

LifeStraw[®] 

PEAK SERIES

GRAVITY WATER PURIFIER

Performance & Test
Reports

TABLE OF CONTENTS

| | |
|--------------------------|----|
| LifeStraw Difference | 3 |
| How we test our products | 4 |
| Performance Data Sheet | 5 |
| Microplastic Reduction | 6 |
| Microbial Reduction | 8 |
| Longevity Test | 10 |
| Virus Reduction | 14 |



LifeStraw products have a history of use in some of the harshest conditions around the world, from refugee camps to natural disasters to extreme back-country, our products have to work because lives depend on them. Our testing and transparency is unparalleled, as is our commitment to social impact and environmental sustainability.

WHAT SETS LIFESTRAW APART

1. Tough and Minimalist: Our products are made with minimal spare parts and are used in the toughest conditions around the world.
2. LifeStraw is the only water filter brand that owns and operates its own fully equipped ISO certified water laboratory
3. 4-step quality control including microbiological testing over every single batch of filters.
4. We give back: We provide a year of safe water to a child in need for every LifeStraw product sold.
5. Transparent testing: We share all internal and external lab reports publicly, on our website.
6. Optimal flow rates: Optimized to operate off of human sucking & last longer in sandy & silty conditions.
7. Sustainable packaging: All packaging is free of plastic and is fully recyclable or compostable
8. It's all about the 9s: We report log removal (99.999999%) data for all of our microbiological claims.



HOW WE TEST OUR PRODUCTS

LifeStraw's testing and transparency is unparalleled and we use the most trusted performance criteria based on protocols established by the World Health Organization, the US EPA, NSF International and the Water Quality Association.

ALL LIFESTRAW PRODUCTS REMOVE:

- LOG 8 (99.999999%) for Bacteria
- LOG 5 (99.999%) for parasites/amoebas/cysts
- LOG 5 (99.999%) for microplastics
- BPA FREE
- FDA Food Grade Materials

4 STEP QUALITY CONTROL

LifeStraw puts 100% of its filters through a rigorous quality control process.

STEP 1: Resistance test at high pressure.

STEP 2: Bubble test to confirm pore size.

STEP 3: Particle test to ensure nothing the size of bacteria or larger can pass through the filters.

STEP 4: We send a sample from every batch for full Bacteria and Protozoa log removal tests.

MICROBIOLOGICAL TESTING - HOW ITS DONE

The only accepted scientific evaluation of microbiological filtration performance is log values (the number of 9s in 99.999999%). PERIOD. All internationally accepted protocols from ANSI, WQA, NSF International, the US EPA, and the World Health Organization evaluate performance through log removal testing. None of these bodies will certify anyone based on pore size; it is ACTUAL PERFORMANCE that matters. LifeStraw products exceed all log-based performance standards.

LifeStraw is the only water filter brand that owns and operates its own fully equipped ISO certified water laboratory capable of performing cutting edge tests on microbiological performance longevity, turbidity and other performance indicators. LifeStraw also tests all products through external internationally recognized labs.



PEAK GRAVITY WATER PURIFIER

PERFORMANCE DATA

INDEPENDENTLY TESTED

LifeStraw water purifiers are rigorously tested by independent labs and our own ISO certified lab to meet protocols established by the US Environmental Protection Agency (EPA) and NSF International/ANSI.

- Membrane Ultrafilter pore size - 0.02 micron
- Meets NSF/ANSI P231 standard for reduction of viruses, bacteria, and parasites



**MEMBRANE ULTRAFILTER
LASTS UP TO 18,000 L**

REMOVES 99.99% OF VIRUSES

| | | |
|-----------------------------|-----------------------------|----------------------|
| Adenoviridae | Influenzavirus | Human parvovirus B19 |
| Astroviridae | Norovirus | Rhinovirus |
| Calicivirus | Human parainfluenza viruses | Rotavirus |
| Enterovirus | (HPIVs) | Alphavirus |
| Hepatovirus A (Hepatitis A) | Paramyxovirus | Rubivirus (Rubella) |

REMOVES 99.999% OF PARASITES

| | | |
|-----------------------|-------------------------------------|-----------------|
| Ascaris lumbricoides | Giardia intestinalis (Beaver Fever) | Taenia saginata |
| Cryptosporidium spp. | Naegleria gruberi | |
| Entamoeba histolytica | Schistosoma mansoni | |

