

# Landscape Management Plan

## Landscape and Irrigation For The Albuquerque International Sunport



*Prepared for:*

City of Albuquerque  
Aviation Department

October 9, 2006

*Prepared by:*



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## ***Statement of Purpose and Assumptions:***

*This landscape management plan has been written to facilitate the maintenance and operations of the landscape and irrigation system for the Sunport Roadway System. The information contained in this plan shall be utilized in a general way because seasonal and daily variation in the temperature, precipitation and sunlight may dictate a temporary and different care regimen than what is presented. The basic information in no way constitutes a guarantee or warranty that all plant materials and irrigation equipment will remain in a viable condition if recommended procedures are followed. However, if the recommended care and maintenance procedures are followed, the plants and irrigation system should remain in good condition. The recommendations were gathered from information provided by plant and material suppliers, contractors, surveyors, and information authored by Sites Southwest.*

*The following assumptions were made in the development of this Maintenance Plan:*

- *Plant materials addressed in this maintenance plan have been based upon available landscape plans. It is assumed that any plants that have been replaced have been replaced by the same species.*
- *No runoff from irrigation shall be permitted. Any runoff problems incurred shall be immediately remedied.*
- *A Storm Waste Water Protection Plan shall be the responsibility of the Aviation Department.*
- *All hardscape; sidewalks, walls, bricks, and signage, is not included and shall be maintained by others.*
- *De-icing and snow removal shall be done by others.*
- *Any herbicides and/or insecticides shall be used according to Federal Regulations and City Of Albuquerque Specifications.*
- *The landfill liner along the slopes of Sunport Boulevard shall be protected from damage; if damage*

*does occur it shall be immediately repaired.*

- *This Landscape Maintenance Plan does not address complications related to catastrophic events. Should a catastrophic event affect the landscape; it shall be dealt with by direction of the Sunport Manager.*
- *All litter in the landscaped areas included in this contract shall be removed and disposed of according to a schedule and instructions provided by the Aviation Department Manager.*

*This Landscape Maintenance Plan is the property of those authors and the City of Albuquerque Aviation Division.*

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## Introduction

### *A Note about Water Management:*

*The City of Albuquerque is currently in the process of modifying the landscape at the Sunport, one of the State's most visited landscapes, in order to conserve water. The Sunport landscape is a unique combination of native, adapted, and higher water use plants complimented by art works. In the near future, this landscape will be irrigated by non-potable re-use water.*

*The water conserving retrofitting of the landscape at the Sunport includes four major components: A. Substituting low water use plants for moderate and high water use plants wherever feasible, B. Repairing and upgrading the current irrigation to work with the new planting and to increase water savings in areas not being re-landscaped, C. The creation of retaining walls and swales to facilitate the harvesting of storm water so it can be used to augment the irrigation, and D. The use of non-potable water for irrigation.*

*In addition, the Sunport landscape is intended to showcase the high desert landscape. Maintenance practices shall strive to allow for year-round beauty and seasonal highlights of the plantings and enjoyment of the rock work and art that play an integral role in the landscape design. Signs and sculptural art pieces add colorful and informative elements that contribute to the overall design that welcomes visitors to Albuquerque and New Mexico.*

*The Sunport landscape is subject to the City of Albuquerque Waste Water Conservation Ordinance. This ordinance is intended to conserve water by numerous means, including landscape irrigation efficiency. This landscape management plan is written with the express intention of conforming to the standards and goals of City*

*ordinances and to promote a high standard of horticultural practices by standardizing the maintenance of this important landscape.*

*As mentioned previously, there are many different types of landscaped areas throughout the Albuquerque Sunport property. The City of Albuquerque- Sites Southwest team encourages responsible water management in all landscaped areas. This Landscape Maintenance Plan classifies all the landscaped areas into the following six typologies: **Cool Season Turf, Warm Season Turf and Native Grass Meadow, High Water Use Landscape, Moderate Water Use Landscape, Low Water Use Landscape, and Annuals.** Please refer to the annotated aerial photographs and the accompanying tables for plant lists, landscape type, locations and irrigation information. The duration of watering will increase or decrease, depending upon soil conditions, weather, temperature, slopes, and drainage in the areas being watered. Adjustments to the watering schedule should be based on visual observations made during routine maintenance. In order to attain the goal of a healthy, water conserving landscape, the irrigation specialist operating the controller must visually confirm soil moisture levels and make necessary adjustments to the irrigation system as specified in Section 2, The Irrigation System.*

# 1. Landscape Types

Many of the plant materials and landscape design concepts for the Albuquerque Sunport have been established to reflect a distinctly New Mexican plant palette. The intent is to present a landscape that is unique to Albuquerque. Some of the older established landscapes are less regional in character and showcase plants common to many places in the United States. This section of the manual is divided into the six landscape typologies found on Sunport property: **High Water Use Landscape, Moderate Water Use Landscape, Low Water Use Landscape, Cool Season Turf, Warm Season Turf and Native Grass Meadow, and Annuals**. General classifications of plants and specifications for their management are listed under each typology.

All maintenance practices or plant materials replacements shall strive to adhere to original palettes, specifications, and design intentions unless otherwise directed by the Aviation Department Project Manager.

## 1.1. Cool Season Grass Turf

### 1.1.1. General

The Cool Season Grass Turf areas of the Sunport Landscape are largely of the Kentucky Bluegrass variety. These grow best in temperatures between 60° -77 ° Fahrenheit. Cool Season grasses green early in the spring and remain green in the late fall, or may even remain somewhat green through the winter. They can survive in warmer climates if given plenty of water. Cool season grasses can be kept healthy and attractive with good management practices. These practices include watering, fertilizing, mowing and aerating.

*These cool season grass turf areas are classified as high water use. The turf provides a lush, cool and green landscape. The desired appearance is that of a manicured lush green lawn. Turf areas shall be kept mowed to a height of 2-3 inches and be free of weeds and disease.*

### 1.1.2. Watering

It is important to provide turf areas with adequate moisture; however, too much water is as problematic as too little water. The soil shall be soaked to the root zone, approximately 6-8 inches. The amount of water that should be applied to bluegrass turf can be calculated by determining the length of time it takes to soak the soil to a depth of 6 inches. If the soil condition, grade or other situation results in runoff then the time it takes should be divided into shorter run times separated by one hour to allow the water to soak in.

Frequency of watering is determined by seasons and the type of soil. In the hottest part of the summer, bluegrass shall be watered once every three days if  $\frac{2}{3}$  of an inch is applied at each watering. (If this watering schedule is not possible to accomplish given the water window limitations, then  $\frac{1}{2}$  inch shall be applied every two days.) During the spring and fall, the turf can be watered less frequently, but for the same amount of time.

Frequent, shallow watering shall not be permitted as it encourages a shallow root system, and lowers resistance to drought and some pests. According to City Ordinance, spray irrigation for all City of Albuquerque owned property must occur between 6:00 pm and 10:00 am, during the months of April through September and between 10:00 am and 2:00 pm during the months of December through March.



**Blue Grass Turf**

### **1.1.3. Mowing, Aeration, De-thatching**

#### ***1.1.3.a. Mowing***

Mowing is a critical aspect of turf lawn maintenance as mowing too short or too tall can cause problems. Kentucky bluegrass should be mowed no shorter than 2 inches and not taller than 3 inches. Mowing shall occur weekly during the active growing seasons of spring (February to April) and fall (September to November); less frequently during the heat of summer. Preset mowing schedules shall be dictated by growth and adjustments made to accommodate changes as necessary. The ‘one-third’ rule applies, when the grass reaches 3 inches, it shall be cut to two inches tall. Cycles of tall and short grass must be avoided. However, if conditions prohibit mowing until grass is taller than three inches, the mower blades shall be raised so that no more than  $\frac{1}{3}$  of total height is removed on first cut. Then the blade can be lowered and the grass may be cut to three inches mowing from a different angle.

Mower blades shall be kept sharp to provide a clean cut for a better appearance and disease resistance. Clippings can be left on the lawn provided the 'one-third' rule is followed. When a mulching mower is used one pass should suffice to get clippings small enough to fall to ground level. If a regular mower is used two passes shall be made with the mower to ensure that the clippings fall to ground level. Clippings shall not be left when diseases are present to prevent the possibility of spreading or developing disease. Mowing shall only occur on dry grass.

All cool season turf grass areas along sidewalks, curbs, mowstrips, plantings, tree mulch and other edges should be kept with clean trimmed edges.

#### ***1.1.3.b. Aeration***

Aeration is a method used to increase air exposure to the soil. Air in the soil is crucial because it allows water to penetrate and allows the subsurface activities of the soil and the roots to take place; it also helps in the decomposition of thatch. Aerating can be accomplished by coring or hole punching which create holes or slits in the turf and top lens of the soil. Aeration shall be performed at least twice a year during the growing season in spring and fall.

#### ***1.1.3.c. De-thatching***

Thatch is composed of living and dead roots, rhizomes and stolons that develop between the green vegetation and the soil surface. A little thatch is helpful to the turf because it reduces water loss due to evaporation, and reduces temperature fluctuations. When the layer of thatch becomes greater than  $\frac{3}{4}$ " it can interfere with the movement of water and air into the soil. Regular thinning and raking the turf will keep thatch from accumulating and reduce excessive thatch build up. Vertical mowing is required if an excessive thatch layer (over  $\frac{3}{4}$ " in depth) accumulates. Vertical mowing is to be performed annually in the late spring or early summer to reduce excessive thatch.

#### **1.1.4. Fertilization**

The total annual fertilizer requirement of blue grass is four pounds of actual nitrogen per 1,000 square feet. Having nitrogen present during the critical times of growth Spring and Fall, helps to create a thicker turf. At a minimum, soil testing shall be performed every two years to ascertain the nutrient available for the grass. Unless unusual circumstances are present, 50% of the total yearly nitrogen shall be applied to the turf in the fall in two applications of one pound actual nitrogen per 1000 square feet. Additionally, in the spring two applications of slow-release nitrogen at the rate of 1 pound of actual nitrogen per 1,000 square feet shall be applied to re-establish dormant turf. Slow release nitrogen does not have the effect of encouraging diseases in the spring and summer that regular nitrogen can. Log any fertilization in the log provided in Appendix D.

### **1.1.5. Pest Management**

Well-managed turf should be relatively free of pests. When weeds appear they should be removed by hand wherever possible. A weed is any undesirable plant growth in a given area as defined by the landscape coordinator. However, in extreme cases, chemical controls may be used, but broadleaf herbicides shall not be used when trees are in the turf. Routine inspections will ensure that weeds will be kept in check. Under no circumstances shall weeds be allowed to set seed.

Insects and diseases, including fungal infections, shall be identified and treated quickly using the least toxic and most effective controls possible such as Integrated Pest Management (IPM) techniques. IPM economic and aesthetic pest thresholds should be established based upon discussions with the Sunport Representative and the Landscape Maintenance contractor. Should more powerful intervention be necessary, the Ortho Problem Solver, a horticulturalist or other plant professional shall be consulted for recommendations. Application of chemicals shall be applied in accordance with all City, State and Federal restrictions. Log any pest management efforts in the log in Appendix D.

Although not exhaustive; a list of pests common to cool season grass turf in this area has been included. Consult a horticulturalist for advice on management of these and other pest problems. Lawn pests common to this region are:

*Sod webworms*- the larva of several types of moths. Infestations can be recognized by the small dead patches in the spring and gradually grow larger in the summer. Parasitic nematodes are effective in controlling these pests. Products containing Permethrin are effective chemical control.

*White grubs*-are the larva of several species of beetles that feed on the roots of turf grasses. They can be identified by the appearance of distinct irregular shaped brown patches of turf from which grass can be pulled out easily. Severe infestations can be controlled by the application of nematodes. Chemical controls include carbaryl and imidacloprid, which work best if lawn is de-thatched first.

*Prairie dogs*-Control of prairie dogs is a sensitive issue and methods of control should be discussed. There are several measures that can be used that will ensure the public that all options have been explored and used.

*Fairy ring*-is a fungal disease that leaves small circles of dark green grass surrounding areas of dead or light-colored areas that may or may not include mushrooms. Applying a nitrogen fertilizer and keeping the lawn wet for 3-4 days can accomplish control of fairy ring.

*Rust*-Kentucky blue grass is susceptible to rust problems. Rust infected lawns have an overall yellowish to reddish color. Older leaf blades may have small reddish-purple pustules in circular or elongated patches. Blades

eventually wither and die. Watering in the early morning is the most effective prevention of rust. Adequate application of nitrogen fertilizer also helps to control rust. The fungicides triadimefon and chlorothalonil may be effective.

**1.1.6. Sod/ Seed Replacement**

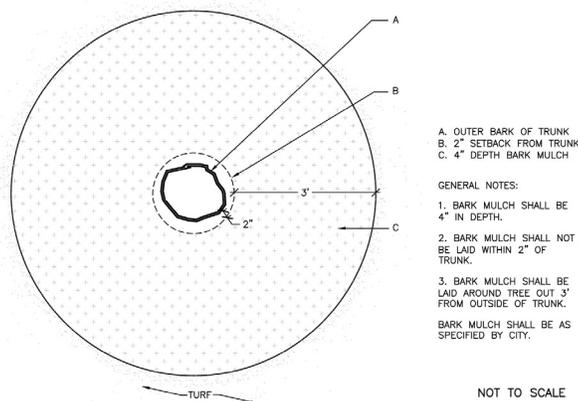
Should it become necessary to replace the cool season turf grass it shall be replaced by the same species originally planted. Small patches (5’ x 5’ maximum) can be reseeded by hand and larger areas shall be re-sodded following soil preparation. Soil shall be prepared by removing all large debris from the area, the soil shall be tilled to reduce compaction and to incorporate a minimum of a one-inch layer of compost and soil amendments as needed. Soil testing will dictate which, if any, soil amendments to add.

Seed shall be applied at a rate of 3 pounds per 1,000 square feet. The seed shall be lightly raked in and a 1/16<sup>th</sup> inch layer of mulch shall be spread over the seed. The area shall be rolled with an empty roller and watered thoroughly. The area shall be kept uniformly moist with frequent light watering (four to five times a day), until the seeds sprout.

Sod shall be laid on a prepared site that has been moistened. The strips shall be staggered and the ends pressed together firmly. Roll the sod with a roller half-filled with water. The new sod shall be watered at least once a day, (more during hot weather) for six weeks. Manual watering may be necessary to avoid potential overwatering adjacent turf and to comply with city water restrictions.

**1.1.7. Trees, Mulch Ring**

A three to four foot diameter ring of bark mulch shall surround trees planted in turf. The bark mulch shall be four inches in depth. (See the City of Albuquerque Tree Technical Manual, Section 8.) There are two reasons for the mulch ring; 1) to protect the tree trunk from damage from mowing and trimming the grass and 2) to allow air to pass through to the roots thereby reducing the incidence of tree roots coming up into the turf.



**Mulching Ring**

## 1.2. Warm Season Turf and Native Grass Meadow

### 1.2.1. General

Several areas of the Sunport are planted with Buffalo and/or a combination of Buffalo and Blue Grama turf grass. Warm season grasses go dormant in the fall, typically in September or October, becoming a tawny color. They turn green in the late spring. The warm season grass and native grass meadow areas require less water than the cool season turf grasses and suffer when watered too much.

*Warm Season turf areas consist of Buffalo grass, a fine-bladed low growing grass that should be kept mowed to a height of between 4-6 inches in areas. In meadow areas, the native grass is a combination of Buffalo and Blue Grama grasses; these areas should not be mowed except in early spring, which will allow the curls of seed heads to remain to wave in the wind throughout the winter. All warm season native grass and turf areas should be kept weed and disease free.*

### 1.2.2. Warm Season Turf

Warm season turf typically consists of buffalo grass or buffalo grass blends.



**Buffalo Grass turf**

#### 1.2.2.a. Watering

This grass propagates via stolons and is deep-rooted. This turf is irrigated by a spray irrigation system to keep these areas greener than they would be if they were not irrigated. This irrigation shall be monitored in order to reduce the frequency and duration of irrigation during the rainy season if possible.

During the growing season, June through September, Buffalo grass turf will require approximately ½” of water per week delivered by spray irrigation. (See Section 2 Irrigation and Appendix C. Irrigation Schedule).

**1.2.2.b. Fertilization**

Generally, Buffalo grass does not require fertilization, and can actually be damaged by the fertilization regimens normally used on turf grass. At a minimum, soil testing shall be performed every two years to ascertain the nutrient available for the grass. When used as a lawn, buffalo grass shall be fertilized in late spring and in August at the rate of one pound actual slow release nitrogen per 1,000 square feet.

If the Buffalo grass turf does become yellow, a reduction in watering should return it to green. If that reducing water does not turn the grass green, a light application of nitrogen; (at a rate of ½ pound of nitrogen per 1,000 square feet) may help.

**1.2.2.c. Pest Management**

Well-managed Buffalo grass turf should be relatively free of pests. When weeds appear they should be removed by hand wherever possible. Routine inspections will ensure that weeds will be kept in check. A weed is any undesirable plant growth in a given area as defined by the landscape contractor. Under no circumstances shall weeds be allowed to set seed.

Insects and diseases, including fungal infections, shall be identified and treated quickly using the least toxic and most effective controls possible such as Integrated Pest Management techniques. Should more powerful intervention be necessary, the Ortho Problem Solver, a horticulturalist or other plant professional shall be consulted for recommendations. If absolutely necessary, a broad leaf herbicide that is specially formulated for warm season grasses may be used on Buffalo grass turf when no trees are in the turf.

Under no circumstances shall weeds be allowed to set seed. Occasionally, cool season grasses invade warm season grass turf. When this occurs a non-residual herbicide such as Round up can be used between the months of October and March when the Buffalo Grass is dormant. Application of chemicals shall be applied in accordance with all City, State and Federal restrictions.

**1.2.2.d. Mowing, Aeration and De-thatching**

**Mowing**

Buffalo grass will only grow to a height of four to six inches and will only require mowing when it reaches five inches in height. The buffalo turf areas should be maintained as a tall lawn. If conditions prevent mowing until grass is over five inches, the blade shall be raised so that no more than 1/3 of total blade height is removed, the blade can then be lowered and the blades cut to five inches by mowing in another direction. All warm season turf areas along sidewalks, curbs,

mowstrips, boulders, plantings, tree mulch, and other borders should be kept with clean trimmed edges.

### **Aeration**

Aeration is a method used to increase air exposure to the soil. Air in the soil is crucial because it allows water to penetrate and allows the subsurface activities of the soil and the roots to take place; it also helps in the decomposition of thatch. Aerating can be accomplished by coring or hole punching which create holes or slits in the turf and top lens of the soil. Aeration shall be performed once a year in late spring.

### **De-thatching**

Thatch is composed of living and dead roots, rhizomes and stolons that develop between the green vegetation and the soil surface. A little thatch is helpful to the turf because it reduces water loss due to evaporation, and reduces temperature fluctuations. When the layer of thatch becomes greater than ¾" it can interfere with the movement of water and air into the soil. Regular thinning and raking the turf will keep thatch from accumulating and reduce excessive thatch build up. Vertical mowing is required if an excessive thatch layer (over ¾" in depth) accumulates. Vertical mowing is to be performed in the late spring or early summer when it is necessary to reduce excessive thatch.

#### ***1.2.2.e. Sod/ Plug Replacement***

Replacement of Buffalo grass may be necessary under particular seasonal circumstances. Buffalo grass shall be replaced by a variety identified to match the existing variety. Small patches (5' x 5') can be reseeded or plugs planted by hand and larger areas shall be re-sodded following soil preparation. Soil shall be prepared by removing all large debris from the area, the soil shall be tilled to reduce compaction and to incorporate a minimum of a one-inch layer of compost and soil amendments as needed. Soil testing will dictate which, if any, soil amendments to add.

Certain varieties of Buffalo grass are not available in seed, if so plugs are to be used for replacement. Before the plugs are planted, they should be well-watered, but not dripping wet. Make a 1/8" deep cut through the surface roots on each side and the bottom of each plug. Use a trowel or small bladed shovel to make a hole big enough to accept the plug. Insert the plug in the hole and fill the space around it with loose soil, water thoroughly. Plug shall be planted about 6" apart in a grid pattern. A one inch layer of mulching material such as compost, seed-free wheat or barley straw or similar material shall be added to shade the soil and maintain moisture levels between

waterings and discourage weed growth. Weeding is important during the establishment period and should be performed by hand.

Water newly planted plugs twice daily for the first week, once daily for the second week, then gradually decrease the frequency to every other day for the third week, the fourth week water every two days, the fifth week, water every three days until watering is occurring once a week. This watering schedule is only a suggestion and each plug planting will need to be evaluated and adjustments made on a case-by-case basis.

If seed does exist in the verified existing variety, seed application shall be at the rate of 4 pounds per 1,000 square feet or after consultation with a horticulturist or other plant professional. The seed shall be lightly raked in and a 1/16th inch layer of mulch shall be spread over the seed. The area shall be rolled with an empty roller and watered thoroughly. The area shall be kept uniformly moist with frequent, light watering, (four to five times a day), until the seeds sprout.

Buffalo grass sod may be laid in when large areas require replacement. Sod shall be laid on a prepared site that has been moistened. The strips shall be staggered and the ends pressed together firmly. Roll the sod with a roller half-filled with water. The new sod shall be watered at least once a day, (more during hot weather) for six weeks.

Foot traffic over the sod shall be restricted during establishment periods so as to not disturb tender or germinating grass. Foot disturbance and compaction during other maintenance operations such as trash collection shall be avoided in these areas during establishment periods. Particular care shall be taken to use correct sod type shall any replacement be required.

#### ***1.2.2.f. Trees, Mulch Ring***

A three to four foot diameter ring of bark mulch shall surround trees planted in turf. The bark mulch shall be four inches in depth. (See the City of Albuquerque Tree Technical Manual, Section 8.) There are two reasons for the mulch ring; 1) to protect the tree trunk from damage from mowing and trimming the grass and 2) to allow air to pass through to the roots thereby reducing the incidence of tree roots coming up into the turf.

### **1.2.3. Seeded Native Grass Meadows**

#### ***1.2.3.a. Watering***

The Buffalo and Blue Grama grass are deep-rooted; they both require periodic deep watering. The meadows are irrigated by a spray

irrigation system to keep these areas greener than they would be if they were not irrigated. This irrigation shall be monitored in order to reduce the frequency and duration of irrigation during the rainy season if possible.



**Blue Grama in Winter**

During the growing season, Buffalo/Blue Grama grasses will require approximately  $\frac{1}{2}$ " of water per week.

#### ***1.2.3.b. Fertilization***

Generally, warm season grasses do not require fertilizing when used for a prairie grassland effect. At a minimum, soil testing shall be performed every two years to ascertain the nutrient available for the grass. If fertilization is necessary, apply at the rate of 1 pound actual slow release nitrogen per 1000 square feet in September.

If warm season grasses do become yellow, a reduction in watering should return it to green. If that reducing water does not turn the grass green, a light application of nitrogen may help. Log any fertilization in the log provided in Appendix D. A light application of nitrogen; (at a rate of  $\frac{1}{2}$  pound of nitrogen per 1,000 square feet) may help.

#### ***1.2.3.c. Pest Management***

Well-managed native grass meadows should be relatively free of pests. When weeds appear they should be removed by hand wherever possible. A weed is any undesirable plant growth in a given area as defined by the landscape coordinator. Routine inspections will ensure that weeds will be kept in check. Under no circumstances shall weeds be allowed to set seed.

Insects and diseases, including fungal infections, shall be identified and treated quickly using the least invasive and most effective controls

possible such as Integrated Pest Management (IPM), techniques. Should more powerful intervention be necessary, the Ortho Problem Solver, a horticulturalist or other plant professional shall be consulted for recommendations. Application of chemicals shall be applied in accordance with all City, State and Federal restrictions.

**1.2.3.d. Mowing**

Native grass meadows should appear like less manicured than the turf areas. With proper management practices, they should exhibit fairly uniform height and color. The Blue Grama grass has attractive seed heads that will grow eight to 10 inches in the fall. No mowing shall be required as a normal practice for aesthetics. It shall, however, be mown at least once a year in early spring.

Aeration and de-thatching should not be necessary as a regular management practice in native grass meadows.

**1.2.3.e. Replacement**

Reseeding may be desirable under particular seasonal circumstances. Buffalo grass propagates via stolons, the Blue Grama propagates through seeds, therefore the seed heads must remain through to early spring. During either harsh drought years or particularly wet years, reseeding may be done to increase planting density.

Should it become necessary to replace the warm season and native grass meadows it shall be replaced by the same species originally planted. The Buffalo grass shall be the same variety as the verified existing Buffalo grass *Buchloe dactyloides*. Likewise the blue grama shall be the same variety as the existing *Bouteloua gracilis*. Reseeding shall be done following soil preparation, by hand in small areas and on steep slopes and mechanically in larger areas. Certain varieties of Buffalo grass are not available in seed, if so plugs are to be used for replacement. Before the plugs are planted, they should be well-watered, but not dripping wet. Make a 1/8" deep cut through the surface roots on each side and the bottom of each plug. Use a trowel or small bladed shovel to make a hole big enough to accept the plug. Insert the plug in the hole and fill the space around it with loose soil, water thoroughly. Plug shall be planted about 6" apart in a grid pattern. A one inch layer of mulching material such as compost, seed-free wheat or barley straw or similar material shall be added to shade the soil and maintain moisture levels between waterings and discourage weed growth. Weeding is important during the establishment period and should be performed by hand.

Water newly planted plugs twice daily for the first week, once daily for the second week, then gradually decrease the frequency to every

other day for the third week, the fourth week water every two days, the fifth week, water every three days until watering is occurring once a week. This watering schedule is only a suggestion and each plug planting will need to be evaluated and adjustments made on a case-by-case basis.

If seed does exist in the verified existing variety of Buffalo grass, and for Blue Grama, the application shall be at the rate of 4 pounds per 1,000 square feet or after consultation with a horticulturist or other plant professional. The seed shall be lightly raked in and a 1/16<sup>th</sup> inch layer of mulch shall be spread over the seed. The area shall be rolled with an empty roller and watered thoroughly. The area shall be kept uniformly moist with frequent light watering until the seeds sprout. Log any pest management efforts in the log provided in Appendix D.

#### **1.2.4. Native Grass Management**

Some level of management is needed to establish and maintain seeded native grass. A stand may require from two to five or more years to become established and balanced. Often plantings that were thought to be a failure at the end of the seeding year develop into excellent stands the following year. Also, grasses will germinate at different rates. New seedlings shall not be destroyed until they have been thoroughly examined by a horticulturist or other plant professional that can identify the seeds and seedlings. Seeds may germinate one or two years after seeding if moisture was not available earlier.

