



## Testing Engineers & Consultants, Inc.

1343 Rochester Road • PO Box 249 • Troy, Michigan 48099-0249  
(248) 588-6200 or (313) T-E-S-T-I-N-G • Fax (248) 588-6232  
[www.testingengineers.com](http://www.testingengineers.com)

TEC Report Number: 61130-01A

Date Issued: April 21, 2021

Mr. Richard VanGorder  
Manager, Buildings and Grounds  
Grosse Pointe Public School System  
389 St. Clair Avenue  
Grosse Pointe, MI 48226

Re: District-wide Screening Sampling for *Legionella* Bacteria. Sampling Dates: March 31, 2021 and April 1, 2021,

Testing Engineers & Consultants, Inc. (TEC) was retained by Grosse Pointe Public Schools (GPPS) to conduct preliminary screening sampling for *Legionella* bacteria in the potable water supply systems of each school building as well as the Administration building. This work was performed in tandem with district-wide screening sampling for lead and copper in drinking water.

Water sampling for *Legionella* was conducted at representative kitchen or food preparation sinks and bottle filling stations. The fixtures to be tested were pre-selected by TEC and were flushed by GPPS facilities/engineering staff the evening before the water samples were collected. In general two locations were sampled in elementary schools, three in middle schools and four in each high school.

The samples for *Legionella* analysis were collected after first draw and flushed water samples had been collected for metals analysis (copper and lead). The results for the district-wide lead and copper testing will be provided in a separate report (TEC Report Number: 61130-01).

Afterward, the samples were forwarded to PathCon Laboratories, Inc.; Norcross, GA) for culture and enumeration of *Legionella* spp. bacteria. PathCon Laboratories is A2LA-certified for *Legionella* analysis and an AIHA-accredited environmental microbiology laboratory.

Continued.....

Copyright 2007 Testing Engineers & Consultants, Inc. All rights reserved.

All services undertaken are subject to the following policy. Reports are submitted for exclusive use of the clients to whom they are addressed. Their significance is subject to the adequacy and representative character of the samples and the comprehensiveness of the tests, examinations and surveys made. No quotation from reports or use of TEC's name is permitted except as expressly authorized by TEC in writing.

CONSULTING ENGINEERS & FULL-SERVICE PROFESSIONAL TESTING AND INSPECTION  
OFFICES IN ANN ARBOR, DETROIT, AND TROY  
FOUNDED IN 1966

**Testing Engineers & Consultants, Inc.**

Mr. Richard VanGorder

Grosse Pointe Public Schools

April 21, 2021

TEC Report Number: 61130-01A

Appendix A presents the findings from the screening sampling campaign. *Legionella* bacteria were not detected in water samples collected from six of the buildings that were tested. For the remaining buildings, results ranged from positive but below detection limit (<1 cfu/ml) to 30 cfu/ml.

A total of 32 samples were collected in the 14 buildings that were tested. These are summarized in the following table.

<b>Description</b>	<b>No. of samples</b>
No <i>Legionella</i> bacteria detected	18
<i>Legionella</i> bacteria detected but below quantitation limit	5
<i>Legionella</i> bacteria concentrations between 1 cfu/ml and 9 cfu/ml	5
<i>Legionella</i> bacteria concentration of >9 cfu/ml	4

The distribution of water sample results by building is found in Table One on Page 3 of this report. A copy of the PathCon Laboratories Technical Bulletin 1.5 is found in Appendix B and is useful in interpreting the significance of these findings and recommended follow-up actions.

It is recognized that both forms of the diseases caused by *Legionella* bacteria (i.e., Legionnaire's disease and Pontiac Fever) are respiratory in nature and are associated with the inhalation of contaminated water droplets. In general, as the concentration of *Legionella* bacteria in water droplets increases, the risk of receiving an infectious dose also increases. Risk also increases with a number of other factors including occupants' age, personal behaviors such as smoking and alcohol consumption as well as underlying diseases, particularly those associated with the immune system.