REMOVES 99.999999% OF BACTERIA

| | | |
|---------------------------|---|----------------------------|
| Brucella melitensis | Yersinia enterocolitica | Mycoplasma pneumoniae |
| Campylobacter jejuni | Yersinia pestis | Burkholderia pseudomallei |
| Francisella tularensis | Enteropathogenic Escherichia coli (E. coli) | Salmonella enterica |
| Pseudomonas aeruginosa | Haemophilus influenzae | Salmonella typhi (Typhoid) |
| Shigella | Klebsiella pneumoniae | Streptococcus pneumoniae |
| Staphylococcus aureus | Legionella pneumophila | Streptococcus pyogenes |
| Vibrio cholerae (Cholera) | Mycobacterium tuberculosis | Leptospira |
| Vibrio parahaemolyticus | | |

REMOVES 99.999% OF MICROPLASTICS

REDUCES TURBIDITY (SILT, SAND, CLOUDINESS)

The above is not an exhaustive list of all bacteria, parasites, and other contaminants removed by LifeStraw filters but rather the main waterborne disease-causing contaminants. If you have additional questions about a specific contaminant not included on the list, please email us at info@lifestraw.com.


**IAPMO INDIA PRIVATE LIMITED
LABORATORY**

No.43, PMR Tower, 3rd Floor, Above SBI, Beretena Agrahara,
Near Hosa Road Junction, Hosur Main Road,
Bangalore - 560 100 Karnataka INDIA
Ph: + 91 7349604940
GSTIN:29AABC18589C1Z7
<http://www.iapmoindia.org>

TEST REPORT

Report No: IAPMOI/LAB/19864/23-24
Date: 12.04.2023.

| CUSTOMER DETAILS | SAMPLE DETAILS | TEST DETAILS |
|---|--|---|
| Name & Address Kind Attn: Mr. Chung Quang Nguyen Vestergaard Frandsen Inc., 333, W Ostend St. Suite 300 Baltimore, MD 21230, USA | Sample received: 03.04.2023 | Method: Microplastic reduction (as 1 micron plastic spheres) – black dyed microspheres |
| | Sample code no: IAPMOI/LAB/19864/23-24 | |
| | Sample Description: LifeStraw Peak Gravity purifier product | |
| | Sample Quantity for Testing: 1 No | |
| | Submitted by: Vestergaard Frandsen Inc. | |
| | Product supplied: NA | |
| | Date of Analysis started: 05.04.2023 | |
| | Date of Analysis Completed: 12.04.2023 | |
| | Subcontract: Not Applicable | |
| Sample condition when received: Intact | | |

EXECUTIVE SUMMARY: One sample of LifeStraw Peak Gravity Purifier product was tested for reduction of Microplastic (as 1 micron poly styrene black dyed microspheres) at very high loads in influent water. The product has reduced microplastic (as 1-micron microspheres) at >99.9994% (5.2 log) .

PRODUCT PICTURE

Report No: IAPMOI/LAB/19864 /23-24, Date: 12.04.2023, Page 1 of 2
RECOGNIZED BY IAPMO R&T – USA

We undertake analytical job for water, food, biocidal resins, detergents & sanitizers and soil. We carry out performance evaluation of drinking water treatment units as per NSF/ANSI specifications. Based on performance we can arrange for certification from IAPMO – USA

Note:

- The results pertain only to the tested samples and applicable parameters.
- Samples will be disposed after 15 days from the issue of test certificate unless otherwise specified, in case of bacteriological tests, the samples will be disposed after 7 days itself from the date of issuing the certificate.
- This report is not to be reproduced either wholly or in parts and cannot be used as evidence in the court of Law and should not be used in any advertising media without prior written permission.
- In case, any recommendation of contents of this certificate is required please contact our office.


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TEST REPORT

DATA: 1-microspheres reduction test after 10-15 liters

| Tested parameter | LifeStraw Peak Gravity Purifier – 1 | | |
|----------------------|--|------------------------------------|------------------------|
| | Input Water Microspheres Count | Output Water Microspheres Count | % Reduction |
| 1-micron microsphere | 2.57x 10 ⁷ Microspheres/ L | <160 Microspheres/L | >99.9994 (5.20 log) |

<160cells/L: detection limit of 1-micron microsphere analysis method

LifeStraw Peak Gravity Purifier - Flow rate: 450ml/min
Samples were taken after 10 liters of filtration.

