SECTION F - WATER EFFICIENT IRRIGATION

From the SFPUC Rules and Regulations Governing Water Service to Customers
As amended December 14, 2010.

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Appendix Sample Calculations of Maximum Applied Water Allowance (MAWA) and Estimated Total Water Use (ETWU)

Purpose

Section F - Water Efficient Irrigation Rules will:

a) Promote the values and benefits of landscapes while recognizing the need to invest water and other resources as efficiently as possible;

b) Establish a structure for planning, designing, installing, maintaining, and managing water efficient landscapes in new construction and rehabilitated projects;

c) Establish provisions for water management practices and water waste prevention for existing landscapes;

d) Promote using water efficiently without waste by setting a Maximum Applied Water Allowance, using state mandated formulas and accounting for local climatic conditions, that will serve as an upper limit for water use by irrigated landscapes;

e) Comply with the requirements of Article 10.8 of the California Government Code, enacted by the State as the Water Conservation in Landscaping Act; and

f) Delineate the conditions under which the San Francisco Public Utilities Commission provides water for landscape irrigation uses.

Rule 1. Applicability

a) Section F shall apply to all of the following projects and activities.

   i. Tier 1: All public agency, residential, and commercial new construction and rehabilitated landscape projects with a modified landscape area equal to or greater than 1,000 square feet and less than 2,500 square feet.

   ii. Tier 2: All public agency, residential and commercial new construction and rehabilitated landscape projects with a modified landscape area equal to or greater than 2,500 square feet.

   iii. The irrigation and maintenance of any landscape irrigation system.

b) Section F does not apply to:

   i. Registered local, state or federal historical sites where the landscape is maintained as part of the historical integrity of the site;

   ii. Ecological restoration projects that do not require a permanent irrigation system; and

   iii. Plant collections or animal habitat areas, as part of botanical gardens, zoological gardens, and arboretums open to the public.

c) The General Manager may waive some or all of the requirements of Section F for landscape rehabilitation projects proposed by San Francisco Public Utilities Commission's retail water customers located outside the boundaries of the City and County of San Francisco, if after

consultation with the local agency having jurisdiction pursuant to California Government Code sections 65591, et. seq., the General Manager determines-that the retail water customer must comply with the local agency's ordinance requirements. If the General Manager determines that the retail water customer is not required to comply with the local agency's ordinance requirements, the retail water customer must comply with Section F of the San Francisco Public Utilities Commission Rules for Water Service Customers.

d) The General Manager may waive some or all of the requirements of Section F if, after a site inspection, the General Manager determines that compliance is not feasible due to one or more of the following conditions.

   i. Wet soil conditions stemming from proximity to naturally occurring water features such as a high water table, springs, ponds, lakes, creeks, and wetlands.

   ii. Substantial health or safety related risk of injury or harm to property owner, users or workers.

   iii. Disproportionately high costs for achieving minor or minimal water savings.

e) A process for document submissions and approvals pursuant to Section F will be developed by the General Manager in conjunction with the Department of Building Inspection, with the purpose of administrative efficiency and effective customer service.

Rule 2. Definitions

The terms used in this section have the following meanings.

a) **Applied water:** the portion of water supplied by the irrigation system to the landscape.

b) **Automatic irrigation controller:** an automatic timing device used to remotely control valves that operate an irrigation system. Automatic irrigation controllers schedule irrigation events using either evapotranspiration (weather-based) or soil moisture data.

c) **Backflow prevention device:** a safety device used to prevent pollution or contamination of the water supply due to the reverse flow of water from the irrigation system.

d) **Certificate of Landscape Completion:** the document required under Rule 13.

e) **Certified irrigation designer:** a person certified to design irrigation systems by an accredited academic institution, a professional trade organization, or other program such as the US Environmental Protection Agency’s WaterSense Partners irrigation designer certification program and the Irrigation Association’s Certified Irrigation Designer program.

f) **Certified landscape irrigation auditor:** a person certified to perform landscape irrigation audits by an accredited academic institution, a professional trade organization, or other program such as the US Environmental Protection Agency’s WaterSense irrigation auditor certification program and the Irrigation Association’s Certified Landscape Irrigation Auditor program.

g) **Check valve** or **anti-drain valve:** a valve located under a bubbler and sprinkler head, or other location in the irrigation system, to hold water in the system to prevent low head drainage from sprinkler heads when the sprinkler is off.

h) **Common interest developments:** community apartment projects, condominium projects, planned developments, and stock cooperatives per California Civil Code Section 1351.

i) **Conversion factor of 0.62**: the number that converts acre-inches per year to gallons per square foot per year.

j) **Drip irrigation:** any non-spray low volume irrigation system utilizing emission devices with a flow rate measured in gallons per hour.

k) **Ecological restoration project:** a project where the site is intentionally altered to establish a defined, indigenous, historic ecosystem.

l) **Emitter:** a drip irrigation emission device that delivers water slowly from the system to the soil.

m) **Established landscape:** the point at which plants in the landscape have developed significant root growth into the soil. Typically, most plants are established after 1 or 2 years of growth while tree establishment is 3 to 5 years.

n) **Estimated Total Water Use (ETWU):** the total water used for the landscape.

o) **ET adjustment factor (ETAF):** a factor of 0.7, that, when applied to reference evapotranspiration, adjusts for plant factors and irrigation efficiency, two major influences upon the amount of water that needs to be applied to the landscape. A combined plant mix with a site-wide average of 0.5 is the basis of the plant factor portion of this calculation. For purposes of the ETAF, the average irrigation efficiency is 0.71. Therefore, the ET Adjustment Factor is (0.7) = (0.5/0.71). ETAF for a Special Landscape Area shall not exceed 1.0. ETAF for existing non-rehabilitated landscapes is 0.8.

