

**WATERBORNE PATHOGEN REMOVAL EFFICACY TESTING**  
Filtration Efficacy Raoultella terrigena (RT), MS2 Coliphage (Virus), and 3.0 Micron Cysts

Filter Description	Date Tested	pH	Filter Time (min:sec)
GRAYL GeoPress	03/2021	8.31	0:15
PATHOGEN	INFLUENT CONCENTRATION	FILTERED WATER CONCENTRATION	PERCENT REMOVAL
BACTERIA (Raoultella terrigena)	3.93E+05 cfu/mL	<0.45 cfu/mL	>99.9999%
VIRUS (MS2 Coliphage)	4.16E+05 pfu/mL	9.3 pfu/mL	99.998%
PROTOZOAN CYST (3.0um Microsphere)	3.53E+04 Microspheres per mL	<0.67 Microspheres per mL	>99.998%

Filter Description	Date Tested	pH	Filter Time (min:sec)
GRAYL Ultralight	11/2016	7.41	0:15
PATHOGEN	INFLUENT CONCENTRATION	FILTERED WATER CONCENTRATION	PERCENT REMOVAL
BACTERIA (Raoultella terrigena)	4.90E+05 cfu/mL	<4.50E-01 cfu/mL	>99.9999%
VIRUS (MS2 Coliphage)	8.20E+05 pfu/mL	1.40E+00 pfu/mL	99.9998%
PROTOZOAN CYST (3.0um Microsphere)	4.10E+04 Microspheres per mL	<1.00E+00 Microspheres per mL	>99.998%

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 were 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.

**MICROPLASTICS REDUCTION EFFICACY TESTING**  
5-1000 Micron

Filter Description	Date Tested	Turbidity	pH	Flow Rate
GRAYL GeoPress	10/2018	0.2 NTU	7.9	1.5 L/min
MICROPLASTICS	INFLUENT	FILTERED WATER	PERCENT REMOVAL	
Microplastics (5-1000 Micron)	2.5E+05 Particles/mL	2.7E+01 Particles/mL	99.99%	

All collected samples were analyzed in triplicates as per standard laboratory operating procedure. Study & analysis was conducted as per laboratory's accredited ISO17025:2005 methodology: Particles were enumerated using Beckman Coulter MS-4 particle counter, turbidity was measured per SM2130B, pH as per SM4500HB, TDS as per SM2540, and hardness as per SM2340C. Analysis was conducted using calibrated and/or validated instruments to traceable standards (NIST).

**NSF 42-2018: 7.4.1**  
Class I Particle Reduction Efficacy

Filter Description	Date Tested	Turbidity	pH	Flow Rate
GRAYL GeoPress	03/2019	0.4 NTU	7.6	1.5 L/min
PARTICLE	INFLUENT	FILTERED WATER	PERCENT REMOVAL	
CLASS I (0.5 - <1.0 micron)	9.2E+05 particles/mL	2.0E+04 particles/mL	97.8%	

All collected samples were analyzed in duplicates as per standard laboratory operating procedure. Matrix spikes and pre-challenge water samples were also analyzed as per method requirements. Study & analysis was conducted as per laboratory's accredited ISO17025:2005 methodology: Particles were enumerated using Beckman Coulter MS-4 particle counter using a 20-micron aperture, turbidity was measured per SM2130B, pH as per SM4500HB, TDS as per SM2540, and hardness as per SM2340C. Analysis was conducted using calibrated and/or validated instruments to traceable standards (NIST).

**NSF 53-2019: 7.3.2.2.6.3**  
Microsphere Reduction Efficacy

Filter Description	Date Tested	Turbidity	pH	Flow Rate
GRAYL GeoPress	03/2019	0.4 NTU	7.6	1.5 L/min
PARTICLE	INFLUENT	FILTERED WATER	PERCENT REMOVAL	
Parasites (3.0um Microspheres)	1.6E+4 microspheres/mL	7.0E-01 microspheres/mL	99.995%	

All collected samples were stabilized as per method and analyzed in triplicates. Matrix spikes and pre-challenge water samples were also analyzed as per method requirements. Study & analysis was conducted as per laboratory's accredited ISO17025:2005 methodology: Microspheres were enumerated as per EPA 1623.1, turbidity was measured per SM2130B, pH as per SM4500HB, TDS as per SM2540, and hardness as per SM2340C. Analysis was conducted using calibrated and/or validated instruments to traceable standards (NIST).

