

# Chemical and Odour Removal of the UltraStream Water Treatment System



AlkaWay

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UltraStream Water Treatment System

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## 1.0 Introduction

This work has been designed to provide a preliminary assessment of the chemical removal capacity of the ultraStream alkalising water treatment system according to the AS/NZS 4348:1995 Water supply – Domestic type water treatment appliances – Performance requirements. For full compliance for chemical removal, AS/NZS 4348:1995 requires two filtration devices tested in parallel to achieve 66% or greater removal of a chemical from a spiked challenge solution at five different points through the life of the treatment device (measured in the number of litres of potable water filtered through the device). To provide a preliminary measure of compliance of the ultraStream system, a spiked “Witch’s Brew” challenge solution was treated by the system and the chemical removal efficiency assessed for a pristine system and after it had filtered 3600 L potable water (120% of the 3000 L filter life specified by the distributor). Though not fully compliant to the standard, this testing protocol provides ample indication of the chemical removal capacity of the ultraStream system and allows a cost-effective means of screening a wider array of contaminants.

## 2.0 Methodology

A single ultraStream water treatment system was plumbed into the local domestic water supply and the maximal flow rate was through the system with the supply tap fully open was measured using a volumetric cylinder and a stop watch (2.6 L/min). The ultraStream unit was then removed from the local domestic water supply and 10 L of chemical challenge solution was passed through system at a flow rate of 1.8 L/min using an external pump. Samples were collected before and after treatment for analysis of trace level contaminants in NATA accredited testing faculties. The ultraStream system was then reconnected to the local domestic water supply and water passed through the system continuously for 23 hours at 2.6 L/min until approximately 3600 L had been filtered. The flow rate of the filtered water from the ultraStream was measured again to ensure there was no reduction in flow rate due to filter clogging. A second 10 L of challenge solution was passed through the ultraStream system using the same conditions as the first challenge test and samples taken pre and post treatment for chemical analysis.

### 3.0 Results

Results are displayed in Table 2. Chemical concentrations for compliance to chemical and odour removal requirements according AS/NZS 4348 are displayed. **The data reported here is a preliminary assessment of chemical and free chlorine removal capacity. As full chemical and odour removal testing according to the AS/NZS 4348: 1995 (Appendix B: Chemical reduction and filter life test) was not conducted these results DO NOT indicate the ultraStream water treatment system meets the standard.**

- The result has been considered compliant to AS/NZS 4348 for chemical removal if treatment resulted in a 66% or greater removal of the analyte in both the new filter and at 120% of the 3000 L filter life specified by the supplier (Refer AS/NZS 4348: 1995 Section 3.2).
- Free Chlorine and Odour Control: Table 1 is annotated directly from AS/NZS 4348: 1995 Section 5.2 and outlines the classifications for different grades of free chlorine removal. Values in Table 1 for compliance to AS/NZS 4348: 1995 indicate achievement Class I removal.

*Table 1: Requirements for chlorine removal classification stipulated in AS/NZS 4348: 1995 Section 5.2*

| Class | Chlorine removal |
|-------|------------------|
| I     | 75% or greater   |
| II    | 50% - 75%        |
| III   | 25% - 50%        |

Table 2a: Physicochemical testing

| Physicochemical Parameters   | New Filter    |                | After filtration of 3600L potable water |                | Unit | Limit of Quantification |
|------------------------------|---------------|----------------|---|----------------|------|-------------------------|
|                              | Pre-treatment | Post-treatment | Pre-treatment                           | Post-treatment |      |                         |
| pH                           | 3.9           | 10.6           | 6.1                                     | 9.5            | N/A  | 0.03                    |
| Turbidity                    | 2             | 0.81           | 2                                       | 1.1            | NTU  | 0.1                     |
| Total Dissolved Solids (TDS) | 180           | 160            | 190                                     | 160            | mg/L | 1                       |