Mowing shall not take place during establishment periods unless it is deemed necessary to control excessive weed growth. Set mowing heights from 4" to 6" minimum; mowing shall never be performed by a thrashing or flail mower. Tall volunteer grasses or weeds in undesirable locations may be pulled by hand.

Reseeding may be desirable under particular seasonal circumstances. ***Refer to Appendix A for the Plant List.*** During either harsh drought years or particularly wet years, reseeded may be done to increase planting density. Application shall be determined by reference to the original application rate on plans or after consultation with a horticulturist or other plant professional.

### **1.3. High Water Use Landscape**

#### **1.3.1. General**

***The higher water use landscapes are mainly located near structures and adjacent to walkways, therefore they play important roles in the overall aesthetic of the Sunport and the impression visitors have of Albuquerque and New Mexico. Plants***

*shall be kept free of disease and pests, and damage. Trees and shrubs shall be pruned to enhance their natural habit and shall not be shaped into balls, boxes or topped. Perennials shall be kept healthy and in bloom throughout the growing season. Much of the high water use landscape will eventually be converted to lower water use landscapes in the future. In the meantime, they are to be well maintained so they appear lush and healthy.*

Maintenance personnel shall be familiar with the City of Albuquerque, Tree Technical Manual for Parks and Recreation Facilities, (2005). In general, maintenance shall consist of weeding around trees, reshaping of earthen basins, watering, pruning and pest management as directed in the City of Albuquerque Tree Technical Manual. The information given below is an abbreviated version; personnel shall refer to the manual for detailed instructions.

### **1.3.2. Trees**

High water use trees found at the Sunport include Modesto Ash, London Plane, Austrian Pine and Blue Spruce. The deciduous trees, the Ash and the Plane trees, should have lush green foliage in the summer; the evergreens should be green all year. All tree trunks and branches shall be free from damage, disease and pests. No topping or pruning shall distort the natural habit of the specimen.

In general, maintenance shall consist of weeding, watering, pruning and pest management. Management techniques shall also adhere to the following guidelines.

#### ***1.3.2.a. Watering***

Establishment — When trees are initially planted, deep watering shall occur every five days for the first growing season, depending on natural rainfall. After this initial establishment period, depending on rainfall, watering for trees can take place approximately every week unless planted in turf. Trees planted in turf with spray irrigation may need no additional watering once established. This should be considered on a case-by-case basis. The growing season can be generally defined as the time period from May 1 to September 1. Watering of trees shall continue throughout the winter on a time regimen of once every month. This shall be accomplished on warm days (40° F+) when possible. Watering shall be assessed monthly and adjusted as needed to compensate for variations in precipitation, temperature and wind.

Established Trees — Trees should become established in a period of two to three years. After that time period, during the growing season trees shall be watered deeply at least every week (more often

when rainfall is below normal averages) unless planted in turf. Trees planted in turf with spray irrigation may need no additional watering once established. This should be considered on a case-by-case basis. Should trees ever exhibit general signs of stress such as yellowing of leaves, wilting, browning, discoloration or other signs of distress, a thorough check of the irrigation system shall be performed and plants shall be examined for pests and treated as necessary to correct the problem.

### **1.3.3. Shrubs**

Examples of high water use shrubs on Sunport are Red Tip Photinia and Forsythia. All shrubs shall be kept healthy and thriving and allowed to grow into the natural growth habit for the species, unless pruning is necessary for sidewalk clearance or visual sight lines. Required general maintenance includes weeding, watering, pruning and pest management.

#### **1.3.3.a. Watering**

**Establishment** — When shrubs are initially planted, watering shall occur about once every two days for an initial period of approximately one to three months, or during the first growing season, to supplement natural rainfall. After this period, watering shall take place about twice a week from spring through fall. Watering of shrubs shall continue throughout the winter once every month. This shall be accomplished on warm days (40° F).

**Established Shrubs** — Shrubs should become established in a period of approximately two to three years. After that time period, shrubs shall only require irrigation twice each week. During the growing season in drought years when rainfall is below average, additional irrigation may be required. Should shrubs ever exhibit general signs of stress such as yellowing of leaves, wilting, browning, discoloration etc., a thorough check of the irrigation system shall be performed, and plants shall be inspected for pests. Once the cause of the problem is identified, treatment can be implemented. Overwatering can be a major cause of plant mortality.

### **1.3.4. Perennials**

#### **1.3.4.a. Watering**

**Establishment**-When the perennials are initially planted, watering shall occur about once every other day for a period of approximately one month during the first growing season, depending on natural rainfall. After this initial period or plant establishment, watering can take place about once every two to three days, depending on natural rainfall, for the duration of the

growing season or until the fall. In the winter, watering shall occur approximately once per month.

Established Perennials — Perennials should become established in a period of one to two years. After that time period, they shall require irrigation during the growing season approximately two to three times every week, depending on natural rainfall. As perennials age, they die or become degraded in appearance, at such time they shall be replaced in kind. Should perennials ever exhibit general signs of stress such as yellowing of leaves, wilting, browning, discoloration or others, a thorough check of the irrigation system shall be performed and plants shall be inspected for pests. Consult a horticulturalist for advice.

### **1.3.5. Fertilizing**

Fertilization of trees, shrubs, and perennials shall not be necessary unless there are outward signs of a problem including yellowing of the leaves, wilting, discoloration, stunted growth, or tip dieback. If symptoms occur, before any remediation is attempted, consult a horticultural expert.

High water use shrubs and perennials tend to leach minerals; especially nitrogen, leaching can also alter pH. Therefore, the soil may need to be checked around these shrubs more often than low water use shrubs. Trees planted in turf will benefit from regular turf fertilizations and may not require additional fertilization.

Because the Sunport site covers an extensive area, many different soil conditions are present. Some soil conditions such as pH, porosity, and organic content will affect fertilization requirements. A soil test is an appropriate indicator of what amendments, if any, need to be added for optimal plant health. If fertilizing is needed, the minimum recommended dosages of the elements lacking shall be worked into the soil. Watering rates need to be increased temporarily to help dissolve fertilizers and prevent burning due to concentrated dosages if fertilizers are used. ***Log any fertilization in the log provided in Appendix D Table 3.***

### **1.3.6. Pest Management**

Trees, shrubs, and perennials introduced to the landscape should be inspected prior to delivery to ensure they are free of infestations and are in good health. Pest management shall be handled on a case-by-case basis. Before remediation of any problem is attempted, an arborist, horticulturalist, or other plant professional shall be consulted. IPM economic and aesthetic pest thresholds should be established based upon discussions with the Sunport Representative and the Landscape Maintenance contractor. An Integrated Pest Management (IPM) approach is recommended. Pest activity should

be monitored and controls implemented when IPM thresholds are breached. When intervention is deemed necessary, the most effective and least toxic controls shall be used. This approach reduces the exposure of people and wildlife to toxins and promotes a natural equilibrium where predators limit pest activity. ***Log any pest management efforts in the log provided in Appendix D.***

A well managed landscape should be relatively free of pests. When weeds appear they should be removed by hand wherever possible. A weed is any undesirable plant growth in a given area as defined by the landscape coordinator.

References: See Appendix F for complete list of references.

*Integrated Pest Management: potential, constraints and challenges*, Koul, O.; Dhaliwal, G.S.; Cuperus, G.W. (eds.)

*The Ortho Problem Solver*, Ortho

*Common Sense Pest Control*, Olkowski and Daar.

*Pests of Landscape Trees and Shrubs: An IPM Guide*,  
University of California, Division of Agriculture and Natural  
Resources Publication 3359.

Although not exhaustive; a list of pests common to high water use landscapes in this area has been included. Consult a horticulturalist for advice on management of these and other pest problems.

Common pests for High Water Landscapes in this region are:

*Ash tree borers*-attack trunks and large branches, after larva have eaten and pupated, they pupae emerge from the tree leaving holes in the tree often with the papery pupal cases extending out of the wood. The moths emerge from the pupal cases in late summer. Scientists are experimenting with treatments for trees infected with borers. The best option is to keep the trees in optimal health.

*Ash bark beetle*-are recognized by the pin-head sized holes they make in twigs. Twigs snap easily at the points where the bark beetle has stripped the cambium layer just below the epidermis layer of the twig. Bark beetle infestations occur very rapidly and heavily infested trees shall be removed immediately. Prevention is the best method for controlling bark beetle. Permethrin preparations have been moderately successful in treating mild infestations when the timing is correct.

*Sycamore scale*-Scale that affect sycamore tree are extremely small, requiring a hand lens to identify them in their usual habitat on the undersides of leaves. Scale infestation, which can be a significant problem, is recognized by hundreds of minute yellow dots on the undersides of leaves, eventually turning brown. As other pests also create similar symptoms, accurate identification is crucial so the correct treatment can be used. Biological control can be achieved by

the use of the two species of lady beetles; check with horticultural expert for the correct species and how to purchase them. Insecticidal soaps and horticultural oil are also effective when used at the proper time.

*Aphids and Spider mites*-are tiny sucking insects that are present in most cultivated landscapes, but are only a problem if the population causes visible damage. Spraying with high pressure water hose every three days for two weeks usually corrects the aphid problem. Insecticidal soap may be used if the problem persists and for spider mites.

*Flea Beetles*-Various species of flea beetles can create significant damage to young growth. Some cultural remedies that help control flea beetles are:

- Elimination of weeds
- Beneficial predators
- Pyola-(a Canola oil/Pyrethrium product)

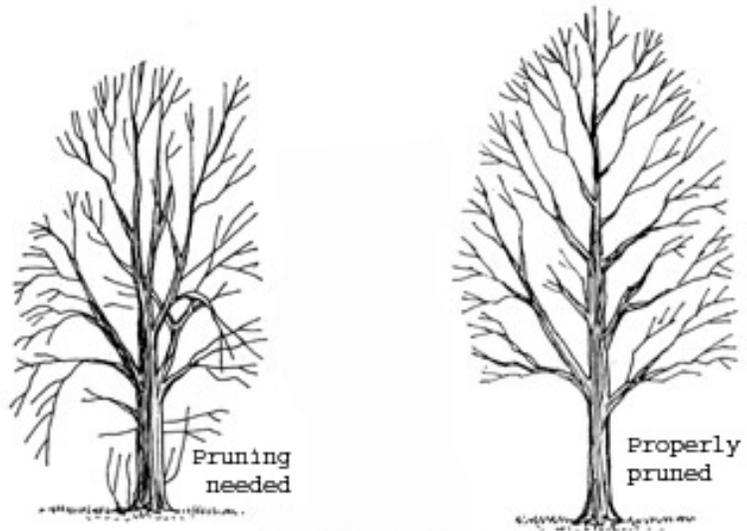
*Rabbits*-commonly damage landscapes in open settings throughout New Mexico, especially during drought periods. If desired, organic compounds such as blood meal or liquid products such as "Ro-pel" may be applied around plants to discourage browsing; however, irrigation and rains will leech these applications into the soil. Watering can also be reduced to limit tender new growth.

All other pest management shall be handled on a case-by-case basis and a horticulturist or other plant professional shall be consulted. Natural methods of pest management such as Integrated Pest Management (I.P.M.) are recommended. ***Log any pest management efforts in the log provided in Appendix D.***

### **1.3.7. Pruning**

#### ***1.3.7.a. Trees***

Pruning of trees is periodically necessary for general upkeep and maintenance of trees. Pruning at other times may be necessary due to the blocking of pedestrian paths or vehicular sight lines, safety concerns, or other conditions such as suckers or crossing branches. A pruning guide such as the ISA Tree Pruning Guidelines in the *City of Albuquerque Tree Technical Manual*, or *A New Tree Biology* by Alex Shigo shall be used, or an arborist or plant professional shall be consulted. It may be necessary to prune suckers or crossing branches. It shall be noted that some deciduous trees might freeze back 6"-8" in harsh winters. This damaged growth can be pruned off for aesthetic reasons. Any pruning shall leave plant materials with an informal or natural aesthetic. **Topping or rounding is neither appropriate nor acceptable.**



**Pruning of trees**



**Improper pruning of trees (not acceptable)**



**Topped Tree (not acceptable)**

**1.3.7.b. Shrubs**

In general, pruning of shrubs shall not be necessary, except to remove or repair storm breakage or to maintain unobstructed vehicular or pedestrian passage along walkways. Some of the shrubs may be pruned or deadheaded in early spring every year to maintain a neat appearance and stimulate growth. Forsythia, dogwoods and other early spring blooming shrubs shall be pruned late spring after blooming is completed. Volunteer seedlings shall be removed where they interfere with other plants or block pedestrian or sight lines. Any pruning shall leave plant materials with an informal or natural aesthetic in natural areas. **No pruning into compact ball or rounded forms shall be permitted unless specifically approved by Sunport Representative.** Pruning with string trimmers is discouraged.



**Properly pruned shrub**

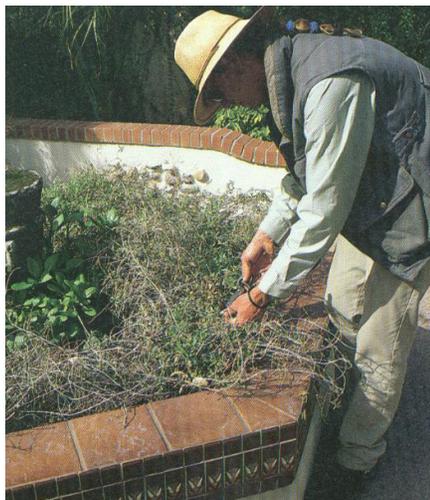


**Improperly pruned shrubs**

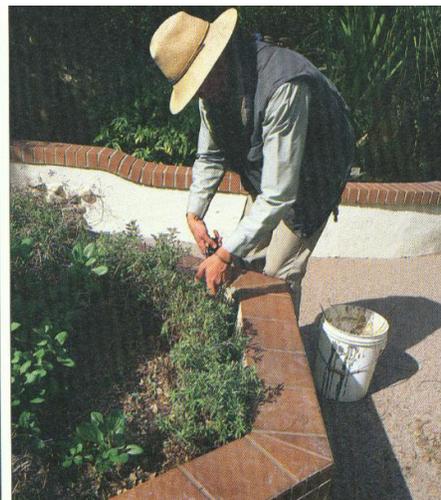
Hedges may be necessary for use as barriers or screening. These will require pruning as directed by Sunport Representative.

**1.3.7.c. Perennials**

"Dead-heading" or the removal of dried and completed blooms of certain perennials for additional flower production is necessary and shall be accomplished by reference to a good plant care guide such as *Sunset Western Garden*, by Sunset Magazine; *The Xeriscape Flower Gardener* by James Knopf; or *Natural By Design/Plants for Natural Gardens* by Judith Phillips. The flower/seed stalks of the grasses shall be cut back in early spring. Dried blooms shall be removed from other perennials so they will continue to bloom throughout the growing season. Flower/seed stalks of the flowering perennials shall be pruned following blooming periods to encourage repeat blooming.



**Perennials before dead-heading**



**Perennials properly dead headed**

**1.3.8. Tree Guying/Staking**

Some of the recently planted trees have been guyed and staked as part of the planting installation if necessary due to specific site conditions. Winds can loosen guys over time. All tree guys shall be checked on a weekly basis as part of the routine maintenance. If guys are loose, they shall be tightened as defined in the original plans. All guys shall be removed after the first growing season. Replacement plants may require guying/staking. This shall be decided on a case-by-case basis.

## 1.4. Moderate Water Use Landscape

### 1.4.1. General

*The moderate water use landscapes are mainly located in and around the parking areas and some of the structures, therefore they play important roles in comfort of visitors, the overall aesthetic of the Sunport and the impression visitors have of Albuquerque and New Mexico. Plants shall be kept free of disease and pests, and damage. Trees and shrubs shall be pruned to enhance their natural habit and shall not be shaped into balls, boxes or topped. Perennials shall be kept healthy and blooming as long as possible during the flowering seasons. All moderate water use plant materials are to be well maintained so they appear healthy and in their natural growth habit.*

Maintenance personnel shall be familiar with the City of Albuquerque, Tree Technical Manual for Parks and Recreation Facilities, (2005). In general, maintenance shall consist of weeding around trees, reshaping of earthen basins, watering, pruning and pest management as directed in the City of Albuquerque Tree Technical Manual. The information given below is an abbreviated version; personnel shall refer to the manual for detailed instructions.

### 1.4.2. Trees

Most of the moderate water use trees at the Sunport are either well adapted or native to the high desert region. Some of the trees in the moderate water use category are the various varieties of Pine, Oaks, New Mexico Olive, and Locust Trees. Most of the trees will require frequent health checks, as for pests and weeding, and periodic maintenance, such as pruning.

#### 1.4.2.a. Watering

Establishment — When trees are initially planted, deep watering shall occur every five days for the first growing season, depending on natural rainfall. After this initial establishment period, depending on rainfall, watering for trees can take place approximately every 2 weeks unless planted in turf. Trees planted in turf with spray irrigation may need no additional watering once established. This should be considered on a case-by-case basis. The growing season can be generally defined as the time period from May 1 to September 1. Watering of trees shall continue throughout the winter on a time regimen of once every month. This shall be accomplished on warm days (40° F+) when possible. Watering shall be assessed monthly and adjusted as needed to compensate for variations in precipitation, temperature and wind

Established Trees — Trees should become established in a period of two to three years. After that time period, during the growing season trees shall be watered deeply at least every week (more often when rainfall is below normal averages) unless planted in turf. Trees planted in turf with spray irrigation may need no additional watering once established. This should be considered on a case-by-case basis. Should trees ever exhibit general signs of stress such as yellowing of leaves, wilting, browning, discoloration or other signs of distress, a thorough check of the irrigation system shall be performed and plants shall be examined for pests and treated as necessary to correct the problem.

### **1.4.3. Shrubs**

Examples of moderate water use shrubs on Sunport are Cherry Sage, Lavender, Barberry, Cotoneaster, Silverberry, and Blue Mist Spirea. All shrubs shall be kept healthy and thriving and allowed to grow into the natural growth habit for the species, unless pruning is necessary for sidewalk clearance or visual sight lines. Required general maintenance includes weeding, watering, pruning and pest management.

#### ***1.4.3.a. Watering***

Establishment — When shrubs are initially planted, watering shall occur about once every two to three days for an initial period of approximately one to three months, or during the first growing season, to supplement natural rainfall. After this period, watering shall take place about once a week from spring through fall. Watering of shrubs shall continue throughout the winter once every month if no substantial rain or snow has fallen. This shall be accomplished on warm days (40° F).

Established Shrubs — Shrubs should become established in a period of approximately two to three years. After that time period, shrubs shall only require irrigation once week. During the growing season in drought years when rainfall is below average, additional irrigation may be required. Should shrubs ever exhibit general signs of stress such as yellowing of leaves, wilting, browning, discoloration, stunted or distorted growth, etc., a thorough check of the irrigation system shall be performed, and plants shall be inspected for pests. Once the cause of the problem is identified, treatment can be implemented. Overwatering can be a major cause of plant mortality with this group of shrubs.

### **1.4.4. Perennials**

Some of the moderate water use perennials found on Sunport property are: English lavender, angelita daisy, and moonshine

yarrow. Together, these plants provide a long season of colorful interest to the landscape. They are relatively low maintenance; requiring weeding, watering, dead-heading, pruning and pest management.

#### **1.4.4.a. Watering**

Establishment — When perennials are initially planted, watering shall occur about once every two to three days for a period of approximately one month during the first growing season, depending on natural rainfall. After this initial period or plant establishment, watering can take place about once every five days, depending on natural rainfall, for the duration of the growing season or until the fall. In the winter, watering shall occur approximately once per month.

Established Perennials — Perennials should become established in a period of one to two years. After that time period, they shall require irrigation during the growing season approximately once every week, depending on natural rainfall. As perennials age, they die or become degraded in appearance, at such time they shall be replaced in kind. Should perennials ever exhibit general signs of stress such as yellowing of leaves, wilting, browning, discoloration, stunted growth, or others, a thorough check of the irrigation system shall be performed and plants shall be inspected for pests.

#### **1.4.5. Fertilizing**

Fertilization of trees, shrubs, and perennials shall not be necessary unless there are outward signs of a problem including yellowing of the leaves, wilting, discoloration, stunted growth, or tip dieback. If symptoms occur, before any remediation is attempted, consult a horticultural expert.

Moderate water use shrubs and perennials tend to leach minerals; especially nitrogen, leaching can also alter pH. Therefore, the soil may need to be checked around these shrubs more often than low water use shrubs. Trees planted in turf will benefit from regular turf fertilizations and may not require additional fertilization.

Because the Sunport site covers an extensive area, many different soil conditions are present. Some soil conditions such as pH, porosity, and organic content will affect fertilization requirements. A soil test is an appropriate indicator of what amendments, if any, need to be added for optimal plant health. If fertilizing is needed, the minimum recommended dosages of the elements lacking shall be worked into the soil. Watering rates need to be increased temporarily to help dissolve fertilizers and prevent burning due to concentrated dosages if fertilizers are used. ***Log any fertilization in the log provided in Table 3.***

#### 1.4.6. Pest Management

Trees, shrubs, and perennials introduced to the landscape should be inspected prior to delivery to ensure they are free of infestations and are in good health. Pest management shall be handled on a case-by-case basis. Before remediation of any problem is attempted, an arborist, horticulturalist, or other plant professional shall be consulted. An Integrated Pest Management (I.P.M.) approach is recommended. Pest activity should be monitored and controls implemented when IPM thresholds are breached. When intervention is deemed necessary, the most effective and least toxic controls shall be used. This approach reduces the exposure of people and wildlife to toxins and promotes a natural equilibrium where predators limit pest activity. ***Log any pest management efforts in the log provided in Appendix D.***

A well managed landscape should be relatively free of pests. When weeds appear they should be removed by hand wherever possible. A weed is any undesirable plant growth in a given area as defined by the landscape coordinator.

References: **See Appendix F for complete list of references.**

*Integrated Pest Management: potential, constraints and challenges*, Koul, O.; Dhaliwal, G.S.; Cuperus, G.W. (eds.)  
*The Ortho Problem Solver*, Ortho  
*Common Sense Pest Control*, Olkowski and Daar.  
*Pests of Landscape Trees and Shrubs: An IPM Guide*,  
University of California, Division of Agriculture and Natural  
Resources Publication 3359.

Although not exhaustive; a list of pests common to moderate water use landscapes in this area has been included. Consult a horticulturalist for advice on management of these and other pest problems. Common pests for Moderate Water Landscapes in this region are:

*Locust borer*-a black beetle with vivid yellow marking that is known to attack locust trees less than six inches in diameter, particularly during dry spells. Adults lay their eggs in bark crevices in the fall, larva pass into the sap and heart woods. Heavily infested trees should be removed and destroyed. An early spring application of a diluted Permethrin solution may prevent larva from tunneling into the wood.

*Locust leaf miner*-a small flattened beetle that mines into the inner layers of leaves, eventually skeletonizing them. Control is normally not necessary unless infestation is severe. Treatment in mid spring with any of the numerous agents available; consult horticulturalist.

*Pine bark beetle*-can cause devastating damage to pine trees and are difficult to control. Small, about the size of a grain of rice, beetles live under the bark; a prominent symptom is pine pitch exuding from the trunk and large limbs. Removal of affected trees is the preferred course of action.

*Pine tip moth*-although Ponderosa pine are the usual host for this pest, other pine trees have also been damaged by it. Once trees grow over twenty feet high they are no longer susceptible to this pest. Larvae mine into new shoots and kill the buds, leaving tents of pitch, silk and frass. Eventually, the dried out shoots turn brown resulting in accumulations of dried needles, shoots, frass and silk webbing. Severe infestations result in deformed trees. Natural enemies of pine tip moth are various parasitic wasps and flies. Timing is critical in use of chemical controls because they are only effective at the larval stages. Check with horticulturalist for directions and timing of pesticides.

*Aphids and Spider mites*-are tiny sucking insects that are present in most cultivated landscapes, but are only a problem if the population causes visible damage. Spraying with high pressure water hose every three days for two weeks usually corrects the aphid problem. Insecticidal soap may be used if the problem persists and on spider mites.

*Flea Beetles*-Various species of flea beetles can create significant damage to young growth. Some cultural remedies that help control flea beetles are:

- Elimination of weeds
- Beneficial predators
- Pyola-(a Canola oil/Pyrethrium product)

*Rabbits*-commonly damage landscapes in open settings throughout New Mexico, especially during drought periods. If desired, organic compounds such as blood meal or liquid products such as "Ro-pel" may be applied around plants to discourage browsing; however, irrigation and rains will leech these applications into the soil. Watering can also be reduced to limit tender new growth. If rabbit damage becomes a problem to a significant landscape, the use of wire cages to protect plant material may be an option. Sunport Representative shall be consulted for approval of this measure.

*Prairie Dogs*-If Prairie Dogs damage landscape Sunport Representative shall be informed; no action shall be taken unless instructed to do so by Sunport Representative.

All other pest management shall be handled on a case-by-case basis and a horticulturist or other plant professional shall be consulted. Natural methods of pest management such as Integrated Pest

Management (I.P.M.) are recommended. ***Log any pest management efforts in the log provided in Appendix D.***

#### **1.4.7. Pruning**

##### ***1.4.7.a. Trees***

Pruning of trees should not be necessary, but if it becomes necessary to prune due to the blocking of pedestrian paths or vehicular sight lines, safety concerns, or other condition, a plant pruning guide such as the ISA Tree Pruning Guidelines in the *Tree Technical Manual*, Appendix 11.11, or *A New Tree Biology* by Alex Shigo shall be used or an arborist or a plant professional shall be consulted (see Appendix F for reference). It may be necessary to prune suckers or crossing branches. It shall be noted that some deciduous trees might freeze back 6"-8" in harsh winters. This damaged growth can be pruned off for aesthetic reasons. Any pruning shall leave plant materials with an informal or natural aesthetic. **Topping or rounding is neither appropriate nor acceptable. (See figures in High Water Use Landscape, section 1.3.7.a.)**

##### ***1.4.7.b. Shrubs***

Some of the shrubs such as Blue Mist, Cherry Sage as well as other plants such as the Muhlenbergia, may be pruned or deadheaded in early spring every year to maintain a neat appearance and stimulate growth. Lavender shall be trimmed by no more than 1/3 its size after blooming every year to prevent it from becoming woody. Volunteer seedlings shall be removed where they interfere with other plants or block pedestrian or sight lines. Any pruning shall leave plant materials with an informal or natural aesthetic in natural areas. No pruning into compact ball or rounded forms shall be permitted unless specifically approved by Sunport Representative. Pruning with string trimmers is discouraged. **(See figures in High Water Use Landscape, section 1.3.7.b.)**

##### ***1.4.7.c. Perennials***

"Dead-heading" or the removal of dried and completed blooms of certain perennials for additional flower production is necessary and shall be accomplished by reference to a good plant care guide such as *The Xeriscape Flower Gardener* by James Knopf, or *Natural By Design/Plants for Natural Gardens* by Judith Phillips. The flower/seed stalks of the grasses shall be cut back in early spring. Dried blooms shall be removed from other perennials so they will continue to bloom throughout the growing season. Flower/seed stalks of the flowering perennials shall be pruned late winter – early spring. Others, such as the primrose and angelita daisy shall be cut

down to 4”-6” in late winter. The stems of desert four o’ clock break off at ground level so the brown top growth can just be lifted off and removed.