Risks of exposure to contaminated aerosols from sources such as bottle filling stations are generally considered to be low. Exposures to aerosols generated at kitchen or food preparation sinks would be considered to be intermediate depending upon the amount of aerosolization that occurs.

,

**Testing Engineers & Consultants, Inc.**

Mr. Richard VanGorder

Grosse Pointe Public Schools

April 21, 2021

TEC Report Number: 61130-01A

**Table One**  
**Summary of Findings for**  
**District-Wide Water Sampling & Analysis for *Legionella* Bacteria**

Building	Sample Location	<i>Legionella</i> Result (cfu/ml)
Administration Building	1 <sup>st</sup> floor; Room 108. Sink	ND
	2 <sup>nd</sup> floor; Room 212. Sink	ND
Barnes Early Childhood	1 <sup>st</sup> floor; BF station across from Room 101	ND
	2 <sup>nd</sup> floor; Staff Lounge; sink	ND
Brownell Middle School	1 <sup>st</sup> floor employee lounge sink, closest to window	ND
	2 <sup>nd</sup> floor BF station across from Room A59	30 <i>Legionella pneumophila</i> , not serogroup 1 <i>Legionella</i> species (fluorescent).
Defer Elementary School	1 <sup>st</sup> floor; BF station outside office	ND
	3 <sup>rd</sup> floor; BF station outside Room 310	ND
Ferry Elementary School	1 <sup>st</sup> floor; BF station across from Receiving	ND
	1 <sup>st</sup> floor; BF station across from Room 128	ND
Kerby Elementary School	1 <sup>st</sup> floor; BF station outside Room 23	<1 <i>Legionella</i> species (fluorescent)
	1 <sup>st</sup> floor; Faculty lounge sink	30 <i>Legionella</i> species (fluorescent)
Mason Elementary School	1 <sup>st</sup> floor; Kitchen sink	<1 <i>Legionella pneumophila</i> serogroup 1
	2 <sup>nd</sup> floor BF station outside Room 203	<1 <i>Legionella</i> species fluorescent
Monteith Elementary School	1 <sup>st</sup> floor; BF station across from Room 101	1 <i>Legionella</i> species (fluorescent)
	2 <sup>nd</sup> floor; Faculty lounge sink	ND
Grosse Pointe North High School	1 <sup>st</sup> floor; Faculty Lounge sink across from Room B133	1 <i>Legionella pneumophila</i> serogroup 1 <i>Legionella</i> species (fluorescent)
	1 <sup>st</sup> floor; Green Room sink	ND
	2 <sup>nd</sup> floor; BF station outside Room B216	<1 <i>Legionella pneumophila</i> serogroup 1
	3 <sup>rd</sup> floor; BF station outside Room B320	1 <i>Legionella pneumophila</i> serogroup 1
Parcells Middle School	1 <sup>st</sup> floor; BF station near Room 157	ND
	2 <sup>nd</sup> floor; BF station outside Room 220	ND
Pierce Middle School	1 <sup>st</sup> floor; BF station outside gym	ND
	2 <sup>nd</sup> floor; BF station across from Room 201	ND
Richard Elementary School	1 <sup>st</sup> floor; Right BF station across from Receiving	1 <i>Legionella</i> species (fluorescent)
	1 <sup>st</sup> floor; Kitchen sink	ND
Grosse Pointe South High School	1 <sup>st</sup> floor; BF station across from cashiers	ND
	1 <sup>st</sup> floor; BF station adjacent to Room 166	10 <i>Legionella pneumophila</i> serogroup 1
	2 <sup>nd</sup> floor; Cafeteria west food prep sink	ND
	2 <sup>nd</sup> floor; Faculty Lounge sink	30 <i>Legionella pneumophila</i> , serogroup 1
Trombly Elementary School	1 <sup>st</sup> floor; Right Kitchen sink	3 <i>Legionella pneumophila</i> , serogroup 6 <i>Legionella</i> species (fluorescent)
	2 <sup>nd</sup> floor; Faculty lounge sink	<1 <i>Legionella pneumophila</i> serogroup 6 <i>Legionella</i> species (fluorescent)

ND= Not Detected

BF Station= Bottle filling station

cfu/ml= colony forming units of *Legionella* bacteria per milliliter of water.

