

although located and serving people outside Chester County, utilize surface waters originating at least partially, in Chester County. To protect these surface water supply sources, neither direct nor indirect uncontrolled sewage discharges should be permitted within pertinent drainage areas.

Raw sewage is an acknowledged source of bacterial contamination to the bodies of water to which it may be discharged. However, often ignored are the other less apparent forms of contamination effected by sewage discharges. The organic constituents of sewage can consume sufficient amounts of oxygen to so deplete the receiving waters that the aquatic population balance is severely upset, if not altogether destroyed. This often results in unsightliness and occasional severe taste and odor problems. The nutrient materials present even in treated sewage can, and occasionally do, support enormous quantities of algae and other growths, which seriously and adversely affect the taste and odor of the water.

Additionally, the surface waters of Chester County are a source of recreational enjoyment to residents of the County and are also the foundation of the County's extensive wildlife population. The same conditions that could interfere with continued and expanded use of these surface waters as sources of water supply can also inhibit or even destroy their recreational or wildlife supporting use. For these same reasons, then, control of all sewage discharges to surface waters is essential to the well-being of Chester County.

#### Stream Classifications

The streams in Chester County are classified generally according to use. Based on existing or future uses certain water quality criteria have been adopted for each water course.

The streams in the County fall into two categories: interstate waters, and intrastate waters. All interstate streams such as the Big Elk, Little Elk, Brandywine, Octoraro, Red Clay and White Clay, and North East Creeks have been classified under Article 301, Water Quality Criteria of the Sanitary Water Board. The Classifications of each stream appear in Appendix B. The Implementation Plan for Interstate waters is located in Appendix C. It is expected that the tributaries to these streams will be classified in a similar manner under intrastate stream standards. The Delaware River Basin Commission has adopted similar water quality standards for the Delaware River Basin interstate streams.

Intrastate standards are presently being formulated and adopted on a drainage basin basis throughout the State. On December 21, 1967 public hearings were held by the Sanitary Water Board on the Schuylkill River Basin. In general, it was recommended that stream quality

standards and treatment requirements throughout the basin be raised. The recommended Water Quality Criteria pertaining to Chester County streams in the Schuylkill Basin are given in Appendix A.

The Brandywine Creek in the Downingtown area is subject to special conditions imposed by the Sanitary Water Board. In this area present treatment requirements are equivalent to 94 percent BOD removal. Any additional loadings will be subject to detailed study by the Health Department, and specific treatment requirements will be set for discharges.

Under present law Delaware River tributaries in Chester County (Chester, Crum, Ridley and Darby Creeks) are subject to requirements of "complete treatment" as defined by the Pennsylvania Department of Health and the Delaware River Basin Commission. The establishment of standards similar to those adopted for the Schuylkill Basin will be the subject of future public hearings.

#### Ground Water

The presence of near-surface ground water can seriously inhibit proper functioning of on-lot sewage disposal systems. Overflow of such systems during wet seasons can pose a real public health hazard in addition to the more readily detectable problems of odors and unsightliness. The not so obvious potential pollution of ground water from on-lot sewage disposal systems can be particularly serious in an area like Chester County, where more than 40 percent of the residents obtain their water from individual private well systems. Fortunately, the rural character of that part of the County which still relies on individual wells has prevented any large-scale consumption of contaminated ground water. Of particular importance, however, are some ground water contamination problems in the West Whiteland-Exton area. Here subsurface geologic structures consist of limestones that contain fractures and solution channels. Sewage flows from on-site disposal systems have traveled through the limestone voids and polluted ground water supplies in the area. Several wells require heavy chlorination now. The construction of public sewage collection, treatment and disposal facilities would alleviate these present ground water pollution problems. However, as the County grows, this problem may intensify unless regional sewage disposal or water supply systems are built. If adequate controls are not implemented soon, what is possibly Chester County's greatest resource -- its relatively untapped, extensive ground supply -- could be seriously damaged. Although somewhat hard, the ground water, with only minimal disinfection treatment, is capable of supplying enormous quantities of water for residential, commercial, and/or industrial uses.

### Air and Climate

The following news release pertaining to the Air Quality Act of 1967 was issued on January 16, 1968 by the U.S. Department of Health, Education and Welfare, Public Health Service, National Center for Air Pollution Control, Washington, D.C.

"Eight atmospheric areas covering 48 States were defined today by the Department of Health, Education, and Welfare as a preliminary step toward designation of air quality control regions.

Under the Air Quality Act of 1967, signed into law last November 21, definition of atmospheric areas is a required step in the development of a system under which States will be called upon to develop and apply air quality standards to deal with air pollution on a regional basis.

Several additional steps must be taken by the Department before States will actually be obligated to develop air quality standards.

The eight atmospheric areas defined today in the Federal Register are the: Great Lakes-Northeast, Mid-Atlantic Coastal, South Florida, Appalachian, Great Plains, Rocky Mountain, California-Oregon Coastal, and Washington Coastal. Areas covering Alaska and Hawaii will be defined later.

Each atmospheric area is a segment of the country in which climate, meteorology, and topography--all of which influence the capacity of air to dilute and disperse pollution--are essentially homogeneous.

The next step will be designation of air quality control regions, which will include groups of communities, in the same or different States, that share common air pollution problems. Air quality control regions will be designated on the basis of factors which suggest that a group of communities should be treated as a unit for purpose of setting and implementing air quality standards. Factors to be considered include meteorological and topographical considerations, jurisdictional boundaries, the extent of urban-industrial concentrations, and the nature and location of air pollution sources.

Atmospheric areas now defined were delineated mainly on the basis of meteorological data on the occurrence of thermal inversions (in which a layer of warm air above an area tends

to keep pollutants from being dispersed) and on the speed and direction of winds. The location of major topographical features, such as the Rocky Mountains, was also taken into account.

On an annual basis, the characteristic mixing capacity of the air in each atmospheric area is different from that in adjoining areas, but the differences tend to diminish near the boundary lines between areas.

This means that the boundary lines represent zones of change, rather than sharp cutoff points, and that air, polluted or not, can and does flow from one atmospheric area to another. For these reasons, some of the air quality control regions to be designated by the Secretary may include communities which are in different atmospheric areas.

The meteorological data used to define the atmospheric areas were derived principally from cooperative research conducted over the past several years by the National Center for Air Pollution Control of the Public Health Service and the Environmental Science Services Administration of the Department of Commerce.

Chester County lies in the Mid-Atlantic Coastal area which has been defined under the Air Quality Act of 1967 as follows:

"Mid-Atlantic Coastal area includes the extreme southwestern part of Connecticut; the extreme southern part of New York State (including New York City and Long Island), almost all of New Jersey, southeastern Pennsylvania (including Philadelphia); all of Delaware, the District of Columbia, and the eastern parts of Maryland, Virginia, and North Carolina."

Although Chester County's climate does not differ appreciably from that of much of the Mid-Atlantic Coastal Area, certain climatic conditions, particularly air quality, are sufficiently different to warrant examination. For the most part, the air in Chester County is clean and relatively unpolluted. The severe air pollution problems being experienced by more intensely-developed areas within the Delaware Valley Region have not yet been felt in Chester County as a whole. There are, however, localized air pollution problems.

Any substantial unilateral effort from within Chester County to limit pollution of the air would necessarily restrict the rate of industrial growth within the County. However, if controls are not developed, the County's rural environment may be placed in serious jeopardy.

Elsewhere in the Delaware Valley Region, particularly in the Philadelphia metropolitan area, air pollution has become a serious matter under certain climatic conditions. Solutions are now being sought on a regional basis, with an "air shed" theme. Development of air pollution controls on an air quality control region basis under the Air Quality Act of 1967 should insure adequate air pollution control in Chester County while not unduly restricting industrial growth.

### Topography

The gently rolling landscape of Chester County has been sculpted by winds, rains, and streams continually wearing away the land surface. Hard, erosion-resistant rocks underlie the rolling uplands (elevations ranging between 400 and 1,000 feet), while the softer limestones, shales and sandstones have been worn into undulating lowlands and broad valleys (elevations between 65 and 400 feet).

The limitations imposed on the growth of Chester County by its topography are perhaps the most easily defined of all the natural environmental conditions within the County. The Chester County Planning Commission, in its report, Chester County: Natural Environment and Planning, has estimated that approximately 11.2 percent of the land within the County has a slope of 15 percent or greater; with few exceptions, such a severe slope does not permit extensive residential, commercial, or agricultural development. This report also estimates that approximately 23.2 percent of the County has slopes of from 8 percent to 15 percent, conditions which, while permitting limited residential development, are not particularly suited to commercial and crop land uses. The remaining land, approximately 65.6 percent, varies from nearly level to gently sloping. Included in this remainder are the flood plains of the various streams draining Chester County, which should be restricted from residential, commercial or other structure-based development.

Areas of relatively steep slope (15 percent or greater) are not particularly amenable to on-lot sewage disposal. On-lot disposal systems are only marginally feasible in areas with 8-15 percent slopes, and special care must be taken both in design and in construction. Installation costs of on-lot systems in such areas are somewhat higher than the installation costs of equivalent systems in areas of lesser slope.

