



**Site Review and Audit: Los Alamos Sports Park, 37000 Ruth Ellen Rd,
Murrieta, CA**

Date: 4/19/2012 - 8/1/2012

**Project Owner: EcoFlow: Earl Coleman
Manager: City of Murrieta Parks Department, Bob Kast**

General Observations:

The initial existing landscaping is what is seen as normal for a playable football/ soccer field surface. Turf was sparse in the center field strips from end zone to end zone and patches of healthy and stressed turf were noted over the whole field. Increased maintenance levels were scheduled for 4/20 to get the field ready for upcoming league use. These turf fields are used way beyond the suggested playing limits of 45 – 75 days of play and to allow the turf to “rest” if healthy turf is to be maintained, as are most municipal facilities.

- The test site was chosen for its central location on the field and had a normal use pattern of normal to excessive foot traffic.
- The control area was chosen as it is adjacent to the test location with the same patterns.
- Both test and control areas used the same irrigation type heads, the same size nozzles, running for the same length of time, operating sequentially with, with the same watering days and receiving the same amount of water per cycle as each other. It can be garnered that precipitation rates and system uniformity was close to equal also as the head spacing and head layout was the same for both zones.
- The test valve was 3B and the control valve was 2B.
- Valve 3B and 2B were rated at 68 gpm respectively.
- The EcoFlow unit was rated at 100 gpm.
- All core samples tested showed that the soil was at field capacity – even the center bare areas.
- Runoff was at 8 minutes for the compacted center areas and 11 minutes 15 feet from the sideline markers.



- Cores were initially pulled from random areas within the testing location: 15 feet from the sideline to 50 feet from the sideline. 5 cores were sampled and it appeared that the whole playing surface was compacted most in the center and less going back towards the sidelines.
- The cores showed that core tool penetration could only go 3 1/2" deep at 15 feet from the sideline locations and decreased to apx 1/2"- 3/4" at the center of the field where no grass was present and compaction was complete.
- Initially only 5 cores were pulled in the test area and then 5 cores were pulled from both the test and control area for a total of 10 cores.
- The cores were pulled in the approximate same area each time for all tests.
- Care was taken to test only undisturbed turf and in between any perceived turf or soil disturbed areas or aeration penetrations. No core sample was taken from any aeration holes or soil penetrations or irrigation repaired areas.
- Core tool pressure was conducted in both the initial testing and all other testing by the same 200 lb man using full weight pressure twisting down on the coring tool in one direction.
- The coring tool used was the same in all tests and new coring teeth were installed before each of the tests.
- A densitometer was scheduled to be used and tried in one spot but it was found that it could not be anchored properly and firmly enough to get proper depth penetration and appeared to be damaging the surrounding soil integrity when installed/ removed. We believed this was going to skew the results and this test was promptly discontinued.
- The EcoFlow water treatment processor was installed downstream from valve 3B on a 3" lateral line using flanged fittings, installed 6" below grade, encased in a jumbo valve box with filter cloth covering the top/ sides/ bottom to allow for easy removal or repairs. No core samples were taken from within 15 feet of this area.

Core samples were pulled May 14 from both the test and control site (5 each) after the renovation but the results were inconclusive and were equal for both the test and control area. It was assumed that this was a result of the renovations.

5 core samples were pulled June 15 and soil penetration was at 1 1/2" to 3 1/2" for the control site and 2 3/4" to 4 1/2" for the test site. July was not tested.

Final core samples were pulled on August 1st and photos taken for both the core sample test tool depth of penetration and root depth growth. The results were:

- For the control site the soil probe was able to penetrate: 1", 2¹/₄", 3¹/₂", 4" and 5".
- For the test site the soil probe was able to penetrate: 4³/₄", 5¹/₄", 5¹/₂", 6¹/₂" and 6 ³/₄".
- For the control site root depth was at: 1", 2", 3¹/₄", 3¹/₂" and 4¹/₂" (average 2 - 6/7")
- For the test site root depth was at: 2³/₄", 4", 5¹/₂", 5³/₄" and 6" (average 4 ³/₄ ")
- More bare areas were noted in the center field areas of the control section turf than in the center of the test section.
- Runoff time for the test area was 20m+.
- Runoff time for the control area was 16m.
- There was no visible build up of surface salts and none were expected.
- This test can be repeated at this location and the same results could be expected.

Conclusion:

- The test site root depth grew a 68% deeper root system than the control site.
- It appears that watering duration could be reduced in the test site area as the collective retained water or Plant Available Water (PAW) within the root zones of valve 3B increased over the test site of valve 2B. A water run time reduction test could not be conducted without possible damage to the surrounding control site and other areas.

Summary and Observation:

- Water run times could be reduced by this amount or some fraction depending on the area use.
- The test has shown a potential for water reduction and improved plant health by providing stress protection with increased PAW.
- The reduction in irrigation run times should allow for the savings, from the cost the utility department charges for electricity to pump/ deliver the water and cost of water used for site irrigation, to pay for the product in short time.
- The design of the product leads to minimal maintenance which may reduce labor costs compared to other soil health practices.

- The operation of the product shows that there may be no need for extra added soil penetrates or extra fertilizer to break down the water/ soil barrier to maintain plant health other than standard maintenance practices. And, that this product may actually increase plant health over the longer term with standard maintenance practices.
- There should be cost savings for reduction in chemicals and or aeration services with the EcoFlow installed at the irrigation systems point of connection.
- It appears that the way the EcoFlow unit works is by reducing the ability of salt, in the water applied and in the content of the existing soil, to bind the soils ability to give up its free water for plant use. EcoFlow appears to be modifying the soils electrical conductivity which may then improve the osmotic interaction to make available more free water that can then move from the soil across into the plant cells using less energy. This may be the explanation of why the difference in root penetration depth between the control and test areas.
- Based on this observation, the EcoFlow system may also reduce the need for plant food.

Soil Survey:

A soil survey was completed to determine the initial soil structure and was found to be CaD2 or Cajalco Sandy Loam which allows for good water penetration, has good water to air capacity and which should recover from compaction readily. The majority of the soil has a water holding capacity of about 5 inches per foot. The soil intake rate for non- compacted soil is about 1.9 in/hr. Soil dSm was listed at 750.