**Testing Engineers & Consultants, Inc.**

Mr. Richard VanGorder

Grosse Pointe Public Schools

April 21, 2021

TEC Report Number: 61130-01A

Based upon our review of the test results obtained for this project and the PathCon Laboratories information, we recommend considering the following as follow up measures:

1. It is our understanding that GPPS has established a district-wide flushing policy to help minimize water stagnation. Consider developing a formalized (written) protocol describing procedures and flushing locations which also would include a means of verifying that flushing is routinely being conducted.
2. For buildings with positive *Legionella* test results up to 9 cfu/ml for water samples, conduct cleaning of fixtures or replacement of bottle filling station filters where appropriate. Conduct follow-up *Legionella* sampling and analysis after completion of these tasks.
3. For buildings with positive *Legionella* tests results 10 cfu/ml or greater, conduct the same responses as in Item 2 as well as consider full building flushing and/or biocide treatment (hyperchlorination) of sections of water lines with elevated results.

We are pleased to provide this service. Should you have any questions or require additional information, please contact this office at your earliest convenience.

Respectfully Yours,

TESTING ENGINEERS & CONSULTANTS, INC.



Scott M. Chandler, CIH

Manager, Industrial Hygiene Services

SMC/sc

## **APPENDIX A**

April 12, 2021

Final Report EE0547

Scott Chandler  
Testing Engineers and Consultants  
1343 Rochester Road  
Troy, MI 48083  
Re: 61130-01A

Dear Mr. Chandler,

Environmental samples submitted to PathCon Laboratories have been analyzed for *Legionella* bacteria by the culture procedure. Samples were received on April 2, 2021 and analysis initiated on April 2, 2021. Samples received in acceptable condition were analyzed and reported herein. Results are presented in the attached table(s). Results in this report are based on samples submitted by the on-site investigator.

No viable *Legionella* were detected in the submitted samples (see Table 1).

A negative result does not indicate that the source of the sample was free of *Legionella*. A negative result indicates only that if present, the number of *Legionella* in the sample was below detection limits of the test.

Sincerely,

PATHOGEN CONTROL ASSOCIATES, INC.

By:



Brian G. Shelton, M.P.H  
President/CEO

Table 1: Identification of Samples & Results of Microbiological Analysis

Sample #	Description	Concentration <sup>1</sup>	Results
01	61130-01A-1, Barnes, 1st Floor, Water filling station, Across from Rm 101, 9:34	Not detected	
02	61130-01B-2, Barnes, 2nd Floor, Staff lounge sink, 9:45	Not detected	

## FOOTNOTES

<sup>1</sup> Colony forming units of *Legionella* per milliliter of sample. Limits of the test were approximately 1 colony forming unit of *Legionella* per milliliter of sample.

This report must be copied and distributed in its entirety. No portions of this report may be copied or distributed without the expressed written approval of PathCon Laboratories.

April 12, 2021

Final Report EE0497

Scott Chandler  
Testing Engineers and Consultants  
1343 Rochester Road  
Troy, MI 48083  
Re: 61130-01B

Dear Mr. Chandler,

Environmental samples submitted to PathCon Laboratories have been analyzed for *Legionella* bacteria by the culture procedure. Samples were received on April 1, 2021 and analysis initiated on April 1, 2021. Samples received in acceptable condition were analyzed and reported herein. Results are presented in the attached table(s). Results in this report are based on samples submitted by the on-site investigator.

There are no governmental regulations concerning permissible numbers of *legionellae* bacteria in water systems. Based on the numbers of *Legionella* organisms that we find in the environment, the numbers reported by other laboratories, and the numbers found to have caused outbreaks, we have developed suggested criteria for use by our clients as to the level at which it would be advisable to take corrective actions. A copy of PathCon Technical Bulletin No. 1.5 describing our criteria is enclosed. The recommendations would not be applicable in areas with the presence of immunocompromised individuals or people with *legionellosis*. In this situation, more stringent limits would apply. The result does not predict the future safety of the water systems; it only represents the count in the sample on the test day.

