

Chapter 4 – Irrigation & Water Management



Water resources are an important part of the Parks & Community Services Department's landscape assets. Turf, shrubs and trees all require water to live, but not all require the same amounts. Wise water use must consider both the preservation of landscape assets and the impact on the broader watershed. An efficient irrigation program makes the best use of the resource by not wasting water vital to other natural resources, such as fish, while at the same time preserving landscape assets.

The design and programming of irrigation systems is complex. It requires understanding the principles of hydro-zoning and knowledge of basic hydraulics, site conditions such as soils, slopes and plants, and knowledge of the irrigation system tools themselves. As competition for available water becomes more acute, the department will continue to be equally dedicated to carefully managing this resource.

4.2 Definitions

Evapotranspiration – The sum of water lost from the soil surface (evaporation) and the amount of water used by the plant (transpiration).

Water Management – Term for the efficient use of supplemental irrigation water required for most landscapes in the Puget Sound region.

Notes:

Notes:

4.3 Background

Best management practices for irrigation system operations combine activities for maximizing a range of technologies for water control and common field practices.

Irrigated Park Areas

Because our mission is to preserve all landscape assets, most developed landscape areas are irrigated, including the following:

- Athletic fields
- Community and neighborhood parks
- Golf greens, tees, and fairways
- Most turf areas
- Most shrub and annual plant beds
- Newly installed landscapes
- Most areas in high-use or high-visibility parks
- Special gardens
- City building facilities

Non-Irrigated Park Areas

The following City assets are not irrigated:

- Meadow areas
- Natural areas
- Low visibility and low use turf areas

Design

Irrigation design is the foundation of sound water management. The design process involves determining which sites to irrigate, what portions of each site should be irrigated and choosing the appropriate automated system. (Note: all new irrigation systems are designed and installed in compliance with City of Bellevue's water budget requirements.)

Choosing an Automatic Irrigation Control Option

The City of Bellevue utilizes a variety of controllers for timing the application of irrigation water. These automatic controllers serve three primary purposes:

1. Operate remotely rather than manually, saving labor hours

and water.

2. Accurately time irrigation to specific needs of soils, slopes and plants.
3. Reduce impacts to park use and water loss to evaporation by operating at night.

Notes:

Types of Irrigation Controllers used in Bellevue Parks:

- Electronic
 - Battery Operated
 - Solar Powered
 - Computer ET Based (Maxicom)
1. **Electric Controllers.** These controllers use electrical circuitry. Advantages of these controllers include relatively low cost, significant programming flexibility and ease of repair. The only disadvantage of these controllers is that they operate as individual units, thereby lacking the savings potential of central computer control. Electric is the preferred controller for parks that will not be connected to central control.
 2. **Battery-Operated Controllers.** Battery-operated controllers are either mechanical or solid state controllers that operate off of battery power. They are typically used at locations where automatic irrigation is desirable but access to electric power is not feasible. The City uses very few of these devices currently as constant monitoring is required to make the systems reliable. Batteries are subject to failure and moisture problems, requiring regular replacement.
 3. **Solar Powered Controllers.** Solar powered controllers utilize solar energy to provide power for the controller. This technology is relatively new and requires the use of on-site solar panels which are susceptible to vandalism and misuse.
 4. **Computer ET Based (Maxicom).** Maxicom is the brand name for the centralized computer-controlled ET based irrigation system that the City uses at those parks where communication linkages are possible. The use of a centralized ET based computer system provides the following advantages as it pertains to irrigation water management:
 - Allows remote irrigation systems to be programmed without a physical site visit.
 - Monitors water use within individual systems and can

Notes:

- detect and flag problems and pinpoint them for repair.
- Since the system is linked to a weather station, it can be automatically programmed to withhold water on rainy days.
- Remote systems can be automatically programmed not to water when soil moisture levels indicate water is not needed. These built in sensors can determine where water is being used and where there may be problems.
- Uses flow control monitoring devices that provide valuable data on water usage at each specific park site.

