Commercial Site Assessment™ Tier II

Prepared for:

Boulder Village

16840 Iredale Path
Lakeville, MN 55044

2020 Season

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Conserva Irrigation's Methodology and Approach

1. **Perform Commercial Site Assessment (CSA™)**
   - **Tier I CSA™:** High Level Water Use Assessment
     - irrigated acreage data from water purveyor
     - Obtain water usage reports from the water purveyor
     - Determine overall application efficiency
     - Develop water usage goals
   - **Tier II CSA™:** "Boots on the Ground" System Assessment
     Tier I CSA, plus:
     - Full hydraulic and electronic asset assessment
     - Observe and record system functions
     - Perform risk assessment/exposure analysis
     - Document system repairs and improvements

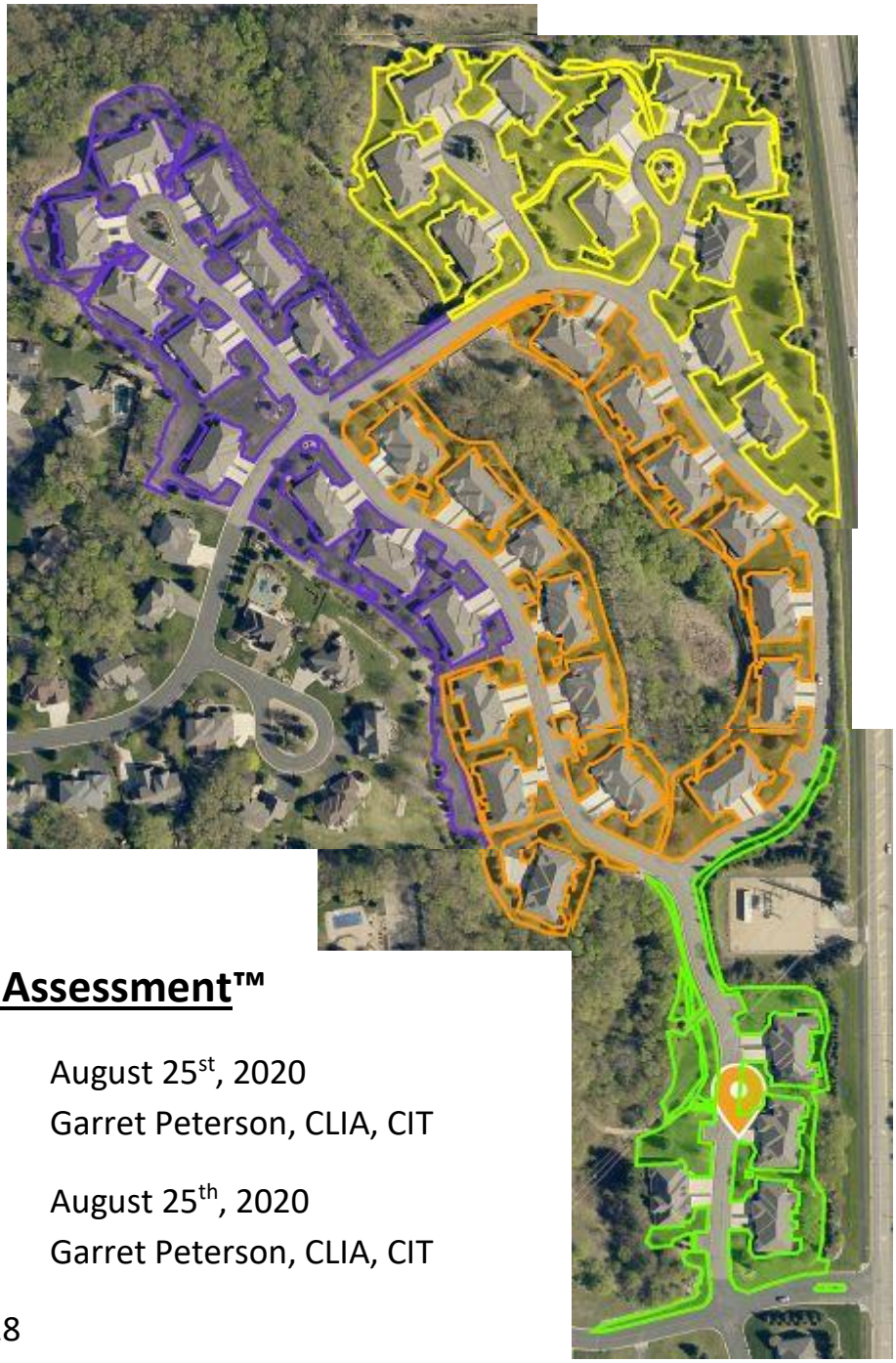
2. **Prioritize Critical Repairs/Adjustments to Optimize the System Performance**

