vetoed

9/16/77 Introduced by: Mike Lowry
Bob Gaines

77-686

ORDINANCE NO. 3403 vetoed

AN ORDINANCE approving a sewer general comprehensive plan for King County Water District No. 90.

STATEMENT OF FACT:

1. King County Water District No. 90 submitted a sewer general comprehensive plan to King County for approval as required by RCW 56.08.020 and Ordinance No. 1709;

2. In April 1975, the Utilities Technical Review Committee reviewed the proposed plan and included in its recommendation for approval certain conditions pertaining to sewer connections in the Cedar River floodplain;

3. County Council approval of Water District No. 90's sewer general comprehensive plan is a prerequisite to state and federal funding of a project included in the plan, known as the Orton Road Interceptor;

4. The Newcastle Communities Plan which will include the area to be served by Water District No. 90, is scheduled to begin in early 1978.

BE IT ORDAINED BY THE COUNCIL OF KING COUNTY:

SECTION 1. The sewer general comprehensive plan of King County Water District No. 90, as described in Exhibit A, is hereby approved subject to the following conditions:

1. The sewer general comprehensive plan shall be limited in geographic scope to the Orton Road Drainage Basin, as shown in Exhibit A, Item #1. The approved lines and facilities shall be limited to those identified in Exhibit A, Item #1.

2. No sewer connections or sewer services shall be permitted within the flood hazard area, as shown in Exhibit A, Item #1.

3. Pending completion of the Newcastle Communities Plan and reconsideration of the sewer general comprehensive plan for Water District No. 90, no sewer connections or sewer services shall be permitted outside the flood hazard area, except that service may

be provided to the following:

a. Liberty High School, Maywood Junior High School, Briarwood Elementary School and Maplewood Elementary School;

b. Existing residences which are certified by the King County Department of Public Health to have an on-site sewage disposal system which has failed, cannot be reasonably repaired or maintained, and resulted in an identifiable health hazard; and

c. Existing plats and residences with dry sewers and plats which have been given preliminary approval subject to the provision of sewer service as of the effective date of this ordinance.

4. Connections to residences which do not meet the criteria stated in Section 1, subsection 3(b), shall be considered disallowed by the district for the purposes of WAC 248-96-016 and Section 7 of the King County Board of Health Regulations No. III and IV.

5. Water District No. 90 may provide service to any residence which exists as of the effective date of this ordinance and for which service is requested by the owner.

6. Water District No. 90 shall not accept any developer sewer extensions unless (a) the criteria set forth in Section 1, Subsection (3)b or c are met, or (b) the developer extension is approved by the King County Council or its designee as consistent with applicable comprehensive plans and land use policies. Upon completion of the Newcastle Communities Plan and its approval by the County Council, Water District No. 90 shall revise, if necessary, its general comprehensive sewer plan, in accordance with the adopted Newcastle Community Plan, and within 12 months submit a revised copy to the County Council for review and approval.

SECTION 2. This ordinance shall constitute interim approval of Water District No. 90's sewer general comprehensive plan until the County Council approves a revised sewer general comprehensive plan for the entire area.

SECTION 3. No right-of-way construction permits for sewer construction shall be issued to Water District No. 90 or within Water District No. 90 unless the Department of Real Property receives certification from the Division of Building and Land Development that such construction is consistent with the comprehensive plan approved herein.

INTRODUCED AND READ for the first time this 1st day of August, 1977.

PASSED this 21st day of September, 1977.