#### **1.4.8. Tree Guying/Staking**

Some trees have been guyed and staked as part of the planting installation if necessary due to specific site conditions. Winds can loosen guys over time. All tree guys shall be checked on a weekly basis as part of the routine maintenance. If guys are loose, they shall be tightened as defined in the original plans. All guys shall be removed after the first growing season. Replacement plants may require guying/staking – this shall be decided on a case-by-case basis.

### **1.5. Low Water Use Landscape**

#### **1.5.1. General**

*Although not necessarily native to the site, the plants in the low water use landscapes are either well adapted or native to the region. The plant materials in this landscape type reflect the arid areas of the high desert region. Because the plants are native or well-adapted to the region, maintenance needs are fairly minimal. After establishment, water needs are very low and pests are not usually a problem. Weeding on a regular basis, deadheading, and pruning when necessary keep low water landscapes looking well maintained. Low water landscapes presently comprise a low percentage of Sunport landscapes; Sunport Boulevard, the rental car facility and some outlying areas. The plan is to convert most of the Sunport landscapes to the low water use type of landscape in the future.*



Maintenance personnel shall be familiar with the City of Albuquerque, Tree Technical Manual for Parks and Recreation Facilities, (2005). In general, maintenance shall consist of weeding around trees, reshaping of earthen basins, watering, pruning and pest management as directed in the City of Albuquerque Tree Technical Manual. The information given below is an abbreviated version; personnel shall refer to the manual for detailed instructions.

### **1.5.2. Low Water Use Trees**

Low water use trees at the Sunport include desert willows, mountain mahogany, and several varieties of juniper. Minimal water is necessary for these trees once they are established and very little maintenance is also required.

#### ***1.5.2.a. Watering***

**Establishment** — When trees are initially planted, deep watering shall occur about four to five times a month for the first three months of the growing season, depending on natural rainfall. After this initial establishment period, depending on rainfall, watering for trees can take place approximately every 2 weeks. The growing season can be generally defined as the time period from May 1 to September 1. Watering of trees shall continue throughout the winter on a time regimen of once every month. This shall be accomplished on warm days (40° F+) when possible. Watering shall be assessed monthly and adjusted as needed to compensate for variations in precipitation, temperature and wind.

**Established Trees** — Trees should become established in a period of two to three years. After that time period, during the growing season (especially when rainfall is below normal averages), Low water trees shall be watered deeply every other week. Should trees ever exhibit general signs of stress such as yellowing of leaves, wilting, browning, discoloration, stunted growth, or other signs of distress, a thorough check of the irrigation system shall be performed and plants shall be examined for pests and treated as necessary to correct the problem.

### **1.5.3. Shrubs**

The shrubs were selected for drought tolerance and overall adaptability in addition to their aesthetics. Some of the low water use shrubs you might expect to find at the Sunport include: Hardy Dwarf Broom, Three Leaf Sumac, and Chamisa. In general, maintenance shall consist of weeding, watering, pruning and pest management.

#### **1.5.3.a. Watering**

Establishment — When shrubs are initially planted, watering shall occur about once every three to four days for an initial period of approximately one to three months, or during the first growing season, to supplement natural rainfall. After this period, watering can take place about once every other week from spring through fall. Watering of shrubs shall continue throughout the winter once every month if no rain or snow has occurred. This shall be accomplished on warm days (40° F+) when possible.

Established Shrubs — Shrubs should become established in a period of approximately two to three years. After that time period, shrubs shall only require irrigation every other week. During the growing season in drought years when rainfall is below average, additional irrigation may be required. Should shrubs ever exhibit general signs of stress such as yellowing of leaves, wilting, browning, discoloration etc., a thorough check of the irrigation system shall be performed, and plants shall be inspected for pests. Once the cause of the problem is identified, treatment can be implemented. Overwatering is a major cause of plant mortality.

#### **1.5.4. Perennials**

The low water use perennials found on Sunport property includes Mexican Evening Primrose and Rocky Mountain Zinnia. These plants augment the other perennials in providing a long season of colorful interest to the landscape. They are relatively low maintenance; requiring weeding watering, dead-heading, pruning and pest management.

#### **1.5.4.a. Watering**

Establishment — When perennials are initially planted, watering shall occur about once every two to three days for a period of approximately one month during the first growing season, depending on natural rainfall. After this initial period or plant establishment, watering can take place about once every week, depending on natural rainfall, for the duration of the growing season or until the fall. In the winter, watering shall occur approximately once per month.

Established Perennials — Perennials should become established in a period of one to two years. After that time period, they shall require irrigation during the growing season approximately once every week, depending on natural rainfall. As perennials age, they die or become degraded in appearance, at such time they shall be replaced in kind. Should perennials ever exhibit general signs of stress such as yellowing of leaves, wilting, browning, discoloration, stunted growth, or others, a thorough check of the irrigation system shall be performed and plants shall be inspected for pests.

### **1.5.5. Monocots**

Monocots used in Sunport landscapes include Agave and Yucca species. These plants require special treatment and therefore warrant their own section in this Maintenance Plan. Monthly inspections shall occur to insure they remain problem-free. Desert natives, these plants provide striking silhouettes to any landscape without much maintenance. General maintenance includes minimal watering, weeding and pest management. They should appear healthy and in their natural growth habit free from trimming or clipping.

#### ***1.5.5.a. Watering***

Establishment-During establishment, they shall be watered via a drip emitter once a week. No watering during winter months December to March. Maintenance crews shall be cautioned against over-watering as these plant materials are extremely prone to root rot and fungal infections.

Established Monocots-Yuccas and Agaves should become established in the first growing season. The valves shall be turned off following establishment, but left in place, to be used in the event of periods of extended drought.

### **1.5.6. Fertilizing**

Fertilization of low water use trees, shrubs, and perennials should not be necessary unless there are outward signs of a problem including yellowing of the leaves, wilting, discoloration, stunted growth, or tip dieback. If symptoms occur, before any remediation is attempted, consult a horticultural expert. Trees planted in turf will benefit from regular turf fertilizations and may not require additional fertilization.

Because the Sunport site covers an extensive area, many different soil conditions are present. Some soil conditions such as pH, porosity, and organic content will affect fertilization requirements. A soil test is an appropriate indicator of what amendments, if any, need to be added for optimal plant health. If fertilizing is needed, the minimum recommended dosages of the elements lacking shall be worked into the soil. Watering rates need to be increased temporarily to help dissolve fertilizers and prevent burning due to concentrated dosages if fertilizers are used. ***Log any fertilization in the log provided in Appendix D Table 3.***

**Monocots shall not be fertilized.**

### 1.5.7. Pest Management

Trees, shrubs, perennials and monocots introduced to the landscape should be inspected prior to delivery to ensure they are free of infestations and are in good health. Pest management shall be handled on a case-by-case basis. Before remediation of any problem is attempted, an arborist, horticulturalist, or other plant professional shall be consulted. An Integrated Pest Management (IPM) approach is recommended. IPM economic and aesthetic pest thresholds should be established based upon discussions with the Sunport Representative and the Landscape Maintenance contractor. Pest activity should be monitored and controls implemented when IPM thresholds are breached. When intervention is deemed necessary, the most effective and least toxic controls shall be used. This approach reduces the exposure of people and wildlife to toxins and promotes a natural equilibrium where predators limit pest activity. ***Log any pest management efforts in the log provided in Appendix D.***

A well managed landscape should be relatively free of pests. When weeds appear they should be removed by hand wherever possible. A weed is any undesirable plant growth in a given area as defined by the landscape coordinator.

References: **See Appendix F for complete list of references.**

*Integrated Pest Management: potential, constraints and challenges*, Koul, O.; Dhaliwal, G.S.; Cuperus, G.W. (eds.)  
*The Ortho Problem Solver*, Ortho  
*Common Sense Pest Control*, Olkowski and Daar.  
*Pests of Landscape Trees and Shrubs: An IPM Guide*, University of California, Division of Agriculture and Natural Resources  
Publication 3359.

Although not exhaustive; a list of pests common to low water use landscapes in this area has been included. Consult a horticulturalist for advice on management of these and other pest problems.

Common pests for Low Water Landscapes in this region are:

*Aphids and Spider mites*-are tiny sucking insects that are present in most cultivated landscapes, but are only a problem if the population causes visible damage. Spraying with high pressure water hose every three days for two weeks usually corrects the aphid problem. Insecticidal soap may be used if the problem persists and on spider mites.

*Flea Beetles*-Various species of flea beetles can create significant damage to young growth. Some cultural remedies that help control flea beetles are:

- Elimination of weeds
- Beneficial predators
- Pyola-(a Canola oil/Pyrethrium product)

*Agave snout weevi*-A black insect about one inch long that lays eggs at the base of a leaf about the time the plant is about to bloom. A sudden wilting of leaves is usually the first sign of infection. Removal of infected plants is necessary to control the spread to other plants.

*Pronuba moths*-specific to each type of Yucca, lay their eggs in the flowers. Larvae eat their way through the developing seeds and exit the seed capsule.

*Rabbits*-commonly damage landscapes in open settings throughout New Mexico, especially during drought periods. If desired, organic compounds such as blood meal or liquid products such as "Ro-pel" may be applied around plants to discourage browsing; however, irrigation and rains will leech these applications into the soil. Watering can also be reduced to limit tender new growth.

*Prairie dogs*-Control of prairie dogs is a sensitive issue and methods of control should be discussed. There are several measures that can be used that will ensure the public that all options have been explored and used.

*Fungal problems*-Agave and Yucca are prone to fungal infections if they receive too much water. Fungal infections can also render the plants susceptible to infestations from pests. Therefore, overwatering is not permitted.

### **1.5.8. Pruning**

#### **1.5.8.a. Trees**

Pruning of trees shall not be necessary, but if it becomes necessary to prune due to the blocking of pedestrian paths or vehicular sight lines, safety concerns, or other condition, a plant pruning guide such as the ISA Tree Pruning Guidelines in the *Tree Technical Manual*, Appendix 11.11, or *A New Tree Biology* by Alex Shigo shall be used or an arborist or a plant professional shall be consulted (see Appendix F for reference). It may be necessary to prune suckers or crossing branches. It shall be noted that some deciduous trees might freeze back 6"-8" in harsh winters. This damaged growth can be pruned off for aesthetic reasons. Any pruning shall leave plant materials with an informal or natural aesthetic. **Topping or rounding is neither appropriate nor acceptable. (See figures in High Water Use Landscape, section 1.3.7.a.)**

#### **1.5.8.b. Shrubs**

Some of the shrubs such as turpentine bush and broom may be pruned or deadheaded in early spring every year to maintain a neat appearance and stimulate growth. Volunteer seedlings shall be removed where they interfere with other plants or block pedestrian

or sight lines. Any pruning shall leave plant materials with an informal or natural aesthetic in natural areas. No pruning into compact ball or rounded forms shall be permitted unless specifically approved by Sunport Representative. Pruning with string trimmers is discouraged. (See figures in High Water Use Landscape, section 1.3.7.b.)

#### **1.5.8.c. Perennials**

"Dead-heading" or the removal of dried and completed blooms of certain perennials for additional flower production is necessary and shall be accomplished by reference to a good plant care guide such as *The Xeriscape Flower Gardener* by James Knopf, or *Natural By Design/Plants for Natural Gardens* by Judith Phillips. The flower/seed stalks of the grasses shall be cut back in early spring. Dried blooms shall be removed from other perennials so they will continue to bloom throughout the growing season. Flower/seed stalks of the flowering perennials shall be pruned late winter – early spring. Mexican evening primrose dies back to ground level in the winter so the dried stems and leaves shall be raked up and removed in the winter. Desert Zinnia spreads by rhizomes, so after the growing season a sharp, long-bladed shovel shall be used to cut into the soil around established plants to stimulate sub-surface branching. Once the stand of Zinnias is established, it can be mowed in late winter in preparation for the coming growing season.

#### **1.5.8.d. Monocots**

Pruning should not be necessary unless the plants have been planted too close to roadways or pedestrian walkways, in which case it may be more appropriate to move them. Spent flower stalks shall be left on for winter interest and can be pruned away in the early spring or before then if they fall over. Some blade litter may need to be removed around yuccas. Agaves will die after the season after they flower. Dead plant materials shall be removed and replaced as necessary.

#### **1.5.9. Tree Guying/Staking**

Some trees and yucca have been guyed and staked as part of the planting installation if necessary due to specific site conditions. Winds can loosen guys over time. All guys shall be checked on a weekly basis as part of the routing maintenance. If guys are loose, they shall be tightened as defined in the original plans. All guys shall be removed after the first growing season. Replacement plants may require guying/staking. This shall be decided on a case-by-case basis.

## 1.6. Annuals

### 1.6.1. General

The annuals selected for the Sunport landscape are known for their drought tolerance, hardiness, and outstanding color show. Every attempt shall be made to use annuals that are indigenous to the High Desert region; however, other plants may be used to provide a colorful landscape throughout the year. Annuals should be planted at the rate of 1 flat of 36-21/4" plants per 8 square feet, or 3 1/2 -4 plants per square foot. A complete plant list can be found in Appendix A although seasonal annual selections shall be at the direction of the Sunport Project Manager.

The annual beds shall be changed with the seasons throughout the year. The annuals must be kept in prime condition. In general, management shall consist of weeding, watering, deadheading, replanting and pest management. Management techniques shall also conform to the following guidelines:

### 1.6.2. Watering

**Establishment** — When the annuals are initially planted, watering shall occur every day for a period of approximately one month, depending on natural rainfall. After this initial period, watering can take place about once every two days, depending on natural rainfall, for the duration of the growing season. In the winter, watering shall occur approximately twice per week after establishment. *Refer to Appendix C, Irrigation Schedule for more accurate watering run times by month.*

**Established Annuals** — The period of establishment for annuals is highly variable. The watering schedule will depend upon the plant and the season and soil conditions, in general, they shall require irrigation during the growing season approximately three times per week or every other day, depending on natural rainfall and needs of plant materials. Winter annuals require water twice a week after establishment. Annuals shall be selected for seasonal appeal and shall be replaced when blooming period has ended. Shall annuals ever exhibit general signs of stress such as yellowing of leaves, wilting, browning, discoloration or others that are not related to senescence, a thorough check of the irrigation system shall be performed and plants shall be inspected for pests. *Refer to Appendix C, Irrigation Schedule for more accurate watering run times by month.*

### 1.6.3. Fertilizing

In order to look their best, some annuals will require fertilizing, most however, can perform very well with the addition of compost to the

soil mix. Fertilization of annuals shall occur at the time of planting with a granular high fertilizer; 10-10-10 or 5-10-10. Additional fertilizing shall not be necessary unless there are signs of a problem. These symptoms include yellowing of leaves or stunted growth. If problems occur consult a horticultural expert for specific recommendations based on the species and symptoms. Watering rates need to be increased temporarily to help dissolve fertilizers and prevent burning due to concentrated dosages if fertilizers are used. ***Log any Fertilization in the log provided in Appendix D.***

#### **1.6.4. Pest Management**

*Various species of flea beetles* can create significant damage to young growth. Some cultural remedies that help control flea beetles are:

- Elimination of weeds
- Beneficial predators
- Pyola-(a Canola oil/Pyrethrium product)

*Aphids and spider mites* are present in most cultivate landscapes, but are only a problem if the population causes visible damage. Spraying with high pressure water hose every three days for two weeks usually corrects the problem.

*Rabbits*-commonly damage landscapes in open settings throughout New Mexico, especially during drought periods. If desired, organic compounds such as blood meal or liquid products such as "Ro-pel" may be applied around plants to discourage browsing; however, irrigation and rains will leech these applications into the soil. Watering can also be reduced to limit tender new growth.

*Prairie dogs*-Control of prairie dogs is a sensitive issue and methods of control should be discussed. There are several measures that can be used that will ensure the public that all options have been explored and used.

All other pest management shall be handled on a case-by-case basis and a horticulturist or other plant professional shall be consulted. Natural methods of pest management such as Integrated Pest Management (I.P.M.) are recommended. ***Log any pest management efforts in the log provided in Appendix D.***

A well managed landscape should be relatively free of pests. When weeds appear they should be removed by hand wherever possible. A weed is any undesirable plant growth in a given area as defined by the landscape coordinator.

### **1.6.5. Pruning**

"Dead-heading" or the removal of dried and completed blooms of certain annuals for additional flower production is necessary and shall be accomplished by reference to a good plant care guide such as *The Xeriscape Flower Gardener* by James Knopf, or *Natural By Design/Plants for Natural Gardens* by Judith Phillips. Dried blooms can be removed from annuals so they will continue to bloom throughout the growing season.

### **1.6.6. Replacement of Annuals**

Annuals shall be replaced seasonally, at a minimum. The goal is to provide a show of color and texture throughout the year. Every attempt shall be made to keep the annual plantings in bloom.

Planning will be required so that replacement plants are ordered in advance of the season change so there will be no time period in which the annual beds are not attractive and in bloom. Selection of annuals shall be approved by the Sunport Representative.

## 2. Irrigation System

### 2.1. General

There are many different landscaped areas throughout the Albuquerque Sunport property. Please refer to the annotated aerial photographs and the accompanying tables and appendices for landscape type, locations and irrigation information.

While the Sunport landscape types will have unique watering requirements: irrigation bubblers, spray heads and drip emitters deliver water at varying rates, so the number of minutes that each zone should run must be determined on a case by case basis. Additionally, the duration of watering will go increase or decrease depending upon season, soil conditions, weather, temperature, slopes, and drainage in the areas being watered.

The most effective way to verify proper watering of plants is to perform periodic, or at least seasonal, soil probe testing. Perennial plants and all 1 gallon and 5 gallon shrubs shall be monitored to a depth of 12". Trees shall be monitored to a depth of 16" or as deep as the soil permits. All tests shall be performed 12 inches outside the water basin or inside the tree mulch ring (3' from trunk) on the side away from the bubbler or emitter.

Native and low water use trees, shrubs, and grasses can just as easily be overwatered as underwatered in the high desert climate. If a plant is subjected to stress (yellowing of leaves, wilting, browning, discoloration etc.), the soil around the shrub should be checked. If it is dry, water shall be directed to it from the nearest source by trenching from the water source to the plant or moving the drip emitter closer to the root zone. If the area around the shrub is saturated, the amount of water that shrub receives shall be lowered by reducing watering time or flow.

***Caution: Some of the newer or retrofitted portions of the Sunport irrigation system have been installed according to the New Mexico Environment Department (NMED) Policy for Above Ground Use of Reclaimed Domestic Wastewater (August 7, 2003), in order to operate with non-potable water, when it becomes available. Personnel shall take necessary precautions when dealing with the non-potable irrigation equipment. In some areas, purple tops have been installed on the irrigation heads and purple warning tape has been laid in the trenches with the lateral lines and on the valves. Upon conversion to the non-potable water, signs (in***

*English and Spanish) shall be placed throughout the landscaped areas. See Appendix G for complete text of policy or locate at: <http://www.nmenv.state.nm.us/fod/LiquidWaste/AGURWW.pdf>*

Note: The Albuquerque International Sunport landscape contains over 50 acres of irrigated area. Irrigation system operation monitoring, trouble shooting, and adjustment is an ongoing, constant requirement of the maintenance contractor. Sufficient resources for performing these critical tasks need to be provided, especially during growing season months. In addition, the maintenance contractor shall provide an entire comprehensive system inspection twice a year; in the Spring before increasing irrigation run times and in the fall before decreasing the irrigation run times. Any system equipment failure shall be brought to the immediate attention of the property manager.

If for any reason irrigation water shall cause run-off or overspray into the public right-of-way, the irrigation system shall be adjusted immediately to eliminate any water waste including misting or excessive water pressure.

By City Ordinance, the irrigation operational window shall occur between 6:00 PM and 10:00 AM in the growing season and during warm transition months. The entire system shall be visually inspected during operation bi-monthly (during seasons of use) and checked for leaks and for adjustments required. Managing routine scheduling by evapotranspiration (ET) rate does not consider either field capacity or rainfall. Proper management of the irrigation schedule requires consideration of both factors. Should certain species appear to be growing in water logged soils, emitters and/or bubblers may be replaced with a lower flow model or spray heads shall be nozzled down to reduce this condition. This manual does not make recommendations regarding leaching requirements. Shall plant health become an issue, soil and water testing is recommended to determine E.C. (sat. extract), pH, and SAR (calcium).

## **2.2. Maintenance and Operation of Irrigation Systems**

### **2.2.1. Irrigation Control/Controllers**

#### **2.2.1.a. General**

The Sunport irrigation system is currently controlled by approximately 40 site controllers. Many of the larger landscape areas are controlled by stand alone Toro/Motorola Irrinet or Scorpio controllers. The largest areas are controlled by satellite Scorpio

units linked to a primary Irrinet controller. These Motorola controllers have the capability to all be linked by central control software. A conversion of the system to a centralized control system is planned. When the conversion is complete, the contractor shall work closely with the Sunport Landscape Coordinator in programming the irrigation system.

The maintenance Contractor will be responsible for acquiring their own key pads and training to allow for field operations of these irrigation units. Many of the more remote or smaller irrigation systems at the Sunport facility utilize stand alone Rainbird ISC controllers. In the future, these controllers may be modified to accommodate central control capability, however at this point they require manual programming. In addition, several smaller landscape areas irrigated by manual valve activation.

**2.2.1.b. Operation**

The automatic Irrinet/Scorpio and ISC controllers operate DC solenoids at each valve.

**2.2.1.c. Maintenance**

Daily monitoring of the central control system is required for proper operation of the irrigation system and water conservation. If the controllers or weather stations malfunction, the trouble shooting procedures as recommended by the manufacturer shall be followed. Stand alone controllers will need to field monitored and manually tested on a regular schedule. The controller locations shall be kept free of debris and weeds for aesthetics as well as easy locating and maintenance accessibility. Solenoids should be checked annually for proper operation prior to the growing season.

**2.2.2. Backflow Prevention**

**2.2.2.a. General**

Backflow prevention devices at the Albuquerque International Sunport must be maintained and tested for proper operation to meet the City of Albuquerque Cross Connection Control Ordinance requirements.

**2.2.2.b. Testing**

The backflow prevention devices on the project must be tested at the time of installation and every year thereafter by a Certified Backflow Prevention Assembly Tester in accordance with the City of Albuquerque Cross Connection Control Ordinance. After any repairs to the backflow device it must be retested by a City of Albuquerque Certified Backflow Prevention Assembly Tester. The contractor shall be responsible for recording all tests of PVBs and for all charges related to the tests, etc. Copies shall be delivered to the Sunport Representative for record.

### **2.2.2.c. Maintenance**

The backflow prevention devices on the project shall be visually inspected on a weekly basis for signs of malfunction. If the backflow device requires repair a City of Albuquerque Certified Backflow Prevention Assembly Repair Person shall be employed.

## **2.2.3. Master Valves and Flow Meters**

### **2.2.3.a. General**

Master Valves and flow meters are typically installed in two configurations on the Sunport irrigation systems. A hydrometer is a combination of a flow meter and a hydraulically operated valve. The other configuration utilizes a separate “master valve” and flow meter installed within the same valve box or adjacent to each other in individual valve boxes.

Maintenance contractor shall provide or connect existing master valves and/or flow meters to field controllers throughout where necessary for proper operation of central control functions.

### **2.2.3.b. Operation**

In either configuration, it is critical that the flow meter portion of the combination is linked to the field controllers in order to provide flow control and sensing capability in the event of main line breaks or stuck valves. This is an important feedback component of the central control system. Master valve components operate similar to automatic zone valves.

### **2.2.3.c. Maintenance**

Master valves and flow meters should be inspected daily by the central control software. Visual inspection and manual testing should occur on a semi-annual basis prior to and after each growing season.

## **2.2.4. Isolation Valves and Mainline Pipe and Fittings**

### **2.2.4.a. General**

Isolation valves have been installed on the mainline usually at locations where a tee occurs upstream from zone valves. Should a problem occur within the irrigation system, these valves can be utilized to “turn off” the specific mainline zone without affecting other areas of the Sunport irrigation.

### **2.2.4.b. Operation**

When re-pressurizing a mainline that has been partially or completely drained, open the isolation valve very slowly allowing

the air in the line to bleed through the air relief valves so as not to build excessive hydraulic pressure in the line. When closing an isolation valve it must be done slowly to avoid water hammer.

#### **2.2.4.c. Maintenance**

Isolation valves will be checked on a semi-annual basis; before and after each growing season; for proper operation. The system should be pressurized and water flowing. Slowly open the isolation valve to avoid hydraulic ram and water hammer while re-pressurizing the system then the valve should be shut off slowly to verify the system isolation.

Isolation valve boxes will be clearly marked and kept free of debris and weeds so that they can be located and accessed easily.

### **2.2.5. Air Relief Valves**

#### **2.2.5.a. General**

Air relief valves are installed on the mainline at the high points and ends, below grade and in a valve box.

#### **2.2.5.b. Operation**

Air relief valves allow air to be bleed from the mainline pipe avoiding hydraulic ram.

#### **2.2.5.c. Maintenance**

The air relief valve will be visually inspected on a monthly basis for any water leakage. If there is any leakage, the valve under the air relief valve is shut off and the air relief valve will be removed and cleaned. If leakage continues, replace with a new air relief valve. Always make sure the valve under the air relief is opened after repairing, replacing, or checking.

The valve box that the air relief is located in must be kept free of debris and weeds for easy location and accessibility.

### **2.2.6. Pressure Reducing Valve with Y Strainer on the Mainline**

#### **2.2.6.a. General**

Pressure reducing valves can be located on the mainline at points of lower elevation from the point of connection where excessive pressure needs to be mitigated. Y strainers may be located upstream of the pressure reducing valves where sediment may create a maintenance problem in Pressure Reducing Valves.

#### **2.2.6.b. Operation**

Pressure reducing valves reduce the pressure increase in the mainline due to mainline drop in elevation. These valves are usually

preset to 50 psi, but are adjustable. There is a control nut located on the adjustable PRV. To decrease pressure, turn the control nut out or counterclockwise. To increase pressure, turn the control nut in or clockwise. The Y strainer keeps debris from clogging or damaging the Pressure Reducing Valve.

**2.2.6.c. Maintenance**

Check the Y strainer for debris monthly or after any mainline repairs. The Pressure Reducing Valve pressure will be checked by screwing a pressure gauge in the down stream port of the valve or on a downstream riser. This should also be done whenever pressure appears to be higher or lower than normal in the main. The valve box for the Pressure Relief valve and the Y strainer will be kept free of debris and weeds for easy location and accessibility.