Table 2b: Chemical and disinfectant removal compliance to AS/NZS 4348: 1995

| Test                              | New Filter    |                |                                  | After filtration of 3600L potable water |                |                                  | Unit | Limit of Quantification |
|-----------------------------------|---------------|----------------|----------------------------------|---|----------------|----------------------------------|------|-------------------------|
|                                   | Pre-treatment | Post-treatment | Compliant removal concentration† | Pre-treatment                           | Post-treatment | Compliant removal concentration† |      |                         |
| <b>Chlorination Odour Control</b> |               |                |                                  |   |                |                                  |      |                         |
| Free Chlorine                     | 0.77          | < 0.01         | 0.19                             | 1.65                                    | 0.02           | 0.41                             | mg/L | 0.01                    |
| <b>Metals</b>                     |               |                |                                  |   |                |                                  |      |                         |
| Aluminium                         | 0.73          | 0.009          | 0.24                             | 0.66                                    | 0.073          | 0.22                             | mg/L | 0.005                   |
| Iron                              | 0.91          | 0.02           | 0.30                             | 0.93                                    | < 0.01         | 0.31                             | mg/L | 0.01                    |
| Zinc                              | 9.2           | 1.6            | 3.07                             | 9.2                                     | 1.3            | 3.07                             | mg/L | 0.01                    |
| Lead                              | 0.083         | 0.011          | 0.03                             | 0.094                                   | 0.01           | 0.03                             | mg/L | 0.005                   |
| Copper                            | 0.67          | < 0.005        | 0.22                             | 0.72                                    | 0.06           | 0.24                             | mg/L | 0.005                   |
| Calcium                           | 4.1           | 7.1            | N/A                              | 6.8                                     | 9.4            | N/A                              | mg/L | 1                       |
| Potassium                         | 7.4           | 7.1            | N/A                              | 6.9                                     | 6.8            | N/A                              | mg/L | 0.5                     |
| Sodium                            | 29            | 29             | N/A                              | 14                                      | 14             | N/A                              | mg/L | 0.5                     |
| Magnesium                         | 4.7           | 6.4            | N/A                              | 5.5                                     | 13             | N/A                              | mg/L | 0.5                     |

Table 2b continued

| Test                             | New Filter    |                |                                  | After filtration of 3600L potable water |                |                                  | Unit | Limit of Quantification |
|----------------------------------|---------------|----------------|----------------------------------|---|----------------|----------------------------------|------|-------------------------|
|                                  | Pre-treatment | Post-treatment | Compliant removal concentration† | Pre-treatment                           | Post-treatment | Compliant removal concentration† |      |                         |
| <b>Organochlorine Pesticides</b> |               |                |                                  |   |                |                                  |      |                         |
| α-Hexachlorocyclohexane (α-BHC)  | 9.3           | < 0.2          | 3.10                             | 8.8                                     | < 0.2          | 2.93                             | µg/L | 0.2                     |
| β-Hexachlorocyclohexane (β-BHC)  | 21.4          | < 0.2          | 7.13                             | 20.4                                    | < 0.2          | 6.80                             | µg/L | 0.2                     |
| δ-Hexachlorocyclohexane (δ-BHC)  | 17.7          | < 0.2          | 5.90                             | 19.5                                    | < 0.2          | 6.50                             | µg/L | 0.2                     |
| Lindane                          | 13.1          | < 0.2          | 4.37                             | 13.3                                    | < 0.2          | 4.43                             | µg/L | 0.2                     |
| Endosulfan-β                     | 1.6           | < 0.5          | 0.53                             | 2.2                                     | < 0.5          | 0.73                             | µg/L | 0.5                     |
| Endosulfan sulphate              | 5.9           | < 0.5          | 1.97                             | 7.7                                     | < 0.5          | 2.57                             | µg/L | 0.5                     |
| Endrin                           | 7.1           | < 0.5          | 2.37                             | 9.3                                     | < 0.5          | 3.10                             | µg/L | 0.5                     |
| Heptachlor epoxide               | 0.27          | < 0.2          | 0.09                             | 0.27                                    | < 0.2          | 0.09                             | µg/L | 0.2                     |
| <b>Phosphorous</b>               |               |                |                                  |   |                |                                  |      |                         |
| Phosphorous (Total)              | 1.7           | 0.03           | 0.57                             | 1.8                                     | 0.051          | 0.60                             | mg/L | 0.005                   |
| <b>Halides</b>                   |               |                |                                  |   |                |                                  |      |                         |
| Fluoride                         | 5.4           | 1.2            | 1.80                             | 4.8                                     | 2.7            | 1.60                             | mg/L | 0.1                     |
| Iodide                           | 15.9          | 0.09           | 5.3                              | 15.9                                    | 0.7            | 5.3                              | mg/L | 0.001                   |

† Concentration to meet chemical and chlorine removal requirements to comply with AS/NZS 4348: 1995.

Colour coding system:



