrains. Lagoon effluent is poured on the beds intermittently, allowed to percolate, and dry out. Periodically the sand is scarified and eventually replaced after it becomes thoroughly plugged.

6.1.1.5 Total Evaporation System

In Colorado, the evaporation rate exceeds the precipitation rate by about 33 inches per year. This phenomenon can be put to work by designing ponds large enough to store water during periods of low evaporation and to totally evaporate when the rate is high. Since no discharge occurs, the need to meet standards is nullified.

6.1.1.6 Mechanical Systems

As previously stated, only biological mechanical plants will be evaluated.

6.1.1.7 Extended Aeration

Extended aeration is a modified activated sludge process suitable for use by small communities. Basically, raw wastewater is aerated for 24 hours in a tank containing a high concentration of activated sludge microorganisms which break down the waste substances. The mixture of water and sludge is then sent to a clarifier or settling tank where the activated sludge organisms are separated from the liquid phase. The settled sludge is returned to the aeration tank and the clear wastewater is discharged. Depending on the discharge quality requirements, disinfection of the final outflow may be required.

The major mechanical equipment required for an extended aeration plant are aerators (diffused or mechanical) and sludge return pumps. External separate sludge digestion facilities are not required since digestion occurs while the sludge is in the aeration circuit (internal digestion). A relatively small aerated sludge holding tank enabling uniform wasting of sludge from the aeration circuit would be required in Colorado. Depending on local conditions, sludge is generally pumped to sludge drying beds for dewatering and subsequent trucking to sanitary landfills, disposed of by land treatment, or trucked as a liquid to an appropriate disposal site.

The primary advantage of extended aeration over conventional activated sludge is that extended aeration is more stable biologically and thus requires less operation and maintenance. Proper operation will require the services of a relatively highly-trained operator for several hours each day. It has generally been found that a well-operated plant does not result in any odor problem.

6.1.1.8 Oxidation Ditch

The oxidation ditch is a modification of the extended aeration-activated sludge process which utilizes a closed loop channel as an aeration chamber. The process was originally intended to be a low cost system requiring non-sophisticated construction methods and mechanical equipment. The process flow scheme consists of aeration of raw wastewater in the loop channel followed by the sedimentation of the activated sludge in a clarifier. The activated sludge (active microorganisms) is returned from the clarifier back to the aeration tank. Brush aerators are used to supply oxygen and to retain solids in suspension in the aeration channel.

Internal sludge digestion occurs and eliminates the requirements for external sludge digestion facilities. Depending on land availability for sludge drying beds, it may be cost-effective to provide for external sludge digestion in plants having design flowrates greater than 0.5 mgd. Sludge can also be disposed of by other methods such as land treatment or liquid sanitary landfill.

The biological stability of the oxidation ditch process causes it to have one of the lowest operation and maintenance requirements of any of the controlled biological treatment processes such as activated sludge or bio-filters. This is a significant advantage for small communities where highly trained operators might not be readily available. Land requirements are typical of controlled biological processes.

6.1.1.9 Rotating Biological Contactor

A rotating biological contactor is similar in operation to a trickling filter plant. It is available in package form and can therefore be installed by a small community for much less money than can a trickling filter plant. This plant uses a rotating drum on which a biological slime layer grows. This slime layer is the BOD_5 removal mechanism. Remaining solids are settled in a clarifier prior to discharge.

6.1.1.10 Land Disposal

Land disposal can follow any of the previously mentioned alternatives. The most common land disposal technique is irrigation of a crop used as cattle feed, such as corn or alfalfa. Sufficient capacity to store the flow for 120 to 180 days is required for good irrigation systems. Less storage capacity is required if the goal is merely to dispose of the water on land. There are many warm winter days when irrigation equipment can be used without fear of freezing. Colorado water laws must be given serious attention while evaluating this alternative.

6.1.1.11 Septic Tank Systems

More dwellings in the Larimer-Weld region use septic tanks for wastewater disposal than all of the rest of the processes combined. Wastewater goes through the tank, where solids are settled, to a leach field. Wastewater is leached, or filtered, through the soil where impurities are removed.

6.2. OPERATION AND MAINTENANCE

The State of Colorado requires that all wastewater treatment plants be operated by a certified operator. Different degrees of skill are required for various sizes and complexities of treatment plants.

At Timnath, any of the lagoon alternatives would require a "D" operator, which is the lowest operator classification. Any mechanical plant would require a Class C operator, which is a more skilled class of operator.

6.3 SCREENING OF ALTERNATIVE PLANS

The alternatives discussed above are presented in large part to give the reader a better understanding of the decisions involved in choosing a best alternative. Table 6.3-A indicates the capital costs for the applicable alternatives discussed.

TABLE 6.3-A

ESTIMATED COSTS OF ALTERNATIVE PLANS

PROCESS	CAPITAL COST		
	750	1500	2000
Aerated Lagoon	110,000	145,000	206,000
Total Evaporation Pond	190,000	290,000	340,000
Extended Aeration	150,000	220,000	295,000
Oxidation Ditch	195,000	225,000	295,000
Aerated Lagoon with Intermittent Filter	220,000	370,000	450,000

NOTE: The capital cost figures are estimates based on estimated 1977 prices, and include 30 percent for engineering, legal fees, and contingencies. It is assumed that each system has 25 percent excess capacity.

Algae removal from a lagoon system appears to be an unnecessary element in light of the proposed EPA regulations, and removal costs are prohibitively high.