**2.2.7. Manual Mainline Drain**

**2.2.7.a. General**

The manual mainline drain is a gate valve located at the low end of the irrigation main line.

**2.2.7.b. Operation**

The manual drain is used to drain the mainline for repairs or for freeze protection/winterization.

**2.2.7.c. Maintenance**

Manual Drains shall be inspected on an annual basis. Open and close the gate valve with the mainline off to insure proper operation. The valve box for the manual drains will be kept clear of debris and weeds for easy location and accessibility.

**2.2.8. Automatic Valve**

**2.2.8.a. General**

Automatic valves are installed on the mainline to operate irrigation zones. Each zone should be composed of the same type of emission device such as bubblers, rotor heads, or drip emitters.

**2.2.8.b. Operation**

Automatic valves are typically plastic chambers with rubber diaphragms that are actuated by a solenoid. In our arid climate and using high mineral content water it is not unusual for sediment to cause valves to stick on or off. Constant monitoring is required. Signs of under or over watering may be an indication of a stuck or defective valve. All valves shall be checked before and after each growing season for proper operation.

**2.2.8.c. Maintenance**

Automatic valves shall be serviced as needed. If a valve does not

operate properly, the trouble shooting procedures recommended by the manufacturer of the valve and solenoid shall be followed. The valve box for the valves shall be kept clear of debris and weeds for easy location and accessibility.

### **2.2.9. Spray Head Rotors**

#### **2.2.9.a. General**

Large rotor spray heads are utilized for irrigation of large turf areas within the Sunport landscape where coverage on wide spacing is required. These are typically manufactured by Hunter Industries and range from short radius PGMs or PGPs to larger radius I-40 or I-60. Some heads in native grass turf or meadows may have taller stems (6" or 12") to compensate for grass height. It is critical that any replacement of heads or nozzles of rotors be made with identical equipment. Much of the Sunport landscapes exist on slope conditions. This provides several unique challenges for spray irrigation. It is also critical both for plant material health and Water Waste Ordinance compliance that the rotors be inspected for proper operation and adjustment on a daily basis during growing season watering. An inspection schedule should be in place to visually inspect all turf areas on a regular cycle. First, proper alignment of heads is necessary to avoid "digging" into slopes with water. Also, slopes create extreme water pressure differentials within valve zones. This can cause areas of low head drainage and high pressure misting. Should low head drainage create problems, the head(s) should be replaced with an identical head with an in-line check valve. High pressure misting which contributes to wind/evaporation waste can be mitigated by adding pressure regulating valves in appropriate locations. Slope conditions may also mandate cycle and soak irrigation scheduling for turf areas.

#### **2.2.9.b. Operation of rotor spray heads**

The rotor spray heads will pop-up to operate and are easily adjustable from the top for arc coverage. Radius screw should only be adjusted as a last resort. Renozzeling of head is a preferable method to adjust radius without effecting proper precipitation rate. **Absolutely no overspray shall be allowed in the street. Strictly observe 12 a.m. - 6 a.m. water window, for spray areas, subsequent to germination period except during winter watering.** If over spray onto the public right-of-way is observed, adjust heads by turning them or reducing radius length.

#### **2.2.9.c. Maintenance**

All rotor heads will need to be visually checked for proper operation weekly while operational. If any lateral line or spray head repairs occur on a rotor zone, all heads on the affected zone must be flushed prior to use subsequent to such repairs.

## 2.2.10. Pop-Up Spray Heads

### 2.2.10.a. General

Pop-up spray heads are installed on the lateral pipe of the auto valves to irrigate smaller turf areas or shrub/perennial planter areas. Spray nozzles will pop-up to operate.

### 2.2.10.b. Operation

The pop-up spray heads typically pop-up 3", 6", or 12" and has interchangeable nozzles or pressure compensation screens (PCS). These nozzles or PCS's can be changed to adjust spray radius. Any change of these nozzles or PCS's will also, however, affect the total gallons per minute of flow through the spray heads. **Absolutely no overspray should be allowed in the street.** Strictly observe the 10 p.m. to 6 a.m. water window for spray heads. If overspray onto the public right-of-way or other hard surfaces is observed, adjust via nozzle or PCS replacement or by turning ratcheting riser to correct position.

### 2.2.10.c. Maintenance

The pop-up spray heads will be visually checked for proper operation weekly during operation. If there are lateral line or spray head repairs, all head risers on the affected zone will need to be flushed of dirt and debris prior to installation and operation.

## 2.2.11. Bubbler Heads

### 2.2.11.a. General

Bubbler heads are installed on lateral piping of automatic valves to irrigate the trees, shrubs and perennials within the Sunport Landscape. Most of the bubblers are flood type nozzles on fixed risers. Some bubblers are flood or stream type nozzles on pop-up heads.

### 2.2.11.b. Operation

The majority of bubbler heads are Rainbird 1400 Series Pressure Compensating nozzles. Newly installed bubblers have PA- 8S-NP adapter which is a purple flange to note non-potable applications. Some bubblers may be full circle pop-up nozzles on six inch risers. Spacing is usually one bubbler per tree. Tree bubblers are most commonly either .5 GPM or 1 GPM nozzles.

Shrub and perennial bubbler heads are most typically Rainbird 1400 Series Pressure Compensating nozzles. Newly installed bubblers have PA- 8S-NP adapter which is a purple flange to note non-potable applications. Some bubblers may be full circle pop-up

bubbler on six inch risers. Spacing is typically one bubbler per plant. Shrub and perennial bubblers are most commonly either .25 GPM, or .5 GPM nozzles.

**2.2.11.c. Maintenance**

The bubbler heads shall be visually checked for proper operation weekly when system is operational. If lateral line or bubbler head repairs are required, the affected heads shall be flushed of dirt and debris prior to installation and use.

**2.2.12. Drip Pressure Regulators**

**2.2.12.a. General**

Drip zone pressure regulators are located at automatic valves of within round boxes where the PVC lateral piping changes to poly drip tube.

**2.2.12.b. Operation**

The drip pressure regulators are typically preset to 20 or 30 psi.

**2.2.12.c. Maintenance**

To check the pressure regulator, a pressure gauge can be installed down stream of the device to ensure correct pressure reduction. If the pressure is measured to be above the set factory psi or emitters are being popped off drip lines, the pressure reducer may need to be replaced. The valve box for the pressure reducer shall be kept clear of debris and weeds for easy location and accessibility.

**2.2.13. Drip Emitters**

**2.2.13.a. General**

Drip emitters for the Sunport landscapes are installed above grade on ¼” poly tubing at individual plants or are part of an eight multi-outlet emitter system installed in round boxes with planting masses. Regardless of drip delivery system, it is typical to provide 2.0 GPH emitters at two per plant.

**2.2.13.b. Operation**

Drip emitters for this project are installed above grade or within round boxes to permit easy access and maintenance. If emitters appear to be clogged during operation, the emitter head tab plug shall be removed to clear water path. If this fails to clear the emitter, a new emitter shall be installed.

**2.2.13.c. Maintenance**

The drip emitters shall be visually inspected for proper operation weekly during operation. Drip emitters shall be replaced when

damaged, missing or when mineral build-up impedes water flow. Replacements parts must be the same as originally installed.

#### **2.2.14. Drip Filter**

##### ***2.2.14.a. General***

Drip Filters are located before or after the automatic drip valve usually within or adjacent to the drip valve box.

##### ***2.2.14.b. Operation***

The mesh size or count of the filter should always be equivalent to or larger than the mesh count requirement of the selected emitter. Drip valve filters filter out particles that could clog or damage an emitter. Some newer drip zones are equipped with Rainbird auto backflush filters. These filters are self flushing during normal operation of the drip valve.

##### ***2.2.14.c. Maintenance***

Drip filters shall be checked and cleaned annually prior to the growing season as well as after any mainline repair. When servicing, remove and wash out the filter and check for rips or cracks in the filter element. Replace if damaged, then reassemble. Rainbird backflush filters should not require annual cleaning, but should be checked on a periodic basis.

#### **2.2.15. Subsurface In-line Drip (@ Annual Planting Areas)**

##### ***2.2.15.a. General***

A subsurface in-line emitter tubing system has been installed in annual planting beds throughout the Sunport. The tubing is laid out in a matrix of longitudinal runs on approximately 12” to 16” centers. The tubing was installed on the surface or at the depth of root zone of the annuals. **Care should be taken to avoid piercing the tubing with any sharp tools or instruments such as spades or other planting or weeding devices.**

##### ***2.2.15.b. Operation***

The subsurface in-line emitter tubing installed in the annual planting areas contains in-line emitters at 12” to 16” centers. Some zones contain an automatic flush valve at the low point and an air relief valve at the high point. The emitters are self draining which allows water to drain out of the system subsequent to each use. However, systems should be manually drained or winterized through the end cap or flush valve prior to freezing weather each year where winter plantings are not being watered. **Should extended winter plantings mandate supplemental irrigation, the**

**system should be run only during a warm (40°F+) days if possible.**

***2.2.15.c. Maintenance***

The subsurface drip zones contain a filter and pressure regulator within the zone valve enclosure. The filter should be inspected on a monthly basis April through October. To clean, remove and wash in a bucket of water or spray clean with a pressurized water source.

Also included on some systems at the low end of the subsurface tubing matrix is an automatic flushing valve. This valve operates each time the zone is pressurized and flows approximately one gallon/flush. The flushing process takes approximately 30 seconds. If the flush valve does not seal after this time period, remove and check it for debris. If the condition persists, the diaphragm may need replacement. Flush valves should be removed and the zone flushed at the initiation of spring use and one time every other month thereafter (April through September.)

Should the planting area being served by the subsurface irrigation become dry, or patchy dry in some areas, the system should be checked for leaks, blockages and proper operation. During zone operation, check the area for excessively wet areas that may indicate a leak. In this case, after locating the leak, flush the system thoroughly and install a coupling to repair the leak.

### **3. Re-Planting and Transplanting Operations**

#### **3.1. General**

Shall replacement or additions of plants be desired or become necessary, planting operations shall conform to the original or as-built plant palette and intent of the project. Techniques for planting operations and cultivation shall conform to original project specifications. In some cases plant materials may be exchanged for new or different species. In such instances, a Xeriscape reference such as *The Complete How to Guide to Xeriscaping* by the City of Albuquerque, shall be used in selection of replacement plants. Occasionally plant materials not available at the original time of planting will be installed late. In these circumstances plant materials will have to be manually watered through establishment.

#### **3.2. Soils**

Shall soil be required for replacement planting or to repair trench settlement, erosion, vandalism, etc., follow criteria under original project specifications for planting soil mixtures.

## **4. Mulching**

Planted areas that contain mulch shall be annually remulched, cleaned of dirt, or groomed to maintain the standards of original drawings and specifications. Mulch materials shall meet guidelines noted under planting soil mixtures or mulching notes of original project plans and specifications.

At time of installation, mulch was spread in all planting areas. Care shall be taken to insure that the mulch is not washed or blown away in storms. After re-planting and transplanting work, the mulch shall be replaced and spread out to the depth as specified in the plans. The mulch shall be maintained at the stated level for water conservation, weed suppression and aesthetic reasons. During storms, the mulch may be washed out onto sidewalks and drains. After storms, the mulch material shall be cleaned up and replaced.

### **4.1. Replacement and Repair**

Filter fabric has been laid under mulching materials in many locations. Torn or frayed filter fabric shall be removed and replaced with Dewitt Pro-5 Filter Fabric or equal and a 4-inch overlap on all edges and mulch materials replaced on top to specified depth.

### **4.2. Weed Control**

Weeds shall be removed from crusher fine mulch when they are small and can be removed by hand. Sharp implements can damage the filter fabric. Only flat, horizontal slicing implements shall be used as they only penetrate the top 1/4 -inch of the mulch.

Herbicidal sprays shall be used on areas with cobble and/or gravel mulch when necessary. Pre-emergent herbicides may be most effective in mulch areas. These should be incorporated into an annual maintenance schedule based on a 'least toxic' approach. Usually, pre-emergent herbicides need to be water activated after application. Federal regulations and City of Albuquerque specifications for herbicide use must be strictly adhered to.

## 5. Management Log and Communications

For all maintenance and management operations conducted, a management log shall be kept by the maintenance contractor for record keeping and reporting purposes. *Appendices B and D of this maintenance plan can be used as the basis of the log.* The log shall include actual watering schedules as applied, pest management efforts, fertilizing schedules, pruning and general maintenance and upkeep records. The log shall be presented to the Sunport Representative seasonally or as conditions require.

Communications shall occur between the maintenance contractor and Sunport Representative on a continual (at least a monthly) basis and at as-needed meetings as requested by either party. At these meetings, the management logs shall be reviewed, problem areas discussed and any situations in need of attention addressed.

**APPENDIX A**

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**PLANT LIST**

## PLANT LIST

(Note that this plant list may not be comprehensive, if plants are found to not be on this list, a reference shall be consulted for identification and proper classification.)

<b>Botanical Name</b>	<b>Common Name</b>
<b>COOL SEASON GRASS TURF</b>	
<i>Poa pratensis</i>	Kentucky Bluegrass mix with Fescue and Rye

## WARM SEASON TURF AND NATIVE GRASS MEADOW

### *Warm Season Turf*

<i>Bucheloe dactyloides</i> 'Legacy'	Buffalo Grass
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### *Native Grass Meadows*

<i>Bucheloe dactyloides</i> 'Legacy'	Buffalo Grass
<i>Bouteloua gracilis</i>	Blue Grama "Hachita"

## HIGH WATER USE LANDSCAPES

### *Trees*

<i>Fraxinus pennsylvanica</i> "Summit"	Summit Ash
<i>Fraxinus velutina</i> 'Modesto'	Arizona Ash
<i>Platanus acerifolia</i>	London Plan Tree
<i>Pyrus calleryana</i> "Aristocrat"	Aristocrat Pear

### *Shrubs*

<i>Cornus mas</i> 'Variegata'	Variegated Dogwood
<i>Euonymus fortunei</i> "Colorata"	Purple Winter Creeper
<i>Forsythia intermedia</i>	Forsythia
<i>Photinia fraseri</i>	Red Tip Photinia

### *Perennials*

## MODERATE WATER USE LANDSCAPES

### *Trees*

<i>Gledisia triacanthos</i> "Shademaster"	Shademaster Honeylocust
<i>Juniperus sp.</i>	Junipers
<i>Pinus flexilis</i> "Vanderwulf"	Vanderwulf Limber Pine
<i>Pinus nigra</i>	Austria Black Pine
<i>Pinus strobiformis</i>	Southwestern White Pine
<i>Prunus cerasifera</i> "Krauter vesuvius"	Flowering Plum
<i>Quercus fusiformis</i>	Escarpment Live Oak
<i>Quercus turbinella</i>	Shrub Live Oak
<i>Quercus virginiana</i> "Heritage"	Heritage Live Oak
<i>Robinia pseudoacacia</i> "Purple Robe"	Purple Robe Locust

<b>Botanical Name</b>	<b>Common Name</b>
<b><i>Shrubs</i></b>	
<i>Baccharis x 'Starn' Thompson</i>	Starn Thompson Broom
<i>Berberis sp.</i>	Barberry
<i>Cotoneaster apiculatus</i>	Cranberry Coloneaster
<i>Cotoneaster microphyllus</i>	Rockspray Cotoneaster
<i>Cotoneaster parneyi</i>	Clusterberry
<i>Elaeagnus pungens "Fruitland"</i>	Silverberry
<i>Forestiera neomexicana</i>	New Mexican Olive
<i>Genista lydia</i>	Hardy Dwarf Broom
<i>Hedera helix</i>	English Ivy
<i>Juniperus chinensis "Armstrong"</i>	Armstrong Juniper
<i>Juniperus chinensis "Fruitland"</i>	Fruitland Juniper
<i>Juniperus sabina "Broadmoor"</i>	Broadmoor Juniper
<i>Pyracantha coccinea</i>	Firethorn
<i>Raphiolepis indica</i>	Indian Hawthorn
<i>Salvia greggii "Furman's Red"</i>	Cherry Sage
<i>Taxus baccata "repandans"</i>	Spreading English Yew
<b><i>Perennials</i></b>	
<i>Achillea taygetea</i>	Moonshine Yarrow
<i>Caryopteris X clandonensis</i>	Blue Mist
<i>Hymenoxys acaulis</i>	Angelita Daisy
<i>Lavandula angustifolia</i>	English Lavender
<i>Mirabilis multiflora</i>	Desert Four O'clock
<b>LOW WATER USE LANDSCAPES</b>	
<b><i>Trees</i></b>	
<i>Chilopsis linearis Warren Jones</i>	Desert Willow
<i>Chilopsis linearis Lucretia Hamilton</i>	Desert Willow
<i>Chilopsis linearis "Art's Seedless"</i>	Seedless Desert Willow
<b><i>Shrubs</i></b>	
<i>Baccharis pilularis</i>	Dwarf Coyote Brush
<i>Cercocarpus ledifolius</i>	Curl-leaf Mountain Mahogany
<i>Chrysothamnus nauseosus</i>	Chamisa, Rabbitbrush
<i>Ericameria laricifolia "Aguirre"</i>	Turpentine Bush
<i>Fallugia paradoxa</i>	Apache Plum
<i>Rhus trilobata</i>	Threeleaf Sumac
<i>Rhus trilobata 'prostrate'</i>	Dwarf Threeleaf Sumac
<b><i>Perennials</i></b>	
<i>Oenothera berlandiera</i>	Primrose
<i>Zinnia grandiflora</i>	Rocky Mountain Zinnia

**Botanical Name****Common Name**

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***Monocots****Agave neomexicana*

New Mexican Agave

*Hesperaloe funifera*

Giant Hesperaloe

*Hesperaloe parviflora*

Red Yucca

*Hesperaloe parviflora "Yellow"*

Yellow Flowering Yucca

*Muhlenbergia emersleyi*

Del Toro Bull Muhly

*Nolina microcarpa*

Beargrass

*Yucca pendula*

Yucca Pendula

*Yucca thompsoniana*

Thompson's Yucca

**APPENDIX B**

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**CONTRACTORS ANNUAL MAINTENANCE FORM**

# ANNUAL MAINTENANCE SCHEDULE

**Winter**  
**Nov. 15 – Mar. 15**

<b>1.1 TREES</b>
1.1.2. Low Water Use Trees
1.1.3. Moderate Water Use Trees
<b>1.2 MONOCOTS</b>
<b>1.3 SHRUBS</b>
1.3.2a.. Low Water Use Shrubs
1.3.2b. Moderate Water Use Shrubs
<b>1.4 PERENNIALS</b>
1.4.2a.. Low Water Use Perennials
1.4.2b. Moderate Water Use Perennials
<b>1.5 ANNUALS</b>
<b>1.6 NATIVE GRASSES</b>
<b>1.7 BLUE GRASS TURF</b>

# ANNUAL MAINTENANCE SCHEDULE

**Spring**  
**Mar. 16 – May 1**

<b>1.2 TREES</b>
1.1.2. Low Water Use Trees
1.1.3. Moderate Water Use Trees
<b>1.2 MONOCOTS</b>
<b>1.3 SHRUBS</b>
1.3.2a.. Low Water Use Shrubs
1.3.2b. Moderate Water Use Shrubs
<b>1.4 PERENNIALS</b>
1.4.2a.. Low Water Use Perennials
1.4.2b. Moderate Water Use Perennials
<b>1.5 ANNUALS</b>
<b>1.6 NATIVE GRASSES</b>
<b>1.7 BLUE GRASS TURF</b>

# ANNUAL MAINTENANCE SCHEDULE

Summer  
May 1 – Aug. 31

<b>1.3 TREES</b>
1.1.2. Low Water Use Trees
1.1.3. Moderate Water Use Trees
<b>1.2 MONOCOTS</b>
<b>1.3 SHRUBS</b>
1.3.2a.. Low Water Use Shrubs
1.3.2b. Moderate Water Use Shrubs
<b>1.4 PERENNIALS</b>
1.4.2a.. Low Water Use Perennials
1.4.2b. Moderate Water Use Perennials
<b>1.5 ANNUALS</b>
<b>1.6 NATIVE GRASSES</b>
<b>1.7 BLUE GRASS TURF</b>

# ANNUAL MAINTENANCE SCHEDULE

Fall  
Sept. 1 – Nov. 14

<b>1.4 TREES</b>
1.1.2. Low Water Use Trees
1.1.3. Moderate Water Use Trees
<b>1.2 MONOCOTS</b>
<b>1.3 SHRUBS</b>
1.3.2a.. Low Water Use Shrubs
1.3.2b. Moderate Water Use Shrubs
<b>1.4 PERENNIALS</b>
1.4.2a.. Low Water Use Perennials
1.4.2b. Moderate Water Use Perennials
<b>1.5 ANNUALS</b>
<b>1.6 NATIVE GRASSES</b>
<b>1.7 BLUE GRASS TURF</b>

**APPENDIX C**

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**IRRIGATION SCHEDULE**

## General Irrigation Schedule

This General Irrigation Schedule presents general guidelines for approximate water requirements for the various landscapes on Sunport property. Contractor is to develop watering schedules based on weather, site conditions (slope), soil testing, plant health, and evapotranspiration rates. Blank forms for watering schedules are provided in this Appendix.

VEGETATION TYPE	APPROXIMATE INCHES OF WATER REQUIRED PER WEEK			
	<b>Spring</b> (March 22-June 21)	<b>Summer</b> (June 22-September 21)	<b>Fall</b> (September 22-December 21)	<b>Winter</b> (December 22-March 21)
Cool Season Turf	1" - 1 1/2"	1 1/2"	1"	1/2" (every other week)
Warm Season Turf*	1/4" - 1/2"	1/2"	1/4" (every other week if no precipitation)	1/4" (every other week if no precipitation)

\* Native meadow: water during growing season at approximately 1/4" per week if no precipitation

**VEGETATION TYPE**

**APPROXIMATE GALLONS OF WATER REQUIRED PER WEEK**

<b>SEASON</b>	<b>Spring</b> (March 22-June21)	<b>Summer</b> (June 22-September 21)	<b>Fall</b> (September 22-December 21)	<b>Winter</b> (December 22-March 21)
High Water Use Landscape	Trees: 30 Shrubs: 15 Perennials: 5	Trees: 30 Shrubs: 15 Perennials:5	Trees: 15 Shrubs: 10 Perennials:3	Trees: 15 Shrubs: 10 Perennials:3 Once per month if no precipitation
Moderate Water Use Landscape	Trees: 20 Shrubs: 10 Perennials: 3	Trees: 20 Shrubs: 10 Perennials:3	Trees: 10 Shrubs: 5 Perennials:2	Trees: 10 Shrubs: 5 Perennials:2 Once per month if no precipitation
Annuals	3.5	3.5	3.5	1

**VEGETATION TYPE**

**APPROXIMATE GALLONS OF WATER REQUIRED PER EVERY OTHER WEEK**

<b>SEASON</b>	<b>Spring</b> (March 22-June21)	<b>Summer</b> (June 22-September 21)	<b>Fall</b> (September 22-December 21)	<b>Winter</b> (December 22-March 21)
Low Water Use Landscape	Trees: 20 Shrubs: 10 Perennials: 3	Trees: 20 Shrubs: 10 Perennials:3	Trees: 10 Shrubs: 5 Perennials:2	Trees: 10 Shrubs: 5 Perennials:2 Once per month if no precipitation

**Summer Irrigation Schedule - \_\_\_\_\_(Year)**

Location	Valve #	Plant Species	Precip. Rate / Flow Rate	Late June			July / August			Early September		
				Days Watered Per Month	Cycles/Day	Run Time	Days Watered Per Month	Cycles/Day	Run Time	Days Watered Per Month	Cycles/Day	Run Time

Notes:

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## Winter Irrigation Schedule - \_\_\_\_\_ (Year)

Location	Valve #	Plant Species	Precip. Rate / Flow Rate	Late December			January			February / Early March		
				Days Watered Per Month	Cycles/Day	Run Time	Days Watered Per Month	Cycles/Day	Run Time	Days Watered Per Month	Cycles/Day	Run Time

Notes: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

## Spring Irrigation Schedule - \_\_\_\_\_ (Year)

Location	Valve #	Plant Species	Precip. Rate / Flow Rate	Late March			April			May			Early June		
				Days Watered Per Month	Cycles/Day	Run Time	Days Watered Per Month	Cycles/Day	Run Time	Days Watered Per Month	Cycles/Day	Run Time	Days Watered Per Month	Cycles/Day	Run Time

Notes: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

## Fall Irrigation Schedule - \_\_\_\_\_ (Year)

Location	Valve #	Plant Species	Precip. Rate / Flow Rate	Late September			October			November			Early December		
				Days Watered Per Month	Cycles/Day	Run Time	Days Watered Per Month	Cycles/Day	Run Time	Days Watered Per Month	Cycles/Day	Run Time	Days Watered Per Month	Cycles/Day	Run Time

Notes: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

**APPENDIX D**

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**WEED CONTROL, PEST MANAGEMENT AND FERTILIZATION LOG**





**Table 3  
Fertilization Record**

Date \_\_\_\_\_

Plant Type	Material Used	Date Applied	Rate	Check One-Month Results

Date \_\_\_\_\_

Plant Type	Material Used	Date Applied	Rate	Check One-Month Results

Date \_\_\_\_\_

Plant Type	Material Used	Date Applied	Rate	Check One-Month Results

Date \_\_\_\_\_

Plant Type	Material Used	Date Applied	Rate	Check One-Month Results

**APPENDIX E**

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**ALBUQUERQUE INTERNATIONAL SUNPORT LANDSCAPE MAINTENANCE  
PLAN ANNOTATED COVERAGE**

## Sunport Landscape GIS Management Tool and Map

As part of the Sunport Landscape Management Plan, a GIS map and management tool was developed to make it easier to quantify and analyze existing and future landscape management areas.

### *How the Tool was developed*

1. **Designing the Management Tool:** The GIS management tool was designed to meet the ongoing needs of the Sunport landscape management team. The first step consisted of classifying landscaped areas of the Sunport into six landscape types. Cool Season Turf, Warm Season Turf and Native Grass Meadows, High Water Use Landscape, Moderate Water Use Landscape, Low Water Use Landscape, and Annuals. In addition, other information that would be needed for each landscape area, e.g. irrigation system needs, surface or slope was identified.
2. **Mapping Management Areas:** A digital map of all the management areas was developed in CAD based on aerial photographs, landscape plans, and field observation. The result was a series of polygons, or shapes, that correspond to the actual landscape areas on the ground. These shapes were then moved into a Geographic Information System (GIS) and checked against the aerial imagery, which is tied into the City's geodetic control system. A unique identifier or ID number was given to each shape. The square footage of each landscape management area was then calculated. The final result was a clean GIS map file that will work with any of the City's or Sunport's other GIS files.
3. **Linking Information to the Map:** The information gathered for each area was then developed into a database and checked against field notes, plans and as-builts. This digital data base was then linked to a unique ID number in the GIS map file, so that each shape on the map is classified as a vegetation type, and is associated with corresponding information, and the square footage. The final result of this part of the process is the Landscape Management Data Base Table, the Albuquerque International Sunport Landscape Maintenance Plan Annotated Coverage, and the Sunport Landscape Management GIS File all found in this Appendix. Both the GIS file and the database in MS Excel format have been provided to the Sunport staff as part of the delivery of this manual.
4. **Creating a Map:** One large map has been developed and incorporated into the management plan. This map, found in the pocket at the back of the plan provides an overall graphic image of the Sunport Management Plan using a generalized identifier for each landscape area.