p) **ETo** or **reference evapotranspiration:** a standard measurement of environmental parameters which affect the water use of plants. ETo is expressed in inches per day, month, or year and is an estimate of the evapotranspiration of a large field of four- to seven-inch tall, cool-season grass that is well watered. Reference evapotranspiration is used as the basis of determining the Maximum Applied Water Allowance so that regional differences in climate can be accommodated.

q) **Evapotranspiration rate:** the quantity of water evaporated from adjacent soil and other surfaces and transpired by plants during a specified time.

r) **Existing landscape area:** a landscape area of any size that has not been rehabilitated or constructed within the previous 12 months.

s) **First construction document:** the first building permit issued for a project or, in the case of a site permit, the first building permit addendum issued or other document that authorizes construction of the project. "First construction document" shall not include permits or addenda for demolition, grading, shoring, pile driving, or site preparation work.

t) **Flow rate:** the rate at which water flows through pipes, valves, and emission devices, measured in gallons per minute, gallons per hour, or cubic feet per second.

u) **General Manager:** the General Manager of the Public Utilities Commission, or his or her designee.

v) **Hardscape:** any durable material (pervious and non-pervious).

w) **Hydrozone:** a portion of the landscaped area having plants with similar water needs. A hydrozone may be irrigated or non-irrigated.

x) **Infiltration rate:** the rate of water entry into the soil expressed as a depth of water per unit of time (e.g., inches per hour).

y) **Invasive plant species:** species of plants not historically found in California that spread outside cultivated areas and can damage environmental or economic resources. Invasive species may be regulated by county agricultural agencies as noxious species. "Noxious weeds" means any weed designated by the Weed Control Regulations in the Weed Control Act and identified on a Regional District noxious weed control list. Lists of invasive plants are maintained at the California Invasive Plant Inventory and USDA invasive and noxious weeds database.

z) **Irrigation audit:** an in-depth evaluation of the performance of an irrigation system conducted by a Certified Landscape Irrigation Auditor. An irrigation audit includes, but is not limited to: inspection, system test with distribution uniformity or emission uniformity, precipitation rates, reporting deficiencies in the system, reporting overspray or runoff that causes overland flow, and preparation of an irrigation schedule. An irrigation audit may include suggested upgrades, current estimated water usage, and suggested system upgrades.

aa) **Irrigation efficiency (IE):** the measurement of the amount of water beneficially used divided by the amount of water applied. Irrigation efficiency is derived from measurements and estimates of irrigation system characteristics and management practices. The minimum average irrigation efficiency for purposes of this ordinance is 0.71. Greater irrigation efficiency can be expected from well designed and maintained systems.

bb) **Landscape Application:** the documents required under Rule 3 for Tier 1 compliance.

cc) **Landscape architect:** a person who holds a license to practice landscape architecture in the state of California pursuant to California Business and Professions Code.

dd) **Landscape area:** all the planting areas, turf areas, and water features in a landscape design plan subject to the Maximum Applied Water Allowance calculation, including any adjacent planted areas in the public right-of-way for which the property owner is responsible pursuant to the Section 400.1 or Section 805 of the Public Works Code. The landscape area does not include footprints of buildings or structures unless the footprints include planted areas such as living roofs. The landscape area also does not include sidewalks, driveways, parking lots, decks, patios, gravel or stone walks, other pervious or non-pervious hardscapes, and other non-irrigated areas designated for non-development such as open spaces and existing native vegetation.

ee) **Landscape contractor:** a person licensed by the State of California to construct, maintain, repair, install, or subcontract the development of landscape systems.

ff) **Landscape Documentation Deadline:** the date by which Tier 1 or Tier 2 documentation must be submitted for approval by the General Manager. This date shall be not more than 100 days after the issuance of the first construction document, or as determined by the General Manager in consultation with the Director of Department of Building Inspection.

gg) **Landscape Documentation Package:** the documents required under Rule 8 for Tier 2 compliance.

hh) **Landscape rehabilitation project** or **rehabilitated landscape**: includes any modifications to landscape areas over a 12-month period at a site that cumulatively exceeds 1,000 square feet. A landscape rehabilitation project or rehabilitated landscape does not include turf replacements on sports fields where the turf replaced provides a playing surface, routine weeding, brush removal where no new plant materials are installed, seasonal plantings, and areas dedicated solely to edible plants. A rehabilitated landscape does not include landscape areas where only the irrigation system is retrofitted for the use of recycled water and only plantings that restore areas disturbed by the recycled water retrofits are installed. Recycled water irrigation retrofit projects shall employ best management practices to prevent runoff, ponding and overspray as directed in their recycled water use permit and comply with all applicable local and state regulation.

ii) **Lateral line:** the water delivery pipeline that supplies water to the emitters or sprinklers from the valve.

jj) **Low volume irrigation:** the application of irrigation water at low pressure through a system of tubing or lateral lines and low-volume emitters such as drip, drip lines, and bubblers. Low volume irrigation systems are specifically designed to apply small volumes of water slowly at or near the root zone of plants.

kk) **Low water use plants** or **climate appropriate plants:** plants, shrubs, groundcovers or tree species that meet at least one of the following conditions.

i. The species has a water use ranking of “low” or “very low” in Region 1 (North-Central Coast) as established in the California Department of Water Resources 2000 publication “Water Use Classification of Landscape Species” or subsequent editions as it may be updated.

ii. The species has a water use ranking of “no water”, “little water,” or “little to moderate water” in the climate zone for the planting location as established in the Sunset Western Garden Book, Eighth Edition, published by Oxmoor House on February 1, 2007 or subsequent editions as it may be updated.