3. **Recommend Efficiency Upgrades**
   - Replace inefficient spray nozzles with highly efficient Toro Precision™ Series Nozzles or Hunter MP™ Rotary Nozzles
   - Recommend potential system additions and redesigns

4. **Optimize the System Performance**

5. **Annually Maintain and Monitor the Irrigation System**

Water Sources	
#1	
#2	
#3	
#4	



Commercial Site Assessment™

Date of Tier I CSA: August 25st, 2020
Certified Technician: Garret Peterson, CLIA, CIT

Date of Tier II CSA: August 25th, 2020
Certified Technician: Garret Peterson, CLIA, CIT

Irrigated Acres: 9.18
Irrigated ft^2: 399,695.79

Boulder Village Audit Observations

Boulder Village has 4 water sources and controllers with 57 zones total .

- ***System #1*:** Hunter Pro-C (2006), 9 zones, Hunter Rain Click™ (active)
  - *Program A*: Start 12am, odd days, zones 1-9
- ***System #2*:** Hunter Pro-C (2002), 12 zones, Hunter Rain Click™ (active)
  - *Program A*: Start 12am, odd days, zones 1-9
  - *Program B*: Start 10:45pm. odd days, zones 10-12
- ***System #3*:** Hunter ICC (2001), 18 zones, Hunter Rain Click™ (active)
  - *Program A*: Start 12am, odd days, zones 1-11
  - *Program B*: Start 9:30pm. odd days, zones 12-18
- ***System #4*:** Hunter ICC (2001), 18 zones, Hunter Rain Click™ (active)
  - *Program A*: Start 12am, odd days, zones 1-12
  - *Program B*: Start 9:30pm. odd days, zones 13-18

Controllers are basic "set and forget" controllers. We recommend upgrading to smart controllers with Hotspot for weather data. Smart controllers manage water use based on weather data and plant need (evapotranspiration) reducing overall use and saving water.

Some zones across the property do not account for microclimate separation. This means that front lawns (dry, hot microclimates requiring more irrigation) and backyards (wet, cool microclimates requiring less irrigation) are currently applying the same amount of water. Differences in microclimates on the same zone usually result in soaked backyards that can have standing water and promote disease since the front yard must water longer than normal. It can also cause under watered and dry front yards if you water less than normal to address the backyards watering needs. The easiest option is to replace nozzles (application rates) for these areas for more water in front/sunny areas and less water for shady/backyards that need less water. This does not resolve the issue completely, as nozzles can only go up or down a little in nozzle size but brings these areas as close as possible to resolved without complete redesign and new installation.

Boulder Village Audit Observations Continued

Most of the front yards on all systems had gaps in their coverage due to curving landscaping, sidewalks corners, or even driveways. These areas are easily covered by adding an additional head(s) to the area and/or moving existing heads to better cover area. In some cases, this will also prevent wasted water on hard surfaces. Increasing coverage can reduce water use. If a zone has a dry spot that is not covered well, the tendency is to increase the run time for the whole zone. This usually results in using a lot more water to cover a relatively small dry area. By adding heads, the proper coverage is addressed and the need to water to address the driest spot resolved, resulting in reduction of the whole zone's runtime and saving water.

Each system had a booster pump to maintain operating pressure on the systems. However, this often resulted in 60-80 psi at the heads of each zone. Spray heads have a recommended operating pressure at 30 psi, and a rotor heads recommended operating at 45psi. This extra pressure creates a water wasting "misting" effect that is water immediately evaporating as it comes out of the head. However, when the pumps are turned off the operating pressure is too low to operate the zones. The best solution is to put in a constant pressure pump. These pumps monitor the psi and increase or decrease the output to always maintain proper psi.

There are many mixed sprinkler heads (rotor and spray) on zones. Sprays apply approximately two to three times as much water in their areas as rotors, causing over watering/wasted water. Solutions are to split up head types or convert spray nozzles to rotary nozzles.