Because the Sunport landscape management tool has been developed in a digital GIS format, it is possible for the Sunport Landscape Management team to use it as an interactive tool on their computers by using easy-to-use map viewing software.

### ***How to use the tool***

The way to use the GIS Management Tool in this manual is by working with the maps and the Landscape Management Database Table. Users can look up a management area in the Database that they have identified on Albuquerque International Sunport Landscape Maintenance Plan Annotated Coverage map. The identification number of the landscape area shape on the map will correspond to a number in the Database Table on page in Appendix E. Users can then note the vegetation type listed for that management area and look up the requirements for the particular vegetation type in the manual. Users can also find the area, irrigation types, water use, and any relevant special notes for that particular management area. Users can also work the other way, that is, use the unique identifier number in the Database Table to locate a particular landscape management area of interest on the annotated coverage map.

The square footage of landscape areas have been aggregated by vegetation type for use in assessing the overall landscape management. This table contains information that can be particularly helpful for managers and contractors to calculate total areas and costs of maintenance for the facility. The aggregated areas are shown in the table below.

#### **VEGETATION TYPES-LANDSCAPED AREAS**

<b>Vegetation Type</b>	<b>Area (Sq. ft)</b>	<b>Acres</b>	<b>%</b>
Cool Season Turf	630,715	14.5	19.3%
Warm Season Turf And Native Grass Meadows	824,647	18.9	25.2%
High Water Use Landscape	85,820	2.0	2.7%
Moderate Water Use Landscape	714,028	16.4	21.8%
Low Water Use Landscape	652,704	15.0	20%
Annuals	2,649	.06	.1%
Mulch Only	358,172	8.2	10.9%
<b>TOTAL</b>	<b>3,268,735</b>	<b>75.1</b>	<b>100%</b>

If in a digital format resident on a user's computer, the landscape management tool would enable users to look up vegetation type, area and other information by clicking on the landscape area on a map.

### *Updating the tool*

The Sunport Landscape Management Tool will need to be updated periodically as landscape areas are added or changed at the Sunport. Changes to existing landscape areas merely require changing the data in the MS Excel spreadsheet version of the Landscape Management Database. For example, if two High Water Trees & Shrubs areas were changed to Warm Season Grasses areas, then the “vegetation type” category and other information categories that corresponded to those two landscape areas (using the ID number) would need to be changed.

New landscape areas can be added into the digital version of the Landscape Management Database and drawn on the map with the next ID number. For example, if the last number is 147, then the next number would be 148. The GIS data file and/or map can also be updated by drawing in the as-built of the new landscape area. Without using the digital version, changes will have to be made by hand directly on the map. Periodically, all the maps could be updated by GIS personnel with the City or a contractor to reflect the changes over the previous years. If the digital version of the tool is resident on the Sunport staff computers, then it would be possible to update the GIS files and maps as changes are made.

ID	Vegetation Type	Exposure	Water Use	Environment	Surface	Irrigation	Slope	Area (Sq. ft)	Location	Notes
<b>TOTAL</b>								<b>3,268,184.45</b>		
1	Cool Season Grass Turf	Full Sun	High	Turf	Turf	Spray (Bubbler)	Flat	222,549.20	Along Girard	Trees in turf
2	Cool Season Grass Turf	Full Sun	High	Turf	Turf	Spray (Bubbler)	Moderate	24,980.60	South of curve on Girard	Trees
3	Moderate Water Use Landscape	Full Sun	Moderate	Planter	Bark	(Bubbler)	Flat	2,918.51	East of Parks Office	Shrubs
4	Cool Season Grass Turf	Full Sun	High	Turf	Turf	Spray (Bubbler)	Moderate	9,930.71	South of Parks Office	Trees
5	Cool Season Grass Turf	Full Sun	High	Turf	Turf	Spray (Bubbler)	Flat	22,751.34	North of curve on Girard	Trees
6	Low Water Use Landscape	Full Sun	Low	Median	Gravel	Bubbler/Drip	Flat	5,678.61	Median on Girard	Trees, shrubs, perennials
7	Moderate Water Use Landscape	Full Sun	Moderate	Median	Gravel	Bubbler	Flat	3,857.70	Median center	Trees
8	Mulch	Full Sun	None	Planter	Gravel		Flat	4,868.25	East of parking structure	Gravel buffer over filter fabric
9	Moderate Water Use Landscape	Full Sun	Moderate	Island	Native ground	Bubbler	Flat	1,338.65	Parking island	Bare ground - tree only
10	Moderate Water Use Landscape	Full Sun	Moderate	Island	Bark	Bubbler	Flat	7,596.93	Parking island	
11	Low Water Use Landscape	Partial Sun	Low	Planter	Cobble	Bubbler	Moderate	3,128.10		Trees, shrubs
12	Moderate Water Use Landscape	Shade	Moderate	Planter	Cobble	Bubbler	Flat	851.61		
13	Moderate Water Use Landscape	Full Sun	Moderate	Planter	Cobble	Bubbler	Moderate	4,403.82		
14	Cool Season Grass Turf	Partial Sun	High	Turf	Turf	Spray	Flat	7,331.44	Triangle N. of Terminal	Trees
15	Moderate Water Use Landscape	Shade	Moderate	Planter	Bark	Bubbler	Flat	995.84	Under parking bridge	
16	Low Water Use Landscape	Full Sun	Low	Terrace	Cobble	?	Flat-Moderate	4,024.92		Cobble and native ground
17	Moderate Water Use Landscape	Full Sun	Moderate	Median	Bark	Bubbler	Terrace	3,692.12		
18	Cool Season Grass Turf	Partial Sun	High	Turf	Turf	Spray, Bubbler	Moderate	1,240.74		Trees
19	Cool Season Grass Turf	Partial Sun	High	Turf	Turf	Spray, Bubbler	Flat	2,661.60		Trees
20	Low Water Use Landscape	Partial Sun	Low	Median	Crusher Fines, Filter Fabric	Drip	Flat	6,524.18		
21	Low Water Use Landscape	Sun	Low		Gravel, Filter Fabric		Flat	16,788.75		
23	Low Water Use Landscape	Sun	Low		Gravel, Filter Fabric	Drip	Flat	0.00		
24	Moderate Water Use Landscape	Partial Sun	Moderate	Planter	Bark	Bubbler	Flat	17,220.13		Bark almost gone; Not parking structure
25	Moderate Water Use Landscape	Partial Sun	Moderate	Planter	Bark	Bubbler	Flat	3,613.26	NW corner of entry into parking structure	
26	Cool Season Grass Turf	Partial Sun	High	Turf	Turf	Spray	Moderate	14,773.72	West of parking structure	
27	Cool Season Grass Turf	Full Sun	High	Turf	Turf	Spray	Flat	4,944.03		
28	Moderate Water Use Landscape	Partial Sun	Moderate-Low	Planter	Bark	Bubbler	Terrace	11,526.29	Planters south of parking structure	Moderate water - shrubs, mod-low water trees
29	Cool Season Grass Turf	Full Sun	High	Turf	Turf	Spray (Bubbler)	Flat	104,752.81		Trees
30	Low Water Use Landscape	Partial Sun	Low	Planter	Cobble	Bubbler	Steep	24,356.06		
31	High Water Use Landscape	Partial Sun	High	Turf	Turf	Spray	Moderate	47,554.81		
32	High Water Use Landscape	Shade	High	Planter	Bark	Bubbler	Terrace	3,998.74	Under stairway	
33	High Water Use Landscape	Partial Sun	High	Planter	Cobble	Bubbler	Moderate	19,090.75		
34	Warm Season Grass Turf and Native Grass Meadows	Full Sun	Low	Turf	Turf	Spray	Moderate-Flat	51,933.81		Buffalo, Blue Grama
35	Moderate Water Use Landscape	Full Sun	Moderate	Median	Bark	Bubbler	Flat	9,231.39		Medians on Yale
36	Cool Season Grass Turf	Full Sun	High	Turf	Turf	Spray	Flat	6,660.02		From retaining wall to curb
37	Cool Season Grass Turf	Partial Sun	High	Turf	Turf	Spray	Flat	7,151.26		Shade trees
38	Cool Season Grass Turf	Full Sun	High	Turf	Turf	Spray	Steep	90,608.06		Trees and shrubs
39	Moderate Water Use Landscape	Full Sun	Moderate	Planter	Native Ground	Bubbler	Flat	4,786.65	Around monument	Trees and shrubs stressed
40	Annuals	Full Sun	High-Moderate	Bed	Bark	Spray	Flat	296.75	Around monument	Small bed of annuals
41	Cool Season Grass Turf	Full Sun	High	Turf	Turf	Spray	Flat	12,694.58		Trees
42	Low Water Use Landscape	Full Sun	Low	Median	Crusher Fines, Filter Fabric	Drip	Flat-Moderate	102,899.38		
43	Moderate Water Use Landscape	Full Sun	Moderate	Median	Gravel	Bubbler	Flat-Moderate	73,039.23		In swales
44	Low Water Use Landscape	Full Sun	Low	Median	Gravel, Filter Fabric	Bubbler	Flat-Moderate	39,618.18		
45	Annuals	Full Sun	High	Median	Crusher Fines, Filter Fabric	Drip	Flat-Moderate	2,352.00		
48	Low Water Use Landscape	Full Sun	Moderate	Terrace	Cobble	Drip	Terrace	26,428.38		
49	Moderate Water Use Landscape	Full Sun	Moderate	Gravel/Mulch	Gravel, Filter Fabric	Bubbler	Steep	25,288.89		
50	Low Water Use Landscape	Full Sun	Low	Terrace	Cobble, Crusher Fines	Bubbler	Steep	150,288.55		South aspect

ID	Vegetation Type	Exposure	Water Use	Environment	Surface	Irrigation	Slope	Area (Sq. ft)	Location	Notes
51	Moderate Water Use Landscape	Full Sun	Low	Turf	Turf	Spray	Moderate	3,329.80		South aspect, trees in turf
52	Moderate Water Use Landscape	Full Sun	Moderate	Turf	Turf	Bubbler	Moderate	4,804.25		North aspect
53	Moderate Water Use Landscape	Full Sun	Moderate	Turf	Turf	Bubbler	Moderate	1,967.98		North aspect
54	Warm Season Grass Turf and Native Grass Meadows	Full Sun	Low	Turf	Turf	Spray	Moderate	81,243.74		North aspect
55	Warm Season Grass Turf and Native Grass Meadows	Full Sun	Low	Turf	Turf	Spray	Moderate	33,239.43		South aspect, slope range from flat to steep
56	Moderate Water Use Landscape	Full Sun	Moderate	Turf	Turf	Spray	Moderate	4,304.33		South aspect, slope range from flat to steep - Trees
57	Warm Season Grass Turf and Native Grass Meadows	Full Sun	Low	Turf	Turf	Spray	Moderate	47,501.66		South aspect, slope range from moderate to flat
58	Moderate Water Use Landscape	Full Sun	Moderate	Turf	Turf	Bubbler	Flat	11,859.52		Slope range from flat to moderate, south aspect - Trees
59	Low Water Use Landscape	Full Sun	Low	Terrace	Cobble, Filter Fabric	Bubbler	Terrace	2,949.16		
60	Moderate Water Use Landscape	Full Sun	Moderate	Terrace	Cobble, Filter Fabric	Drip	Terrace	31,596.79		
61	Warm Season Grass Turf and Native Grass Meadows	Full Sun	Low	Turf	Turf	Spray	Steep	63,085.52		
62	Moderate Water Use Landscape	Full Sun	Moderate	Gravel	Gravel	Bubbler	Steep	58,326.30		Trees
64	Low Water Use Landscape	Full Sun	Moderate	Median	Crusher Fines, Filter Fabric	Bubbler	Flat	704.79		
66	Low Water Use Landscape	Full Sun	Low	Planter	Crusher Fines, Filter Fabric	Bubbler	Flat	15,259.48		Cobble almost gone
67	Moderate Water Use Landscape	Full Sun	Moderate-Low	Planter	Bark	Bubbler	Flat	5,829.12		
68	Moderate Water Use Landscape	Shade	Moderate	Planter	Cobble	Bubbler	Flat	5,006.43	North of large wall	
69	Moderate Water Use Landscape	Full Sun	Moderate	Planter	Bark	Bubbler	Flat	15,554.81		
70	Cool Season Grass Turf	Full Sun	High	Planter	Turf	Spray-Bubbler	F, M, S	7,170.51		Trees
71	Moderate Water Use Landscape	Full Sun	Moderate-Low	Planter	Cobble	?	Flat	774.90		
72	Moderate Water Use Landscape	Full Sun	Moderate	Planter	Bark	Bubbler	Flat	7,353.50		Tree, island
73	Cool Season Grass Turf	Full Sun	High	Planter	Turf	Spray-Bubbler	F, M, S	10,308.07		
74	Moderate Water Use Landscape	Full Sun	Moderate	Planter	Bark	Bubbler	Flat	1,475.66		Sycamore & chamisa
75	Moderate Water Use Landscape	Full Sun	Moderate	Planter	Native Ground	?	Flat	1,396.45		Lone elm in area with hydrant BFP
76	Warm Season Grass Turf and Native Grass Meadows	Full Sun	High	Turf	Turf	Spray	Flat	18,651.97		Old terminal: natural grass, weeds, mix of native and non-native, trees
77	Moderate Water Use Landscape	Full Sun	Moderate	Planter	Crusher Fines	Bubbler	Flat	15,592.36		Barberry shrubs
78	Moderate Water Use Landscape	Full Sun	Moderate	Planter	Native Ground	?	Flat	7,323.65		
79	Moderate Water Use Landscape	Full Sun	Moderate	Planter	Native Ground	?	Flat	3,002.85		
80	Moderate Water Use Landscape	Full Sun	Moderate-Low	Planter	Bark			10,613.43		Plastic under
81	Moderate Water Use Landscape	Full Sun	Moderate	Bed	Bark	Drip	Flat	5,170.78		
82	Moderate Water Use Landscape	Full Sun-Partial Sun	Moderate	Planter	Native Ground	Spray	Terrace	1,729.19		Planters under bridge
83	Moderate Water Use Landscape	Full Sun	Moderate	Planter	Bark	Bubbler	Flat	11,036.04		Some pines
84	Moderate Water Use Landscape	Full Sun	Moderate	Planter	Bark	Bubbler	Flat	8,410.35		All end islands
85	Moderate Water Use Landscape	Full Sun	Moderate-High	Median	Turf	Spray	Flat	26,143.06		
86	Low Water Use Landscape	Full Sun	Moderate	Median	Crusher Fines-Cobble	Bubbler	Flat	11,984.67		Medians on University
87	Low Water Use Landscape	Full Sun-Partial Sun	Low	Planter	Cobble-Gravel	Drip	Steep	21,971.96		
88	Low Water Use Landscape	Partial Sun	Low	Planter	Gravel	Drip	Steep	29,542.41		Mostly native
89	Warm Season Grass Turf and Native Grass Meadows	Full Sun	Low	Turf	Turf	Spray	Flat-Moderate	62,797.95		
90	Warm Season Grass Turf and Native Grass Meadows	Full Sun	Low	Turf	Turf	Spray	Moderate	127,059.91		Trees
91	Low Water Use Landscape	Full Sun	Low	Planter	Gravel	Bubbler or Drip	Moderate-Steep	26,695.98		
92	Low Water Use Landscape	Full Sun	Low	Median	Crusher Fines-Cobble	Bubbler	Moderate	5,676.38		
93	Low Water Use Landscape	Full Sun	Low	Median	Crusher Fines		Flat-Moderate	29,636.26		Medians on University (South End)
94	Moderate Water Use Landscape	Full Sun	Moderate	Planter	Gravel	Bubbler	Moderate	11,150.06		South aspect

ID	Vegetation Type	Exposure	Water Use	Environment	Surface	Irrigation	Slope	Area (Sq. ft)	Location	Notes
95	Low Water Use Landscape	Full Sun	Low	Median	Gravel	Bubbler	Moderate	2,495.95		
96	Moderate Water Use Landscape	Partial Sun-Shade	Moderate	Planter	Gravel	Bubbler	Moderate	11,028.23		North aspect
97	Warm Season Grass Turf and Native Grass Meadows	Full Sun	Low	Turf	Turf	Spray	Flat	15,429.78		Trees in turf
98	Low Water Use Landscape	Full Sun	Low	Planter	Gravel	Bubbler	Flat	9,189.62		
99	Low Water Use Landscape	Full Sun	Low	Planter	Gravel	Bubbler	Moderate	7,183.46		
100	Warm Season Grass Turf and Native Grass Meadows	Full Sun	Low	Turf	Turf	Spray	Moderate-Flat	124,299.67		
101	Low Water Use Landscape	Full Sun	Low	Bed-Planter	Gravel-Filter Fabric	Bubbler/Drip	Flat	8,813.62		
102	Low Water Use Landscape	Partial Sun-Shade	Low	Bed	Gravel-Filter Fabric	Bubbler/Drip	Flat	3,776.63		Shrubs
103	Moderate Water Use Landscape	Full Sun	Low	Planter	Cobble-Gravel	Drip	Moderate	16,632.97		
104	Low Water Use Landscape	Full Sun	Low	Planter	Gravel	Bubbler	Flat	11,128.34		
105	Warm Season Grass Turf and Native Grass Meadows	Full Sun	Moderate-Low	Turf	Turf	Spray	Moderate-Flat	74,031.67		Trees, slope on South
106	Low Water Use Landscape	Full Sun	Low	Planter	Gravel		Moderate	8,117.44		
107	Warm Season Grass Turf and Native Grass Meadows	Full Sun	Moderate-Low	Meadow	Meadow	Spray	Flat	33,294.96		Trees in turf
108	Warm Season Grass Turf and Native Grass Meadows	Full Sun	Low	Meadow	Meadow	?	Flat	25,399.88		Trees
109	Warm Season Grass Turf and Native Grass Meadows	Full Sun	Moderate	Meadow	Meadow	?	Flat	66,676.98		Trees
110	Mulch	Full Sun-Partial Sun	Low	Open Area	Gravel		Flat	15,034.12		
111	Moderate Water Use Landscape	Full Sun	Moderate	Open Area	Native Ground	Bubbler	Flat	80,518.71		Sycamore trees & reclamation seeding
112	Low Water Use Landscape	Full Sun	Low	Open Area	Gravel	Bubbler	Moderate	23,784.73		
113	Low Water Use Landscape	Full Sun	Low	Median	Gravel	Bubbler	Flat	3,320.48		
114	Cool Season Grass Turf	Full Sun	High	Turf	Turf	Spray	Flat-Moderate	36,050.18		Trees
115	Moderate Water Use Landscape	Full Sun	Moderate	Planter	Bark	Bubbler	Flat	960.90		Parking island
116	Moderate Water Use Landscape	Full Sun	Moderate	Planter	Bark	Bubbler	Flat	15,006.22		Juniper & Sycamore
117	Cool Season Grass Turf	Full Sun	High	Turf	Turf	Spray	Flat	2,352.90		
118	Cool Season Grass Turf	Full Sun	High	Turf	Turf	Spray	Flat	17,602.83		Trees
119	Moderate Water Use Landscape	Full Sun	Moderate	Planter	Native Ground	Bubbler	Moderate	3,073.06		Native plants, some trees (pines & sycamore), no irrigation
122	Moderate Water Use Landscape	Full Sun	Moderate	Planter	Native Ground	Bubbler	Moderate	32,075.49		Trees, North aspect
123	Moderate Water Use Landscape	Full Sun	Moderate	Planter	Native Ground	Bubbler	Moderate-Flat	24,700.25		Trees, South aspect
124	Moderate Water Use Landscape	Full Sun	Moderate	Planter	Native Ground	Bubbler	Flat	8,684.64		
125	Moderate Water Use Landscape	Full Sun	Moderate	Planter	Bark	Bubbler	Flat	184.95		
126	Moderate Water Use Landscape	Full Sun	Moderate	Planter	Gravel	Bubbler	Flat	2,703.15		Red scoria
127	Cool Season Grass Turf	Full Sun	High	Turf	Turf	Spray	Flat	1,138.17		Trees
128	Cool Season Grass Turf	Full Sun-Partial Sun	High	Turf	Turf	Spray	Flat	1,521.47		Trees
129	Moderate Water Use Landscape	Full Sun-Partial Sun	Moderate	Planter	Bark	Bubbler	Flat	1,925.56		
130	Moderate Water Use Landscape	Full Sun	Moderate	Planter	Native Ground	Bubbler	Flat	3,016.74		
131	Moderate Water Use Landscape	Full Sun	Moderate	Planter	Gravel	Bubbler	Flat	5,378.96		Red scoria
135	Moderate Water Use Landscape	Full Sun	Moderate	Planter	Bark	Bubbler	Flat	4,663.77		
136	Cool Season Grass Turf	Full Sun	High	Turf	Turf	Spray	Flat	21,540.44		
137	High Water Use Landscape	Full Sun	High	Turf	Turf	Spray	Flat	7,742.69		Trees in turf
138	Moderate Water Use Landscape	Full Sun	Moderate	Planter	Native Ground-Cobble	Bubbler	Flat	7,377.88		
139	Low Water Use Landscape	Full Sun	Low	Planter	Native Ground	Bubbler	Flat	825.62		
140	Moderate Water Use Landscape	Full Sun	Moderate	Planter	Native Ground	Bubbler	Flat	3,610.17		Plus the others in the area (islands for the parking)
141	Moderate Water Use Landscape	Full Sun	Moderate	Planter	Native Ground	Bubbler	Flat	2,907.26		

ID	Vegetation Type	Exposure	Water Use	Environment	Surface	Irrigation	Slope	Area (Sq. ft)	Location	Notes
142	Moderate Water Use Landscape	Full Sun	Moderate	Planter	Bark	Bubbler	Flat	7,437.02		Bark almost gone, some forsythia
143	Moderate Water Use Landscape	Full Sun	Moderate	Planter	Native Ground	Bubbler	Flat	975.39		Composed of four (4) islands
144	Mulch	Full Sun	None	Median	Gravel	None		5,484.31		
145	Mulch	Partial Sun	None	Median	Gravel	None	Steep	332,785.80		West facing slope behind rental car facility
146	Moderate Water Use Landscape	Full Sun	Moderate-Low	Planter	Native Ground-Cobble	Bubbler	Flat	33,698.51		Around Eastern perimeter of parking lot (swaled to catch runoff)
147	Moderate Water Use Landscape	Full Sun	Moderate-Low	Planter	Bark	Bubbler	Flat	11,884.73		
148	Low Water Use Landscape	Full Sun	Moderate-Low	Slope	Fractured Cobble, Native Soil		Moderate-Steep	34,506.12		Top of south slope
149	Low Water Use Landscape	Full Sun	Low	Terrace	Native Soil	Bubbler	Flat	13,531.79		Terraces along Sunport Blvd
150	Moderate Water Use Landscape	Full Sun	Moderate	Planter	Gravel	Bubbler	Flat	11,470.95		
151	Low Water Use Landscape	Full Sun	Low	Planter	Native Soil	?	Flat	1,323.20		Non-secure side of fence
152	High Water Use Landscape	Partial Shade	High	Planter	Grates	Bubbler	Flat	7,433.27		Trees in grates in front of terminal

## **APPENDIX F**

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**APPENDIX G**

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**NEW MEXICO ENVIRONMENT DEPARTMENT (NMED) POLICY FOR THE  
ABOVE GROUND USE OF RECLAIMED DOMESTIC WASTEWATER**

# NEW MEXICO ENVIRONMENT DEPARTMENT (NMED) POLICY FOR THE ABOVE GROUND USE OF RECLAIMED DOMESTIC WASTEWATER

August 7, 2003

## I. PURPOSE

This Policy describes requirements for minimum discharge standards for the above ground use of reclaimed domestic wastewater (“reclaimed wastewater”) to ensure protection of public health and the environment. NMED has developed this Policy to promote the safe use of reclaimed wastewater to offset the use of limited potable water resources in the State. The Policy is intended to provide direction to NMED staff in review of Ground Water Discharge Permit applications which include the use of reclaimed wastewater in order to ensure consistency in the application review process and in the development of permit requirements to the fullest extent possible. The Policy will also be made available to the regulated community and their consultants to provide guidance for future facility planning. It is recommended that Ground Water Discharge Permits that include the discharge of reclaimed wastewater contain at a minimum the standards set forth in this Policy. NMED will review all permit applications objectively and with professional judgment to establish whether they conform to applicable laws, regulations, and requirements. NMED encourages the development and implementation of new processes and equipment, and will favorably consider them with an appropriate demonstration of meeting the performance standards contained within this Policy.

The responsibility of meeting the standards set forth in this Policy shall be assigned to the generator of the reclaimed wastewater unless this responsibility is assumed by a separate entity pursuant to an approved Ground Water Discharge Permit. Implementation of the standards for existing dischargers will be determined on a individual facility basis at the time of permit renewal and/or modification.

Finally, the discharge of reclaimed wastewater may also be regulated by the United States Environmental Protection Agency (EPA) or the New Mexico Construction Industries Division (CID). Discharges to waters of the United States (including ephemeral streams and dry arroyos) require a National Pollutant Discharge Elimination System permit from EPA. The use of reclaimed wastewater for indoor plumbing (e.g., toilet flushing, fire suppression) requires approval from CID.

## II. DEFINITIONS

Agronomic Rate: the rate of application of nutrients to plants that is necessary to satisfy the plants’ nutritional requirements while strictly minimizing the amount of nutrients that run off to surface waters or which pass below the root zone of the plants.

Class 1A Reclaimed Wastewater: the highest quality reclaimed wastewater described in this Policy and can be most broadly utilized except for direct consumption. [approved uses listed in Table 1]

Class 1B Reclaimed Wastewater: the second highest quality reclaimed wastewater described in this Policy and is suitable for uses in which public exposure is likely. [approved uses listed in Table 1]

Class 2 Reclaimed Wastewater: reclaimed wastewater suitable for uses in which public access and exposure is restricted. [approved uses listed in Table 1]

Class 3 Reclaimed Wastewater: reclaimed wastewater suitable for uses in which public access and exposure is prohibited. [approved uses listed in Table 1]

Domestic wastewater: wastewater containing human excreta and water carried waste from typical residential plumbing fixtures and activities, including but not limited to wastes from toilets, sinks, bath fixtures, clothes or dishwashing machines and floor drains. Municipal and private wastewater treatment facilities receiving industrial waste must demonstrate adequate industrial waste pretreatment.

