

WATCH
Level 1

ALERT
Level 2

CRITICAL
Level 3

OPERATOR FIELD GUIDE • DROUGHT OPERATIONS

Efficient Water Treatment in Drought Conditions

Source Water • Treatment Process • Chemical Dosing • Distribution & Demand



KEY DROUGHT CHALLENGES FOR WATER TREATMENT

Operator awareness guide

01

Low Reservoir Levels

Reduced storage exposes the inlet works, resulting in increased turbidity and higher concentrations of algae. Consequently, adjusting the intake depth becomes essential.

02

Concentrated Contaminants

As the volume decreases, the concentrations of metals, organics, and nutrients increase. Consequently, there is a significant rise in the dosage of coagulants and the precursors of disinfection byproducts (DBPs).

03

Higher Chlorine Demand

Elevated levels of organic carbon from algae and sediment lead to increased chlorine consumption, resulting in manual dosing setpoints lagging behind.

04

Low Flow & Long Residence

Reduced demand results in water remaining stagnant in the pipes for extended periods. Consequently, residual substances may decay before reaching dead ends, necessitating an increase in flushing frequency.

05

Temperature-Driven Decay

Elevated temperatures accelerate the decay of chlorine and foster the growth of biofilms. Additionally, the heightened demand during the summer months exacerbates this issue.

Drought conditions change rapidly — review treatment parameters daily and adjust proactively, not reactively.

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01 SOURCE WATER MANAGEMENT

Monitor intake quality — conditions change fast in drought

1. Increase Raw Water Sampling

Conduct daily assessments of turbidity, pH, color, and algal counts at the intake. Additionally, implement midday checks during heatwaves or algal bloom events.

2. Watch for Cyanobacteria

Warm, shallow reservoirs create an environment conducive to the concentration of blue-green algae blooms. It is advisable to test for cyanotoxins if the cell count exceeds 2,000 cells per milliliter.

3. Adjust Intake Depth

Utilise the highest quality layer for extraction. During thermal stratification, it is essential to avoid the hypolimnion, which is characterized by low oxygen levels along with elevated concentrations of iron and manganese.

4. Monitor DOC & Colour

An increase in elevated dissolved organic carbon elevates the demand for coagulants and heightens the risk of disinfection byproduct (DBP) formation. Utilizing UV254 as a rapid daily surrogate is recommended for monitoring purposes.

INCREASE MONITORING

Turbidity Filter breakthrough risk	Every 2 hrs
pH Affects HOCl/OCl ⁻ balance	Every 4 hrs
Algae counts Cyanotoxin trigger	3x per week
DOC / UV254 DBP precursor load	Daily
Iron & Manganese Hypolimnion intrusion	Daily
Taste & Odour MIB / geosmin events	Daily

OPERATOR TIP:

Taste & odour compounds (MIB, geosmin) spike during algal events — notify customers proactively and check GAC performance. A customer complaint about 'earthy water' is a useful early warning signal.

02 & 03 TREATMENT PROCESS & CHEMICAL DOSING

Adapt process to lower flows and poorer quality — demand changes daily, manual setpoints will fall behind

TREATMENT PROCESS OPTIMISATION

Optimise Coagulant Dose Daily

Utilise jar testing, as drought conditions often necessitate higher dosages due to increased dissolved organic carbon (DOC) and color levels. It is crucial not to depend solely on historical setpoints.

Treat Less, Treat Better

Should the quality degrade, it is imperative to reduce plant throughput. Operating at full capacity with subpar source water increases the risk of filter breakthrough and potential compliance failures.

Check Filter Run Times

Increased turbidity and algal growth lead to accelerated head loss. It is advisable to enhance the frequency of backwashing while closely monitoring differential pressure and turbidity breakthrough.

Optimise Sedimentation

Slower flow rates enhance settling efficiency. It is essential to adjust the overflow rate and flocculation mixing to align with the current throughput rather than the design flow.

CHEMICAL DOSING CONTROL

Increase Chlorine Monitoring

Network demand varies with temperature and low flow conditions. Transitioning from daily manual checks to continuous or hourly online monitoring is recommended for better responsiveness.

Consider Breakpoint Chlorination

If ammonia breakthrough increases combined chlorine (CC), adjust chlorine dosage to breakpoint to restore free residual, maintaining a $\text{Cl}_2:\text{NH}_3\text{-N}$ ratio of approximately 7.6:1.

Maintain pH 7.0-7.5

Drought water is typically more acidic due to organic acids. An optimal pH range enhances the HOCl fraction, the most effective disinfectant form.

Check Chemical Inventory

Droughts can disrupt supply chains; maintain a 30+ day buffer stock for chlorine, coagulant, pH correction, and essential chemicals.

TIP: Automated chlorine dosing with online analysers handles demand variability far better than manual adjustments during drought — consider upgrade if not already in place.

04 DISTRIBUTION, DEMAND & ESCALATION LEVELS

Low flow = long residence times = residual decay risk — respond before you lose compliance

DISTRIBUTION & DEMAND ACTIONS

Flush Dead Ends & Low-Demand Zones

Residuals deplete fastest where water sits. Map and flush dead ends regularly — increase frequency in summer.

Implement Demand Restrictions

Stage outdoor watering, car washing and irrigation bans. Each restriction extends storage and reduces peak treatment load.

Optimise Network Pressure

Reduce pressure in zones where possible — lower pressure cuts leakage and losses without impacting service delivery.

Accelerate Leak Detection

Every litre lost is critical in drought. Prioritise acoustic surveys on trunk mains and repair all known leaks urgently.

ESCALATION TRIGGER LEVELS

NORMAL OPERATIONS

Storage > 60%

Standard treatment process
Baseline monitoring frequency
Review drought response plan

DROUGHT WATCH — Level 1

Storage 40-60%

Increase monitoring frequency
Outdoor watering restrictions
Optimise coagulant dose daily
Begin leak detection patrols

DROUGHT ALERT — Level 2

Storage 20-40%

Stage 2 demand restrictions
Activate alternate supply options
Reduce non-essential flushing
Notify regulator of conditions

CRITICAL — Level 3

Storage < 20%

Emergency demand restrictions
Emergency supply activation
Ministerial notification required
All non-essential use suspended

Adapt storage thresholds to your utility's specific reservoir, source and regulatory requirements.

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DROUGHT OPERATIONS

Quick Reference Checklist

SOURCE WATER

- Daily turbidity, pH & colour checks at intake
- Algae & cyanotoxin counts 3x/week
- Monitor DOC/UV254 for coagulant demand
- Adjust intake depth during stratification
- Alert customers if taste & odour detected

TREATMENT PROCESS

- Jar test coagulant dose daily
- Reduce throughput if quality degrades
- Increase backwash frequency for filters
- Optimise sedimentation for actual flow
- Check salt/hardness for infrastructure impacts

CHEMICAL DOSING

- Continuous or hourly chlorine residual monitoring
- Maintain pH 7.0–7.5 for optimal HOCl
- Check for ammonia breakthrough (high CC)
- Review dose setpoints every shift
- Maintain 30+ day chemical inventory buffer

DISTRIBUTION & DEMAND

- Flush dead ends and low-demand zones
- Implement staged demand restrictions
- Reduce network pressure to cut leakage
- Accelerate leak detection surveys
- Escalate to Level 1/2/3 at storage thresholds