



TECHNICAL WHITE PAPER

Optimization of Swimming Pool Chlorination

Monitoring Results for Disinfection By-Products in Two Pools
Using a Stable Low-Dose TCCA Protocol

Parameter	Details
Publisher	PoolDesign, Naousa, Greece pooldesign.gr
Year	2026
Version	1.1 — revised technical edition
Scope	Low-bather-load private swimming pools
Monitoring period	October 2021 – September 2024 (Pool B) Summer 2024 (Pool A)
Analytical laboratories	VELTIA Labs (Sindos) ANALYSIS-DELKOF S.A. (Naousa)
Status	Evaluation edition — for technical briefing of partners

DISCLAIMER: The results in this document apply exclusively to the two pools described, under the stated operating conditions. They do not constitute a universal operating guideline, a recommendation to reduce residual chlorine, or a substitute for national swimming-pool operating requirements. Any application requires compliance with applicable national and European legislation, assessment by a qualified technician or engineer, and an individualized analysis of the specific installation.

1. Executive Summary

This technical white paper presents monitoring results for disinfection by-products (DBPs) in two low-bather-load private swimming pools operated under a stable low-dose trichloroisocyanuric acid (TCCA) protocol. In the 60 m³ outdoor pool, measured TTHM was 8.6 µg/L and HAAs were 104.4 µg/L (DBAA 62.2 + TCAA 42.2 µg/L). The main technical finding is not that all DBPs were low: THMs were low, while HAAs were measurable and elevated compared with the indicative U.S. EPA drinking-water limit for HAA5 (≤ 60 µg/L), which is not a pool-specific limit. The only quantified THM was bromoform, a finding consistent with possible Br⁻ presence in the feed water, although bromide was not directly measured. In the 100 m³ indoor pool, the transition from the previous NaOCl regime to a controlled low-dose TCCA protocol was associated with a 96.7% reduction in introduced active chlorine, low combined chlorine (CC), and non-detectable microbiological indicators in the available analyses. The results should be interpreted as observations under specific low-load conditions, not as a generalizable operating guideline. Further verification is required through repeated DBP measurements, Br⁻, DOC/TOC, and direct assessment of active HOCl before any broader application.

1.1 Key Findings and Strength of Evidence

The table below separates direct laboratory findings from technical estimates and assumptions requiring confirmation.

Finding / Claim	Evidence base	Strength
TTHM 8.6 µg/L in Pool A	Direct laboratory measurement by VELTIA Labs	Strong for this specific sampling event
HAAs 104.4 µg/L in Pool A	Direct laboratory measurement by VELTIA Labs	Strong for this specific sampling event
Non-detectable microbiological indicators	Laboratory analyses of available samples	Strong for the samples, not for generalization
Possible Br ⁻ presence in feed water	Indirect indication from bromoform/DBAA dominance	Hypothesis — Br ⁻ measurement required
96.7% reduction of active chlorine in Pool B	Calculation based on consumption/dosing records	Strong as an installation-level calculation
DBP reduction in Pool B after intervention	Theoretical estimate, without THM/HAA measurements	Weak — laboratory confirmation required
Absence of biofilm	Visual inspection, not laboratory confirmation	Technical observation

2. Purpose and Scope

2.1 Purpose

This document aims to present, in a technically substantiated manner, the results from applying a stable low-dose TCCA protocol in two swimming pools, with emphasis on THM, HAA, and microbiological-indicator measurements, and on analysis of the mechanisms that may explain the results.

2.2 Scope

The results apply to:

- Low-bather-load private swimming pools (≤ 10 users/day)
- Outdoor and indoor pools using TCCA chlorination
- Water temperature 20–31°C, pH 7.4–7.6
- Recirculation rate: 3.5–4.2 filtration cycles/day

They do not apply directly to:

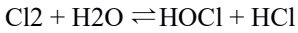
- Public or semi-public high-load facilities (> 50 users/day)

- Pools using seawater or with high bromide-ion content (> 0.5 mg/L)
- Installations with water temperature > 35°C (spas, hot tubs)

3. Theoretical Background

3.1 Chlorine Chemistry — HOCl/OCl- Equilibrium

Chlorine in aqueous solution undergoes hydrolysis:



Hypochlorous acid (HOCl) is the active disinfectant and is significantly more effective than the hypochlorite ion (OCl-). The distribution between HOCl and OCl- depends critically on pH:

pH	% HOCl (active)	% OCl-	Disinfection strength
7.0	73%	27%	High
7.2	67%	33%	Good
7.4–7.6*	55–49%	45–51%	Acceptable — balanced
7.8	33%	67%	Reduced
8.0	23%	77%	Low

* pH range of both pools during monitoring.