On-lot sewage disposal in areas of gentle slope (less than 8 percent) generally poses few problems in the physical construction of the necessary facilities. However, developed areas within frequently-wetted flood plains are definitely unsuitable for on-lot sewage disposal; in addition, such areas often present sewer construction problems from flooding of excavations.

Soils

In 1963 the Chester County Planning Commission estimated that approximately two-thirds of the land area of Chester County has soil that is, or could easily be made, suitable for use as crop land. Of this total, approximately 80 percent of the soils have little restriction on the type of crop other than requiring minor conservation practices or fertilization. The remaining 20 percent is somewhat limited in the type of crop that can be produced and also requires the utilization of more difficult and expensive conservation practices.

The remaining third of the County has soil drainage or slope problems that either severely restrict or completely prevent their use as crop land. A portion of this (approximately 15 percent of the County land area) is suitable for occasional specific cropping, and the remainder is primarily suitable for grazing, recreation, wildlife development, water supply, etc.

The well-drained nature of the most desirable crop land generally permits on-lot disposal of residential sewage, provided such residential development is limited to reasonable lot sizes. In some cases, this would mean minimum lot sizes of 1 to 2 acres. Conversely, those areas considered less desirable for use as crop lands for residential-commercial building sites, be it for reasons of slope, drainage or some other aspect, often have the greatest need for public sewage collection and disposal facilities.

A map, Urban Suitability for Buildings and Septic Tanks for Undisturbed Soils, compiled and published by the Chester County Planning Commission, is included in the Appendix of this report. The map shows relative urban soil suitability for the various parts of the County through a seven-part, color-coded system. The soil suitability classifications denoted by the various colors are presented in Table 5.

Table 5

Soils Classification - County Map

<u>Color</u>	<u>Classification</u>
Dark Green	Suitable
Light Green	Variable - probably suitable
Yellow	Hazardous - with ground water problems
Orange	Conditional - too shallow
Light Red	Unsuitable - too wet
Dark Red	Unsuitable - flood plain soils
Brown	Unsuitable - excessive slope and stoniness

The Pennsylvania Sewage Facilities Act (Act 537) requires the delineation of soil suitability for on-site sewage disposal systems. The soil classification system used under Act 537 is that established by the Soil Conservation Service of the United States Department of Agriculture.

This U.S.D.A. classification of soil limitations for disposal of effluent from on-site sewage disposal systems includes the following definitions:

1. Slight limitations:

- a) Rapid percolation.
- b) Soil depth to seasonal high water table 6 feet or more.
- c) Well drained soils.
- d) Depth to bedrock greater than 5 feet, 6 inches.
- e) Slight slopes, less than 8 percent.
- f) Outcrop covering less than 2 percent of surface.
- g) Non-stony.

2. Moderate limitations:

- a) Moderate percolation.
- b) Soil depth to seasonal high water table 1 foot, 6 inches to 6 feet.
- c) Moderately drained soils.
- d) Depth to bedrock 3 feet to 5 feet, 6 inches.
- e) Moderate slopes, ranging from 8 to 15 percent.
- f) Outcrop covering from 2 to 10 percent of surface.
- g) Moderately stony.

3. Severe limitations:

- a) Slow percolation.
- b) Soil depth to seasonal high water table less than 1 foot, 6 inches.

- c) Poorly drained soil.
- d) Depth to bedrock less than 3 feet.
- e) Steep slopes greater than 15 percent.
- f) Outcrop covering more than 10 percent of surface.
- g) Very stony.
- h) Soil susceptible to flooding.

The Soil Conservation Service classification system for on-site sewage disposal criteria is color coded. The color code is as follows: slight limitations are indicated by green; moderate limitations are indicated by yellow; severe limitations are indicated by red. The Pennsylvania State Department of Health requires an additional designation: soils that may be well drained but which present a high risk of contaminating the ground water. The color code applied to these soils is blue and they are classified as unsuitable. Table 6 shows the correlation between the color coding system used on the Chester County Map of Urban Suitability for Buildings and Septic Tanks for Undisturbed Soils and the color designation used by the Pennsylvania State Department of Health and the Soil Conservation Service.

Table 6

Soils Classification Correlation

<u>Classification</u>	<u>Color Codes</u>	
	<u>Pennsylvania State Department of Health</u>	<u>Chester County Planning Commission Soils Map</u>
Slight Limitations	Green	Green
Moderate Limitations	Yellow	Light Green
Severe Limitations	Red	Orange, Light Red, Dark Red, and Brown
Unsuitable (high risk of ground water contamination)	Blue	Yellow

### Minerals

The mineral resources of Chester County include small deposits of chromium, graphite, iron, lead and zinc. These deposits are either too small or too expensive to recover to have any significant effect on the economic growth of the County. Some clay is available from the shales of the Triassic lowland area, but the clay is suitable only for brick manufacture.

The only mineral resources of current economic significance are the limestones and dolomites found in the great limestone valley which traverses the County from east to west along the general path of U.S. Route 30. These limestones and dolomites are the County's principal mineral products and are quarried both for lime and for aggregates and road materials.

As currently practiced, limestone quarrying is a consumptive land use in that, for the most part, the pits have not been refilled and the land reclaimed. In addition, limestone quarrying is a nuisance industry because of the extensive truck traffic, blasting shocks, dust, and the general unsightliness of the substantial space required by such operations. The Chester County Planning Commission has suggested that some of the limestone and dolomite operations be preserved by appropriate exclusive industrial zoning, which would include provisions for ample space for associated supporting operations and buffer zones. Such action would remove the areas so zoned from any near future sewage-producing use.

The presence of these limestone deposits exerts two other significant effects on sewer needs within the County. First, the limestone deposits, because of their susceptibility to development of solution channels, are a significant source of ground water, producing the wells of greatest yield in the County. However, this susceptibility to formation of solution channels (and in the case of severely weathered rock formations, the high permeability) contributes to easy contamination of the ground water from on-lot sewage disposal systems, both by vertical travel of sewage and by extensive horizontal transport of such contaminants throughout the channel-connected ground water systems. Additionally, the susceptibility to solution channeling creates potential hazards with regard to foundation suitability for the support of large buildings and other structures, through development of sink holes, rock slides, and other localized surface and subsurface displacements. Such conditions can have substantial adverse effect on potential land use within the susceptible areas.

In addition to the effects of limestone deposits, the presence of near-surface rock in extensive areas of the County, limits the type and effectiveness of on-lot sewage disposal systems because of limited soil percolation or absorption capability, and can exert a significant effect on the costs of constructing sewage collection systems.

### Agricultural Land Use Patterns and Trends

Agriculture in Chester County is changing in response to two major forces: 1) economics and technological change within agriculture; and 2) competition of other activities for agricultural land. A survey was made of available literature sources and pertinent agency records and publications to identify agricultural trends in the County.

Since 1944, as shown in Table 7, there have been steady decreases both in the number of farms and in total farm acreage. These have been in part caused by the necessity for a high rate of productivity to support the large investment in farm machinery and by the decrease in the supply of farm labor. Both of these factors have influenced the trend toward larger farms, which can make more efficient use of machines and manpower.

There is increasing competition for use of land in the areas of the County with good access to major transportation routes. Land values in these areas are being affected by the economic growth of the Philadelphia and Wilmington metropolitan areas. As more land leaves agricultural use for intensive development, an increased demand for the sewerage facilities needed for adequate protection of the environment can be expected.

In the 1944-64 period, there has been a significant shift in the County's agricultural production, as measured by the value of farm products sold. Table 8 shows that Livestock and Related Products no longer constitute the largest share of total farm products sold. The All Crops category, which includes Horticultural Specialties, Field Crops, Vegetables and other crops, now produces a greater share of the overall farm income, primarily through the increasing importance of Horticultural Specialties, which include mushrooms, cut flower and nursery products.

At the present time the two major segments of the County's agricultural production are dairy farming and the mushroom industry. The general trend in dairy farming is toward the utilization of more productive livestock and the implementation of efficient dairying practices, which give better milk production. Dairy farming requires relatively large capital outlays for equipment, buildings, land and livestock. To realize a reasonable return on the investment, a dairy farm must be operated on a fairly permanent basis. However, in Chester County many farmers (47% in 1954) do not farm on a full-time basis, and 74% of these part-time farmers derive the greater share of their family income from non-farm sources. This indicates that many of the dairy farmers in the County are currently operating on a marginal economic basis. Such farmers are in a vulnerable position because increased competition from other areas coupled with limited

Table 7  
Agricultural Land Use in Chester County, 1945-1964

<u>Year</u>	<u>Acreage</u>	<u>Percent of Total Land Area</u>	<u>Number of Farms</u>	<u>Average Size in Acres</u>
1944	383,322	78.6	4,172	91.9
1949	358,812	73.6	3,817	94.0
1954	335,966	68.9	3,383	99.3
1959	292,776	60.0	2,746	106.6
1964	269,522	55.3	2,339	115.2

Source: U. S. Censuses of Agriculture, 1945, 1950, 1954, 1957,  
and 1964.

