Vicky,

Thank you for contacting the Town of Dillon to request an irrigation audit on behalf of the East Bay Homeowners Association. This test was conducted by myself, Evan Dawson (Assistant Public Works Director) and Matt Mango (Grounds Foreman) between 8a.m. and 10 a.m. on Tuesday, August 29, 2023. Both of us are Qualified Water Efficient Landscapers (QWEL) certified by the Eagle River Water and Sanitation District. (ID's ERWSD-4796 and -4792)

Please note that the included recommendations are based off our own training, experience, and opinions, and should not be considered as definitive for the needs of your property. There are many variables which can impact the irrigation needs of a property including mowing frequency, fertilizing, specific species of plants and grass, as well as the desires of the homeowners. There is also a lack of strong scientific data in our area regarding evapotranspiration (ET) rates, and the plant water requirement (PWR) for turfgrass at high altitude – both of which are important factors in calculating the total irrigation time needed to water your lawn and plants. For this analysis we used a PWR of 0.9, and an ET of 1 for "normal monsoonal" weather, and an ET of 1.5 for hot and dry weather.

Please let me know if you have any questions.

Evan Dawson

Assistant Public Works Director

Town of Dillon

PO Box 8

Dillon, CO 80435

(970) 262-3432

evand@townofdillon.com

Findings


← Distribution Test

Overall, our analysis shows that everything is in good/reasonable working order and the irrigation schedule is well tuned for the needs of the lawn. We conducted a distribution analysis on zones 3 & 4, which is the sloped lawn on the east side of the property between Tenderfoot Street and the driveway into the parking garage. We also took soil samples in the test area, and ran several of the zones on the west side of the building to look for any other noticeable issues.


Core Sample, excellent soil

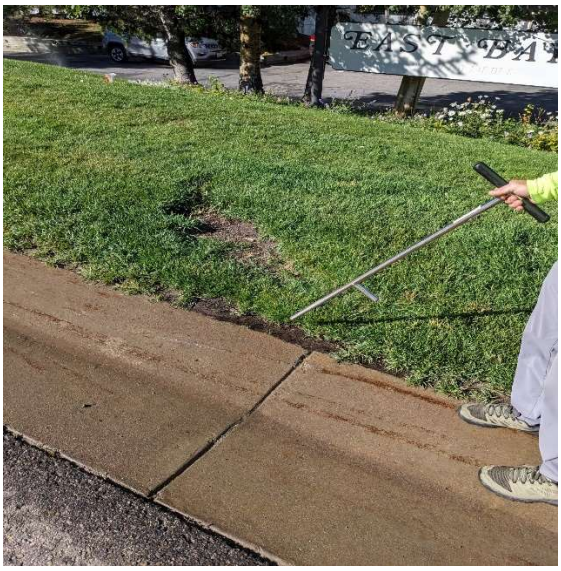
The distribution analysis is not guaranteed to be an accurate representation of all the irrigated areas on the property, but in my opinion it does come close since most of the zones are irrigated with rotor style heads, and with the exception of the south side of the building, most of the zones receive about the same amount of sunlight.

Our analysis indicates that the zones tested need approximately 145 minutes of watering each week at the “normal” ET, and 219 minutes of watering at the high ET. This equates to 10 minutes of runtime, twice a day on the low end, and 15 minutes twice a day on the high end. Your distribution uniformity was .70, which is good (below .55 needs improvement, and above .85 is typically impossible)

We found that the system was currently programed to water the tested zones 138 minutes each week, based on the two active programs. Given that the current schedule is only a few minutes shy of the analysis, and the overall healthy appearance of the grass, ***the current programming is already providing a sufficient amount of water to the lawn*** (nor is the lawn being over-watered). The only other issues we found are very minor. It is clear that your maintenance workers are doing a great job maintaining the irrigation system and the lawns.

Recommendations

- During hot and dry weather, ie: more than 7 days without rain or cloud cover, the irrigation times may need to be increased to maintain a lush green appearance.
- We did not see a weather bypass station, and the switch for such a station was turned off on the controller. We would recommend installing a weather bypass, which prevents the irrigation from turning on if it has rained enough recently (usually within 12 or 24 hours). This can save on the utility bill and prevent overwatering or drowning the lawn if it is not manually turned off.
- Some of the heads on zone 4, which is next to the street, do not appear to be seating fully, and continue to drain water out of the irrigation lines after the zone is shut off. This is called low head drainage, and is why the sprinklers seem to pop and fizz every time they come on, as they have to push air back out of the system. This is usually resolved by removing the head from the body and cleaning out any debris. Unless there is an issue with the zone valve, the only water lost is what remains in the lines when the valve closes (maybe 1-2 gallons), so it is not a big concern.



