

COMMUNITY FACILITIES AND SERVICES

A. GENERAL INTRODUCTION

Community facilities and services in the Sherwood Planning Area are provided by Washington County, the City of Sherwood, special service districts, semi-public agencies and the State and Federal government, (see Table VII-1). Public facilities and services include sewer, water, fire and police protection, libraries, drainage, schools, parks and recreation, solid waste and general governmental administrative services. Semi-public facilities and services are those which are privately owned and operated but which have general public benefit. They include health facilities, energy and communication utilities, and day care.

Although a small community, Sherwood has learned well the importance of adequate community facilities and services to orderly urban growth. Lack of sewer treatment capacity curtailed growth in the City in the 1970's. Planning for public facilities and services in response to growth rather than in advance of growth results in gaps in facilities and services. As population growth and density increase in the Sherwood Planning Area, greater facility and service support will be required. In recognition of this basic fact, the Plan stresses the need for provision of necessary facilities and services in advance of, or in conjunction with, urban development.

The Community Facilities and Services element identifies general policy goals and objectives; service areas and providers, problems, and service plans, and potential funding for key public and semi-public facilities and services. Park and recreation facilities are treated in Chapter 5, Environmental Resources. Transportation facilities are treated in Chapter 6, Transportation. This element was updated in 1989 to comply with OAR 197.712(2)(e).

B. POLICY GOAL AND OBJECTIVES

To insure the provision of quality community services and facilities of a type, level and location which is adequate to support existing development and which encourages efficient and orderly growth at the least public cost.

OBJECTIVES

1. Develop and implement policies and plans to provide the following public facilities and services; public safety fire protection, sanitary facilities, water supply, governmental services, health services, energy and communication services, and

recreation facilities.

2. Establish service areas and service area policies so as to provide the appropriate kinds and levels of services and facilities to existing and future urban areas.
3. Coordinate public facility and service plans with established growth management policy as a means to achieve orderly growth.
4. Coordinate public facility and service provision with future land use policy as a means to provide an appropriate mix of residential, industrial and commercial uses.
5. Develop and implement a five-year capital improvements and service plan for City services which prioritizes and schedules major new improvements and services and identifies funding sources.
6. The City will comply with the MSD Regional Solid Waste Plan, and has entered into an intergovernmental agreement with Washington County to comply with the County's Solid Waste and Yard Debris Reduction Plan, 1990.
7. Based on ~~the~~ Sewer, Water, Stormwater, and Transportation Plan updates ~~in 1989 and 1990~~, the City shall prepare a prioritized list of capital improvement projects to those systems and determine funding sources to ~~make-realize~~ the improvements ~~by the end of 1991~~ envisioned in those plans.
8. It shall be the policy of the City to seek the provision of a wide range of public facilities and services concurrent with urban growth. The City will make an effort to seek funding mechanisms to achieve concurrency.

C. PUBLIC AND SEMI-PUBLIC UTILITIES

Public utilities including water, sanitary sewer, drainage, and solid waste, as well as semi-public utilities including power, gas and telephone services are of most immediate importance in the support of new urban development. Water, sewer collection, and drainage facilities are the major services for which the City of Sherwood has responsibility. Service plans for these key services are contained in this section. The other utilities referred to above are the principal responsibilities of those agencies listed in Table VII-1. These agencies have been contacted for the purpose of coordinating their service planning and provision with the level and timing of service provision required to properly accommodate growth anticipated by the Plan.

**TABLE VII-1
FACILITY AND SERVICE PROVIDERS
IN THE SHERWOOD PLANNING AREA**

1. Public Utilities

a. Public Water Supply
City of Sherwood

b. Sanitary Sewer System
(1) ~~Unified Sewerage Agency Clean Water Services~~
(2) City of Sherwood

c. Storm Drainage System
(1) City of Sherwood
(2) Washington County
(3) State of Oregon

2. Private/Semi-Public Utilities

a. Natural Gas
Northwest Natural Gas Co.

b. Electric Power
Portland General Electric

~~e. Telephone
General Telephone and Electric Co.~~

~~d. Cable Television: Columbia Cable~~

~~ec.~~ Solid Waste: Pride Disposal Co.

3. Transportation

a. Paved Streets, Traffic Control, Sidewalks, Curbs,
Gutters, Street Lights
(1) City of Sherwood
(2) Washington County
(3) State of Oregon

- b. Bikeways
 - (1) City of Sherwood
 - (2) Washington County
 - (3) State of Oregon

- c. Public Transit
 - Tri-Met

4. Public Health and Safety

a. Police Protection

- (1) City of Sherwood
- (2) Washington County
- (3) State of Oregon

b. Fire Protection

Tualatin -Valley Fire and Rescue

c. Animal Control

Washington County

5. Recreation

a. Parks and Recreation

City of Sherwood

b. Library

City of Sherwood

6. Schools

Sherwood School District 88J

D. SEWER SERVICE PLAN

INTRODUCTION

The Sewer Service Plan of the Comprehensive Plan was updated in 1990 and is included as an appendix to the Plan, and is incorporated into this chapter. The following describes the existing sewer system, recommended improvements to the existing system, recommended expansion of the sewer system and estimated costs.

EXISTING SEWER SYSTEM

The City of Sherwood's existing sewer system is as shown on Figure VII-1. The system is located in USA's Durham South Basin which consists of two sub-basins are centered around Cedar Creek and Rock Creek, respectively, and will be referred to as the Cedar Creek basin and the Rock Creek basin throughout the remainder of this section.