System #1, zone 4 has mixed head types, mixed microclimates, and mixed plant material. In this zone, rotors are irrigating turf and sprays irrigating landscaping plants on road entrance island. It is recommended to split up areas by making them separate zones, effectively splitting head types by adding new valves.

System #3, zones 17 & 18 should have heads eliminated that are covering woods and a steep hill. Instead of redesigning and capping, install a new zone that would encompass the turf area, eliminating the old zones all together.

System #4, zone 18 is oversized, with mixed head types, and mixed microclimates. Even with the booster pump the zone barely has the heads pop up. Recommend splitting the zone into two separate zones, one covering front yards and one covering the back yards. This action would also solve both the mixed microclimate and pressure issues. We would also recommend changing spray nozzles to MP rotary nozzles for consistent irrigation application rates. This would also take some of the heads from system number two's, zone 1 that is too large.

Water Rates:

Meter Reading Interval: ☐ Monthly ☒ Quarterly ☐ Other _____

Units Measured As: ☒ 1000 gallons ☐ CCF

Converted Units: ☒ 1 unit = 1000 gallons

WATER RATES	Irrigation Metered System
Price per unit (per 1,000 gals)	$5.64
Threshold per quarter	Irrigation Metered System
Sewer Rate per unit (if unmetered):	Does not apply

Historical Water Usage:

Water Source #1

Year	Annual Water Usage (gallons)	Annual Water Cost*
2019	431,000	$2,430.84
2018	460,000	$2,594.40
2017	458,000	$2,583.12
2016	379,000	$2,137.56
2015	622,000	$3,508.08
2014	583,000	$3,288.12
2013	725,000	$4,089.00
2012!	*2,000*!	$11.28!
2011	374,000	$2,109.36
2010	312,000	$1,759.68
9 Year Average	482,666	$2,722.24

Water Source #2

Year	Annual Water Usage (gallons)	Annual Water Cost*
2019	733,000	$4,134.12
2018	794,000	$4,478.16
2017	749,000	$4,224.36
2016	669,000	$3,773.16
2015	853,000	$4,810.92
2014	896,000	$5,053.44
2013	1,052,000	$5,933.28
2012	1,247,000	$7,033.08
2011	609,000	$3,434.76
2010	512,000	$2,887.68
10 Year Average	811,400	$4,576.30

! Outlier that is dropped for average.

*Based on current Water Rates for best year to year comparison.

Water Source #3

Year	Annual Water Usage (gallons)	Annual Water Cost*
2019	821,000	$4,630.44
2018	844,000	$4,760.16
2017	736,000	$4,151.04
2016	735,000	$4,145.40
2015	1,227,000	$6,920.28
2014	1,135,000	$6,401.40
2013	1,306,000	$7,365.84
2012	1,553,000	$8,758.92
2011	613,000	$3,457.32
2010	560,000	$3,158.40
10 Year Average	953,000	$5,374.92

Water Source #4

Year	Annual Water Usage (gallons)	Annual Water Cost*
2019	542,000	$3,056.88
2018	717,000	$4,043.88
2017	598,000	$3,372.72
2016	549,000	$3,096.36
2015	669,000	$3,773.16
2014	963,000	$5,431.32
2013	1,289,000	$7,269.96
2012	1,310,000	$7,388.40
2011	621,000	$3,502.44
2010	674,000	$3,801.36
10 Year Average	793,200	$4,473.65

*Based on current Water Rates for best year to year comparison.

Water Source Totals

Year	Annual Water Usage (gallons)	Annual Water Cost*
2019	2,527,000	$14,252.28
2018	2,815,000	$15,876.6
2017	2,541,000	$14,331.24
2016	2,332,000	$13,152.48
2015	3,371,000	$19,012.44
2014	3,577,000	$20,174.28
2013	4,372,000	$24,658.08
2012	4,112,000	$23,191.68
2011	2,217,000	$12,503.88
2010	2,058,000	$11,607.12
10 Year Average	2,992,200	$16,876.00

Plant Water Requirement (ET Data & Average Effective Rainfall):

Plant Material: **1,786,152 gallons** Spend: **$10,074/yr.**

Efficiency %

$$Eff\ \% = \frac{water\ need}{water\ use} \qquad Eff\ \% = \frac{1{,}786{,}152}{2{,}992{,}200} = 60\%$$

Minimum EPA efficiency standard = 75%

Water Usage Goals:

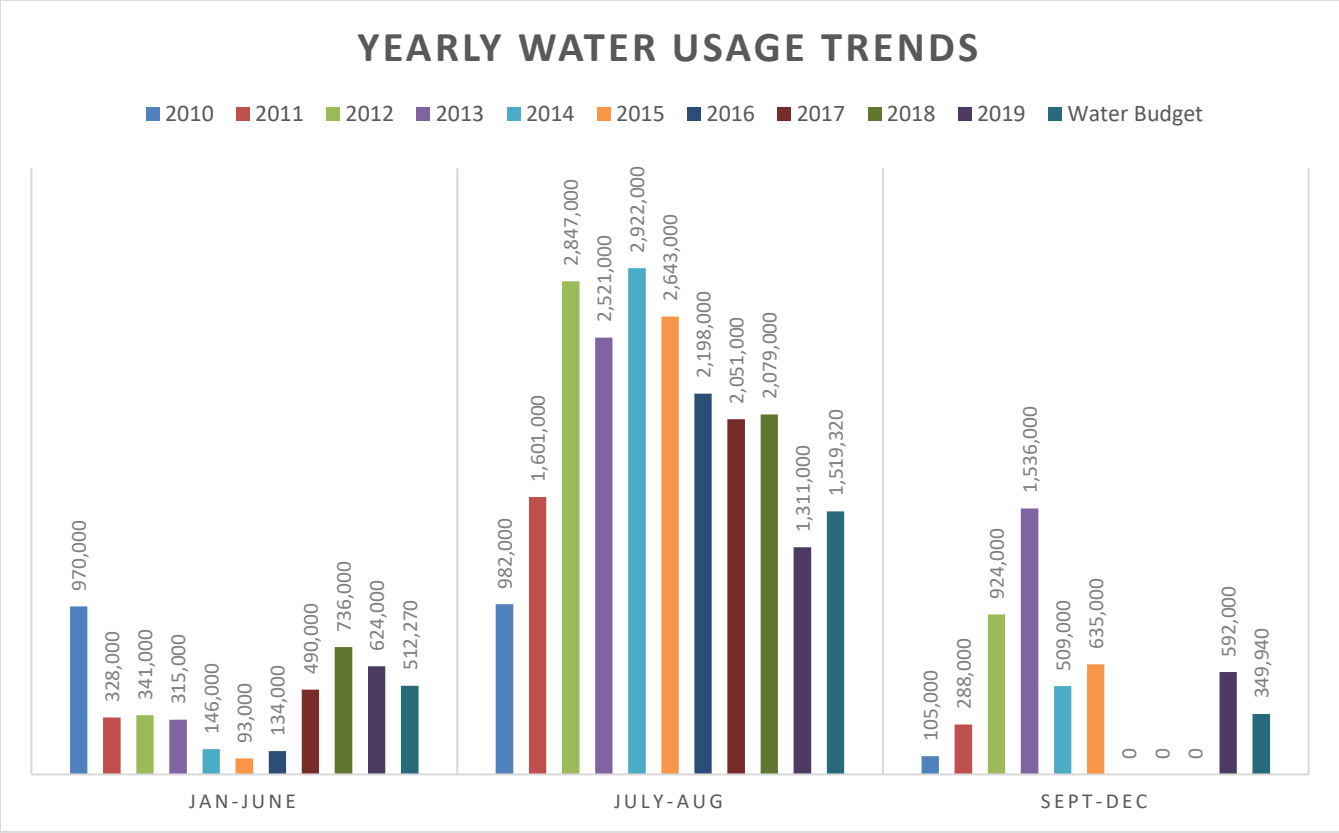
$Eff = 75\%$: 2,381,536 gallons used at an annual cost of **$14,278**

$Eff = 85\%$: 2,101,355 gallons used at an annual cost of **$12,698**

$Eff = 95\%$: 1,880,160 gallons used at an annual cost of **$11,450**

Water Budgeting

Month	Jan-June	July-Sept	Sept-Dec	Total(gal)
2019 Usage	624,000	1,311,000	592,000	**2,527,000**
2018 Usage	736,000	2,079,000	0	**2,815,000**
2017 Usage	490,000	2,051,000	0	**2,541,000**
2016 Usage	134,000	2,198,000	0	**2,332,000**
2015 Usage	93,000	2,643,000	635,000	**3,371,000**
2014 Usage	146,000	2,922,000	509,000	**3,577,000**
2013 Usage	315,000	2,521,000	1,536,000	**4,372,000**
2012 Usage	341,000	2,847,000	924,000	**4,112,000**
2011 Usage	328,000	1,601,000	288,000	**2,217,000**
2010 Usage	970,000	982,000	105,000	**2,057,000**
Avg Usage	**417,700**	**2,115,500**	**459,000**	**2,992,200**
Water Budget	**512,270**	**1,519,320**	**349,940**	**(75%eff) 2,381,540**