The extended aeration treatment method was used extensively in Colorado until a few years ago. One of the advantages is that it can be delivered in package form. Another is that it is one of the more easily operated of the activated sludge processes. Unfortunately, activated sludge facilities require a great deal of skill and time to properly operate compared to other treatment techniques. Because of this, the communities using extended aeration treatment have not been consistently meeting effluent standards, and the Colorado Health Department has discouraged its use.

The oxidation ditch has performed well in Colorado. However, the capital costs are prohibitively high, as they are with rotating biological contactors.

The aerated lagoon alternative meets all the requirements desired. The capital costs and O & M costs are low. It has the flexibility of being operational at very low influent flow rates, and capacity can be easily expanded. Its reliability makes it very attractive. This alternative will be further expanded.

7.0 BEST ALTERNATIVE PROJECT

Should Timnath adopt a policy which encourages growth, it is recommended that a municipal wastewater treatment facility be installed. This plant should be sized so that the existing population and the new residents can be served. The above analysis of treatment alternatives indicates that the best solution for any expected population is treatment and discharge using an aerated lagoon system.

7.1 RECOMMENDED PLANT LOCATION

The recommended site for a sewage treatment plant is south of town on the bluff above the river. This site was chosen for accessibility to the service area, while being above the flood plain of the Cache la Poudre River [Corps of Engineers-1975]. This location is shown on Figure 7.1-A. This location should not be considered to be inflexible. For instance, if the town wanted to irrigate a park or school grounds with the wastewater effluent, the site can be changed accordingly.

7.2 RECOMMENDED FACILITIES DESCRIPTION

All facilities must be designed and constructed such that they would meet minimum design criteria published by the Colorado Department of Health.

7.2.1 Collection and Interceptor Facilities

The cost of collection lines to serve existing residents will not be affected by other growth. This cost is shown in Table 7.2.1-A. It is assumed that collection lines in a new subdivision would be installed by the developer at no expense to the town. The installation cost of an interceptor sewer line could change if the treatment plant were located somewhere other than the location shown on Figure 7.1-A.

7.2.2 Hook-Up Costs

It is estimated that the actual hook-up or tap from each home to the sewer line would cost between $200 and $300. Most communities have a hook-up fee of up to $700, and the actual tap is made for this. Any excess money can be used to help pay for the collection and treatment facilities.

TABLE 7.2.1-A

COLLECTION AND INTERCEPTOR LINE COSTS
TO SERVE EXISTING RESIDENTS

ITEM	COST
Sewer Line & Manholes	$ 99,000
Railroad Crossing	14,000
Lift Station	60,000
Total 1976 Construction Cost	$173,000
Engineering, Legal Fees, and Contingencies - 30 percent	52,000
TOTAL 1976 PROJECT COST	$225,000

NOTE: The project cost should be increased by about 11 percent per year for inflation. Thus, the 1977 Project Cost would be about $250,000.

7.2.3 Treatment and Disposal Facilities

A three-cell lagoon system is proposed. The first two cells should be aerated. The first cell should have a detention time of at least five days; the second a detention time of at least nine days. The final pond should not be aerated, and should have a detention time of about three days. This pond is to be used as a settling pond.

Disinfection is to be accomplished with chlorination equipment. A chlorine contact basin should be provided with a detention time of 30 minutes. Treated effluent will be discharged to the Cache la Poudre River.

The layout of these facilities is shown on Figure 7.2.3-A.

The cost of these facilities will naturally be dependent upon the design capacity. Figure 7.2.3-B indicates the 1977 project cost for any given population. Twenty-five percent excess plant capacity is built into this graph.