3.2 Role of Cyanuric Acid (CYA) — Dual Character

Cyanuric acid (CYA), released by TCCA, forms a complex with HOCl and performs opposing functions:

CYA concentration	Positive effect	Negative effect — active HOCl reduction
0 mg/L	—	0% (baseline)
10 mg/L	Moderate UV protection	~30%
30 mg/L*	Good UV protection	~50–55%
50 mg/L	Maximum recommendation	~70%
> 100 mg/L	Risk of “chlorine lock”	> 85%

* CYA value measured in the indoor pool after 2.5 years of operation.

Practical consequence: At approximately 30 mg/L CYA, conservative FC/CYA-ratio approaches are often used to maintain equivalent disinfection strength. Monitoring with FC 0.3–0.7 mg/L and CYA ~30 mg/L in these specific pools must not be interpreted as a general operating recommendation at low FC. The non-detectable microbiological indicators are an observation under limited conditions of low bather load, controlled use, and, for the outdoor pool, additional solar UV influence.

3.3 DBP Formation — Kinetics

The formation rate of disinfection by-products (DBPs) may be described by the relationship:

$$d[\text{DBP}]/dt \approx k \times [\text{HOCl}] \times [\text{DOC}] \times f(\text{T}, \text{pH})$$

Note: This is a simplified kinetic approach. It does not account for: (a) the bromide term [Br-], which is probably important in this case due to bromoform dominance over chloroform, (b) speciation among HOCl/OCl-/Cl-CYA, or (c) residence time and hydraulic behavior. For a full kinetic analysis, see Chowdhury et al. (2014).

Here, k is the reaction-rate constant, DOC is dissolved organic carbon, and f(T,pH) is a temperature and pH function. DBP control is therefore linked to: (a) control of [HOCl] through stable low dosing, (b) limitation of [DOC] through low bather load and a clean filter, and (c) temperature and pH control. These relationships explain trends but do not, by themselves, prove causation for the two installations.

THM/HAA distinction: THMs are volatile and may be removed into the air, while in outdoor pools they may also be affected by photochemical processes. HAAs are far less volatile and tend to remain in the water and accumulate, being influenced mainly by organic precursors, dosing, pH, temperature, and halides such as Br⁻.

3.4 Biofilm in the Filter Medium

In typical pools, the filter medium (sand, glass) may become a secondary source of DOC when biofilm develops within the medium. Some studies estimate that this mechanism may contribute up to approximately 30% of total DBP production (Hansen et al., 2012), depending on bather load, age, and filter-backwash frequency. In the present work, biofilm was not confirmed by laboratory analysis; therefore, related references are based on visual inspection and should be treated as a technical observation rather than a laboratory finding.

3.5 Estimation of Active Chlorine (HOCl) in the Presence of CYA — Bounded Estimation

In the presence of cyanuric acid (CYA), free chlorine (FC) does not correspond fully to active hypochlorous acid (HOCl). Chloroisocyanurate complexes form and substantially reduce available HOCl:



The exact HOCl/bound-chlorine distribution was not directly measured in this work. Based on literature data (Wojtowicz, 2001; White, 1999), at pH 7.4–7.6 and CYA ~30 mg/L, relative disinfection strength (as HOCl) is estimated to decrease by 50–70% compared with a system without CYA. Consequently, CT values calculated from FC (Section 4.3) overestimate actual disinfection capacity. Without direct HOCl measurement, precise quantification is not possible — CT_{effective} (as HOCl) is estimated to be 30–50% of the values presented in Table 3.

Estimated CT_{effective} range (as HOCl) for Pool A:

- FC = 0.3 mg/L, CYA ~30 mg/L → CT_{effective} ≈ 18–30 mg·min/L (versus 60 by the simple calculation)
- FC = 0.7 mg/L, CYA ~30 mg/L → CT_{effective} ≈ 42–70 mg·min/L (versus 140)

These results indicate that the system operates below the classic Giardia benchmark. The absence of detectable microbiological indicators in the available analyses is probably consistent with: (a) extremely low bather load, (b) absence of coliforms in the feed water, and (c) the supplementary effect of solar UV in Pool A.

