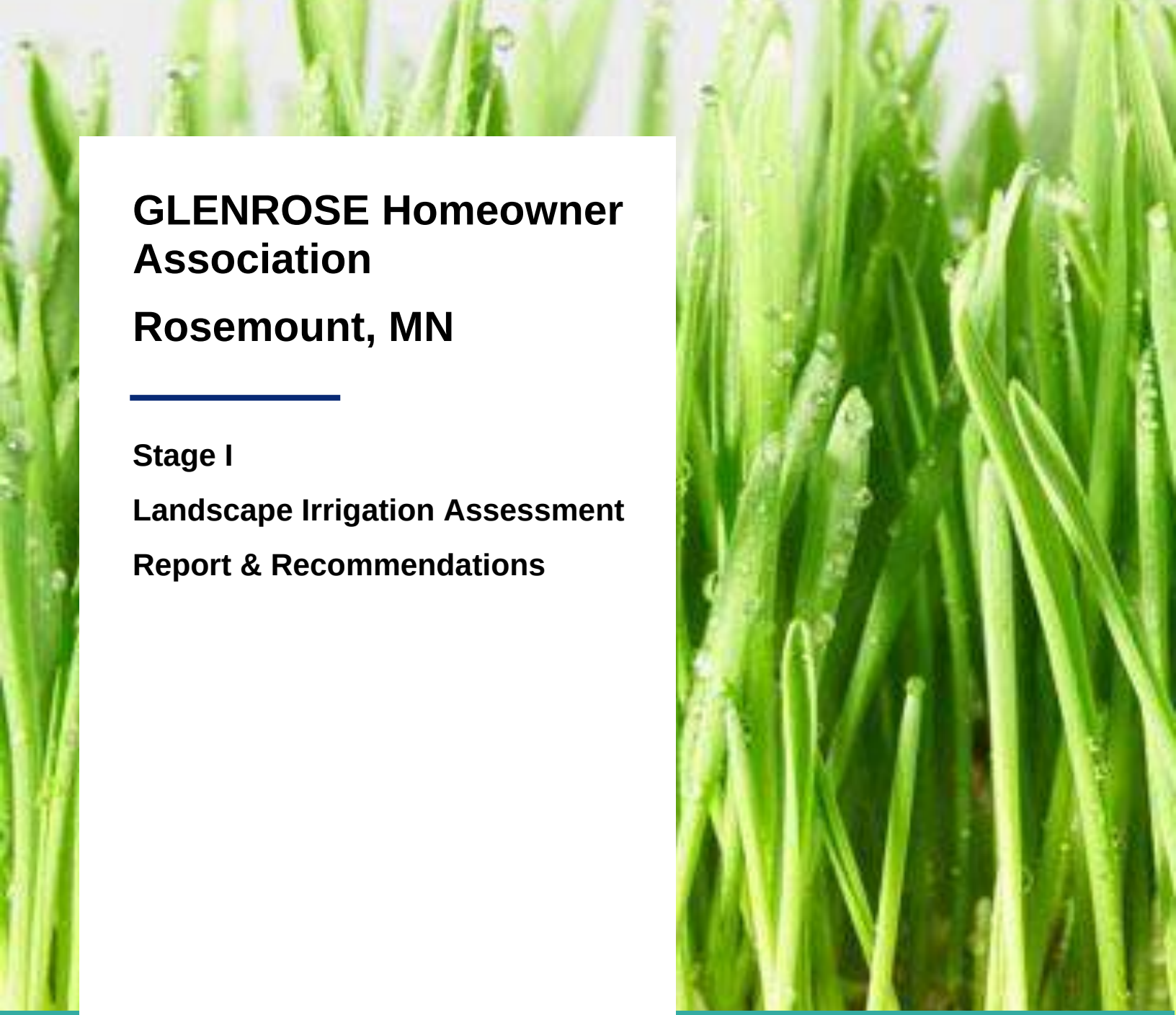


GLENROSE Homeowner Association

Rosemount, MN

Stage I

Landscape Irrigation Assessment

Report & Recommendations

OCTOBER 14, 2022

Water in Motion, Inc.
Authored by: Timothy Malooly, CLIA,
US EPA WaterSense Partner

GENERAL

Date of Site Assessment: September 1st, 2022 Approx. Irrigated acres/Ft^2: 2.7/116,205
Approximate 2022 value of a well-designed system this location: $98,000 to $120,000

IRRIGATION SYSTEM GENERAL OBSERVATIONS

The irrigation system installation is still in process of being finished as of this report. There are two separate irrigation systems currently comprising twenty-nine stations of sprinklers. The irrigation systems serve turf areas only. System One is comprised of 18 sprinkler stations and system two has 11 sprinkler stations.