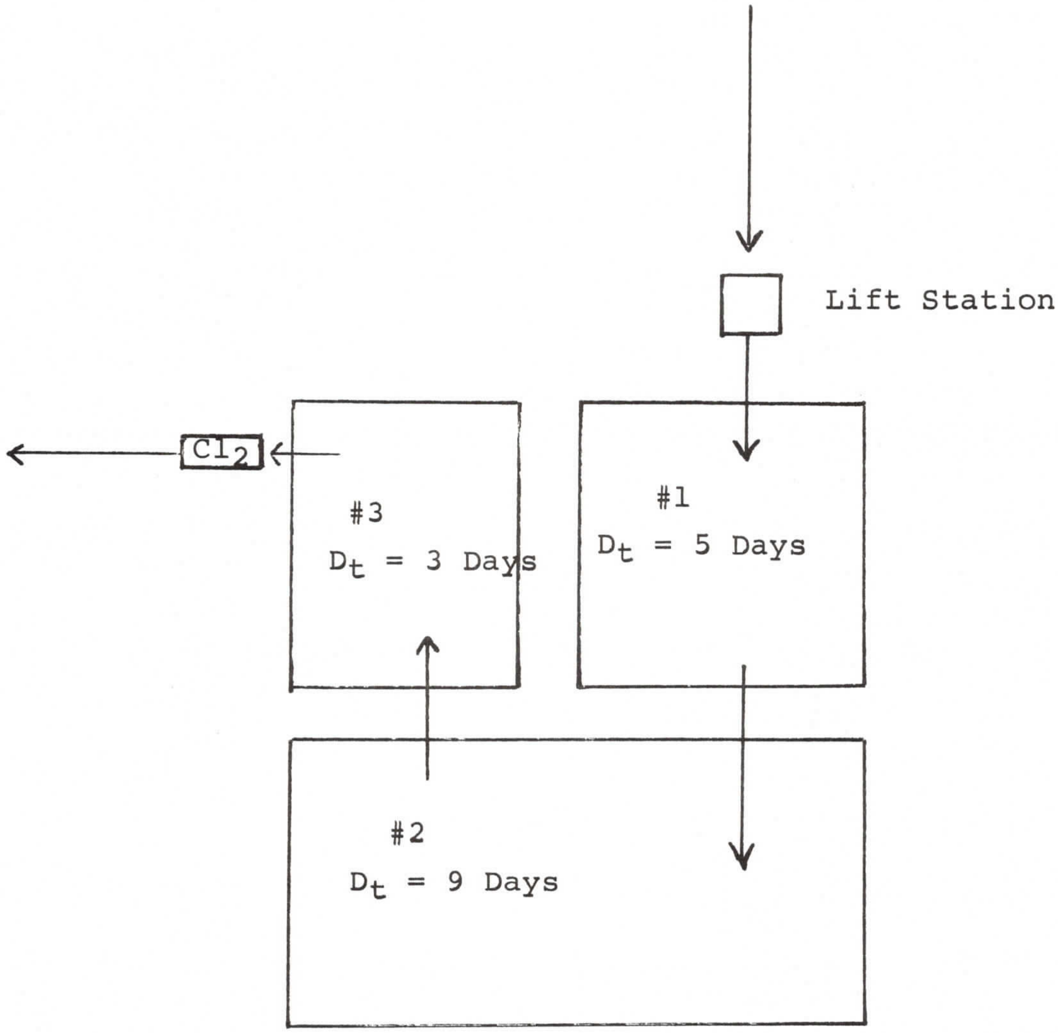

FIG. 7.2.3-A. PROPOSED LAYOUT OF TREATMENT FACILITIES.

8.0 FINANCIAL PROGRAM

8.1 EXISTING CONDITIONS IN TIMNATH

8.1.1 Financial Capabilities

The 1975 estimated population of Timnath was 175, approximately the same as the 1970 census figure.

The community's 1977 financial picture can be summarized as follows:

- Assessed Valuation: $233,770
- Anticipated Town Revenue from Property Tax: $2,567
- Combined Mill Levy on Timnath Taxpayers: 99.008

Town	10.980 mills	
County	30.958 mills	(includes "other")
School District	57.070 mills	

- Total Sales Tax: 3% (State only)
- Additional Sales Tax Capability (Town and County): 4%
- Town's Bonded Indebtedness (January 1, 1977):

General Obligation Bonds	None	
Revenue Bonds (Water)	$105,000	(Loan from FmHA - 40 yr)
Total	$105,000	

- Town's General Obligation Bond Capacity (10% of Assessed Valuation): $23,377
- Median Family Income: $9,047

Timnath's small population and low tax base give it little capability to finance programs or services to meet significant community needs. At the present combined mill levy of nearly 100 mills, there is little potential for increasing revenues from this source. The Town presently levies no sales tax. However, based on data from State collections of sales tax from accounts within the Town, something less than $4,500 would be collected per penny of sales tax levied. Because the State counts all sales by Timnath accounts in its figures, including deliveries made outside the Town which would not be subject to a Town tax, the $4,500 figure is high. Only a detailed account-by-account review would reveal a more accurate estimate. Even with maximum use of a sales tax, Timnath's fiscal capacity is quite limited.

8.1.2 Sewage Handling Facilities and Proposed Improvements

The Town of Timnath has no central sewer system; all sewage disposal is through individual systems.

The engineering analysis has concluded that the Town will need sewerage system facilities costing a total of $335,000 in capital costs: $225,000 for a collection system and $110,000 for a treatment facility. Operations and maintenance costs for the system are estimated to be $4,000 per year.

Timnath has 80 water users that could hook up to a central sewage handling system, so that the system would potentially have 80 taps at the start of operation.

8.2 RECOMMENDATIONS FOR SEWER UTILITY MANAGEMENT

The following are suggested general principles for a balanced utility program. This management process has proven successful in preventing construction and operation of sewer systems from posing an unreasonable burden on residents of small communities, and is the basis for determining optimum financing capabilities.

8.2.1 Utility Service Area

The community should lead, not merely follow, development. The community should decide where it is most economical and efficient to provide services, and make known where it prefers growth to take place. By not annexing or extending utility lines outside the Town into areas it does not want to see grow, it can avoid having to serve those areas. Conversely, for those areas in which it wishes to encourage growth, it can build trunk lines into them and save potential developers that front end cost. This approach must be tied to other community goals, programs, and strategies in order to be successful.

8.2.2 Financial Policies

Utility financing for growing communities should be designed so that "he who benefits pays." This approach may be tempered by other community policies, such as a desire to keep or attract an industry unable to pay its fair share, or to assist development of low income housing which could not be built if a full share of utility costs were required.

This philosophy can be implemented by applying the following policies:

- Establish service fees based on all costs of operation, including employees' wages and benefits, maintenance, and depreciation. Additional costs may be included, such as a reasonable fee paid into the General Fund for services or facilities, provided to the sewer utility by other municipal departments, such as office space and vehicles.

- Establish plant investment or tap fees (PIF) for all new customers or expansions of service, proportionate to treatment plant and trunk capacities the customer is expected to use. (See 8.3.1.1)

- Charge all direct costs of attaching to the system directly to the customer; e.g., costs of tapping into the line, and laterals and pipe from the street to the building.

8.2.3 Service for New Developments

Internal or lateral lines or pumps required to serve new developments should be provided by the developers per the Town's specifications. They may directly finance and build them, passing on costs to future occupants; or, where occupancy is relatively assured, the community may permit a special improvement district to be formed with the bonds paid back over an extended period of years through added mill levies on the properties benefiting. The cost of these localized facilities should not be borne by the community at large.

All extensions of lines past undeveloped areas to a development should be financed by the development seeking the service. Some of these costs can be paid back as intervening property is developed and attached to the system. The community should not be committed to providing such lines on request.

