

Facility Name	Unit Well 11	Facility Description
Well ID	BF511	Drilled in 1956, Unit Well 11 has a pumping capacity of 2,300 gallons per minute. It operates year-round and serves Madison's East side including the Emerson East, Eken Park, Marquette, Schenk-Atwood, Hawthorne, and Worthington Park neighborhoods as well as homes in Burke Heights, Hiestand, Rolling Meadows, and Eastmorland. In 2017, the well pumped 625 million gallons of water compared to its 5-year average of 526 million gallons annually.
Service Zone	6E	
Capacity	2.88 MGD	
Reservoir Capacity	0.150 MG	
Number of Assets	31	
Current Replacement Cost	\$3.2M	

Asset Condition Profile

Overall Condition Assessment: The assets at Unit Well 11 are in good to excellent condition with over 90% scoring 3 or better.

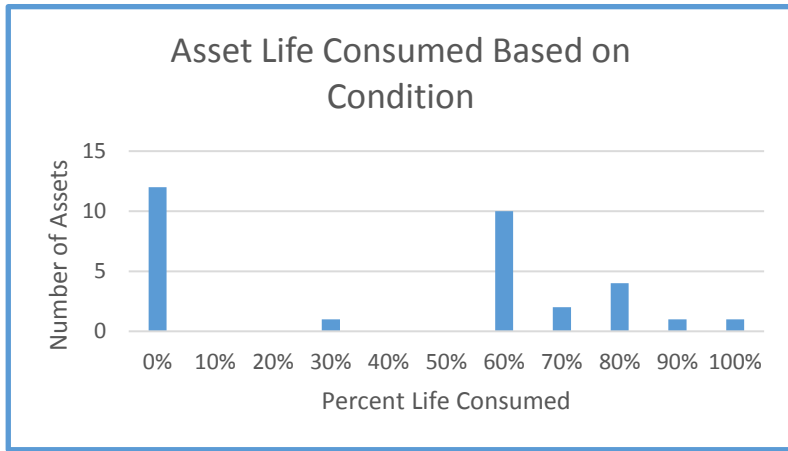


Figure 1. Life Consumed

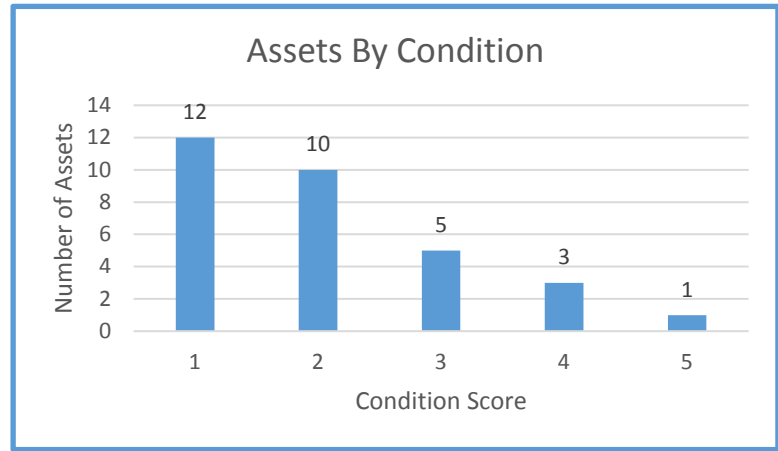


Figure 2. Asset Condition

Asset Risk Profile

Based on the analysis, there are 3 assets falling in zone 5 (significant risk zone) that require immediate attention, including: Chlorine System, Fluoride System, and PUMP-71 Starter. The MCC and Level/Pressure Instruments fall just outside zone 5 and should also be addressed in the short term.

Failure Modes

Failure modes acting on Unit Well 11 include Capacity, Levels of Service, and Physical Mortality. Signs of pumping sand have been observed. There have been water quality issues related to VOCs. Huge caverns have been observed underneath. The reservoir is undersized. The chemical storage room has code violations.