Records appear to indicate work was performed in 2021 to replace controls and sprinklers. Records appear to indicate the two systems receive spring start, break-fix repair service and autumn close. Condition of sprinklers was generally good (ex. few leaks, breaks or pitched sprinklers) but we observed the need to relocate some sprinklers that are in wood lines and reconfiguration of sprinkler selections, especially on System 2 (the 11-station system).

Observations of equipment and system performance indicate there may have been separate installers of the two systems as System 1 (18-station system) appears to be designed closer to best practices than System 2. System 1 installation includes the use of newer sprinkler technology in the form of multi-stream, multi-trajectory (MSMT) rotating nozzles. The MSMT sprinklers do not appear to be installed onto EPA WaterSense®-labeled water efficient sprinkler bodies. We observed long-throw rotor sprinklers do not appear to have pressure regulation or matched application rate nozzles.

We also noted that station #1 serving the front and side of addresses appear to have been wired together at the controller.

Irrigation scheduling was observed to be basic, lacking best practice techniques to help achieve efficient irrigation water application. Scheduling improvements can be accomplished in concert with applied maintenance and a water manager who is knowledgeable of plant-soil-water relationships and best scheduling practices.

GENERAL RECOMMENDATIONS:

A. Budget for regular bi-weekly proactive system maintenance.
B. Replace the faulty rain sensor at Controller 1 with the same unit as Controller 2. Program both sensors for 48-hour delay following rain events and place into service
C. Assemble a list of suitable replacement components for vendors to install to maintain system integrity. Include pressure-regulated sprinkler bodies to reduce overwatering and check valve sprinklers for low points to reduce waste.
D. Require matched application rate nozzles on large rotor sprinklers to reduce overwatering.
E. Relocate sprinklers blocked by landscape growth.
F. Enact and document scheduling practices that improve water-efficient delivery of irrigation water.

GENERAL RECOMMENDATION ESTIMATED COST RANGES:

ITEM	COST RANGE	ESTIMATED PAYBACK
A	$3,000-$3,500 annually, plus parts	
B	$250	2 seasons
C	Zero cost to create the requirement. Recommended sprinklers cost about 20% more than basic sprinklers	
D	Approximately 5 minutes of Tech time per sprinkler to properly nozzle	2 seasons
E	$300	2 seasons
F	$400-$600 (Approx. four hours of professional time)	2 seasons

CONTROLLER AND SENSORS

The two systems are operated from two Rain Bird ESP-Me3 controllers located at each water supply cabinet. One controller receives solar power and operates eighteen stations of sprinklers. The second controller receives electric power conventionally and operates eleven stations of sprinklers. The controllers are budget-based EPA WaterSense-ready and can be upgraded in concert with, or after sprinkler improvements.

At one controller there was observed to be a basic Irritrol® brand wireless rain sensor that was indicating a malfunction. The second controller had an advanced Rain Bird wireless rain sensor set to "basic" function and was bypassed.

System scheduling was basic. Each controller had one schedule operating generally every-other-day beginning at midnight. We did not observe water-efficient scheduling practices such as:

- station-by-station runtime calculations based on plant/soil/water and sprinkler type
- monthly schedule adjustments for historical weather patterns
- cycle-and-soak scheduling to reduce runoff and waste

CONTROLLER AND SENSOR RECOMMENDATIONS:

A. Replace the faulty rain sensor at Controller 1 with the same unit as Controller 2. Program both sensors for 48-hour delay following rain events and place into service
B. Calculate and input station runtimes based on soil, sun, plant type and sprinkler type
C. Employ cycle-and-soak operation to reduce runoff and waste
D. Upgrade the controllers to full US EPA WaterSense ability and remote-control operation including daily weather-based scheduling adjustments.
E. Consider adding flow sensing to enable actions and reporting of malfunctions

CONTROLLER AND SENSOR IMPROVEMENT ESTIMATED COST RANGES:

ITEM	COST RANGE	PAYBACK
A	$250	1 season
B	$200-$300 (Approx. two hours of professional time)	2 seasons
C	$200-$300 (Approx. two hours of professional time)	2 seasons
D	$1,000	3 seasons
E	$1,500 ($750x2)	

WATER SUPPLY AND BACKFLOW PREVENTION

The two municipal irrigation water supplies are sized adequately to serve each system. The supplies are robust enough (1.5" supply size, 72psi) to enable flow management of most irrigation stations to reduce the time required to complete watering cycles. The reduced pressure zone backflow prevention assemblies appear to have been tested/tagged per local code requirements.