8.3 ANALYSIS OF TIMNATH'S ABILITY TO CONSTRUCT A CENTRAL SEWAGE SYSTEM

The major questions a community must ask itself when considering its capabilities to finance and operate a sewer utility are:

- Can the community raise enough money to cover capital cost requirements?

- Can the community support the system on a continuing basis (operating and maintenance costs)?

- What are the utility financing implications of whether or not the population in the community increases?

In developing a financing program, sewer utility needs for financing should always be placed in the context of total community funding needs. Because locally generated funds all come from the same taxpayer or user, a more moderate commitment to sewer costs may be necessary in order to achieve other community goals. Considering that there are many ways to accomplish funding goals, financing strategy must be used to develop the most equitable system for the users with a minimum of future risk.

Tables 8.3-A and 8.3-B illustrate the basic financial picture. The residents of Timnath will have to pay an estimated $4,000 annually by 1981 to maintain the central system, plus some amount to retire whatever borrowing is required for the system's construction. The tables show how much cost for these two items would fall upon each system user (tap) annually under various assumptions about future growth, and required borrowing for construction. Table 8.3-A assumes 40 hookups can be secured from the existing residents, and Table 8.3-B assumes the full potential of 80.

The remainder of this section addresses questions of how capital and operating funds for the system might be raised and, in particular, the implications of various population growth rates.

8.3.1 Financing the Proposed Capital Improvements

A total capital investment of $335,000 would be required to implement the improvements proposed in the engineering analysis. Major sources of capital funding are plant investment fees (PIF's), grants, and borrowing.

8.3.1.1 Plant Investment Fees

A plant investment fee is normally set by dividing the total capital cost of the system by its capacity, and determining the pro rata share. For example, a $100,000 system to serve 100 units would indicate a PIF of $1,000 per unit. Where a community is large and wealthy enough to generate proportionate shares of the capital cost, PIF's could fully finance its system.

In the case of Timnath, PIF revenue from existing residents cannot be counted on as the sole source of capital funding. Even if all 80 potential users in Timnath chose to hook up to the central system, PIF's of $4,185 each would be required to fully finance the capital costs of $335,000. This is clearly an unreasonable amount. In fact, it is likely that not all existing units would hook up immediately should such a large PIF (or perhaps any PIF) be charged. Other towns' experience has demonstrated that people are not likely to move to central service without an incentive.

Should 100% financing assistance be available, it may be desirable to offer immediate hookup free to existing residents. This would expand the base of users and lower the operating cost burden for each. PIF revenue may also be generated by requiring proposed developments to prepay some PIF's. The amount can vary according to funding from other sources, the number of Town residents who choose to hook up (and the amount of PIF charged them), and agreement by the Town and developers as to a reasonable fee.

TABLE 8.3-A*

TYPICAL ANNUAL COST FOR EACH UNIT ON THE SYSTEM**

Annual Growth Every Year Through 1996

Growth Rate Relative to 1975 Population	New Population Each Year	New Taps	Funds Borrowed By Town For Sewer System Improvements					
			$ 0	$50,000	$100,000	$150,000	$200,000	$250,000
0%	0	0	100	223	345	468	591	713
2	3	1	72	181	290	399	508	617
4	7	2	50	148	246	344	442	541
6	10	3	32	121	210	299	389	478
8	14	4	14	98	180	262	344	426
10	17	5	3	79	155	230	306	381
12	21	6	Surplus	63	133	203	273	343
14	24	7		49	114	180	245	310
16	28	8		36	98	159	220	281
18	31	9		25	83	141	199	256
20	35	10		16	70	125	179	234
ANNUAL COSTS:								
Operation and Maintenance			$4,000	4,000	4,000	4,000	4,000	4,000
Old Wastewater Debt			None	None	None	None	None	None
New Debt			None	4,906	9,812	14,718	19,624	24,530
TOTAL ANNUAL COSTS:			$4,000	8,906	13,812	18,718	23,624	28,530

* See notes page 32.

** The costs in this table are based on the assumption that 40 hookups could be obtained immediately from existing residents.

Source: Murray; Briscoe, Maphis, Murray & Lamont, Inc.; April, 1977

TABLE 8.3-B*

TYPICAL ANNUAL COST FOR EACH UNIT ON THE SYSTEM**

Annual Growth Every Year Through 1996

Growth Rate Relative to 1975 Population	New Population Each Year	New Taps	Funds Borrowed By Town For Sewer System Improvements					
			$ 0	$50,000	$100,000	$150,000	$200,000	$250,000
0%	0	0	50	111	173	234	296	357
2	3	1	38	96	154	211	269	327
4	7	2	28	82	137	191	246	300
6	10	3	18	70	122	173	225	277
8	14	4	10	59	108	157	206	255
10	17	5	2	49	96	143	189	236
12	21	6	Sur-plus	40	85	129	174	218
14	24	7		32	74	117	161	202
16	28	8		24	65	106	147	188
18	31	9		17	56	96	135	174
20	35	10		11	49	86	124	162
ANNUAL COSTS:								
Operation and Maintenance			4,000	4,000	4,000	4,000	4,000	4,000
Old Wastewater System Debt			None	None	None	None	None	None
New Debt			None	4,906	9,812	14,718	19,624	24,530
TOTAL ANNUAL COSTS			$4,000	8,906	13,812	18,718	23,624	28,530

* See notes page 32.

** The costs in this table are based on the assumption that 80 hookups could be obtained immediately from existing residents.

Source: Murray; Briscoe, Maphis, Murray & Lamont, Inc.; April, 1977

NOTES ON TABLES 9.3-A and 9.3-B

- All costs are calculated for 1981, but nevertheless are close enough estimates of any year through 1996.