iii. The plantings are part of an engineered stormwater management feature approved by the General Manager pursuant to the San Francisco Stormwater Design Guidelines established by the Public Utilities Commission.

iv. The Department of Public Works, the Recreation and Park Department, or the General Manager has determined that the species, when watered for sufficient plant health and appearance, is low water use based on the agency’s experience with the

species, and the agency has added the species to the Low Water Use and Climate Appropriate Plant List maintained by the General Manager.

v. The species appears on the San Francisco Street Tree Species List established by the Department of Public Works Bureau of Urban Forestry.

vi. The planting is part of a species test approved by the Department of Public Works or the Recreation and Park Department.

vii. The species has been permitted at the site by the Department Public Works or the General Manager based on wet soil conditions stemming from proximity to naturally occurring water features such as a high water table, springs, ponds, lakes, creeks, and wetlands.

ll) **Maximum Applied Water Allowance (MAWA):** the amount of annual applied water established by the San Francisco Public Utilities Commission for a landscaped area, using state mandated formulas and accounting for local climatic conditions, that serves as an upper limit for lawful water use for irrigating landscaped areas. The MAWA is based upon the area's reference evapotranspiration, the ET Adjustment Factor, and the size of the landscape area. The Estimated Total Water Use shall not exceed the Maximum Applied Water Allowance. Special Landscape Areas, including recreation areas, areas permanently and solely dedicated to edible plants such as fruit and nut trees and vegetable gardens, and areas irrigated with gray water or harvested rainwater, are subject to the MAWA with an ETAF not to exceed 1.0.

mm) **Mulch** or **mulching product:** any organic material such as leaves, bark, straw, compost, or inorganic mineral materials such as rocks, gravel, and decomposed granite left loose and applied to the soil surface for the beneficial purposes of reducing evaporation, suppressing weeds, moderating soil temperature, and preventing soil erosion.

nn) **New construction:** a new building or structure with a landscape, or other new landscape, such as a park, playground, median strip, or greenbelt without an associated building or structure.

oo) **New construction landscape project**: the total area of landscape in the project as defined in "landscape area," and the modified landscape area for a landscape rehabilitation project.

pp) **Operating pressure:** the pressure at which the parts of an irrigation system are designed by the manufacturer to operate.

qq) **Overhead sprinkler irrigation systems:** systems that deliver water through the air (e.g., spray heads and rotors).

rr) **Overspray:** the irrigation water which is delivered beyond the landscape area.

ss) **Permit:** an authorizing document issued by the General Manager or Department of Building Inspection.

tt) **Pervious:** any surface or material that allows the passage of water through the material and into the underlying soil.

uu) **Plant factor** or **plant water use factor:** a factor that, when multiplied by ETo, estimates the amount of water needed by plants. The plant factor range for low water use plants is 0 to 0.3, the plant factor range for moderate water use plants is 0.4 to 0.6, and the plant factor range for high water use plants is 0.7 to 1.0. Plant factors for any plant shall be as established in the Department of Water Resources 2000 publication "Water Use Classification of Landscape Species" or subsequent additions. Plants used in the landscape project that are not found in WUCOLS shall use the plant factor of a similar species included on WUCOLS.

vv) **Precipitation rate:** the rate of application of water measured in inches per hour.

ww) **Project applicant:** the person or entity applying for approval of a landscape project for a new construction project or a landscape rehabilitation project. A project applicant may be the property owner or his or her designee.

xx) **Property owner:** the legal owner of a property.

yy) **Rain sensor:** a rain sensing shutoff device that automatically suspends an irrigation event when it rains.

zz) **Recreational area:** areas dedicated to active play such as parks, sports fields, and golf courses where turf provides a playing surface.

aaa) **Recycled water, reclaimed water, gray water, or harvested rain water:** non-potable water suitable for uses such as landscape irrigation or water features. This water is not intended for human consumption.

bbb) **Runoff:** water which is not absorbed by the soil or landscape to which it is applied and flows from the landscape area. For example, runoff may result from water that is applied at too great a rate (application rate exceeds infiltration rate) or when there is a slope.

ccc) **Soil moisture sensor:** a device that measures the amount of water in the soil. The device may also suspend or initiate an irrigation event.

ddd) **Soil texture:** the classification of soil based on its percentage of sand, silt, and clay.

eee) **Special Landscape Area (SLA):** an area of the landscape dedicated solely to edible plants, areas irrigated all or in part with gray water or harvested rain water, water features using only harvested rain water, and areas dedicated to active play such as parks, sports fields, golf courses, and where turf provides a playing surface.

fff) **Sprinkler head:** a device which delivers water through a nozzle.

ggg) **Static water pressure:** the pipeline or municipal water supply pressure when water is not flowing.

hhh) **Station:** an area served by one valve or by a set of valves that operate simultaneously.

iii) **Swing joint:** an irrigation component that provides a flexible, leak-free connection between the emission device and lateral pipeline to allow movement in any direction and to prevent equipment damage.

jjj) **Turf:** a ground cover surface of mowed grass, including but not limited to Annual bluegrass, Kentucky bluegrass, Perennial ryegrass, Red fescue, Tall fescue, Bermudagrass, Kikuyugrass, Seashore Paspalum, St. Augustinegrass, Zoysiagrass, and Buffalo grass.

kkk) **Valve:** a device used to control the flow of water in the irrigation system.

lll) **Water feature:** a design element where open water performs an aesthetic or recreational function. Water features include artificial ponds, lakes, waterfalls, and streams, and fountains, spas, and swimming pools. The surface area of water features is included in the high water use hydrozone of the landscape area. Constructed wetlands used for on-site wastewater treatment or stormwater best management practices that are not irrigated and used solely for water treatment or stormwater retention are not water features and, therefore, are not subject to the water budget calculation.

mmm) **WUCOLS:** the Water Use Classification of Landscape Species published by the University of California Cooperative Extension, the Department of Water Resources and the Bureau of Reclamation, 2000, or subsequent editions as it may be updated.