WATER SUPPLY AND BACKFLOW RECOMMENDATIONS:

A. Add support posts and brace brackets under the plumbing equipment to relieve stress on fittings
B. Replace plastic (PVC) pipe and fittings with metallic pipe until below grade
C. See Item F in the Controller section

WATER SUPPLY IMPROVEMENT ESTIMATED COST RANGES:

ITEM	COST RANGE	PAYBACK
A	$150	
B	$400	

IRRIGATION STATIONS/ZONES

A “station” or “zone” is a group of sprinklers that operate together.

The irrigation system was operated station-by-station with photos taken and basic observations noted. Please refer to the *Station By Station* section of this report.

System One design can be considered average for a developer/builder influenced community system. System Two design can be considered below average.

We observed:

- several sprinklers partially blocked by landscape growth, particularly along woodlines
- several sprinklers with clogged nozzles and/or pitched or sunken in need of maintenance
- locations where sprinkler spacing was too far or lack of coverage by complementary sprinklers
- Many low-efficiency variable arc nozzles on fixed spray sprinklers instead of more efficient fixed-arc nozzles
- Little or no pressure regulation at the sprinklers
- No matched application rate practices on the long-throw rotor-sprinkler stations

IRRIGATION STATION/ZONE RECOMMEDATIONS:

A. Implement a plan to replace rotor-sprinklers that are randomly nozzled with matched application rate nozzles to improve distribution uniformity and water efficiency*
B. Separate the two stations wired together at station One (front and side of 14085 and 14093) to enable independent scheduling of the two sprinkler areas
C. Move sprinklers to overcome changes in landscape or hardscape
D. Add sprinklers in areas of inadequate coverage
E. Use pressure regulated sprinkler bodies on replacement sprinklers

** A nozzle is the orifice that emits water from a sprinkler. Nozzles come in assorted sizes resulting in different amounts of water applied to the landscape. Best design and maintenance practices include matching application rates to the area being covered by a sprinkler – smaller nozzles on ¼ circle sprinklers, larger nozzles on sprinklers with greater coverage. “Distribution uniformity” is the evenness that sprinklers deliver water onto the landscape.*

IRRIGATION STATION IMPROVEMENT ESTIMATED COST RANGES:

ITEM	COST RANGE	PAYBACK
A	$500	2-3 seasons
B	$100-$200 (Aprox. Two hours of professional time)	3-4 seasons
C	$500	2-3 seasons
D	$750 +/-	
E	Approximately 20% more cost than basic sprinkler bodies	

EXAMPLES OF REPLACEMENT PRODUCTS FOR FUTURE MAINTENANCE

ORIGINAL ITEM	REPLACE WITH	OPTIONAL
Hunter ProSpray or Rain Bird 1800 series spray body	same	EPA WS-labeled sprinkler body like ProSpray30 or 40 or Rain Bird 1804-PRS-COM
Hunter or Rain Bird variable arc spray nozzles	Hunter or Rain Bird fixed arc spray nozzles	Hunter or Rain Bird high-efficiency fixed-arc spray nozzles
Hunter PgP rotor or Rain Bird 5004	Rain Bird 5004	Rain Bird 5004-PCSR pressure-regulating
Hunter PgJ or Rain Bird 3500 series small rotor	same	MP rotator w/WS labeled sprinkler body
Hunter MP Rotator or K-Rain brand nozzle on a sprinkler body	Pick one brand of rotating nozzle	EPA WS-labeled sprinkler body like ProSpray40 or 1804-PRS-COM

EXAMPLES OF HOW TO ADD MATCHED APPLICATION RATE NOZZLES TO ROTOR-STYLE SPRINKLERS

Where rotor sprinklers water same/similar areas	Where rotor sprinklers simultaneously water fronts/sides/backs	OPTIONAL
Small nozzles on 1/4 to 1/3 arc, medium nozzles on 1/2 to 2/3, large nozzles on 3/4 to full circle	Small nozzles in shady areas, larger nozzles in sunny areas	Convert rotors to MSMT nozzles on WS-labeled sprinkler bodies