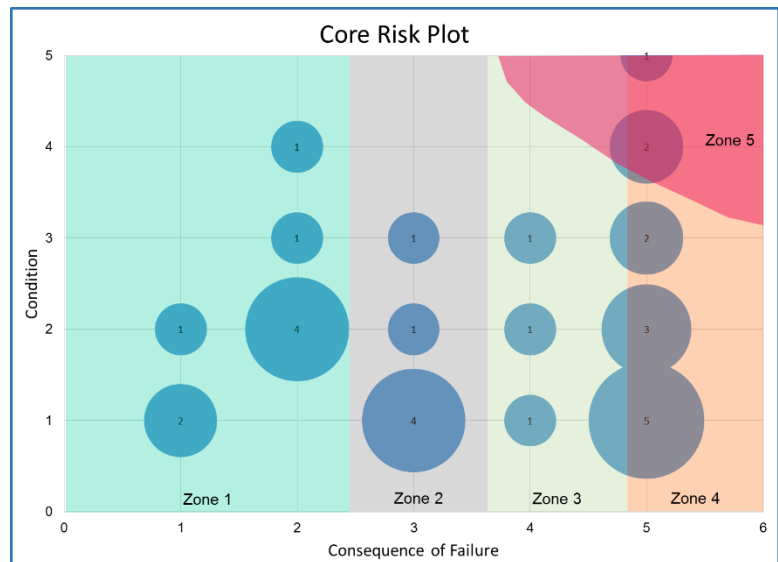


Figure 3. Risk Zone Plot

Investment Scenarios

Two investment scenarios were analyzed in order to estimate the future investment requirements.

Base Scenario Description

The Base Scenario runs all assets to failure (condition 5) regardless of risk management zone. This scenario results in a baseline, lowest possible investment requirements, without regard to risk. The Base Scenario 10-year investment requirement for Unit Well 11 is shown in Figure 4. Although the investment requirement is relatively low with this scenario, it results in a much higher level of residual risk.

Significant Risk Scenario Description

The Significant Risk Scenario establishes a trigger for asset replacement or rehabilitation for assets that reach the tolerable core risk limit of 16. In this scenario, intervention occurs for assets in risk management zones 3 and 4 before they reach the significant risk zone. Action is taken to move assets that are already in zone 5. Assets in zones 2 and 3 are run to failure (condition 5). The Significant Risk Scenario 10-year investment requirement for Unit Well 11 is shown in Figure 5.