← Low head drainage

- Minor overspray was noticed on the street and driveway. Some of the heads could probably be adjusted slightly to prevent this, but it is not a big concern.

← minor overspray

- There is a rotor on zone 3 that may be leaking below grade. Water is seeping through the retaining wall.

← water seeping through the retaining wall

- There is also a fixed spray nozzle on zone 3 along the retaining wall that is causing low head drainage, since there is no internal mechanism to shut off the flow of water. We'd recommend changing this to a pop up spray head.

- The dry area in the middle of the lawn on the lake side appears to be caused due to shallow soil and some kind of subsurface obstruction (old concrete foundation, or cobble rock is my guess). We could not get our core sampler to penetrate more than a few inches. It does appear to be getting adequate water.
- The irrigation system backflow did not have a current inspection tag. This should be tested annually by a certified backflow inspector to ensure that fertilizers and other contaminants do not end up in the potable water supply for the building.

- There is no dedicated water meter or flow sensor on the irrigation system. A dedicated meter would help you determine how much water is actually being used to irrigate the lawns, and what percentage of your water utility bill is used for irrigation.
- If the association feels that irrigating all of the lawns is too costly, the alternative would be to change some of the irrigated areas to native grass and wildflowers, or some other type of low-water use landscaping. There are many QWEL certified professionals in our area that could help design and install these features. Go to https://qwel.net/hire-a-qwel-pro

Current Irrigation Schedule

Pgm A : Start @ 10:30 p.m. only on Mon, Wed, Fri, Sun

Zone

1 = 5 min

2 = 6

3 = 12

4 = 12

5 = 11

6 = 10

7 = 10

8 = 10

9 = 12

10 = 15

Pgm B : Start at midnight 6 days a week, M,T, TH, F, Sa, Su

1 = 0 min
2 = 15
3 = 15
4 = 15
5 = 15
6 = 15
7 = 16
8 = 15
9 = 14
10 = 15

Auditor Name: Evan Dawson Date: 8-29-23

Certifying Organization: Town of Dillon

Audit Location: East Bay HOA, 460 Tenderfoot St, Dillon, CO 80435

① The irrigation audit must be conducted as part of a QWEL workshop or independently supervised by a QWEL certified professional. Calculations must be completed independently. Completed forms must be submitted to the QWEL Professional Certifying Organization through which you are obtaining the QWEL certification.

② Complete site information, evaluation, and basic system tune-up prior to irrigation system testing.
- Only conduct an irrigation audit if the irrigation system is determined to be in good working order.

③ Irrigation System Testing Procedures
- Draw a diagram of the test area including dimensions, head locations, and catch can locations.
- Only conduct an irrigation audit on overhead irrigation systems if the wind speed is 5 mph or less.
- Run zone to be tested and mark spray bodies with flags.
- Place catch cans in zone to be tested.
  - Ensure all cans are of the same size and shape.
  - Use a minimum of 24 catch cans and a number of cans that can be divided by four.
  - Leave a space of about 2 feet between a spray body and a catch can.
  - Layout catch cans in a uniform grid.
  - Space cans approximately 5 – 8 feet on center for fixed and rotary spray sprinklers.
  - Space cans approximately 10 – 20 feet on center for rotors.
- Pull flags before running test as they will obstruct the path of the spray.
- Run the irrigation zone for a sufficient amount of time to collect a minimum volume of water of 20 ml. Typically 5 – 10 min for fixed spray sprinklers and 10 – 30 mins for rotors and rotating sprinklers.
  - If the test area covers more than one station the run time for each station must be adjusted to achieve a matched precipitation rate across the test area.
- Measure and record the amount of water in each catch can.
  - Use scale on catch can if available to measure volume of water in ml or depth of water in inches or centimeters.
  - If no scale is available pour water into a graduated cylinder with a ml scale.
  - For catch cans with straight sides and a flat bottom, simply measure the depth of water in inches or centimeters using a ruler.
  - Ensure that catch cans are numbered on the diagram so that the location of the measurements is known as this may help to identify issues with the irrigation system.

④ Calculate the low quarter distribution uniformity (DU_{LQ}):

⑤ Calculate the net precipitation rate (PR_{NET}):

⑥ Use the DU_{LQ} and PR_{NET} to determine a basic irrigation schedule for the test area.

Date: 8-29-23

Auditor

First Name:	Evan	Phone Number:	970 262 3432
Last Name:	Dawson	Email:	evand@townofdillon.com

Test Area

Site Name:	East Bay HOA	Test Area Name:	zone 3 & 4
Site Type:	Residential	Test Area Size:	1,500 sq ft
Soil Type:	loam (east) silt (west)	Plant Material:	turfgrass
Microclimate:	Full sun	Root Depth:	3 to 4 inches
Slope:	moderate	Plant Factor (PF):	.9
Time to Runoff:	20 min	ETo for 1 Week:	1 to 1.5 inches

Irrigation System

Water Source:	Municipal	Meter Type:	mixed
Static Pressure:	no gauge - estimate 60 psi	Meter Size:	2 inches
Dynamic Pressure:	no gauge, not tested psi	Meter Units	gal
Irrigation Type:	rotors / mixed	Backflow:	RP

Options

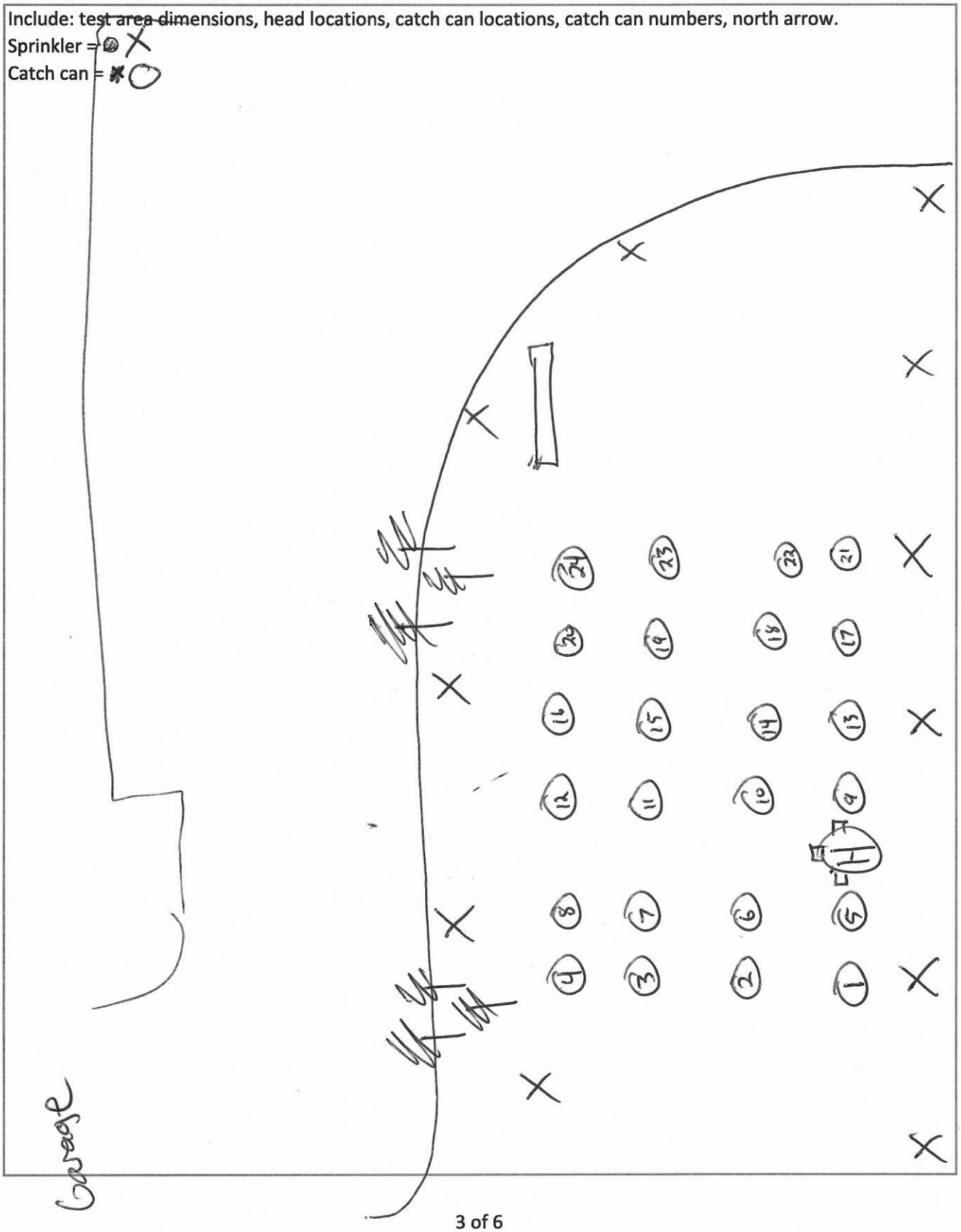
Site Type	Microclimate	Water Source	Meter Type	Backflow Device
Residential	Shade	Municipal Well	Dedicated irrigation	Reduced pressure assembly
Commercial	Part shade	Recycled water	Mixed use	Double check valve
	Full sun	Graywater		Anti-siphon valve
Soil Type	Extreme heat	Rain water	Meter Size	(atmospheric breaker)
Sandy			5/8", 1", 1.5", 2",	Pressure vacuum breaker
Loam	Slope	Irrigation Type	3", 4", 5", 6"	None
Silt	Flat	Spray sprinklers		
Clay loam	Slight	Rotating sprinklers	Meter Units	
Clay	Moderate	Rotors	Gallons	
	Steep		CCF	