- The operations and maintenance (O&M) costs are inflated for price and wage increased to 1981. The total operations and maintenance cost is estimated to be $4,000.

- New debt is figured at being retired in 20 years and paying an interest rate of 7-1/2%. Actual terms will be closely related to local financial conditions and bond market conditions upon issue. For a community the size of Timnath, rates may be higher.

- Tap or Plant Investment Fees are used to retire as much new debt as possible. For instance, with the addition of 10 taps at $750 each, as much as $7,500 in new debt could be retired. In some cases where the growth rate is high and borrowing low, tap fees are applied to O&M costs.

- The yearly growth rate necessary to achieve the annual costs shown on the chart would have to occur every year. For example, on Table 9.3-B, if $150,000 were borrowed, 10 new taps would have to be added every year for the next five years (or a total of 50 new taps added to the system over the five-year period) for the annual cost to be $86 per unit by 1981. To maintain that annual charge, the growth would have to continue by that rate beyond 1981.

- The source of revenue to pay the annual costs is a local decision. The Tables simply indicate the amount needed.

- The Tables may be adjusted as new information becomes available by using the following basic formula:

$$\text{Annual Cost Per Unit} = \frac{\text{Annual O\&M} + \text{Annual Debt Service} - \text{Tap Fees}}{\text{Number of Units on System}}$$

- Note that the Tables show the remaining cost, over and above that paid by tap fees, to be shouldered by system users. For a given amount of required borrowing, it may be determined that the maximum or "worst case" figure shown in the top row of the table is not unreasonable in terms of user's ability to pay. The top row shows the case where no growth occurs and only current residents are available to pay the full cost. If the figure is unreasonable, funds from other sources should be sought to cover the total cost. An alternative would be initially to scale down the amount of borrowing, if possible.

8.3.1.2 Grants and Subsidized Loans

Grant funds are likely to be available to assist with the costs of capital construction. Because the availability of such funds will be important in figuring the remaining burden on the local residents, this source of funding should be investigated early in the process of deciding if and how the Town should proceed.

Determine the approximate amount of grants (and/or subsidized loans) available from various government sources. For smaller communities such as Timnath, these are the most likely sources at this time:

- Farmers Home Administration
- The Colorado Department of Local Affairs
- HUD Community Development discretionary funds for service lines

In order to gauge a community's eligibility, these funding agencies typically evaluate the locality's ability and efforts to finance its own system. For example, for each community requesting assistance the Colorado Department of Local Affairs takes into consideration the following:

- Legal ability to tax
- Assessed valuation
- Median family income
- Current bonded indebtedness
- Total tax effort
- Number of people on fixed incomes
- Level of user charges

The key element considered by the Department of Local Affairs and the Farmers Home Administration, other factors being equal, is the state guideline that a community's annual user charge for sewer service should be at least 1-1/2% of the median family income. This guide is used to determine if a community is doing its fair share to pay for the system. The figure can be lowered for a number of reasons: for example, if a town is in a weak financial condition, or has a large number of people on fixed incomes. But as a general guide, this tells a community how it will stand in potential aid levels from the various funding sources.

The state guideline that 1-1/2% of a community's median family income represents a reasonable annual user fee, indicates that Timnath's minimum fee level would be $135.70 per tap per year (1-1/2% of $9,047). Comparing this figure with annual costs projected in Tables 8.3-A and 8.3-B above indicates that Timnath would clearly qualify for some grant assistance. How much assistance might be received will depend on funding agencies' priorities and fund availability. It is unlikely that a 100% grant would be received from any given agency.

All potential sources should be checked for assistance. A summary of sources of financial aid can be found in Table 8.3.1-A. Funding availability varies from month to month as new revenues are made available or previously obligated funds are returned for redistribution.

8.3.1.3 Town Borrowing

To determine estimated borrowing needs, deduct anticipated grant amounts and any immediate local funds (such as PIF's charged existing residents or obtained from a developer) that might be allocated to the project from the capital cost estimates for the proposed system.

Whenever possible, revenue bonds should be used to finance sewer system improvements. If a community must borrow to finance utility improvements, it is desirable to protect its general obligation bonding capacity (tied by state law to assessed valuation) for uses where revenue bonding is not feasible. This is because numerous community needs usually cannot be financed from revenue bonds (e.g., parks, libraries, or police facilities). Therefore, any revenue generating operation, such as a sewer system, should borrow on the direct ability of the system to retire the debt.

There are limitations to this financing method; i.e., cases where the cost of the system exceeds its ability to generate revenue, or where general obligation bonds are not limited by state statute (e.g., bonds for water improvements). Even in these cases, the maximum reasonable revenues should be raised from PIF and user fees to retire at least a portion of the debt. Other sources must then supplement system revenues if the project is to occur.

Timnath's borrowing capacity for general obligation bonds is limited, due to its low assessed valuation. At the statutory limit of 10% of assessed value, only $23,377 would presently be available.

8.3.2 <u>Sources for Financing System Operating Costs</u>

Funds to pay annual operating costs can be obtained from a number of sources. Most typically, these sources are service or user rates, property taxes and sometimes other general fund revenues.

Service or user rates can be the most equitable source of funds. The beneficiary pays in proportion to the amount of benefit received. Rates should be pegged to reflect the full cost of operation, maintenance, and depreciation, and perhaps some portion of debt service where borrowing to provide a plant for existing customers remains unpaid. Tap or plant investment fees can also be used if necessary, but this is not considered a desirable practice for paying operating costs, as it defeats the purpose of the tap fee.