4. Methodology

4.1 Swimming Pool Characteristics

Parameter	Pool A (Outdoor)	Pool B (Indoor)
Type	Outdoor	Indoor
Water volume (V)	60 m ³	100 m ³
Water surface area	—	55 m ²
Cover	No cover	—
Pump flow rate (Q)	18 m ³ /h	28 m ³ /h
Turnover time (V/Q)	3.33 h	3.57 h
Filter cycles/day	4.2	3.9
Pump operating hours	2 × 7 h/24 h = 14 h/day	2 × 7 h/24 h = 14 h/day
Filter type	Sand	Sand
Monitoring period	6 months (Summer 2024)	2.5 years (2021–2024)

Table 1. Swimming pool characteristics

4.2 Operating Conditions

Parameter	Pool A (Outdoor)	Pool B (Indoor)
Disinfection chemical	TCCA (200 g tablets)	TCCA (200 g tablets)
TCCA dosing	200 g/week	200 g/month
Dose (mg/L/day)	0.47 mg/L/day	0.097 mg/L/day
Active Cl ₂ introduced/day	~25.7 g Cl ₂ /day	~5.8 g Cl ₂ /day
Free chlorine (FC)	0.3–0.7 mg/L	0.3–0.7 mg/L
Combined chlorine (CC)	0.1–0.2 mg/L	0.1–0.2 mg/L
pH	7.4–7.6	7.4–7.6
Ambient temperature	40°C (summer)	—
Water temperature	~28–32°C (est.)	31°C
Bather load	~6 people/day	Private use (low)
Water renewal	~800 L/week	~800 L/week
Shock chlorination	Seasonal	Every 2 months
CYA (measured)	~41 mg/L (est.)	~30 mg/L (measured at 2.5 years)

Table 2. Swimming pool operating conditions

4.3 CT Calculation (Contact Time × Concentration)

The CT index (mg·min/L) expresses the disinfection strength of the system:

$$CT = [FC] \text{ (mg/L)} \times t \text{ (min)}$$

where t = turnover time in minutes.

IMPORTANT QUALIFICATION: The calculation is based on FC (total free chlorine), not on HOCl (the truly active fraction). In the presence of CYA ~30 mg/L, CT_{effective} (as HOCl) is estimated to be 30–50% of the following values — see Section 3.5.

Pool	FC (mg/L)	Turnover (min)	CT _{FC} (mg·min/L)*	Estimated CT _{effective} †
A — Outdoor (min.)	0.3	200	60	18–30 mg·min/L
A — Outdoor (max.)	0.7	200	140	42–70 mg·min/L
B — Indoor (min.)	0.3	214	64	19–32 mg·min/L
B — Indoor (max.)	0.7	214	150	45–75 mg·min/L

Table 3. CT calculation — based on FC and estimated as HOCl

* CT_{FC}: calculation based on total FC — overestimates actual disinfection strength because of CYA.

† CT_{effective}: estimated range as HOCl (based on Wojtowicz, 2001 — see Section 3.5). Required CT for 99.9% Giardia inactivation: ~150 mg·min/L (WHO, 2022). The estimates show that the protocol operates below this conservative reference point. This finding reinforces the need not to generalize the practice to public or high-load facilities without separate technical and regulatory assessment.

4.4 Sampling

- Sampling time: 09:00 (before first daily use — corresponding to the minimum daily DBP value)
- Sampling performed by the client according to their statement — shipped to the laboratory on the same day
- Pool A: 1 chemical sampling + 1 microbiological sampling
- Pool B: 2 microbiological analyses during the 2.5-year period

4.5 Analytical Methods

Parameter	Method	Limit of detection	Laboratory
THMs (4 compounds)	GC-MS/HS-SPME (in-house O.B.15.002) based on ISO/DIS 17943	1.0 µg/L	VELTIA Labs, Sindos
HAAs (9 compounds)	LC-MS/MS (in-house O.15.006) based on J. Chromatogr. A 1217 (2010) 4873	5.0 µg/L	VELTIA Labs, Sindos
Colony count 36°C	ELOT EN ISO 6222:1999	1 cfu/mL	ANALYSIS-DELKOF
Colony count 22°C	ELOT EN ISO 6222:1999	1 cfu/mL	ANALYSIS-DELKOF
Total coliforms	ELOT EN ISO 9308-1:2014	1 cfu/100 mL	ANALYSIS-DELKOF
E. coli	ELOT EN ISO 9308-1:2014	1 cfu/100 mL	ANALYSIS-DELKOF
Enterococci	ELOT EN ISO 7899-2:2000	1 cfu/100 mL	ANALYSIS-DELKOF

