



inc. BIOLOGICAL CONSULTING SERVICES
OF NORTH FLORIDA, INC.

November 15, 2016

Travis Merrigan
GRAYL
1631 15th Ave W. #208
Seattle, WA. 98119

travismerrigan@thegrayl.com

Client ID: Lot: 410-B90033: 6000-7000, Lot: 410-B90033: 7000-8000, Lot: 410-B90033: 9000-10000

BCS ID: 1611108, 1611109, 1611110

Project Name: Purifier Initial Filtration Efficacy Validation

Dear Travis Merrigan,

We have completed the filtration efficacy study on the submitted units as outlined below. The contaminant species, study conditions, and water parameters utilized were based on client's request and adaptation of the guidance documents and protocols listed below:

Validation of Water Purifier Efficacy (Biological): ANSI/NSF protocol 53 and P231 (ISO17025 only accredited)

Following, you will find our report on the results of the study conducted on the referenced samples. Should you have any questions, please do not hesitate to contact me.

Sincerely,

George Lukasik, Ph.D.
Laboratory Director

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Final Report BCS ID 1611108, 1611109, 1611110

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Purifier Initial Filtration Efficacy Validation

BCS LABORATORIES, INC. — GAINESVILLE
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FL DOH #E82924, ISO/IEC 17025:2005 L2422 (L-A-B), PA DEP# 68-03950, EPA# FLO1147
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LABORATORY
ACCREDITATION
BUREAU
a division of A-S-B
ACCREDITED ISO/IEC 17025



Analysis: *3.0 Microspheres Filtration Efficacy (parasite)* Test Water: General Test Water I

Test Point: Water Purifier Filtration Efficacy Validation

Flow rate: N/A pH: 7.41 NTU: 0.74 TDS: 221 Hardness: 132

Influent Conc: 4.10E+04 microspheres/mL

BCS Sample ID 1	1611108	Client ID 1	Lot: 410-B90033: 6000-7000	Press 1(psi): N/A
Eff Conc 1:	<1.00E+00 microspheres/mL	% Reduct 1:	>99.998	Log10 Reduct 1: >4.6
BCS Sample ID 2	1611109	Client ID 2	Lot: 410-B90033: 7000-8000	Press 2(psi): N/A
Eff Conc 2:	<1.00E+00 microspheres/mL	% Reduct 2:	>99.9978	Log10 Reduct 2: >4.6
BCS Sample ID 3	1611110	Client ID 3	Lot: 410-B90033: 9000-10000	Press 3(psi): N/A
Eff Conc 3:	<1.00E+00 microspheres/mL	% Reduct 3:	>99.998	Log10 Reduct 3: >4.6

Test Notes: Microspheres were not detected in units effluent (Qualifier: U). System's performance meets and/or exceeds the NSF P231 water purifier standard for microsphere removal; 3 Log10 or greater (>99.9%).

Analysis: *R. terrigena Bacteria Filtration Efficacy* Test Water: General Test Water I

Test Point: Water Purifier Filtration Efficacy Validation

Flow rate: N/A pH: 7.41 NTU: 0.74 TDS: 221 Hardness: 132

Influent Conc: 4.90E+05 cfu/mL

BCS Sample ID 1	1611108	Client ID 1	Lot: 410-B90033: 6000-7000	Press 1(psi): N/A
Eff Conc 1:	<4.50E-01 cfu/mL	% Reduct 1:	>99.9999	Log10 Reduct 1: >6
BCS Sample ID 2	1611109	Client ID 2	Lot: 410-B90033: 7000-8000	Press 2(psi): N/A
Eff Conc 2:	<4.50E-01 cfu/mL	% Reduct 2:	>99.9999	Log10 Reduct 2: >6
BCS Sample ID 3	1611110	Client ID 3	Lot: 410-B90033: 9000-10000	Press 3(psi): N/A
Eff Conc 3:	<4.50E-01 cfu/mL	% Reduct 3:	>99.9999	Log10 Reduct 3: >6

Test Notes: Bacteria was not detected in units effluent (Qualifier: U). System's performance meets and/or exceeds the NSF P231 water purifier standard for bacterial removal; 6 Log10 or greater (>99.9999%).

