

Brigantino Park

Landscape Irrigation Evaluation



Report

Reclaimed Water Meter

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Table of Contents

| | |
|---|-----------|
| Executive Summary | 2 |
| Irrigation Maintenance Efficiency | 3 |
| Irrigation Maintenance Efficiency - Continued | 4 |
| Irrigation Maintenance Efficiency - Continued | 5 |
| Additional Notes..... | 6 |
| Additional Notes - Continued | 7 |
| Sprinkler Distribution Uniformity..... | 9 |
| Water Budget..... | 10 |
| Recommendations | 11 |
| Irrigation Hardware | 11 |
| Best Water Conservation Practices | 11 |
| Landscape Water Management Program | 14 |
| Conclusion..... | 14 |
| Attachment 1 | 15 |
| General Tips | 16 |
| Create a Fire Wise Landscape | 16 |
| The Many Benefits of Trees..... | 17 |
| Tips for Planning a Year-Round Garden..... | 17 |
| Monthly System Inspections | 18 |
| Examine the Automatic Irrigation Timer..... | 18 |

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Executive Summary

Project: Brigantino Park
Location: City of Hollister

Introduction

This report is the result of an irrigation evaluation. Irrigation evaluations are conducted to determine detailed performance data about the irrigation equipment, and provide recommendations for improving distribution uniformity and conserving landscape water by reducing runoff of irrigation water.

Site Description

Brigantino Park has 35.1 acres of irrigated landscape throughout the property, all of which is turf. The irrigation system that is responsible for keeping the 35.11 acres of landscape alive consists of a Toro TR70P gear driven rotors. One Toro controller manages 57 irrigation control valves at Brigantino Park.

The water used to irrigate the landscape at Brigantino Park is recycled water supplied by the local sewage plant. The sewage plant has requested that Brigantino Park use a determined amount of water per month. Despite treatment of the recycled water, the #200 grit filter that was installed on the irrigation system at Brigantino Park is continually clogged by debris in the recycled water, causing the filter to fail. Debris then travels into the irrigation mainline, getting caught in valve diaphragms resulting in low water pressure evident by dry rings in the turf around sprinkler heads throughout the property. The debris also causes rotors to get clogged up and cause rotors to fail. The manufacturer of the rotors has stopped replacing the fail rotors due to debris because of the volume of replacements that have occurred since park irrigation system was installed. Because water has not been delivered to the park on a consistent basis since the park was installed, the quantity of water to be used by Brigantino Park on a month to month basis has never been determined.

Recommended CCF amounts located on Page 10 in Table 2 and Figure 2 can be used as an irrigation budget for each month. Recommended amounts were determined at 100% reference ET and an 18 inch root depth. Based on four meter readings per month, on site staff will be able to adjust irrigation schedules accordingly to fall within the recommended monthly CCF. Provided as Attachment 1, please find schedules for Toro Clock, Stations #3, #17, #34, and #44. Once schedules are implemented, additional sprinklers may need to be added to increase distribution uniformity. Once controllers are adjusted according to meter readings, it is necessary to visually inspect landscaped areas to assure that all areas receive adequate water. This may require additional adjustments to each station or possible renovation of the irrigation system.

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The following is a summary of irrigation efficiencies for Brigantino Park:

Irrigation Maintenance Efficiency

Irrigation Maintenance Efficiency is estimated to be 53% out of a possible 100%. Maintenance efficiency is the percentage of sprinklers properly adjusted compared to all sprinklers observed. Many sprinklers are low causing blocked spray patterns and flooding.