Auditor Name: Evan Dawson Date: 8-29-23

Include: ~~test area dimensions~~, head locations, catch can locations, catch can numbers, north arrow.

Sprinkler = X

Catch can = O



Auditor Name: Evan Dawson Date: 8-29-23

Check relevant boxes			
Priority	**High**	**Low**	**Fixed**
Mixed hydrozone		some trees & flowers in zone	
Needs mulch N/A			
High pressure N/A			
Low pressure N/A			
Valve malfunciton N/A			
Broken pipes N/A			
Unmatched precipitation rates N/A			
Mixed emission devices		rotors/sprays	
No head-to-head coverage N/A			
Uneven head spacing N/A			
Excessive overspray		Minor	
Broken or missing nozzles N/A			
Tilted heads		minor	
Heads below grade N/A			
Blocked spray N/A			
Leaking seals		minor	
Clogged nozzles N/A			
Low head drainage		minor	
Heads not rotating N/A			

Observations

No flow sensor

No weather bypass

Backflow should be tested annually

Minor low head drainage - clean or replace rotor bodies & seals

Rotor by retaining wall appears to be leaking below grade

excellent soil!

Auditor Name: Evan Dawson Date: 8-29-23

Catch Can Number	Catch Can Volume / Depth	Low Quarter
1	37	
2	40	
3	22	22
4	34	
5	25	25
6	32	
7	30	
8	45	
9	40	
10	33	
11	35	
12	47	
13	44	
14	35	
15	35	
16	25	25
17	33	
18	30	
19	30	
20	20	20
21	27	
22	25	25
23	22	22
24	45	
25		
26		
27		
28		
29		
30		
31		
32		
33		
34		
35		
36		
Sum		
Average		

Instructions

- Enter catch can volume (ml) in the second column of the table.
- Enter the depth in inches for cans with straight sides and a flat bottom.
- Identify catch cans in the low quarter and enter the volume (or depth) of these cans in the third column of the table.
- Enter the sum of each column at the bottom of the table.
- Divide the sum of each column by the number of cans in the column to calculate the average for all cans and for the low quarter.
- DU_{LQ}: Divide the average catch volume of the low quarter by the average for all cans. Round to two decimal points.
- PR_{NET}: Use the correct formula depending on whether using volume in ml or depth in inches or centimeters. Round to two decimal points.

Catch Can Type	Throat Area (sq in)
Cal Poly / ITRC / DWR	16.25
Texas A & M System	16.61
Utah State University	12.94

Catch Can Type: Orbit

Throat Area: 16.25 sq in

Test Run Time: 20 min

DU_{LQ} Calculation

$$DU_{LQ} = \frac{\text{Average catch volume of low quarter}}{\text{Average catch volume of all cans}} = \frac{23.17}{32.96} = .70$$

PR_{NET} Calculation using volume in ml

$$PR_{NET} = \frac{\text{Average volume of all cans} \times 3.66}{\text{Test run time} \times \text{Catch can throat area}} = \frac{120.63}{325} = .37 \text{ in / hr}$$