**CHEMICAL & HEAVY METALS REMOVAL EFFICACY TESTING**  
GRAYL PURIFIER

HEAVY METALS	INFLUENT mg/l	FILTERED WATER mg/l	PERCENT REMOVAL	VOLATILES, <i>Continued</i>	INFLUENT ug/l	FILTERED WATER ug/l	PERCENT REMOVAL
Arsenic	0.45	0.0315	93.00%	Bromoform	750	37.00	95.07%
Cadmium	0.44	0.0011	>99.8%	Bromomethane	50	13.00	>74%
Chromium	0.46	0.0023	>99.5%	Carbon disulfide	20	5.00	>75%
Copper	0.0049	0.0029	40.82%	Carbon tetrachloride	190	11.50	93.95%
Lead	0.46	0.0020	>99.6%	Chlorobenzene	350	3.70	>98.5
Silver	0.15	0.0365	75.67%	Chlorobromomethane	540	115.00	78.70%
				Chlorodibromomethane	650	28.00	95.69%
VOLATILES	INFLUENT ug/l	FILTERED WATER ug/l	PERCENT REMOVAL	Chloroethane	50	13.00	>74%
1,1,1,2-Tetrachloroethane	460	17.00	96.30%	Chloroform	400	50.00	87.50%
1,1,1-Trichloroethane	230	19.50	91.52%	Chloromethane	20	5.00	>75%
1,1,2,2-Tetrachloroethane	840	36.00	95.71%	cis-1,2-Dichloroethene	260	18.50	92.88%
1,1,2-Trichloroethane	740	42.5	94.26%	cis-1,3-Dichloropropene	310	13.00	95.81%
1,1-Dichloroethane	310	52.00	83.23%	Dibromomethane	740	92.50	87.50%
1,1-Dichloroethene	170	13.00	92.35%	Dichlorobromomethane	530	37.50	92.92%
1,1-Dichloropropene	130	6.65	94.88%	Dichlorodifluoromethane	50	13.00	>74%
1,2,3-Trichlorobenzene	440	3.90	>99.11%	Ethylbenzene	230	4.90	97.87%
1,2,3-Trichloropropane	970	39.00	95.98%	Ethylene Dibromide	740	26.00	96.49%
1,2,4-Trichlorobenzene	290	2.90	>99.0%	Hexachlorobutadiene	200	2.00	>99%
1,2,4-Trimethylbenzene	270	4.30	>98.1	Isopropylbenzene	180	7.15	96.03%
1,2-Dibromo-3-Chloropropane	1200	28.00	97.67%	Methyl tert-butyl ether	8.8	2.20	>75%
1,2-Dichlorobenzene	460	2.30	>99.5%	Methylene Chloride	440	175.00	60.23%
1,2-Dichloroethane	590	81.50	86.19%	m-Xylene & p-Xylene	560	6.35	98.87%
1,2-Dichloropropane	370	24.00	93.51%	Naphthalene	690	13.00	>98%
1,3,5-Trimethylbenzene	240	6.10	97.46%	n-Butylbenzene	150	3.40	>97.7%
1,3-Dichlorobenzene	380	3.20	>99.2%	N-Propylbenzene	200	3.90	>98.1%
1,3-Dichloropropane	700	30.00	95.71%	o-Xylene	310	6.35	97.95%
1,4-Dichlorobenzene	370	2.60	>99.3%	sec-Butylbenzene	180	3.20	>98.2%
2,2-Dichloropropane	110	11.00	90.00%	Styrene	380	5.15	98.64%
2-Butanone (MEK)	170	85.50	49.71%	tert-Butylbenzene	190	5.75	>97%
2-Chlorotoluene	280	4.85	98.27%	Tetrachloroethene	200	2.75	98.63%
2-Hexanone	88	22.00	>75%	Toluene	280	3.80	98.64%
4-Chlorotoluene	300	3.15	>99%	trans-1,2-Dichloroethene	230	9.80	95.74%
4-Isopropyltoluene	200	3.50	>98.3%	trans-1,3-Dichloropropene	450	14.50	96.78%
4-Methyl-2-pentanone (MIBK)	76	19.00	>75%	Trichloroethene	200	4.85	97.58%
Benzene	270	7.10	97.37%	Trichlorofluoromethane	50	13.00	>74%
Bromobenzene	420	3.35	>99.2%	Vinyl chloride	10	2.50	>75%

## Testing Performed by

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### BCS ACCREDITATIONS

- ISO/IEC 17025:2017 Certificate Number L2422 (ANSI)
- FL DOH Lab ID E82924
- Louisiana DEQ Lab ID 05008
- Virginia Environmental Laboratory Accreditation Program (VELAP) ID 460252
- Pennsylvania DEP ID: 68-03950
- Texas CEQ ID: T104704542-16-1
- Georgia ID #M089
- Puerto Rico QAO-N-060-18-SIG-FL01147
- EPA Lab ID FL01147, Environmental Response Laboratory Network (ERLN), Compendium of Environmental Testing Laboratories (CETL), and Water
- Laboratory Alliance (WLA) member laboratory
- USDA Facility ID 2949; Animal and Plant Health Inspection Service Permit P526P-13-01699
- Centers for Disease Control (CDC) Environmental Legionella Isolation Techniques Evaluation (ELITE) Program Accredited Laboratory

### BCS Laboratories is accredited under the following agencies

