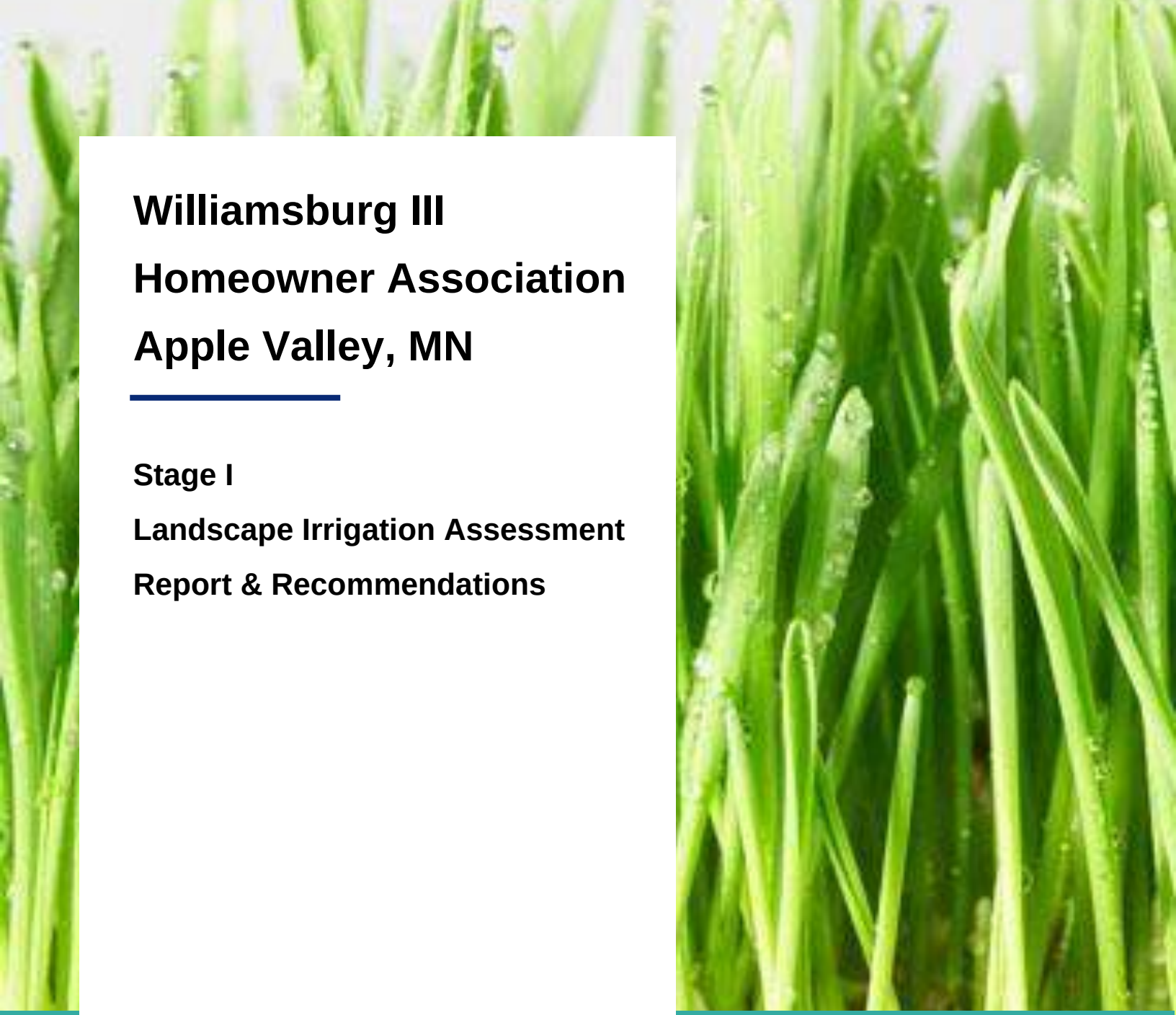


Williamsburg III Homeowner Association Apple Valley, MN

Stage I

Landscape Irrigation Assessment Report & Recommendations

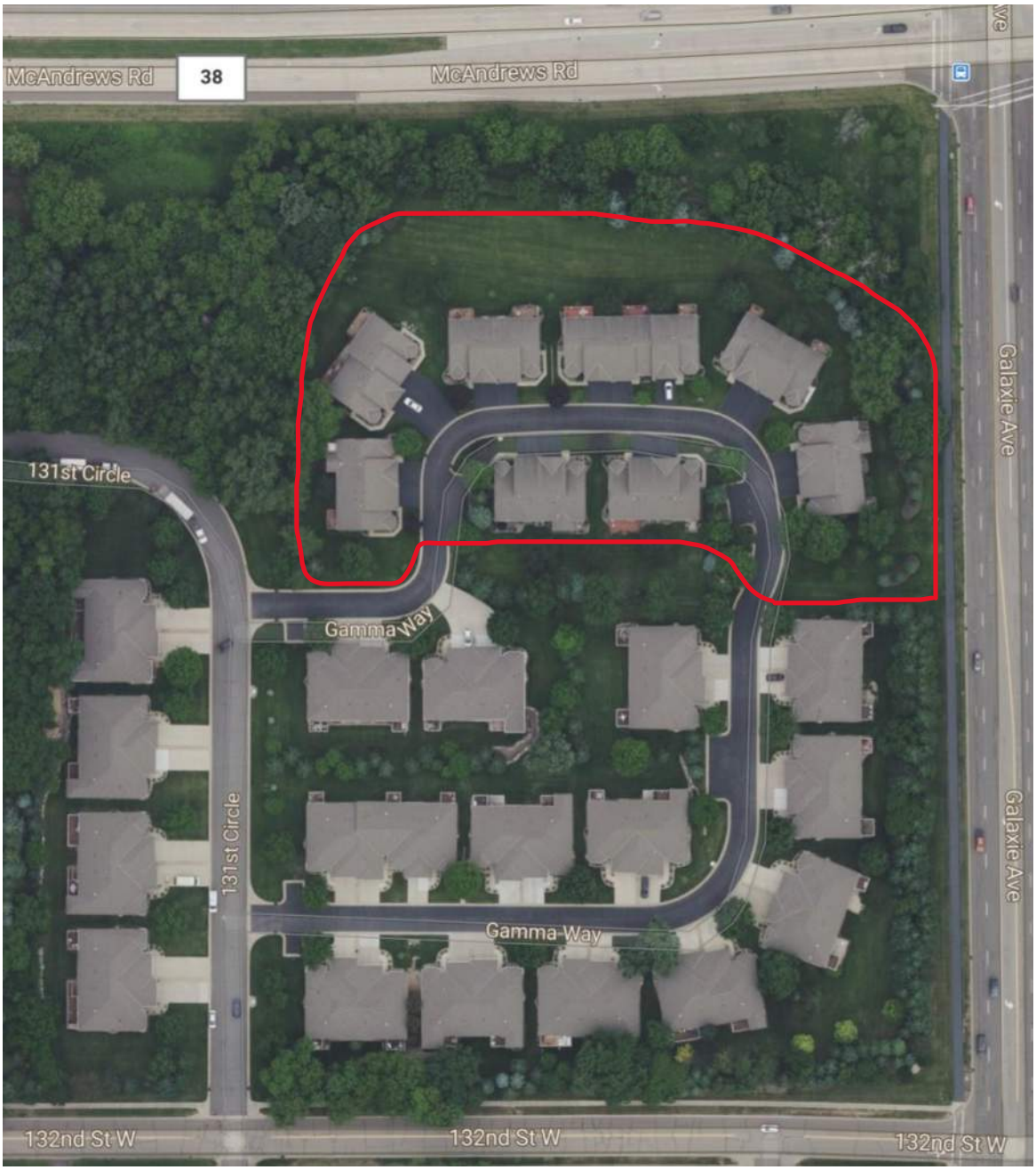
June 29, 2023

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

GENERAL

Date of Site Assessment: June 29, 2023 Approx. Irrigated acres/Ft^2: 2.9/127,195
Approximate 2023 value of a well-designed system this location: $60,000 to $80,000

The auditor met onsite with a representative of the HOA who furnished an orientation of the areas of coverage and enabled entry into the water supply cabinet.



IRRIGATION SYSTEM GENERAL OBSERVATIONS

The irrigation system installation date was not furnished. No record drawings were furnished. The system is comprised of eight stations of sprinklers encompassing eight buildings and two open spaces. One open space (station 1) was located between 13127 and 13129 Gamma Way. The second open space was a slope behind 13135 to 13155 Gamma Way. The system design is poor. The system installation is poor. System scheduling was observed to be poor.