KING COUNTY COUNCIL
KING COUNTY, WASHINGTON

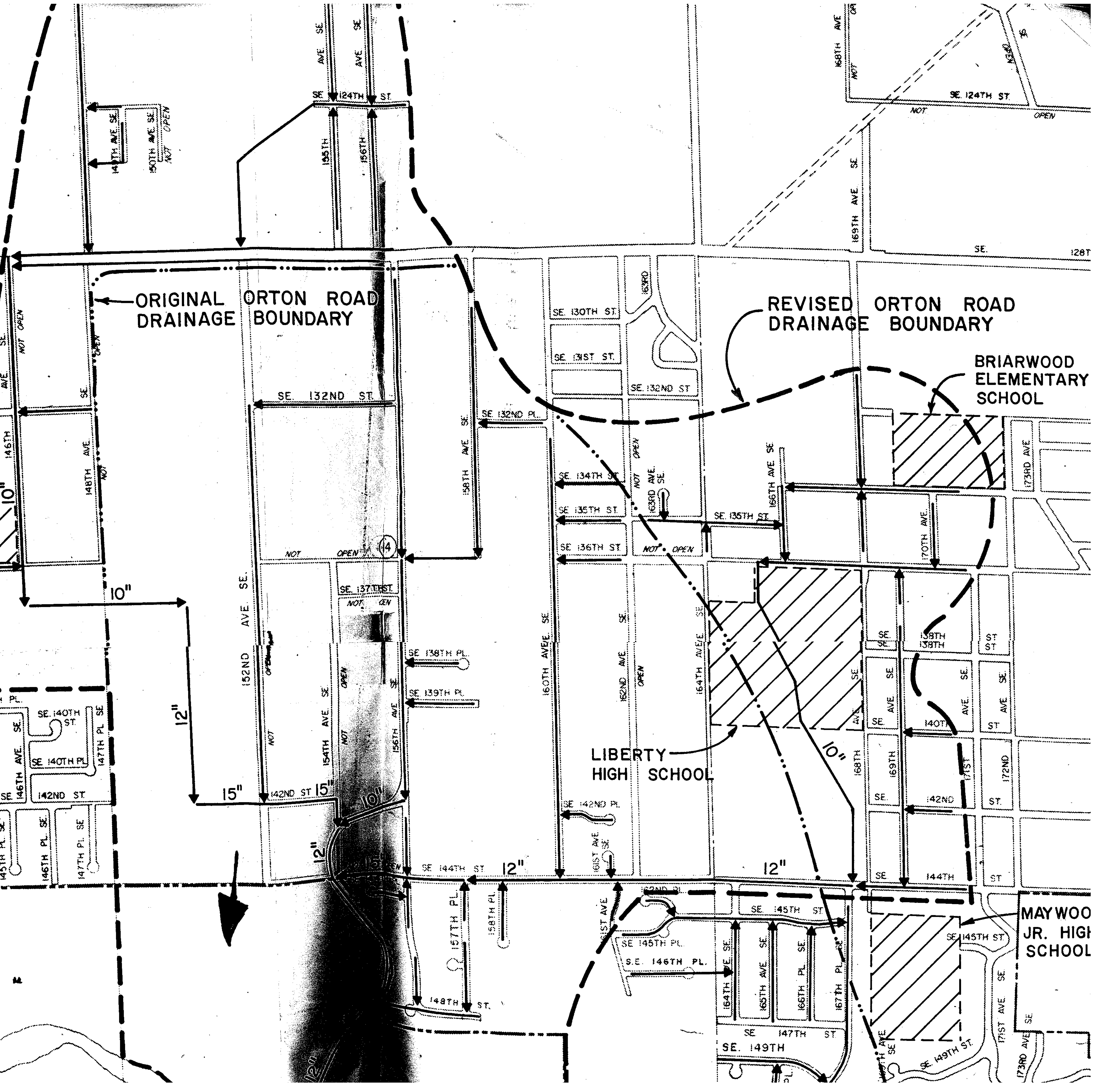
Mike Lowry
Chairman

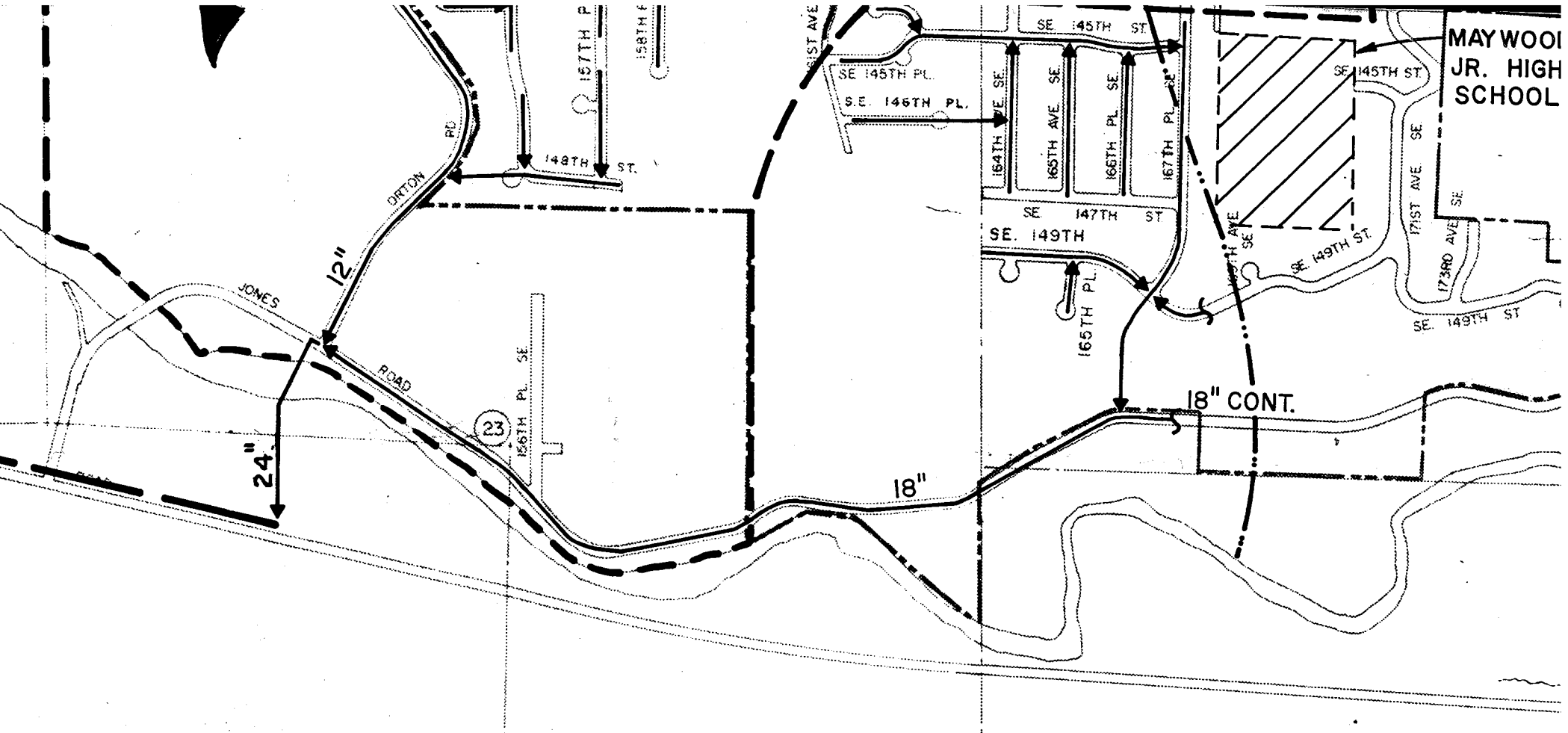
ATTEST:

Dorothy M. Owens
Deputy Clerk of the Council

VETOED
~~APPROVED~~ this 26th day of September, 1977.