Dwelling unit: a structure which contains bedrooms.

Establishment: a structure used as a place of business, education, or assembly.

Flood Irrigation: land application of reclaimed wastewater by ditches, furrows, pipelines and other non-sprinkler methods.

Food Crops: any crop intended for human consumption.

Grab Sample: an individual sample collected in less than 15 minutes.

Major WWTP: any treatment plant with a maximum design capacity of 1,000,000 gallons or more per day.

Minor WWTP: any treatment plant with a maximum design capacity of less than 1,000,000 gallons per day.

Monthly Geometric Mean: value calculated by taking the sum of the logarithms (sum log x) of each of the data points from the previous calendar month, dividing the sum by the number of data points and then taking the anti-logarithm of the result ( $10^y$  = anti-logarithm of 'y').

NTU: nephelometric turbidity units.

Occupied establishment: any establishment that is occupied at the time of irrigation.

Peak hourly flow: the highest hourly flow rate within a 24 hour period.

Reclaimed wastewater: domestic wastewater that has been treated to the standards required for the specific uses set forth in this policy and other applicable local, state, or federal regulations.

Spray Irrigation: land application of reclaimed wastewater by dispersing it in the air utilizing equipment which provides a low trajectory application and which minimizes misting of the reclaimed wastewater.

Surface Drip Irrigation: any method of land application of reclaimed wastewater through an array of emitters placed on or above the ground surface, each of which has a maximum discharge rate of 1.0 gallon per hour.

3-hour Composite Sample: three effluent portions collected no closer together than one hour (collected between 8:00 am and 4:00 pm) and composited in proportion to flow.

6-hour Composite Sample: six effluent portions collected no closer together than one hour (collected between 8:00 am and 4:00 pm) and composited in proportion to flow.

24-hour Composite Sample: twenty-four effluent portions collected no closer together than one hour and composited in proportion to flow.

30-day Average:

*For fecal coliform bacteria*: the geometric mean of the values for all effluent samples collected during a calendar month.

*For other than for fecal coliform bacteria*: the arithmetic mean of the daily values for all effluent samples collected during a calendar month, calculated as the sum of all daily discharges measured during a calendar month divided by the number of daily discharges measured during that month.

### III. BACKGROUND

This Policy supersedes the New Mexico Environmental Improvement Division (NMEID) 1985 Policy for the Use of Domestic Wastewater Effluent for Irrigation. The Policy establishes specific quality standards, operational requirements, and approved uses for different categories of reclaimed wastewater (Class 1A, Class 1B, Class 2, and Class 3) dependent on public exposure. While the standards set forth in this Policy are deemed protective of public health and the environment, the policy does not prevent communities from adopting more stringent requirements.

### IV. WASTEWATER TREATMENT PROCESS REQUIREMENTS

The quality standards for Class 1B, Class 2, and Class 3 assume a minimum of conventional secondary wastewater treatment plus disinfection. Class 1A assumes treatment to remove colloidal organic matter, color and other substances that interfere with disinfection, thereby allowing for the use of the reclaimed wastewater for urban landscaping adjacent to dwelling units or occupied establishments.

### V. GENERAL ABOVE GROUND USE PERMIT REQUIREMENTS

#### A. ALL APPROVED USES

1. Whenever reclaimed wastewater is used for any use approved in this Policy, the wastewater shall meet the minimum standards set forth in this Policy.
2. Whenever reclaimed wastewater other than Class 1A is used in areas with public access it shall be applied at times and in a manner that minimizes public contact.
3. Whenever reclaimed wastewater is used in areas with restricted public access, the public shall be excluded from entering the area.
4. Reclaimed wastewater shall only be used for soil compaction or dust control in construction areas where application procedures minimize aerosol drift to public areas.
5. Reclaimed wastewater quality standards shall be measured at the discharge point of the wastewater treatment plant.
6. Signs (in English and Spanish) shall be placed at the entrance to areas receiving reclaimed wastewater, and other locations where public access may occur stating: **“NOTICE – THIS AREA IS IRRIGATED WITH RECLAIMED WASTEWATER – DO NOT DRINK”**; **“AVISO – ESTA ÁREA ESTÁ REGADA CON AGUAS NEGRAS RECOBRADAS – NO TOMAR”**
7. All piping, valves and outlets, shall be color-coded in purple pursuant to the latest revision of the New Mexico Plumbing and Mechanical Code to differentiate piping or fixtures used to convey reclaimed wastewater from piping or fixtures used for potable or other water. All valves, outlets, and sprinkler heads used in reclaimed wastewater systems should be of a type that can only be operated by authorized personnel. Those portions of reclaimed wastewater systems that are underground and were installed prior to the adoption of this Policy are exempt from the purple color-coding requirement if all accessible portions of the reclaimed wastewater system are colored purple or clearly labeled as being part of a reclaimed wastewater distribution system.
8. Reclaimed wastewater systems shall have no direct or indirect cross connections with potable water systems pursuant to the latest revision of the New Mexico Plumbing and Mechanical Code. For reclaimed wastewater systems that were installed prior to the adoption of this Policy, the absence of cross connections may be demonstrated via

hydrostatic testing or as-built drawings, supported by an affidavit under oath that no cross connection exists.

9. Above ground use of reclaimed wastewater shall not result in excessive standing or pooling of wastewater, and shall be applied at the appropriate agronomic rate. Irrigation shall not be conducted at times when the receiving area is saturated or frozen.
10. The discharge of reclaimed wastewater shall be confined to the area designated and approved for receiving the wastewater. Irrigation shall be postponed at times when windy conditions may result in drift of reclaimed wastewater outside the designated area of application.
11. Treatment facilities which provide reclaimed wastewater to parks, golf courses, schools and other areas where human exposure is likely, must have an emergency storage pond or alternate disposal method where reclaimed wastewater can be diverted during periods when conditions are unfavorable for approved uses or when the quality standards defined in this Policy cannot be met.

## **B. IRRIGATION OF FOOD CROPS**

1. Reclaimed wastewater shall not be used for the spray irrigation of food crops.
2. Reclaimed wastewater shall not be used for surface irrigation of food crops except where there is no contact between the edible portion of the crop and the wastewater, and the wastewater shall have a level of quality no less than Class 1B Reclaimed Wastewater (Table 2).

## **C. IRRIGATION OF FODDER, FIBER AND SEED CROPS**

1. Reclaimed wastewater used for the irrigation of pasture to which milking cows or goats have access shall have a level of quality no less than Class 2 Reclaimed Wastewater (Table 2).
2. Except pasture for milk-producing animals, reclaimed wastewater used for the irrigation of fodder, fiber and seed crops shall have a level of quality no less than Class 3 Reclaimed Wastewater (Table 2).

## **D. IRRIGATION OF LANDSCAPES**

1. Reclaimed wastewater used for irrigation shall be applied such that direct and windblown spray is confined to the area designated and approved for application.
2. Reclaimed wastewater used for the irrigation of freeway landscapes and landscapes in other areas where the public has similarly limited access or exposure shall have a level of quality no less than Class 2 Reclaimed Wastewater (Table 2). Public access to the irrigation site must be restricted during the period of application.
3. Reclaimed wastewater used for the irrigation of parks, playgrounds, schoolyards, golf courses, cemeteries and other areas where the public has similarly open access or exposure shall have a level of quality no less than Class 1B Reclaimed Wastewater (Table 2), and the irrigation system must have low trajectory spray nozzles. *Areas which are spray irrigated and located within 100 feet of a dwelling unit or occupied establishment shall only receive Class 1A Reclaimed Wastewater (Tables 2 & 3).*

## VI. SPECIFIC ABOVE GROUND USE REQUIREMENTS

### A. CLASSIFICATION AND USES OF RECLAIMED WASTEWATER

This Policy establishes four classes of reclaimed wastewater (Class 1A, Class 1B, Class 2, and Class 3) based on the quality of the wastewater following treatment and disinfection, and dependent on the likelihood of public exposure. Class 1A reclaimed wastewater may be used for any purpose except direct consumption, food handling and processing, and spray irrigation of food crops. Class 1B reclaimed wastewater may be used where public exposure is likely, and where the appropriate setback requirements are met (Table 3). Class 2 and Class 3 reclaimed wastewater may be used where public access is restricted with correspondingly less stringent requirements for treatment and disinfection.

Table 1 presents the approved uses for Classes 1A, 1B, 2, and 3 reclaimed wastewater. Any reclaimed wastewater treated to higher quality than the lower classes may be used for the purposes established for the lower classes. *Other uses of reclaimed wastewater not included in Table 1 must be evaluated on a case by case basis by NMED for review and approval.*

**Table 1. Approved Uses for Reclaimed Wastewater by Class**

Class of Reclaimed Wastewater	Approved Uses
Class 1A	All Class 1 uses. <i>No setback limit</i> to dwelling unit or occupied establishment.
	Backfill around potable water pipes
	Irrigation of food crops <sup>1</sup>
Class 1B	Impoundments (recreational or ornamental)
	Irrigation of parks, school yards, golf courses <sup>2</sup>
	Irrigation of urban landscaping <sup>2</sup>
	Snow making
	Street cleaning
	Toilet flushing
Class 2	Backfill around non-potable piping
	Concrete mixing
	Dust control
	Irrigation of fodder, fiber, and seed crops for milk-producing animals
	Irrigation of roadway median landscapes
	Irrigation of sod farms
	Livestock watering
Soil compaction	
Class 3	Irrigation of fodder, fiber, and seed crops for non-milk-producing animals
	Irrigation of forest trees (silviculture)

<sup>1</sup> Irrigation of food crops shall only be allowed for food crops when there is no contact between the edible portion of the crop and the wastewater. Spray irrigation is prohibited for food crops.

<sup>2</sup> If reclaimed wastewater is applied using spray irrigation, the setback limitation of Table 3 “Spray Irrigation” is required.

## **B. WASTEWATER QUALITY STANDARDS AND MONITORING REQUIREMENTS**

This section establishes minimum wastewater quality standards and monitoring frequencies for Classes 1A, 1B, 2, and 3 of reclaimed wastewater. The frequency of wastewater quality monitoring is patterned after EPA requirements for discharges of treated and disinfected wastewater to surface waters. The monitoring requirements are dependent on the quality of reclaimed wastewater produced at the treatment plant and the design capacity of the treatment plant. For example, a “major” wastewater treatment plant (having a maximum design capacity of 1 million gallons or more per day) producing Class 1A Reclaimed Wastewater has the most stringent monitoring requirements. The wastewater quality standards and monitoring frequencies for Classes 1A, 1B, 2, and 3 of reclaimed wastewater are presented below in Table 2. In the event that a facility proposes alternate wastewater quality standards and/or monitoring frequencies, it is the responsibility of the facility owner/operator to demonstrate that the proposed alternate provides equal assurance of the protection of public health and ground water as the minimum standards.

Reclaimed wastewater generated from communities with significant commercial and/or industrial wastewater generators may be subject to more extensive contaminant screening and monitoring requirements.

**Table 2. Wastewater Quality Standards and Monitoring Frequencies by Class of Reclaimed Wastewater.**

Class of Reclaimed Wastewater	Wastewater Quality Parameter	Wastewater Quality Standards		Wastewater Monitoring Requirements	
		30-Day Average	Maximum	Sample Type	Measurement Frequency
Class 1A	BOD <sub>5</sub>	10 mg/l	15 mg/l	6-hour composite <sup>5</sup>	3 tests per week for major WWTP <sup>1</sup> ; 1 test per 2 weeks for minor WWTP
	Turbidity	3 NTU	5 NTU	Continuous	Continuous
	Fecal Coliform <sup>2</sup>	5 per 100 ml <sup>3</sup>	23 per 100 ml <sup>4</sup>	Grab sample at peak flow	3 tests per week for major WWTP; 1 test per week for minor WWTP
	TRC or UV Transmissivity	Monitor Only	Monitor Only	Grab sample or reading at peak flow	Record values at peak hourly flow
Class 1B	BOD <sub>5</sub>	30 mg/l	45 mg/l	6-hour composite <sup>5</sup>	3 tests per week for major WWTP <sup>1</sup> ; 1 test per 2 weeks for minor WWTP
	TSS	30 mg/l	45 mg/l	6-hour composite	3 tests per week for major WWTP <sup>1</sup> ; 1 test per 2 weeks for minor WWTP
	Fecal Coliform <sup>2</sup>	100 organisms per 100 ml <sup>3</sup>	200 organisms per 100 ml <sup>4</sup>	Grab sample at peak flow	3 tests per week for major WWTP; 1 test per week for minor WWTP
	TRC or UV Transmissivity	Monitor Only	Monitor Only	Grab sample or reading at peak flow	Record values at peak hourly flow
Class 2	BOD <sub>5</sub>	30 mg/l	45 mg/l	6-hour composite for major WWTP <sup>5</sup> ; Grab sample for minor WWTP	1 test per week for major WWTP; 1 test per month for minor WWTP
	TSS	30 mg/l	45 mg/l	6-hour composite for major WWTP; Grab sample for minor WWTP	1 test per week for major WWTP; 1 test per month for minor WWTP

**Table 2. Wastewater Quality Standards and Monitoring Frequencies by Class of Reclaimed Wastewater.**

Class of Reclaimed Wastewater	Wastewater Quality Parameter	Wastewater Quality Standards		Wastewater Monitoring Requirements	
		30-Day Average	Maximum	Sample Type	Measurement Frequency
Class 2 continued	Fecal Coliform <sup>2</sup>	200 organisms per 100 ml <sup>3</sup>	400 organisms per 100 ml <sup>4</sup>	Grab sample at peak hourly flow	1 test per week for major WWTP; 1 test per month for minor WWTP
	TRC or UV Transmissivity	Monitor Only	Monitor Only	Grab sample or reading at peak hourly flow	Record values at peak hourly flow
Class 3	BOD <sub>5</sub>	30 mg/l	45 mg/l	3-hour composite for major WWTP <sup>5</sup> ; Grab sample for minor WWTP	1 test per week for major WWTP; 1 test per month for minor WWTP
	TSS	75 mg/l	90 mg/l	3-hour composite for major WWTP; Grab sample for minor WWTP	1 test per week for major WWTP; 1 test per month for minor WWTP
	Fecal Coliform <sup>2</sup>	1,000 organisms per 100 ml <sup>3</sup>	5,000 organisms per 100 ml <sup>4</sup>	Grab sample at peak hourly flow	1 test per week for major WWTP; 1 test per month for minor WWTP
	TRC or UV Transmissivity	Monitor Only	Monitor Only	Grab sample or reading at peak hourly flow	Record values at peak hourly flow

<sup>1</sup> The composite samples must be taken on separate days.

<sup>2</sup> The E. coli organism may alternately be tested once equivalent concentrations are determined.

<sup>3</sup> Measured as the monthly geometric mean.

<sup>4</sup> Single sample maximum value.

<sup>5</sup> 24-hour composite sampling may be used in lieu of 3 or 6-hour composite sampling requirements.

**C. ACCESS RESTRICTIONS AND SET-BACK REQUIREMENTS**

Table 3 presents the minimum standards for access controls and setback distances necessary to minimize direct and indirect public exposure to reclaimed wastewater. Setback distances required in this Policy are in all cases the distance from the edge of any area receiving reclaimed wastewater to well casings, dwelling unit, or occupied establishment.

*In addition to the setback requirements described in Table 3, all water supply wells within 200 feet of a wetted irrigation area must be evaluated for adequate well head construction and irrigation practices to ensure protection of ground water. NMED may impose setback requirements as needed to make certain that the application of reclaimed wastewater does not threaten ground water resources.*

**Table 3. Access Restrictions and Set Back Requirements**

<b>Class of Reclaimed Wastewater</b>	<b>Spray Irrigation</b>	<b>Flood Irrigation and Surface Drip Irrigation</b>
Class 1A	<ul style="list-style-type: none"> <li>• No access control</li> <li>• No setback to dwelling unit or occupied establishment</li> </ul>	<ul style="list-style-type: none"> <li>• No access control</li> </ul>
Class 1B	<ul style="list-style-type: none"> <li>• No access control; irrigate at times when public exposure is unlikely</li> <li>• 100 ft set-back from dwelling unit or occupied establishment</li> </ul>	<ul style="list-style-type: none"> <li>• No access control; irrigate at times when public exposure is unlikely</li> </ul>
Class 2	<ul style="list-style-type: none"> <li>• Access restricted by perimeter fencing using 4-strand barbed wire and locking gate or other NMED approved access controls</li> <li>• 100 ft set-back from dwelling unit or occupied establishment</li> </ul>	<ul style="list-style-type: none"> <li>• Access restricted by perimeter fencing using 4-strand barbed wire and locking gate, or other NMED approved access controls</li> </ul>
Class 3	<ul style="list-style-type: none"> <li>• Access restricted by perimeter fencing using 4-strand barbed wire and locking gate</li> <li>• 500 ft set-back from dwelling unit or occupied establishment</li> <li>• Low pressure/low trajectory irrigation system only</li> </ul>	<ul style="list-style-type: none"> <li>• Access restricted by perimeter fencing using 4-strand barbed wire and locking gate</li> <li>• 100 ft set-back to dwelling unit or occupied establishment.</li> </ul>

\_\_\_\_\_  
 Ron Curry, Secretary  
 Environment Department

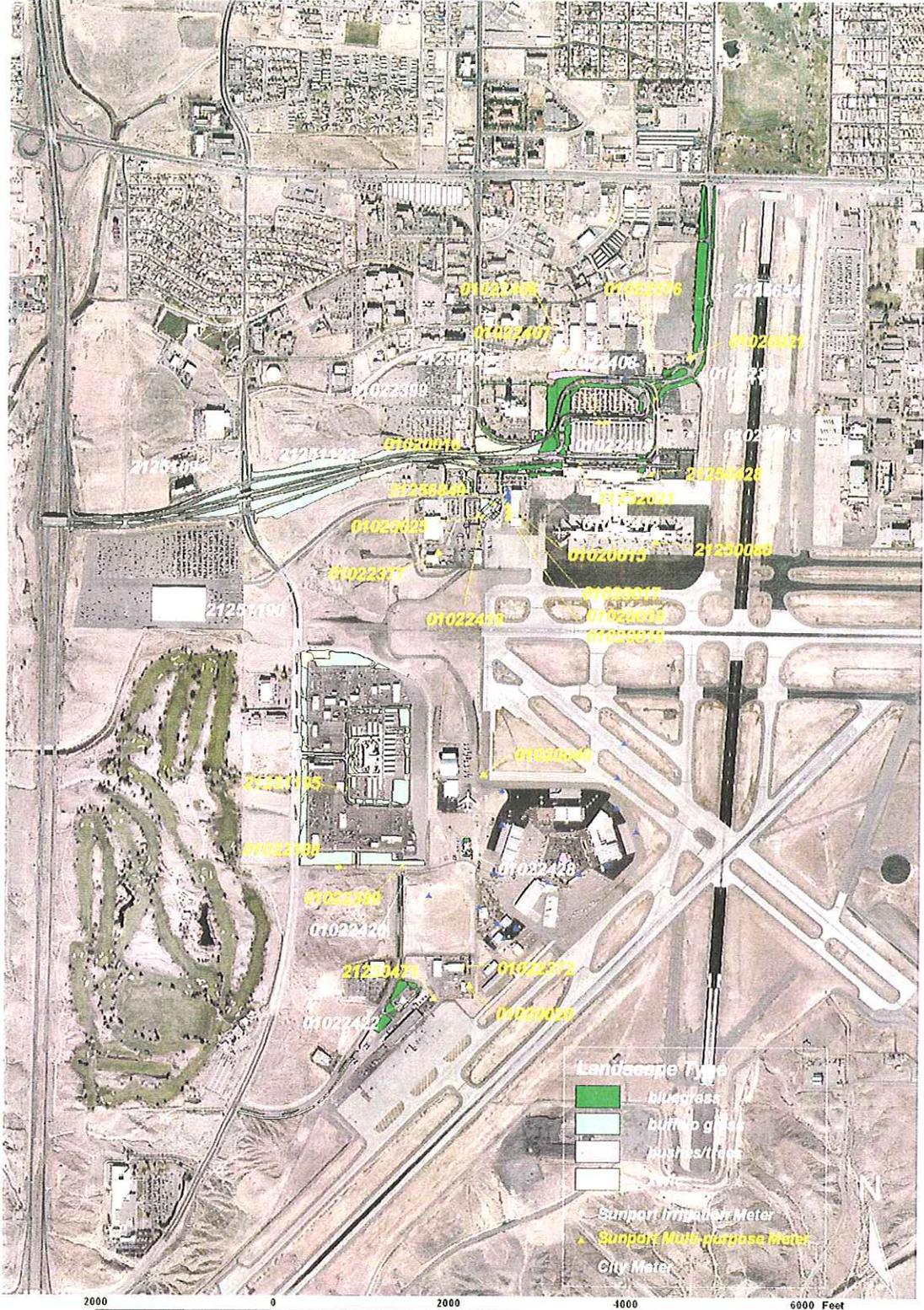
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**APPENDIX H**

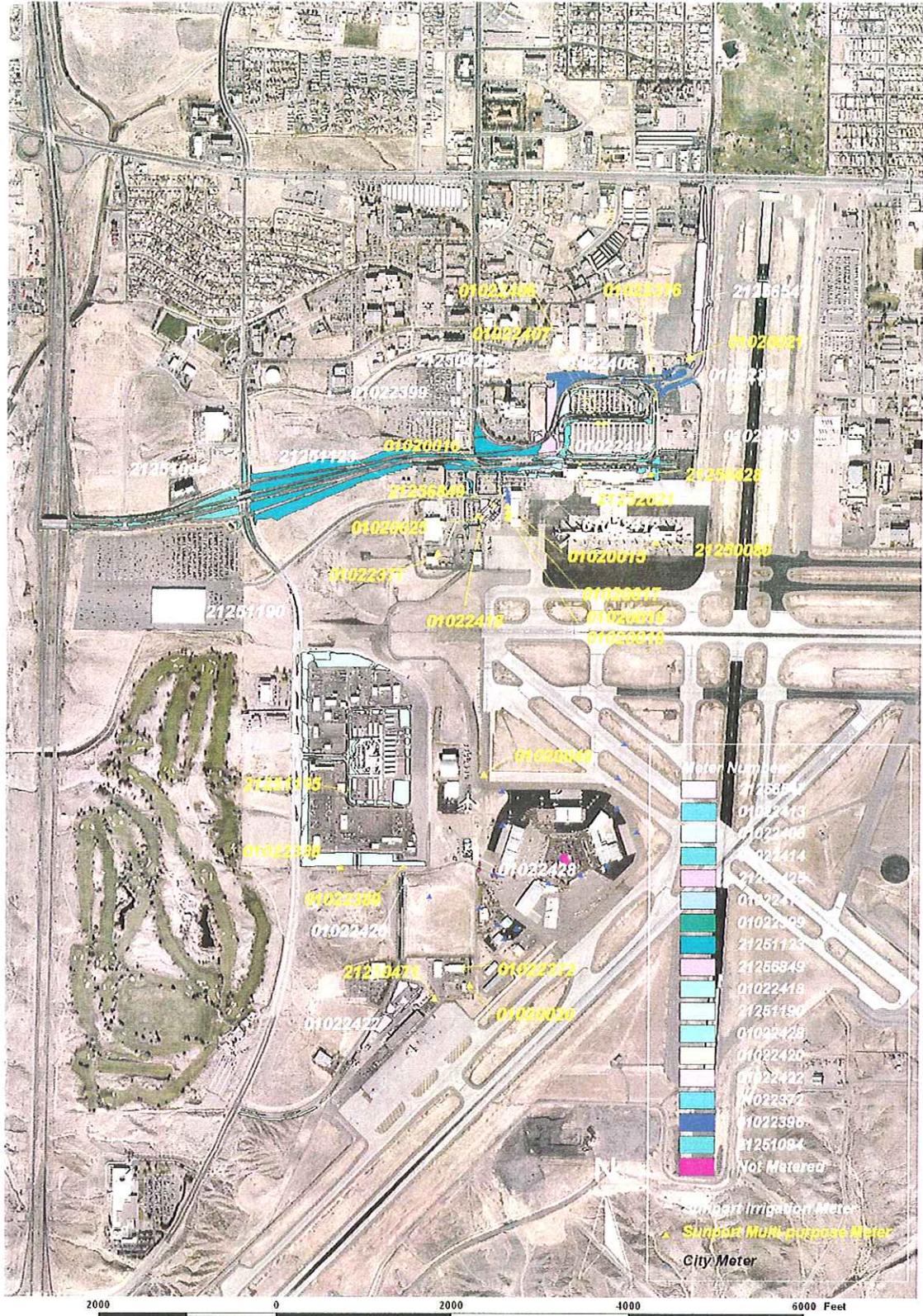
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**CH2M HILL AUDIT (IRRIGATION SECTION ONLY)**

# Sunport Landscape Types



# Sunport Irrigation Meter Designation



**Irrigation Area: All Sunport Landscaped Areas**

This analysis includes all landscaped areas that have designated irrigation meters and the landscaped areas on building meters at the old terminal building and airfield maintenance. The landscape on Sunport from University to I-25 is also included.

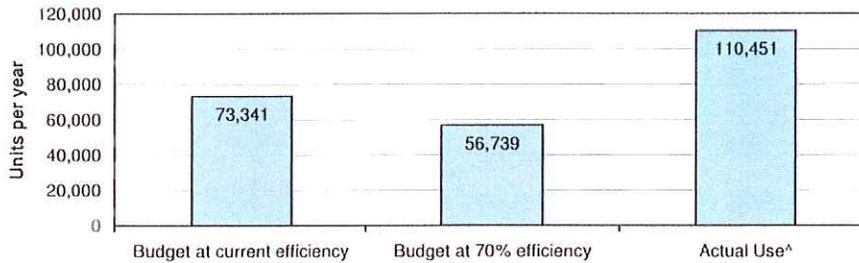
Area of Landscape:	Sq ft.	Percent
Xeriscape	574,701	23%
Buffalo Grass	1,036,642	42%
High water use	702,314	28%
Medium water use	154,273	6%
<b>TOTAL Irrigated Area</b>	<b>2,467,929</b>	
	<b>56.66 acres</b>	

	Total Annual Use	Avg monthly water use
1994	43,738 units/yr	3,645 units/month
1995	42,009 units/yr	3,501 units/month
1996	40,781 units/yr	3,398 units/month
1997	32,143 units/yr	2,679 units/month
1998	65,085 units/yr	5,424 units/month
1999	65,249 units/yr	5,437 units/month
2000	90,644 units/yr	7,554 units/month
2001	107,120 units/yr	8,927 units/month
2002	94,421 units/yr	7,868 units/month
2003	129,889 units/yr	10,824 units/month

**Efficiency of Irrigation System**

The amount applied to the landscape in 2003 was 39 gallons per square foot  
 based on average use in 2001-2003 33 gallons per square foot  
 Inches applied based on 3-yr average 53.72 inches

**Water Use Before and After Conservation**



**Water Budget**

difference unit/month 4,476  
 difference gal/year 40,176,801  
 Possible Savings 49% You could save water, see recommendations.