PR_{NET} Calculation using depth in inches or centimeters

$$PR_{NET} = \frac{\text{Average depth of all cans} \times 60}{\text{Test run time}} = \frac{\quad \times 60}{\quad} = \quad$$

Auditor Name: Evan Dawson Date: 8.29.23

Plant Water Requirement (PWR) - use ETo for 1 week Low evaporation

PWR	=	ETo	x	PF			
	=	1	x	.9	=	.9	in / wk

Run Time Multiplier (RTM) - used to adjust time for irrigation system inefficiencies

RTM = $1 \div [0.4 + (0.6 \times DU_{LQ})]$

= $1 \div [0.4 + (0.6 \times \frac{.7}{.82})]$ = 1.22

Irrigation Water Requirement (IWR)

IWR	=	PWR	x	RTM			
	=	.9	x	1.22	=	1.1	in / wk

Minimum and Maximum Weekly Irrigation Run Time (IRT_{MIN} and IRT_{MAX})

IRT_{MIN} = (PWR ÷ PR_{NET}) × 60

= (.9 ÷ .37) × 60 = 145.95 min / wk

IRT_{MAX} = (IWR ÷ PR_{NET}) × 60

= (1.1 ÷ .37) × 60 = 178.38 min / wk

Daily Run Time

- Weekly IRT is a management decision between weekly IRT_{MIN} and IRT_{MAX}
- Number of days to irrigate is a management decision. Use the table for guidance.

Number of Days Per Week to Irrigate (Mature Plants)

Weekly ETo	Cool 0 - 0.5 "	Warm 0.6 - 1.0"	Hot above 1"
Turf	1 - 2 days	2 - 3 days	3 - 7 days
Annuals	2 - 3 days	3 - 5 days	4 - 7 days
Shrubs	Every 2 weeks	Every week	2 - 4 days
Trees	None	Every 2 months	Every month

Daily IRT = (Weekly IRT ÷ Number of Days to Irrigate)

= (145 ÷ 7) = 20.71 ~ 20 min

Cycles Per Day - round up to the next whole number

Cycles Per Day = (Daily IRT ÷ Time to Runoff)

= (_____ ÷ _____) = 2

Run Time Per Cycle - round up to the next whole minute.

Run Time Per Cycle = (Daily IRT ÷ Cycles Per Day)

= (_____ ÷ _____) = 10

Auditor Name: _____ Date: _____

Plant Water Requirement (PWR) - use ETo for 1 week

PWR = ETo x PF (High Evaporation)

= 1.5 x .9 = 1.35 in / wk

Run Time Multiplier (RTM) - used to adjust time for irrigation system inefficiencies

RTM = $1 \div [0.4 + (0.6 \times DU_{LQ})]$

= $1 \div [0.4 + (0.6 \times .7)]$ = 1.22

Irrigation Water Requirement (IWR)

IWR = PWR x RTM

= 1.35 x 1.22 = 1.65 in / wk

Minimum and Maximum Weekly Irrigation Run Time (IRT_{MIN} and IRT_{MAX})

IRT_{MIN} = (PWR ÷ PR_{NET}) × 60

= (1.35 ÷ .37) × 60 = 218.92 - 219 min / wk

IRT_{MAX} = (IWR ÷ PR_{NET}) × 60

= (1.65 ÷ .37) × 60 = 267.57 .268 min / wk

Daily Run Time

- Weekly IRT is a management decision between weekly IRT_{MIN} and IRT_{MAX}
- Number of days to irrigate is a management decision. Use the table for guidance.

Number of Days Per Week to Irrigate (Mature Plants)

Weekly ETo	Cool 0 - 0.5 "	Warm 0.6 - 1.0"	Hot above 1"
Turf	1 - 2 days	2 - 3 days	3 - 7 days
Annuals	2 - 3 days	3 - 5 days	4 - 7 days
Shrubs	Every 2 weeks	Every week	2 - 4 days
Trees	None	Every 2 months	Every month

Daily IRT = (Weekly IRT ÷ Number of Days to Irrigate)

= (219 ÷ 7) = 31.29 min

Cycles Per Day - round up to the next whole number

Cycles Per Day = (Daily IRT ÷ Time to Runoff)

= (31 ÷ _____) = 2

Run Time Per Cycle - round up to the next whole minute.

Run Time Per Cycle = (Daily IRT ÷ Cycles Per Day)

= (_____ ÷ _____) = 15