The Rock Creek Basin system currently serves a residential area bounded by Lincoln Street to the west, West Sunset Boulevard to the south, Oregon Street to the north and the UGB to the east. Rock Creek Basin also contains approximately 71.2 acres of land, north of Oregon Street, which is currently zoned and developed for industrial use. The remaining northern portion of the Basin is essentially undeveloped and zoned primarily for industrial use. Flow is by gravity from south to north, eventually connecting to USA's Rock Creek trunk. This trunk then follows Rock Creek until it connects with the Upper Tualatin Interceptor which transports sewage to the Durham treatment plant.

The Cedar Creek Basin system serves the majority of Sherwood. Drainage is again from south to north and the main trunk of the system follows Cedar Creek from Sunset Boulevard under Pacific Highway continuing north until it connects with the Upper Tualatin Interceptor. From this point sewage is transported to the Durham Treatment plant.

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ANALYSIS OF EXISTING SEWER SYSTEM

The population for the City of Sherwood in the year 2008 is estimated to be 7,000 people. The 1979 Sewer Service Plan estimated a population of 10,600 people in the year 2008, and a full-development population within the Sherwood Urban Growth Boundary (UGB) of 18,900 people.

In order to accentuate any deficiencies in the existing sanitary sewer system, peak flowrates were generated based on full development or saturation of the Sherwood UGB. This analysis was used for the following reasons. Maximum design flows for sanitary sewers are far less than peak storm sewer flows. Very often sanitary sewer pipes are sized at a minimum 8-inch diameter for maintenance purposes; consequently the majority of these pipes are flowing at a minimum of their capacity. A full-development demand analysis was the most conservative and efficient way of analyzing the system for all deficiencies.

Wastewater flow criteria for the analysis was taken from USA's 1985 Master Sewer Plan Update and is based on land use designation as listed below:

**TABLE VII-2
WASTEWATER FLOW DESIGN CRITERIA
DESIGN UNIT FLOW RATE**

<u>LAND USE DESIGNATION</u>	<u>EXISTING</u>	<u>FUTURE</u>
RESIDENTIAL	75 gpcd	75 gpcd
COMMERCIAL	1000 gpad	1000 gpad
INDUSTRIAL	3000 gpad	3000 gpad
INSTITUTIONAL	500 gpad	500 gpad
PEAK ANNUAL	4000 gpad	4000 gpad

The City of Sherwood Zoning Map was used to determine the amount of acreage of each land use designation. This acreage was then applied to tributary basins contributing to their respective sewers and multiplied by the appropriate land use design unit flowrate in order to generate the total design flowrate. An average of residential densities per tributary basin was used to account for the five different residential zoning densities shown on the current City Zoning Map.

The domestic sewage flow allowance for the 1979 Sewer Plan followed the 1969 USA Master Plan value of 90 gallons per capita per day (gpcd). The updated, June 1985 USA Master Plan, has reduced this value to 75 gpcd.

In order to account for periods of maximum use, flowrates are multiplied by factors which result in peak flowrates. The 1979 Sewer Service Plan used peak factors of 3.0 for lateral sewers and 2.7 for trunk sewer lines. The 1985 USA Master Plan Update requires peak factors ranging from 1.5 to 2.0. These lower values are based on actual dry-weather flow monitoring, performed in June and

July of 1984, at points throughout the Durham Basin.

The July 1979 Sewer Service Plan used values ranging from 500 gallons per acre per day (gpad) to 700 gpad for inflow and infiltration (I&I), depending on land use designation. These values were concurrent with past EPA design standards and were based on the assumption that rehabilitation measures would remove 60 to 90 percent of excessive I&I. According to USA's 1985 Master Plan these abatement techniques proved to be ineffective. USA's review of the Durham treatment facility led to the design rate of 4000 gpad for the existing peak annual occurrence for infiltration and inflow. This value is not anticipated to decrease for the Durham basin and is therefore also used for the future design flowrates.

Two areas of special concern exist inside the current City of Sherwood UGB. Both areas are recent additions to the UGB and have not yet been assigned a land use. Rather than assume zoning designations for the areas they were both excluded from the model. Both areas can be served by gravity and neither will cause deficiencies in the system. Their service routes are discussed below.

The first area is located in the southwest corner of the UGB in the Cedar Creek Basin, between Pacific Highway and Old Highway 99W. This area can be served by line number 1 in area A (Figure VII-2). The northern half of this area may also be served by connecting to the southern most extension of line number 2 in area B. The second area is located east of Pacific Highway and north of Edy Road, in the Rock Creek Basin. The southern portion should be incorporated in line number 3 extending from Rock Creek west along Edy Road (Figure VII-2). The northern half must be served using a direct lateral to the area from the Rock Creek trunk.

RECOMMENDED IMPROVEMENTS TO EXISTING SEWER SYSTEM

The analysis of the existing system shows no size deficiencies in any of the City maintained pipes. City officials have confirmed that there are areas of surcharge in the system due to pipe under sizing. Surcharge due to blockage of the system has occurred but has since been remedied.

Improvements are recommended to the existing sewer systems main trunk lines. These improvements are required due to very slight slips which occur in the northern sections of the Rock Creek and Cedar Creek main trunk lines.

The Rock Creek trunk requires improvements from manhole number 11663, which is located at the confluence of the Rock Creek and Cedar Creek trunk lines, south to a manhole located near the Southern Pacific crossing of Rock Creek. The existing 18-inch diameter pipe has a length of 6,035 feet and an existing slope of 0.0031 feet/feet. The USA master plan recommends that a 15-inch diameter pipe be placed parallel to the existing 18-inch in order to convey future flows based on 20-year ultimate development peak flowrates. Our analysis is based on total ultimate development of the Sherwood UGB and therefore suggests that an 18-inch diameter pipe parallel the existing 18-inch at the existing slope of 0.0031 feet/feet.