Maxicom is the preferred computerized control system for the majority of the City's park sites. This system requires daily monitoring by a trained technician who can make appropriate changes based on water use data and weather conditions. Since this system is relatively complicated to operate, only sufficiently trained staff should program and operate Maxicom controllers. The use of a computer ET based system for medium to large parks and athletic fields is very important and should continue to be a high priority.

Installing Irrigation Systems

All new irrigation systems and renovations shall be designed and installed according to departmental standard specifications, and shall comply with the City of Bellevue's water efficiency and irrigation regulations and codes. In order to have water service (meter) provided, a water budget must be prepared and approved by the Utilities Department. To the extent possible, standard material and products will be used to increase ease of maintenance and reduce inventory confusion and incompatibility problems.

Programming Automatic Irrigation Controllers

Programming automatic irrigation controllers relies more on understanding a site and its plant materials than the mechanics of the system itself. Controllers should be checked bi-weekly to ensure proper operation to maximize watering efficiency. The primary goal of using automatic irrigation controllers is to maintain a consistent soil moisture environment that maximizes plant health and vigor, while closely monitoring water use so as to not needlessly expend resources.

Water Auditing and Conservation

As budget allows, the Parks Department may perform occasional water audits on existing systems to determine if water usage exceeds, meets or fails to meet the needs of plant species, soil types and weather conditions. In such cases, usage adjustments are made if a water audit shows that efficiencies can be gained with little or no impact to the plant resources.

During drought seasons, the City of Bellevue follows a water shortage management plan which is based on the voluntary curtailment of water usage by Bellevue residents, as well as a 50% reduction in normal irrigation usages on City property. For a detailed description of the City of Bellevue Parks and Community Services Department's Water Shortage Response Plan, see appendix. The Parks Department, in cooperation with the Utilities Department, also adheres to the City-wide Water Shortage Contingency Plan, adopted in 1994 (see appendix). Water restrictions are kept in effect until reservoirs are returned to a safe level, and water quality testing has proven the water safe to drink.

Notes:

4.4 Best Management Practices

- Water use needs of the turf, shrubs, and trees shall be researched prior to irrigation. Apply no more water each week than required to sustain healthy plants. For turf areas, a general rule of thumb is no more than 1 inch of irrigation water per week, including rainwater.
- Turf should be watered 1 – 3 times per week, and for longer periods, to promote deep rooting. Deep rooting leads to healthier, more drought-tolerant grass.
- Soil also plays an important role in irrigation. Soil conditions should be considered, particularly in turf areas with heavy use. Heavier, clay-type soils cannot be watered as long during each watering cycle as can sandy soils.
- Turf and planted areas should be aerated and cultivated to relieve soil compaction and increase water uptake.
- Wherever possible, watering should be avoided during the hottest part of the day. Watering at night is preferred to reduce evaporation of water as well as possible vandalism to equipment and irrigation heads.
- Staff shall not allow manually operated systems to apply water longer than needed. The system shall not be turned on in the

To Program a Non-Maxicom Automatic Irrigation Controller:	
Component	You Should Know:
Irrigation System	<ul style="list-style-type: none"> • Daily amount of water discharged. Most important is the inches per hour (IPH) or precipitation that has fallen and how that translates into “inches of water per week.” • Daily multiple programming ability. All controllers allow for multiple programming daily; Certain sites, such as those with steep slopes, may require multiple programming. • Capabilities of each system. Each type of controller operates slightly differently. Know enough about the variety of products and their operation to select among them.
Site Conditions	<ul style="list-style-type: none"> • Soil conditions. Watering regimen differs from soil to soil. Sandy soils drain much faster than clay soils. Clay soils often will not absorb water very quickly. • Topography. The more sloped the site, the greater the potential for runoff. • Watering requirements of plants. Most sites are designed so that plants with similar water needs are grouped. Most lawns are on separate irrigation “zones” from plant beds because their watering needs differ.
Other Info	<ul style="list-style-type: none"> • Uses of site. Know how a site is used, including type of use, intensity, misuse potential (vandalism). • Various nuances in system or local water service. For instance, it may not be possible to get sufficient water pressure during certain times of the day. • Fundamental problems with system itself. Check for and correct the following: <ul style="list-style-type: none"> -If the system has heads that are unsuited to the site, misaligned or damaged. -If the controller needs capacity for multiple daily programming.