Access is cramped to the water supply and to the controller making maintenance inconvenient. There was a basic rain sensor installed but was bypassed.

Adjustments and retrofits can improve water efficiency but, without significant investment in a re-design and re-installation, this system will not likely achieve a high level of water efficiency.

GENERAL RECOMMENDATIONS:

A. Budget for bi-weekly proactive system walk-through maintenance
B. Enact mowing heights of 4 inches or greater from June 1 through September 15th to help make the lawn less water and fertilizer dependent and more drought tolerant
C. Enact scheduling practices that employ water-efficient delivery of irrigation water. Adjust scheduling to water more precisely and include cycle-and-soak and monthly schedule adjustments based on historical weather.
D. Require matched application rate nozzles on sprinklers to reduce overwatering.
E. 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 from low point drainage.
F. Add sprinklers where needed to improve coverage and improve distribution uniformity.
G. Upgrade the irrigation controller to US EPA WaterSense-level SMART functionality.

GENERAL RECOMMENDATION ESTIMATED COST RANGES:

ITEM	COST RANGE	ESTIMATED PAYBACK
A	$2,500-$3,000 annually, plus parts	
B	Zero cost	1 season
C	$300 to $400 (approx. 4 hours of professional time)	1 to 2 seasons
D	Approximately 10 minutes of Tech time per sprinkler to properly nozzle	3 to 4 seasons
E	Zero cost to create the requirement. Recommended sprinklers cost about 20% more than basic sprinklers	
F	$2,000 to $3,000	
G	See the Controller and Sensors section	

CONTROLLER AND SENSORS

The irrigation system is comprised of eight stations of sprinklers. There was observed to be a basic rain sensor installed but was bypassed. System scheduling was basic. The observed schedule operates each station sequentially, on odd days of the month beginning at 1:00AM.

All stations were set to 30 or 35 minutes without consideration for the hydrozone or landscape characteristics. The assessor did not observe water-efficient scheduling practices such as:

- station-by-station calculations based on plant/soil/water and system application rates
- cycle-and-soak scheduling to reduce runoff and waste
- programmed schedule adjustments based on historical weather

The system is operated from a Hunter ICC SMART-ready controller. The controller was found to be in base configuration, without optional SMART features such as:

- remote-control communication that enables remote system monitoring and management;
- weather data module or service enabling automatic schedule adjustments for changing weather;
- master valve and flow sensor to enable actions to stop irrigation when flow-based alarm conditions occur, such as broken sprinklers or pipes.

The controller can be upfitted to EPA WaterSense-level functionality by adding optional equipment and programming the controller from its base configuration to SMART functionality.

CONTROLLER AND SENSOR RECOMMENDATIONS:

A. Engage the rain sensor. Consider installing an advanced, adjustable rain sensor
B. Calculate, document and input station runtimes based on soil, sun, plant type
C. Employ and document cycle-and-soak operation to reduce runoff and waste
D. Add monthly schedule adjustments based on historical weather
E. Upgrade the controller full US EPA WaterSense ability, utilize water-efficient scheduling including daily weather-based adjustments
F. Consider adding flow sensing to enable action and reporting of malfunctions such as leaks

CONTROLLER AND SENSOR IMPROVEMENT ESTIMATED COST RANGES:

ITEM	COST RANGE	PAYBACK
A	Zero cost to $250 +/-	1 season
B	$150 +/- (Approx. 1 hour of professional time)	1 to 2 seasons
C	$150 +/- (Approx. 1 hour of professional time)	1 to 2 seasons
D	$150 +/- (Approx. 1 hour of professional time)	1 to 2 seasons
E	$750 to $2,000 depending on model selected	3 to 5 seasons
F	$750 to $1,200	

WATER SUPPLY AND BACKFLOW PREVENTION

One municipal irrigation water supply is sized adequately to serve the property. One reduced pressure zone backflow prevention assembly (RPZ) appeared to be tagged as tested per local code. The RPZ and meter were "free-standing" without support, placing stress on piping.

WATER SUPPLY AND BACKFLOW RECOMMENDATIONS:

A. Add support posts and brackets under the plumbing equipment to relieve stress on fittings.
B. Consider exchanging the current supply cabinet for a more maintenance-friendly cabinet.