Rule 3. Tier 1 - New Construction and Rehabilitation Landscape Projects

Beginning January 1, 2011, project applicants for all public agency, commercial, and residential new construction landscape projects and landscape rehabilitation projects, with a modified landscape area equal to or greater than 1,000 square feet and less than 2,500 square feet, shall comply with the following.

a) Landscape irrigation shall not exceed the applicable Maximum Applied Water Allowance (MAWA) established in Rule 7.

b) Any turf area, planned or installed, shall not exceed 25 percent of the landscape area. Landscape projects exceeding the 25 percent turf limit shall be considered a Tier 2 landscape project and must follow the requirements for Tier 2 as described in Rule 4.

c) At least 75 percent of the landscape area shall consist of low water use plants or climate appropriate plants as defined in Rule 2. Landscape projects with less than 75 percent of the landscape area consisting of low water use plants or climate appropriate plants shall be considered a Tier 2 landscape project and must follow the requirements for Tier 2 as described in Rule 4.

d) Prior to commencing installation or modification of landscape that is not an edible plant, and prior to the issuance of the first construction document, if applicable, the project applicant shall:

i. Submit and have approved by the General Manager a Tier 1 Landscape Application including:

A. Tier 1 landscape project checklist, which serves as a preliminary summation of selected landscape components to determine whether a proposed landscape is consistent with the applicable MAWA established in Rule 7; and

B. List of plants, trees, shrubs, or other vegetation that are to remain or be installed in the landscape area.

ii. For landscape projects installed as part of the construction or renovation of a building, the Tier 1 Landscape Application shall be submitted prior to the Landscape Documentation Deadline; and

iii. In the case of project applicants or property owners that are not required to obtain permits and approvals from the City's Department of Building Inspection, a Tier 1 Landscape Application shall be submitted to and approved by the General Manager prior to commencing installation or modification of landscape.

e) Following the installation of the landscape and any irrigation system, the project applicant shall submit a Certificate of Landscape Completion which certifies that the installed landscape and/or irrigation area does not consume water at a rate that exceeds the applicable MAWA established in Rule 7.

f) Landscape areas that are part of a compliance plan pursuant to Rule 5 shall be required to provide Tier 1 compliance documents as set forth in the provisions of the compliance plan.

g) If complete documentation for Tier 1 compliance has not been submitted to the General Manager on or before the Landscape Documentation Deadline, the General Manager shall request to the Director of Department of Building Inspection that an address restriction shall be placed on the property such that no further construction permits or addenda shall be issued and no further inspections by the Department of Building Inspection shall occur, unless and until all landscape documentation, developed in accordance with the provisions of this chapter and the Public Utilities Commission's rules and regulations has been submitted to the General Manager for approval.

Rule 4. Tier 2 - New Construction and Rehabilitation Landscape Projects

Beginning January 1, 2011, the project applicant for all public agency, commercial, and residential new construction landscape projects and landscape rehabilitation projects, with a modified landscape area equal to or greater than 2,500 square feet, or a project under Tier 1 with a turf limitation exceeding 25 percent of the landscape area or with less than 75 percent of the landscape area consisting of low water use plants or climate appropriate plants, shall comply with the following.

a) Prior to commencing installation or modification of landscape, the project applicant shall submit and have approved by the General Manager, a Landscape Documentation Package consistent with the Water Efficient Design and Operation Elements in Rule 6.

b) For landscape projects installed as part of the construction or renovation of a building, the Tier 2 Landscape Documentation Package shall be submitted prior to the Landscape Documentation Deadline.

c) In the case of project applicants or property owners that are not required to obtain permits and approvals from the City's Department of Building Inspection, a Tier 2 Landscape Documentation Package shall be submitted to and approved by the General Manager prior to commencing installation or modification of landscape.

d) Submit and have approved by the General Manager, prior to the submittal date of a first certificate of occupancy or prior to sign off on a landscape project authorization, the Landscape Documentation Package and a Certificate of Landscape Completion. The General Manager may authorize issuance of a first certificate of occupancy prior to approval of a Certificate of Landscape Completion, subject to conditions determined by the General Manager.

e) Landscape areas that are part of a compliance plan pursuant to Rule 5 shall be required to provide Tier 2 compliance documents as set forth in the provisions of the compliance plan.

f) If complete documentation for Tier 2 compliance has not been submitted to the General Manager on or before the Landscape Documentation Deadline, the General Manager shall request to the Director of Department of Building Inspection that an address restriction shall be placed on the property such that no further construction permits or addenda shall be issued and no further inspections by the Department of Building Inspection shall occur, unless and until all landscape documentation, developed in accordance with the provisions of this chapter and the Public Utilities Commission's rules and regulations has been submitted to the General Manager for approval.