King County Executive


ORIGINAL ORTON ROAD DRAINAGE BOUNDARY
REVISED ORTON ROAD DRAINAGE BOUNDARY
BRIARWOOD ELEMENTARY SCHOOL
LIBERTY HIGH SCHOOL
MAYWOO JR. HIGH SCHOOL
SE. 124TH ST.
SE. 132ND ST.
SE. 132ND PL.
SE. 130TH ST.
SE. 131ST ST.
SE. 134TH ST.
SE. 135TH ST.
SE 136TH ST.
SE. 137TH ST.
SE 138TH PL.
SE 139TH PL.
SE 142ND PL.
SE 144TH ST.
SE. 145TH ST.
SE 145TH PL.
S.E. 146TH PL.
SE 147TH ST.
SE. 149TH
SE. 149TH ST.
148TH ST.
142ND ST.
SE. 140TH ST.
SE 140TH PL.
152ND AVE. SE.
154TH AVE. SE
156TH AVE
158TH AVE. SE.
160TH AVE. SE
162ND AVE. SE.
164TH AVE. SE
169TH AVE. SE
173RD AVE
10"
12"
15"



N

KING CO. WATER DISTRICT NO. 90
REVISED ORTON ROAD DRAINAGE BASIN

0 500 1000 2000ft.

SCALE

SEPTEMBER 1975

EXHIBIT A - ITEM 2

SERVICE AREAS

The area to be served by the Comprehensive Sewerage Plan has been divided into two basic areas:

1. Immediate Service Area, which includes area within the existing Water District boundaries, and

2. Future Service Areas, which includes all areas closely related to the existing Water District boundaries which could be logically served by the Water District considering favorable topography from a gravity drainage standpoint and/or close physical proximity to future District facilities.

The combination of these two service areas will be known as Ultimate Service Area.

These three terms apply throughout this report.

The area to be served by the general overall sewerage plan has been determined primarily by considerations of topography, population and future growth potential. This area is referred to in this report as the Ultimate Service Area and is shown on Figure 1. The Ultimate Service Area encompasses some 10,600 acres of which 7,000 acres is already within the boundaries of the Water District and the additional 3,600 acres could be annexed to the District as the needs of the area dictate.

HISTORY

King County Water District No. 90 was formed August 12, 1952, to serve approximately five square miles on the relatively level upland immediately east of the City of Renton. Since then, it has grown by annexations to cover most of the upland area between May Creek and the Cedar River, plus a considerable amount of the lower slopes on the south side of May Creek, the southwest slope of

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Squak Mountain and some of the lower slopes along the north side of the Cedar River, to a total area of approximately 11 square miles. The result has been an area practically coincident with the drainage basins on the south side of May Creek and the north side of the Cedar River with the east end of the District draining toward the Issaquah Creek.

The service area of the District is the only large area immediately east of the Lake Washington-Renton-Kent area, not under the service of a city, a sewer district or a sewer-water district. The westerly boundary of the District is, except for some isolated small areas, coincident with the City of Renton.

The lower reaches of the May Creek drainage is served by the Newport Hills Sewer District on the north and the City of Renton on the south. The Issaquah Creek Basin to the east is served at its lower end only by the City of Issaquah. King County Water and Sewer District No. 108 serves the area to the south of the Cedar River opposite Water District No. 90.

The area immediately East of the City of Renton began to show signs of a period of accelerated growth soon after Water District #90 was formed. The physical and aesthetic characteristics of the land, along with relatively close proximity to Renton and Seattle, made the whole area that is surrounded by the May Creek and Cedar River ideally suited for residential development. These and other favorable factors have encouraged the development of a large number of plats of varying sizes. Over the years, many of the farm lands and pasture lands have been subdivided into smaller tracts that have become the site of many homes with individual septic tanks. However, with enactment of stricter rules and regulations by the Washington State Department of Health regarding the minimum size of a lot with septic tank, and the high cost of raw lands, many developers have found it not very economical to plat their lands into large lots, in some cases one acre or larger, which is being requested by the regulatory agencies. As a result, there has been some slow down in the overall development of the area which has become more evident in the past two years.

Having faced the poor market for plats with large size lots, stricter rules and regulations of the State Health Department and, in some instances, a definite answer of "No" to their request for building large quantities of houses with septic tanks, many developers have contacted King County Water District No. 90 and have asked for the District's assistance in getting sewerage facilities for the area.

After thorough investigation of all matters, the Board of Water Commissioners on February 20, 1968, adopted Resolution No. 184 which authorized and approved the power of the Commissioners of the Water District to ESTABLISH, MAINTAIN AND OPERATE A SEWER SYSTEM WITHIN THE WATER DISTRICT AREA. A copy of said resolution is included as a part of this report in the Appendix.