A negative result does not indicate that the source of the sample was free of *Legionella*. A negative result indicates only that if present, the number of *Legionella* in the sample was below detection limits of the test.

Sincerely,

PATHOGEN CONTROL ASSOCIATES, INC.

By:



Brian G. Shelton, M.P.H.  
President/CEO

Table 1: Identification of Samples & Results of Microbiological Analysis

Sample #	Description	Concentration <sup>1</sup>	Results
01	61130-01B-1, Brownell, 1st Floor, Emplyee lounge sink, Closest towers, 12:33	Not detected	
02	61130-01B-2, Brownell, 2nd Floor, Bottle filling station across from rm AS9, 12:25	30	<i>Legionella pneumophila</i> not serogroup 1 <i>Legionella</i> species (fluorescent)

## FOOTNOTES

<sup>1</sup> Colony forming units of *Legionella* per milliliter of sample. Limits of the test were approximately 1 colony forming unit of *Legionella* per milliliter of sample.

This report must be copied and distributed in its entirety. No portions of this report may be copied or distributed without the expressed written approval of PathCon Laboratories.

April 12, 2021  
Final Report EE0534

Scott Chandler  
Testing Engineers and Consultants  
1343 Rochester Road  
Troy, MI 48083  
Re: 61130-01C

Dear Mr. Chandler,

Environmental samples submitted to PathCon Laboratories have been analyzed for *Legionella* bacteria by the culture procedure. Samples were received on April 1, 2021 and analysis initiated on April 1, 2021. Samples received in acceptable condition were analyzed and reported herein. Results are presented in the attached table(s). Results in this report are based on samples submitted by the on-site investigator.

No viable *Legionella* were detected in the submitted samples (see Table 1).

A negative result does not indicate that the source of the sample was free of *Legionella*. A negative result indicates only that if present, the number of *Legionella* in the sample was below detection limits of the test.

Sincerely,

PATHOGEN CONTROL ASSOCIATES, INC.

By:



Brian G. Shelton, M.P.H  
President/CEO

Table 1: Identification of Samples & Results of Microbiological Analysis

Sample #	Description	Concentration <sup>1</sup>	Results
01	61130-01C-1, Defer location, Bottle filling station, 1st Floor, Outside office, 9:33	Not detected	
02	61130-01C-2, Defer location, 3rd Floor, Bottle filling station, Outside rm 310, 9:45	Not detected	

## FOOTNOTES

<sup>1</sup> Colony forming units of *Legionella* per milliliter of sample. Limits of the test were approximately 1 colony forming unit of *Legionella* per milliliter of sample.

This report must be copied and distributed in its entirety. No portions of this report may be copied or distributed without the expressed written approval of PathCon Laboratories.

April 12, 2021

Final Report EE0548

Scott Chandler  
Testing Engineers and Consultants  
1343 Rochester Road  
Troy, MI 48083  
Re: 61130-01D-2

Dear Mr. Chandler,

Environmental samples submitted to PathCon Laboratories have been analyzed for *Legionella* bacteria by the culture procedure. Samples were received on April 2, 2021 and analysis initiated on April 2, 2021. Samples received in acceptable condition were analyzed and reported herein. Results are presented in the attached table(s). Results in this report are based on samples submitted by the on-site investigator.

No viable *Legionella* were detected in the submitted samples (see Table 1).

A negative result does not indicate that the source of the sample was free of *Legionella*. A negative result indicates only that if present, the number of *Legionella* in the sample was below detection limits of the test.

Sincerely,

PATHOGEN CONTROL ASSOCIATES, INC.