General Test Water Composition:
pH-7.45, TDS-310ppm, Turbidity- 1.0 NTU, TOC- 1.0 mg/L Temperature- 23.5°C

Dr Vishwanath N H
Technical Manager

Report No: IAPMO/LAB/19864 /23-24, Date: 12.04.2023, Page 2 of 2
00-----End of the Test Report -----00

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TEST REPORT

Report No: IAPMOI/LAB/19864/23-24

Date: 12.04.2023.

| CUSTOMER DETAILS | SAMPLE DETAILS | TEST DETAILS |
|---|---|---------------------------------------|
| Name & Address Kind Attn: Mr. Chung Quang Nguyen Vestergaard Frandsen Inc., 333, W Ostend St. Suite 300 Baltimore, MD 21230, USA | Sample received: 03.04.2023 | Method: NSF P 231 NSF 53 |
| | Sample code no: IAPMOI/LAB/19864/23-24 | |
| | Sample Description: LifeStraw Peak Gravity Purifier product | |
| | Sample Quantity for Testing: 1 No | |
| | Submitted by: Vestergaard Frandsen Inc. | |
| | Product supplied: NA | |
| | Date of Analysis started: 05.04.2023 | |
| | Date of Analysis Completed: 12.04.2023 | |
| Subcontract: Not Applicable | | |
| | Sample condition when received: Intact | |

EXECUTIVE SUMMARY: One sample of LifeStraw Peak Gravity Purifier product was tested for reduction of *E.coli*, *Klebsiella terrigena* bacteria and MS2 phage virus and 3-micron Microspheres as artificial cysts at very high loads in influent water. The products have reduced *E. Coli* (9.84 log), *Klebsiella terrigena* (9.95 log), MS2 phage virus (5.69log) and 3-micron microspheres (5.13 log) which exceeds requirements of NSF P231 standard on bacteria, virus, and protozoa removal. The sample was tested for Turbidity reduction test with 11 ± 1 NTU as per the requirements of NSF-53 and the product water shown <0.5 turbidity hence, passing the criteria as per of NSF 53 for turbidity reduction test.

PRODUCT PICTURE



Report No: IAPMOI/LAB/19864 /23-24, Date: 12.04.2023, Page 1 of 2

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TEST REPORT

DATA: Microbial reduction, microspheres reduction and turbidity reduction test after 10-15 liters

| Tested parameter | LifeStraw Peak Gravity Purifier – 1 | | |
|--|---|----------------------------------|---------------------------|
| | Input Water Microbial Count | Output Water Microbial Count | % Reduction |
| <i>E. coli</i> MTCC 68 | 7.0 x 10 ⁷ Cfu/ml | No Viable counts/100 ml | >99.9999999 (9.84 log) |
| MS2 phage ATCC 15597 B1 | 5.0x 10 ⁵ Pfu/ml | No Plaque forming units/ml | >99.9998 (5.69 log) |
| <i>Klebsiella terrigena</i> MTCC 2271 | 9.0x10 ⁷ Cfu/ml | No Viable counts/100 ml | >99.9999999 (9.95 log) |
| 3-micron microsphere | 2.15 x 10 ⁷ Microspheres/ L | <160 Microspheres/L | >99.9993 (5.13 log) |
| Turbidity in NTU | Input water turbidity in NTU | Output water turbidity in NTU | 96% |
| | 11.5 NTU | < 0.5 NTU | |

Cfu: Colony forming units.

Pfu: Plaque forming units,

<160cells/L: detection limit of 3-micron microsphere analysis method

LifeStraw Peak Gravity Purifier - Flow rate: 450ml/min

Samples were taken after 10 liters of filtration.

General Test Water Composition:

pH-7.45, TDS-310ppm, Turbidity- 1.0 NTU, TOC- 1.0 mg/L Temperature- 23.5°C

Dr Vishwanath N H
Technical Manager

Report No: IAPMOI/LAB/19864 /23-24, Date: 12.04.2023, Page 2 of 2
00-----End of the Test Report -----00

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Study Report

PHÒNG THÍ NGHIỆM NƯỚC
Water Laboratory

Performance on Longevity of LifeStraw Peak Gravity Purifier

Study Number: LSF.22.1001.4

| | |
|-------------------------------|---------------------------------|
| Attention to: Jean Luc Madier | Date of issuance: 21 March 2023 |
| Issued by: Chung Quang Nguyen | Approved by: Le Thu Cao |

Overview

LifeStraw (LS) Peak Gravity Purifier is the water filter product applying ultra filtration (UF) membrane technology for households/outdoor activities to remove the microorganisms in water.