IRRIGATION EXPENSES <sup>1</sup>				
Month	Budget at current efficiency	Budget at 70% efficiency	Actual Use <sup>^</sup>	\$ Gain/(Loss)
Jan	732	566	275	\$358
Feb	1,232	953	682	\$334
Mar	2,772	2,145	544	\$1,968
Apr	5,313	4,110	2,662	\$1,781
May	8,816	6,820	8,441	(\$1,993)
Jun	12,262	9,486	16,868	(\$9,076)
Jul	13,802	10,677	19,805	(\$11,222)
Aug	12,377	9,575	19,905	(\$12,700)
Sep	8,508	6,582	17,128	(\$12,965)
Oct	4,851	3,753	16,442	(\$15,600)
Nov	1,790	1,385	6,433	(\$6,206)
Dec	886	685	1,266	(\$714)
<b>TOTALS</b>	<b>73,341</b>	<b>56,739</b>	<b>110,451</b>	<b>(\$66,034)</b>
<b>Monthly Avg</b>	<b>6,112</b>	<b>4,728</b>	<b>9,204</b>	<b>(\$5,503)</b>

**Recommendations**

The Sunport has many aging irrigation systems. Parks and Rec reported several leaks in lines and broken valves on the irrigation system. Other reasons for high water use include: over-watering buffalo grass, establishment of new plants, and broken heads and bubblers.

NOTE: The actual water use would be around 10,000 units more if the Girard meter was working properly.

<sup>1</sup>Irrigation expenses based on commodity cost of water only.  
<sup>^</sup> Actual use is equal to 01' through 03' average metered water use.

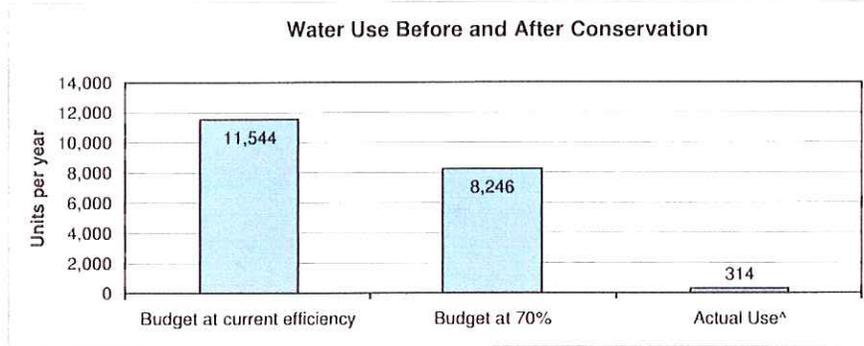
Irrigation Area: Girard Blvd.  
 Service Address: 2301 Girard Blvd. SE  
 Account Number: 21256547

These two meters serve the irrigation systems along Girard. The landscape is all high-water use turf, and this area is often used for walking and picnics.

	Total Annual Use	Avg monthly water use
1994	328 units/yr	27 units/month
1995	333 units/yr	28 units/month
1996	338 units/yr	28 units/month
1997	261 units/yr	22 units/month
1998	302 units/yr	25 units/month
1999	315 units/yr	26 units/month
2000	312 units/yr	26 units/month
2001	359 units/yr	30 units/month
2002	259 units/yr	22 units/month
2003	323 units/yr	27 units/month

Area of Landscape:	Sq. ft.	Percent
Xeriscape	-	0%
High water use turf	227,250	100%
Trees and Bushes	-	0%
<b>TOTAL Irrigated Area</b>	<b>227,250</b>	

Efficiency of Irrigation System      Irrigation efficiency test was performed.  
 The application efficiency of this area is 64%.



Water Budget      difference unit/month      (661)  
 difference gal/year      (5,933,343)  
 Possible Savings      N/A      meter data not reliable

IRRIGATION EXPENSES*				
Month	Budget at current efficiency	Budget at 70%	Actual Use^	\$ Gain/(Loss)
Jan	115	82	2	\$99
Feb	194	139	1	\$169
Mar	436	312	5	\$377
Apr	836	597	15	\$716
May	1,388	991	35	\$1,175
Jun	1,930	1,379	54	\$1,629
Jul	2,173	1,552	43	\$1,855
Aug	1,948	1,392	70	\$1,624
Sep	1,339	957	43	\$1,123
Oct	764	545	35	\$628
Nov	282	201	10	\$235
Dec	139	100	1	\$122
<b>TOTALS</b>	<b>11,544</b>	<b>8,246</b>	<b>314</b>	<b>\$9,752</b>
Monthly Avg	962	687	26	\$0

**Recommendations**

This meter is either not working or is not being read. Without reliable data this irrigation area could not be evaluated.

Public Works is in the process of automating this meter reading, but the meter maintenance records should be evaluated. This information is available at Customer Services at 768-2800.

\*Irrigation expenses based on commodity cost of water only  
 ^ Actual use is equal to 01' through 03' average metered water use.

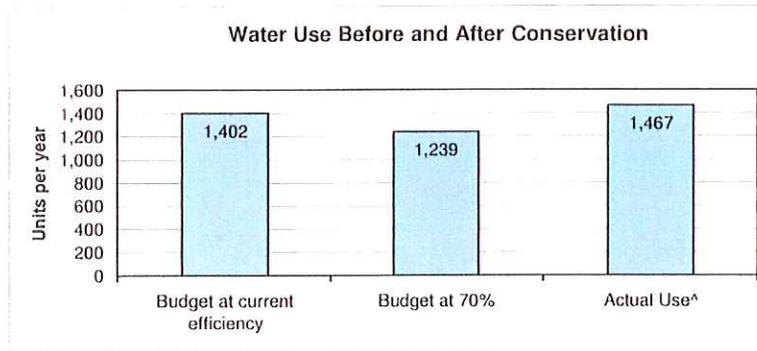
**Irrigation Area:** Employee Parking  
**Service Address:** 8 Sunport Blvd SE  
**Account Number:** 01022413

This meter serves the area in the employee parking lot, along the walkway to the police parking, and the grassy area at the east end of the terminal building.

	Total Annual Use	Avg monthly water use
1994	1,535 units/yr	128 units/month
1995	1,673 units/yr	139 units/month
1996	1,326 units/yr	111 units/month
1997	1,226 units/yr	102 units/month
1998	1,549 units/yr	129 units/month
1999	1,643 units/yr	137 units/month
2000	2,003 units/yr	167 units/month
2001	2,110 units/yr	176 units/month
2002	1,580 units/yr	132 units/month
2003	1,467 units/yr	122 units/month

Area of Landscape:	Sq. ft.	Percent
Xeriscape	8,384	18%
High water use turf	15,197	32%
Trees and Bushes	23,267	50%
<b>TOTAL Irrigated Area</b>	<b>46,848</b>	

**Efficiency of Irrigation System** One test done on grass at east end of terminal.  
 The efficiency of this area was 54 %.



**Water Budget** difference unit/month (14)  
 difference gal/year (122,212)  
 Possible Savings 16% You could save water, see recommendations.

IRRIGATION EXPENSES*				
Month	Budget at current efficiency	Budget at 70%	Actual Use^	\$ Gain/(Loss)
Jan	14	12	9	\$4
Feb	24	21	23	(\$3)
Mar	53	47	-	\$58
Apr	102	90	20	\$86
May	169	149	143	\$7
Jun	234	207	153	\$66
Jul	264	233	153	\$98
Aug	237	209	171	\$47
Sep	163	144	171	(\$34)
Oct	93	82	219	(\$169)
Nov	34	30	334	(\$373)
Dec	17	15	71	(\$69)
<b>TOTALS</b>	<b>1,402</b>	<b>1,239</b>	<b>1,467</b>	<b>(\$281)</b>
Monthly Avg	117	103	122	(\$23)

**Recommendations**

Percent savings is based on 70% efficiency and assumes there are no leaks in the irrigation system. Many areas have been xeriscaped on this system and it shows by the decline in annual water use. Now that the new plants are established, they need less water. It appears from looking at the monthly water use, the timer is set for summer and then not adjusted for fall. Be sure to decrease the irrigation time as the seasons change.

\*Irrigation expenses based on commodity cost of water only  
 ^ Actual use is equal to 2003 seasonal water use for this meter.

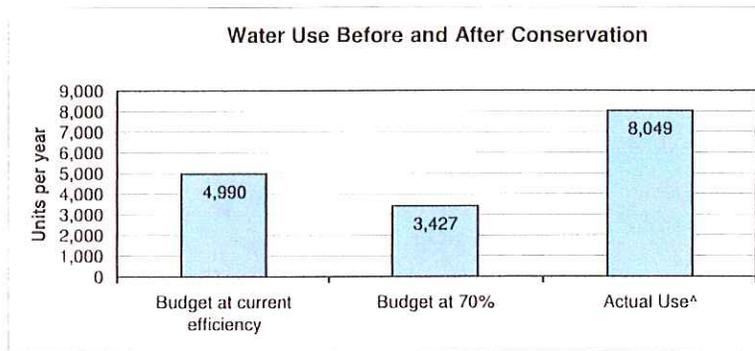
**Irrigation Area:** Long Term Parking  
**Service Address:** 6 Sunport Blvd. SE  
**Account Number:** 01022408

This meter serves landscaping in the long term parking area and grass along Sunport on south side east of Wyndham hotel area.

Area of Landscape:	Sq ft.	Percent
Xeriscape	-	0%
High water use turf	82,559	84%
Trees and Bushes	15,853	16%
<b>TOTAL Irrigated Area</b>	<b>98,412</b>	

	Total Annual Use	Avg monthly water use
1994	6,101 units/yr	508 units/month
1995	6,509 units/yr	542 units/month
1996	5,900 units/yr	492 units/month
1997	4,152 units/yr	346 units/month
1998	6,098 units/yr	508 units/month
1999	6,005 units/yr	500 units/month
2000	8,189 units/yr	682 units/month
2001	8,098 units/yr	675 units/month
2002	6,898 units/yr	575 units/month
2003	9,151 units/yr	763 units/month

**Efficiency of Irrigation System** no test done on this area.



**Water Budget** difference unit/month 385  
 difference gal/year 3,457,151  
 Possible Savings 57% You could save water, see recommendations.

IRRIGATION EXPENSES*				
Month	Budget at current efficiency	Budget at 70%	Actual Use^	\$ Gain/(Loss)
Jan	50	34	9	\$31
Feb	84	58	23	\$42
Mar	189	130	0	\$159
Apr	361	248	199	\$60
May	600	412	676	(\$324)
Jun	834	573	1,212	(\$785)
Jul	939	645	1,283	(\$785)
Aug	842	578	1,291	(\$876)
Sep	579	398	1,229	(\$1,022)
Oct	330	227	1,141	(\$1,124)
Nov	122	84	751	(\$820)
Dec	60	41	235	(\$238)
<b>TOTALS</b>	<b>4,990</b>	<b>3,427</b>	<b>8,049</b>	<b>(\$5,682)</b>
<b>Monthly Avg</b>	<b>416</b>	<b>286</b>	<b>671</b>	<b>(\$474)</b>

\*Irrigation expenses based on commodity cost of water only

^ Actual use is equal to 01' through 03' average metered water use.

**Recommendations**

This zone has had broken lines as well as broken bubbler heads. The bubblers are breaking in the ground where they attach to the riser. This makes leaks difficult to detect.

**Irrigation Area:** Short Term Parking  
**Service Address:** 4 Sunport Blvd  
**Account Number:** 01022414

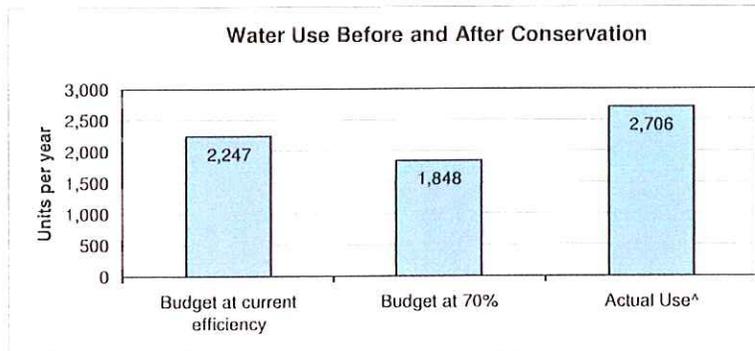
This meter serves the irrigation system for landscape around the short term parking garage.

			Total Annual Use	Avg monthly water use	
			1994	2,396 units/yr	200 units/month
			1995	2,834 units/yr	236 units/month
			1996	2,649 units/yr	221 units/month
			1997	1,852 units/yr	154 units/month
			1998	1,829 units/yr	152 units/month
			1999	2,206 units/yr	184 units/month
			2000	2,311 units/yr	193 units/month
			2001	2,716 units/yr	226 units/month
			2002	2,261 units/yr	188 units/month
			2003	3,142 units/yr	262 units/month

Area of Landscape:	Sq ft.	Percent
Xeriscape	1,609	3%
High water use turf	29,497	50%
Trees and Bushes	27,502	47%
<b>TOTAL Irrigated Area</b>	<b>58,609</b>	

**Efficiency of Irrigation System** no test done on this area.  
 Used average efficiency of all tests, 51%.



**Water Budget** difference unit/month 72  
 difference gal/year 642,041  
 Possible Savings 32% You could save water, see recommendations.

IRRIGATION EXPENSES*				
Month	Budget at current efficiency	Budget at 70%	Actual Use^	\$ Gain/(Loss)
Jan	22	18	2	\$20
Feb	38	31	10	\$26
Mar	85	70	2	\$83
Apr	163	134	57	\$95
May	270	222	258	(\$44)
Jun	376	309	291	\$22
Jul	423	348	322	\$31
Aug	379	312	415	(\$126)
Sep	261	214	376	(\$199)
Ocl	149	122	513	(\$481)
Nov	55	45	331	(\$351)
Dec	27	22	129	(\$131)
<b>TOTALS</b>	<b>2,247</b>	<b>1,848</b>	<b>2,706</b>	<b>(\$1,055)</b>
<b>Monthly Avg</b>	<b>187</b>	<b>154</b>	<b>226</b>	<b>(\$88)</b>

**Recommendations**

The amount of water applied is the close to that required at the current efficiency.

Much of the landscape is in shady areas which may need more water to stimulate growth.

\*Irrigation expenses based on commodity cost of water only  
 ^ Actual use is equal to 01' through 03' average metered water use.

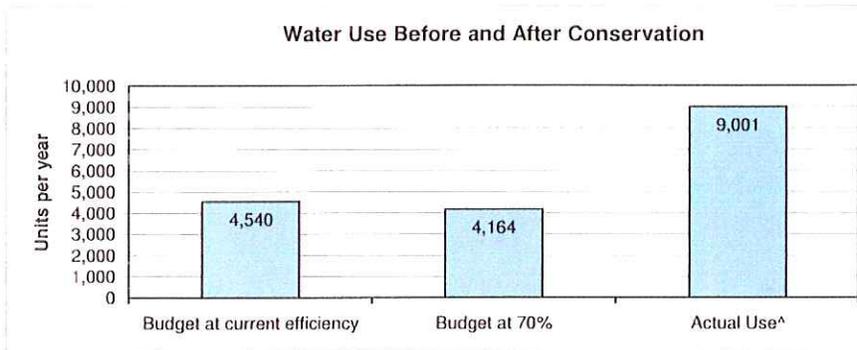
**Irrigation Area:** Sunport, Windham, and Flags  
**Service Address:** 10 Sunport Blvd SE  
**Account Number:** 21250425

This meter serves the medians on Sunport east of Yale, the streetscape all the way around the Wyndham Hotel, and a portion of the landscape east of the Wyndham.

Area of Landscape:	Sq ft.	Percent
Xeriscape	-	0%
High water use turf	110,640	95%
Trees and Bushes	6,256	5%
<b>TOTAL Irrigated Area</b>	<b>116,896</b>	

	Total Annual Use	Avg monthly water use
1994	12,998 units/yr	1,083 units/month
1995	12,123 units/yr	1,010 units/month
1996	10,859 units/yr	905 units/month
1997	5,909 units/yr	492 units/month
1998	7,036 units/yr	586 units/month
1999	7,770 units/yr	648 units/month
2000	8,279 units/yr	690 units/month
2001	10,704 units/yr	892 units/month
2002	6,982 units/yr	582 units/month
2003	9,318 units/yr	777 units/month

**Efficiency of Irrigation System** no irrigation efficiency test done



**Water Budget** difference unit/month 403  
 difference gal/year 3,618,598  
 Possible Savings 53.7% You could save water. see recommendations.

IRRIGATION EXPENSES*				
Month	Budget at current efficiency	Budget at 70%	Actual Use^	\$ Gain/(Loss)
Jan	45	42	145	(\$127)
Feb	76	70	167	(\$119)
Mar	172	157	110	\$58
Apr	329	302	639	(\$414)
May	546	501	925	(\$521)
Jun	759	696	1,328	(\$776)
Jul	854	784	1,506	(\$889)
Aug	766	703	1,312	(\$750)
Sep	527	483	1,354	(\$1,071)
Oct	300	275	1,146	(\$1,070)
Nov	111	102	367	(\$327)
Dec	55	50	3	\$58
<b>TOTALS</b>	<b>4,540</b>	<b>4,164</b>	<b>9,001</b>	<b>(\$5,947)</b>
<b>Monthly Avg</b>	<b>378</b>	<b>347</b>	<b>750</b>	<b>(\$496)</b>

\*Irrigation expenses based on commodity cost of water only  
 ^ Actual use is equal to 01' through 03' average metered water use.

**Recommendations**

This area has a lot of high water-use grass that could be converted to xeriscape.

This is an older system that should be checked for leaks.

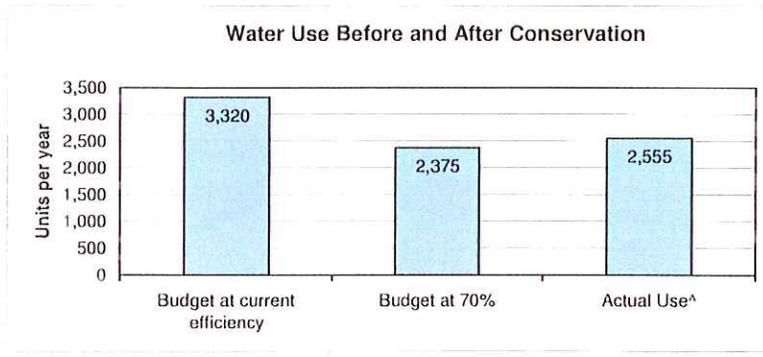
**Irrigation Area:** Mid Sunport Area  
**Service Address:** 9 Sunport Blvd. SE  
**Account Number:** 01022412

This meter serves the irrigation system along Sunport Blvd on the south side, west of the terminal and parking lot north of belly freight.

	Total Annual Use	Avg monthly water use
1994	6,803 units/yr	567 units/month
1995	6,514 units/yr	543 units/month
1996	4,999 units/yr	417 units/month
1997	2,098 units/yr	175 units/month
1998	2,274 units/yr	190 units/month
1999	2,369 units/yr	197 units/month
2000	3,010 units/yr	251 units/month
2001	2,857 units/yr	238 units/month
2002	2,693 units/yr	224 units/month
2003	2,116 units/yr	176 units/month

Area of Landscape:	Sq ft.	Percent
Xeriscape	-	0%
High water-use turf	49,927	68%
Trees and Bushes	23,652	32%
<b>TOTAL Irrigated Area</b>	<b>73,578</b>	

**Efficiency of Irrigation System** One test done on bluegrass east of horses.  
 The irrigation efficiency tested at 46 %.



**Water Budget** difference unit/month (64)  
 difference gal/year (571,990)  
 Possible Savings -30% You are watering very efficiently!

IRRIGATION EXPENSES <sup>*</sup>				
Month	Budget at current efficiency	Budget at 70%	Actual Use <sup>^</sup>	\$ Gain/(Loss)
Jan	33	24	-	\$29
Feb	56	40	6	\$42
Mar	125	90	-	\$110
Apr	241	172	67	\$129
May	399	285	291	(\$7)
Jun	555	397	370	\$34
Jul	625	447	363	\$103
Aug	560	401	373	\$35
Sep	385	276	357	(\$100)
Oct	220	157	374	(\$266)
Nov	81	58	296	(\$293)
Dec	40	29	58	(\$36)
<b>TOTALS</b>	<b>3,320</b>	<b>2,375</b>	<b>2,555</b>	<b>(\$222)</b>
<b>Monthly Avg</b>	<b>277</b>	<b>198</b>	<b>213</b>	<b>(\$18)</b>

**Recommendations**  
 Water use on this meter has been decreasing over the years. The watering schedule is right on target for the current efficiency.  
 If the efficiency is increased to 70 %, an estimated 50 units per month could be saved.

<sup>\*</sup>Irrigation expenses based on commodity cost of water only.  
<sup>^</sup> Actual use is equal to 2003 metered water use.

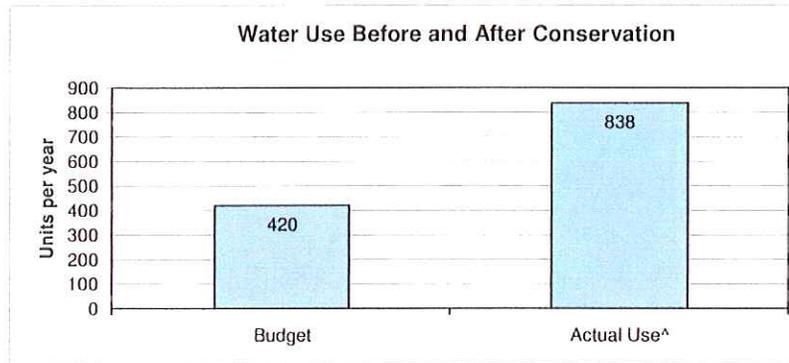
**Irrigation Area:** Yale medians  
**Service Address:** 2910 Yale SE  
**Account Number:** 01022399

This meter serves the landscape on the medians on Yale Blvd SE. This area estimate includes the median at the turn-around that has buffalo grass landscape.

Area of Landscape:	Sq ft.	Percent
Xeriscape	15,229	100%
High water use turf	-	0%
Trees and Bushes	-	0%
<b>TOTAL Irrigated Area</b>	<b>15,229</b>	

	Total Annual Use	Avg monthly water use
1994	1,767 units/yr	147 units/month
1995	1,002 units/yr	84 units/month
1996	1,042 units/yr	87 units/month
1997	638 units/yr	53 units/month
1998	599 units/yr	50 units/month
1999	455 units/yr	38 units/month
2000	1,073 units/yr	89 units/month
2001	827 units/yr	69 units/month
2002	912 units/yr	76 units/month
2003	774 units/yr	65 units/month

**Efficiency of Irrigation System** no test done on this area.



**Water Budget** difference unit/month 35  
 difference gal/year 312,080  
 Possible Savings 50% You could save water, see recommendations.

IRRIGATION EXPENSES *			
Month	Budget	Actual Use^	\$ Gain/(Loss)
Jan	4	4	(\$0)
Feb	7	19	(\$14)
Mar	16	10	\$8
Apr	30	27	\$4
May	51	52	(\$1)
Jun	70	123	(\$65)
Jul	79	111	(\$39)
Aug	71	145	(\$91)
Sep	49	127	(\$97)
Oct	28	108	(\$99)
Nov	10	90	(\$98)
Dec	5	22	(\$21)
<b>TOTALS</b>	<b>420</b>	<b>838</b>	<b>(\$513)</b>
<b>Monthly Avg</b>	<b>35</b>	<b>70</b>	<b>(\$43)</b>

\*Irrigation expenses based on commodity cost of water only.  
 ^ Actual use is equal to 2003 metered water use.

**Recommendations**

Broken heads were reported as well as a leak in the line that is still leaking.  
 High foot-traffic is the main cause for broken heads.

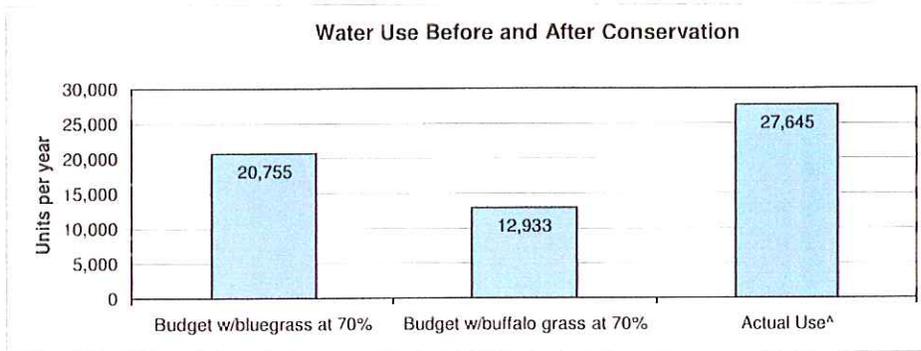
**Irrigation Area:** West Sunport  
**Service Address:** 1850 George Rd.  
**Account Number:** 21251123

This meter serves the irrigation system along Sunport Blvd from Yale to University. This landscape was installed in 1997.

Area of Landscape:	Sq ft.	Percent
Xeriscape	239,134	35%
Buffalo Grass	431,090	62%
High water use turf	21,318	3%
Trees and Bushes	-	0%
<b>TOTAL Irrigated Area</b>	<b>691,542</b>	

	Total Annual Use	Avg monthly water use
1994	- units/yr	- units/month
1995	- units/yr	- units/month
1996	- units/yr	- units/month
1997	5,973 units/yr	498 units/month
1998	27,801 units/yr	2,317 units/month
1999	26,238 units/yr	2,187 units/month
2000	36,482 units/yr	3,040 units/month
2001	26,310 units/yr	2,193 units/month
2002	28,980 units/yr	2,415 units/month
2003	41,981 units/yr	3,498 units/month

**Efficiency of Irrigation System** no test done on this area.



**Water Budget** difference unit/month 1,226  
 difference gal/year 11,004,329  
 Possible Savings 53% You could save water, see recommendations.

