

The reliable booster pumping capacity evaluations for the current design maximum day demand and the 2040 projected maximum day demand are summarized in Table 5-2 and Table 5-3, respectively. For each pressure zone, the tables summarize the maximum day demand requirements and the required reliable booster pumping capacity. The table also illustrates the current available reliable booster pumping capacity and identifies the deficiency in reliable booster pumping capacity if one exists.

As summarized in the tables, Appleton has adequate reliable booster pumping capacity to meet existing and projected 2040 maximum day demands in the Ridgeway Pressure Zone and North Pressures Zone.

## 5.2 Water Storage Analysis

### 5.2.1 Water Storage Needs

In addition to providing water for fire protection, system storage is used as a “cushion” to equalize fluctuations in customer demands, establish and maintain water system pressures, provide operational flexibility for water supply facilities, and improve water supply reliability. The primary criteria used in this study for evaluating storage volume needs include average and peak demands, water supply capacities, and fire protection needs.

In general, storage facilities should be adequately sized to provide sufficient quantities of water for fire protection on days of maximum customer demands. Peak hour demands, and reliable supply capacities will change as the community grows and improvements are implemented; however, generally storage requirements for fire protection do not change over the planning period (as noted later in this section the North Pressure Zone storage requirements may change if industrial growth occurs).

Figure 5-2 illustrates general categories of system storage which are described as follows:

**Operating Storage:** Operating storage is provided to allow for the daily fluctuation of water in storage tanks. Operating storage is typically used and replenished throughout the day, thus allowing for tank turnover. Typically, 10 to 15 percent of total storage is designated as operating storage. In some instances, it may be desirable to provide additional reserve operating storage for other purposes. Additional storage may also be desired to take advantage of off-peak electrical rates for pumping

**Peak Hour Equalization Storage:** As customer demands exceed supply capacities during peak hour conditions, the excess demands must be met by depleting available storage. The amount of storage depleted is referred to as equalizing storage for peak hour requirements.

**Fire Protection Storage:** Storage should also be available for fire protection purposes. To assure a reliable supply for fire protection, this reserve storage should not be utilized to meet peak hour requirements (equalization storage).

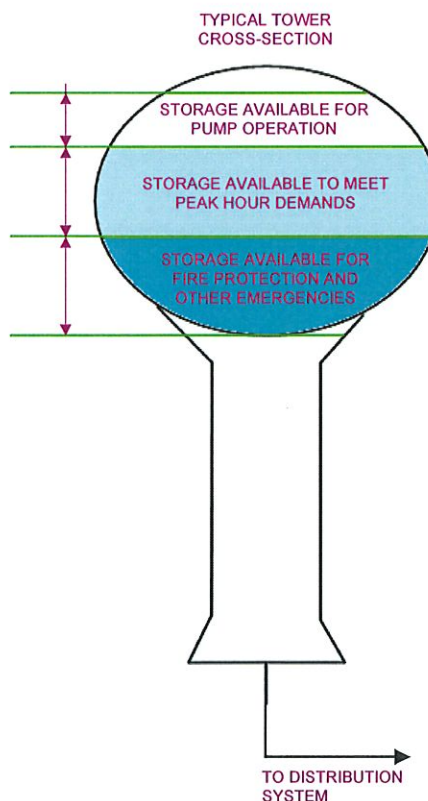


FIGURE 5-2: DISTRIBUTION SYSTEM STORAGE REQUIREMENTS

**TABLE 5-8: EXISTING STORAGE REQUIREMENTS BASED ON OPERATIONAL STORAGE**

|  | <b>Main<br/>Pressure<br/>Zone</b> | <b>Ridgeway<br/>Pressure<br/>Zone</b> | <b>North<br/>Pressure<br/>Zone</b> |
|--|-----------------------------------|---------------------------------------|------------------------------------|
| <b><u>SUPPLY REQUIREMENTS</u></b>  |                                   |                                       |                                    |
| Design Average Day Demand (gpm)  | 6,400                             | 850                                   | 230                                |
| Design Maximum Day Demand (gpm)  | 10,370                            | 1,370                                 | 370                                |
| Design Peak Hour Demand (gpm)  | 11,740                            | 1,700                                 | 600                                |
| Present Reliable Supply Capacity (gpm)   | 15,300                            | 2,500                                 | 1,900                              |
| <b>Reliable Supply Capacity in Excess of Maximum Day Demand (gpm)</b>  | <b>4,930</b>                      | <b>1,130</b>                          | <b>1,530</b>                       |
| <b>Reliable Supply Capacity in Excess of Peak Hour Demand (gpm)</b>  | <b>3,560</b>                      | <b>800</b>                            | <b>1,300</b>                       |
| <b><u>STORAGE REQUIREMENTS</u></b>   |                                   |                                       |                                    |
| Peak Hour Equalizing Requirements (gallons) <sup>1</sup>   | 699,000                           | 166,000                               | 62,000                             |
| Optimum Fire Protection Needs (gallons) <sup>2</sup>   | 630,000                           | 630,000                               | 450,000                            |
| Operational Storage (gallons; 15% of Total) <sup>3</sup>   | <u>235,000</u>                    | <u>141,000</u>                        | <u>91,000</u>                      |
| <b>Total Optimum Storage Requirements (gallons)</b>  | <b>1,564,000</b>                  | <b>937,000</b>                        | <b>603,000</b>                     |
| <b>Available Operational Effective Storage Capacity (gallons):</b>   |                                   |                                       |                                    |
| Matthias Tower (0 MG peak hour; 0 MG fire flow)  | 0                                 |                                       |                                    |
| Glendale Tower (0.032 MG peak hour, 0.415 MG fire flow)  | 447,200                           | Ridgeway<br>Tower                     | North<br>Tower                     |
| North Reservoir (0.46 MG peak hour, 0.12 MG fire flow)   | 581,700                           | 256,000                               | 471,000                            |
| Lindbergh Standpipe (0.077 MG peak hour, 0.14 MG fire flow)  | 216,900                           |                                       |                                    |
| <b>Total Operational Effective Storage Capacity</b>  | <b>1,245,800</b>                  | <b>256,000</b>                        | <b>471,000</b>                     |
| <b>Subtotal Capacity Required (gallons)</b>  | <b>318,200</b>                    | <b>681,000</b>                        | <b>132,000</b>                     |
| Less Excess Maximum Day Reliable Supply Capacity for Fire Protection <sup>4</sup>  | 630,000                           | 203,400                               | 275,400                            |
| Less Excess Maximum Day Reliable Supply Capacity for Peak Hour <sup>5</sup><br>Available from North Pressure Zone (47 Valve Station) | 699,000                           | 166,000                               | 62,000                             |
| <b>Total Additional Capacity Required (gallons)</b>  | <b>None</b>                       | <b>None</b>                           | <b>None</b>                        |

Footnotes:

- 1 Peak hour storage is storage required to meet demands which exceed the maximum day demand rate assuming the reliable supply capacity is equal to the maximum day demand rate.
- 2 Optimum fire protection based on requirement for industrial of 3,500 gpm for 3 hours and commercial of 2,500 gpm for 3 hours.
- 3 Operational storage is storage required to provide a start/stop range for pump operation and an emergency reserve storage supply.
- 4 Credit for fire protection storage determined based on reliable supply capacity in excess of maximum day demand for a duration of 3 hrs.
- 5 Credit for peak hour equalization storage determined based on reliable supply capacity in excess of maximum day demand.