



ENHANCING WATER TREATMENT TO CONTROL ALGAE WITH VARIOUS TECHNOLOGIES

By Samantha Stitt

1

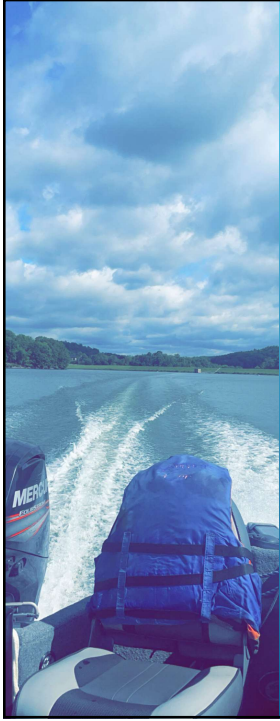
A landscape photograph of a large body of water, likely a reservoir, with a dense line of green trees on the far shore under a blue sky with scattered white clouds.

► The George R. Sweeney WTP in Bell Township, PA sources raw water from the 11-billion-gallon Beaver Run Reservoir.

► Seasonal algae presents a major challenge, and the plant uses no algaecides. Instead, advanced monitoring determines the ideal intake depth.

INTRODUCTION

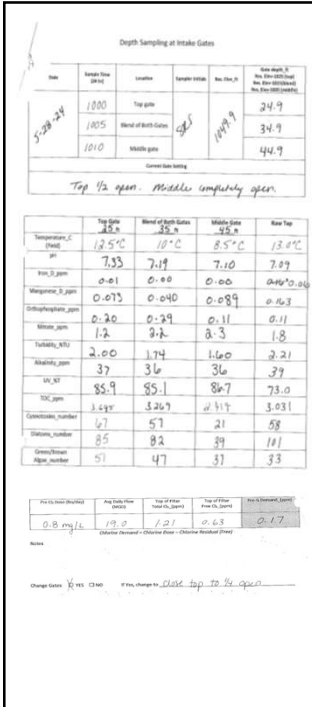
2



- ▶ Raw water is drawn via two intake gates at different depths. Monitoring includes temperature and quality indicators such as pH, TOC, algae, and manganese.
- ▶ The plant optimizes gate settings based on data to draw the best quality water.

INTAKE MONITORING STRATEGY

3



Depth Sampling at Intake Gates

Date	Sample Date (M/D)	Location	Sample Depth	Raw Water Depth	Gate Depth (ft)	Raw Water Depth (ft)
5-28-24	1000	Top gate	24.9			
	1005	Mid gate	34.9			
	1010	Bottom gate	44.9			

Current Gate Setting: Top 1/2 open, Middle completely open.

Parameter	Top gate	Mid gate	Bottom gate	Raw Water
Temperature, °C (°F)	12.5°C	10°C	8.5°C	13.4°C
pH	7.55	7.19	7.10	7.89
Turbidity, NTU	0.01	0.00	0.00	0.00
Chlorophyll, µg/L	0.073	0.040	0.099	0.057
Manganese, ppm	0.20	0.29	0.11	0.11
Aluminum, µg/L	1.2	0.2	0.3	1.8
Iron, µg/L	2.00	1.74	1.60	2.21
NO ₃ -N, ppm	37	36	36	39
NO ₂ -N, ppm	85.9	85.1	86.7	73.0
Chlorine, mg/L	3.492	3.267	3.117	3.031
Chlorine, number	67	57	21	58
Chlorine, number	85	82	29	101
Chlorine, number	57	47	37	33

Notes: If you change the gate, please top to 1/2 open.

IN-HOUSE WATER SAMPLING

4



- ▶ FlowCam flow imaging microscopy allows precise identification and enumeration of algae from a 1 mL sample.
- ▶ Images are captured in real time and sorted into categories like cyanobacteria, diatoms, green/brown algae, and rotifers using a custom image library.
- ▶ The process replaces time-consuming manual microscopy, increasing both speed and accuracy.

ALGAE CLASSIFICATION – FLOWCAM

5



- ▶ The TOC 4200 analyzer performs catalytic combustion analysis of up to six streams.
- ▶ The WTP uses four: raw, settled, combined filter effluent, and effluent.
- ▶ Analysis every two hours, replacing delayed monthly lab testing and enabling more responsive treatment adjustments.