Table 4. Analytical methods and limits of detection

5. Results

5.1 Pool A — Outdoor 60 m³

5.1.1 Disinfection By-Products

Parameter	Result	Reference limit	Maximum statutory limit	Evaluation
Trichloromethane (chloroform)	< 1.0 µg/L	1.0 µg/L	—	< limit of detection
Bromodichloromethane	< 1.0 µg/L	1.0 µg/L	—	< limit of detection
Dibromochloromethane	< 1.0 µg/L	1.0 µg/L	—	< limit of detection
Tribromomethane (bromoform)	8.6 µg/L	1.0 µg/L	—	Quantified
TTHM (sum)	8.6 µg/L	—	Indicative reference limit — standard confirmation required	Low THM finding — not a full DBP assessment
Chloroacetic acid (MCAA)	< 5.0 µg/L	5.0 µg/L	—	< limit of detection
Bromoacetic acid (MBAA)	< 5.0 µg/L	5.0 µg/L	—	< limit of detection
Dichloroacetic acid (DCAA)	< 5.0 µg/L	5.0 µg/L	—	< limit of detection
Dibromoacetic acid (DBAA)	62.2 µg/L	5.0 µg/L	—	Quantified
Trichloroacetic acid (TCAA)	42.2 µg/L	5.0 µg/L	—	Quantified
Other HAAs (4 compounds)	< 5.0 µg/L	5.0 µg/L	—	< limit of detection
Total HAAs (quantified)	104.4 µg/L	—	—	—

Table 5. Chemical analysis results for Pool A — VELTIA Labs 02/10/2024 (No. 15-891/2024)

NOTE — Bromoform dominance: The only quantified THM was bromoform (8.6 µg/L), while chloroform was < 1.0 µg/L. In TCCA pools without external bromide addition, this suggests the presence of bromide ions (Br⁻) in the feed water — possibly from the regional water-supply network. The phenomenon deserves confirmation through bromide analysis of the network water.

5.1.2 Microbiological Indicators

Parameter	Result	Method
Colony count 36°C	Non-detectable (N.D.)	ELOT EN ISO 6222:1999
Colony count 22°C	Non-detectable (N.D.)	ELOT EN ISO 6222:1999
Total coliforms	Non-detectable (N.D.)	ELOT EN ISO 9308-1:2014
E. coli	Non-detectable (N.D.)	ELOT EN ISO 9308-1:2014
Enterococci	Non-detectable (N.D.)	ELOT EN ISO 7899-2:2000

Table 6. Microbiological results — ANALYSIS-DELKOF 06/10/2023 (Code 4101/10/231003)

5.2 Pool B — Indoor 100 m³

5.2.1 Results Before and After the Intervention

Parameter	Before (NaOCl)	After (TCCA)	Change
Chemical consumption/month	50 L NaOCl (~55 kg)	200 g TCCA	-99.6% by mass
Active Cl ₂ introduced/month	~5,500 g Cl ₂	~180 g Cl ₂	-96.7%
Active Cl ₂ (mg/L/day)	~1.83 mg/L/day	~0.060 mg/L/day	-96.7%
Free chlorine (FC)	1.0–1.5 mg/L	0.3–0.7 mg/L	Reduced
Combined chlorine (CC)	High (est.)	0.1–0.2 mg/L	Significant reduction
Chlorine odor	Present	Non-detectable	Not reported after intervention
Filter/wall biofilm	Present / visually observed	No visual indications (2.5 years)	Not laboratory confirmed
Microbiological indicators	N.D.	N.D.	Maintained
CYA (measured)	0 mg/L	~30 mg/L	Stabilization
Water replacement	Regular	First after 2.5 years	Drastic reduction

Table 7. Comparative results for Pool B before and after replacing NaOCl with TCCA

IMPORTANT — Absence of DBP measurements for Pool B after intervention: No chemical THM/HAA analysis was performed after the replacement. Expected levels can only be estimated theoretically based on: (a) 96.7% reduction in introduced Cl₂, (b) low CC, and (c) absence of visual biofilm indications. This estimate is not laboratory-confirmed and must not be presented as a measured result.