Shortly after adoption of Resolution No. 184, the District Commissioners filed an application with the State of Washington Water Pollution Control Commission and the Washington State Health Department requesting issuance of an approval and certification of necessity pursuant to the provisions of RCW 57.08.065. An order granting the above requested approval and certification was issued on June 9, 1969, and June 10, 1969, by the Washington State Health Department and the Washington State Water Pollution Control Commission respectively. A copy of these orders are included in the Appendix.

Recognizing the need for a community sewer system, the Commissioners of King County Water District No. 90, after having met all the necessary requirements of the regulatory agencies, authorized their consulting engineers to proceed with a comprehensive sewerage study which reflects not only current needs, but anticipated future needs as well.

Figure 1 shows the boundaries of the existing Water District as of the date of this report.

CHAPTER III

TOPOGRAPHY

In the planning of municipal utility systems, consideration must be given to the physical and economic characteristics of the area. Physical features which influence planning include location, topography and climate of the area. Economic factors which influence planning include industry, economic position and transportation. Together, these factors are of substantial importance in determining locations, size and extent of facilities to be planned and the ability of the area to finance the planned improvements.

The topography, that is, the ground slope and natural drainage features of the terrain, determine to a large extent, the tributary area to be served. On Figures 1 and 2, boundaries of the Ultimate Service Area were established on this basis except where existing adjacent City Limits or other existing adjacent Sewer District boundaries extended into the natural drainage patterns. In such cases, the political subdivision boundaries were followed.

Topography of the Ultimate Service Area, in general, slopes toward Cedar River on the south and May Creek on the north and both of these water boundaries slope westerly toward the City of Renton and eventually to METRO's Renton Treatment Plant. Outlying sections are interspersed with ravines which provide routes of natural drainage and desirable locations for laying main trunk sewers.

DRAINAGE BASINS

There are 11 major drainage basins included within the Ultimate Service Area with a total area of 10,600 acres. Nine of these major drainage basins basically make up the immediate service area for which lateral and trunk sewers have been planned. The overall configurations of the major individual drainage basins are shown on Figure 2, which shows the confines and the general slope of each drainage pattern.

Immediate Service Area

3. Orton Road - This drainage basin is bounded approximately as follows: By 148th Ave. S. E. to the West; by S. E. 128th St. to the North; by an irregular ridge line beginning at the intersection of S. E. 128th St. and 156th Ave. S. E. and ending at 168th Ave. S. E. (extended) and Cedar River; and by Cedar River to the South. The total area of this drainage pattern is about 980 acres, composed of relatively steep terrain.

LAND USE

Land use in the Ultimate Service Area ranges from residential growth in the drainage patterns surrounding Lake McDonald and Lake Kathleen and also drainage basins with steep terrains to light industrial and commercial in areas close to the City of Renton. Lack of adequate drainage along the Cedar River area has hindered any extensive commercial or even residential growth in this area. Most of the outlying areas are undeveloped and covered with second growth timber and, to a lesser extent, the suitable land has been cleared for agricultural use.

Residential Development

Nearly all of the area being studied is presently, or can in the future, be made suitable for residential use. Aside from being near to places of employment, Boeing Plant and the City of Renton, the view seen from most of the hillsides has attracted much of the

sewer trunks and lift stations. Facilities with a relatively short useful life or which can be replaced or expanded at a reasonable cost along with rapid population growth rates and stable economic conditions tend to favor shorter design periods. These facilities include lift station components such as pumps and motors. In planning these facilities, consideration must also be given to the ability of the consumers to pay for the improvements.

The design period for this study is twenty years for areas anticipated to be served, however, trunks have been sized for ultimate development.

LOADINGS FOR SEWERAGE FACILITIES

Sanitary, commercial and industrial sewage quantity estimates as well as ground water infiltration and surface water inflow estimates have been developed for this study. These quantity estimates are based on records from existing sewerage systems and on previous engineering studies. Capacities for facilities included in the comprehensive sewerage plan are based on these quantities.

The flow in a sanitary sewerage system is composed of commercial and industrial wastes, ground water infiltration and surface water inflows in addition to sanitary wastes. All portions of the sewerage system must be capable of carrying the peak volumes from these sources.

These peak flows may vary from 250 to 300 gallons per person per day for large areas (10,000 acres) to 450 to 500 gallons per person per day for small areas (100 acres).

Table 2 lists the estimated quantities of the various components which are included in the flow in sanitary sewers.

SANITARY WASTES

The domestic portion of the sewage flows can be estimated using water consumption data. The water consumption is very nearly equal to the domestic waste flow during periods when water is used primarily for domestic purposes; however, there is little similarity during periods when water is used for lawn and garden irrigation. In determining peak domestic flows, a peaking factor must be applied to the average water consumption figures.

If definite information and accurate water measurements are not available, the quantity of sewage may be estimated from experiences at establishments similar to that for which the new sewerage facilities are intended. The quantities listed in Table 3 from Public Health Services Publication No. 526, may be used for estimating sewage flows.

residential development that currently is taking place at a somewhat slow rate.

A major deterrent to residential development, in many otherwise desirable areas, stems from the lack of sanitary sewerage facilities. As long as there are no sanitary sewerage facilities in the area, the rate of growth of residential development will remain relatively slow. This is in part, due to drainage problems in some of the areas, but mostly stems from the fact that houses with septic tank require much larger size lots and therefore, much higher costs than the ones with sanitary sewers, which in most areas within King County are 7,200 sq. ft. When steps are taken to provide sewer facilities, it can be anticipated that many locations now considered unsuitable, either economically because of the larger lot sizes or drainagewise, will be rapidly developed by real estate and building developers.