| Controller | Station | Sprinkler Type | Plant Type | Micro Climate | Slope | Sprinkler Observations* |
|------------|---------|-------------------------------|-----------------|---------------|-------|--|
| Toro Clock | 1 | Toro TR70P Gear Driven Rotors | Turf | Sun | Yes | 4 with Radius Problems, 3 Low & Flooding, 5 Operating Correctly |
| Toro Clock | 2 | Toro TR70P Gear Driven Rotors | Turf with Trees | Sun | Yes | 1 with Radius Problems, 2 Tilted, 1 Blocked, 3 Low & Flooding, 5 Operating Correctly |
| Toro Clock | 3 | Toro TR70P Gear Driven Rotors | Turf with Trees | Sun | Yes | 1 with Radius Problems, 1 Tilted, 2 Blocked, 8 Operating Correctly |
| Toro Clock | 4 | Toro TR70P Gear Driven Rotors | Turf with Trees | Sun | Yes | 2 Tilted, 1 Low & Flooding, 11 Operating Correctly |
| Toro Clock | 5 | Toro TR70P Gear Driven Rotors | Turf | Sun | Yes | 2 Tilted, 1 Blocked & Flooding, 4 Low & Flooding, 7 Operating Correctly |
| Toro Clock | 6 | Toro TR70P Gear Driven Rotors | Turf | Sun | Yes | 1 with Radius Problems, 3 Tilted, 2 Low & Flooding, 7 Operating Correctly |
| Toro Clock | 7 | Toro TR70P Gear Driven Rotors | Turf | Sun | Yes | 1 with Radius Problems, 4 Tilted, 4 Low & Flooding, 3 Operating Correctly |
| Toro Clock | 8 | Toro TR70P Gear Driven Rotors | Turf | Sun | No | 3 Tilted, 4 Low & Flooding, 5 Operating Correctly |
| Toro Clock | 9 | Toro TR70P Gear Driven Rotors | Turf | Sun | Yes | 1 with Radius Problems, 2 Tilted, 5 Low & Flooding, 5 Operating Correctly |
| Toro Clock | 10 | Toro TR70P Gear Driven Rotors | Turf | Sun | No | 1 with Radius Problems, 1 Tilted, 3 Low & Flooding, 5 Operating Correctly |
| Toro Clock | 11 | Toro TR70P Gear Driven Rotors | Turf | Sun | Yes | 3 Tilted, 4 Low & Flooding, 4 Operating Correctly |
| Toro Clock | 12 | Toro TR70P Gear Driven Rotors | Turf | Sun | No | 3 Tilted, 3 Low & Flooding, 4 Operating Correctly |
| Toro Clock | 13 | Toro TR70P Gear Driven Rotors | Turf | Sun | No | 2 Tilted, 3 Low & Flooding, 6 Operating Correctly |
| Toro Clock | 14 | Toro TR70P Gear Driven Rotors | Turf | Sun | No | 1 Tilted, 3 Low & Flooding, 6 Operating Correctly |
| Toro Clock | 15 | Toro TR70P Gear Driven Rotors | Turf | Sun | No | 3 Tilted, 3 Low & Flooding, 5 Operating Correctly |
| Toro Clock | 16 | Toro TR70P Gear Driven Rotors | Turf | Sun | Yes | 1 with Radius Problems, 3 Tilted, 2 Low & Flooding, 5 Operating Correctly |
| Toro Clock | 17 | Toro TR70P Gear Driven Rotors | Turf | Sun | No | 1 with Radius Problems, 1 Tilted, 5 Low & Flooding, 4 Operating Correctly |

*Key For Sprinklers: Blocked = Blocked By Plant Material, Blocked & Flooding = Blocked By Plant Material Causing Flooding, Low = Set Below Landscape Grade, Low & Flooding = Set Below Landscape Grade Causing Flooding

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Irrigation Maintenance Efficiency - Continued

| Controller | Station | Sprinkler Type | Plant Type | Micro Climate | Slope | Sprinkler Observations* |
|------------|---------|-------------------------------|------------|---------------|-------|---|
| Toro Clock | 18 | Toro TR70P Gear Driven Rotors | Turf | Sun | No | 1 with Radius Problems, 2 Tilted, 4 Low & Flooding, 4 Operating Correctly |
| Toro Clock | 19 | Toro TR70P Gear Driven Rotors | Turf | Sun | Yes | 2 Tilted, 2 Low & Flooding, 5 Operating Correctly |
| Toro Clock | 20 | Toro TR70P Gear Driven Rotors | Turf | Sun | No | 2 with Radius Problems, 3 Tilted, 2 Low & Flooding, 3 Operating Correctly |
| Toro Clock | 21 | Toro TR70P Gear Driven Rotors | Turf | Sun | No | 1 with Radius Problems, 2 Tilted, 2 Low & Flooding, 5 Operating Correctly |
| Toro Clock | 22 | Toro TR70P Gear Driven Rotors | Turf | Sun | No | 2 with Radius Problems, 1 Tilted, 5 Low & Flooding, 2 Operating Correctly |
| Toro Clock | 23 | Toro TR70P Gear Driven Rotors | Turf | Sun | Yes | 2 with Radius Problems, 4 Low & Flooding, 3 Operating Correctly |
| Toro Clock | 24 | Toro TR70P Gear Driven Rotors | Turf | Sun | No | 1 Tilted, 3 Low & Flooding, 4 Operating Correctly |
| Toro Clock | 25 | Toro TR70P Gear Driven Rotors | Turf | Sun | No | 2 with Radius Problems, 3 Tilted, 3 Low & Flooding, 8 Operating Correctly |
| Toro Clock | 26 | Toro TR70P Gear Driven Rotors | Turf | Sun | Yes | 1 with Radius Problems, 5 Tilted, 4 Low & Flooding, 5 Operating Correctly |
| Toro Clock | 27 | Toro TR70P Gear Driven Rotors | Turf | Sun | Yes | 2 with Radius Problems, 3 Tilted, 1 Low & Flooding, 7 Operating Correctly |
| Toro Clock | 28 | Toro TR70P Gear Driven Rotors | Turf | Sun | No | 2 with Radius Problems, 3 Tilted, 2 Low & Flooding, 3 Operating Correctly |
| Toro Clock | 29 | Toro TR70P Gear Driven Rotors | Turf | Sun | No | 2 with Radius Problems, 1 Tilted, 6 Operating Correctly |
| Toro Clock | 30 | Toro TR70P Gear Driven Rotors | Turf | Sun | Yes | 4 with Radius Problems, 2 Tilted, 3 Operating Correctly |
| Toro Clock | 31 | Toro TR70P Gear Driven Rotors | Turf | Sun | No | 6 with Radius Problems, 2 Tilted, 3 Low & Flooding, 4 Operating Correctly |
| Toro Clock | 32 | Toro TR70P Gear Driven Rotors | Turf | Sun | Yes | 2 with Radius Problems, 7 Operating Correctly |
| Toro Clock | 33 | Toro TR70P Gear Driven Rotors | Turf | Sun | No | 1 with Radius Problems, 2 Tilted, 2 Low & Flooding, 1 Not Rotating, 4 Operating Correctly |
| Toro Clock | 34 | Toro TR70P Gear Driven Rotors | Turf | Sun | No | 2 with Radius Problems, 1 Tilted, 3 Low & Flooding, 4 Operating Correctly |
| Toro Clock | 35 | Toro TR70P Gear Driven Rotors | Turf | Sun | Yes | 3 with Radius Problems, 2 Tilted, 3 Low & Flooding, 6 Operating Correctly |
| Toro Clock | 36 | Toro TR70P Gear Driven Rotors | Turf | Sun | No | 2 with Radius Problems, 1 Tilted, 1 Low & Flooding, 10 Operating Correctly |