The Cedar Creek Trunk presents similar slope problems along the northern trunk. USA's Master Plan breaks these into three sections but this report will combine them for simplicity. The section of sewer begins at manhole 11663, which is located at the confluence of the Rock Creek and Cedar Creek trunks, and continues south to manhole number 11752 which is 200 feet south of Edy Road and slightly west of the UGB. (see Fig.1) The entire 12,640 feet of this line is outside of the UGB, and has a slope averaging between 0.0016 feet/foot and 0.0025 feet/foot. Depending on existing slopes a parallel system will be required ranging from 18 to 30-inches in diameter.

insert Figure VII-2

RECOMMENDED SEWER SYSTEM EXPANSION

The City of Sherwood's Urban Growth Boundary includes significant areas that are currently not served by the existing sanitary sewer system. All of these areas are part of either the Rock Creek Basin system or the Cedar Creek Basin system and can be easily served by extending laterals off the respective trunk lines of each basin. These new laterals have no special priority except to serve those who require sewer service. The locations of the recommended sewers are shown on Figure VII-3.

All new sewer lines should have a minimum diameter of 8-inches for ease of serviceability. These new laterals were designed by setting the slope of the sewer pipe invert, equal to the slope of the existing ground along the sewer line path. Individual pipe slopes may be required to be less than natural ground slopes in order to serve isolated areas of low ground elevation.

The sewer expansions are listed below under the basin in which they occur. The costs are listed by pipe diameter and are in 1990 dollars. These costs are typically paid for by the land developments that create the need for the extensions. The costs include design and construction. Land acquisition may be required but those costs are not included in the estimates below.

1.	Sewer Trunk Lines		
	Cedar Creek Parallel (15"-30")	12,640LF	\$991,000
	Rock Creek Parallel (18")	6,750 LF	\$378,000
2.	Rock Creek Basin Lines (All 8")		
	Tonquin	1400 LF	\$ 47,000
	Highland/12th	3000 LF	\$100,800
	Tualatin-Sherwood	2300 LF	\$ 77,300
	Onion Flats W.	5000 LF	\$168,000
	Onion Flats E.	2900 LF	\$ 97,500
3.	Cedar Creek Basin Lines (8" except as noted)		
	Steeplechase S. (10")	4100 LF	\$160,700
	Steeplechase N. (12")	650 LF	\$ 29,100
	Steeplechase N. (10")	4100 LF	\$161,000
	E. Sunset	1300 LF	\$ 43,700
	W. Sunset	3500 LF	\$117,600
	Scholls-Sherwood W.	1200 LF	\$ 40,300
	Scholls-Sherwood E.	3100 LF	\$104,200
	BPA#	3500 LF	\$117,600

insert Figure VII-3

WATER SERVICE PLAN

INTRODUCTION

The City draws the majority of its water supply from the Willamette River Water Treatment Plant (WRWTP) in the City of Wilsonville, approximately 6 miles southeast of Sherwood. The City owns 5 million gallons per day (MGD) of production capacity in the existing WRWTP facilities. Sherwood also maintains four groundwater wells within the city limits for back-up supply. Prior to 2011, the City also purchased water from the Portland Water Bureau (PWB) through the City of Tualatin's water system and maintains an emergency connection and transmission piping associated with this supply source.

~~This is a 1988 update to the Water Service Plan element of the Sherwood Comprehensive Plan dated July, 1979.~~

The City's future water service area is comprised of five different planning areas:

1. Sherwood city limits
2. Tonquin Employment Area (TEA)
3. Brookman Annexation Area
4. West Urban Reserve
5. Tonquin Urban Reserve

Each of these areas has their own land use characteristics, approximate development timelines and existing planning information. Estimates of future growth and related water demand are developed using the best available information for each area including Sherwood buildable lands geographic information system (GIS) data, population growth projections, development area concept plans and current water demand data.

Water demand growth is projected at 10 years, 20 years and at saturation development. Estimated water demands at saturation development are used to size recommended transmission and distribution improvements. The population projections used in this analysis are for the year 2008. The following is fully described in the City of Sherwood "Water Service Plan Update," May 1988.

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~~The year 2008 population projections are significantly lower today than were anticipated in the original Water Service Plan. This population projection difference, upgrades to the City's water system, and the growth that has actually occurred since 1979, warrant an update to the 1979 Water Service Plan.~~

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~~In this update, the City's existing major water distribution lines were analyzed for their ability to deliver peak domestic and fire flows with adequate pressure to all developed areas of the City. The amount of water needed supply to meet future growth is also reviewed.~~

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~~Specific improvements are recommended to the existing water system to meet the year 2008 needs~~

~~in currently served areas of the City. Major water lines required as extensions to areas without service are also identified. The cost of all recommended and identified improvements are listed in 1990 dollars.~~

~~The amount of growth that can occur within distinct areas and neighborhoods within the City's Urban Growth Boundary without creating pressure or overall supply problems is also estimated.~~

~~1. The City's existing reservoir capacity of 2.5 million gallons (MG) is adequate to cover the needs of the City until a population of 8,200 is reached.~~

EXISTING WATER SYSTEM CONDITIONS

Pressure Zones

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~~The City's existing distribution system is divided into three major pressure zones. Pressure zone boundaries are defined by ground topography in order to maintain service pressures within an acceptable range for all customers in the zone. The hydraulic grade line (HGL) of a zone is designated by overflow elevations of water storage facilities or outlet settings of pressure reducing valves (PRVs) serving the zone.~~