CHAPTER V

EXISTING SEWERAGE SYSTEM

The area within Water District No. 90 is completely unsewered at the time of writing this report, however, a sewerage system is being designed to serve an elementary school located at approximately S. E. 120th Street and 148th Avenue S. E. This system upon completion, construction to be completed by October 1970, will serve, in addition to the elementary school, approximately 100 acres and will consist of Lateral Sewers, Force Main and a Package Lift Station. The Lift Station and Force Main portion of this system is designed as an interim facility and will be discharging sewage into existing City of Renton facilities until such time that the District has built its own gravity trunks intercepting this line and flowing either northerly toward Metro's future May Creek Interceptor or southerly toward Metro's Cedar River Interceptor.

Special agreements have been worked out among Metro, City of Renton, Water District No. 90 and Issaquah School District No. 411, so that only said elementary school could be served through City of Renton facilities. These restrictions, of course, could be lifted by the mutual agreement of the parties involved. A copy of the said agreement is included as a part of this report in Appendix B.

The existing sewer line (the one that is to be constructed this year) is shown as a part of the Comprehensive Plan in Chapter VII of this report.

CHAPTER VI

DESIGN CRITERIA FOR SEWERAGE FACILITIES

The development of design criteria for sewerage facilities is one of the basic requisites of this portion of this study.

The purpose of this chapter is to develop these criteria to be used in the planning of proposed facilities in accordance with the comprehensive sewerage plan set forth in this study.

These criteria include provisions for lift stations, trunk mains and lateral sewers as well as provisions for individual service connections. The criteria are based on the requirements of the various regulatory agencies and on proven and accepted practices normally used in the design and construction of sewerage facilities.

ABBREVIATIONS

A number of common technical terms have been abbreviated in this report to facilitate reading the tabulations and printed text and to avoid lengthy repetition where the same terms appear frequently. For the convenience of the reader, these terms and their abbreviations are presented here:

Acre(s)	AC
Cubic feet per second	cfs
Gallon(s)	gal
Gallons per acre per day	gpad
Gallons per capita per day	gpcd
Gallons per minute	gpm
Mean Sea Level	MSL
Million gallons per day	mgd

DESIGN PERIOD

The design period is the length of time that a given facility will provide adequate service. The period selected for a given facility is based on the economic life of the facility. Factors which influence the economic life of a facility are the useful life of the facility, cost of replacing the facility, cost of increasing the capacity of the facility, and the projected rate of growth of population served by the facility.

Facilities with a long or indefinite life and which can be expanded only at a great expense and low population growth rates tend to favor increased design periods. These facilities include

TABLE 2

DESIGN CRITERIA FOR SEWAGE FLOWS

Quantity of Sanitary Sewage (Average):	
Use Allowance for residential area flows from unauthorized connections in addition to basic sanitary flows 0%-40% as appropriate	85 gallons per perso
Population Density	
Low Density Residential Areas	4 to 6 persons per acr
Medium Density Residential Areas	6 to 12 persons per ac
High Density Residential Areas	12 to 15 persons per ac
Quantity of Sanitary and Industrial Sewage (Average)	
Light Industrial	2,000 gpad
Heavy Industrial	4,000 gpad
Commercial	37,000 gpad
Peak Infiltration and Storm Inflow	
New Systems in areas of High Ground Water & Poor Storm Drainage	
- Peak Infiltration	800 gpad
- Peak Storm Inflow	1,300 gpad
	2,100 gpad = 0.00325 c
New Systems in Areas of Average Ground Water Level & Good Storm Drainage	
- Peak Infiltration	600 gpad
- Peak Storm Inflow	500 gpad
	1,100 gpad = 0.0017 cfs

Peaking Factors for Sanitary & Industrial Sewage:

	100 Ac.	1,000 Ac.	5,000 A
Residential (10 Persons per Acre)	4.00	3.14	2.24
Light Industrial	3.20	2.70	2.00
Heavy Industrial	2.50	2.20	1.70
Commercial (Metro Study)	1.75	1.75	-

TABLE 3

SEWAGE FLOW QUANTITIES

Type of Establishment	Flow On Basis Shown
Airports	5 gpd per Passenger
Apartments-Multiple Family	60 gpd per Resident
Bath Houses and Swimming Pools	10 gpd per Person
Camp Ground with Central Comfort Stations	35 gpd per Person
Cottages and small dwellings with seasonal occupancy	50 gpd per Resident
Country Clubs	100 gpd per Resident Member
Single Family Dwellings	75 gpd per Resident
Factories (exclusive of industrial wastes)	35 gpd per Employee
Hospitals	250+gpd per Bed Space
Hotels with private baths	60 gpd per Guest
Institutions other than hospitals	125 gpd per Bed Space
Laundries, self-service	50 gallons per Customer
Mobile Home Parks	250 gpd per Space
Restaurants (toilet and kitchen wastes)	10 gpd per Patron

COMMERCIAL AND INDUSTRIAL WASTES

Commercial and industrial wastes may be estimated using water consumption data presented in the preceding section of this study. If estimates are required for large areas, special studies may be warranted. In addition to flow estimates, consideration should also be given to the possible need for pre-treatment of the waste waters prior to entering the sanitary sewers. Pre-treatment if required, is normally performed by the industry involved.

GROUND WATER INFILTRATION

The quantity of water which may infiltrate into a sewer can be estimated and will generally increase with the age of the sewer. However, the design of the sewer system and the inspection during the course of construction will have much to do with the amount of infiltration that will enter the sewer pipes. By the use of certain types of joint materials, it can be assured that pipe joints will be more effective, remain in better condition and last longer than would other types of joints.