IRRIGATION EXPENSES*				
Month	Budget w/bluegrass at 70%	Budget w/buffalo grass at 70%	Actual Use <sup>^</sup>	\$ Gain/(Loss)
Jan	207	129	-	\$159
Feb	349	217	-	\$267
Mar	784	489	26	\$570
Apr	1,503	937	171	\$942
May	2,495	1,555	1,710	(\$191)
Jun	3,470	2,162	4,320	(\$2,652)
Jul	3,906	2,434	6,298	(\$4,751)
Aug	3,503	2,183	5,341	(\$3,883)
Sep	2,408	1,500	4,159	(\$3,268)
Oct	1,373	855	3,965	(\$3,823)
Nov	507	316	1,657	(\$1,648)
Dec	251	156	-	\$192
<b>TOTALS</b>	<b>20,755</b>	<b>12,933</b>	<b>27,645</b>	<b>(\$18,087)</b>
<b>Monthly Avg</b>	<b>1,730</b>	<b>1,078</b>	<b>2,304</b>	<b>(\$1,507)</b>

\*Irrigation expenses based on commodity cost of water only  
<sup>^</sup> Actual use is equal to 01' through 02' average metered water use.

**Recommendations**

These areas are hard to water because they are on steep slopes. Ideally, sloped turf areas should be watered more often with shorter run times, called pulse-watering. The meter provides water to so many zones that multiple programs for pulse-watering are not practical. A broken valve has caused problems over the last year. Routine failure of a valve may indicate the need for a different (heavy duty) valve.

**Irrigation Area:** Old Terminal Building  
**Service Address:** 2929 Yale SE  
**Account Number:** 21256849

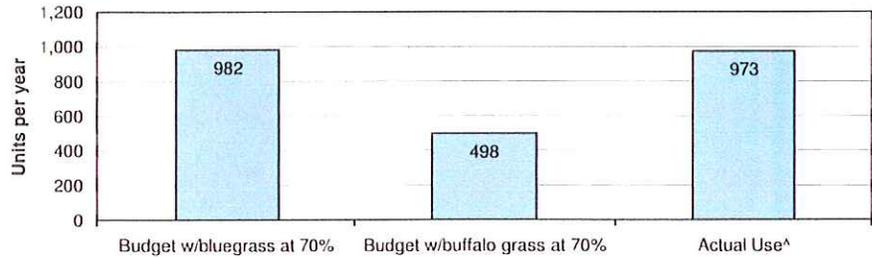
This meter serves the landscape around the old terminal building as well as the indoor use. This analysis reflects only the irrigation use in this meter.

Area of Landscape:	Sq ft.	Percent
Xeriscape	861	3%
Buffalo Grass	26,692	97%
High water use turf	-	0%
Trees and Bushes	-	0%
<b>TOTAL Irrigated Area</b>	<b>27,552</b>	

	Total Annual Use	Avg monthly water use
1994	24 units/yr	2 units/month
1995	20 units/yr	2 units/month
1996	- units/yr	- units/month
1997	- units/yr	- units/month
1998	- units/yr	- units/month
1999	64 units/yr	5 units/month
2000	14 units/yr	1 units/month
2001	196 units/yr	16 units/month
2002	1,435 units/yr	120 units/month
2003	973 units/yr	81 units/month

**Efficiency of Irrigation System** no test done on this area.

**Water Use Before and After Conservation**



**Water Budget** difference unit/month 40  
 difference gal/year 355,428  
 Possible Savings 49% You could save water, see recommendations.

IRRIGATION EXPENSES <sup>*</sup>				
Month	Budget w/bluegrass at 70%	Budget w/buffalo grass at 70%	Actual Use <sup>^</sup>	\$ Gain/(Loss)
Jan	10	5	5	(\$0)
Feb	16	8	-	\$10
Mar	37	19	-	\$23
Apr	71	36	-	\$44
May	118	60	26	\$42
Jun	164	83	181	(\$120)
Jul	185	94	209	(\$142)
Aug	166	84	158	(\$91)
Sep	114	58	183	(\$154)
Oct	65	33	168	(\$166)
Nov	24	12	43	(\$38)
Dec	12	6	-	\$7
<b>TOTALS</b>	<b>982</b>	<b>498</b>	<b>973</b>	<b>(\$584)</b>
<b>Monthly Avg</b>	<b>82</b>	<b>41</b>	<b>81</b>	<b>(\$49)</b>

<sup>\*</sup>Irrigation expenses based on commodity cost of water only  
<sup>^</sup> Actual use is equal to 2003 seasonal water use for this meter.

**Recommendations**  
 High water use here is probably due to establishment of the landscape in addition to filling the closed loop system that serves the building's heating and cooling.  
 Watch this account for decrease in water use. If decrease does not occur, the irrigation system should be checked for leaks.

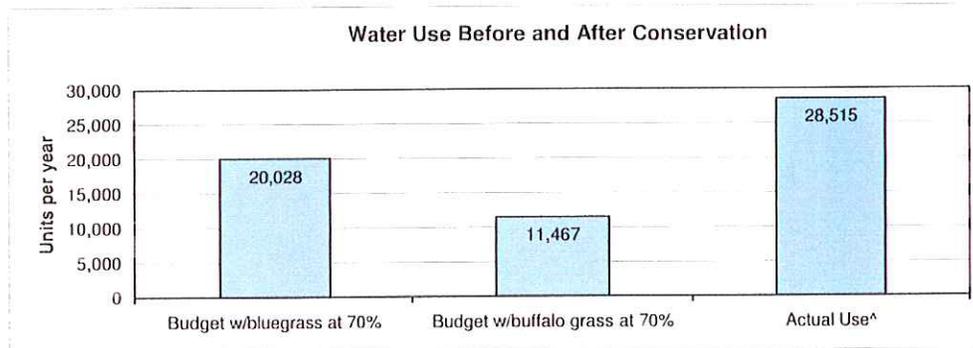
**Irrigation Area:** Rental Car Consolidation Terminal Landscaping and University medians  
**Service Address:** 3720 Spirit Dr. SE  
**Account Number:** 21251190

This meter serves the landscape around the new Rental Car Facility and the medians on University Blvd. These areas are maintained by Lee Landscapes. The water use has increased significantly from 2002 to 2003

Area of Landscape:	Sq Ft.	Percent
Xeriscape	183,040	28%
Buffalo Grass	471,875	72%
High water use turf	-	0%
Trees and Bushes	-	0%
<b>TOTAL Irrigated Area</b>	<b>654,914</b>	

	Total Annual Use	Avg monthly water use
1994	- units/yr	- units/month
1995	- units/yr	- units/month
1996	- units/yr	- units/month
1997	- units/yr	- units/month
1998	- units/yr	- units/month
1999	- units/yr	- units/month
2000	8,820 units/yr	735 units/month
2001	32,006 units/yr	2,667 units/month
2002	25,024 units/yr	2,085 units/month
2003	40,640 units/yr	3,387 units/month

Efficiency of Irrigation System no test done on this area.



**Water Budget** difference unit/month 1,421  
 difference gal/year 12,751,973  
 Possible Savings 60% You could save water, see recommendations.

IRRIGATION EXPENSES <sup>*</sup>				
Month	Budget w/bluegrass at 70%	Budget w/buffalo grass at 70%	Actual Use <sup>^</sup>	\$ Gain/(Loss)
Jan	200	114	-	\$141
Feb	336	193	409	(\$266)
Mar	757	433	370	\$79
Apr	1,451	831	847	(\$20)
May	2,408	1,378	1,938	(\$687)
Jun	3,349	1,917	5,974	(\$4,987)
Jul	3,769	2,158	4,874	(\$3,339)
Aug	3,380	1,935	5,477	(\$4,354)
Sep	2,323	1,330	4,458	(\$3,845)
Oct	1,325	758	3,415	(\$3,265)
Nov	489	280	581	(\$370)
Dec	242	138	175	(\$44)
<b>TOTALS</b>	<b>20,028</b>	<b>11,467</b>	<b>28,515</b>	<b>(\$20,959)</b>
<b>Monthly Avg</b>	<b>1,669</b>	<b>956</b>	<b>2,376</b>	<b>(\$1,747)</b>

<sup>\*</sup>Irrigation expenses based on commodity cost of water only  
<sup>^</sup> Actual use is equal to 01' through 03' average metered water use.

**Recommendations**

Landscape was installed in 2000. Water use was high in 2001 due to establishment period. Some grassy areas are on steep slopes, which are difficult to water efficiently. The water use in 2002, the lowest water use year, is higher than the water required if all the buffalo grass were bluegrass. Slopes should be pulse-watered to prevent runoff. Line breaks and malfunctioning drip lines were reported for 2003, which made the water use very high.

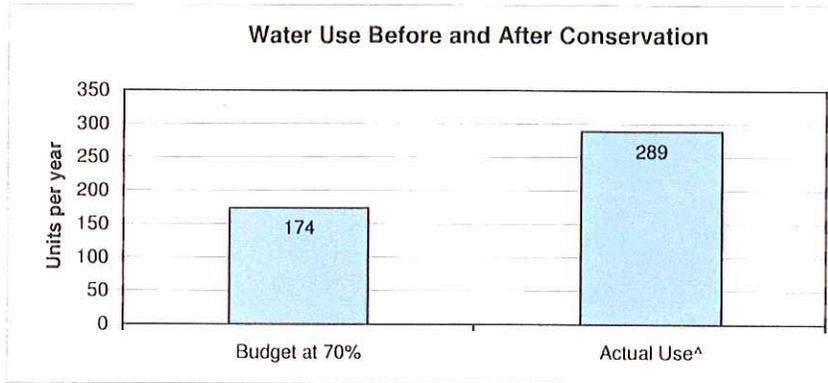
**Irrigation Area:** National Weather Service Irrigation  
**Service Address:** 2341 Clark Carr Loop  
**Account Number:** 01022428

This meter serves the irrigation system around the National Weather Service building. Also included in the total area is the landscape in the parking lot at Eclipse and Cutter.

	Total Annual Use	Avg monthly water use
1994	146 units/yr	12 units/month
1995	357 units/yr	30 units/month
1996	369 units/yr	31 units/month
1997	276 units/yr	23 units/month
1998	342 units/yr	29 units/month
1999	381 units/yr	32 units/month
2000	390 units/yr	33 units/month
2001	451 units/yr	38 units/month
2002	504 units/yr	42 units/month
2003	289 units/yr	24 units/month

Area of Landscape:	Sq ft.	Percent
Xeriscape	3,565	49%
High water use turf	2,324	32%
Trees and Bushes	1,385	19%
<b>TOTAL Irrigated Area</b>	<b>7,274</b>	

**Efficiency of Irrigation System** no test done on this area.



**Water Budget** difference unit/month 10  
 difference gal/year 86,092  
 Possible Savings 40% You could save water, see recommendations.

IRRIGATION EXPENSES*			
Month	Budget at 70%	Actual Use^	\$ Gain/(Loss)
Jan	2	-	\$2
Feb	3	-	\$4
Mar	7	-	\$8
Apr	13	-	\$15
May	21	20	\$1
Jun	29	41	(\$15)
Jul	33	43	(\$13)
Aug	29	42	(\$16)
Sep	20	40	(\$24)
Oct	12	50	(\$47)
Nov	4	45	(\$50)
Dec	2	8	(\$7)
<b>TOTALS</b>	<b>174</b>	<b>289</b>	<b>(\$141)</b>
<b>Monthly Avg</b>	<b>14</b>	<b>24</b>	<b>(\$12)</b>

\*Irrigation expenses based on commodity cost of water only  
 ^ Actual use is equal to 2003 water use.

**Recommendations**  
 A line break was reported for 2002 and it appears, from the increasing annual water use that the line had been leaking for a few years. Watering times should be adjusted for less time in the fall as the weather gets cooler.

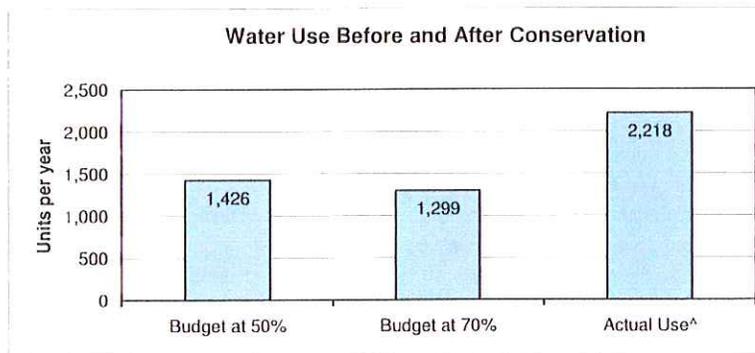
**Irrigation Area:** Spirit Drive Medians  
**Service Address:** 3720 Spirit Dr. SE  
**Account Number:** 01022420

This meter serves the medians along Spirit Drive from Clark Carr Rd to University Blvd.

Area of Landscape:	Sq ft.	Percent
Xeriscape	61,849	88%
High water use turf	8,748	12%
Trees and Bushes	-	0%
<b>TOTAL Irrigated Area</b>	<b>70,597</b>	

	Total Annual Use	Avg monthly water use
1994	1,532 units/yr	128 units/month
1995	1,599 units/yr	133 units/month
1996	1,623 units/yr	135 units/month
1997	1,139 units/yr	95 units/month
1998	1,473 units/yr	123 units/month
1999	1,621 units/yr	135 units/month
2000	1,933 units/yr	161 units/month
2001	2,138 units/yr	178 units/month
2002	2,328 units/yr	194 units/month
2003	2,187 units/yr	182 units/month

**Efficiency of Irrigation System** no test done on this area.



**Water Budget** difference unit/month 77  
 difference gal/year 686,959  
 Possible Savings 41% You could save water, see recommendations.

IRRIGATION EXPENSES <sup>1</sup>				
Month	Budget at 50%	Budget at 70%	Actual Use <sup>^</sup>	\$ Gain/(Loss)
Jan	14	13	-	\$16
Feb	24	22	4	\$22
Mar	54	49	-	\$60
Apr	103	94	41	\$66
May	171	156	193	(\$45)
Jun	238	217	238	(\$26)
Jul	268	245	336	(\$112)
Aug	241	219	349	(\$159)
Sep	165	151	296	(\$179)
Oct	94	86	378	(\$359)
Nov	35	32	324	(\$360)
Dec	17	16	58	(\$52)
<b>TOTALS</b>	<b>1,426</b>	<b>1,299</b>	<b>2,218</b>	<b>(\$1,129)</b>
<b>Monthly Avg</b>	<b>119</b>	<b>108</b>	<b>185</b>	<b>(\$94)</b>

<sup>1</sup>Irrigation expenses based on commodity cost of water only  
<sup>^</sup> Actual use is equal to 01' through 03' average metered water use.

**Recommendations**

The medians as well as some of the curbsides are watered along Spirit Drive through this meter. Currently, construction is in progress that will remove some of the landscape which will cause a decrease in water use. If the water use does not decrease next year, a leak investigation should be pursued.

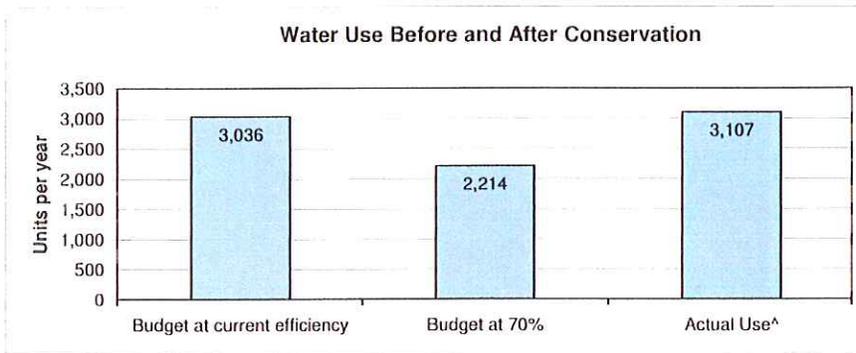
**Irrigation Area:** Air Cargo Landscape  
**Service Address:** 3720 Spirit Dr. SE  
**Account Number:** 01022422

This meter serves the landscape around the Air Cargo facility. The total use chart to the right indicates that improvements were made to in recent years to conserve water.

	Total Annual Use	Avg monthly water use
1994	3,979 units/yr	332 units/month
1995	3,139 units/yr	262 units/month
1996	5,650 units/yr	471 units/month
1997	2,602 units/yr	217 units/month
1998	4,652 units/yr	388 units/month
1999	4,348 units/yr	362 units/month
2000	4,027 units/yr	336 units/month
2001	4,610 units/yr	384 units/month
2002	3,059 units/yr	255 units/month
2003	3,154 units/yr	263 units/month

Area of Landscape:	Sq. ft.	Percent
Xeriscape	9,999	15%
High water use turf	56,649	85%
Trees and Bushes	-	0%
<b>TOTAL Irrigated Area</b>	<b>66,647</b>	

**Efficiency of Irrigation System**      Irrigation efficiency test was performed.  
 The application efficiency of this area is 50%.



**Water Budget**      difference unit/month      74  
 difference gal/year      667,385  
 Possible Savings      29% You could save water, see recommendations.

IRRIGATION EXPENSES <sup>*</sup>				
Month	Budget at current efficiency	Budget at 70%	Actual Use <sup>^</sup>	\$ Gain/(Loss)
Jan	30	22	-	\$27
Feb	51	37	13	\$30
Mar	115	84	8	\$93
Apr	220	160	44	\$143
May	365	266	196	\$86
Jun	508	370	487	(\$143)
Jul	571	417	517	(\$123)
Aug	512	374	528	(\$190)
Sep	352	257	495	(\$292)
Oct	201	146	516	(\$454)
Nov	74	54	266	(\$260)
Dec	37	27	39	(\$14)
<b>TOTALS</b>	<b>3,036</b>	<b>2,214</b>	<b>3,107</b>	<b>(\$1,097)</b>
<b>Monthly Avg</b>	<b>253</b>	<b>185</b>	<b>259</b>	<b>(\$91)</b>

**Recommendations**

The current watering schedule is applying the right amount of water. Savings could be realized by increasing the efficiency of the system.

Note: Systems over 20 years old may need to be replaced.

<sup>\*</sup>Irrigation expenses based on commodity cost of water only  
<sup>^</sup> Actual use is equal to 02' through 03' average metered water use.

**Irrigation Area:** East Sunport and Girard  
**Service Address:** 7 Sunport Blvd. SE  
**Account Number:** 01022396

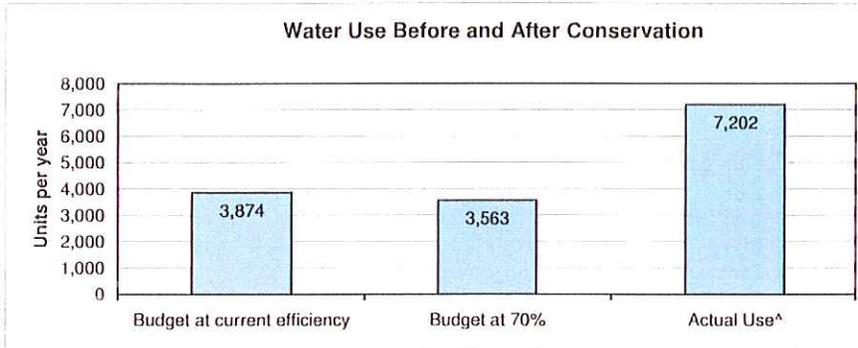
These two meters serve the irrigation systems along Girard. The landscape is all high-water use turf, and this area is often used for walking and picnics.

	Total Annual Use	Avg monthly water use
1994	6,129 units/yr	511 units/month
1995	5,906 units/yr	492 units/month
1996	6,026 units/yr	502 units/month
1997	4,710 units/yr	393 units/month
1998	6,410 units/yr	534 units/month
1999	7,194 units/yr	600 units/month
2000	10,076 units/yr	840 units/month
2001	8,136 units/yr	678 units/month
2002	6,799 units/yr	567 units/month
2003	6,670 units/yr	556 units/month

Area of Landscape:	Sq ft.	Percent
Xeriscape	-	0%
High water use turf	98,204	68%
Trees and Bushes	45,444	32%
<b>TOTAL Irrigated Area</b>	<b>143,649</b>	

**Efficiency of Irrigation System**

Irrigation efficiency test was performed on area with rotor heads. The application efficiency of this area is 64%.



**Water Budget**      difference unit/month      303  
                                  difference gal/year      2,721,417  
                                  Possible Savings      50.5%

IRRIGATION EXPENSES <sup>*</sup>				
Month	Budget at current efficiency	Budget at 70%	Actual Use <sup>^</sup>	\$ Gain/(Loss)
Jan	39	36	12	\$29
Feb	65	60	45	\$19
Mar	146	135	7	\$157
Apr	281	258	196	\$77
May	466	428	626	(\$243)
Jun	648	596	1,084	(\$600)
Jul	729	671	1,181	(\$627)
Aug	654	601	1,137	(\$658)
Sep	449	413	1,139	(\$892)
Oct	256	236	1,091	(\$1,052)
Nov	95	87	568	(\$592)
Dec	47	43	116	(\$90)
<b>TOTALS</b>	<b>3,874</b>	<b>3,563</b>	<b>7,202</b>	<b>(\$4,473)</b>
<b>Monthly Avg</b>	<b>323</b>	<b>297</b>	<b>600</b>	<b>(\$373)</b>

**Recommendations**

The water use is more than twice the amount required.

<sup>\*</sup>Irrigation expenses based on commodity cost of water only  
<sup>^</sup> Actual use is equal to 01' through 03' average metered water use.

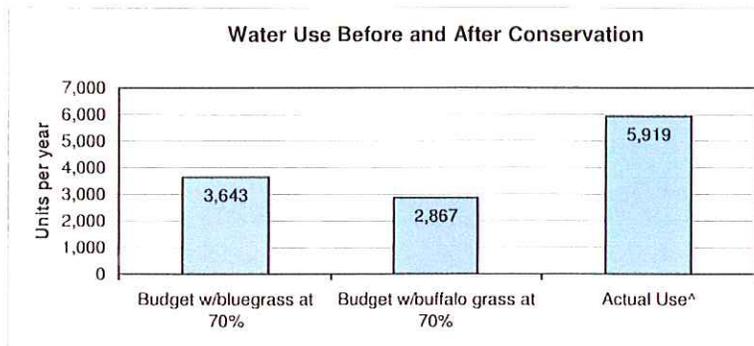
**Irrigation Area:** West Sunport  
**Service Address:** 3165 University Blvd. SE  
**Account Number:** 21251094

This meter serves the irrigation system along Sunport Blvd from Yale Blvd to University Blvd. This landscape was installed in 1997. This meter is currently paid for by the Parks and Recreation Department.

	Total Annual Use	Avg monthly water use
1994	- units/yr	- units/month
1995	- units/yr	- units/month
1996	- units/yr	- units/month
1997	1,307 units/yr	109 units/month
1998	4,720 units/yr	393 units/month
1999	4,640 units/yr	387 units/month
2000	3,725 units/yr	310 units/month
2001	5,517 units/yr	460 units/month
2002	4,622 units/yr	385 units/month
2003	7,619 units/yr	635 units/month

Area of Landscape:	Sq. ft.	Percent
Xeriscape	51,031	32%
Buffalo Grass	106,987	68%
High water use turf	-	0%
Trees and Bushes	-	0%
<b>TOTAL Irrigated Area</b>	<b>158,018</b>	

**Efficiency of Irrigation System** no test done on this area.



**Water Budget** difference unit/month 254  
 difference gal/year 2,283,223  
 Possible Savings 52% You could save water, see recommendations.

IRRIGATION EXPENSES <sup>*</sup>				
Month	Budget w/bluegrass at 70%	Budget w/buffalo grass at 70%	Actual Use <sup>^</sup>	\$ Gain/(Loss)
Jan	36	29	-	\$35
Feb	61	48	-	\$59
Mar	138	108	-	\$133
Apr	264	208	53	\$190
May	438	345	337	\$9
Jun	609	479	664	(\$227)
Jul	686	540	1,282	(\$913)
Aug	615	484	1,363	(\$1,080)
Sep	423	333	1,067	(\$903)
Oct	241	190	954	(\$940)
Nov	89	70	199	(\$159)
Dec	44	35	-	\$43
<b>TOTALS</b>	<b>3,643</b>	<b>2,867</b>	<b>5,919</b>	<b>(\$3,753)</b>
<b>Monthly Avg</b>	<b>304</b>	<b>239</b>	<b>493</b>	<b>(\$313)</b>

<sup>\*</sup>Irrigation expenses based on commodity cost of water only  
<sup>^</sup> Actual use is equal to 01' through 03' average metered water use.

**Recommendations**

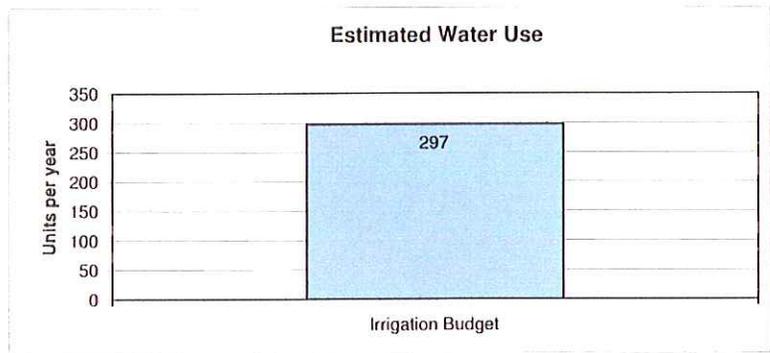
These areas are hard to water areas because they are on steep slopes. Ideally, sloped turf areas should be watered more often with shorter run times, called pulse-watering. The meter provides water to so many zones that multiple programs for pulse-watering are not practical. There was one efficiency test done on the area by the horses. The efficiency was affected by tall grass blocking the rotor heads. Placing sprinkler heads on risers in areas where buffalo grass is planted will improve efficiency.

**Irrigation Area:** Landscape Along Clark Carr Loop east of the Weather Service Building and in the parking area of the commercial aviation buildings.  
**Account Number:** no meter

The area is not currently metered. This area is highlighted on the map in Appendix

Area of Landscape:	Sq ft.	Percent
Xeriscape	-	0%
High water use turf	-	0%
Trees and Bushes	10,913	100%
<b>TOTAL Irrigated Area</b>	<b>10,913</b>	

**Efficiency of Irrigation System** N/A



**Water Budget**

Month	Irrigation Budget
Jan	3
Feb	5
Mar	11
Apr	22
May	36
Jun	50
Jul	56
Aug	50
Sep	34
Oct	20
Nov	7
Dec	4
<b>TOTALS</b>	<b>297</b>
Monthly Avg	25

**Recommendations**

The irrigation water used for these areas is not currently metered. The lines should be checked for point of connection to a water source. Currently, the irrigation system is controlled manually. A digital timer should be installed for this landscape and the water use should be metered properly.