WATER EFFICIENCY PREREQUISITE

Outdoor Water Use Reduction

This prerequisite applies to:

New Construction
Core and Shell
Schools
Retail
Data Centers
Warehouses and Distribution Centers
Hospitality
Healthcare

INTENT

To reduce outdoor water consumption.

REQUIREMENTS

Reduce outdoor water use through one of the following options. Nonvegetated surfaces, such as permeable or impermeable pavement, should be excluded from the landscape area calculations. Athletic fields and playgrounds (if vegetated) and food gardens may be included or excluded at the project team's discretion.

OPTION 1. NO IRRIGATION REQUIRED

Show that the landscape does not require a permanent irrigation system beyond a maximum two-year establishment period.

OR

OPTION 2. REDUCED IRRIGATION

Reduce the project's landscape water requirement by at least 30% from the calculated baseline for the site's peak watering month. Reductions must be achieved through plant species selection and irrigation system efficiency, as calculated by the Environmental Protection Agency (EPA) WaterSense Water Budget Tool.

BEHIND THE INTENT

Landscape irrigation practices consume large quantities of potable water, sometimes accounting for 30% to 70% of the water consumed in nonagricultural use. Potable water is a precious resource globally. For example, in many European cities, groundwater is being used at a faster rate than it can be replenished, according to the World Business Council for Sustainable Development.[1] Good landscape design and use of native, adapted, and drought-tolerant plants can dramatically reduce and even eliminate the need for irrigation while better integrating the building site into its surroundings and attracting native wildlife. Native plants also tend to require less fertilizer and fewer chemical pesticides, which degrade water quality when carried away in stormwater runoff.

The landscape water requirement (LWR) can be estimated by developing a water budget that allows landscape professionals to consider the effects of the many design variables, such as plant types, planting density, and irrigation system elements. Using a water budget optimizes water use in landscape designs.

STEP-BY-STEP GUIDANCE

Projects with no landscape area are exempt from this prerequisite.

For U.S. projects, the WaterSense Water Budget Tool automatically derives rainfall and evapotranspiration from the project's zip code. Skip Step 1 and go to Step 2.

STEP 1. PROJECTS OUTSIDE U.S. ONLY: OBTAIN PRECIPITATION AND EVAPOTRANSPIRATION DATA TO DETERMINE IRRIGATION REQUIREMENTS

Gather average monthly precipitation data and evapotranspiration rates (ET_o) for the project area to determine the site's potential irrigation needs. Precipitation data and ET_o can be found for most locations around the world (see *Further Explanation, International Tips*).

- Projects outside the U.S: use the non-U.S. water budget calculator, which can be found on usgbc.org. Projects must provide rainfall and evapotranspiration data for their location. This calculator uses SI units.

STEP 2. DETERMINE VEGETATED AREAS

On a map, indicate all areas on the project site that will have vegetation.

- The following landscape types may be included or excluded from landscape calculations: vegetated playgrounds, athletic fields, food gardens, and urban agricultural areas.
- When planning the site layout, consider factors such as proximity to water source for optimized irrigation, distance from water meter, and so on.

STEP 3. SELECT PLANT TYPES AND COVERAGE

Identify plant types and coverage that will balance water use efficiency with the area's intended function.

- Reserve grass for play fields or other activities that require turf; using turf for groundcover will make it very difficult to meet prerequisite and credit thresholds.
- Once established, native and drought-tolerant plants generally require little to no irrigation.
- Consider the U.S. Department of Agriculture's plant database and the Lady Bird Johnson Wildflower Center's native plant database as resources. Both databases provide standardized information about native plants—for example, moisture requirements and preferred growing conditions—along with distribution data, plant images, and references.

STEP 4. SELECT ONE OPTION

Select the appropriate option for the project's irrigation needs, as described in the credit requirements.

- Option 1 is for projects that do not require irrigation, based on the location and landscape design. Projects that have no landscape area automatically achieve this prerequisite.
- Option 2 is for projects that require irrigation.

1. *unwater.org/statistics_use.html.*

Option 1. No Irrigation Required

STEP 1. DEVELOP THE PLANT SPECIES AND WATER REQUIREMENT NARRATIVE

- Describe the plantings and explain why they will not require irrigation beyond their specified establishment periods. Indicate why average rainfall will be sufficient.
- A landscaping plan showing native plants may be provided to confirm that irrigation will not be required, based on local rainfall and plants' water demands.