6. Discussion

6.1 Interpretation of Low THMs in Pool A

The TTHM value of 8.6 µg/L (exclusively bromoform) is consistent with the combined effect of four possible mechanisms:

- Low Cl₂ dose (0.47 mg/L/day), which probably contributed to lower THM production under the specific conditions
- Solar UV radiation and outdoor operation, which can affect volatile THM concentration through volatilization and photochemical processes
- Low organic load due to limited use and absence of visual biofilm indications
- Bromoform dominance, a finding compatible with possible Br⁻ presence in feed water. This hypothesis requires confirmation by direct bromide analysis.

6.2 Interpretation of HAA Levels

HAAs of 104.4 µg/L (DBAA 62.2 + TCAA 42.2 µg/L) are the most important technical point of attention in the dataset. The value exceeds the U.S. EPA drinking-water limit for HAA5 (≤ 60 µg/L), which is cited only as an indicative comparison point, since there is no harmonized European or Greek limit for HAAs in pool water. Comparison with drinking-water limits is not directly applicable because exposure patterns and intake routes differ substantially. Nevertheless, the finding shows that stable low chlorination may be associated with low THMs under specific conditions, but it is not sufficient by itself for full control of non-volatile HAAs when bromides or organic precursors are present.

- DBAA dominance (brominated): consistent with possible Br- presence in feed water — direct measurement is required for confirmation
- TCAA presence: compatible with chlorination and organic precursors
- DCAA absence (< 5 µg/L): unusual for a chlorinated pool; possible explanations include low Cl₂ dose, bromide chemistry, and specific sampling conditions
- HAAs: because of low volatility, they tend to remain in the water and accumulate; therefore, they require separate monitoring and must not be evaluated only through THMs

6.3 Role of a Clean Filter as an Independent Factor

No visual indications of biofilm were observed in the filter medium or on the pool walls during inspection, but laboratory confirmation was not performed. This finding may represent an independent factor reducing organic precursors, beyond chlorine dosing. According to the literature (Hansen et al., 2012), filter biofilm can act as a DOC reservoir that continuously supplies the water with DBP precursors. Its possible contribution in the present case remains an estimate and requires laboratory verification.

6.4 Interpretation of the 96.7% Reduction in Active Chlorine Consumption

In the specific installation, the transition from the previous NaOCl regime to a controlled low-dose TCCA protocol was associated with a 96.7% reduction in introduced active chlorine. The result should not be attributed exclusively to the disinfectant type, but to the overall operating protocol, low bather load, CYA stabilization, operating temperature, and specific installation conditions.

7. Limitations

- Limited dataset: Two pools in one geographic area. This is insufficient for statistically significant conclusions.
- Low bather load: The results apply to ≤ 10 users/day. They are not directly generalizable to public facilities.
- Single chemical sampling event (Pool A): No time evolution of DBPs during the day or season was recorded.
- Absence of DBP measurements after intervention (Pool B): No laboratory THM/HAA measurements exist after replacing NaOCl with TCCA.
- Sampling time 09:00: Corresponds to the minimum daily value. Afternoon values are estimated to be 50–100% higher.
- Bromide ions: Br- presence in network water was not measured — it is inferred from bromoform dominance among THMs.
- No DOC/TOC measurement: Dissolved organic carbon concentration was not directly measured.
- Simplified CT calculation: Turnover time was used — not hydraulic residence time (HRT), which is more accurate.

8. Conclusions

Based on the results and under the stated conditions, the following conclusions are drawn:

- Application of stable low-dose TCCA (0.47 mg/L/day) in a low-load outdoor pool was associated with TTHM 8.6 µg/L and HAAs 104.4 µg/L. THMs were low, while HAAs were elevated compared with the indicative U.S. EPA drinking-water limit (HAA5 ≤ 60 µg/L). The finding shows that THMs and HAAs must be evaluated separately.
- THMs consisted exclusively of bromoform, a finding suggesting possible bromide-ion presence in the feed water. The hypothesis requires confirmation through direct Br⁻ analysis.
- Microbiological indicators (5 parameters) were non-detectable in the available analyses. The result is positive for the specific conditions, but it does not constitute general operating evidence at low FC, especially because the estimated CT_{effective} is below conservative reference points.
- In Pool B, the transition from NaOCl to a controlled TCCA protocol was associated with a 96.7% reduction in introduced active chlorine, low CC (0.1–0.2 mg/L), non-detectable microbiological indicators, and no visual biofilm indications for 2.5 years.
- The absence of visual biofilm indications in the filter medium may be a factor reducing organic precursors and DBPs. Because no laboratory confirmation was performed, the finding should be treated as a technical observation, not as quantified proof.
- The results are not directly generalizable to high-load or public-use facilities without repeated chemical and microbiological measurements, direct Br⁻ and DOC/TOC measurement, and compliance review under applicable legislation.