Table 8  
Agricultural Production in Chester County, 1944-1964

	<u>1944</u>	<u>1949</u>	<u>1954</u>	<u>1959</u>	<u>1964</u>
Total Sales (\$) (millions of dollars)	22.6	31.1	32.8	41.9	44.9
<u>Percent of Total Sales</u>					
All Crops	39.5	35.5	43.7	49.7	53.3
Horticultural Spec- ialties <sup>1</sup>	26.9	27.6	32.8	40.9	42.5
Field Crops, Animal Feed, etc.	9.2	6.7	8.9	8.0	10.4
Vegetables	3.4	1.2	2.0	0.8	0.4
Livestock and Related Products	60.5	64.5	56.3	50.3	46.7
Dairy	38.4	37.2	34.6	30.4	30.3
Poultry	11.9	10.1	9.3	6.0	1.1
Other <sup>2</sup>	10.2	17.2	12.4	13.9	15.3

<sup>1</sup>Mushroom industry is the principal component.

<sup>2</sup>Includes beef cattle, horses, pigs, sheep, goats, wool, mohair, etc.

capital for expansion and improvements will restrict their ability to maintain a competitive position in the future. Furthermore, they may also be more vulnerable to competition for land by non-agricultural sources. Poultry production in the County has decreased both as a share of the County's total agricultural production and in dollar value; this decline is largely attributable to intense competition from other regions. Production of other livestock products such as beef cattle, horses, pigs, sheep, wool, etc. has gained a larger share of the County's farm income during the 1944-64 period. Of particular interest in Beef Cattle Production are the Buck and Doe Run Valley Farms lying in West Marlborough, Londonderry, Highland, East Fallowfield and Newlin Townships. These farms, covering a total area of about 12,000 acres, are maintained by the King Ranch of Kingsville, Texas. Annually, about 6,000 steers, shipped from Texas, are grazed on the lands before being sold in eastern markets.

The increased importance of the horticultural specialties lies in an increase in specialized farm operations which use a relatively small amount of land. The mushroom industry, concentrated around Kennett Square, is the major contributor to farm sales in this category. The 1964 U.S. Census of Agriculture shows Chester County sales of about \$19,000,000 for horticultural specialties, with sub-categories as shown below:

	<u>Percent</u>
Nursery Products	7.6
Cut Flowers	12.6
Forest Products	0.5
Mushrooms, Vegetable Seeds, and Vegetables under glass	79.3

The climate and location of Chester County provide a good market area for these perishable specialty products. It therefore seems likely that these specialty farm products will have an increasingly large share of the total County farm income.

On the basis of the foregoing discussion, mushroom growing and the dairy industry are likely to remain the principal segments of agricultural production for the period covered by this study. Both of these industries generate substantial quantities of pollutants which could, if uncontrolled, create significant local water pollution problems.

EXISTING AND PRESENTLY PLANNED SEWAGE FACILITIES

Existing Public Facilities

The City of Coatesville, nine of the County's fifteen boroughs, and two townships have public sewage service facilities. The Boroughs are: Downingtown, Kennett Square, Oxford, Parkesburg, Phoenixville, South Coatesville, Spring City, West Chester, and West Grove; the Townships are North Coventry and West Goshen.

Parts of East Goshen, West Goshen, Easttown, Westtown and Uwchlan Townships are served by privately owned and operated sewage facilities. The Milltown Drainage Company serves a portion of East Goshen Township; the North Hill Disposal Company serves part of West Goshen Township; Devon Drainage Association serves the Devon area of Easttown Township; the Lionville Sanitation Company serves the Lionville area of Uwchlan Township; and the Westtown Sewer Company serves part of Westtown Township, including the Pennwood School.

There are also several townships which have sewage collection systems that transport wastes to treatment facilities owned and operated by others. Sewage from parts of Cain Township (including the Coatesville Veterans Hospital) and East Fallowfield Township is treated in the City of Coatesville sewage treatment plant. Sewage from the northeastern part of Tredyffrin Township is conveyed to Upper Merion Township, Montgomery County for treatment and disposal at the Trout Run Treatment plant. Sewage from the southeastern portion of Tredyffrin Township is treated at the Radnor-Haverford-Marple sewage treatment plant in Delaware County.

The location of each of the sewage treatment facilities is shown on the Existing Sewerage Facilities and Sewered Areas map, which also indicates the sewered areas served by each of the treatment plants. Table 9 lists the owners, communities sewered, degree of treatment, theoretical design capacity, present use, and receiving stream of treatment facilities currently serving public needs of the County. Each of the listed facilities is briefly discussed below.

City of Coatesville

The City of Coatesville sewage treatment plant has a design capacity of 4 MGD (million gallons per day). At the present time, the plant is treating approximately 2 MGD, including sewage generated in Cain and East Fallowfield Townships.

The treatment plant is of the two-stage, high-rate trickling filter type, and is located on the east bank of the West Branch of Brandywine Creek, about 3,500 feet south of U.S. Route 30.

Table 9

Existing  
Public Sewage Treatment Facilities

Treatment Facility Owner	Date * Constructed	Communities Served	Degree of Treatment	Design Capacity		Present Use		Receiving Stream
				Pop. <sup>2</sup>	Flow (MGD)	Connected Pop. <sup>2</sup>	Aver. Flow (MGD)	
Coatesville Sewer Authority	1961	Coatesville, Cain Township, East Fallowfield Twp. (Newlinville Area)	Secondary	30,000	4.000	17,305	2.000	West Branch of Brandywine Creek
Borough of Downingtown	1950	Downingtown	Secondary	6,500	1.400	7,200	1.800	Brandywine Creek
Kennett Square Borough	1933	Kennett Square	Secondary	5,000	0.500	5,000	0.489	West Branch of Red Clay Creek
Oxford Borough	1943	Oxford Borough	Secondary	3,500	0.350	2,200	0.213	Tweed Run
Parkesburg Authority	1916	Parkesburg Borough	Secondary	3,600	0.360	2,095	0.177	Buck Run
Phoenixville Borough	1950	Phoenixville	Secondary	16,500	2.000	22,447	1.860	Schuylkill River
South Coatesville	1967	South Coatesville	Secondary	2,982	0.390	2,000	0.260	Brandywine Creek
Spring City Sewer Authority	1937 1950	Spring City Borough	Secondary	2,500	0.250	2,450	0.250	Schuylkill River
Borough of West Chester	1911 1966	West Chester	Secondary	20,000	2.000	8,400 <sup>4</sup>	1.200	Goose Creek
	1911 1956 1950	West Chester	Secondary	10,000	1.000	8,200 <sup>4</sup>	0.800	Taylor Run
West Grove Borough Authority	1963	West Grove Borough	Secondary	2,000	0.200	1,850	0.180	Middle Branch White Clay Creek
North Coventry Municipal Authority	1961	North Coventry Township (South Pottstown Area)	Secondary	5,000	0.500	3,000	0.290	Schuylkill River
West Goshen Sewer Authority	1963	West Goshen Township	Secondary	20,000	2.000	6,000	0.600	Goose Creek
North Hill Disposal Company	1953	West Goshen Township (North Hills)	Secondary	--	0.033	525	0.027	None
Hilltown Drainage Company (Private)	1965	E. Goshen Township (Waterview Farms, Grand Oak Run Subdivisions and apartments)	Secondary	529	0.037	429	0.030	East Branch of Chester Creek
Devon Drainage Association (Private)	1960 1963	Easttown Township (Devon Area)	Secondary	1,600	0.160	890	0.16+	Derby Creek
Lionville Sanitation Company (Private)	1962	Uwchlan Township (Lionville Area)	Secondary	1,000	0.100	1,267 <sup>3</sup>	0.080	Valley Creek
Westtown Sewer Company (Private)	1966	Westtown Township (Subdivision and Pennwood School)	Secondary	1,000	0.100	747 <sup>3</sup>	0.071	East Branch of Chester Creek
Upper Merion Township Authority (Montgomery County)		Tredyffrin Township (Northeastern portion)	Secondary	25,000	2.500	25,000	2.500	Trout Run
Haverford-Radnor-Marpie Townships (Delaware County)		Tredyffrin Township (Southeastern portion)	Secondary	36,000	3.600	36,000	3.600	Derby Creek

<sup>1</sup>Reported by Owner.

<sup>2</sup>Or Equivalent Population.

<sup>3</sup>Includes School.

<sup>4</sup>Estimated.

\* Where more than one date appears, the other dates are dates of modification or expansion.

Downingtown Borough

Downingtown owns and operates a standard-rate trickling filter plant with a design capacity of 1.4 MGD. At the present time, the plant is operating in excess of design capacity. However, new final tanks and trickling filter recirculation facilities now under construction will alleviate the present problem. The plant is located on the east bank of the East Branch of Brandywine Creek in the north-westerly corner of East Bradford Township. Effluent is discharged to the East Branch of Brandywine Creek. The Borough has future plans to construct a new sewage treatment plant at a new location, north of the existing plant site.