Option 2. Reduced Irrigation

STEP 1. REDUCE IRRIGATION NEEDS BY ALTERING DESIGN

Project teams can dramatically alter irrigation demand by selecting plants that are appropriate for their intended uses.

- Reserve grass for play fields or other activities that require turf; using turf for groundcover will dramatically affect the ability to meet prerequisite and credit thresholds.
- Restore or plant native species to replace areas requiring intensive irrigation.

STEP 2. CALCULATE LANDSCAPE WATER BUDGET

Calculate water use as a percentage of total irrigation and peak-month irrigation demand using the WaterSense Water Budget Tool (see *Further Explanation, About WaterSense, Examples,* and *International Tips*).

- Use the tool for vegetated areas only. Do not include hardscapes (whether pervious or impervious) or unvegetated softscapes, such as mulched paths and playgrounds.
- Resolve uncertainties about plants' water requirements by referring to local resources such as plant guides, the state agricultural extension service, or nurseries to classify each plant type as a low, medium, or high water user.
- Projects may not enter zero landscape water consumption for any landscaped area.
- If only part of the lot is irrigated, complete the calculation twice—once for the irrigated section, and again for the unirrigated area—and sum the results.
- Additional savings gained by using alternative water sources and smart sensor technologies are addressed in WE Credit Outdoor Water Use Reduction. No credit is given for alternative water sources in this prerequisite.

FURTHER EXPLANATION

CALCULATIONS

See calculations in *Step-by-Step Guidance.*

ABOUT WATERSENSE

The U.S. Environmental Protection Agency's WaterSense website includes this reference for native vegetation in various parts of the U.S.: epa.gov/watersense/outdoor/what_to_plant.html.

Use the WaterSense Water Budget Data Finder to estimate the evapotranspiration rate (ET_o) in inches per month for the critical month of the year, based on a project's zip code. ET_o, a measurement of water lost from a well-maintained expanse of average-height green grass and the surrounding soil, varies with a location's sunshine, wind, humidity, and temperature. Hot, dry, and windy locations have higher ET_o values than cool, humid locations. Data for these variables are based on 30-year historical averages. Data for projects outside the U.S. are not included in this tool.

The WaterSense Water Budget Tool (epa.gov/watersense/water_budget/) calculates a baseline landscape water requirement of a typical landscape, as described above. Different plant species and their arrangement in the landscape can be entered, and the tool estimates the effect of these design variables on LWR. Project teams outside the U.S. may use this tool with local data.

Design decisions about the different components of irrigation water delivery systems also factor into the estimates the tool provides.

WaterSense irrigation controller specifications (epa.gov/WaterSense/products/controltech.html) outline the requirements for weather-based irrigation controller systems. These systems earn projects a standard 15% reduction in landscape water requirement for WE Credit Outdoor Water Use Reduction.