SAMPLE IRRIGATION MAINTENANCE REQUEST FOR PROPOSAL GUIDANCE CAN BE FOUND AT:

https://www.vermillionriverwatershed.org/wp-content/uploads/2020/03/HOA-Irrigation-System-Services-RFP-Template-Final-3_6_2020.docx

WATER INFORMATION

Rosemount, MN 2022 monthly outdoor water price per unit (1,000 gallons) is $3.99

WATER USE HISTORY:

YEAR	ANNUAL USAGE (GALS)	APPROX. ANNUAL COST
2021	1,472,000	$ 5,873
2020	1,077,00	$ 4,297
2019	683,000	$ 2,725
AVERAGE (3 YRS)	*1,077,333*	*$ 4,297**

** Water usage reports provided by the Rosemount, MN. The cost calculations use the 2022 water rate*

ESTIMATED WATER NEED (BASED ON ET DATA & EFFECTIVE RAINFALL)

TURF (full sun to mostly sunny): 642,204 gallons Cost: $ 2,562

APPLICATION EFFIENCY RANGES AND SYSTEM OBSERVATIONS

An exceptionally well-designed and maintained sprinkler irrigation system may achieve up to 70% efficiency.

“A Level” effectiveness and water use based on 70% efficiency = 917,434-gals Water Cost: $3,659

“B Level” effectiveness and water use based on 60% efficiency = 1,070,3402-gals Water Cost: $4,269

“C Level” effectiveness and water use based on 50% efficiency = 1,284,408-gals Water Cost: $5,123

Efficient irrigation system designs include consideration for plant type(s), soil, slope, sun, water requirement, water supply, watering timeframes and sprinkler performance -known as distribution uniformity (how evenly a sprinkler applies water). Rainfall is considered 100% uniform and is a reference when factoring sprinkler performance.

Based only on a calculation of irrigation system efficiency (avg. water use/water need) at Glenrose HOA, the efficiency of the system appears to approach 58% (42% water waste). Observations from this assessment indicate the system is not effectively applying water confirming a "C level" effectiveness at 50% or lower **(> 50% water waste)**.

It should be the desire of Glenrose HOA to operate the irrigation system in a manner to achieve "A level" effectiveness that includes both efficient water application and best practice-based scheduling.

Watering with a system that has had leaks repaired, employs water-saving components, uses nozzles that are sized for their respective application areas, a SMART irrigation controller with working rain sensor and automatic, SMART-based scheduling practices will help to achieve greater effectiveness and efficiency.

The resulting health of the landscape will improve over time as a result of such changes."

STATION FINDINGS SUMMARY

Controller 1

STATION	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	TTL
Number of Sprinklers	14	12	12	12	14	14	10	14	15	15	15	14	20	14	18	18	18	12	261
Broken or Leaking				X		X													0
Blocked or Move							X												0
Pitched or Too Low		X		X		X				X	X								
Add or Change Sprinklers	X								X	X	X	X	X	X	X	X	X	X	
Balance Nozzles	X				X		X	X	X	X		X	X	X			X	X	0
Low Sprinkler Drainage																			
Other																			