System Components:

Water Source				Deficiency?
#1	Location	16840 Iredale Path, Lakeville, MN 55044		
	Source	2” City Feed		
	Anti-syphon			
		Brand	Wilkins Zurn	
		Size	1 ½”	
		Inspection Date	6-18-2020	
		Visual Inspection	No apparent leaks	
	Deduct Meter			
		Brand	Sensus	
		Size	1 ½”	
		Serial Number	63230827	
		Reading	3,892,482 Gallons	
		Visual Inspection	Good	
	Booster Pump			
		Brand	Flint & Walling	
		Size	1 ½”, 2 horse (1 Phase)	
		Volt/AMP	115-230 Volt / 21.4-10.7 AMP	
		Visual Inspection	Good	
	Notes:	No Master Valve		

Water Source				Deficiency?
#2	Location	16700 Iredale Path, Lakeville, MN 55044		
	Source	2" City Feed		
	Anti-syphon			
		Brand	Wilkins Zurn RPZ	
		Size	1 ½"	
		Inspection Date	6-18-2020	
		Visual Inspection	Good, no leaks	
	Deduct Meter			
		Brand	Sensus	
		Size	1 ½"	
		Serial Number	52662872	
		Reading	227,416,420 Gallons	
		Visual Inspection	Good	
	Booster Pump			
		Brand	Sta-rite	
		Size	1 ½" , 2 horse (1 Phase)	
		Volt/AMP	230 Volt / 12 AMP	
		Visual Inspection	Good	
	Notes:	No master Valve		

Water Source				Deficiency?
#3	Location	16566 Iredale Path, Lakeville, MN 55044		
	Source	1 ¼" City Feed		
	Anti-syphon			
		Brand	Watts 009M2 RPZ	
		Size	1 ½"	
		Inspection Date	6-18-2020	
		Visual Inspection	Good, no leaks	
	Deduct Meter			
		Brand	Neptune T-10	
		Size	1 ½"	
		Serial Number	61055536	
		Reading	1,969,971 Gallons	
		Visual Inspection	Good	
	Booster Pump			
		Brand	Flint & Walling	
		Size	1 ½" , 2 horse (1 phase)	
		Volt/AMP	115/230 Volt / 12.5 AMP	
		Visual Inspection	Good	
	Notes:	No master Valve		

Water Source				Deficiency?
#4	Location	16587 Irwinton Cir, Lakeville, MN 55044		
	Source	2” City Feed		
	Anti-syphon			
		Brand	Watts RP OT	
		Size	1 ½”	
		Inspection Date	6-18-2020	
		Visual Inspection	Good, no leaks	
	Deduct Meter			
		Brand	Sensus	
		Size	1 ½”	
		Serial Number	57028705	
		Reading	17,569,152 Gallons	
		Visual Inspection	Good	
	Booster Pump			
		Brand	Flint & Walling	
		Size	1 ½” , 2 horse	
		Volt/AMP	230Volt / 12AMP	
		Visual Inspection	Good	
	Notes:	No master Valve		

Recommend Critical Repairs and Adjustments Source #1

	Zones									
Head Type	***1***	***2***	***3***	***4***	***5***	***6***	***7***	***8***	***9***	***Total***
Total # Rotors	25	20	11	20	20	7	13			**116**
Total # Sprays	1	1		6						**8**
Rotating Nozzles						1	1			**2**
Mini Rotors					1			13	13	**27**
High Pop Rotors										
6" Sprays										
12" High Pop Sprays										
Mixed Head Types	X	X	X	X	X	X	X			
Zone GPM	25	25	19	29	23	16	20	15	13	-
Repairs	***1***	***2***	***3***	***4***	***5***	***6***	***7***	***8***	***9***	***Total***
Damaged Rotors	8	7	4	6	1			3	1	***30***
Damaged 4" Sprays										
Damaged 6" Sprays										
Damaged High Pop Rotor										
Damaged High Pop Spray										
Line Leaks										
Wrong Nozzles Sizing	2	1								**3**
Damaged Nozzles	1	1								**2**
Raise/Straighten Heads				2		1				**3**
Design Improvements	***1***	***2***	***3***	***4***	***5***	***6***	***7***	***8***	***9***	***Total***
Move Head for better coverage	2					1	3			***6***
Add Head for better coverage				1		1	2			**4**