~~The majority of Sherwood customers are served from the 380 Pressure Zone which is supplied by gravity from the City's Sunset Reservoirs. The 535 Pressure Zone, serving the area around the Sunset Reservoirs, is supplied constant pressure by the Sunset Pump Station, and the 455 Pressure Zone serves higher elevation customers on the western edge of the City by gravity from the Kruger Reservoir.~~

Storage Reservoirs

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~~Sherwood's water system has three reservoirs with a total combined storage capacity of approximately 9.0 million gallons (MG). Two reservoirs, Sunset Nos. 1 and 2, provide 6.0 million gallons (MG) of gravity supply to the 380 Pressure Zone. The other reservoir, Kruger Road, provides 3.0 mg of gravity supply to the 455 Pressure Zone.~~

Pump Stations

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~~Sherwood's water system includes two booster pump stations, the Sunset Pump Station and the Wyndham Ridge Pump Station.~~

~~The Sunset Pump Station is located in Snyder Park adjacent to the Sunset Reservoir complex and has an approximate total capacity of 3,770 gallons per minute (gpm). This station provides constant pressure service and fire flow to the 535 Pressure Zone.~~

The Wyndham Ridge Pump Station is located on SW Handley Street west of Highway 99W. Two 40-hp pumps supply a total capacity of approximately 1,200 gpm from 380 Zone distribution piping to the Kruger Road Reservoir.

Distribution System

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~~The City's distribution system is composed of various pipe materials in sizes up to 24 inches in diameter. The total length of piping in the service area is approximately 77.4 miles. Pipe materials include cast iron, ductile iron, PVC and copper. The majority of the piping in the system is ductile iron. The City of Sherwood's existing water system is as shown on Figure VII 4. The source of all of the City's water is from three wells. A single 2.0 million gallon reservoir is the sole source of storage and controls operating pressures throughout the City. The major pipelines that distribute the flows to the users range in size from 16 inch diameter to 6 inch diameter. Many smaller diameter lines are not analyzed because they are not relied upon for the distribution of large amounts of flow to general areas of the City. It is, however, recommended that the City continue its recent active policy of upgrading these smaller lines through the processes of annexation, development, and direct City cost sharing.~~

~~The three wells are located at the intersection of S.E. Pine and E. Willamette streets in Old Town, near Pacific Highway by S.W. Meinecke Road, and on W. Sunset Boulevard near St. Charles Way. The storage reservoir is located on high elevation ground in the southeastern portion of the City on E. Division Street. The distribution system is characterized by looped water lines in Old Town and nearby established residential areas. The water lines in the vicinity of Edy Road extend as unlooped single lines for long distances.~~

~~One small residential area bounded by E. Division Street on the north and S. Pine Street on the west in the vicinity of the water storage reservoir is in a separate pressure zone from the remainder of the City. This area is too high in elevation to rely on gravity to provide required pressures. A booster pump station adjacent to the reservoir provides the needed pressure.~~

~~Data on all the physical aspects of the water system was provided by the City of Sherwood staff. The physical system was modeled using the Pressure Pipe Network Analysis water distribution computer model.~~

~~Data on population projections were also provided by City staff. Design flow considerations were based on the information provided in the City of Sherwood's 1979 Water Service Plan.~~

ANALYSIS OF EXISTING WATER SYSTEM

Water Supply

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Sherwood's supply from the WRWTP is sufficient to meet MDD through the 10-year planning

horizon with an additional 1 mgd of capacity required at 20 years and an additional 4 mgd needed at build-out. Existing City groundwater wells provide an effective emergency supply to complement emergency storage in the City's reservoirs.

Pumping and Storage

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The City's distribution system has adequate storage and pumping capacity to meet existing service area demands through 2034. Due to significant uncertainty related to long-term growth and system expansion, minor storage and pumping deficiencies at build-out should be re-evaluated with the next Water Master Plan Update or as development warrants. Additional pump stations are recommended to serve proposed high-elevation closed pressure zones in the water service expansion areas: Brookman Annexation and West Urban Reserve.

Distribution Piping

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Sherwood's distribution piping is sufficiently looped to provide adequate fire flow capacity to commercial, industrial and residential customers. Few piping improvement projects are needed to meet fire flow criteria. Extensive large diameter mains will be needed to expand the City's water service area to supply the Brookman Annexation, TEA and West Urban Reserve as development occurs.~~Peak Domestic Flows Analysis~~

~~The total peak domestic flow rate for the year 2008 used in this analysis is 3,000 gallons per minute. The domestic flow is the combination of all residential, commercial, and industrial uses other than those for fire protection. Domestic use also accounts for summertime irrigation of lawns and landscaping.~~

~~The total peak domestic flow rate of 3,000 gallons per minute is derived from the detailed data published in the 1979 Water Service Plan and has been increased by approximately 15 percent as a conservative measure for unexpected conditions such as excessive water line leakage, high volume users, etc.~~

~~The 1979 Water Service Plan estimated the water usage by the City's commercial and industrial customers to be 30 percent of the residential use when the City's population reached 7,800 people. This percentage was used in the determination of the peak domestic flow rates in this analysis. The total peak domestic flow rate is based on a maximum peak consumption of 410 gallons per capita per day, and is consistent with the 1979 Water Service Plan.~~