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Irrigation Maintenance Efficiency - Continued

| Controller | Station | Sprinkler Type | Plant Type | Micro Climate | Slope | Sprinkler Observations* |
|------------|---------|-------------------------------|-----------------|---------------|-------|---|
| Toro Clock | 37 | Toro TR70P Gear Driven Rotors | Turf | Sun | No | 3 with Radius Problems, 2 Tilted, 4 Low & Flooding, 7 Operating Correctly |
| Toro Clock | 38 | Toro TR70P Gear Driven Rotors | Turf | Sun | Yes | 2 with Radius Problems, 1 Low & Flooding, 12 Operating Correctly |
| Toro Clock | 39 | Toro TR70P Gear Driven Rotors | Turf | Sun | No | 5 Tilted, 4 Low & Flooding, 4 Operating Correctly |
| Toro Clock | 40 | Toro TR70P Gear Driven Rotors | Turf | Sun | Yes | 4 with Radius Problems, 1 Tilted, 3 Low & Flooding, 8 Operating Correctly |
| Toro Clock | 41 | Toro TR70P Gear Driven Rotors | Turf | Sun | Yes | 2 with Radius Problems, 1 Tilted, 3 Low & Flooding, 5 Operating Correctly |
| Toro Clock | 42 | Toro TR70P Gear Driven Rotors | Turf | Sun | No | 4 with Radius Problems, 1 Tilted, 4 Low & Flooding, 4 Operating Correctly |
| Toro Clock | 43 | Toro TR70P Gear Driven Rotors | Turf | Sun | Yes | 1 with Radius Problems, 2 Low & Flooding, 10 Operating Correctly |
| Toro Clock | 44 | Toro TR70P Gear Driven Rotors | Turf with Trees | Sun | Yes | 1 with Radius Problems, 1 Blocked & Flooding, 3 Low & Flooding, 8 Operating Correctly |
| Toro Clock | 45 | Toro TR70P Gear Driven Rotors | Turf | Sun | Yes | 1 with Radius Problems, 4 Tilted, 3 Low & Flooding, 6 Operating Correctly |
| Toro Clock | 46 | Toro TR70P Gear Driven Rotors | Turf | Sun | Yes | 2 with Radius Problems, 3 Tilted, 2 Low & Flooding, 10 Operating Correctly |
| Toro Clock | 47 | Toro TR70P Gear Driven Rotors | Turf | Sun | Yes | 3 Tilted, 3 Low & Flooding, 1 Not Rotating, 9 Operating Correctly |
| Toro Clock | 48 | Toro TR70P Gear Driven Rotors | Turf | Sun | Yes | 4 Tilted, 2 Low & Flooding, 8 Operating Correctly |
| Toro Clock | 49 | Toro TR70P Gear Driven Rotors | Turf | Sun | Yes | 3 Low & Flooding, 1 Not Rotating, 10 Operating Correctly |
| Toro Clock | 50 | Toro TR70P Gear Driven Rotors | Turf | Sun | No | 2 Tilted, 4 Low & Flooding, 10 Operating Correctly |
| Toro Clock | 51 | Toro TR70P Gear Driven Rotors | Turf | Sun | Yes | 2 Tilted, 16 Operating Correctly |
| Toro Clock | 52 | Toro TR70P Gear Driven Rotors | Turf | Sun | Yes | 4 with Radius Problems, 2 Tilted, 2 Low & Flooding, 8 Operating Correctly |
| Toro Clock | 53 | Toro TR70P Gear Driven Rotors | Turf with Trees | Sun | Yes | 1 Tilted, 3 Low & Flooding, 11 Operating Correctly |
| Toro Clock | 54 | Toro TR70P Gear Driven Rotors | Turf | Sun | Yes | 15 Operating Correctly |
| Toro Clock | 55 | Toro TR70P Gear Driven Rotors | Turf with Trees | Sun | Yes | 1 with Radius Problems, 1 Low & Flooding, 8 Operating Correctly |
| Toro Clock | 56 | Toro TR70P Gear Driven Rotors | Turf with Trees | Sun | Yes | 2 with Radius Problems, 8 Operating Correctly |
| Toro Clock | 57 | Toro TR70P Gear Driven Rotors | Turf with Trees | Sun | Yes | 2 with Radius Problems, 7 Operating Correctly |