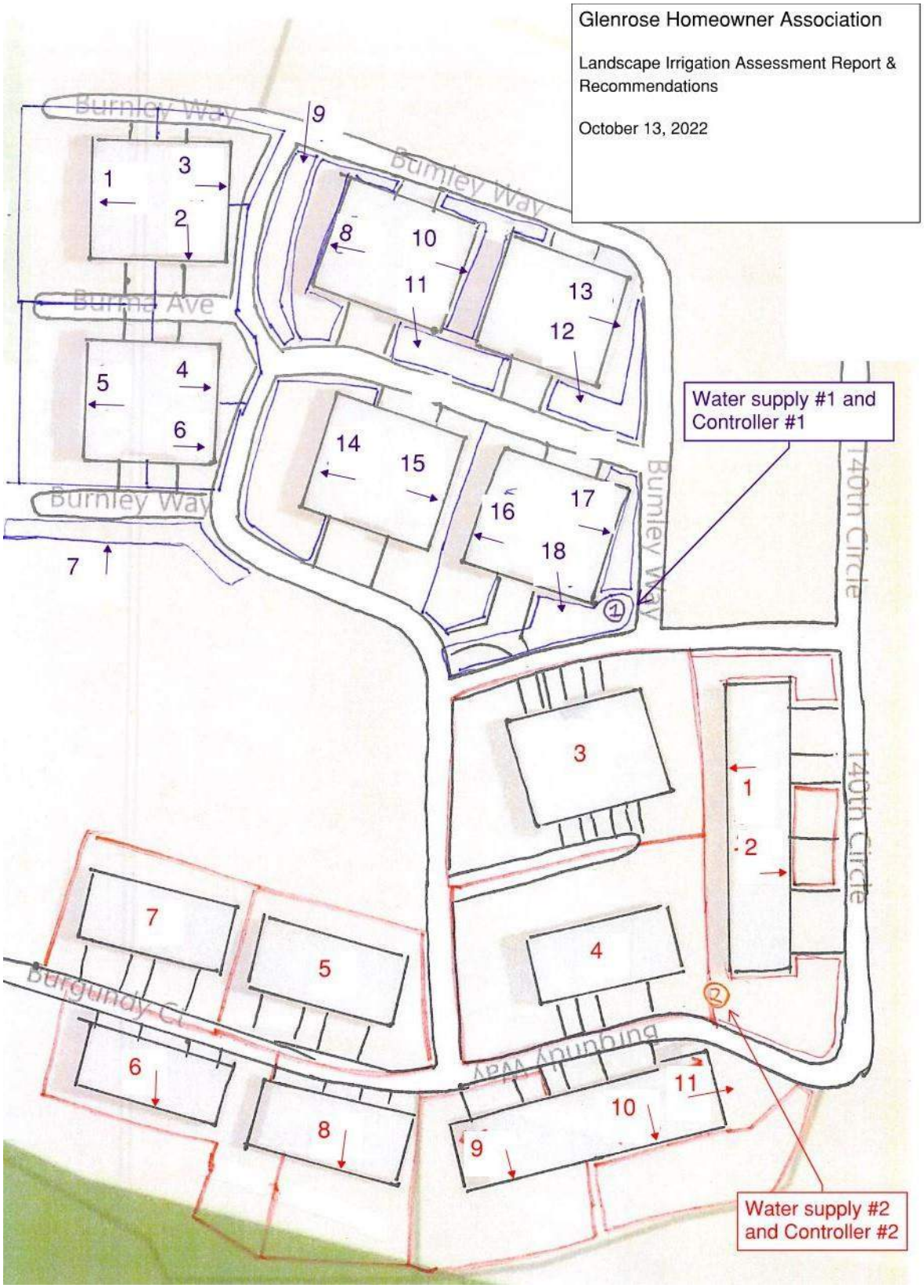
Entries with an "X" on the summary chart illustrate findings observed during the assessment. Some entries may include a number to help quantify an observation. Whether a cell depicts an "X" or is numerical, irrigation system performance will be improved by resolving the observed findings.

Controller 2

STATION	1	2	3	4	5	6	7	8	9	10	11	TTL
Number of Sprinklers	18	20	20	20	20	20	20	14	10	8	12	182
Broken or Leaking	X				X	X	X				X	0
Blocked or Move	X				X	X	X	X			X	0
Pitched or Too Low	X	X	X	X			X			X	X	0
Add or Change Sprinklers			X	X	X	X	X	X	X			
Balance Nozzles	X		X	X	X	X	X	X	X	X		0
Low Sprinkler Drainage												
Other												

Entries with an "X" on the summary chart illustrate findings observed during the assessment. Some entries may include a number to help quantify an observation. Whether a cell depicts an "X" or is numerical, irrigation system performance will be improved by resolving the observed findings.

STATION MAP


Glenrose Homeowner Association
Landscape Irrigation Assessment Report & Recommendations
October 13, 2022
Burnley Way
Burma Ave
Burnley Way
Burnley Way
140th Circle
Water supply #1 and Controller #1
Burgundy Ct
Water supply #2 and Controller #2

STATION BY STATION OBSERVATIONS

Sys 1 water supply and controller next to 14061 Burgundy Way.

Solar power.

Sys1 cabinet = 72psi static before plumbing equipment.

1.5" water service, 1.5" Sensus brand water meter.

Apollo RPLF4A 1.5" reduced pressure zone backflow assembly with a recent test tag.

1.5" PVC feed pipe to system.