Kennett Square Borough

The Kennett Square Borough sewage treatment plant is of the trickling filter type and has a design capacity of 0.50 MGD. At present the plant is receiving approximately 0.489 MGD and is in need of expansion. The plant is located about 600 feet south of Quarry Road and 600 feet west of Chandler's Mill Road in Kennett Township. Effluent is discharged to the West Branch of the Red Clay Creek.

Oxford Borough

The Oxford Borough sewage treatment plant is located on the north bank of Tweed Run, a tributary of the Octoraro Creek about 500 feet south of Locust Street. This plant has a design capacity of 0.35 MGD, is of the standard-rate trickling filter type, and presently treats an average flow of 0.213 MGD.

Parkesburg Borough

The Parkesburg Borough Authority owns and operates a trickling filter plant located in the extreme southeastern corner of the Borough. The plant has a design capacity of 0.36 MGD and presently treats approximately 0.177 MGD. Treated effluent is discharged to a minor tributary of Buck Run.

Phoenixville Borough

The Borough of Phoenixville sewage treatment plant is of the activated sludge type and has a design capacity of 2.0 MGD. At present the plant receives approximately 1.36 MGD and has a connected population of about 15,000 persons. The Borough plans to expand the plant to 4.0 MGD to meet future needs and to serve portions of adjacent townships. This plant is located on and discharges treated effluent to the Schuylkill River.

#### South Coatesville Borough

The Borough has recently completed construction of new interceptor sewer, pumping stations, force mains and a new sewage treatment plant, which is to replace two older existing facilities. Both of the existing older facilities which are now being phased out discharge treated effluent to the West Branch of Brandywine Creek. The new plant will also provide treatment for approximately 25 percent of the Borough's sewage which currently is treated at the City of Coatesville plant, and about 25 percent which until now has received no treatment at all. The new sewage treatment plant has been located adjacent to the southern boundary of the Borough, near Lower Gap Road. The new facility has been designed to treat 0.39 MGD from a connected population of about 2,980 persons, and will discharge treated effluent to the West Branch of Brandywine Creek.

#### Spring City Borough

The Spring City Sewer Authority operates a 0.25 MGD sewage treatment plant, which is located on the south bank of the Schuylkill River. The plant is presently operating near capacity. A report prepared for Spring City in 1965 recommended expansion of portions of the existing facility, but no steps have been taken to implement the recommendations.

#### West Chester Borough

West Chester Borough operates two sewage treatment plants; one discharging effluent to Taylor Run in the Brandywine Creek Basin, and the other discharging effluent to Goose Creek in the Delaware River Basin. The Taylor Run plant has a design capacity of 2.0 MGD. According to recent reports, the Goose Creek facility is presently treating an average daily flow of 1.2 MGD and the Taylor Run plant is treating an average flow of 0.8 MGD.

#### West Grove Borough

The West Grove Borough Authority operates a sewage treatment plant with a design capacity of 0.20 MGD. The plant is currently treating approximately 0.18 MGD from a connected population of 1,850 persons. This treatment facility is located south of Valley Road on the Middle Branch of White Clay Creek, and discharges treated effluent to the Creek.

#### North Coventry Township

The North Coventry Municipal Authority owns and operates a sewage treatment plant of the high-rate trickling filter type located on, and discharging treated effluent to, the Schuylkill River. The plant has a design capacity of 0.50 MGD and serves South Pottstown and adjacent

areas. At present the plant treats approximately 0.29 MGD from a connected population of 3,000 people.

West Goshen Township

The West Goshen Sewer Authority operates a high-rate, two-stage trickling filter plant with a design capacity of 2.0 MGD. At present the plant treats approximately 0.60 MGD. Discussions are currently underway regarding provisions of sewage treatment services to residents of East Goshen Township. The plant is located adjacent to the north boundary line of Westtown Township east of the Pennsylvania Railroad, and discharges treated effluent to Goose Creek.

North Hill Disposal Company

The North Hill Disposal Company is a public utility serving approximately 150 customers in the North Hill section of West Goshen Township. The plant provides complete treatment of wastes. There is no discharge to a State water course. The effluent is ponded and allowed to percolate into the ground. The design capacity of the facility is about 33,000 gallons per day, and the present flow to the plant is nearly 27,000 gallons per day. Based on an estimated 3.5 persons per household the present population served by the North Hill Disposal Company is 525 persons.

Milltown Drainage Company

The Milltown Drainage Company, privately-owned and operated, serves the Waterview Farms and Grand Oak Run subdivisions in East Goshen Township. This plant, which has a design capacity of 0.037 MGD, presently serves 429 persons and treats approximately 0.030 MGD. The plant is located about 1,000 feet north of West Chester Pike (Route 3), on the East Branch of Chester Creek to which it discharges treated effluent.

Devon Drainage Association

The Devon Drainage Association operates a privately-owned sewage treatment plant of the extended-aeration type with a design capacity of 0.16 MGD. The design connected population is 1,600 persons. Approximately 890 persons are now connected to the plant, but because of high infiltration, the plant now is receiving flows in excess of 0.16 MGD. The treatment plant is located in the Devon area of Easttown Township on the east bank of a minor tributary to Darby Creek, about 1,000 feet north of Sugartown Road.

Lionville Sanitation Company

The Lionville Sanitation Company, privately-owned and operated, provides sewer service to the Lionville area of Uwchlan Township.

The treatment plant has a design capacity of 0.10 MGD and is of the extended-aeration type. 1,267 persons, including students at the elementary school, are connected to the system at this time, and the plant receives an average flow of 0.03 MGD. Treated effluent is discharged to a branch of Valley Creek in the Brandywine Basin.

#### Westtown Sewer Company

The Westtown Sewer Company, a privately-owned company, provides sewage service to a section of Westtown Township. At present the plant serves a subdivision and the Pennwood School, but plans are underway to pump a portion of the flow from Westtown School to the plant. The Westtown Sewer Company plant is of the extended-aeration type and has a design capacity of 0.10 MGD. The plant is presently treating an average flow of approximately 0.07 MGD. Treated effluent is discharged to the East Branch of Chester Creek. The plant is located on the Creek, west of Milltown Way, opposite Westtown Lake.

#### Upper Merion Township, Montgomery County

The northeastern section of Tredyffrin Township, lying generally in the Trout Run Drainage Basin, is sewered. Sewage is conveyed from Tredyffrin to the Upper Merion sewage treatment plant, which is located near the Schuylkill River and discharges treated effluent to the River. The existing treatment plant has a design capacity of 2.5 MGD. However, plans are underway to expand the facility capacity to 5 MGD.

#### Radnor-Haverford-Marple Townships, Delaware County

Sewage from the southeastern portion of Tredyffrin Township is conveyed to the Radnor-Haverford-Marple sewage treatment plant in Delaware County. The plant is currently overloaded, but plans are underway to divert excess flow to the Darby Creek Joint Authority Plant located on the Darby Creek in Darby Township.

#### Existing Private Facilities

Table 10 lists the industrial, commercial and institutional treatment plants located in Chester County. Most of these facilities are small and are designed to treat sanitary wastes from a particular industrial plant, institution, school, or other establishment. Each facility number corresponds to a circled number on the Existing Sewerage Facilities and Sewered Areas map indicating the location of each treatment plant.

#### Planned Sewage Facilities

Several Boroughs and Townships have sewerage plants in various stages of completion. A number of municipalities are in the process

Table 10

Existing Sewage Treatment Facilities  
Industrial, Commercial, Institutional

<u>Facility Number</u>	<u>Name</u>	<u>Municipality</u>
1 (1)	Oakleigh Mobile Homes Park	South Coventry Township
2	Owen J. Roberts School	South Coventry Township
3 (1)	Turner's Trailer Grove	East Coventry Township
4	Pennhurst School	East Vincent Township
5	Philadelphia Electric Company	East Pikeland Township
6	Gulf Oil Turnpike Station No. 6	Wallace Township
7	Downingtown Motor Inn	East Caln Township
8	Foote Mineral Company	West Whiteland Township
9	Great Valley High School	East Whiteland Township
10	Burroughs Corporation	East Whiteland Township
11	Wyeth Laboratories	East Whiteland Township
12	White Motor Company	West Whiteland Township
13	Immaculata College	East Whiteland Township
14	Camilla Hall	East Whiteland Township
15	Villa Maria House of Studies	East Whiteland Township
16	Rush Hospital	Willistown Township
17	Freedoms foundation at Valley Forge	Schuylkill Township
18	Gulf Oil Turnpike Station No. 7	Tredyffrin Township
19	Paoli Industrial Park	Tredyffrin Township
20	Downingtown Joint Elementary School	West Bradford Township
21	Embreeville State Hospital	Newlin Township
22	Chester County Home	Pocopson Township
23	North Junior High School	West Goshen Township
24	Westtown School	Westtown Township
25	Radley Run Country Club	Birmingham Township
26	Lincoln University	Lower Oxford Township
27	Avon Grove Trailer Park	London Grove Township
28	Longwood Gardens	East Marlboro Township
29	Downingtown Industrial School	East Brandywine Township
30	Chatham Acres	London Grove Township
31	Chadds Ford Elementary School	Pennsbury Township
32	Sproul-Leeds	Westtown Township
33	Scott-Taylor, Inc.	Westtown Township
34	Octoraro School District	West Fallowfield Township
35	French Creek Valley Joint School	South Coventry Township

(1) Permit issued, but facilities are not constructed at this time.

of designing sewer systems, several have feasibility reports which are complete, and others have sewer feasibility studies currently underway. A brief description of proposed facilities for each municipality having completed the feasibility report phase of such planning is given below.