On the basis of using rubber gaskets or other improved materials now available, the design allowance for infiltration for the regular sized pipes would be as shown in Table 4. Utilizing the data from this table and considering trunks, lateral sewers and side sewers, the design basis for ground water infiltration and storm inflow for new sewers is 600 and 500 gallons per acre per day, respectively.

Table 4

ALLOWABLE INFILTRATION
FOR VARIOUS SIZED SEWERS

Pipe Sizes (Inches)	Infiltration in Gallons per hour per 100 feet
8"	3.2
10"	4.0
12"	4.8
15"	6.0
18"	7.2
21"	8.4
24"	9.6
30"	12.0

High ground water levels and poor storm drainage facilities would cause infiltration and storm inflow rates to be higher. Estimated flows for these conditions are included in Table 2.

SURFACE WATER INFLOWS

Surface water inflows consist of storm waters entering the sewers through manhole covers and through connections from roof, footing and area drains. Although illegal, many surface water drains such as downspouts, are connected to sanitary sewers. The amount of flow from these sources is considerable (see Table 2) and must be included in design flows.

SEWAGE PROPERTIES AND CHARACTERISTICS

Sewage is a complex mixture of various kinds of dissolved materials, micro ogranisms and particulate matter. Detailed description of sewage composition and sewage strength would require identification and measurement of a large number of properties and substances. Fortunately, such a detailed evaluation of sewage composition is not required in order to establish a basis for defining disposal requirements.

Commercial and industrial wastes can be the source of materials which may have an adverse effect on sewerage facilities and may give rise to serious water pollution problems. Experience has shown that the best way to handle potentially troublesome commercial and industrial wastes is to regulate the amount and type of waste substances that may be admitted to the sewer system. Most sewage and drainage agencies, therefore, have ordinances regulating the use of their systems. An example of some of the restrictions imposed by typical sewer ordinance is shown in Table 5. In general, these ordinances require that the discharge of objectionable substances result in concentrations well below tolerance limits and receiving water standards.

TABLE 5

TYPICAL MUNICIPAL SEWER ORDINANCE
WASTE WATER RESTRICTIONS

Waste Classification	Restrictions
Flammable or Explosive Substances - Gasoline, solvents, fuel oil, etc.	Do not allow in system.
Toxic Materials	
Hazardous, Viz Cyanides, Etc.	Usually reject but may accept if adequate dilution assured at point of entry to the system.
Heavy metals, organic materials, etc.	Adequate dilution in system and/or treatment at source.

Waste Classification	Restrictions
Solid Wastes	
Trash and rubbish, metal, glass, plastics, etc.	Usually reject.
Suspended solids as from food processing, etc.	Restrict to materials that will not settle out in the sewer and to amounts that will not overload treatment facilities.
Acid Wastes	Neutralize before acceptance.
Alkaline Wastes	pH after dilution in sewer.
Fats and Grease	Usually require removal at source with grease traps; discharge concentration generally restricted to less than 100 mg/L.

DESIGN OF SEWERAGE FACILITIES

The criteria for sewerage facilities included in the following paragraphs have been used in the preparation of the comprehensive sewerage plan and will provide guidelines for future design and construction.

The State of Washington Pollution Control Commission published a guide for "Sewage Works Design" in 1963. This publication, currently being revised, contains criteria for the design of sewerage facilities and defines requirements which must be met prior to the construction of sewerage systems.

An engineering report to be submitted to the Pollution Control Commission and to the State Department of Health for review and approval is a basic requisite which should be met prior to the design of a sewerage system.

LATERAL AND TRUNK SEWERS

Sewers must be designed with sufficient capacity to carry peak flows from the tributary area at ultimate development, however, the minimum diameter of all gravity sewers should be eight inches.

The ability of a sewer to transport suspended solids contained in sewage is related to the velocity of flow in the sewer. A velocity of two feet per second is generally considered to be the minimum which will keep pipe surfaces clean and free of deposited material. Table 6 gives a minimum allowable slope for various sizes of sewers to obtain a cleansing velocity under average flow conditions.

TABLE 6

MINIMUM SLOPES FOR SEWER PIPE

Pipe Size In Inches	Slope Foot/Foot
8	0.005
10	0.004
12	0.003
15	0.0025
18-21	0.002
24-30	0.0015
36-54	0.0010

Diameters of gravity sewers constructed of concrete are determined by means of Manning's pipe friction formula, using a roughness coefficient "n" of 0.0013 and considering the pipe to be flowing 0.8 full.

FORCE MAINS AND INVERTED SIPHONS

The design of force mains and inverted siphons is predicated on the basis that they flow full and under pressure. Again, as in the case of gravity sewers, the mains must be capable of carrying the peak flow from a given area.

Proper cleaning velocities are obtained in a force main by selection of a size that will insure this with a specified pumping capacity. Inverted siphons may consist of two or three parallel lines of different sizes to obtain the desired velocities. Inlet and outlet structures provide for use of one line until the flow increases to the point where the capacity of the second line is needed. Since the design flow is either pumped or divided between parallel lines, force mains and siphons are commonly of smaller size than gravity sewers.