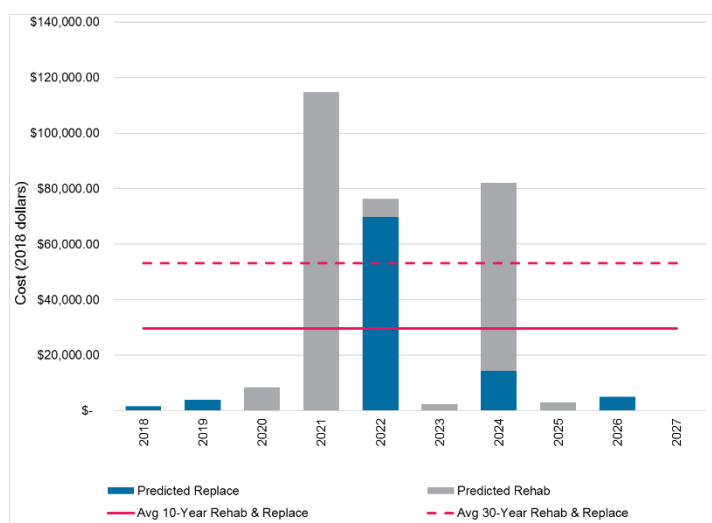


Figure 4. Base Scenario 10-Year Investment Requirements

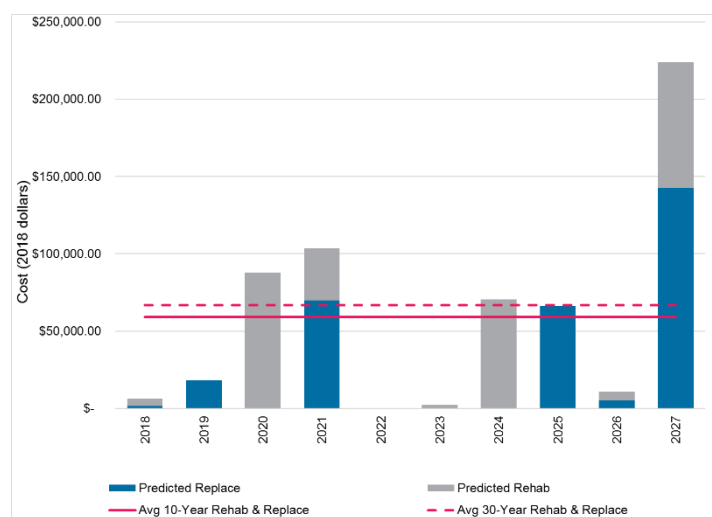


Figure 5. Significant Risk Scenario 10-Year Investment Requirements

Recommended Operations & Maintenance Strategies

Continued preventive and corrective maintenance is recommended for assets falling in zones 3 and 4. Evaluate zone 1 and 2 assets for maintenance optimization.

2018 - 2019 Recommended Projects

Asset Name	Intervention Type	Driver	Cost
Chlorine System	Rehabilitation	Risk	\$2,398
Fluoride System	Rehabilitation	Risk	\$2,398
MCC	Replacement	Risk	\$14,452
PUMP-71 Starter	Replacement	Risk	\$1,530
Level/Pressure Instruments	Replacement	Risk	\$3,910
		Total	\$24,688

Asset Register (sorted by TBL Risk score)

Asset ID	Asset Name	Condition Rating	Replacement Cost	% Life Consumed Based on Condition	Estimated Remaining Life (years)	Core Risk	TBL Risk (w/ mitigation)	Enterprise Risk (w/ system mitigation)	Risk Zone
24	PUMP-71 Starter	5	\$1,530	100%	0	25	55	9.2	5
5	Chlorine System	4	\$11,900	83%	3	20	44	7.3	5
11	Fluoride System	4	\$11,900	83%	3	20	44	7.3	5
17	MCC	3.5	\$14,452	85%	6	17.5	38.5	6.4	5
23	PUMP-71	3	\$36,574	62%	13	15	33	2.8	4
31	WELL-11 Borehole	2.5	\$1,001,300	71%	59	12.5	30	2.5	4
19	MTR1-11	2	\$69,767	60%	4	10	22	3.7	4
1	Analyzer	2	\$5,100	60%	5	10	22	3.7	4
12	General Interior	3.5	\$42,500	85%	12	14	21	3.5	4
26	Roof	2	\$40,923	60%	10	8	18	3.0	4
16	Level/ Pressure Instruments	4	\$3,910	91%	1	8	16	2.7	2
13	HVAC	3	\$11,627	62%	8	9	15	2.5	3
29	Valves	2	\$20,418	36%	13	6	14	2.3	3
28	Structure	3	\$191,350	79%	21	6	12	2.0	2
25	PUMP-72	1	\$32,794	0%	35	5	11	1.8	4
27	SCADA	1	\$25,500	0%	50	5	11	1.8	4
30	VFD PUMP-72	1	\$38,162	0%	10	5	11	1.8	4
20	MTR1-12	1	\$104,651	0%	10	5	11	1.8	4
7	Exterior	2	\$53,639	60%	24	4	10	1.7	2
14	Interior	2	\$53,639	60%	24	4	10	1.7	2
22	Piping	2	\$29,270	60%	20	4	10	1.7	2
6	Column	1	\$1,002,150	0%	200	5	9	1.5	4
4	Chlorine Leak and Shut-off	1	\$5,100	0%	12	4	8	1.3	4
3	CCTV	1	\$4,080	0%	10	3	8	1.3	3
8	Exterior Lighting	2	\$12,762	60%	32	4	8	1.3	2
2	Card Access	1	\$4,080	0%	10	3	7	1.2	3
10	Fire Extinguishers	1	\$23,205	0%	80	3	6	1.0	3
21	Pavement	2	\$331,022	60%	30	2	6	1.0	1
9	Eye Wash Station	1	\$4,250	0%	30	3	5	0.5	3
15	Landscaping	1	\$42,500	0%	200	1	3	0.5	1
18	Meters	1	\$5,865	0%	20	1	3	0.5	1