

CHAPTER 10: WATER SUPPLY AND DISTRIBUTION

INTRODUCTION

A Comprehensive Water Supply and Distribution Plan for the City of Dayton has been developed to meet the anticipated near term and ultimate needs of the Dayton municipal water system. The plan identifies the anticipated water facilities and infrastructure proposed to serve Dayton through the ultimate build-out. The plan presents an “ultimate system” and there is flexibility for Dayton Officials and staff to make adjustments in the future that will benefit Dayton as it continues to grow. This chapter is a summary of Dayton’s Comprehensive Water Supply and Distribution Plan.

Appendix C is the Department of Natural Resources-Division of Waters and Metropolitan Council Water Supply Plan (Emergency and Conservation Plan) from the Comprehensive Water Supply and Distribution Plan. This attachment includes details of the Water Supply System Description and Evaluation, Emergency Response Procedures, Water Conservation Planning, and Comprehensive Plan Requirements.

GROWTH

Dayton’s population has increased from approximately 2,600 in 1970 to about 5,013 today. Existing water service has been provided to the Historic Village, Nature’s Crossing development, and Wicht Industrial Park development. The remainder of the City obtains water from private wells.

In 2007, the City started construction of a water distribution system to serve residents in the northeast area of Dayton. The northeast Dayton system includes a well and a 500,000 gallon elevated storage tank and will be operational in the fall of 2008.

In March of 2005, the City of Dayton adopted a resolution and an ordinance regarding the adoption of a Growth Management Policy which limits the number of building permits the City of Dayton will issue each year to 2010. This Growth Management Policy is being revised congruently with the 2007 update to the Dayton Comprehensive Plan to extend beyond 2010. Table 10.1 – Served Population Projections shows the Metropolitan Council projections, the City’s projections based on the current Growth Management Policy, and estimated projections for a potential revised Growth Management Policy.

The 2007 Water Supply and Distribution plan allows for 300 units per year to be served. The revision to the Growth Management Policy will eliminate the 300 units per year maximum. The expected served population and the water use projections should be revised accordingly if at any point the City wishes to permit more than 300 units in a given year.

Table 10.1- Served Population Projections

YEAR	METROPOLITAN COUNCIL PROJECTIONS	CITY PROJECTIONS UNDER CURRENT GROWTH MANAGEMENT POLICY	CITY PROJECTIONS WITH POTENTIAL REVISED GROWTH MANAGEMENT POLICY
2010	2,615	3,118	8,434
2020	17,188	10,318	26,213
2030	27,400	17,518	35,140

EXISTING FACILITIES

The City of Dayton presently obtains its water supply for the northwest portion of Dayton from a deep well (Historic Village Well No. 1) in the FIG aquifer system with a capacity of 300 gallons per minute (gpm). Pressure in the water distribution system is provided by a hydro-pneumatic tank with a water capacity of 2,000 gallons. The facility includes chemical feed equipment that provides chlorination and fluoridation. Polyphosphates are added to control iron and manganese. The Historic Village well serves approximately 120 units.

The Recommended Standards for Water Works (Ten States Standards) place several limitations on hydro-pneumatic systems. Systems should serve no more than 150 units; the minimum tank size should be 10 times the well capacity; and well capacity should be 10 times average day demand. Therefore, with a 2,000 gallon tank, the well pump should be 200 gpm or less, and corresponding average day demand should be less than 28,800 gallons per day (gpd). The 2001 Historic Village Water Supply Plan projected 2005 to include 200 units and a 50,000 gpd average day demand. However, the Historic Village has not grown at the projected rate.

The City of Dayton is currently constructing another deep well (Northeast Dayton Well No. 2) in the FIG aquifer system with a capacity of 800 gpm. A 500,000 gallon elevated storage tower is being constructed with the system to provide pressure. Fluoride and chloride treatment will be provided through chemical feed equipment. Polyphosphates will be added to control the iron and manganese levels.

COMPUTER MODEL

A hydraulic analysis of Dayton's ultimate water supply and trunk distribution system was conducted using computer modeling software, simulating the system's response to average and peak demands, tank refill, and fire fighting scenarios. Each condition creates different responses in the water system. The modeling and its results help to identify, gauge, and respond to conditions that could result in poor water system performance.