#### Atglen Borough

The Borough of Atglen has been issued a Sanitary Water Board Permit for proposed sewage collection and treatment facilities. The treatment plant is to be located within the Borough on the East Branch of White Clay Creek. Construction of the planned facilities has been deferred pending financing of the project.

#### Caln Township

Caln Township has been issued a Sanitary Water Board Permit for proposed sewage collection facilities which would convey sewage to the Downingtown Borough plant for treatment and disposal.

#### East Caln Township

East Caln Township has a nearly completed sewerage facilities plan and is presently negotiating with Downingtown Borough for treatment and disposal of sewage in the Downingtown sewage treatment plant. Certain sewers in East Caln have already been approved by the Sanitary Water Board to collect and convey sewage from a portion of the Township to the existing Downingtown Motor Inn sewage treatment plant for treatment and disposal. It is probable that the Motor Inn treatment facilities will be incorporated into the Township system in the future.

#### East Goshen Township

East Goshen has recently completed a study which proposed additional sewers in the Township outside the Milltown Drainage Company Service Area and purchase of the Milltown Drainage Company's facilities, and is negotiating for treatment and disposal of all collected sewage at the West Goshen sewage treatment plant.

#### East Pikeland Township

A feasibility study recently completed for East Pikeland Township proposes a sewage collection system and a sewage treatment plant, with the plant to be located within the township discharging treated effluent to French Creek. Investigations are now underway to determine the feasibility of conveying sewage to Phoenixville for treatment and disposal.

Easttown Township

Easttown Township has recently completed a sewerage study which presents three alternative collection and treatment systems. No alternate was selected because full cost information was not available for the plans which included participation in adjacent municipal systems.

East Whiteland Township

Detailed design of a sewage collection system is currently underway for the southeastern portion of the Township. East Whiteland is seeking to be included in the proposed Tredyffrin sewage treatment plant on Valley Creek.

Honeybrook Borough

A feasibility study completed for Honeybrook Borough proposes a collection system and a sewage treatment facility, with the treatment plant to be located in Honeybrook Township on the West Branch of Brandywine Creek about 800 feet south of Suplee Road.

London Grove Township

London Grove Township has recently completed a feasibility study which proposes sewerage of the Route 41-U.S. Route 1 area, and conveying of sewage to the proposed Avondale Borough sewage plant for treatment and disposal.

Modena Borough

The Borough of Modena has a feasibility study underway at this time.

New Garden Township

New Garden Township has recently completed detailed plans for sewerage of the Toughkenamon area and a portion of Route 41, conveying sewage to the proposed Avondale plant for treatment and disposal. This project has been deferred indefinitely pending receipt of financial assistance in the form of a Federal Grant.

Schuylkill Township

Schuylkill Township has completed a feasibility study which proposes a collection system for certain portions of the Township and presents two alternatives for sewage treatment: within the Township, or pumping sewage to the Phoenixville plant for treatment and disposal.

A final decision has been deferred pending the results of an engineering study of the Phoenixville Sewage Treatment Plant.

#### Tredyffrin Township

Tredyffrin Township has been studying a sewage collection system for the Paoli area. The collection system would either terminate at a sewage treatment plant within the Township or at a pumping station which would pump sewage to the Upper Merion Plant for treatment and disposal. However, the selection will depend on the outcome of negotiations between Tredyffrin and Upper Merion.

#### Uwchlan Township

Uwchlan Township has recently completed a feasibility study which proposed additional sewer construction in the Lionville area, purchase of the Lionville Sanitation Company facilities, abandonment of the existing sewage treatment plant, and construction of a new sewage treatment facility on Valley Creek west of Pennsylvania Route 100, about 1,500 feet north of the boundary between Uwchlan Township and West Whiteland Township. Additional studies are currently underway.

#### Valley Township

Valley Township has recently completed a feasibility study which proposes the construction of a sewage collection system with sewage being conveyed to the City of Coatesville plant for treatment and disposal.

#### West Caln Township

West Caln Township has a sewerage feasibility study underway at this time.

#### West Whiteland Township

A preliminary engineering study recently completed for West Whiteland Township proposes a sewage collection system for the relatively densely populated areas of the Township, with a sewage treatment plant to be located in the western section of the Township near Valley Creek adjacent to the Township line between the railroad and Clover Mill Road.

#### Combined Sewers in Chester County

There are no existing combined storm-sanitary sewers in the County, and no combined sewers are contemplated in any of the planned sewer systems. Illegal connections of storm drains to sanitary sewers may exist, but there are no "designed" combined sewers. Furthermore, this report recommends that no combined sewers be planned.

### Individual On-Site Systems

In the areas of the County not served by public or private systems, sewage disposal is accomplished by various on-site or on-lot facilities, including septic tanks and leaching fields or leaching pits, cesspools, and privies.

These types of facilities are used not only by individual lot owners, but also by schools, industries, commercial establishments, and camps. In many areas where population densities are low and soil conditions are suitable, on-site systems are a satisfactory means of sewage disposal. However, as population growth continues and densities increase, it will be necessary to phase out the existing on-site systems and replace them with public sewage facilities.

There are many areas which are currently experiencing problems with on-site sewage disposal systems. These areas are shown in a generalized manner on the Sewage Problem Areas map. Those areas which are near existing public facilities should be served by connection to the public collection systems. In locations which are relatively remote from existing facilities, temporary "package" treatment facilities may be required until new, or enlargements of existing, permanent facilities become feasible.

Sewage problem areas should receive immediate attention. Those which are within feasible reach of existing facilities or could be incorporated into new area-wide systems, have been so shown in the ten-year and twenty-year plans presented in this report. Those problem areas that cannot feasibly be incorporated into existing or proposed regional or multi-municipal systems will require individual solutions, until such time as they can be served by the proposed or other future systems.

### Need for Additional Collection and Treatment Facilities

Chester County has a definite need for additional sewerage facilities. In general, sewerage facility needs fall into five general categories:

1. The need for expansion of existing sewage treatment plants to serve increasing population concentrations within the present areas served by these treatment facilities.
2. The need for expansion of existing sewage treatment plants to serve additional areas outside their present service limits.

3. A definite requirement to sewer additional areas of the County, especially in locations where population densities are high and soil conditions are not suitable for on-site systems. Many of these areas can be incorporated into existing collection and treatment systems with necessary modifications and additions being made to the existing facilities.
4. A definite need to improve treatment efficiencies at sewage treatment plants in Chester County as water quality standards are reviewed and raised throughout the State. It is anticipated that improvements will consist of tertiary or advanced waste treatment units being added to the existing treatment facilities. A specific case at the present time is the Downingtown region of the Brandywine Creek. Here, the Borough and the three paper companies in the area are under orders to up-grade treatment facilities to provide 94 percent BOD (Biochemical Oxygen Demand) removal.
5. The need for both new collection sewers and new treatment facilities in some areas of the County. Many of these areas contain portions of more than one municipality and will be serviced by multi-municipal sewage projects.
6. Finally, throughout the less populated areas of the County, the need for localized systems such as collecting sewers and "package" type sewage treatment plants. These systems would serve small population concentrations, such as sub-divisions or population clusters, which may occur in the future.

The next section of the report deals with the sewers and sewage treatment facilities required to serve the needs of the County for the period from the present through 1978 and for the period from 1978 through 1988. The design basis, sewered populations, sewage flows, and probable required systems are described for each of the various areas in the County.

PROPOSED SEWAGE FACILITIES

General

Sewage facilities proposed for Chester County involve several levels of planning. Planning for regional sewerage systems involves only a few areas of the County during the study period (through 1988), but the regional systems proposed for these areas would provide service to more than fifty percent of the population of Chester County at any given time. Regional systems are proposed for the East and West branches of Brandywine Creek in the Downingtown and Coatesville areas, for Valley Creek in the Paoli area, for Goose Creek in the West Goshen area, for Valley Creek in the West Whiteland area, and for the Phoenixville area. These systems would serve multi-municipal needs, generally over a large service area and on a drainage basin scale.

Other multi-municipal projects are recommended, but these are of relatively small areal coverage and generally would provide service to areas surrounding population centers. Examples of these multi-municipal systems include the Oxford and Avondale areas.