WATER SUPPLY IMPROVEMENT ESTIMATED COST RANGES:

ITEM	COST RANGE	PAYBACK
A	$250 to $300	
B	$1,000 to $1,500	

IRRIGATION STATIONS/ZONES

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

The irrigation system was operated station-by-station and observations noted.

We observed:

- several sprinklers partially blocked by landscape growth, pitched or sunken
- several sprinklers with failed/leaking seals – common to the Hunter PgP® sprinkler
- low sprinkler drainage on hillsides
- No pressure regulation at the sprinklers
- No matched application rate practices on the rotor sprinkler stations to help balance overwater/underwatering
- Many areas of poor sprinkler coverage
- Poor hydrozoning, a design consideration that separates areas for sun/shade, slope, soil and more.

A. Implement a plan to replace rotor-sprinklers randomly nozzled with matched application rate nozzles to improve distribution uniformity and water efficiency*
B. Add sprinklers in areas of inadequate coverage
C. Add check valve sprinklers at low points to reduce drainage water waste
D. 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	$2,000 +/- one time then maintain as part of M&O	2-3 seasons
B	$2,500 to $3,000 one time	2-3 seasons
C	$500 to $1,000 one time then maintain as part of M&O	3-4 seasons
D	Approximately 20% more cost than basic sprinkler bodies	

EXAMPLES OF REPLACEMENT PRODUCTS FOR FUTURE MAINTENANCE

ORIGINAL ITEM	REPLACE WITH	OPTIONAL
Hunter PgP rotor style sprinkler	EPA WS-labeled sprinkler body like Hunter I20-Utra or Rain Bird 5004-Plus w/matched application rate nozzles	Hunter MP rotator® nozzle on a WS-labeled sprinkler body like Hunter ProSPray40 or Rain Bird 1804-PRS-SAM
Hunter PgJ small rotor style sprinkler	Same or Rain Bird 3500 series w/matched application rate nozzles	Hunter MP rotator® nozzle on a WS-labeled sprinkler body like Hunter ProSPray40 or Rain Bird 1804-PRS-SAM

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

Apple Valley, MN 2023 monthly outdoor water price per unit (1,000 gallons) is $5.81.

WATER USE HISTORY: Williamsburg III HOA

YEAR	ANNUAL USAGE (GALS)	APPROX. ANNUAL COST
2022	1,090,000	$ 6,333
2021	1,539,000	$ 8,941
2020	1,526,000	$ 8,866
2019	784,000	$ 4,555
AVERAGE (3 YRS)	*1,234,750*	*$ 7,174*

** Water usage reports provided by the city of Apple Valley, MN. The cost calculations use the 2023 water rate.*

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

TURF (full sun to mostly sunny): 703,257 gallons Cost: $ 4,086

APPLICATION EFFIENCY RANGES AND SYSTEM OBSERVATIONS

An exceptionally well-designed and maintained sprinkler irrigation system may achieve up to 70% efficiency. Estimating the efficiency of this system depicts annual water use as follows:

“A Level” effectiveness and water use based on 70% efficiency = 1,004,653-gals Water Cost: $ 5,837

“B Level” effectiveness and water use based on 60% efficiency = 1,105,118-gals Water Cost: $ 6,420

“C Level” effectiveness and water use based on 50% efficiency = 1,205,584-gals Water Cost: $ 7,004

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.