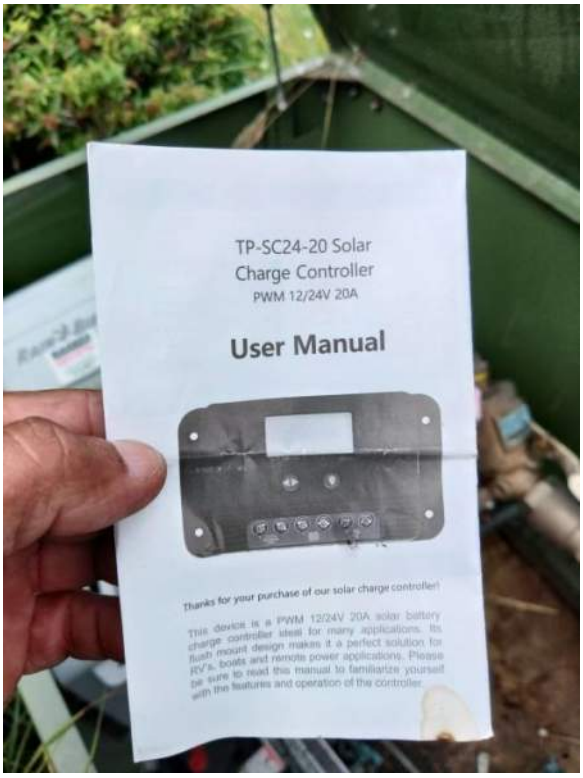
Plumbing support not in place.

Supply ball valve handle not in place. Suggest all-metallic pipe & fittings to below grade.

Inside the water supply cabinet.

Solar power equipment is installed in a wet environment.

Garbage inside.



Solar power user manual.

Rain Bird ESP-ME3 SMART & flow ready controller.

Basic Irritrol brand wireless rain sensor not in service.

Suggest adding upgrading to SMART technology

18 stations scheduling as follows: seasonal adj = 120%, sched A = odd days beginning at midnight. 1,2,3,5,7,15,16,17,18 = 30 mins. 8,9,10,11,12,13,14 =35 mins. 4,6 = 15 mins.

Sta1 - Front & side of 14085 & 14093. 2 stations tied together at controller.

Hunter brand multi-stream, multi-trajectory (MSMT) rotating nozzles are attached to basic Hunter ProSpray sprinkler bodies.

Rain Bird brand 5004 turf rotor sprinklers cover larger areas served by this station.

Pitched sprinklers. Mow height too short. Poor coverage at driveway corners.

Sta2 – Front & side of 14089.

Approx. 12 sprinklers

K-Rain brand of MSMT rotating nozzles on Hunter basic spray bodies

Several pitched sprinklers

Sta3 - front & side of 14081.

Approx. 12 sprinklers

K-Rain brand of MSMT rotating nozzles on Hunter basic spray bodies

Ok

Sta 4 - front & side of 14097.

Approx. 12 sprinklers

Fixed spray-type sprinklers on Hunter basic spray bodies.

Several clogged, pitched

Sta 5 - front & side of 14101 & 14109.

Approx. 14 sprinklers

Mix of K-Rain MSMT rotating nozzles on basic Hunter sprinkler bodies and Rain Bird 5004 turf rotor sprinklers.

Suggest smaller rotor nozzles to reduce overwatering.

Sta6 - front & side of 14105.

Approx. 14 sprinklers

Fixed spray-type sprinklers on Hunter basic spray bodies.

Several clogged, pitched

Sta 7 - across from 14109/14105.

Approx. 10 sprinklers

Dual row 5004 turf rotors in an open space

Suggest matched appl rate nozzles and move blocked sprinklers along mow line

Sta 8 - front and side of 14063.

Approx. 14 sprinklers

Hunter brand MSMT on basic Hunter sprinkler bodies and 5004 turf rotors throwing away from foundation

Suggest matched appl rate nozzles

Sta 9 front and side of 14072.

Approx. 15 sprinklers

Hunter brand Multi-stream, Multi-trajectory (MSMT) sprinklers along the foundation and Rain Bird brand 5004 rotor-style sprinklers along the back of curb.

Suggest matched appl rate nozzles

Suggest adding a sprinkler at the corner closest to 14072.

2 sprinklers in front of 14072 are spray nozzles, replace w/MSMT nozzles.

Sta10 - center courtyard 14068/59/64/55.

Approx. 15 sprinklers

Hunter brand MSMT on basic Hunter sprinkler bodies and 5004 turf rotors

Pitched, imbalanced application rate nozzles. Add sprinklers to overcome poor coverage.

Sta11 - fronts of 14059 and 14055.

Approx. 15 sprinklers

Mixed brand of MSMT rotating nozzles on basic Hunter spray bodies

Pitched. Replace spray nozzle at 14059 driveway w/msmt.

Sta12 - front and side of 14051.