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Additional Notes

- The debris in the recycled water from the sewage plant causes equipment failures two to three times a month stopping delivery of water to the park resulting in dry spots in the turf. Debris also clogs the gear assemblies of the Toro TR70P rotors preventing them from rotating. Toro TR70P rotors cannot be cleaned and must be replaced when clogged. Consider installing a filtration system that can better handle the amount of debris in the water. Or try identifying the debris and further treat the water accordingly at the sewage plant in order to dissolve the debris to prevent further equipment failure and loss of turf due to inadequate coverage and water supply.
- Any new landscape considered for acquisition by the City of Hollister – the airport specifically – should be evaluated for potential problems before the city of Hollister accepts control of the facilities.
- PVC fittings split due to excessive water pressure. Static water pressure averages 80 PSI and can rise to 90 PSI. Six valves have failed due to this problem since installation. Consider using pressure regulating “dirty water irrigation control valves” for recycled water in place of Irritrol valves. Also, some PVC fittings and Schedule 80 nipples appear to have been overly tightened at the time of installation, which combined with high water pressure are causing PVC fittings to crack on the irrigation mainline.
- There appears to be a missing row of sprinklers along the path around the park resulting in very dry and dead turf in this area. Plans should be inspected to determine if this area was to be irrigated. If irrigation laterals do not appear on the plan, this area should be renovated to improve irrigation coverage around the park.
- Consider using larger nozzles to increase radius of throw according to manufacturer’s specifications. Use #24 in place of #12 nozzles and #27 in place of #16 nozzles at 45-60 PSI. This will improve the head-to-head coverage of the irrigation system and help reduce dry spots around the park. Also, consider adding more heads per station to improve distribution uniformity.
- Stations #33, #47, and #49 – Some sprinklers do not rotate due to the amount of debris clogged in the gear assemblies and should be replaced immediately to prevent loss of landscape.
- Stations #25, #26 – Stations are wired to irrigate more than one valve at a time. Valves that are “double-wired” can reduce water pressure which can affect irrigation coverage. Problems with the irrigation equipment may also be more difficult to detect. Only one valve should run at a time.
- Station #5 – Station did not turn off via irrigation timer once inspection was complete. Valve had to be manually turned off. Consider inspecting irrigation valve for faulty internal parts. Consider rebuilding and if this does not solve problem valve may have to be replaced. Any valve experiencing this problem should be inspected immediately and rebuilt or replaced to prevent over irrigating the landscape.

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Additional Notes - Continued