Rule 5. Compliance Plans for Large Irrigated Landscapes

Property owners maintaining a total irrigated landscape of 10 acres or greater may submit compliance plans for approval by the General Manager that support a programmatic approach to compliance with Section F, rather than through the review and approval of individual landscape rehabilitation projects.

a) The General Manager shall establish a deadline for each property owner to develop and submit a compliance plan, which shall not exceed 3 years following the date of the property owner's initial request for review and approval of a compliance plan.

b) The property owner shall comply with all the terms of the approved compliance plan. The property owner's failure to comply with provisions of the compliance plan is a violation of Section F and subject to enforcement under the provisions of these rules or any other remedy available to the General Manager.

c) The compliance plan shall prioritize the phased implementation of landscape projects, beginning with the projects with the greatest water savings, to the extent feasible when balanced with other project objectives.

d) The compliance plan, if authorized by the General Manager, supersedes the process and procedures set forth in Rules 3 and 4.

e) The compliance plan shall ensure compliance with the requirements of Rule 6 and shall include a date or dates by which the components of the compliance plan shall be completed.

Rule 6. Water Efficient Design and Operation Elements

The elements of a landscape shall be designed to achieve water efficiency. Tier 1 projects with a landscape area greater than 1,000 square feet but less than 2,500 square feet shall demonstrate water

efficiency and compliance with this rule by providing appropriate responses to specific checklist items and certification pursuant to Rule 3.

Tier 2 projects with a landscape area greater than 2,500 square feet require a complete Landscape Documentation Package and shall comply with all applicable criteria of this rule.

a) Plant Material

i. Plants shall be chosen and arranged appropriately based upon the site's climate, soil characteristics, sun exposure, wildfire susceptibility and other factors. Plants with similar water needs shall be grouped within hydrozones.

ii. Turf is not allowed on slopes greater than 25 percent.

iii. Turf areas shall not be less than eight feet wide.

iv. The turf grass limitation excludes parklands or public recreation areas, sports fields, golf courses, cemeteries, or public areas, and areas irrigated with gray water or harvested rain water.

v. The use of invasive plant species or noxious weeds is prohibited.

vi. The use of local California native plant species is encouraged in order to reduce water use and promote wildlife habitat.

vii. The architectural guidelines of a common interest development, which include community apartment projects, condominiums, planned developments, and stock cooperatives, shall not prohibit or include conditions that have the effect of prohibiting the use of low-water use plants as a group.

b) Irrigation System

i. Dedicated landscape water meters are required on landscape areas greater than 5,000 square feet to facilitate water management.

ii. Automatic irrigation controllers utilizing either evapotranspiration or soil moisture sensor data shall be required.

iii. Rain sensors either integral or auxiliary, which suspend or alter irrigation operation during unfavorable weather conditions, shall be required on all irrigation systems.

iv. The irrigation hardware for each hydrozone shall include a separate valve.

v. The irrigation systems shall be designed to prevent runoff, low head drainage, overspray and other similar conditions.

vi. Low volume irrigation shall be required in mulched areas, in areas with slope greater than 25 percent, within 24 inches of a non-permeable surface or in any

irregularly shaped areas that are less than eight (8) feet in width. These restrictions do not apply if:

A. The landscape area is adjacent to permeable surfacing and no runoff occurs; or

B. The adjacent non-permeable surfaces are designed and constructed to drain entirely to landscaping.

vii. Irrigation systems shall be designed, maintained, and managed to meet or exceed an average landscape irrigation efficiency of 70 percent.

c) Hydrozones

i. Each valve shall irrigate only hydrozones with similar plant factors or site conditions such as: slope, sun exposure, and soil conditions.

ii. Sprinkler heads and other emission devices shall be selected based on what is appropriate for the plant type within that hydrozone.

iii. Where feasible, trees shall be placed on separate valves from shrubs, groundcovers, and turf.

iv. Individual hydrozones that mix plants of moderate and low water use shall use the higher water using plant factor. High water use plants shall not be mixed with low or moderate water use plants.

v. On the landscape design plan and irrigation design plan, hydrozone areas shall be designated by number, letter, or other designation. On the irrigation design plan, designate the areas irrigated by each valve, and assign a number to each valve.

d) Mulch and Amendments

i. A minimum two-inch (2″) layer of mulch shall be applied on all exposed soil surfaces of planting areas except in direct seeding applications (i.e. hydro-seed).

ii. Stabilizing mulching products shall be used on slopes.

iii. Soil amendments shall be incorporated according to recommendations of the soil report and what is appropriate for the plants selected.

e) Water Features

i. Recirculating water systems shall be used for water features.

ii. Where available, recycled water or harvested rain water shall be used as a source for decorative water features.

iii. Surface area of a water feature shall be included in the high water use hydrozone area of the water budget calculation.

f) Irrigation Scheduling

Irrigation schedules shall be developed, managed, and evaluated to utilize the minimum amount of water required to maintain plant health. Irrigation schedules shall meet the following criteria.

i. Irrigation scheduling shall be regulated by automatic irrigation controllers.

ii. Overhead irrigation shall be scheduled between 8:00 p.m. and 10:00 a.m. unless weather conditions prevent it.

iii. Irrigation schedules for each station shall consider:

A. Irrigation interval (days between irrigation);
B. Irrigation run times (time period per irrigation event to avoid runoff);
C. Number of cycle starts required for each irrigation event to avoid runoff;
D. Application rate setting;
E. Plant type setting;
F. Soil type; and
G. Slope factor setting.

g) Landscape and Irrigation Maintenance Schedule

Landscapes shall be maintained to ensure water use efficiency. A regular maintenance schedule shall be submitted with the Certificate of Landscape Completion and shall include the following.

i. Routine inspection; adjustment and repair of the irrigation system and its components; aerating and de-thatching turf areas; replenishing mulch; fertilizing; pruning; weeding in all landscape areas; replacement of failed plants with same or equivalent plants; and removing obstruction to emission devices.

ii. Repair of all irrigation equipment shall be done with the originally installed components or their equivalents.

h) Irrigation Audits

Landscape and irrigation assessments for new or rehabilitated landscapes shall be conducted after the landscaping and irrigation system have been installed. The findings of the assessment shall be consolidated into the Certificate of Completion submittal and may include, but are not limited to inspection, system tune-up, system test with distribution uniformity, reporting overspray or runoff that causes overland flow, and preparation of an irrigation schedule.

i. For Tier 1 projects, the audit shall be conducted by the project applicant, a designated PUC water service inspector, or by a certified landscape irrigation auditor.

ii. For Tier 2 projects, the irrigation audit shall be conducted by a PUC water service inspector or by a certified landscape irrigation auditor.

iii. The General Manager shall administer programs that may include, but not be limited to, irrigation water use analysis, irrigation audits, and irrigation surveys for compliance with the Maximum Applied Water Allowance.