WATER SUPPLY/DEMAND

Projected average and maximum day water demands are shown in Table 10.2 – Projected Average and Maximum Day Water Demands for various time horizons. Average day demands are used for estimating required storage capacity. Maximum day water demands are used for sizing supply facilities. Maximum day demands for Year 2030 build-out and for the comprehensive study areas are estimated to be 7.3 Million Gallons Per Day (MGD) and 19.MGD, respectively. The per capita demand in the ultimate system decreases due to the assumption that the City develops and successfully implements a water conservation plan.

The water supply for the City of Dayton, in accordance with the Comprehensive Water Supply and Distribution Plan is as follows:

SOUTHWEST

Southwest Dayton is identified as the area located west and south of Elm Creek Park Reserve and Diamond Lake. This area will be served by the

Table 10.2- Projected Average and Maximum Day Water Demands

YEAR ENDING	SERVED POPULATION	AVERAGE DAY PER CAPITA DEMAND (gpcd)	AVERAGE DAY DEMAND (MGD)	MAXIMUM DAY PER CAPITA DEMAND (gpcd)	MAXIMUM DAY DEMAND (MGD)
2005	310	71	0.02	265	0.08
2010	3,118	160	0.5	353	1.1
2020	10,318	165	1.7	417	4.3
2030	17,518	166	2.9	417	7.3
Ultimate Build-Out	57,660	132	7.6	335	19.3

existing connection to the Maple Grove water system. Maple Grove has agreed to provide Dayton with water in sufficient quantity to meet an average day demand not to exceed 2.8 MGD and a maximum day demand of 5.0 MGD. Based on a maximum day per capita demand of 350 gpcd, this is sufficient to serve 14,200 people. Maple Grove may be willing to increase these limits in the future depending on their ultimate water needs. For all of Dayton the 2020 service population is 10,318. Therefore, water supply from Maple Grove should be adequate beyond 2020.

The ultimate maximum day demand for Southwest Dayton is projected to be 9.5 MGD if Dayton develops in accordance with this plan. Therefore, Dayton must provide an estimated 4.5 MGD of additional supply in Southwest Dayton to satisfy the "ultimate" peak demand. This translates to 3,130 gpm of pumping capacity. At a projected 1,050 gpm well capacity, this demand requires 3 wells plus 1 as stand-by totaling 4 wells.

NORTH

The ultimate maximum day demand for North Dayton is anticipated to be 9.8 MGD if Dayton develops in accordance with this plan. This equates to 6,800 gpm of pumping capacity. At an estimate 850 gpm well capacity, this would require 8 wells plus one 1 stand-by totaling 9 wells.

Dayton's north well field is to be located in the center of northern Dayton near Zanzibar Lane along North Diamond Lake Road (County Road 144). Northeast Dayton Well No. 2 is currently being constructed with the Northeast Dayton Areas 1-6 Street and Utility Improvements Project. Future wells including Northeast Dayton Well No. 2 can be connected to a potential water treatment plant planned to be located near Zanzibar Lane and County Road 144.

SOUTHEAST

Southeast Dayton located east of Elm Creek Park Reserve and south of Elm Creek Road will be served by the City of Champlin. This is provided for by the Joint Powers Agreement between the Cities of Champlin and Dayton.



TREATMENT

The iron concentration in the Historic Village well raw water was measured at 0.55 mg/L. The manganese concentration in the well was measured at 0.14 mg/L. The results exceed the secondary (aesthetic) standards for iron and manganese. While these levels of iron and manganese do not pose a health problem, they can present problems with aesthetics (appearance and taste). They can also increase system maintenance, causes staining of laundry and fixtures, clogging of meters and services, as well as other deleterious effects. Customer complaints can be minimized by frequent flushing and cleaning of lines in problem areas.

...it is recommended that the supplemental supply provide a water quality consistent with the Maple Grove supply.