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Analysis: MS-2 Virus Filtration Efficacy

Test Water: General Test Water I

Test Point: Water Purifier Filtration Efficacy Validation

Flow rate: N/A pH: 7.41 NTU: 0.74 TDS: 221 Hardness: 132

Influent Conc: 8.20E+05 pfu/mL

BCS Sample ID 1	1611108	Client ID 1	Lot: 410-B90033: 6000-7000	Press 1(psi):	N/A	
Eff Conc 1:	1.40E+00 pfu/mL		% Reduct 1:	99.9998	Log10 Reduct 1:	5.8

BCS Sample ID 2	1611109	Client ID 2	Lot: 410-B90033: 7000-8000	Press 2(psi):	N/A	
Eff Conc 2:	<4.50E-01 pfu/mL		% Reduct 2:	>99.99995	Log10 Reduct 2:	>6.3

BCS Sample ID 3	1611110	Client ID 3	Lot: 410-B90033: 9000-10000	Press 3(psi):	N/A	
Eff Conc 3:	4.50E-01 pfu/mL		% Reduct 3:	99.99995	Log10 Reduct 3:	6.3

Test Notes: System's performance meets and/or exceeds the NSF P231 water purifier standard for virus removal; 4 Log10 or greater (>99.99%).



Project: Purifier Initial Filtration Efficacy Validation
Date Received: November 08, 2016 13:59 Analyst: David Sekora, M.S.
Test Start Date: November 08, 2016 Test End Date: November 09, 2016 Qualifier: U

Report Notes:

This study evaluated and validated the filtration efficacy of the three lot numbers of the provided purifier units. The study only evaluated initial efficacy following conditioning of the units. Briefly, the units were conditioned by passing 2 liters of General Test Water Type 1 (GTW1, Dechlorinated Municipal water) through each of the filters in the provided bottle. An aliquote of GTW1 water was seeded with the indicated contaminants. The solution was thoroughly homogenized and 500mL was added to the Grayl receiving base. The filtrate reservoir was steadily pushed down using downward force until all the challenge water was filtered. A sample from the filtrate was removed and was assayed for the respective species. A sample of the influent challenge water was removed prior to the beginning of the study and at the end. All analysis was conducted in duplicate at minimum. The number of microorganisms was determined in each sample. The respective percent reductions were determined based on the concentration obtained in the filter influent and analyzed effluent sample. Each filter's Influent and effluent samples was analyzed as per laboratory accredited methodology; RT was analyzed as per SM 9215C (APHA 2012), MS-2 as per EPA 1602 (Lab SOP V-10), and fluorescent microspheres as per EPA 1623.1.

*I certify that I have examined I am familiar with the information submitted herein. The results pertain only to the sample(s) analyzed associated identifier #(s). Based on my inquiry of the individuals responsible for the analysis, I believe the data to be true, accurate, and complete. Unit descriptions and names were obtained from the submitted documents. The analysis was authorized and commissioned by the client or client's representative. The resulting data are representative of the analysis conducted on the collected samples and it's/their condition at the time of analysis. The data provided is strictly representative of the study conducted under laboratory conditions using the material/samples/articles provided by the client (or client's representative) and it's (their) condition at the time of test. The data obtained may not be representative or indicative of a real-life process and/or application. The sample(s) were analyzed in accordance with the appropriate method, however due to the inherent limitations of methods, microorganisms may avoid detection. BCS Laboratories offers no express or implied warranties concerning the quality, safety, and/or purity of any sample, batch, source, or the process they are derived from. Quality assurance controls were performed as outlined in the method and as per Good Laboratory Practices. Analyses were performed in accordance with laboratory practices and procedures set-forth by ISO 17025-2005 and NELAP/TNI accreditation standards unless otherwise noted. BCS makes no express or implied warranty regarding the ownership, merchantability, safety or fitness for a particular purpose of any such property or product.

Signature of Laboratory Director/Authorized Rep.  Date: November 15, 2016



DATA QUALIFIER CODES	
SYMBOL	MEANING
D	Measurement was made in the field.
I	The reported value is between the laboratory method detection limit and the laboratory practical quantitation limit.
J1	The sample matrix interfered with the ability to make any accurate determination.
J2	No Quality Control criteria exist for the component.
^	analysis conducted outside the Laboratory's scope of accreditation
L	Off scale high. Actual value is known to be greater than value given.
O	Sampled, but analysis not performed.
Q	Sample held beyond the accepted holding time.
U	Indicates that the compound was analyzed for but not detected. The reported value is the method detection limit.
V	Analyte was detected in both sample and associated method blank. Data may not be accurate.
Y	The laboratory analysis was from an improperly preserved sample. The data may not be accurate.
Z	Too many colonies present (TNTC); the numeric value given represents the upper end of the value that can be determined based on the volume.
?	Data are rejected and should not be used. QC data did not meet acceptance criteria.
**	Analysis of analyte submitted to an accredited sub-contract laboratory.
!	Data deviate from historically established concentration range.
#	BCS Lab specific qualifier. See laboratory analysis notes.