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~~insert Figure VII-4~~

~~The total 3,000 gallons per minute peak domestic flow was proportioned throughout the existing developed areas of the City, based on knowledge of the amounts and types of potential development that can occur in each area. Within each area of the City the proportioned flow was concentrated at "worst case" locations so that deficiencies in the City's water system would be highlighted.~~

~~Computer models require calibration to known data to assure that they represent the physical system. Known information on the pumping capacity and characteristics of the City's three wells, including their effect on the groundwater table and the historical operation of the wells and the water storage reservoir, was used to calibrate the factors in the computer model. The computer model accurately matches the operation of the City's wells and water storage reservoir during peak use.~~

~~Peak Domestic Flows Results~~

~~The existing water system for the City of Sherwood meets the needs of the peak domestic flows in the year 2008. There are no areas requiring improvements to meet these domestic needs. The resulting operating pressures during the peak flows range from 40 to 85 psi (pounds per square inch) throughout the City. The acceptable range for water line pressures is 20 to 100 psi.~~

~~Fire Protection Flows Analysis~~

~~The flow rate required to provide adequate fire protection varies with the type of building. Single family residential requires fire flows of only 1,500 gallons per minute, whereas large industrial and commercial structures without fire sprinklers can require fire flows in excess of 4,000 gallons per minutes. Most new construction of larger structures is required to have fire sprinklers for increased fire/life safety. Fire sprinklers reduce the flow requirements for fire protection.~~

~~For a City the size of Sherwood, it can only be expected that adequate flows for one major fire at a time can be provided. The low probability of multiple major fires at one time does not warrant the major expense of providing the additional supply sources and the larger diameter pipe lines. Also, because of the expense, it is cost effective to require fire sprinklers in structures that would require excessive amounts of flow for fire protection.~~

~~For this analysis, a fire flow of 2,000 gallons per minute is used to determine the adequacy of the water supply and distribution system to provide fire flows at an adequate operating pressure. The fire flow is assumed to be concurrent in time with the peak domestic flows.~~

~~Fire Protection Flows Results~~

~~The computer model was used to simulate the need for fire flows to every area of the city. In general, the ability to adequately supply fire flows in most areas of the City is good. There are three~~

~~areas where the flows could not be delivered at desired pressures. They are as follows:—~~

- ~~-~~
- ~~—1. Edy Road Area near Tualatin/Sherwood Road.—~~
- ~~-~~
- ~~—2. Scholls Sherwood Road area north of Highway 99W.—~~
- ~~-~~
- ~~—3. Area at the southern end of E. Roy Street.—~~
- ~~-~~

~~The water lines in these three deficient areas are unlooped single lines. Additional lines were added to the computer model to assess the impact of connecting these lines to other existing water lines to form loops. Modeling results show that this improvement to the existing system is sufficient to adequately provide fire flows at adequate operating pressures. Fire flows in excess of 2,000 gallons per minute can be provided to all other areas of the City. Some areas can deliver fire flows in excess of 4,000 gallons per minute.—~~

~~Water Supply Capacity Analysis~~

~~Three wells are the sole source of water for the City. Combined, they provide nearly 2,000 gallons per minute of flow. The pressures they provide are nearly identical to the gravity pressure provided by the water storage reservoir. The pressure supply system is therefore well balanced. The three well pumps and booster pump, at the reservoir, all rely on electrical power only. There is no emergency stand by power.—~~

~~The normal operation of the reservoir and the wells is for the reservoir to supply all the needed water until the reservoir is 225,000 gallons short of being full. At this point, the wells are used to supplement supply to the users and refill the tank. Normally only one well is operating at a time unless the demand is greater than can be provided by the one well. This is a very efficient system and provides a high margin of safety during emergencies as normal operation never allows the reservoir to be less than 89 percent full. This high margin of safety is very unusual foal for communities the size of Sherwood. Many cities must pump constantly for all their water use while having little or no storage for emergencies. This excellent supply system would be considered a luxury to most small cities.—~~

~~In the event of a fire, the reservoir can supply adequate fire protection flows even if all the pumps in the wells are inoperative. The reservoir alone can provide 5,000 gallons per minute of flow for 6.6 hours and 7,000 gallons per minute of flow for 4.7 hours. Five thousand gallons per minute is equal to the year 2008 peak domestic flows and a simultaneous 2,000 gallon per minute fire flow.—~~

~~Water Supply Capacity Results~~

~~The water supply sources and the pressures they provide are well balanced and more than adequate to meet the demand needs through the year 2008. New sources of water are not necessary to provide additional quantities.—~~

~~Emergency stand by power would provide an additional margin of safety during periods of total power loss. The booster pump at the water storage reservoir is the only source of pressure for the residents in the E. Division Street and upper S. Pine Street area. During power outages, this area is without adequate water service. Stand by power is recommended for this booster pump to eliminate this potential problem.~~

~~Although the water storage reservoir provides ample volumes of water for emergencies, it is recommended that stand by power be provided at one of the wells as an added precautionary measure for extended periods of power outage. Since Well No. 3 is the City's largest well, stand by power is recommended for that well. Completion of a manually operated interconnect at Cipole Road with the City of Tualatin water system is also recommended as an additional safeguard against a catastrophic interruption in the City of Sherwood's system.~~

RECOMMENDED IMPROVEMENTS TO EXISTING WATER SYSTEM

Recommended improvements for the City's water system include proposed supply, pump station and water line projects.