Rule 7. Maximum Applied Water Allowance (MAWA)

The operation of irrigation systems in new construction landscapes and landscape rehabilitation projects subject to Rules 3, 4, and 5 shall adhere to a Maximum Applied Water Allowance which shall be the upper limit of water that may be lawfully applied through the irrigation system. The MAWA for an irrigation system installed for a new construction landscape or landscape rehabilitation project shall be calculated using the following equation.

MAWA = (35.1) (0.62) [(0.7 x LA) + (0.3 x SLA)]

Where:
MAWA = Maximum Applied Water Allowance (gallons per year)
35.1 = ETo or Reference Evapotranspiration for San Francisco (inches per year)
0.62 = Conversion Factor (to gallons)
0.7 = ET Adjustment Factor (ETAF)
LA = Landscape Area including SLA (square feet)
0.3 = Additional Water Allowance for SLA
SLA = Special Landscape Area (square feet)

Rule 8. Landscape Documentation Package

Tier 2 projects applications shall include at a minimum:

a) Project information sheet;

b) Water Efficient Landscape Worksheets which establish the project's MAWA and ETWU;

c) Soil management report;

d) Landscape design plan;

e) Irrigation design plan; and

f) Grading design plan.

Rule 9. Soil Management Report

a) In order to reduce runoff and encourage healthy plant growth, a soil management report shall be completed by all Tier 2 project applicants where significant mass grading is planned. The soil management report or other documentation approved by the General Manager, shall document the various soil characteristics such as:

   i. Soil texture;
   ii. Infiltration rate determined by laboratory test or soil texture infiltration rate table;
   iii. pH;
   iv. Total soluble salts;
   v. Sodium;

vi. Percent organic matter; and

vii. Recommendations.

b) The project applicant shall comply with one of the following:

i. If significant mass grading is not planned, the soil analysis shall be submitted as part of the Landscape Documentation Package; or

ii. If significant mass grading is planned, the soil analysis report shall be submitted as part of the Certificate of Landscape Completion.

The soil analysis report shall be made available, in a timely manner, to the designers preparing the landscape design plans and irrigation design plans to make any necessary adjustments to the design plans.

The project applicant shall submit documentation verifying implementation of soil analysis report recommendations to the General Manager with the Certificate of Landscape Completion.

Rule 10. Landscape Design Plan

Tier 2 landscapes shall be carefully designed for the intended function of the project. A landscape design plan shall meet the following design criteria and shall be submitted as part of the Landscape Documentation Package. The landscape design plan, at a minimum, shall:

a) Include all applicable elements of Rule 6: Water Efficient Landscape Design and Operation Elements;

b) Identify all plants to be installed as part of the landscape project including: common name, botanical name, quantity, type (e.g. grass, succulent, vine, shrub, and tree), and plant factor as defined in Rule 2;

c) Delineate and label each hydrozone by number, letter, or other method;

d) Identify each hydrozone as low, moderate, high water, or mixed (low/moderate) water use, as defined by WUCOLS;

e) Include temporarily irrigated areas of the landscape in a low water use hydrozone for the purpose of water budget calculation;

f) Identify recreational areas;

g) Identify areas permanently and solely dedicated to edible plants or edible fruit or nut trees;

h) Identify areas irrigated with gray water or harvested rain water;

i) Identify type of mulch and application depth;

j) Identify soil amendments, type, and quantity;

k) Identify type and surface area of water features;

l) Identify hardscapes (pervious and non-pervious);

m) Identify location and installation details of any applicable stormwater best management practices that demonstrate compliance with the San Francisco Stormwater Design Guidelines for on-site retention and infiltration of stormwater. Examples include, but are not limited to: rain gardens, bioretention areas, infiltration basins, constructed wetlands, pervious pavements, and rain water harvesting systems;

n) Contain the following statement: "I have complied with the requirements of the Water Efficient Irrigation Ordinance and Section F of the San Francisco Public Utilities Commission Rules and Regulations Governing Water Service Customers, and I have applied the requirements for the efficient use of water in this landscape design plan;" and

o) Bear the signature of a licensed landscape architect, licensed landscape contractor, or other person authorized by the General Manager.

Rule 11. Irrigation Design Plan

Irrigation systems shall meet all the requirements listed in this section and the manufacturers' recommendations. The irrigation system and its related components shall be planned and designed to allow for proper installation, management, and maintenance. An irrigation design plan meeting the following design criteria shall be submitted as part of the Landscape Documentation Package. The irrigation design plan, at a minimum, shall contain:

a) Include all applicable elements of Rule 6: Water Efficient Landscape Design and Operation Elements;

b) Location and size of separate water meters for landscape (if applicable);

c) Location, type and size of all components of the irrigation system, including controllers, main and lateral lines, valves, sprinkler heads, moisture sensing devices, rain switches, quick couplers, pressure regulators, and backflow prevention devices;

d) Static water pressure at the point of connection to the public water supply. If a booster pump is used, include the operating pressure downstream from the pump;

e) Flow rate (gallons per minute), application rate (inches per hour), and design operating pressure (pressure per square inch) for each station;

f) Indication of where any recycled water, gray water, or harvested rain water irrigation systems are used;

g) The following statement: "I have complied with the requirements of the Water Efficient Irrigation Ordinance and Section F of the San Francisco Public Utilities Commission Rules and Regulations Governing Water Service Customers, and I have applied the requirements for the efficient use of water in this landscape design plan;" and

h) The signature of a licensed landscape architect, certified irrigation designer, licensed landscape contractor, or other person authorized by the General Manager to design an irrigation system.