On still smaller scale are those projects which serve one municipality, such as the system proposed for Elverson Borough. In the more distant future (beyond the study period) even single municipal systems will most probably be expanded to serve outlying areas. In the distant future, then, all sewerage systems in Chester County will likely be multi-municipal in nature, with large regional systems replacing many of the smaller single and multi-municipal systems recommended in this report.

Each of the proposed regional, multi-municipal, and municipal systems described above is shown on the Existing and Future Sewerage Facilities map; the areas to be sewered for each period (1968-1978 and 1978-1988) are shown on the Existing and Future Sewered Areas map.

Small-scale sewerage facilities will be needed throughout the less populated areas of the County to serve population concentrations which develop in locations remote from existing or proposed sewerage systems. These facilities would consist of collection sewers and "package" type sewage treatment plants serving small areas such as subdivisions. "Package" treatment plants should be considered interim solutions to sewage problems and should be phased out at such time as it is economically feasible to connect to regional sewage collection and treatment systems. Areas requiring such facilities are difficult to predict, because they depend on the pattern of future development in the County. Several areas which require such facilities at this time are described in this section of the report under Areas to be

Served by Interim "Package" Plants. Areas which may need localized facilities in the future are also listed. Finally, in those areas of the County having minimal population densities, on-site sewage disposal systems will be necessary for the foreseeable future. Consideration of on-site sewage disposal systems should be made in accordance with the soil conditions of a given area. Reference should be made to the soils map included in this report and to detailed soils maps on file at the County Planning Commission.

Pennsylvania State Department of Health design criteria have been used in sizing the systems designed for Chester County. An average flow of 100 gallons per capita per day has been used in designing sewage treatment facilities. An exception to this design criterion has been made in areas of existing or expected industrial activity. In these areas, the flows have been increased on a per capita basis to allow for industrial contribution. For the design of trunk sewers 250 gallons per capita per day has been used. Again, in areas where industrial activity is existing or expected, higher design flows have been used to allow capacity for industrial contribution.

No increases in these flow allowances have been made over the study period. New materials and pipe jointing methods are expected to offset increased per capita flows over the next 20 years.

Generally, a minimum population density criterion of about 2,000 persons per square mile has been used to determine areas that are feasible for sewage collection systems. In many cases, however, a series of relatively high density population centers separated by low density development, have been incorporated into a single system. The probable future sewered areas shown on the Existing and Future Sewered Areas map include the less dense areas because trunk or interceptor sewers pass through these areas, thus providing available sewage collection facilities for the whole area.

A summary of the regional, multi-municipal, and municipal treatment facilities discussed below is shown on Table II.

Regional Systems

Coatesville Regional System

Description

The regional system proposed for the Coatesville area would serve Valley Township, a small portion of West Caln Township, the western part of Caln Township, and the City of Coatesville. Major trunk sewers would be required along Sucker Run to serve Valley Township and along Rock Run to serve Valley Township and West Caln Township. The existing City of Coatesville treatment plant would be incorporated into the proposed regional system. Estimated flows to the plant would be 2.45 MGD by 1978 and 3.43 MGD by 1988. The existing facility is adequate to treat expected flows over the study period.

The table below shows the present sewage flows being treated at the Coatesville Plant and the probable future connected population and sewage flow for each municipality to be served by the proposed Coatesville regional sewage treatment plant.

The Chester County Composite Land Use Plan indicates that relatively high density development is permitted north of Coatesville along Pennsylvania Route 82 up to and including the immediate vicinity of the intersection of Pennsylvania Route 82 and U.S. Route 322. Present population forecasts do not indicate intensive growth in this area during the study period, but when the area does develop, it could be incorporated into the recommended Coatesville Area Regional System.

PRESENT AND PROBABLE FUTURE CONNECTED  
POPULATIONS AND SEWAGE FLOWS  
COATESVILLE REGIONAL SYSTEM

<u>Municipality</u>	<u>Present</u>		<u>1978</u>		<u>1988</u>	
	<u>Connected Population</u>	<u>Flow (MGD)</u>	<u>Connected Population</u>	<u>Flow (MGD)</u>	<u>Connected Population</u>	<u>Flow (MGD)</u>
Coatesville City	17,305 <sup>(1)</sup>	2.00 <sup>(2)</sup>	14,600	1.90	16,500	2.31
East Fallowfield Township	--	--	1,200	0.12	2,200	0.22
Valley Township	--	--	3,800	0.38	6,800	0.68
West Caln Township	--	--	--	--	600	0.06
Caln Township	--	--	500	0.05	1,600	0.16
<b>TOTAL</b>	<b>17,305</b>	<b>2.00</b>	<b>20,100</b>	<b>2.45</b>	<b>27,700</b>	<b>3.43</b>

(1) Includes East Fallowfield, Valley and Caln Townships

(2) Existing Treatment Plant Design Capacity: 4.0 MGD.

### Future Considerations

The Coatesville Regional Facility is ideally located to serve the West Branch of the Brandywine Creek drainage basin above Coatesville. It is highly probable that some areas in West Brandywine Township, especially in the vicinity of the North Brandywine Junior High School, will require sewerage facilities in the future; ultimately the areas requiring sewer service should be served by the Coatesville Regional System. However, until such time as there is sufficient population to support extensions to the regional system, localized collection systems and "package" treatment plants will be required. It must, however, be realized that "package" plants constitute an interim solution, and that such treatment plants should be located to facilitate the phasing out of the plants and incorporation of the respective collection systems into the regional system.

### Downingtwn Regional System

#### Description

The regional system proposed for the Downingtwn area would initially serve the Borough of Downingtwn and portions of Uwchlan, Caln, East Caln, and West Bradford Townships. The site limitations at the present Downingtwn sewage treatment plant preclude adequate expansion to treat the expected flows. Therefore, a new sewage treatment facility would be constructed at the site recently acquired by Downingtwn Borough to supplement the existing plant until such time that it is feasible to abandon the present facility. New trunk sewers would be required to serve Caln and East Caln Townships. In addition, relatively small trunk sewers would have to be extended into West Bradford Township. Additionally, expansion of sewer line capacity will be required within the Borough to convey flows to the treatment plant. The estimated sewage flows to the regional sewage treatment facilities will be 2.87 MGD by 1978 and 4.52 MGD by 1988. The table below shows the connected populations for the sewage flows from each of the municipalities to be served by the Downingtwn regional sewage treatment plant.

PRESENT AND PROBABLE FUTURE CONNECTED  
POPULATIONS AND SEWAGE FLOWS  
DOWNTOWN REGIONAL SYSTEM

<u>Municipality</u>	<u>Present</u>		<u>1978</u>		<u>1988</u>	
	<u>Connected Population</u>	<u>Flow (MGD)</u>	<u>Connected Population</u>	<u>Flow (MGD)</u>	<u>Connected Population</u>	<u>Flow (MGD)</u>
Downingtwn Borough	7,200	1.80 <sup>(1)</sup>	10,000	2.50	12,100	3.02
East Caln Township	--	--	1,300	0.13	4,300	0.43
West Bradford Township	--	--	700	0.07	900	0.09
Caln Township	--	--	1,200	0.12	8,800	0.88
Uwchlan Township	--	--	500	0.05	1,000	0.10
<b>TOTAL</b>	<b>7,200</b>	<b>1.80</b>	<b>13,700</b>	<b>2.87</b>	<b>27,100</b>	<b>4.52</b>

(1) Existing treatment plant design capacity: 1.4 MGD.

Future Considerations

In East Brandywine Township there are localized concentrations of population primarily along U.S. Route 322 and in the Guthriesville-Downingtwn Industrial School Area. It is highly probable that on-site sewage disposal problems will develop in these locations. Ultimately, the Downingtwn regional system will be extended northward into East Brandywine, probably along U.S. Route 322 and upstream along Beaver Creek. However, it should be noted that interim solutions such as localized collection systems and "package" plants will probably be required in East Brandywine Township until such time as there is sufficient population to support extensions to the proposed regional system.

The Downingtwn Area facility should serve as a regional facility in the more distant future for most of the East Branch of Brandywine Creek drainage basin. Present population projections do not indicate heavy development south of Downingtwn. There is, therefore, no reason to assume that treatment facilities would have to be moved downstream during the study period.

Paoli Area Regional System (Valley Creek Basin)

Description

Discussions are presently underway concerning a regional system to serve Tredyffrin Township, Easttown, Willistown, and East Whiteland Townships, and Malvern Borough. Tentative plans include the construction of a new sewage treatment plant in Upper Merion Township, Montgomery County and the construction of trunk sewers and a major pumping station in Tredyffrin Township. The sewage treatment plant now serving the Paoli Industrial Park would be phased out, and the Industrial Park collection system would be connected into the proposed regional system.

It is estimated that the proposed regional sewage treatment plant would receive a flow of 3.53 MGD by 1978 and a flow of 5.97 MGD by 1988. The two remaining areas of Tredyffrin Township (those served by the Upper Merion and the Radnor-Haverford-Marple sewage treatment plants) are discussed separately in this report. The table below shows the connected populations for and sewage flows from each of the municipalities to be served by the proposed regional sewage treatment plant.