Diameters of force mains and inverted siphons are determined by means of the Hazen and Williams formula, using a roughness coefficient "C" of 140.

should be designed to permit interception by trunk sewers within the basins as service becomes available. Facilities for transferring sewage to adjacent drainage basins may be designed for relatively short design periods because as the gravity sewers are intercepted, the pump stations may be salvaged for relocation to other sites.

The location of the sewer lines in relation to other utilities is worth consideration, especially in the commercial areas. There will be some conflict in final sewer locations due to interference with existing conduits. In most cases, however, the sewers would pass beneath the other utilities. This is especially true in the case of water mains where it is desirable to have the sanitary sewer a minimum of three feet below the water main.

INTERIM FACILITIES

The planning for improvements included in the comprehensive sewerage plan is based on the criteria set forth in this chapter. Development of the facilities included in the comprehensive plan should be in compliance with the plan, however, interim facilities should not be discouraged.

Among the interim facilities which should be considered are:

1. Trunk sewers - Trunk sewers without sufficient capacity to provide ultimate service, should be considered for large drainage areas which are very sparsely populated and which are anticipated to remain sparsely populated beyond a reasonable design period or beyond the anticipated life of the sewers. These sewers, however, should be designed with sufficient capacities to avoid the need for duplicate facilities within a reasonable period.

2. Pump Stations - Pump stations should be designed to provide adequate service within a reasonable design period; generally about twenty years. Pumps and motors may be designed for shorter periods; however, pump station sites should be acquired with sufficient area to provide for ultimate facilities.

3. Septic Tanks - Septic tanks may be considered interim treatment facilities where soil conditions are favorable; however, their use should be discouraged whenever it is economically feasible to provide satisfactory treatment facilities.

   If the use of septic tank disposal systems is approved for new developments, the construction of "Dry Sewers" should be considered. The term "dry sewers" is used to define a system of sewers generally constructed during initial stages of a development in areas in which sewerage service is not available. These "dry sewers" are connected to sewerage systems as they are extended into these areas.

4. Drainage Basins - Sewers including pump stations and force mains to transfer sewage to adjacent drainage basins may be desired for interim periods. The gravity sewers included in such systems

CHAPTER IX

COST ESTIMATES AND STAGED CONSTRUCTION

An engineering study concerned with the problems of developing a long range program of sewerage improvements requires the preparation of cost estimates for construction of proposed facilities. It is necessary to evaluate the feasibility of various stages, or order of construction, through cost analysis and their location in the various service areas.

CONSTRUCTION COSTS

Construction costs were estimated from prices obtained from various sources, including contractors, manufacturers and suppliers of material and equipment, together with office cost-data available from bid tabulations of other similar projects. In considering these estimates, it is important to realize that changes during final design, quite posibly, could alter the totals to some degree.

Cost estimates involve a judgement factor based on experience, but construction costs may swing in a wide range because of variable factors which cannot be predicted, such as labor availability, competitive conditions, management, mechanization and many other intangibles affecting construction costs at the time the work is actually performed. Generally, actual costs cannot be known until bids are received, and even these may be subject to adjustment because of changed conditions.

The engineers use their past experience and best judgement in preparing cost estimates, but because of impossibility of predicting variable and intangible factors, cannot be and do not represent nor guarantee that the work can be performed for the estimated costs. In decision making, one must always keep in mind that an estimated cost is the engineer's best opinion - not the ultimate fact of cost.

Construction costs have shown a general upward trend over the years, as indicated by the Engineering News Record Cost Index. This index begins with a base of 100 for 1913 and has climbed to 1300 at the present time. Costs used in this report are based on a Cost Index of 1560 for December, 1975, as a major portion of the construction will not begin until that time. The estimated costs developed in this study will have to be adjusted in accordance with the index for construction subsequent to 1975. (See Figure 12 as a guide)

The estimated costs of sewers and pumping stations for the Immediate Service Area are presented in Table 7 by drainage basin and includes allowance for land acquisition taxes, engineering, legal and other overhead allowances.

The letter and number designations refer to the specific units of a trunk sewer system shown on Figure 5. Lateral sewers to serve each drainage pattern are given as a lump sum amount.

TABLE 7

PROJECTED COST ESTIMATE

FOR PROPOSED SEWERAGE SYSTEM

Unit Designation	Description	Cost
	ORTON ROAD DRAINAGE BASIN	
OR-1	650 Linear Feet of 10" Concrete Sewer, includes street restoration	$ 18,000.00
OR-2	2000 Linear Feet of 12" Reinforced Concrete Sewer, includes street restoration	63,000.00
OR-3	1950 Linear Feet of 10" Concrete Sewer, includes street restoration.	54,000.00
OR-4	1150 Linear Feet of 15" Reinforced Concrete Pipe, includes street restoration	41,000.00
OR-5	1500 Linear Feet of 10" Concrete Sewer, includes street restoration; difficult construction.	59,000.00
OR-6	1000 Linear Feet of 12" Reinforced Concrete Sewer, includes Street restoration; difficult construction.	33,000.00
OR-7	2300 Linear Feet of 24" Reinforced Concrete Sewer, includes street restoration, Cedar River Crossing and wet and difficult construction.	236,000.00
LATERALS	30,900 Linear Feet of 8" Concrete Sewer, includes street restoration.	766,000.00
LATERALS	6" Side Sewer	205,000.00
	TOTAL PROJECT COST	$1,475,000.00
	BRIARWOOD DRAINAGE BASIN	
B-1	2400 Linear Feet of 12" Reinforced Concrete Sewer, includes street restoration, clearing and moderately wet and difficult construction	$79,000.00
LATERALS	31,900 Linear Feet of 8" Concrete Sewer, includes street restoration and some difficult and wet construction.	842,000.00
LATERALS	6" Side Sewer	215,000.00
	TOTAL PROJECT COST	$1,136,000.00

PROJECT COST

As previously stated, the estimated costs presented include allowances for land acquisition, taxes, engineering, financial and legal services, interest during construction, discount bond printing and Water District overhead costs.