Rule 12. Grading Design Plan

If the Tier 2 landscape project area will be graded, the grading shall be designed to minimize soil erosion, runoff, and water waste; and a grading plan shall be submitted as part of the Landscape Documentation Package.

The project applicant shall submit a landscape grading plan that indicates finished configurations and elevations of the landscape area including:

a) Height of graded slopes;

b) Drainage patterns;

c) Pad elevations;

d) Finish grade; and

e) Stormwater retention improvements, if applicable.

The grading design plan shall contain the following statement: "I have complied with the requirements of the Water Efficient Irrigation Ordinance and Section F of the San Francisco Public Utilities Commission Rules and Regulations Governing Water Service Customers, and I have applied the requirements for the efficient use of water in this landscape design plan;" and shall bear the signature of a licensed civil engineer or landscape architect as authorized by law.

Rule 13. Certificate of Landscape Completion

For all Tier 1 and Tier 2 projects, the project applicant shall submit to the General Manager the Certificate of Landscape Completion. The Certificate of Landscape Completion shall include the following elements.

a) For Tier 1, certification by the project applicant that the landscape project has been installed per the approved Tier 1 Landscape Application. For Tier 2, certification by the signer of the landscape design plan, the signer of the irrigation design plan, or the licensed landscape contractor that landscape project has been installed per the Landscape Documentation Package.

b) Irrigation scheduling parameters used to set the controller.

c) Landscape and irrigation maintenance schedule.

d) For Tier 2, irrigation audit report.

Rule 14: Irrigation Audits for Landscape Areas

The General Manager may require irrigation audits to evaluate water use on landscape areas. Such audits may be initiated as a coordinated effort between the General Manager and the water service customer as part of the General Manager's Landscape Conservation Program, or if violation is reported to or discovered by the General Manager. When such audit is required, it must be completed by a certified landscape irrigation auditor.

a) Following the findings and recommendations of the certified landscape irrigation auditor, the General Manager may require adjustments to the irrigation usage, irrigation hardware, and/or landscape materials to reduce irrigation water use.

b) The landscape shall comply with the Maximum Applied Water Allowance for landscapes. The ET Adjustment Factor for existing landscapes is 0.8 and the ET Adjustment Factor for new construction landscapes and rehabilitated landscapes is 0.7.

c) The MAWA for an irrigation system for an existing landscape area of any size shall be calculated using the following equation.

MAWA = (35.1) (0.62) [(0.8 x LA) + (0.2 x SLA)]

Where: MAWA = Maximum Applied Water Allowance (gallons per year)
35.1 = ETo or Reference Evapotranspiration (inches per year)
0.62 = Conversion Factor (to gallons)
0.8 = ET Adjustment Factor (ETAF)
LA = Landscape Area including SLA (square feet)
0.2 = Additional Water Allowance for SLA
SLA = Special Landscape Area (square feet)

d) The MAWA for an irrigation system for a new construction landscape or rehabilitated landscape shall be as defined in Rule 7.

Rule 15. Recycled Water, Gray Water, Harvested Rain Water

a) For purposes of Section F, a rehabilitated landscape does not include landscape areas where only the irrigation system is retrofitted for the use of recycled water and only plantings that restore areas disturbed by the recycled water retrofits are installed. Recycled water irrigation retrofit projects shall employ best management practices to prevent runoff, ponding and overspray as directed in their recycled water use permit and comply with all applicable local and state regulation. The installation of recycled water irrigation systems shall be required if the General Manager finds that recycled water meeting all applicable requirements is available for irrigation uses.

b) The San Francisco Public Utilities Commission encourages the installation of gray water or harvested rain water irrigation systems for current and future use. New, rehabilitated and existing landscapes using gray water and harvested rain water shall be considered Special Landscape Areas. An ET Adjustment Factor for the total landscape shall not exceed 1.0. Existing Special Landscape Areas shall be allowed more water by using an ET Adjustment Factor of 0.8 and additional water allowance of 0.2 or 20%. New or rehabilitated Special Landscape Areas shall be allowed more water by using an ET Adjustment Factor of 0.7 and additional water allowance of 0.3 or 30%.

c) Landscapes using gray water and harvested rain water are exempt from the turf limitations subject to Rule 6, but shall comply with the Maximum Applied Water Allowance of the landscape.

d) Irrigation systems and decorative water features shall use recycled water if the General Manager finds that recycled water meeting all public health codes and standards is available

and will be available for the foreseeable future. Use of gray water in irrigation systems and use of harvested rain water in irrigation systems and decorative water features, are strongly encouraged.

e) All recycled water, gray water and harvested rain water systems shall be designed and operated in accordance with all applicable local and State laws.