9. Recommendations for Further Research

- DBP measurement in Pool B after intervention — laboratory verification of the theoretical estimate
- Application of the protocol in moderate-load public pools (50–200 users/day) with full parameter measurement
- Analysis of bromide ions (Br⁻) in feed water — confirmation of the bromoform hypothesis
- DOC/TOC measurement in parallel with DBPs — quantification of the relationship
- Comparison of sand versus glass filter media regarding biofilm development and DBPs
- DBP time-series measurements (morning/noon/afternoon) to map daily variation

10. References

- [1] World Health Organization (2022). Guidelines for Safe Recreational Water Environments, Vol. 2: Swimming Pools and Similar Environments. Geneva: WHO. ISBN 978-92-4-156785-0.
- [2] Richardson S.D. et al. (2010). Occurrence, genotoxicity, and carcinogenicity of regulated and emerging disinfection by-products in drinking water. *Mutation Research*, 636(1–3), 178–242. <https://doi.org/10.1016/j.mrrev.2007.09.001>
- [3] Chowdhury S. et al. (2014). Disinfection by-products in swimming pool: Occurrences, implications and future needs. *Water Research*, 53, 68–109. <https://doi.org/10.1016/j.watres.2014.01.017>
- [4] Kanan A. & Karanfil T. (2011). Formation of disinfection by-products in indoor swimming pool water. *Water Research*, 45(16), 5084–5092. <https://doi.org/10.1016/j.watres.2011.07.016>

- [5] Hansen K.M.S. et al. (2012). Particles in swimming pool filters — does pH determine the DBP formation? *Chemosphere*, 87(3), 325–331. <https://doi.org/10.1016/j.chemosphere.2011.12.001>
- [6] Manasfi T. et al. (2017). Identification of disinfection byproducts in freshwater and seawater swimming pools and evaluation of genotoxicity. *Environment International*, 103, 57–67. <https://doi.org/10.1016/j.envint.2017.03.025>
- [7] White G.C. (1999). *Handbook of Chlorination and Alternative Disinfectants*, 4th Ed. New York: Wiley.
- [8] Wojtowicz J.A. (2001). Effects of cyanuric acid on pool water chemistry. *Journal of the Swimming Pool and Spa Industry*, 4(2), 17–22.
- [9] Montana Department of Public Health and Human Services (DPHHS). Cyanuric Acid in Swimming Pools. <https://dphhs.mt.gov/assets/publichealth/FCS/PublicSwimmingPools/CyanuricAcid.pdf>
- [10] VELTIA Labs (2024). Test Report No. 15-891/02.10.2024/GR. Environmental Laboratory, Sindos. [Internal documentation file]
- [11] ANALYSIS-DELKOF S.A. (2023). Certificate of Analysis Code 4101/10/231003, 06/10/2023. Kopanos, Naousa. [Internal documentation file]
- [12] Amusement Logic (2024). Biofilm in swimming pools — formation, effects and prevention. <https://amusementlogic.com/general-news/biofilm-in-swimming-pools/>
- [13] CDC (2023). Healthy Swimming — Operating Public Pools. <https://www.cdc.gov/healthy-swimming>

Legal Reservation

This technical white paper is issued by PoolDesign for informational and scientific purposes. It does not constitute a universal operating guideline for swimming pools, a recommendation to reduce residual chlorine, or a substitute for national operating requirements.

Any application requires:

- compliance with applicable national and European legislation,
- assessment by a qualified technician or engineer,
- individualized analysis of the parameters of the specific installation,
- laboratory verification where conditions differ from the two cases presented.

PoolDesign bears no responsibility for applications that have not previously been assessed as described above.

Appendix A — Indicative Time Series of FC, CC and Estimated HOCl

Note: The time series is indicative and is used solely to visualize the relationship between FC, CC, and estimated HOCl. It is not a complete laboratory DBP time series or a direct HOCl measurement.