- Stations #10, #11, #18, #32, #33, #49 – Sprinklers were slow to close once the station was turned off. Irrigation valves that open and close slowly may be showing signs of failure and should be inspected for faulty parts.
- Stations #1, #2, #3, #4, #5, #6, #7, #8, #9, #10, #12, #14, #15, #16, #17, #18, #19, #20, #21, #22, #23, #24, #25, #26, #27, #28, #30, #31, #32, #33, #34, #36, #37, #40, #41, #42, #43, #44, #45, #47, #48, #49, #50, #51, #52, #53, #54 – Many sprinklers do not have head to head coverage due to spacing between sprinklers.
- Stations #1, #2, #3, #5, #6, #7, #8, #9, #10, #11, #12, #13, #15, #16, #17, #18, #19, #20, #21, #22, #23, #24, #25, #26, #27, #28, #29, #30, #31, #32, #33, #34, #35, #36, #37, #39, #40, #41, #42, #43, #44, #45, #46, #47, #48, #50, #51, #52, #53, #54, #55, #56, #57 – Stations experience misting.
- Stations #1, #2, #3, #5, #6, #7, #8, #9, #10, #11, #12, #13, #15, #16, #17, #18, #19, #20, #21, #22, #23, #24, #25, #26, #27, #28, #29, #30, #31, #32, #33, #34, #35, #36, #37, #39, #40, #41, #42, #43, #44, #45, #46, #47, #48, #49, #50, #51, #52, #53, #54, #55, #56, #57 – Wind is a factor and can reduce radius of throw by as much as half.
- Stations #7, #8, #10, #11, #12, #14, #15, #16, #17, #18, #20, #21, #22, #23, #24, #25, #26, #27, #28, #31, #32, #33, #34, #35, #36, #37, #38, #39, #40, #41, #44, #46, #47, #49, #51, #54, #56 – Stations have areas with dry spots.
- Some sprinklers rotate faster than others. Consider inspecting all stations and replace slow rotating sprinklers to improve distribution uniformity.
- Gophers are a problem throughout the property and a rodent control program should be put in place.
- Weeds are a problem throughout the property and a weed abatement program should be put in place.
- Install “No Trespassing” signs in English and Spanish at the riparian area. Poison oak is rampant in the area and can pose a safety hazard to the public. Call Kris Griffin, a Certified Pest Control Advisor, at 805-471-4040 for chemical recommendations to eradicate the poison oak in the riparian area.
- Consider installing more signage in English and Spanish notifying the public that recycled water is being used to irrigate the landscape.

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The pictures below demonstrate some problem areas at Brigantino Park:



Replaced Filter after One Week of Use



Split PVC 90° Angle Caused by High Water Pressure



Dry Spots due to Lack of Coverage & Clogged Rotors Not Rotating



Rotor Blocked by Tree



Tilted Rotor

Maintenance needs were identified during a “Wet Check” inspection of the irrigation stations. Please see Recommendations for suggestions that your landscape maintenance staff can implement to increase irrigation efficiency.

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Sprinkler Distribution Uniformity

Four sprinkler stations were tested using the standard Cal Poly Catch Can method; the results are included in Table 1.

Table 1: Sprinkler Performance

| Controller | Station | Precipitation Rate | Distribution Uniformity |
|-------------------|----------------|---------------------------|--------------------------------|
| Toro Clock | 3 | 0.35 | 75% |
| Toro Clock | 17 | 0.32 | 74% |
| Toro Clock | 34 | 0.53 | 82% |
| Toro Clock | 44 | 0.58 | 87% |

Precipitation Rates above are listed in inches per hour, or how fast water is applied to the landscape. The precipitation rates for Stations #3 and #17 are considered normal rates for these types of sprinklers. Higher rates than the infiltration rate of un-amended soil would lead to run-off.

Distribution Uniformity refers to how evenly water is applied to the landscape. The distribution uniformity is less than 80% for Stations #3 and #17, which leads to excess water use whenever irrigation is performed. The target distribution uniformity for these types of sprinklers is 80%.

The four stations tested have an average distribution uniformity of 80%. The City of Hollister will be applying water to a depth of 18 inches, which will be monitored. If the existing irrigation system is only covering 80% of the park, this leaves 20% or 7 acres of turf that is not getting irrigated sufficiently. If the deficient 20% of Brigantino Park receives water via flooding and/or run-off from the existing irrigation system, this will cause areas with adequate coverage to apply water below the 18 inch required result in 80% of the park. Improved distribution uniformity of the irrigation system will allow the recycled water to be applied evenly to the required depth of 18 inches.