Rule 16. Water Waste Prevention

a) For landscaped areas of any size in the City and County of San Francisco, water runoff leaving the landscape area due to low head drainage, overspray, broken irrigation hardware, or other similar conditions where water flows onto adjacent property, walks, roadways, parking lots, structures, or non-irrigated areas, is prohibited.

b) In the event this rule or any other rule is violated, the General Manager may issue a written warning, entered on the user's water service record and delivered to customer via mail, personal service, or other reasonable means. The letter will include information regarding the violation, education information on the restrictions, resources available from the General Manager to assist in complying with regulations, and a deadline for correcting the violation.

c) If the violations are not corrected to the satisfaction of the General Manager, the property owner, and project applicant where appropriate, shall be subject to enforcement in accordance with San Francisco Public Utilities Commission rules for limitation or termination of service, Chapter 100 of the San Francisco Administrative Code with respect to administrative penalties, and any other available legal remedies, at the sole discretion of the General Manager.

APPENDIX - SAMPLE CALCULATIONS OF MAWA AND ETWU

Maximum Applied Water Allowance: The example calculations below are hypothetical to demonstrate proper use of the Maximum Applied Water Allowance equation pursuant to Rule 7 and required water budget calculations.

Example 1: A hypothetical landscape rehabilitation project in San Francisco, with a modified landscape area of 2,500 square feet without any Special Landscape Area (SLA= 0, no edible plants, recreational areas, or use of gray water, or harvested rain water). To calculate MAWA, the annual reference evapotranspiration value for San Francisco is 35.1inches.

MAWA = (35.1) (0.62) [(0.7 x LA) + (0.3 x SLA)]

MAWA = (35.1) (0.62) [(0.7 x 2,500 square feet) + (0.3 x 0)] = 38,084 gallons per year

To convert from gallons per year to gallons per day: 38,084/365 = 104 gallons per day

Water meters measure flow in hundred-cubic-feet (CCF):
1 CCF = 748 gallons so in this example the MAWA is 51 CCF per year

Example 2: A new construction project to build a school in San Francisco has a total landscape area of 100,000 square feet. Within the 100,000 square foot project, there is a 75,000 square foot area to be planted with turf for a soccer field. This 75,000 square foot area is considered to be a Special Landscape Area.

MAWA = (35.1) (0.62) [(0.7 x LA) + (0.3 x SLA)]
MAWA = (35.1) (0.62) [(0.7 x 100,000 square feet) + (0.3 x 75,000 square feet)]
= 21.76 x [70,000 + 22,500]
= 21.76 x 92,500
= 2,012,800 gallons per year or 5,515 gallons per day or 2,691 CCF per year

Estimated Total Water Use: The example calculations below are hypothetical to demonstrate proper use of the Estimated Total Water Use**.** The sum of the Estimated Total Water Use calculated for all hydrozones shall not exceed the MAWA.

$$ETWU = (35.1)(0.62)\left(\frac{PF \times HA}{IE} + SLA\right)$$

Where:
ETWU = Estimated Total Water Use per year (gallons)
35.1 = ETo or Reference Evapotranspiration (inches per year)
0.62 = Conversion Factor
PF = Plant Factor from WUCOLS
HA = Hydrozone Area [high, medium, and low water use areas] (square feet)
(PFxHA) = The sum of the Plant Factor multiplied by the Hydrozone Area for all hydrozones
IE = Irrigation Efficiency (minimum 0.71)
SLA = Special Landscape Area (square feet)

Example 1: A new construction landscape area is 50,000 square feet; plant water use type, plant factor, and hydrozone area are shown in the table below. In San Francisco the ETo value is 35.1 inches per year. There are no Special Landscape Areas (recreational area, area permanently and solely dedicated to edible plants, or area irrigated with gray water or harvested rain water) in this example.

Hydrozone	Plant Water Use Type(s)	Plant Factor (PF)*	Hydrozone Area (HA) (square feet)	PF x HA (square feet)
1	High	0.8	7,000	5,600
2	High	0.7	10,000	7,000
3	Medium	0.5	16,000	8,000
4	Low	0.3	7,000	2,100
5	Low	0.2	10,000	2,000
			Sum	24,700

*Plant Factor from WUCOLS

$$ETWU = 35.1 \times 0.62 \times \left(\frac{24{,}700}{0.71} + 0 \right) = 757{,}072 \text{ gallons per year}$$

Compare ETWU with MAWA for this example:
MAWA = (35.1) (0.62) [(0.7 x 50,000) + (0.3 x 0)] = 761,775 gallons per year. ETWU (757,072 gallons per year) is less than MAWA (761,775 gallons per year). In this example, the water budget complies with the MAWA.

Example 2: ETWU calculation: total landscape area is 50,000 square feet, 2,000 square feet of which is planted with edible plants. The edible plant area is considered a Special Landscape Area (SLA). In San Francisco, the reference evapotranspiration value is 35.1 inches per year. The plant type, plant factor, and hydrozone area are shown in the table below.

Hydrozone	Plant Water Use Type(s)	Plant Factor (PF)*	Hydrozone Area (HA) (square feet)	PF x HA (square feet)
1	High	0.8	7,000	5,600
2	High	0.7	9,000	6,300
3	Medium	0.5	15,000	7,500
4	Low	0.3	7,000	2,100
5	Low	0.2	10,000	2,000
			Sum	23,500
6	SLA	1.0	2,000	2,000

*Plant Factor from WUCOLS

$$ETWU = 35.1 \times 0.62 \times \left(\frac{23{,}500}{0.71} + 2{,}000 \right)$$

= (21.76) (33,099 + 2,000)
= 763,754 gallons per year

Compare ETWU with MAWA. For this example:
MAWA = (35.1) (0.62) [(0.7 x 50,000) + (0.3 x 2,000)]
= 21.76 x [35,000 + 600]
= 21.76 x 35,600
= 774,656 gallons per year

The ETWU (763,754 gallons per year) is less than MAWA (774,656 gallons per year). For this example, the water budget complies with the MAWA.