In this study, the longevity (filtration lifetime) of LS Peak Gravity Purifier was evaluated, and microbiological removal efficacy was tested along the longevity test. The filtration lifetime of product was tested following US EPA (1) and NSF P231 (2) protocols.

All tested samples have been tested till 6000L under NSF P231 test conditions then extrapolation analysis was applied to estimate the full lifetime of the product.

During the test, the flowrate of the samples was about 450ml/min (27L/h) at the beginning, then decreased slowly over the filtrated volume and maintained stable at around 200-250ml/min (12-15L/h) since 3000L.

All tested samples could remove bacteria at higher than 8log reduction and remove virus at higher than 5log reduction during the test. The turbidity of filtrated water was lower than 0.5NTU at all sampling points of all tested samples, and it was 0.1 NTU in average. The quality of the filtered water exceeded requirements of US EPA/NSF P231 on bacteria removal ($\geq \log 6$), virus removal ($\geq \log 4$), and turbidity removal (≤ 0.5 NTU).

Extrapolation analysis showed that the samples can exceed 18000L (target lifetime) without any possible clog before 14000L. From 14000L the flow rate might fall below 100ml/min and need to apply the available unclogging step to maintain higher flow rate till end of lifetime of 18000L.



VESTERGAARD 
IMPACTING PEOPLE

References

- 1) US EPA Guide Standard and Protocol for Testing Microbiological Water Purifiers, April 1987.
- 2) NSF Protocol P231, Microbiological Water Purifiers, 2014.
- 3) WHO (2011), Evaluating household water treatment options: Health-based targets and microbiological performance standards, Geneva, World Health Organization.
- 4) NSF/ANSI 53, Drinking water treatment units – health effects, 2021.
- 5) WL.SOP.062 - SOP Validation LifeStraw Peak Gravity Purifier.

Procedure/ Testing methods

Following US EPA/ NSF P231 protocols, 5 replicates of LS Peak Gravity Purifier were aged with general test. At the beginning and after each 1000L of longevity, samples were tested with challenge test water to evaluate the microbial removal efficacy (*E.coli*, MS2 virus and protozoa) of the product.

Operating the product during testing was done following WL.SOP.062 (5).

Testing water conditions were prepared and controlled following US EPA (1), NSF P231 (2).

Monthly cleaning was applied for all tested samples for every 300L point, following WL.SOP.062 (5).

Results and discussions

1. Longevity performance

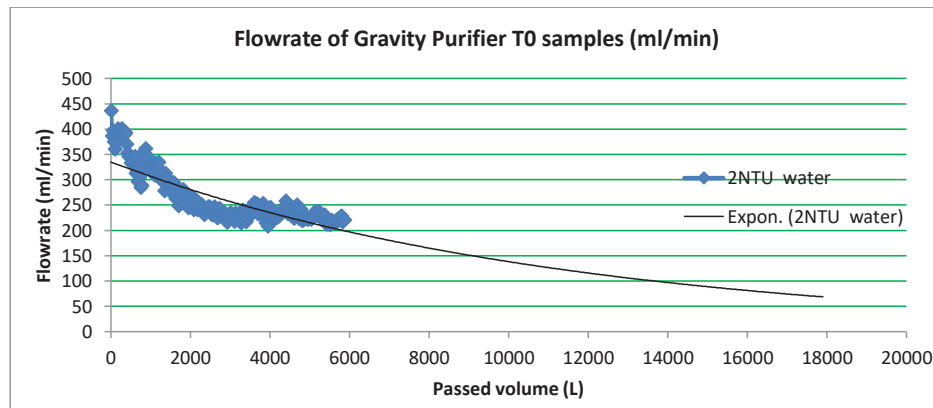


Figure 1: Flowrate of the tested samples of LS Peak Gravity Purifier

- At the beginning, flowrate of the tested samples was around 450ml/min (27L per hour). Then flowrate decreased slowly over the filtrated volume and maintained stable at around 200-250ml/min (12-15L/h) since 3000L.