Cost Estimating Data

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An estimated project cost has been developed for each improvement project recommended. Cost estimates represent opinions of cost only, acknowledging that final costs of individual projects will vary depending on actual labor and material costs, market conditions for construction, regulatory factors, final project scope, project schedule and other factors. The cost estimates presented have an expected accuracy range of -30 percent to +50 percent. As the project is better defined, the accuracy level of the estimates can be narrowed. Estimated project costs include approximate construction costs and an aggregate 45 percent allowance for administrative, engineering and other project related costs.

Capital Improvement Program

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A summary of all recommended improvement projects and estimated project costs is presented in Table ES-3 of the 2015 City of Sherwood Water System Master Plan Update. The table provides for project sequencing by showing fiscal year-by-year project priorities for the first five fiscal years, then prioritized projects in 5-year blocks for the 10-year, 20-year and Beyond 20 year timeframes. The total estimated cost of these projects is approximately \$24.6 million through FY 2034. Approximately \$19.9 million of the total estimated cost is for projects needed within the 10-year timeframe and \$5.4 million of these improvements are required in the next 5 years. Improvements are recommended to the existing water system to provide adequate fire protection capability to three areas of the City. Improvements are not necessary for year 2008 population projections. These recommendations are based upon the assumption that water lines are not required to be extended

~~into areas currently not needing services.~~

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~~The recommended improvements are shown on Figure VII 5 and are listed below. Improvements numbered 1, 2, and 3 are deemed to be of greater priority. The projects can be constructed in almost any order however. The only exception is that the Edy Road Loop Completion should precede the Edy Road to Oregon Street Loop Completion in order to provide the greatest benefit to the users along Edy Road. The costs are in 1990 dollars and include design and construction. Land acquisition may be required but those costs are not included in the estimates below.~~

Recommended Improvements to Existing Water System

1. Loop Projects

— Tualatin-Sherwood	3800 LF	\$238,000
— Scholls-Sherwood	2800 LF	\$178,500
— Murdock/Roy	600 LF	\$ 59,500
— Highland Extension	2700 LF	\$178,500
— Tualatin-sherwood Relocate	2130 LF	\$ 74,100

2. Supply Projects

— Well No. 6 (Murdock)	800' deep	\$236,500
— Reservoir Booster Pump	35 hp gen.	\$ 59,500
— Well No. 3 Standby Power	75 hp gen.	\$119,000
— Cipole Road Intertie with City of Tualatin		\$ 23,400 (50%)

3. 4 Inch Waterline Replacements

— Old Town (8")	1600 LF	\$ 76,800
— Ladd Hill (12")	1300 LF	\$ 92,300
— Meinecke/99W (8")	2000 LF	\$ 96,000
— W. Sunset (10")	1500 LF	\$ 88,500

4. 6 Inch Waterline Replacements (all 8")

— Old Town	1600 LF	\$ 76,800
— Lower Lincoln	1000 LF	\$ 48,000
— Lower Roy	1300 LF	\$ 62,400
— Oregon	1300 LF	\$ 62,400
— Upper Washington	1300 LF	\$ 62,400
— Gleneagle	3000 LF	\$144,000
— Upper Roy	900 LF	\$ 43,400

5. Other Waterline Extensions

— 12 Inch	18,500 LF	\$1,313,500
— 10 Inch	32,800 LF	\$1,935,200
— 8 Inch	25,400 LF	\$1,219,200

Beyond these recommended improvements, the City should continue its existing undersized water lines replacement program.

~~**RECOMMENDED WATER SYSTEM EXPANSION**~~

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~~The City of Sherwood's Urban Growth Boundary includes significant areas that are currently not served by the existing water system. Major water lines are required for expansion of the existing water system into these areas as they develop, and are as shown on Figure VII 5. These line extensions have no special priority except to serve those who require the water service. The locations of the recommended waterlines on Figure VII 6 are schematic only and generally should be conformed to an updated City Transportation Plan for maximum economy and efficiency.~~

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~~The critical element for expanding the water system in segments is to not construct unlooped single lines for long distances. The maximum length will vary depending on the diameter of the water line and the elevation of the site being served. It would be ideal if unlooped line extensions did not extend so far as to not be able to provide 2,000 gallons per minute of flow with an available end operating pressure of 20 psi. It is recommended that the minimum City of Sherwood standard for water line size be eight inches in diameter for all public lines.~~

| ~~insert Fig. VII-5~~

~~As noted on Figure VII 5, the existing booster pump near the water storage reservoir may need modification as the service area of that pressure zone is expanded. Also noted is another area (#1) at the western edge of the Urban Growth Boundary just north of Pacific Highway and along Elwert Road that will require a booster pump and its own pressure zone water lines. This is a high elevation area where the 1979 Water Service Plan identified the location for a future water storage reservoir.~~

~~-~~

~~The 1979 Water Service Plan recommended water line loop expansions outside the Sherwood Urban Growth Boundary. These have been re-routed in this update to be completed within the Urban Growth Boundary. The number of major loops have been reduced from the 1979 Water Service Plan and the area each loop serves increased to provide a more cost efficient future water system.~~

~~-~~

~~The costs of these smaller pressure zone expansion improvements are difficult to estimate. These costs are relatively small compared to the \$4.5 million cost to expand the water system in all the other areas. For the purposes of this report, a cost of \$500,000 is used, making the entire total system expansion cost \$5,000,000.~~

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| ~~Insert Fig VII-6~~

F. DRAINAGE PLAN

INTRODUCTION

The Sherwood Planning Area is located within the Willamette River-Tualatin River Basin as identified in the Portland-Vancouver Metropolitan Area Water Resources Study (PMAWRS). The Cedar Creek and Rock Creek sub-basins channel surface runoff to the Tualatin River just north of the Planning Area. Within these sub-basins there exists considerable variation in slope. A highland area known as Washington Hill has some erosion and sedimentation potential. High groundwater and poorly drained soils in portions of the northern half of the Planning Area will require measures to regulate excavation and site drainage.