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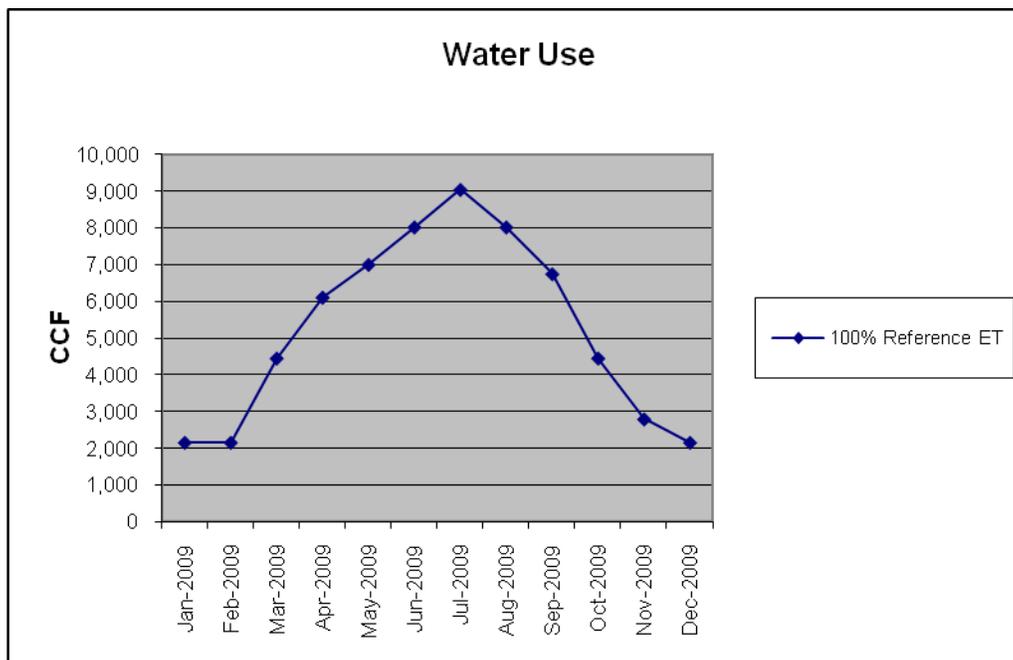
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Water Budget

Table 2

| Month | 100% Reference ET |
|------------------|--------------------------|
| Jan-2009 | 2,167 |
| Feb-2009 | 2,167 |
| Mar-2009 | 4,461 |
| Apr-2009 | 6,118 |
| May-2009 | 7,011 |
| Jun-2009 | 8,030 |
| Jul-2009 | 9,050 |
| Aug-2009 | 8,030 |
| Sep-2009 | 6,756 |
| Oct-2009 | 4,461 |
| Nov-2009 | 2,804 |
| Dec-2009 | 2,167 |
| <i>Total CCF</i> | 63,222 |

Figure 2



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Recommendations

Set aside appropriate resources to assist with the following system improvements:

Irrigation Hardware

- Consider checking all stations one by one to correct any low, tilted, or clogged sprinklers that are not rotating. This can be achieved over a period of time depending on budget expenditures.
- Sprinklers should shoot water sprinkler to sprinkler (head to head coverage is used in the landscape industry to improve distribution of irrigation water). Consider moving the sprinkler heads away from obstructions and tall plant material causing flooding to improve distribution and reduce run-off of irrigation water. If needed, move sprinklers closer together and install additional heads to improve irrigation coverage of landscape and eliminating dry spots.
- To improve distribution uniformity, consider moving or adding additional sprinkler heads to assure at least three sprinklers water the designated area. This would be considered head to head coverage and improves the health of the landscape eliminating dry spots.
- Sprinklers shooting onto or over paths and walkways should be relocated to avoid irrigating hardscapes.
- Some stations have sprinkler heads set below landscape grade, often causing flooding and erosion of the turf and soil. Sprinkler heads set below landscape grade should be raised in order to prevent reduction of radius of throw leading to the cause of deterioration of plant material.

Best Water Conservation Practices

- Due to excessive high winds, spray patterns from pop-up spray heads and gear driven rotors are reduced. In some cases, radius of throw is reduced in half causing loss of irrigation water from overspray and poor distribution of irrigation water. Landscaped areas affected by winds will show signs of stress at the hottest parts of the summer. Consider adding sprinkler to improve distribution uniformity. Higher distribution uniformity of irrigation spray heads and gear driven rotors stations will improve health of plant material and conserve irrigation water.
- Run the irrigation system early in the morning. This is when water pressure is typically at its best. It is also best for the lawn. If you water in the evening the blades of grass will stay wet much longer and make it easier for fungus to grow. Early morning also has the least wind. Wind can easily blow a spray pattern several feet off target resulting in dry areas.