LONGEVITY TEST

Water Laboratory

LSF.22.1001.4 – Longevity of LS Peak Gravity Purifier _ Report

- Extrapolation analysis showed that the samples can exceed 18000L (target lifetime) without any possible clog before 14000L. From 14000L the flow rate might fall below 100ml/min and need to apply the available unclogging step to maintain higher flow rate till end of lifetime of 18000L.
- Turbidity of effluent water was about 0.1 NTU in average, and lower than 0.5NTU at all sampling points of all tested samples (table 1). This result met NSF 53 (4) and USEPA (1) requirements on turbidity of effluent water.

Table 1: Summary of turbidity of effluent water of LS Peak Gravity Purifier

| Sample | LS.22.359.1 | LS.22.359.2 | LS.22.359.3 | LS.22.359.4 | LS.22.359.5 | Average |
|---------|-------------|-------------|-------------|-------------|-------------|---------|
| Average | 0.10 | 0.10 | 0.09 | 0.10 | 0.10 | 0.10 |
| Min | 0.05 | 0.05 | 0.06 | 0.05 | 0.06 | 0.05 |
| Max | 0.15 | 0.15 | 0.15 | 0.25 | 0.26 | 0.19 |

2. Microbial removal efficacy

- LS Peak Gravity Purifier uses ultra filtration (UF) membrane technology which can remove microorganisms bigger than its pore size of 20nm (0.02µm), thus, it can remove E.coli bacteria (ca. 0.5x2µm), protozoa cysts (minimum 3µm), and virus (MS2 coliphage ca. 23-28nm).
- The removal of protozoa will be tested at end of lifetime (as 3 micron microspheres surrogate). Removal of *E.coli* (the smaller tested organisms) guaranteed removal of protozoa.
- The results showed that, throughout the test , microorganism removal efficacy of all LS Peak Gravity Purifier samples was higher than 8.2 log reduction of *E.coli*, and 5.2 log reduction of MS2 virus.
- LS Peak Gravity Purifier exceeded the requirements of US EPA (1)/ NSF P231 (2) on bacteria removal ($\geq \log 6$), virus removal ($\geq \log 4$) (table 2).

Table 2: Summary of microorganism log reduction of LS Peak Gravity Purifier samples

| Challenging point | Log Reduction of E.coli and MS2 at challenging points | | | | | | | | | | | | | |
|-------------------|---|-----|--------|------|--------|------|--------|------|--------|------|--------|------|--------|------|
| | Beginning | | 1000L | | 2000L | | 3000L | | 4000L | | 5000L | | 6000L | |
| Samples | E.Coli | MS2 | E.Coli | MS2 | E.Coli | MS2 | E.Coli | MS2 | E.Coli | MS2 | E.Coli | MS2 | E.Coli | MS2 |
| LS.22.359.1 | >8.4 | 5.3 | >8.6 | >6.6 | >8.3 | >6.5 | >8.6 | 5.9 | >8.8 | 5.8 | >8.8 | 5.5 | >8.8 | 5.4 |
| LS.22.359.2 | >8.6 | 5.6 | >8.6 | 6.2 | >8.3 | >6.8 | >8.6 | >6.3 | >8.8 | 6.3 | >8.8 | 6.2 | >8.8 | 5.5 |
| LS.22.359.3 | >8.6 | 5.6 | >8.6 | >6.9 | >8.3 | 6.3 | >8.6 | >6.6 | >8.8 | >6.3 | >8.8 | >6.3 | >8.8 | 6.3 |
| LS.22.359.4 | >8.2 | 5.5 | >8.6 | >6.9 | >8.3 | >6.8 | >8.2 | >6.3 | >8.8 | >6.6 | >8.8 | >6.3 | >8.8 | >6.3 |
| LS.22.359.5 | >8.6 | 5.2 | >8.6 | 5.7 | >8.3 | 5.9 | >8.2 | 5.5 | >8.8 | 5.8 | >8.8 | 5.5 | >8.8 | 5.5 |

Conclusions

All tested samples have been tested till 6000L under NSF P 231 test conditions then extrapolation analysis was applied to estimate full lifetime of the product.

During the test, flowrate of the samples was about 450ml/min (27L/h) at the beginning, then decreased slowly over the filtrated volume and maintained stable at around 200-250ml/min (12-15L/h) since 3000L.

All tested samples could remove bacteria at higher than 8log reduction and remove virus at higher than 5log reduction during the test. The turbidity of filtrated water was lower than 0.5NTU at all sampling points of all tested samples, and it was 0.1 NTU in average. The quality of the filtered water exceeded requirements of US EPA/NSF P231 on bacteria removal ($\geq\log 6$), virus removal ($\geq\log 4$), and turbidity removal (≤ 0.5 NTU).