In March 1989, DEQ issued draft rules for storm water quality control to all jurisdictions in the Tualatin River sub-basin. The City of Sherwood is required to comply with the rules and participate in the development of a Surface Water Drainage Management Plan for the region. When the Plan is completed and adopted this section will be amended accordingly.

Objectives

1. Comply with DEQ Storm water quality control rules until completion of a Drainage Management Plan.
2. Cooperate with United Sewerage Agency, Washington County, and DEQ in the preparation of a Drainage Management Plan.

Findings

1. A storm drainage plan for the City's urban growth area has been developed and is illustrated on Figure VII-7. Major storm sewers are recommended for construction in accordance with the Plan; minor storm sewers are not shown on the proposed storm drainage plan. This Plan will be updated upon completion of the regional Drainage Plan.
2. Cedar Creek, Rock Creek, and Chicken Creek shall continue to be the City's primary conveyance systems for storm runoff.
3. Existing flood areas have been identified and are analyzed and described in Section VII Background Data and Analysis. It is anticipated, all but one of the problem areas will be eliminated by implementation of the Plan. An area of flooding at N.W. 12th Street and Highway 99W remains to be resolved by construction of a minor storm sewer, which is not shown on the Plan.

4. The rational method formula was used to estimate runoff to proposed storm sewers. This method has a tendency to overestimate design flows when applied to large basins. Runoff coefficients used in the rational method are predicted on the City's Comprehensive Plan. During final design of storm sewers, actual development within the basin should be reviewed to verify previous assumptions in selection of a runoff coefficient.

5. Cost estimates for proposed storm sewer improvements have been prepared, based on 1980 construction costs and increased in 1990 by 1.25%, and on Engineering News Record (ENR) index of 3264. These estimates are presented in Table 2 of the Appendix.

6. Design of relief culverts in Cedar Creek and Rock Creek may significantly alter hydraulic control sections used by the U.S. Army Corps of Engineers to establish water surface elevations and limits of the flood plain as set forth in Flood Insurance Study, City of Sherwood, Oregon, and provided to the City in preliminary draft, dated December 17, 1980. Design of relief culverts should be coordinated with the U.S. Army Corps of Engineers to insure integrity of their flood insurance study.

Implementation

1. The City will endeavor to establish a source of revenue to finance the cost of storm sewer construction, acquisition of lands along creeks, maintenance of storm sewers and waterways, and administration of the storm plan in accordance with the regional Surface Water Drainage Management Plan.

2. Until user fees are in effect, the City should obtain waivers of remonstrance to future storm drainage improvements projects from all property owners wishing to develop their land, and the City should also require all developers to provide adequate storm sewers to serve their property as well as those properties that would naturally drain to the proposed storm sewer.

SOLID WASTE

Solid waste disposal is a regional concern requiring regional solutions. The City of Sherwood recognizes MSD's responsibility and authority to prepare and implement a solid waste management plan and supports the MSD Solid Waste Facilities Model Siting Ordinance and will participate in these procedures as appropriate. There are no landfills in Sherwood.

The Model Siting Ordinance will be incorporated into this Plan when approved by METRO. In addition, the City conducted extensive hearings on solid waste incineration in 1990 and determined incineration is generally not a form of solid waste disposal environmentally compatible in the community except in limited circumstances. Therefore, solid waste incineration is generally prohibited by this Plan.

Electrical Power

The Sherwood Planning Area is well served by major power facilities. Portland General Electric Co. (PGE) runs and operates a major regional sub-station in the northern portion of the Planning Area and has a network of major transmission lines which cross the Planning Area. Minor sub-station siting and construction, if needed in response to development, will be coordinated with PGE.

Natural Gas

The Sherwood Planning Area is served by Northwest Natural Gas Co. (NNG) lines. The existing system consists of a 6" high pressure line extended to the Planning Area via Tualatin-Sherwood Road, So. Sherwood Blvd. and Wilsonville Road. The distribution system is adequate to serve immediate development. NNG reports that the 6" main will be adequate to serve growth projected by the Plan with new lateral line extensions and attention to proper "looping" of existing lines.

Telephone

General Telephone services the Sherwood Planning Area. Planned improvements should have the capability of handling projected growth demands in the Area.

H. SCHOOLS

INTRODUCTION

The Sherwood Planning Area is wholly contained within Sherwood School District 88J. Although the City of Sherwood is the only currently urbanized area within the district, district boundaries include approximately 44 square miles and parts of Washington, Clackamas, and Yamhill Counties. The District is currently predominately rural but, by the year 2000, the Sherwood Planning Area will contribute most of the total student enrollment.

FUTURE ENROLLMENT/FACILITY NEEDS

The School District completed a School Enrollment Study (Metro Service District Analysis) in the Fall of 1990. Revisions were made in the Spring of 1991. The study data suggests that school enrollments will be increasing sharply in the coming years. The growth assumption is supported by record-setting residential building permit issuance during 1990. Major arterial road improvements between I-5 and 99W will also cause further growth and development.

ELEMENTARY AGE STUDENTS (K-5)

J. Clyde Hopkins Elementary School has a capacity to house 600 students. Currently, 670 students are enrolled in grades K-5. Three double portable classrooms and one single portable classroom are utilized to address the growing elementary age population.