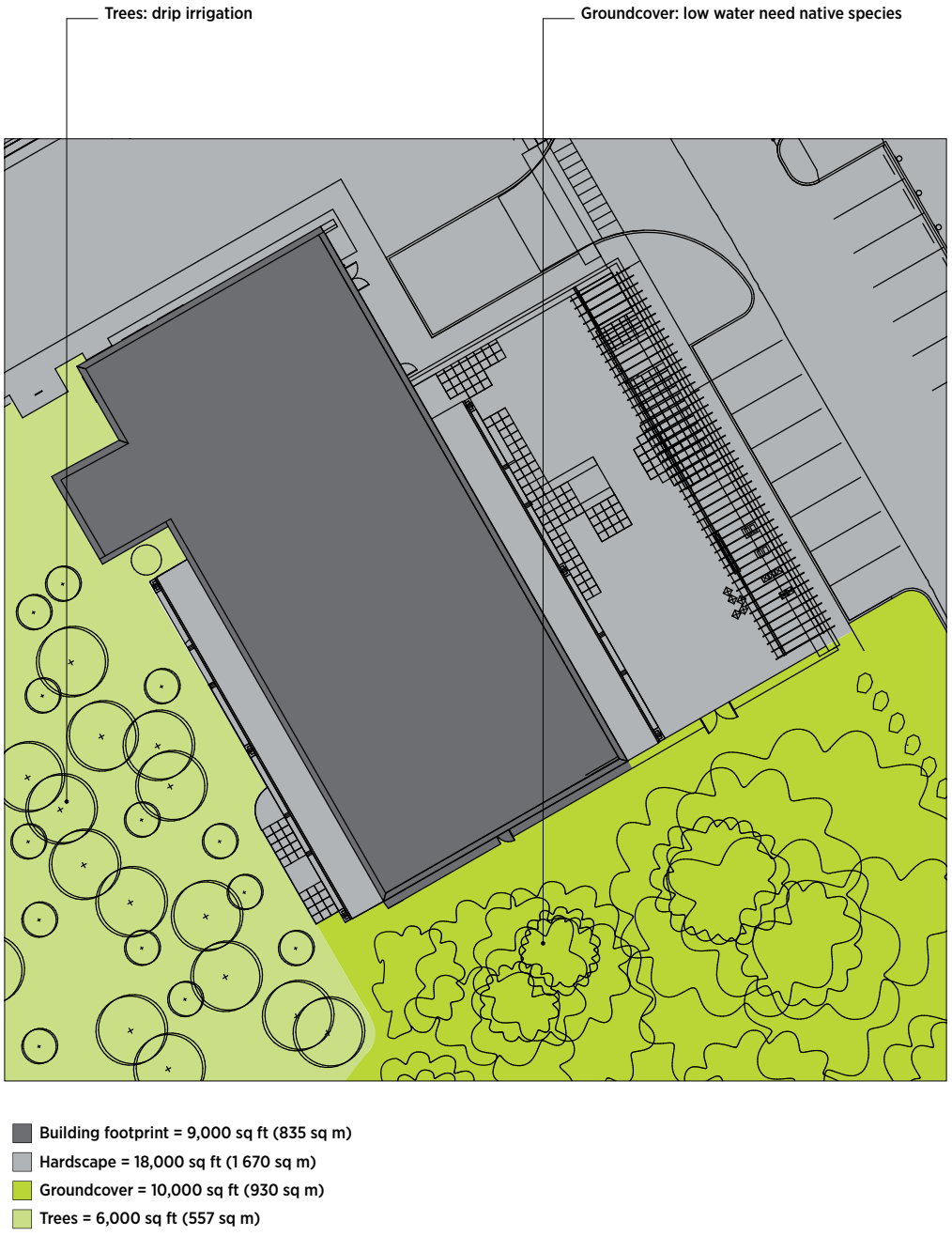

Figure 1. Example Site Plan

Examples

Each location's rainfall and evapotranspiration levels determine how much water a project needs. Consider two projects using Option 2, each with a fairly water-efficient landscape around an office building, one in Livingston, New Jersey, and one in Palo Alto, California (Figure 1).

Example 1. Livingston, New Jersey

The location is a typical suburban community in northern New Jersey. Its zip code is 07039. The team uses the EPA WaterSense Water Budget Data Finder:

- Enter Zip Code: 07039
- Peak Month: Jun
- ET_o Value: 6.30 inches/month
- Rainfall: 3.40 inches/month

When landscape area is entered, the tool offers these results (Figure 2):

- Total: 16,000 sq ft
- 10,000 sq ft of groundcover—low water need, native species, drip irrigation
- 6,000 sq ft of trees—medium water need, drip irrigation