PRESENT AND PROBABLE FUTURE CONNECTED  
POPULATIONS AND SEWAGE FLOWS  
PAOLI AREA (Valley Creek Basin) REGIONAL SYSTEM

Municipality	Present		1978		1988	
	Connected Population	Flow (MGD)	Connected Population	Flow (MGD)	Connected Population	Flow (MGD)
East Whiteland Township	--	--	6,500	0.72	12,200	1.35
Tredyffrin Township (Paoli Area)	--	--	6,000	0.66	13,300	1.60
Willistown Township	--	--	8,500	1.00	9,000	1.20
Easttown Township	890 <sup>(P)</sup>	0.16 <sup>(1)</sup>	5,400	0.54	10,500	1.05
Malvern Borough	--	--	6,100	0.61	7,700	0.77
<b>TOTAL</b>	<b>890</b>	<b>0.16</b>	<b>32,500</b>	<b>3.53</b>	<b>52,700</b>	<b>5.97</b>

(P) Private Treatment Facility: to be phased out.

(1) Existing Treatment Plant Design Capacity: 0.16 MGD.

### Future Considerations

Because the three western most municipalities, namely East Whiteland and Willistown Townships, and Malvern Borough, are at a relatively great distance (approximately 8 miles) from the proposed regional plant it is felt that a technically and economically feasible alternative exists for the proposed regional system.

The alternative consists of Tredyffrin and Easttown Townships following the regional plan, as shown, with Willistown, East Whiteland, and Malvern sharing a joint plant on Little Valley Creek. A plant on Little Valley Creek would have to be of the tertiary treatment type. Whether this alternative is feasible or not can only be determined by a detailed study of the technical and financial aspects of the two plans.

An additional alternative available to Easttown Township would involve conveying sewage to the Radnor-Haverford-Marple Authority treatment facilities. As before, a detailed study is required to determine which of the available alternatives is most beneficial to Easttown Township.

### West Goshen Regional System--West Chester Goose Creek Plant

#### Description

In this regional system, the existing West Goshen plant would be a regional sewage treatment facility serving West Goshen Township, East Goshen Township, small portions of Willistown Township, and parts of Westtown Township. The West Chester Borough Goose Creek Sewage Treatment Plant capacity is not expected to be exceeded during the study period. Beyond the study period, if it is still feasible to operate the West Chester Goose Creek Plant, excess flows may be bypassed to the West Goshen Regional Facility.

Most of the area to be served in West Goshen can be reached by extensions to the existing system. New trunk sewers would be required in East Goshen Township along the East Branch of Ridley Creek into Willistown Township. The areas in Westtown Township would be served by sub-trunk sewers. Sewage collected would be pumped to the West Goshen Plant. When the facilities are completed, the Milltown Drainage Company, the Westtown Sewer Company, and the Westtown School sewage treatment plants should be abandoned. The required capacity of the West Goshen regional treatment plant would be 2.15 MGD by 1978 and 4.50 MGD by 1988. The tables below list the present and probable future sewered populations and the probable sewage flows for each of the municipalities to be served by the West Goshen regional system, and by the West Chester Goose Creek treatment facility.

PRESENT AND PROBABLE FUTURE CONNECTED  
POPULATIONS AND SEWAGE FLOWS  
WEST GOSHEN REGIONAL SYSTEM

<u>Municipality</u>	<u>Present</u>		<u>1978</u>		<u>1988</u>	
	<u>Connected Population</u>	<u>Flow (MGD)</u>	<u>Connected Population</u>	<u>Flow (MGD)</u>	<u>Connected Population</u>	<u>Flow (MGD)</u>
West Goshen Township	6,000 525 <sup>(P)</sup>	0.60 <sup>(1)</sup> 0.03	11,600 --	1.33 --	18,000 --	2.25 --
East Goshen Township	500 <sup>(P)</sup>	0.04 <sup>(2)</sup>	6,500	0.65	12,600	1.26
Willistown Township	--	--	--	--	1,500	0.15
Westtown Township	747 <sup>(3)</sup> (P)	0.07 <sup>(4)</sup>	1,000	0.10	7,800	0.78
East Bradford Township	--	--	700	0.07	1,500	0.15
<b>TOTAL</b>	<b>7,772</b>	<b>0.74</b>	<b>19,800</b>	<b>2.15</b>	<b>41,400</b>	<b>4.59</b>

(P) Private treatment facility: to be phased out.

(1) Existing treatment plant design capacity: 2.0 MGD.

(2) Existing treatment plant design capacity: 0.037 MGD.

(3) Includes 600 Students.

(4) Existing treatment plant design capacity: 0.10 MGD.

PRESENT AND PROBABLE FUTURE CONNECTED  
POPULATIONS AND SEWAGE FLOWS  
WEST CHESTER GOOSE CREEK PLANT

<u>Municipality</u>	<u>Present</u>		<u>1978</u>		<u>1988</u>	
	<u>Connected Population</u>	<u>Flow (MGD)</u>	<u>Connected Population</u>	<u>Flow (MGD)</u>	<u>Connected Population</u>	<u>Flow (MGD)</u>
West Chester Borough (Goose Creek Area)	8,400 <sup>(1)</sup>	1.20 <sup>(3)</sup> (2)	9,300	1.30	10,200	1.43
Additional Students (resident and com- muter)	--	--	4,600	0.28 <sup>(4)</sup>	9,200	0.50 <sup>(4)</sup>
<b>TOTAL</b>	<b>8,400</b>	<b>1.20</b>	<b>13,900</b>	<b>1.58</b>	<b>19,400</b>	<b>1.93</b>

(1) Estimated.

(2) Includes flow from West Chester State College.

(3) Existing treatment plant design capacity: 2.00 MGD.

(4) Based on 75 gpcd for resident students; 20 gpcd.

Future Considerations

It is not economically feasible to phase out the West Chester Goose Creek Plant during the study period. However, operation of two plants in relatively close proximity to each other is not efficient from both an economic standpoint and an operational standpoint. Therefore, it is recommended that when flow to the West Chester Goose Creek facility exceeds the present design capacity excess flows be by-passed to the West Goshen Regional Facility. If, beyond the study period, it becomes feasible to phase out the West Chester plant it should be abandoned.

Beyond the study period, as population densities in the lower part of the Goose Creek Basin increase and additional growth takes place in the northwestern part of Delaware County, it is probable that any treatment plants in Chester County serving this particular region and drainage basin will be phased out, with sewage flows being conveyed to Delaware County for treatment and disposal at a larger regional facility. However, at this time, and throughout the study period, such an undertaking is economically unfeasible. Therefore, it is recommended that those portions of Westtown Township requiring sewers during the study period be served by the West Goshen Regional System.

West Whiteland Regional System

Description

The regional system proposed for the West Whiteland area would serve West Whiteland Township, a portion of Uwchlan Township, a small section of Upper Uwchlan Township and a small part of East Bradford Township, and part of West Goshen Township. The regional facilities would consist of a major trunk sewer along Valley Creek in West Whiteland Township; a smaller trunk sewer along a branch of Valley Creek into Uwchlan Township; a trunk sewer along Route 100 into Uwchlan Township; a trunk sewer along Broad Run in West Whiteland Township, and a pumping station in East Bradford Township to pump flows from the Broad Run trunk sewer and parts of West Goshen and East Bradford Townships. A new sewage treatment plant would be located on Valley Creek at the western boundary of West Whiteland Township. The present Lionville Sanitation Company sewage treatment plant would be phased out upon completion of the regional treatment facility. The proposed treatment plant would treat 0.93 MGD by 1978 and 1.86 MGD by 1988. The present and probable future connected populations and sewage flows for each of the municipalities included in the regional system are shown in the table below.

PRESENT AND PROBABLE FUTURE CONNECTED  
POPULATIONS AND SEWAGE FLOWS  
WEST WHITELAND REGIONAL SYSTEM

<u>Municipality</u>	<u>Present</u>		<u>1978</u>		<u>1988</u>	
	<u>Connected Population</u>	<u>Flow (MGD)</u>	<u>Connected Population</u>	<u>Flow (MGD)</u>	<u>Connected Population</u>	<u>Flow (MGD)</u>
West Whiteland Township	0	0	3,700	0.37	10,200	1.02
East Bradford Township	0	0	500	0.05	1,200	0.12
Uwchlan Township	1,276 (P) (1)	0.08 (2)	4,800	0.48	6,200	0.62
Upper Uwchlan Township	0	0	300	0.03	1,000	0.10
<b>TOTAL</b>	<b>1,276</b>	<b>0.08</b>	<b>9,300</b>	<b>0.93</b>	<b>18,600</b>	<b>1.86</b>

(P) Private treatment facility: to be phased out.

(1) Includes students at elementary school.

(2) Existing treatment facility design capacity: 0.100 MGD.