INTERMEDIATE AGE STUDENTS (6-8)

Approximately 300 students are enrolled in grades 6-8. The Intermediate School building capacity is 400 students. This capacity can be accessed by relocating District office services, which occupy a four classroom wing of the building.

HIGH SCHOOL AGE STUDENTS (9-12)

Sherwood High School has a capacity of 500 students. Approximately 420 students are currently enrolled. No major housing issues exist in this 1971 constructed facility.

SCHOOL FACILITY PLANNING

The School District is preparing to undertake a detailed facility development plan. The most immediate need for the District is to expand housing of elementary age school children (K-5). During the Fall of the 1990-91 school year, the District completed the purchase of a new elementary school site located within the City limits of Sherwood. The District also owns a school site (purchased in 1971) in the proximity of the Tualatin portion of the school district.

The intent of the District is to seek voter approval of a bond measure to address short and long-term housing needs. The measure is planned to be submitted in the Fall of 1991 or the Spring of 1992 in order to construct an additional elementary school.

I. PUBLIC SAFETY

POLICE PROTECTION

The City of Sherwood, Washington County and the State Police co-ordinate police protection within the Planning Area. In 1989 the Sherwood Police Force consisted of five officers. In order to meet future demand it is anticipated that the department will need additional patrolmen proportional to the projected increase in population. The State formula for City police protection is one officer per 500 people. The police force should expand accordingly.

FIRE PROTECTION

The Planning Area is wholly contained within the Tualatin Valley Consolidated Fire and Rescue

District. One engine house is located within the City. The District feels that present physical facilities will be adequate to serve the projected year 2000 growth in the area with some increase in manpower and equipment. The District currently employs a 5-year capital improvement planning process which is updated annually. The City will co-ordinate its planning with the district to assure the adequacy of fire protection capability in the Planning Area.

J. GENERAL GOVERNMENTAL SERVICES

As a general purpose governmental unit, the City of Sherwood intends to fulfill its responsibilities in the principal areas of general administration, planning, public works, and library services. With expected growth in Sherwood, additional manpower and facilities will be required.

1. Manpower Needs

In 1989 there are currently seventeen (17) City staff in general governmental services. A review of cities which have reached Sherwood's projected five and twenty year growth levels indicate that new staffing will be needed proportional to population increases in most departments. Using this assumption a full-time staff of 15-20 persons will be required by 1985 and a staff of 20-40 will be needed by the year 2000. Most critical immediate needs are in the area of clerical staff to support existing departmental work loads.

2. Space Needs

The City offices, water department, police department, planning department and public works, are currently housed in a remodeled turn-of-the-century house. Although the structure is significant historically and should be saved, it may not meet the long term functional or space needs of a City Hall.

In 1982 the Senior and Community Center was built and provides meeting space for the City Council and Planning Commissions.

K. HEALTH FACILITIES

The local health system is linked to a number of organizations and institutions that can and do affect how it will develop. The latest planning legislation P.L. 93-641 and its recent amendments has placed Health care delivery systems planning are under the auspices of the State Certificate of Need laws and the Federal Health System Agency (HSA) planning regulations. Sherwood is located in the six county Northwest Oregon Health Systems Agency (NOHS) which is charged with reviewing new service proposals, expenditures involving public funds and the development of a health system plan for the area. The first HSA plan was adopted in 1978. State agencies administer HSA regulations. NOHS established subdistricts within the six county service area. Sherwood is located in the south-rural sub-district (see Figure VII-8). The only hospital located in the sub-district is Meridian Park Hospital in Tualatin.

Sherwood is served by various Metropolitan area hospitals depending on local physician affiliations. The City currently has only one doctor with offices in the Planning Area. St. Vincent's Hospital in Beaverton has expressed interest in establishing a satellite clinic in Sherwood.

The City will encourage the decentralization of Metropolitan health care delivery to assure that a broad range of inpatient, outpatient and emergency medical services are available to Sherwood residents. To that end the City will support the location of a St. Vincent's Satellite Center in Sherwood and encourage the appropriate expansion of Meridian Park facilities to meet the growing needs of the Planning Area.

L. SOCIAL FACILITIES AND SERVICES

A broad range of social services will be needed in the Planning Area to serve a growing urban population. Sherwood will continue to depend on metropolitan area services for which the demand does not justify a decentralized center. Multi-purpose social and health services and referral are offered by the Washington County Satellite Center in Tigard. The City will encourage the continued availability of such services.

Sherwood is located in Region 8 of the State Department of Human Resources Service Area and benefits from that agency's services. State services are administered through the County's Washington County office located in Hillsboro. In addition to public social service programs, many private organizations serve the Sherwood area.

The City is particularly interested in locating a multi-purpose social and health service referral agency in Sherwood so that residents of Sherwood would be able to get timely information on the available services. The City also supports the development of a Comprehensive Social and health services delivery plan for the Planning Area to identify gaps in needed services and develop an ongoing strategy for their provision. Of particular concern are day care and senior citizens services.

Day Care

A growing need exists for day care. State standards for the establishment of day care centers are supplemented by City standards. Currently day care has been carried on by churches and small home operations. The City recognizes and supports the proper siting and housing of day care services.

Senior Citizens Services

With an increasing proportion of the Planning Areas population reaching the age of 60, Sherwood will require additional specialized services and facilities for senior citizens. The City was awarded a grant from HUD for a Senior Citizen Community Center was completed in 1982. Community Center functions will be carried out under the authority of the City. It is the intent of the City that the Center be the focus for the Community activities requiring meeting and multi-purpose areas with particular emphasis on Senior Citizens programs and activities.