Recommend Critical Repairs and Adjustments Source #2

	Zones												
Head Type	***1***	***2***	***3***	***4***	***5***	***6***	***7***	***8***	***9***	***10***	***11***	***12***	***Total***
Total # Rotors	20	24	22	15	24	25	22	23	16	16	9	24	**240**
Total # Sprays	3							1					**4**
Rotating Nozzles													
Mini Rotors													
High Pop Rotors													
6" Sprays													
12" High Pop Sprays													
Mixed Head Types	X							X					
Zone GPM	36	27	28	28	48	48	38	34	30	26	16	25	-
Repairs	***1***	***2***	***3***	***4***	***5***	***6***	***7***	***8***	***9***	***10***	***11***	***12***	***Total***
Damaged Rotors	5	1	4	2	2	3	7	2		3	1		**30**
Damaged 4" Sprays													
Damaged 6" Sprays													
Damaged High Pop Rotor													
Damaged High Pop Spray													
Line Leaks	1												**1**
Wrong Nozzles Sizing		1		1		2							**4**
Damaged Nozzles	1												**1**
Raise/Straighten Heads	3	4			3	1				1			**12**
Design Improvements	***1***	***2***	***3***	***4***	***5***	***6***	***7***	***8***	***9***	***10***	***11***	***12***	***Total***
Move Head for better coverage		1	2		3	1			1				**8**
Add Head for better coverage				1	1	2			1	2	1	4	**12**

Recommend Critical Repairs and Adjustments Source #3

	Zones																		
Head Type	***1***	***2***	***3***	***4***	***5***	***6***	***7***	***8***	***9***	***10***	***11***	***12***	***13***	***14***	***15***	***16***	***17***	***18***	***Total***
Total # Rotors	12	10	10	17	20	14	26	17	26	26	20	26	18	19	17	12	6	3	**299**
Total # Sprays				5		1	2		2								2	6	**18**
Rotating Nozzles							1		1										**2**
Mini Rotors																			
High Pop Rotors																			
6" Sprays																			
12" High Pop Sprays																			
Mixed Head Types				X		X	X												
Zone GPM	*33*	*29*	*26*	*45*	*45*	*36*	*43*	*33*	*52*	*47*	*65*	*58*	*41*	40	43	33	20	31	-
Repairs	***1***	***2***	***3***	***4***	***5***	***6***	***7***	***8***	***9***	***10***	***11***	***12***	***13***	***14***	***15***	***16***	***17***	***18***	***Total***
Damaged Rotors	4	2	1	1	3	1			2				2		1	3	1		**21**
Damaged 4" Sprays				1														1	**2**
Damaged 6" Sprays																			
Damaged High Pop Rotor																			
Damaged High Pop Spray																			
Line Leaks																			
Wrong Nozzles Sizing									1					2					**3**
Damaged Nozzles									1										**1**
Raise/Straighten Heads		1					1	1			1				1			1	**6**
Design Improvements	***1***	***2***	***3***	***4***	***5***	***6***	***7***	***8***	***9***	***10***	***11***	***12***	***13***	***14***	***15***	***16***	***17***	***18***	***Total***
Move Head for better coverage	1	1					1				1	4					1		**9**
Add Head for better coverage	2			1	2				1		1		1	2	2				**12**
Cap Head					1							1					2	4	**8**