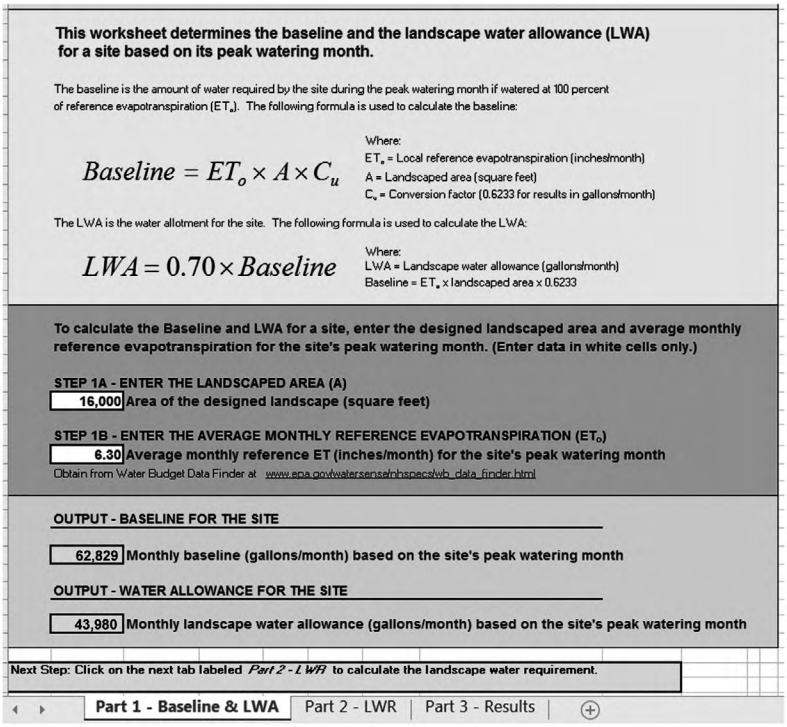

Figure 2. Part 1 - Baseline & LWA of the Water Budget Tool for Livingston, NJ Location. Screenshot taken from https://www3.epa.gov/watersense/excel/water_budget_tool.xlsx

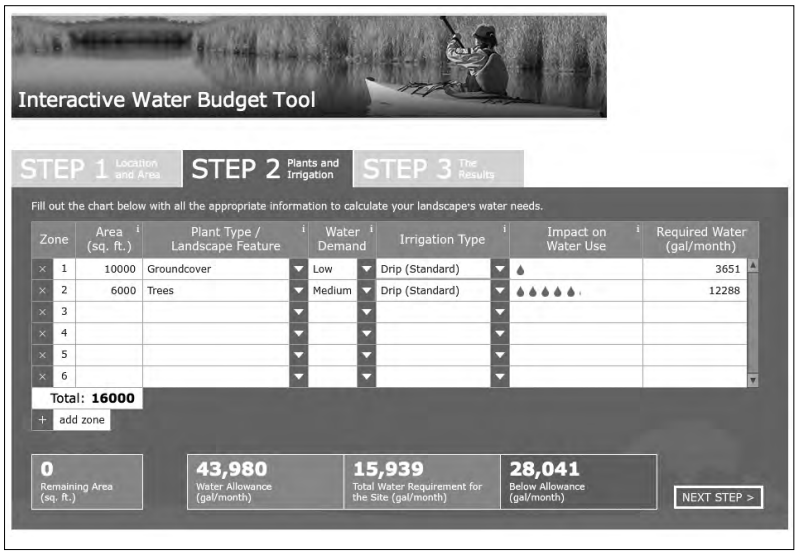

Figure 3. Water Budget Calculation for Livingston, NJ Location. Screenshot taken from http://www.epa.gov/watersense

The landscape water allowance equals 43,980 gallons/month. The landscape water baseline equals 62,829 gallons/month. The LWR for this design in this location is 15,939 gallons/month. The total savings from the baseline amounts to 75%. Since only 30% is required to meet the prerequisite, the project easily achieves compliance.

Example 2. Palo Alto, California

Palo Alto is in a fairly dry region of the country. The team uses the EPA WaterSense Water Budget Data Finder:

- Enter Zip Code: 94301
- Peak Month: Jul
- ET_o Value: 6.00 inches/month
- Rainfall: 0.00 inches/month