TABLE 8.3.1-A
SOURCES OF POTENTIAL FINANCIAL AID

	FHA COMMUNITY FACILITY LOANS/GRANTS - FEDERAL	CONSTRUCTION GRANTS FOR SEWERAGE WORKS (STATE OF COLORADO) STATE	FOUR CORNERS REGIONAL COMMISSION, SUPPLEMENTAL GRANT-REGIONAL	COMMUNITY DEVELOPMENT ACT (HUD)-DISCRETIONARY FUNDS FEDERAL	EPA CONSTRUCTION GRANTS - FEDERAL	PREDESIGN ENGINEERING GRANTS (STATE OF COLORADO) STATE	ECONOMIC DEVELOPMENT-ADMINISTRATION (EDA) - FEDERAL
PROGRAM DESCRIPTION							
FUND USAGE	TO CONSTRUCT, ENLARGE, EXTEND, OR IMPROVE SEWERAGE SYSTEMS.	TO CONSTRUCT, EXPAND, OR MODERNIZE SEWAGE TREATMENT FACILITIES	PROGRAM IS GEARED FOR ECONOMIC DEVELOPMENT TYPE PROJECTS. HOWEVER ECONOMIC DEVELOPMENT HAS A VERY BROAD DEFINITION.	TO CONSTRUCT SEWAGE COLLECTION LINES NOT TREATMENT FACILITIES.	TO PLAN, DESIGN, AND CONSTRUCT SEWERAGE COLLECTION AND TREATMENT FACILITIES.	PREDESIGN ENGINEERING FOR THE EXPANSION, CONSTRUCTION, OR MODERNIZATION OF SEWAGE TREATMENT SYSTEMS INCLUDING COLLECTION OF FACILITIES	THE PROGRAM IS CURRENTLY BEING RECONSIDERED BY THE CONGRESS. IT IS ANTICIPATED THAT THE QUALIFICATION REQUIREMENTS WILL NOT CHANGE. THE BASIC REQUIREMENT BEING HIGH UNEMPLOYMENT RATE AND HIGH NUMBER OF UNEMPLOYED.
FORM OF ASSISTANCE	MAY BE EITHER LOAN OR GRANT. GRANT OR LOAN 50% OF PROJECT, LOAN 40 YEARS AT 5%.	ASSISTANCE IS GIVEN IN THE FORM OF A GRANT. THE AMOUNT VARIES UPON THE FINANCIAL NEED OF THE COMMUNITY	ASSISTANCE IS IN THE FORM OF A GRANT. MAXIMUM SUPPLEMENTAL GRANT IS 60% OF OTHER FEDERAL FUNDING OR $150,000.	GRANT FROM DISCRETIONARY FUNDS FOR ALL PORTION OF PROJECT.	ASSISTANCE IS IN THE FORM OF A 75% GRANT.	NORMAL STATE GRANT OF 30%, APPLICANT MATCHING FUNDS OF 20%. THE APPLICANTS SHARE IS VARIABLE DEPENDING UPON FINANCIAL NEED.	
AMOUNT OF ASSISTANCE	LOAN/GRANT RANGE: $20,000-$200,000.	AVG. GRANT: $50,000 MAX. GRANT: $500,000	AVG. GRANT: $75,000	AVG. GRANT: $130,000 GRANT RANGE: $50,000-$300,000	AVG. GRANT: N/A GRANT RANGE:	AVG. GRANT: $3,000	
CURRENT FISCAL YEAR APPROPRIATION	$4.8 MIL LOANS, .9 MIL GRANTS	$2.3 MIL	$2.5 MIL	$2.5 MIL FISCAL YEAR 1977 (COLORADO NONMETROPOLITAN)		$200,000	
ANTICIPATED APPROPRIATION NEXT FISCAL YEAR	ABOUT THE SAME AS PRIOR YEAR.	$2.0 MIL	$1.7 MIL	MINOR INCREASE FOR FY 1978		$200,000	
ELIGIBILITY REQUIREMENTS							
ELIGIBLE ENTITIES	MUNICIPALITIES AND DISTRICTS	ANY MUNICIPALITY OR SPECIAL DISTRICT	ANYONE WHO CAN GET FEDERAL BASIC FUNDING	A FORM OF GENERAL PURPOSE GOVERNMENT, E.G. INCORPORATED MUNICIPALITIES, COUNTIES, THE STATE OR INDIAN TRIBES.	SEE ATTACHED NOTICE OF FINAL ADOPTION OF FEDERAL CONSTRUCTION GRANT PRIORITY SYSTEM, DATED AUG. 20, 1975.	ANY MUNICIPALITY OR SPECIAL DISTRICT.	
ELIGIBILITY REQUIREMENTS	MUST NOT HAVE THE CAPABILITY TO FINANCE THE PROJECT THROUGH AVAILABLE COMMUNITY RESOURCES. HAVE POP. LESS THAN 10,000 AS OF LAST CENSUS	APPLICANT'S POPULATION MUST BE 5,000 OR LESS, AS OF THE LATEST CENSUS.	MUST HAVE RECEIVED ANOTHER SOURCE OF FEDERAL AID.	N/A	N/A	APPLICANT'S POPULATION MSUT BE 5,000 OR LESS, AS OF THE LATEST CENSUS.	