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- Mow your lawn as infrequently as possible. Mowing puts your lawn under additional stress, causing it to require more water. Adjust your lawn mower to a higher setting. Longer grass will reduce the loss of water to evaporation.
- Consider renovation of turf areas to improve the condition of the turf. Using turf specific to sport fields and high foot traffic will keep these areas greener and healthier longer. Renovation of turf areas may also improve distribution uniformity of the irrigation system. This may require adding or moving sprinklers in this area. Improving distribution uniformity will improve health of turf and reduce the amount of water loss due to excessive irrigation run times.
- Proper lawn watering can save thousands of gallons of water annually. Water only as rapidly as the soil can absorb the water.
- Know where your master water shut-off valve is located. This could save gallons of water and damage to your property if a pipe were to burst.
- Rooting depth of most turf grasses is at least 4 inches, so you'll have to modify at least 4" to affect the turf. The worst thing you can do for turf is to create a layer of dramatically different particle size fairly shallow in the root zone. Water and air will move down only to this layer and stop, and thus the roots will only move down to this layer. This will make for a soil that's waterlogged with even small rain showers producing a shallow-rooted turf incapable of surviving even moderate dry spells. Some try to incorporate sand in clay or heavy soils.
- The condition of turf largely depends on the events occurring below the surface. For grass to grow, deep healthy roots are needed, and roots demand oxygen. In good soil, they receive oxygen from tiny pockets of air trapped between soil and sand particles. On a sports field, the everyday traffic from players combined with the weight of heavy mowing equipment causes the soil to become compacted and the air pockets on which, the roots depend for oxygen are lost. Aerification is a mechanical process that creates more air space in the soil and promotes deeper rooting, water percolation and compaction relief.
- Thatch is a tightly intermingled organic layer of dead and living shoots, stems, and roots that accumulate just above the soil surface. It is not the leaf clippings left over after mowing or those that find their way to the soil surface. A small amount of thatch is desirable because it moderates soil temperature fluctuations and provides a cushion on the soil surface. Too much thatch interferes with water and air movement, reduces fertilizer and pesticide response, and increases disease and insect activity. The worst thing about thatch levels greater than ½ inch, roots begin growing in the thatch and since thatch doesn't hold much water, the turf becomes susceptible to drought damage even under mild water stress.

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- Thatch builds up when growth or organic matter production is higher than the breakdown. Therefore, a neglected lawn will never accumulate a thatch layer whereas an intensely managed lawn will. Too much irrigation and too much nitrogen will increase organic matter production leading to thatch. Conversely, too much irrigation compacted or heavy soils will also lead to thatch because it limits the microbial activity that breaks down thatch. Thatch management includes only watering as needed, moderate fertility, and aerifying at least once every year or two to decompact the soil.
- Summer weed annuals like oxalis, spurge, black medic, and knotweed are tough to control. They germinate in the spring (some of them very early), grow throughout the summer, and die with the first frost. Since they have completed their life cycle by fall, they are not affected by October applications of broadleaf herbicides. Obviously, a thick healthy turf will minimize these weeds, but it might not solve all of the problems. Though some of the pre-emergence annual grass herbicides mention these weeds on the label, the season long control is not reliable. Post-emergence and pre-emergence control options exist for summer annual broadleaf weeds. An early pre-emergence application, or a late April to May application of a broadleaf herbicide should work to control these weeds. However, human nature makes us target the more obvious dandelions at this time of the year, missing the smaller summer annual weeds near the sidewalks and in other hotspots. Furthermore, even if you get good control from a May application of broadleaf herbicide, these summer annuals will continue to germinate well into July. Therefore, consider treating for these weeds in late spring or plan on spot treating with a post-emergence product later in the summer to control summer annuals.
- Continue updating color maps of the irrigation system, showing exact location of each area covered by irrigation control valve, clocks, and backflows in relation to the property. This will eliminate wasted time searching for station numbers when a problem arises with the irrigation system. These maps should be stored inside each controller and copies given to your landscape maintenance contractor.

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Landscape Water Management Program

Implementing a Landscape Water Management (LWM) Program can save a substantial amount of water. This program consists of three steps performed on a monthly basis as follows:

1. **Monitor Water Use** - Local horticultural weather data (ET) is collected from the Internet, visit www.valleywater.org or www.cimis.water.ca.gov. This information along with water meter readings can be used to track water use and identify possible system leaks.
2. **Wet-Check the System** - Color coded maps should be prepared for each controller. These maps along with a hand held remote control unit could be used to quickly walk through the site and check for stressed plants and broken sprinklers. Sprinkler repairs should be made promptly.
3. **Adjust Irrigation Schedules**- ET weather data can be compared with water meter readings to determine the appropriate water use for this site.

Conclusion

Based on the condition of the landscape at Brigantino Park caused by equipment failure due to debris in the recycled water, it is recommended that the filtration system is improved or more extensive methods for treating the water are put in place to allow for a more reliable source of water. Also, improving the distribution uniformity of the irrigation system will allow the recycled water to be applied evenly to the required depth of 18 inches.

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Attachment 1

Site Directory: HOLLISTE Site File: BRIGANTI

BRIGANTINO PARK
CITY OF HOLLISTER

Weather Data - San Benito Location: SB2009
Annual ET: 50.00 Annual Rain: 13.20

| MINUTES PER CYCLE | | | | | | | | | | | | |
|-----------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| STATION | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC |
| 3 | 106 | 123 | 134 | 175 | 178 | 195 | 227 | 184 | 207 | 134 | 160 | 104 |
| 17 | 120 | 140 | 152 | 199 | 202 | 221 | 258 | 209 | 235 | 152 | 182 | 118 |
| 34 | 65 | 76 | 82 | 108 | 109 | 119 | 139 | 113 | 127 | 82 | 98 | 64 |
| 44 | 55 | 64 | 70 | 91 | 93 | 101 | 118 | 96 | 108 | 70 | 83 | 54 |
| DAYS PER PERIOD | 2 | 3 | 5 | 7 | 7 | 7 | 7 | 7 | 6 | 4 | 3 | 1 |
| CYCLES PER DAY | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |