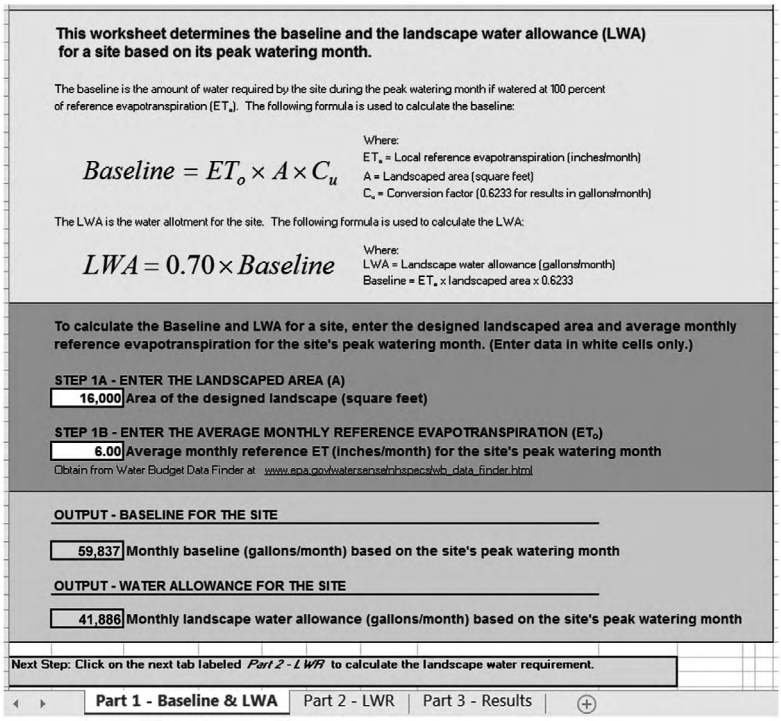

Figure 4. Part 1 - Baseline & LWA of the Water Budget Tool for Palo Alto, CA Location. Screenshot taken from https://www3.epa.gov/watersense/excel/water_budget_tool.xlsx

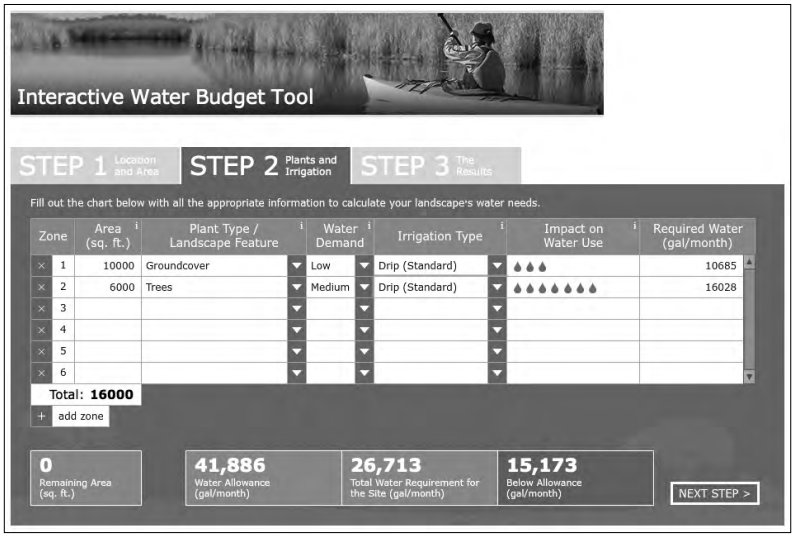

Figure 5. Water Budget Calculation for Palo Alto, CA Location. Screenshot taken from http://www.epa.gov/watersense

With a total landscape area of 16,000 square feet—10,000 square feet of groundcover (low water need, native species, drip irrigation) and 6,000 square feet of trees (medium water need, drip irrigation)—the tool now calculates a landscape water allowance of 41,886 gallons/month, and a landscape water baseline of 59,837 gallons/month. Compared with the New Jersey example above, the landscape water requirement for this design has increased to 26,713 gallons/month. The total savings from baseline is now 55%, but since only 30% is required, the project still achieves the prerequisite.

INTERNATIONAL TIPS

The World Meteorological Organization website (worldweather.wmo.int) and other sources provide annual precipitation data for many sites. If precipitation data for the project location are unavailable, they must be estimated.

Evapotranspiration data are available through various government and academic sources. The Food and Agriculture Organization of the United Nations (fao.org/nr/water/eto.html) calculates reference evapotranspiration using a variety of algorithms based on monthly average weather data. The month with the largest deficit between reference evapotranspiration and rainfall is the peak watering month.

The international version of the WaterSense Water Budget Tool can be found on the USGBC website under this credit's resources section.

CAMPUS

Group Approach

All buildings in the group may be documented as one. Use the total landscaped area of the entire campus. The results of the Water Budget Tool apply to all buildings within the group.