ONLINE TOC ANALYSIS – SHIMADZU TOC 4200

6

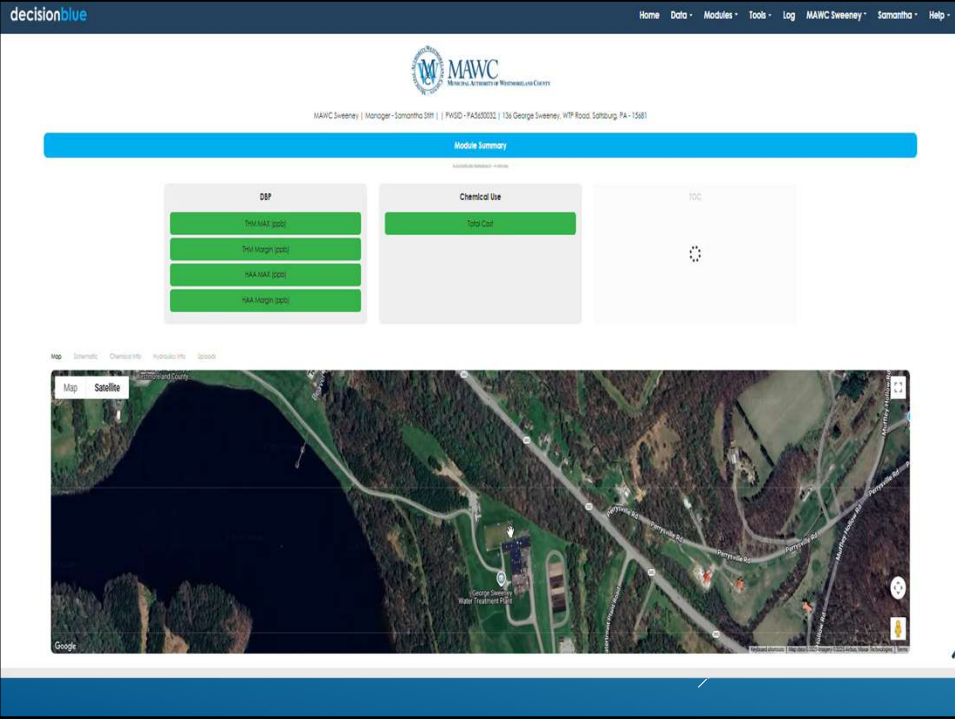


The screenshot displays the Decision Blue platform interface. The top section features two line graphs showing data trends over time. Below the graphs is a table titled 'Virtual Jar' with columns for 'Jar Test Results' and 'Chemical Dosing'. The table contains data for various chemical dosing scenarios, including 'Total Dose', 'Total Cost', and 'Total Volume'.

- ▶ The Decision Blue platform integrates KPIs and historical data to simulate chemical dosing options.
- ▶ Daily data entry enables performance predictions, cost optimization, and water quality improvement.
- ▶ Operators quickly implement suggested dosage changes based on simulated jar test results.

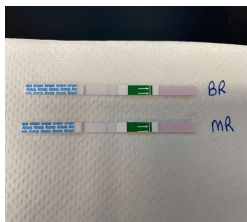
DECISION BLUE – VIRTUAL JAR TESTING

7



The screenshot displays the decisionblue web application interface. The top navigation bar includes links for Home, Data, Modules, Tools, Log, MAWC Sweeney, Samantha, and Help. The main content area features a 'Module Summary' section with three cards: 'DP' (Total Max, Total Margin, HAA Max, HAA Margin), 'Chemical Use' (Total Cost), and 'TOC'. Below the summary cards is a map showing the location of the George Sweeney Water Treatment Plant, with a 'Map' button and a 'Satellite' view option.

8



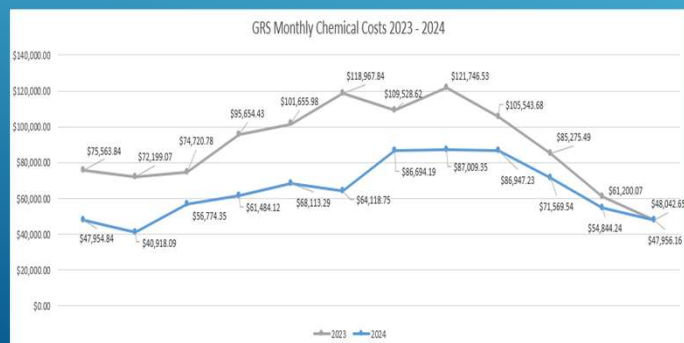
- The WTP monitors for microcystin weekly during peak algae seasons, both in raw and treated water. In-house testing with strips and ELISA allows rapid response to potential cyanotoxin presence, supporting safe water production.

MONITORING CYANOTOXINS

9

- Advanced tools have helped the WTP reduce algae-related treatment issues and improve effluent quality. Operators make informed gate and chemical decisions using real-time data, optimizing both cost and safety.

RESULTS AND IMPACT



10

CONCLUSION

- ▶ Integrating advanced technologies allows proactive, data-driven control of water quality. Tools like FlowCam, TOC analyzers, and Decision Blue enable fast, accurate decisions that enhance operational efficiency and ensure regulatory compliance.