To Operate Maxicom Systems:	
Step	Activity
1.	Program the computer with site-specific information. This data is obtained through an on-site audit. This audit might be best done as a contracted service because staff time is often not available for such time-intensive processes.
2.	Train the selected staff that will have access to the system. A certification course is available that staff will need to attend and complete. There are several levels of certification. In addition to this basic training, the selected staff will also need to attend additional training as the system evolves and changes.
3.	Make sure the: <ul style="list-style-type: none"> • Weather station is up and operating properly. • Evapotranspiration information is accurate. • Various flow sensors and other system hardware are operational.
4.	The fourth step is actual system operation. The system needs to be regularly monitored and corrected as necessary.
5.	The fifth step is maintaining documentation of the actual water use. Maxicom should, over time, show a reduction in water use at those sites where it operates and where the City of Bellevue has irrigated regularly in the past.

- morning and turned off at the end of the day for convenience.
- Special attention shall be paid to verify that manually operated sprinklers are actually watering the landscape and not streets or other non-landscape areas.
 - A water budget should be determined for each site.
 - Depending on the availability of resources, a complete system audit should be completed on a 5-year cycle.
 - Application of irrigation water shall be carefully monitored to determine when controller settings can be reduced to save water and to reduce runoff.
 - A resource management system for irrigation operations should be developed. This system would provide a database from which programming records can be retrieved for annual system reprogramming to avoid starting from scratch.

Notes:

Other considerations for Irrigation:

- Consider plant species and age when programming the irrigation controller or when applying water manually.
- Site topography plays an important role in irrigation timing. Given their potential for runoff, sloped sites may require multiple applications of irrigation water in shorter timing cycles than required for flat sites.
- Site specific soil moisture holding capacity and soil infiltration rate.
- Know what the water requirements of the plants are in each zone. Prevent overwatering.
- Attributes per station such as: slope, exposure level, soil type, and plant requirements.

Irrigation System Maintenance

The following are preventive maintenance procedures for irrigation system operations:

- Visually check the system to make sure it is operating properly.
- Perform regular preventive maintenance on heads, valves and controllers.
- Repair the system promptly to reduce water loss.
- Make sure heads are set at the proper grade and properly aligned.
- Make sure valves are operating properly.
- Use the system winterization and de-winterization processes as

Notes:

opportunities to make complete system visual checks.

- Keep grass and shrubs trimmed away from heads to allow proper functioning.
- Clean heads as needed to ensure optimum performance.

Upgrades and Replacements

- The existing inventory of the condition of all City irrigation systems shall be maintained and updated.
- A replacement program (major maintenance program) is needed to ensure timely upgrading or replacement of old systems. The existing irrigation system major maintenance replacement program shall be maintained to provide priority-based direction for replacement funding.

4.5 Training

Staff training is required in several areas:

Basic Water Conservation

All park maintenance and operations staff should receive training on basic water conservation as part of an overall training program in environmental management. City staff, vendors or state agencies can provide this training. Staff should follow the Parks & Community Services Department drought policy during periods of extreme regional water shortages (see appendix).

Electric Controllers

Programmers for the system are required to become familiar with the unique qualities of each controller. This training should be scheduled when controllers are installed or when unfamiliar with equipment. Training should include all field staff.

Maxicom

Operation of the Maxicom system requires training and certification. This training is provided by outside vendors.