Extrapolation analysis showed that the samples can exceed 18000L (target lifetime) without any possible clog before 14000L. From 14000L the flow rate might fall below 100ml/min and need to apply the available unclogging step to maintain higher flow rate till end of lifetime of 18000L.

Certificate of Analysis

PHÒNG THÍ NGHIỆM NƯỚC/ Water Laboratory
ISO/IEC 17025 accredited

Sample Information

| | | | |
|--|---|---------------------|-----------------------|
| Sample | : LifeStraw® Peak Series Gravity Water Purifier System | Requested by | : PARA Membranes Ltd. |
| Quantity | : 15 pcs | Description | : QC Cartridges |
| Date of receipt of test sample (dd/mm/yyyy) | | | : 12/04/2023 |

Analysis Result

| Parameter | Microbiological log ₁₀ reduction | | | Physico-chemical characteristics | | Conclusion | |
|------------------|---|----------------------------|---|---|-----------------------|------------|--------|
| | Bacteria (<i>E.coli</i>) | Viruses (MS2) | Protozoa (3µm spheres surrogate) | Turbidity of effluent water (NTU) | Flow rate (ml/min) | | |
| Reference method | SMEWW 92221:2017 (*) | US EPA 1602:2001 (*) | US EPA 05/9205/ EPADWC (Modified) (*) | SMEWW 2130B:2017 (*) | WL.SOP.136 | | |
| Specification | Min 8 | Min 4 | Min 5 | Max 0.5 | 500 ± 30% | PASSED | |
| 1 | 23053D1 | >9.0 | 5.0 | >5.3 | 0.12 | 440 | PASSED |
| 2 | 23053D1 | >8.1 | 4.3 | >5.3 | <0.12 | 430 | PASSED |
| 3 | 23053D1 | >9.0 | 4.8 | >5.3 | 0.15 | 410 | PASSED |
| 4 | 23053D1 | >9.0 | 4.8 | >5.3 | <0.12 | 450 | PASSED |
| 5 | 23053D1 | >9.0 | 4.2 | >5.3 | <0.12 | 430 | PASSED |
| 6 | 23063D1 | >9.0 | 4.2 | - | <0.12 | 390 | PASSED |
| 7 | 23063D1 | >9.0 | 4.6 | - | <0.12 | 470 | PASSED |
| 8 | 23063D1 | >9.0 | 4.4 | - | <0.12 | 450 | PASSED |
| 9 | 23063D1 | >9.0 | 4.2 | - | <0.12 | 450 | PASSED |
| 10 | 23063D1 | >9.0 | 4.2 | - | <0.12 | 410 | PASSED |
| 11 | 23073D1 | >9.0 | 4.7 | - | <0.12 | 445 | PASSED |
| 12 | 23073D1 | >9.0 | 4.6 | - | <0.12 | 450 | PASSED |
| 13 | 23073D1 | >9.0 | 4.8 | - | 0.13 | 460 | PASSED |
| 14 | 23073D1 | >9.0 | 4.4 | - | <0.12 | 440 | PASSED |

Page 1 of 2

WL-COA-LS PEAK GRAVITY PURIFIER-20230412

Water Laboratory

| Parameter | Microbiological log ₁₀ reduction | | | Physico-chemical characteristics | | Conclusion |
|------------------|---|----------------------|--------------------------------------|-----------------------------------|--------------------|------------|
| | Bacteria (<i>E.coli</i>) | Viruses (MS2) | Protozoa (3µm spheres surrogate) | Turbidity of effluent water (NTU) | Flow rate (ml/min) | |
| Reference method | SMEWW 9222I:2017 (*) | US EPA 1602:2001 (*) | US EPA 05/9205/EPADWC (Modified) (*) | SMEWW 2130B:2017 (*) | WL.SOP.136 | |
| Specification | Min 8 | Min 4 | Min 5 | Max 0.5 | 500 ± 30% | PASSED |
| 15 23073D1 | >9.0 | 4.7 | - | <0.12 | 430 | PASSED |

Note: (*) ISO/IEC 17025 accredited methods

I, the undersigned, hereby declare that the findings provide a true and accurate record of the results obtained on samples as received.

Date and signature

18/04/2023




Cao Thu Le
Water Laboratory Manager

LifeStraw® 