Maple Grove is providing treated water to southwest Dayton up to the 2.8 MGD average day demand (5.0 MGD maximum day demand) currently allowed in the contract. If Dayton exceeds the capacity Maple Grove is willing to provide, it is recommended that the supplemental supply provide a water quality consistent with the Maple Grove supply. The wells necessary will be either screened wells drilled into the glacial drift, or bedrock wells drawing from the Franconia-Ironton-Galesville (FIG) formation. Water drawn from both the drift and FIG will likely contain at least trace amounts of iron and/or manganese. It is not known, however, if levels will be high enough to warrant treatment of the supplemental supply in southwest Dayton.

In North Dayton, treatment of the source water will be a decision based on the community's perception of the aesthetic quality of the water, desire to improve the aesthetic quality, and the willingness to pay for treatment options. In the event treatment is provided to North Dayton, it is possible to serve a portion of Southwest Dayton with treated water from North Dayton if it is considered during the design.

The water mains have been located and sized with the assumption that all future wells will eventually pump to water treatment plants. Determining the requirement for treatment will eventually need to be made. The location of it is of critical importance to ensuring that a trunk water main is effectively located and efficiently sized.

STORAGE

Water storage facilities serve several purposes in a water system including the storage of water for emergency conditions and providing capacity to meet peak demands which exceed the capabilities of the supply facilities. They also help to maintain constant system pressure and provide for smooth pumping operation by minimizing the starting and stopping otherwise necessary to keep up with varying customer demands.

The only operating available storage is the 2,000 gallon pneumatic tank serving the Historic Village. Projected minimum storage requirements are presented below. Proposed water storage locations

are noted in Table 10.3 – Recommended Locations for Water Storage Reservoirs as shown on the Water Supply and Distribution Map can be found in the DNR Water Emergency and Conservation Plan (Appendix C).

The interim northeast elevated tank is currently under construction with the Northeast Dayton Areas 1-6 Street and Utility Improvement Project and will be operating in the fall of 2008.

...additional storage should be provided at or near proposed treatment plant locations.

The ultimate storage required to service North and Southwest Dayton will be dependent on the supply needed to serve the ultimate development. In accordance with this plan and the ultimate water demand is estimated to total 7.6 MGD. For example, the interim 0.5 MG elevated storage is being constructed based on existing development in northeast Dayton. In the future, dependent on many factors, additional storage can be provided at other locations based on further review. It is assumed that additional storage will be provided at each water treatment plant. If water treatment is not provided and growth occurs as identified in this plan, additional storage should be provided at or near proposed treatment plant locations. As stated previously, these decisions can be addressed in the future depending on Dayton's growth and whether treatment is provided or not.

Table 10.3- Recommended Locations for Water Storage Reservoirs

SITE	CAPACITY (MG)	COMMENTS
Southwest Elevated Tank	1.50	
SW Water Treatment Ground Storage or Storage Tank in Maple Grove	2.25	
Northeast Elevated Tank	0.5* 1**	Pineview Lane adjacent to Elm Creek Park (constructed)
Northwest Elevated Tank	1.00	Along 152nd Avenue midway between Brockton Lane and Lawndale Lane
North Water Treatment Plant Ground Storage	1.85	
Total	7.60	
* Interim		
** Ultimate		

2020 CAPITAL IMPROVEMENTS —

The recommended improvements to meet Dayton's estimated Year 2020 trunk water supply and distribution needs will cost approximately \$14.7 million dollars (excluding costs paid to Maple Grove and treatment). These improvements include:

- 4 new wells and pump houses for North Dayton,
- 2 interconnections with the Maple Grove distribution system,
- 3 new storage reservoirs, and
- Approximately 28 miles of trunk distribution system improvements.

ULTIMATE WATER SYSTEM —

The improvement program for Dayton's ultimate trunk water supply, storage, and distribution system is estimated to cost an additional \$22.3 million dollars (excluding costs paid to Maple Grove and treatment). The ultimate system shown on the map in the back of this report consists of the near term improvements plus the following:

- 7 new wells to serve the growth of the City,
- 2 new standby wells for redundancy,
- An additional 2 ground storage tanks (located at the treatment plants), for a total of 7.6 MG of storage at 5 storage locations,
- Approximately 35 miles of additional distribution mains, and
- Trunk water distribution main.