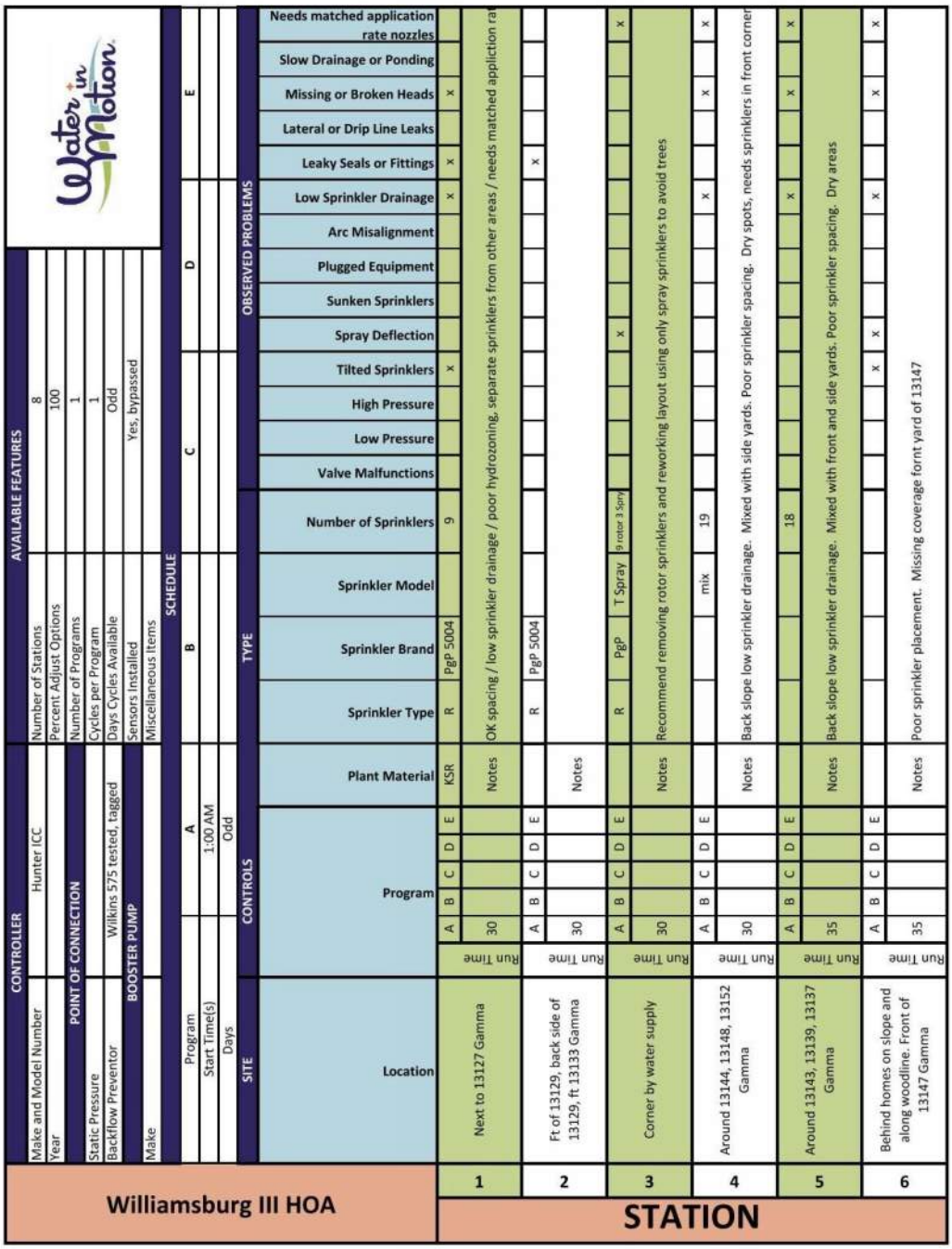
Based only on a calculation of irrigation system efficiency (avg. water use/water need) at this location, the efficiency of the system appears to approach 49% resulting in "C level" effectiveness or lower (**approaching 50% or more water waste**).

It should be the desire 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.

Because of such changes, the resulting health of the landscape will improve over time.