DISCRIMINATING FACTORS	FINANCIAL NEED, THE ENTITY MUST BE AT OR NEAR THEIR LIMIT ON BONDING INDEBTEDNESS.	FINANCIAL NEED, BONDED INDEBTEDNESS, ASSESSED VALUATION, MEDIAN INCOME, ETC.	THE PROJECT MUST PROMOTE ECONOMIC DEVELOPMENT.	EXTENT TO WHICH: COMMUNITY HAS POVERTY, SUBSTANDARD HOUSING, BENEFITS LOW-MODERATE INCOME HOUSING, NEEDED FOR HOUSING STOCK, ALLEVIATING HEALTH,SAFETY, & WELFARE PROBLEMS AND GRANTS FROM OTHER AGENCIES.	N/A	FINANCIAL NEED, SERIOUSNESS OF POLLUTION PROBLEM.	
APPLICATION MECHANICS							
APPLICATION PROCESS	BEGIN WITH COUNTY FHA REPRESENTATIVE.	A. SUBMIT GRANT APPLICATION TO DIRECTOR OF LOCAL GOVERNMENTS AND APPLY FOR SITE APPROVAL FROM THE COLORADO WATER POLLUTION CONTROL COMMISSION. B. DIVISION OF LOCAL GOVT. THEN ISSUE A CERTIFICATE OF FINANCIAL NEED STATING AMOUNT OF GRANT AND THAT THE APPLICANT MUST OBTAIN SITE APPROVAL. C. SUBMIT SITE APPROVAL, FINAL PLANS AND SPECIFICATIONS TO THE DIVISION OF LOCAL GOVERNMENTS. D. SUBMIT TWO SETS OF FINAL PLANS AND SPECIFICATIONS TO COLORADO DEPARTMENT OF HEALTH.	DETERMINE A SOURCE OF FEDERAL FUNDING OR POSSIBILITY THEREOF, ARRANGE A PRE-APPLICATION CONFERENCE WITH THE FOUR CORNERS REGIONAL COMMISSION REPRESENTATIVE, ARRANGE FOR AN A-95 REVIEW OF PROJECT.	APPLICATION PROCESS WAS PUBLISHED IN THE FEDERAL REGISTER ON OCT. 13, 1976. COMPETITION IS VERY STIFF FOR THESE FUNDS.	THE STATE HEALTH DEPARTMENT WILL CONTACT THE MUNICIPALITY WHEN FUNDING BECOMES AVAILABLE.	A. OBTAIN LETTER FROM LOCAL HEALTH DEPARTMENT OFFICIAL CERTIFYING THAT SYSTEM IS CURRENTLY IN VIOLATION OF STATE STANDARDS. B. OBTAIN ENGINEERS PROPOSAL FOR WORK. C. OBTAIN APPLICATION FORM LG-PS275. SUBMIT ALL OF THE ABOVE TO THE DIVISION OF LOCAL GOVERNMENTS.	
APPLICATION DEADLINES	FIRST COME, FIRST SERVED UNTIL APPROPRIATION RUNS OUT.	FUNDING IS ON A FIRST COME, FIRST SERVE BASIS.	NO DEADLINES, FUNDING IS ON A FIRST COME, FIRST SERVE BASIS.	TO BE DETERMINED	N/A	FUNDING IS ON A FIRST COME, FIRST SERVE BASIS.	
TIME REQUIRED TO EVALUATE APPLICATION	3 MONTHS	1-3 MONTHS, THIS INCLUDES TIME REQUIRED FOR HEALTH DEPARTMENT REVIEW OF PLANS AND SPECIFICATIONS.	VERY FAST, AS FUNDING IS TIED TO ALREADY APPROVED FEDERAL FUNDING.	TO BE DETERMINED 5-6 MONTHS, EXCEPT FOR EMERGENCY SITUATIONS	N/A	2 MONTHS	
MISCELLANEOUS		IF FUNDING IS NOT RECEIVED UPON INITIAL APPLICATION, IT IS REVIEWED MONTHLY UNTIL IS IS FUNDED OR THE APPROPRIATION IS EXHAUSTED. THESE FUNDS MAY BE USED IN CONJUNCTION WITH OTHER LOANS OR GRANTS. THE COMMUNITY MUST BE PREPARED TO USE 1.5% OF ITS MEDIAN FAMILY INCOME PER CUSTOMER PER ANNUM TO OPERATE ITS EXISTING SYSTEM AND/OR PAY FOR ITS SHARE OF THE NEW PROJECT.			CURRENTLY THERE IS A LARGE EMPHASIS ON STEP 1 AND 2 GRANTS. HOWEVER, AS COMMUNITIES BECOME READY FOR STEP 3 GRANTS, THE AMOUNTS AVAILABLE FOR STEP 1 AND 2 GRANTS WILL BE GREATLY DIMINISHED.	THESE FUNDS MAY BE USED IN COMBINATION WITH OTHER LOANS/ GRANTS.	
CONTACTS	JOHN MEIKLE, FHA, 337-4717	BILL PEED, STATE OF COLORADO, DIVISION OF LOCAL GOVERNMENTS 892-2156, JEB LOVE, STATE HEALTH DEPT. 388-6111	IVO ROOSPOLD, DEPT. OF LOCAL AFFAIRS, RURAL DEVELOPMENT 892-2631	ARMAND SEDGELEY, HUD-DENVER 837-4666	RON SCHUYLER, STATE DEPT. OF HEALTH, 388-6111 JERRY BURKE, SAM BERMAN FEDERAL EPA, 837-3961	BILL PEED, STATE OF COLORADO DIVISION OF LOCAL GOVERNMENTS 892-2156	PAUL RENNE, ALL PROGRAMS. JOHN ZENDER LOCAL PUBLIC WORKS ACT, 837-4714