Campus Approach

Eligible.

REQUIRED DOCUMENTATION

Documentation	Option 1	Option 2
Site plan showing vegetated areas	X	
Narrative for plant species and water requirements	X	
Site plan showing location and size of landscape zones		X
Water Budget Tool report		X

RELATED CREDIT TIPS

WE Prerequisite Building-Level Water Metering. Projects that meter landscape irrigation separately will find it easier to meet this prerequisite and subsequent credits for outdoor water use and water metering.

CHANGES FROM LEED 2009

- Modified calculator used for this credit
- Moved alternative water source credit and smart sensor irrigation to the credit

REFERENCED STANDARDS

None.

EXEMPLARY PERFORMANCE

Not available.

DEFINITIONS

adapted plant vegetation that is not native to a particular region but that has characteristics that allow it to live in the area. Adapted plants do not pose the same problems as invasive species.

combination oven discharge water released from an oven that includes a steam cycle or option

conventional irrigation a region's most common system for providing water to plants by nonnatural means. A conventional irrigation system commonly uses pressure to deliver water and distributes it through sprinkler heads above the ground.

cooling tower blowdown the water discharged from a cooling tower typically because increased salinity or alkalinity has caused scaling. Cooling tower blowdown may be too saline for use in landscape irrigation.

evapotranspiration the combination of evaporation and plant transpiration into the atmosphere. Evaporation occurs when liquid water from soil, plant surfaces, or water bodies becomes vapor. Transpiration is the movement of water through a plant and the subsequent loss of water vapor.

foundation drain the water discharged from a subsurface drainage system. If a building foundation is below the water table, a sump pump may be required. Discharge from the sump may be stored and used for irrigation.

graywater "untreated household waste water which has not come into contact with toilet waste. Graywater includes used water from bathtubs, showers, bathroom wash basins, and water from clothes-washers and laundry tubs. It must not include waste water from kitchen sinks or dishwashers" (Uniform Plumbing Code, Appendix G, Gray Water Systems for Single-Family Dwellings); "waste water discharged from lavatories, bathtubs, showers, clothes washers and laundry sinks" (International Plumbing Code, Appendix C, Gray Water Recycling Systems). Some states and local authorities allow kitchen sink wastewater to be included in graywater. Other differences can likely be found in state and local codes. Project teams should comply with the graywater definition established by the authority having jurisdiction in the project area.

hardscape the inanimate elements of the building landscaping. It includes pavement, roadways, stonewalls, wood and synthetic decking, concrete paths and sidewalks, and concrete, brick, and tile patios.

hydrozone a group of plantings with similar water needs

industrial process water any water discharged from a factory setting. Before this water can be used for irrigation, its quality needs to be checked. Saline or corrosive water should not be used for irrigation.

landscape water requirement (**LWR**) the amount of water that the site landscape area(s) requires for the site's peak watering month

native vegetation an indigenous species that occurs in a particular region, ecosystem, and habitat without direct or indirect human actions. Native species have evolved to the geography, hydrology, and climate of that region. They also occur in communities; that is, they have evolved together with other species. As a result, these communities provide habitat for a variety of other native wildlife species. Species native to North America are generally recognized as those occurring on the continent prior to European settlement. Also known as native plants.

peak watering month the month with the greatest deficit between evapotranspiration and rainfall. This is the month when the plants in the site's region potentially require the most supplemental water typically a mid-summer month. (Sustainable Sites Initiative)

potable water water that meets or exceeds U.S. Environmental Protection Agency drinking water quality standards (or a local equivalent outside the U.S.) and is approved for human consumption by the state or local authorities having jurisdiction; it may be supplied from wells or municipal water systems

rainwater harvesting the capture, diversion, and storage of rain for future beneficial use. Typically, a rain barrel or cistern stores the water; other components include the catchment surface and conveyance system. The harvested rainwater can be used for irrigation.

reclaimed water wastewater that has been treated and purified for reuse

reference evapotranspiration rate the amount of water lost from a specific vegetated surface with no moisture limitation. Turf grass with height of 120 mm is the reference vegetation.

softscape the elements of a landscape that consist of live, horticultural elements

xeriscaping landscaping that does not require routine irrigation