Land acquisition consists of rights-of-way or easements over private property for pipelines and land for pumping station. The cost of land may vary widely, depending on location of property and time of construction.

For projects consisting of trunk lateral sewers and pumping stations, an allowance of 35 to 40 percent for the above described items is generally used. In this report, 35 percent has been selected for the services and overhead which has been added to construction costs, to compute total project costs.

CHAPTER X

FINANCIAL SECTION

Prepared by
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TYPES OF BONDS AND AUTHORIZATION

Under existing State laws, water districts are empowered to issue either or both of two types of bonds - general obligation bonds and/or sewer revenue bonds.

Before incurring any indebtedness for the system of sanitary sewers set forth in the general comprehensive plan, the Board of Commissioners must submit to the voters of the district at a general or special election, a proposition to authorize the incurrence of indebtedness specifying both the type of bond and the total estimated cost. For general obligation bonds, the proposition must be ratified by 60% of the voters voting thereon and, for sewer revenue bonds, by a simple majority.

(1) General Obligation Bonds

The principal and interest on general obligation bonds is generally paid from annual tax levies on all of the taxable property within the water district. It is the intent therefore, that the facilities constructed from the proceeds of general obligation bonds be of benefit to the entire water district--such as major trunk lines, sewage treatment plants, etc.

The Board of Commissioners of the District have determined not to include, as a part of the financing program, the issuance of general obligation bonds, as, in their opinion, the District would not, due to the operation of the Municipality of Metropolitan Seattle (METRO), be installing facilities which would be considered "general" in the normal meaning of the word.

(2) Sewer Revenue Bonds

The principal and interest on sewer revenue bonds are payable from the gross operating revenues of the sewer system including, but not limited to, monthly service charges, connection charges, and assessments and interest thereon from any utility local improvement district.

The Board of Commissioners have determined that the estimated cost of installing the general comprehensive plan of sanitary sewers can best be financed through the issuance of sewer revenue bonds. Accordingly, the voters of the District will be asked to ratify the issuance and sale of not to exceed $ par value of sewer revenue bonds.

DESCRIPTION OF SEWER REVENUE BONDS ISSUED BY WATER DISTRICTS

The primary objective of water districts establishing a sewer system is to construct and operate sewage collection and disposal systems in suburban and other unincorporated areas. Proper long-range planning and basic economies dictate the design and construction of a sanitary sewer system to service the ultimate population of the area. In most of these areas, the existing density of population is such that the repayment of the high capital costs of installing the sanitary sewer systems from revenues derived solely from the collection of monthly service charges would not be feasible. To supplement the revenues from service charges, water districts are empowered to levy special assessments against properties specifically benefited by sewer construction.

Most of the sewer districts in King County have used the combined assessment and revenue procedure, not only because of low population density, but also for the following reasons:

(1) Were sewer service charges alone imposed, only improved properties (those connected to and utilizing the sewer system) pay the charges and thereby would bear the entire cost of retiring the sewer revenue bonds issued to pay the cost of construction.

(2) Levying of special assessments assumes that all properties, vacant or improved, benefit by the availability of sewer service and places a portion of the cost of the facilities constructed against those properties that would not otherwise contribute toward repayment of the cost until such time as the owners decide to place buildings thereon.

The assessments may be levied in amounts equal to a portion of or to the entire cost of the facilities then being constructed. The areas in which such assessments may be levied are called utility local improvement districts and may consist of a portion of or may contain the entire water district.

The assessments are levied against all property both vacant and improved in the utility local improvement district which will be specially benefited by the improvement.

The rates of assessment may vary in different utility local improvement districts, but once the roll has been confirmed the amounts levied are final and may not be altered. Assessments may be paid in whole or in part without interest during a 30-day prepayment period which commences when the County Treasurer advertises that the assessment roll is in his hands for collection.

The assessments or the unpaid balances are then payable in equal annual installments with interest on the unpaid balance over a period of years as determined by the Board of Commissioners but not to exceed 20 years. The unpaid balance may be paid at any time throughout the assessment period to include only the current year's interest.

Assessment principal and interest as collected is deposited directly into the Bond Fund and must be used for the sole purpose of paying interest on and principal of the sewer revenue bonds.

SEWER REVENUE BONDS OF KING COUNTY WATER DISTRICT NO. 90

The sewer revenue bonds to be issued by the District will be secured by a combination of special assessments and service charges primarily for the reasons explained above. The bonds will likely be issued in varying amounts over a period of years and, for the most part, in conjunction with the construction within a utility local improvement district. The rates of assessment may vary from one utility local improvement district to another depending upon construction cost and the amount of debt serviceable from monthly service charges to be derived within the utility local improvement district. The total amount to be assessed will be determined after the detailed engineering work has been completed and construction bids received and will likely be in an amount 100% or less of the total project cost depending on the nature of the project and upon the net amount of revenues that will become available as a result of the construction.

It is the opinion of the financial consultants that sewer revenue bonds, in adequate amounts, supported by assessments and service charges as outlined above, would be readily marketable.