Approx. 14 sprinklers

Hunter brand MSMT on basic Hunter sprinkler bodies and 5004 turf rotors throwing from back of curb

Balance turf rotor nozzles. Add a turf rotor sprinkler near the outside corner

Sys2 water supply next to 14039.

This system is overwatering and mow heights too low.

Service boxes need maintenance (see next image.)

Sys2 sample of service box being grown over.

Suggest maintenance.

See next image.

Sys2 service boxes sunken and resulting mow scalping

Sys2 water supply 72psi static before plumbing equip.

1.5" service to 1.5" Sensus brand water meter

1.5" Wilkins 975xl reduced pressure zone backflow preventer with a recent inspection tag.

Recommend replacing PVC plumbing w/metal pipe to below grade and adding plumbing equipment supports on a firm base.

Sys2 controller - Rain Bird ESP-Me (early version) w/advanced rain sensor that is set to "bypass".

Key is broken inside the controller door lock.

Suggest adding SMART control technology.

11 stations. Irrigation begins at midnight, odd days. Seasonal adj is at 90%. 1,2,3,4,6,7 = 40 mins 5,8,9,10,11 = 35 mins. Lots of extra station wire to split or add future stations

Sta1a - front of 2940.

Approx. 18 sprinklers

Pointing to rotor sprinklers blocked by plants. Suggest moving sprinklers.

Hunter PGP rotors. Several w/blown seals. Several pitched sprinklers.

Sta1b - pointing to location to add a sprinkler.

Sta1c - back of 2940,50,60,70,80,90.

Approx. 18 sprinklers.

This area is overwatered likely due to design flaw of watering front & back simultaneously.

Suggest nozzle balance (larger in front and smaller in back)

Sta1d - pointing to location to add a sprinkler.

Sta2 - fronts of 2950,60,70,80.

Approx. 20 sprinklers

Spray sprinklers. Several sprinklers are pitched or too low.

Sta3 - entire blng 14066,76,86,67,77,87.

Approx. 20 sprinklers

Suggest MSMT sprinklers in small front and side patches.

Nozzle balance all turf rotors.

Raise, straighten as needed.

Sta4 - entire building 14039, 45,49.

Approx. 20 sprinklers

Suggest MSMT sprinklers in small front and side patches.

Nozzle balance all turf rotors.

Raise, straighten as needed.

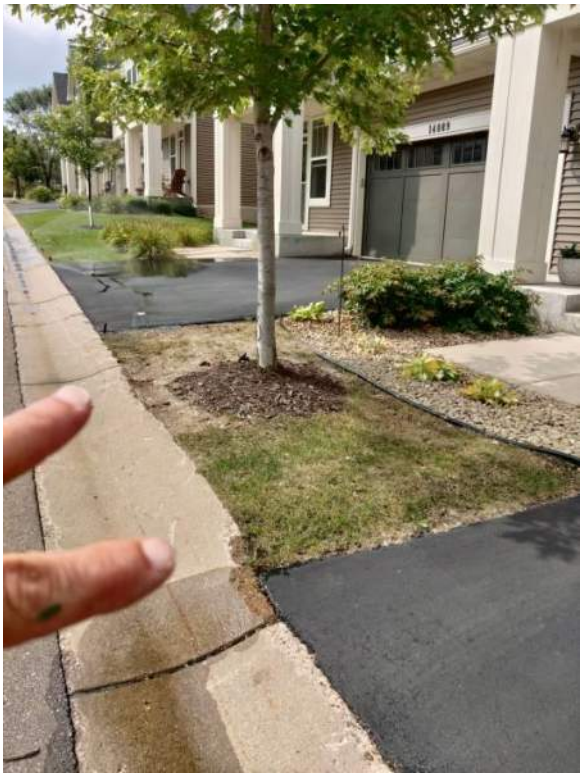
Sta5a - entire building 14081,85,89

Approx. 20 sprinklers

several sprinklers to be moved out of wild border.

Balance nozzles including consideration for sun/shade sprinklers on the same station.

Sta5c – mix of MSMT, spray and small turf rotors. Suggest all MSMT sprinklers in small areas.



Sta5c – broken and ineffective sprinklers.

Sta6a - entire building 14092,96,98 and front and sides, 14088 front and back.

Refer to advice given for station 5

Sta6b - example of sprinklers to be moved from wild border.

Sta7a - broken sprinkler front of 14093

Sta7b - entire building 14093,97,101.

Heavy shade in back. Suggest splitting station.

Sta8a - front, side and back of 14080,84.