### Future Considerations

All of the areas to be served by the West Whiteland Regional Facility lie in the Brandywine Creek Basin with the exception of the Eagle area of Upper Uwchlan Township. The proposed service area in Upper Uwchlan Township lies in the Picking Creek Basin. Since large scale sewerage facilities in the Picking Creek Basin are not expected to reach upstream to the Eagle area during the study period, service has been provided in the West Whiteland Regional System. Sewage from both the northern part of Uwchlan Township and from the Eagle area is to be pumped into the regional system during the study period. In the more distant future these pumping facilities may be phased out with gravity systems conveying flows from Uwchlan Township to the Downingtown Regional System, and from Upper Uwchlan Township to a future Picking Creek Basin Regional System. The presently proposed system services almost the entire tributary drainage basin, and it is not anticipated that the Regional System would be expanded to serve other areas outside the drainage basin.

### Phoenixville Regional System

#### Description

In this regional system, the existing Phoenixville sewage treatment plant could become a regional facility serving the Borough of Phoenixville, East Pikeland Township, Schuylkill Township, and part of Charlestown Township. The presently planned expansion for the existing treatment plant is not sufficient to serve the needs of the proposed service area through the design period covered by this report. Although the present plant site is sufficient for a plant to serve the connected population through the study period, serious consideration must be given to the long-range problem of serving the entire French Creek and Pickering Creek Basins (see Future Considerations). For this reason consideration should be given to a new treatment plant location on Pickering Creek to serve the regional system or to an additional treatment plant at a new location.

However, in this report the existing Phoenixville treatment plant is shown as the regional facility. The major new collection facilities required would be a trunk sewer along French Creek to serve East Pike-land Township, and Charlestown Township, new trunk sewers in Schuylkill Township, and a pumping station to pump sewage from the Pickering Creek Basin to the Phoenixville treatment plant. The estimated sewage flows are 2.84 MGD for 1978 and 4.20 MGD for 1988. The table below shows present and probable future sewage contributions by the various munic- ipalities to be served by the Phoenixville regional sewage system.

PRESENT AND PROBABLE FUTURE CONNECTED  
POPULATIONS AND SEWAGE FLOWS  
PHOENIXVILLE REGIONAL SYSTEM

<u>Municipality</u>	<u>Present</u>		<u>1978</u>		<u>1988</u>	
	<u>Connected Population</u>	<u>Flow (MGD)</u>	<u>Connected Population</u>	<u>Flow (MGD)</u>	<u>Connected Population</u>	<u>Flow (MGD)</u>
Phoenixville Borough	15,000	1.86 <sup>(1)</sup>	16,500	2.22	18,300	2.80
East Pikeland Township	0	0	2,300	0.23	5,000	0.50
Charlestown Township	0	0	100	0.01	600	0.06
Schuylkill Township	0	0	3,200	0.38	7,000	0.84
<b>TOTAL</b>	<b>15,000</b>	<b>1.86</b>	<b>22,100</b>	<b>2.84</b>	<b>30,900</b>	<b>4.20</b>

(1) Existing treatment facility design capacity: 2.0 MGD.  
Expansion planned to 4.0 MGD.

Future Considerations

The proposed Phoenixville Regional System will serve as the beginning of a regional system serving both the Pickering Creek Basin and the French Creek Basin. Because the population forecasts do not indicate a rapid growth rate in the upper reaches of these basins, it is not economically feasible to design the initial trunk sewers to serve the entire basin. However, adequate rights-of-way should be obtained to permit the future installations of parallel trunk sewers as they are required. Increased capacity in certain gravity and force main sewer lines and in pumping stations in Phoenixville Borough will have to be effected to convey sewage from the outlying areas to the treatment facility. If detailed study and financial analysis leads to the selection of an alternate treatment plant site at this time, some of the same facilities in the Borough will have to be modified and enlarged to transmit the flows from the French Creek Basin to the alternate site on the Pickering Creek. It must be realized that at some time in the future a new sewage treatment plant will be needed, and the Phoenixville plant in all probability will be phased out. The decision on phasing the plant out can be made only after a detailed financial analysis is completed.

Multi-Municipal Systems

General

The next type of area-wide sewage system to be discussed is multi-municipal; these systems would serve more than one political subdivision, but would not be as extensive as the regional facilities described in the preceding section. Some of the systems become multi-municipal through the extension of facilities outward from existing systems serving one municipality. Other systems, such as the one proposed for the Avondale area, are completely new systems serving adjoining municipalities.

Oxford Area

Description

The existing Oxford Borough sewage treatment plant would be expanded to serve areas in the immediate vicinity of Oxford Borough. It is expected that by 1978 portions of East Nottingham Township and Lower Oxford Township would be served by extensions to the existing collection system and the proposed expanded treatment facility. Extensions to the proposed expanded system should be made by 1988 to serve additional areas of the two Townships. It is expected that sewage flows to the Oxford area plant would reach 0.73 MGD by 1978 and 1.12 MGD by 1988. Present and probable future connected populations and sewage flows are shown in the following table for each of the municipalities to be served.

PRESENT AND PROBABLE FUTURE CONNECTED  
POPULATION AND SEWAGE FLOWS  
OXFORD AREA SYSTEM

<u>Municipality</u>	<u>Present</u>		<u>1978</u>		<u>1988</u>	
	<u>Connected Population</u>	<u>Flow (MGD)</u>	<u>Connected Population</u>	<u>Flow (MGD)</u>	<u>Connected Population</u>	<u>Flow (MGD)</u>
Oxford Borough	2,200	0.21 <sup>(1)</sup>	5,700	0.57	7,100	0.71
East Nottingham Township	0	0	900	0.09	2,100	0.21
Lower Oxford Township	0	0	700	0.07	2,000	0.20
<b>TOTAL</b>	<b>2,200</b>	<b>0.21</b>	<b>7,300</b>	<b>0.73</b>	<b>11,200</b>	<b>1.12</b>

(1) Existing treatment facility design capacity: 0.35 MGD.

Future Considerations

The Oxford Borough treatment facility has been selected as a multi-municipal facility serving the Borough and the adjacent townships primarily because of its availability. The Borough is located on high ground that drains to several creeks comprising several drainage basins. Most of the outlying areas will have to be pumped to the Borough System. However, population forecasts for the area do not indicate rapid growth outside the Borough. Until such growth begins to occur and the direction of population growth can be determined, it is impossible to recommend a location for a regional facility. In fact, it is conceivable that in the distant future sewage may be conveyed to a Maryland system for treatment and disposal.

West Grove Area

Description

The existing West Grove Borough sewage treatment plant would be expanded to serve parts of London Grove Township. It is estimated that a sewage flow of approximately 0.37 MGD would reach the plant by 1978 and 0.55 MGD by 1988. The table below shows the estimated quantities of sewage contributed by both the Borough and London Grove Township for the present, and for 1978 and 1988.

PRESENT AND PROBABLE FUTURE CONNECTED  
POPULATIONS AND SEWAGE FLOWS  
WEST GROVE AREA SYSTEM

<u>Municipality</u>	<u>Present</u>		<u>1978</u>		<u>1988</u>	
	<u>Connected Population</u>	<u>Flow (MGD)</u>	<u>Connected Population</u>	<u>Flow (MGD)</u>	<u>Connected Population</u>	<u>Flow (MGD)</u>
West Grove Borough	1,850	0.18 <sup>(1)</sup>	3,100	0.31	4,000	0.40
London Grove Township	0	0	600	0.06	1,500	0.15
<b>TOTAL</b>	<b>1,850</b>	<b>0.18</b>	<b>3,700</b>	<b>0.37</b>	<b>5,500</b>	<b>0.55</b>

(1) Existing treatment facility design capacity: 0.20 MGD.

Future Considerations

The West Grove Borough treatment plant was selected to serve the West Grove area for the following reasons: the plant is available

and is situated in a good location to serve the upstream portions of the Middle Branch of White Clay Creek drainage basin; population forecasts for the area indicate that major growth will be along the U.S. Route 1 transportation corridor rather than downstream from the plant; and the present site is well upstream from the proposed Clay Creek Reservoir.

Additionally, local land use planning effort has been directed toward encouraging high density development in the area between West Grove and Avondale generally along the transportation corridor.

In the future a regional system could be developed upstream from Delaware. However, based on the population forecasts for the area the development of such a system is improbable during the next 50 years.

#### Avondale Area

##### Description

A new multi-municipal sewage system is proposed for the Avondale area; it would serve Avondale Borough and adjacent portions of London Grove and New Garden Townships. A trunk sewer would be required along Route 1 and West State Street to serve London Grove Township, and trunk sewers along Route 41 and Trout Run to serve areas in New Garden Township. A pumping station would be required in the Toughkenamon area to lift sewage from the eastern portion of Toughkenamon to the Trout Run trunk sewer. A new sewage treatment plant would be located in Avondale Borough adjacent to the east branch of White Clay Creek. The estimated sewage flows to the new treatment facility for 1978 and 1988 are 0.40 MGD and 0.62 MGD respectively.

Present and probable future connected populations and sewage flows for each of the municipalities to be served by the system are shown in the following table.