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General Tips

Create a Fire Wise Landscape

Remember that the primary goal of creating a fire wise landscape is fuel reduction. To implement this consider following the zone concept. Zone 1 is closest to the structure; Zones 2-4 move progressively further away.

| | |
|---------------|---|
| Zone 1 | This well irrigated area encircles the structure for at least 30 feet on all sides, providing space for fire suppression equipment in the event of an emergency. Plantings should be limited to carefully spaced, low flammability species. |
| Zone 2 | Low flammable plant material should be used here. Plants should be low-growing, and the irrigation system should extend into this section of the landscape. |
| Zone 3 | Place low-growing plants and well-spaced trees in this area of the landscape; remember to keep the volume of vegetation (fuel) low in this area |
| Zone 4 | This furthest zone from the structure is a natural area. Selectively prune and thin all plants and remove highly flammable vegetation. |
| Zone 5 | If needed |

Also remember to:

- Be sure to leave a minimum of 30 feet around the structure to accommodate fire equipment, if necessary.
- Widely space and carefully situate the trees you plant.
- Take out the “ladder” fuels - vegetation that serves as a link between grass and tree tops. This arrangement can carry fire to a structure or from a structure to vegetation.
- Give yourself added protection with fuel breaks like driveways, gravel walkways, and lawns.

Access additional information on the fire wise home page: www.firewise.org

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The Many Benefits of Trees

Trees generate significant measurable environmental benefits:

- Trees clean pollutants from the air, including sulfur dioxide, nitrogen dioxide, ozone, and carbon monoxide.
- Just 100 trees for example, can remove 5 tons of carbon dioxide from the air a year, and about 1,000 pounds of pollutants.
- One hundred mature trees capture about 250,000 gallons of rainwater per year by absorbing rain and slowing the flow of storm water, allowing some water to evaporate and the rest to soak into the ground water.
- Every ton of paper recycled saves 17 trees.

Trees greatly lower energy consumption:

- The shade from trees prevent heat islands, the build up of heat from sunlight pouring onto dark, non-reflective surfaces such as roofs , roads, and parking lots.
- Three strategically placed trees around a structure can cut air-condition usage and cost in half.
- Recycling one ton of paper saves 682.5 gallons of oil, 7,000 gallons of water, and 3.3 cubic yards of landfill space.
- A study by the USDA Forest Service Center for Urban Forest Research found that adding 50 million new trees in California would eliminate the need for seven new 100-megawatt power plants.

Tips for Planning a Year-Round Garden

- Start with winter. Focus first on the plants and structures that will be attractive in the winter. Think about where paths, walls, statues and other hardscape items, then move on to evergreens and other trees with good structure and interesting bark. Next consider shrubs with winter berries and flowers, and select perennials and grasses that will hold their shape through winter.
- Look beyond blooms. To give your garden lasting interest, focus on a plant's structure, foliage, and texture rather than blooms.
- Choose seasonal showstoppers. Visit local nurseries each month to see what's in bloom at that time of the year. Then as you landscaper to install your favorites to get blooms and beautiful foliage all season.
- Time it right. Plant bold-leaved plants so the summer foliage will cover the dying leaves of early bloomers. Likewise late flowering plants cover the unattractive dead foliage of summer bloomers.

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Monthly System Inspections

- Observe each valve circuit in operation.
- Is sprinkler coverage even? Check to see if water from each sprinkler head reaches the adjacent sprinkler heads.
- Do plants block spray patterns? Turf, tree branches, and shrub limbs can grow in the path of spray patterns reducing the radius of throw.
- Do sprinklers need to be added to improve distribution uniformity of irrigation system?
- Are the sprinklers leaning or broken? Sprinkler heads need to be straight to perform at their best.
- Are there any leaks? Don't forget to check hose bibs also.
- Is water being applied to sidewalks? Over time, water can damage fences, cement, and asphalt surfaces.
- Change station run times to accommodate changing weather patterns.

Examine the Automatic Irrigation Timer

- Turn on the irrigation clock manually.
- Check to see that each valve activates (turns on) and runs for the scheduled amount of time.
- Review the irrigation schedule to see if it is appropriate for each area.
- Replace the battery (if timer has a back-up battery).

By following these steps, irrigation maintenance can help identify potential irrigation problems before high water use occurs or decay of hardscape. Please share this information with your landscape maintenance contractor and encourage them to implement a monthly irrigation maintenance program on your property if they are not doing so now.