STATION FINDINGS

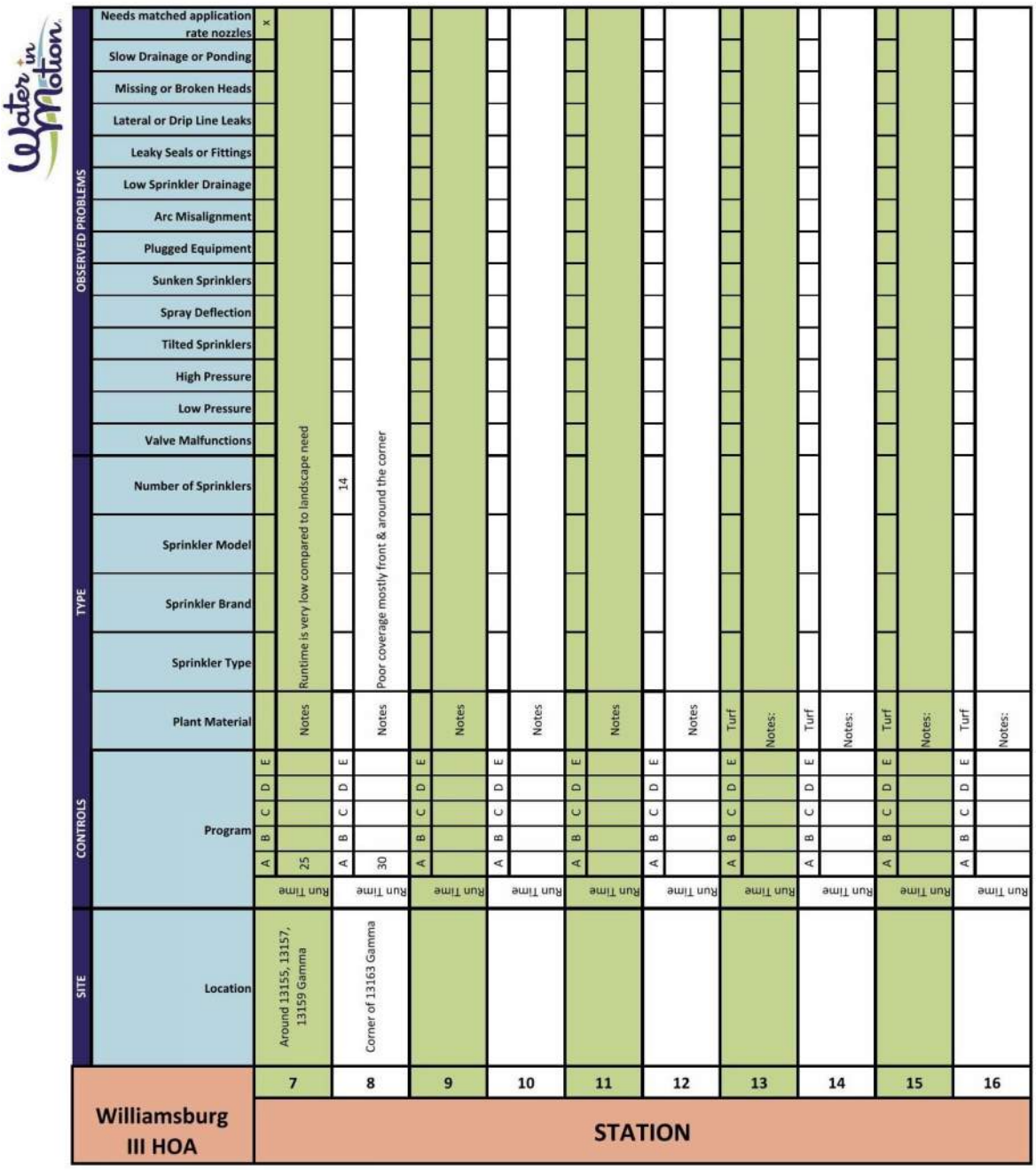


Williamsburg III HOA

CONTROLLER		AVAILABLE FEATURES	
Make and Model Number	Hunter ICC	Number of Stations	8
Year		Percent Adjust Options	100
POINT OF CONNECTION		Number of Programs	1
Static Pressure		Cycles per Program	1
Backflow Preventor	Wilkins 575 tested, tagged	Days Cycles Available	Odd
BOOSTER PUMP		Sensors Installed	Yes, bypassed
Make		Miscellaneous Items	

SCHEDULE	A	B	C	D	E
Program	1:00 AM				
Start Time(s)					
Days	Odd				

STATION	SITE	CONTROLS	TYPE					OBSERVED PROBLEMS											
	Location	Program	Plant Material	Sprinkler Type	Sprinkler Brand	Sprinkler Model	Number of Sprinklers	Valve Malfunctions	Low Pressure	High Pressure	Tilted Sprinklers	Spray Deflection	Sunken Sprinklers	Plugged Equipment	Arc Misalignment	Low Sprinkler Drainage	Leaky Seals or Fittings	Lateral or Drip Line Leaks	Missing or Broken Heads	Slow Drainage or Ponding	Needs matched application rate nozzles
1	Next to 13127 Gamma	Run Time 30 A B C D E	KSR	R	PgP 5004		9				x					x	x		x		
			Notes	OK spacing / low sprinkler drainage / poor hydrozoning, separate sprinklers from other areas / needs matched appliction ra																
2	Ft of 13129, back side of 13129, ft 13133 Gamma	Run Time 30 A B C D E		R	PgP 5004												x				
			Notes																		
3	Corner by water supply	Run Time 30 A B C D E		R	PgP	T Spray	9 rotor 3 Spry					x									x
			Notes	Recommend removing rotor sprinklers and reworking layout using only spray sprinklers to avoid trees																	
4	Around 13144, 13148, 13152 Gamma	Run Time 30 A B C D E				mix	19									x			x		x
			Notes	Back slope low sprinkler drainage. Mixed with side yards. Poor sprinkler spacing. Dry spots, needs sprinklers in front corner																	
5	Around 13143, 13139, 13137 Gamma	Run Time 35 A B C D E					18									x			x		x
			Notes	Back slope low sprinkler drainage. Mixed with front and side yards. Poor sprinkler spacing. Dry areas																	
6	Behind homes on slope and along woodline. Front of 13147 Gamma	Run Time 35 A B C D E									x	x				x			x		x
			Notes	Poor sprinkler placement. Missing coverage fornt yard of 13147																	