Recommend Critical Repairs and Adjustments Source #4

	Zones																		
Repairs	***1***	***2***	***3***	***4***	***5***	***6***	***7***	***8***	***9***	***10***	***11***	***12***	***13***	***14***	***15***	***16***	***17***	***18***	***Total***
Total # Rotors	16	14	12	18	18	13	8	9	8	15	15	14	7	11	11	15	12	18	**234**
Total # Sprays									1	3						1		5	**10**
Rotating Nozzles																			
Mini Rotors																			
High Pop Rotors																			
6" Sprays																			
12" High Pop Sprays																			
Mixed Head Types									X	X						X		X	
Zone GPM	20	16	17	20	20	18	15	9	15	21	24	20	12	18	16	22	18	25	-
Repairs	***1***	***2***	***3***	***4***	***5***	***6***	***7***	***8***	***9***	***10***	***11***	***12***	***13***	***14***	***15***	***16***	***17***	***18***	***Total***
Damaged Rotors	6	2	1	2	2	1		1		2						2		4	**23**
Damaged 4" Sprays																			
Damaged 6" Sprays																			
Damaged High Pop Rotor																			
Damaged High Pop Spray																			
Line Leaks										1	2	1	1						**5**
Wrong Nozzles Sizing			1			4						2							**7**
Damaged Nozzles																			
Raise/Straighten Heads	2	1	1			2							2		2				**10**
Design Improvements	***1***	***2***	***3***	***4***	***5***	***6***	***7***	***8***	***9***	***10***	***11***	***12***	***13***	***14***	***15***	***16***	***17***	***18***	***Total***
Move Head for better coverage			1		1		1				1				2	2		2	**10**
Add Head for better coverage	1	1	1		1		9		1	2	1				2	2		3	**24**
Cap Head		1					4			1								1	**7**

Completed Critical Repairs and Adjustments

Repairs	Price (each)	Count		Total
1R.) Installed 4" Spray	$ 60.00	2		$ 120.00
2R.) Installed 5" Rotor	$ 50.00	104		$ 5,200.00
3R.) Damaged Spray Nozzles (replace with rotary nozzles)	$ 25.00	4		$ 100.00
4R.) Move Head (pricing per foot)	$ 15.00	33 moves for a total of 198'		$ 2,970.00
5R.) Poly Line Leaks	$ 90.00	6		$ 540.00
				$ 8,930.00

Recommended Efficiency Upgrades

System Efficiency and Design Upgrades	Price (each)	Count		Total
1U.) Controller #1: Hunter PHC (9 zones) w/Hot Spot for Internet Access to Local Weather Station Data	$ 950.00 + $ 15 a month	1		$ 950.00 + $ 15 a month
2U.) Controller #2: Hunter PHC (12 zones) w/Hot Spot for Internet Access to Local Weather Station Data	$ 1,000.00 + $ 15 a month	1		$ 1,000.00 + $ 15 a month
3U.) Controller #3&4: Hunter HCC (18 zones) w/Hot Spot for Internet Access to Local Weather Station Data	$ 1,575.00 + $ 15 a month	2		$ 3,150.00 + $ 30 a month
4U.) Install booster pumps with built in frequency converter that controls PSI output.	$ 5,000.00	4		$ 20,000.00
5U.) Rotary Nozzle for Spray Heads (total minus damaged nozzles from R3)	$ 25.00	36		$ 900.00
6U.) Rotor Nozzle Swap to: a) Match Coverage for Rotor Heads	$ 15.00	17		$ 255.00
6U.) Rotor Nozzle Swap to: b) Address microclimate differences	$ 15.00	366		$ 5,490.00
7U.) Add Head to pick up coverage gaps in front yards	$ 100.00	52		$ 5,200.00
8U.) Raise / Straighten Heads	$ 15.00	31		$ 465.00
9U.) Cap Unneeded Heads	$ 35.00	9		$ 315.00
10U.) Install addition valve to split zone 4 on system 1 into two zones.	$ 250.00	1		$ 250.00
11U.) Install new Rotor zone to replace zones 17 & 18 on system #3.	$ 900.00	1		$ 900.00
				$ 38,875.00

In

Summary, completing the recommended critical repairs and upgrades will result in substantially more efficient water usage and healthier plant material.

Next Steps:

- ☐ Fix repair issues
- ☐ Move heads to a better position
- ☐ Upgrade controller to a Smart Controller based on weather
- ☐ Install booster pumps with built in frequency converter
- ☐ Raise/straighten heads as needed to have proper coverage
- ☐ Cap unneeded heads
- ☐ Add heads in front yards that are lacking proper coverage
- ☐ Replace rotor nozzles (gpm application rate) that are incorrect for the area of coverage the head is to cover with the correct size nozzle
- ☐ Install a new zone for system #3's zone 17 & 18 that will cover only the turf portions. Effectively caping the old zones off that had heads in woods and other areas that do not require irrigation.
- ☐ Annually maintain and monitor property