Suggest nozzle balancing.

Mixed sprinklers.

Sta8b - suggest moving sprinklers away from wild line.

Sta9 - front, side, back of 14050,54.

Suggest nozzle balancing and adding opposing rotor sprinklers from path toward 14054

Sta10 - open space behind 14038,42,46.

Raise, straighten, nozzle balance.

Sta11 - lift station and fronts of 14038,42,46.

Sprinklers in front of 14046 need maintenance.

GLOSSARY

Arc – The area a part-circle sprinkler irrigates, expressed in degrees of a circle. For example, a 90-degree arc provides quarter-circle coverage, while a 180-degree arc provides half-circle coverage.

Backflow Preventer – A mechanical assembly installed to protect the potable water supply from potentially contaminated irrigation water.

Best Management Practices – An irrigation BMP is a voluntary irrigation practice that is both economical and practical and is designed to reduce water consumption and protect water quality while maintaining plant health at the desired level.

Certified Landscape Irrigation Auditor – The Certified Landscape Irrigation Auditor is involved in the analysis of landscape irrigation water use. Auditors collect site data, make maintenance recommendations and perform water audits. Through their analytical work at the site, these irrigation professionals develop monthly irrigation base schedules.

Controller – An automatic timing device that sends an electric signal for automatic valves to open or close according to a set irrigation schedule.

Cycle-and-Soak – Allows the user to divide a station's run time into more usable, shorter duration cycles. Cycle-and-soak is particularly applicable for slopes and tight soil (such as clay) and helps prevent excessive runoff. The cycle time is entered into the controller as a fraction of the station's watering time, and the soak time as the minimum soak required before the watering of the next portion. The total number of cycles is determined by taking the total programmed station run time and dividing it by the cycle time.

Distribution Uniformity – (Also referred as "Performance") Measure of the uniformity of irrigation water over an area.

EPA WaterSense Partner – WaterSense is a voluntary, public-private partnership program sponsored by the U.S. Environmental Protection Agency. WaterSense works to protect the future of national water supplies by promoting water-efficient products, practices and professionals. EPA WaterSense Partners are committed to bringing water-efficient products and practices to the market.

Fixed Arc Nozzles – Rotor style sprinkler where the arc stays static and is non-adjustable.

Hydrozone – Grouping of plants with similar water requirements so that they can be irrigated with a common zone.

Maintenance – The work of keeping something in operating condition.

Matched Application Rates – Refers to sprinklers that apply water at the same rate per hour no matter the arc of coverage or part of a circle they cover.

Microclimate – The unique environmental conditions in a particular area of the landscape. Factors include amount of sunlight or shade, soil type, slope and wind.

MSMT – A "multi-stream, multi-trajectory" sprinkler that uses individual, rotating streams of water to distribute irrigation water.

Municipal Water – Domestic or drinking water. It can be used as a source of irrigation water, but once water enters an irrigation system (and passes through the backflow device) it is no longer considered potable.

Nozzle – The final opening through which water passes from the sprinkler or emitter. Nozzle shape, size, and placement has a direct effect on the distance, watering pattern, and distribution efficiency. Pitched Sprinkler Head – A sprinkler that is slanted or tilted.

Point of Connection – Location where irrigation system is connected to a (potable) water supply. Rain Sensor – A device that automatically interrupts irrigation events during periods of sufficient moisture.

Rotor Sprinkler – A type of sprinkler where a primary stream of water is distributed back and forth across the area being watered.

Runoff – Portion of precipitation, snow melt or irrigation, that flows over the soil, eventually making its way to surface water supplies.

Spray Sprinkler – A sprinkler that does not rotate.

Sprinkler to Sprinkler Coverage – Single sprinklers generally do not provide even distribution of water
throughout their range of throw. When overlapping coverage is provided, the weak areas from one sprinkler are supplemented by the strong areas from another sprinkler. Overlapping coverage also reduces time necessary to complete an irrigation cycle from the perspective of total water required.

Station/Zone/Circuit – Section of an irrigation system served by a single point of control. Also known as a Hydrozone, optimally comprised of similar sprinkler types and plant material types and applying water onto a consistent topography or microclimate.

Topography – The arrangement of the natural and artificial physical features of an area.
Valve Box – A protective container installed around an underground valve to allow operation or maintenance access to underground pipeline valves.

Variable Arc Nozzles – Rotor style sprinkler where the arc can be adjusted to more accurately apply irrigation to nonconvention landscape areas.

WiM – Water in Motion, Inc.