Water in Motion
Williamsburg III HOA
STATION
SITE
Location
Around 13155, 13157, 13159 Gamma
Corner of 13163 Gamma
CONTROLS
Program
Run Time
25
30
TYPE
Plant Material
Turf
Notes:
Sprinkler Type
Sprinkler Brand
Sprinkler Model
Number of Sprinklers
14
OBSERVED PROBLEMS
Valve Malfunctions
Low Pressure
High Pressure
Tilted Sprinklers
Spray Deflection
Sunken Sprinklers
Plugged Equipment
Arc Misalignment
Low Sprinkler Drainage
Leaky Seals or Fittings
Lateral or Drip Line Leaks
Missing or Broken Heads
Slow Drainage or Ponding
Needs matched application rate nozzles
x
Runtime is very low compared to landscape need
Poor coverage mostly front & around the corner
7
8
9
10
11
12
13
14
15
16

STATION MAP


McAndrews Rd
38
McAndrews Rd
JULY, 2023
WILLIAMSBURG III HOA
13129-13163 GAMMA WAY
APPLE VALLEY, MN 55124
6
13157
13155
13151
13147
13143
13139
13137
13159
7
5
13135
13133
131st Circle
13161
4
13152
13148
13144
13140
C
2
13129
13163
8
3
1
Gamma Way
13127
131st Circle
Gamma Way
Galaxie Ave
Galaxie Ave
132nd St W
132nd St W
132nd St W

STATION BY STATION OBSERVATIONS

(1)

Created: Thu 29 Jun 14:43 2023

Williamsburg III HOA

Water and controller "doghouse" cabinet

(2)

Created: Thu 29 Jun 14:42 2023

Williamsburg III HOA

Inside very cramped "doghouse" style cabinet. Must crawl to get inside.

Backflow prevention assembly is tagged, tested.

Rain sensor is bypassed.

Controller has only basic scheduling.

(3)

Created: Thu 29 Jun 13:34 2023

Williamsburg III HOA

Station 1 – nine rotor sprinklers next to 13127 Gamma. Poor coverage, low sprinkler drainage, no matched application rate nozzles.

(4)

Created: Thu 29 Jun 13:47 2023

Williamsburg III HOA

Station 3 – nine rotor sprinklers and 3 sprays into mature pines. Should be reconstructed w/sprays

(5)

Created: Thu 29 Jun 13:51 2023

Williamsburg III HOA

Station 4 – rotor sprinklers all around 13144, 13148, 13152. Poor sprinkler spacing, missing sprinklers for good coverage. Mixed with side yards, low sprinkler drainage.

(6)

Created: Thu 29 Jun 14:00 2023

Williamsburg III HOA

Station 5a – Around 13143, 13139, 13137. Poor coverage, low sprinkler drainage.

(7)

Created: Thu 29 Jun 14:03 2023

Williamsburg III HOA

Station 5b – Around 13143, 13139, 13137. Poor coverage, low sprinkler drainage.

(8)

Created: Thu 29 Jun 14:11 2023

Williamsburg III HOA

Station 6 - 19 rotor sprinklers along back slope behind several homes. Some sprinklers blocked behind the woodline. Several tilted sprinklers. Spacing is stretched, poor coverage.

Mowing too short. Wide open unused turf hillside.

(9)

Created: Thu 29 Jun 14:20 2023

Williamsburg III HOA

Station 7 – Approximately 20 sprinklers all around 13155, 13157, 13159 Gamma.

Poor placement, poor spacing. Blown, leaking seals, several non-rotating sprinklers, mixed rotor sprinklers and spray sprinklers.

Low sprinkler drainage.

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.