BRISCOE, MAPHIS, MURRAY & LAMONT, INC. MARCH 3, 1976

Rather, tap fees should be applied to repay bonds issued to finance the added plant capacity serving the new taps.

Because of historical precedent, many communities do not charge users in proportion to their use, but keep a low user rate by subsidizing costs with mill levies on property. This is particularly true in special districts where high user rates would discourage potential hookups. The argument against this use of property tax revenues is that it depletes an important source of funding general purpose, non-revenue producing facilities.

A community can choose to subsidize rates from its general fund monies. These might be composed, for example, of revenue sharing funds, sales tax, fees or licenses, or cigarette taxes. The same drawback as with using property taxes applies.

Most generally, however, operations and maintenance costs are covered by annual user rates. To determine if a community can generate sufficient user rate revenue to support the system, the state guideline of 1-1/2% of the median family income can be used as a general guide. While a community can certainly charge more than 1-1/2%, anticipated user fees far in excess of this figure may indicate that the residents of the community will find the sewer utility extremely difficult to support.

$135.70 represents a reasonable annual user fee level, according to the state guideline. This indicates that meeting annual maintenance and operations costs of $4,000 (estimated for 1981) would require 30 users in the first year of operation, should the guideline be followed. The equivalent tap fee (ETF) is more precise as a measure of financial capability, but for Timnath this is insignificant. The ETF is used for large dischargers such as industry which is not a factor in Timnath. It is simply the amount of discharge converted to the equivalent number of single family users; i.e., one ETF for six single family taps.

Timnath's 80 existing units could easily handle annual operations and maintenance costs for the system, as long as at least 30 hook up right away. Attention should be given to a hookup incentive (such as no or a reduced PIF for immediate hookup) to ensure that there are enough initial users to generate operations and maintenance costs through annual user fees.

Neither property taxes nor miscellaneous fees present a viable means of raising operating revenue, as Timnath's tax base is very small.

8.3.3 Effects of Population Growth

Increased population can provide increased revenue through

PIF's, user fees, and taxes, all of which can ease the burden of supporting the sewer utility on existing residents.

A realistic anticipation of growth might encourage the community to borrow more money to finance its system, and will influence the size and/or type of system the community decides to use.

However, bear in mind that increased population may also generate needs for system expansion (necessitating further borrowing) and that projected growth which does not occur on schedule may seriously burden existing residents with higher annual payments than had been planned. Recognizing the possibility for growth--without counting on it to carry the community's financing needs--is a necessary component of evaluating the community's capabilities to support the sewer utility.

Tables 8.3-A and 8.3-B illustrate impacts for Timnath of various combinations of borrowing levels and growth rates. It can be used to evaluate risk and anticipated cost per user should the Town borrow money to develop a system.

8.4 CONCLUSIONS AND RECOMMENDATIONS FROM FINANCIAL ANALYSIS

8.4.1 Conclusions

The residents of Timnath will have to obtain substantial outside financial assistance in order to afford the construction of $335,000 of wastewater system capital improvements. Of critical importance is securing a maximum number of hookups from among existing residents. Then, whatever costs must be borne by the community can be shared by a larger number of system users, and thus lower the cost to each. For instance, if 80 hookups could be guaranteed, the Town could afford to borrow $50,000 to $100,000 anticipating only moderate future growth. If the Town were willing to be more optimistic concerning growth, and willing to bear a higher cost burden if such growth failed to materialize, perhaps as much as $150,000 could be borrowed.

On the other hand, if only 40 hookups are secured from existing residents, very little can be borrowed without an optimistic assumption about growth.

It seems important that PIF's charged the existing residents be moderate so as not to discourage hookups.

The Town should not have difficulty in affording the system operating costs. At $4,000 per year, these should be manageable with a reasonable number of hookups (we suggest 40 or more).

Thus Timnath must try to locate sources to assist with a large share of the $335,000 in capital costs. If $50,000 to $100,000 can be safely borrowed, and if PIF's charged initial hookups are to be low, it appears grant assistance of something in the area of $250,000 will be required.

The Town's ability to finance its wastewater system improvements is linked with the policies and overall approach to its management of the system. Policies regarding service area extensions, tap fees and user charges will all be critical in ultimately determining whether or not the sewer improvements impose an excessive burden on the Town's existing and new residents.

8.4.2 Summary of Major Problems

The financial analysis has identified the following problem areas for Timnath in financing the central system which has been proposed:

- A significant grant will be needed for capital financing.
- In order to generate annual operations and maintenance costs, at least 30 to 40 users will have to hook up to the system the first year. PIF's may have to be fairly low, or eliminated entirely to ensure 30 to 40 initial hookups. This will increase the amount Timnath will have to be granted or borrow.

8.4.3 Recommendations

It is recommended that Timnath be sure of residents' desire for a central system, and their willingness and ability to pay annual user fees (plus a possible PIF) before deciding to proceed. The Town should investigate hookup incentives--such as seeking a grant large enough to allow immediate hookups free--to ensure at least 30 to 40 immediate system users. Community support for the system is essential before financial commitments are made by the Town.

Secondly, with some idea in mind as to the total amount of grant assistance required, town representatives should contact the agencies suggested above to get an idea of the likelihood of obtaining financial aid. It appears something in the area of $250,000 will be required.

Finally, the Town should agree on policies regarding its overall approach to management of a central wastewater system. A recommended approach is discussed in detail in the Utility Management Handbook (1977), available from the Larimer-Weld Council of Governments.

APPENDIX A

BIBLIOGRAPHY

Colorado Department of Health, Water Quality Control Division, Comprehensive Water Quality Management Plan - South Platte River Basin, Colorado, Engineering Consultants, Inc., Toups Corporation, October, 1974.

Environmental Protection Agency, Alternative Waste Management Techniques for Best Practical Waste Treatment, EPA 430/9-75-013, October, 1975.