By:



Brian G. Shelton, M.P.H  
President/CEO

Table 1: Identification of Samples & Results of Microbiological Analysis

Sample #	Description	Concentration <sup>1</sup>	Results
01	61130-01D-1, Ferry, 1st Floor, Bottle filling across from receiving, 11:00	Not detected	
02	61130-01D-2, Ferry, 1st Floor, Bottle filling across from Rm 128, 11:04	Not detected	

## FOOTNOTES

<sup>1</sup> Colony forming units of *Legionella* per milliliter of sample. Limits of the test were approximately 1 colony forming unit of *Legionella* per milliliter of sample.

This report must be copied and distributed in its entirety. No portions of this report may be copied or distributed without the expressed written approval of PathCon Laboratories.

April 12, 2021

Final Report EE0535

Scott Chandler  
Testing Engineers and Consultants  
1343 Rochester Road  
Troy, MI 48083  
Re: 61130-01E

Dear Mr. Chandler,

Environmental samples submitted to PathCon Laboratories have been analyzed for *Legionella* bacteria by the culture procedure. Samples were received on April 1, 2021 and analysis initiated on April 1, 2021. Samples received in acceptable condition were analyzed and reported herein. Results are presented in the attached table(s). Results in this report are based on samples submitted by the on-site investigator.

There are no governmental regulations concerning permissible numbers of *legionellae* bacteria in water systems. Based on the numbers of *Legionella* organisms that we find in the environment, the numbers reported by other laboratories, and the numbers found to have caused outbreaks, we have developed suggested criteria for use by our clients as to the level at which it would be advisable to take corrective actions. A copy of PathCon Technical Bulletin No. 1.5 describing our criteria is enclosed. The recommendations would not be applicable in areas with the presence of immunocompromised individuals or people with *legionellosis*. In this situation, more stringent limits would apply. The result does not predict the future safety of the water systems; it only represents the count in the sample on the test day.

Sincerely,

PATHOGEN CONTROL ASSOCIATES, INC.

By:



Brian G. Shelton, M.P.H.  
President/CEO

Table 1: Identification of Samples & Results of Microbiological Analysis

Sample #	Description	Concentration <sup>1</sup>	Results
01	61130-01E-1, Kerby, 1st Floor, Bottle filling station outside rm 23, 12:48	<1	<i>Legionella</i> species (fluorescent)
02	61130-01E-2, Kerby, 1st Floor, Faculty lounge, 12:55	30	<i>Legionella</i> species (fluorescent)

## FOOTNOTES

<sup>1</sup> Colony forming units of *Legionella* per milliliter of sample. Limits of the test were approximately 1 colony forming unit of *Legionella* per milliliter of sample.

This report must be copied and distributed in its entirety. No portions of this report may be copied or distributed without the expressed written approval of PathCon Laboratories.

April 12, 2021

Final Report EE0549

Scott Chandler  
Testing Engineers and Consultants  
1343 Rochester Road  
Troy, MI 48083  
Re: 61130-01G

Dear Mr. Chandler,

Environmental samples submitted to PathCon Laboratories have been analyzed for *Legionella* bacteria by the culture procedure. Samples were received on April 2, 2021 and analysis initiated on April 2, 2021. Samples received in acceptable condition were analyzed and reported herein. Results are presented in the attached table(s). Results in this report are based on samples submitted by the on-site investigator.

There are no governmental regulations concerning permissible numbers of *legionellae* bacteria in water systems. Based on the numbers of *Legionella* organisms that we find in the environment, the numbers reported by other laboratories, and the numbers found to have caused outbreaks, we have developed suggested criteria for use by our clients as to the level at which it would be advisable to take corrective actions. A copy of PathCon Technical Bulletin No. 1.5 describing our criteria is enclosed. The recommendations would not be applicable in areas with the presence of immunocompromised individuals or people with *legionellosis*. In this situation, more stringent limits would apply. The result does not predict the future safety of the water systems; it only represents the count in the sample on the test day.

Sincerely,

PATHOGEN CONTROL ASSOCIATES, INC.

By:



Brian G. Shelton, M.P.H.  
President/CEO

Table 1: Identification of Samples & Results of Microbiological Analysis

Sample #	Description	Concentration <sup>1</sup>	Results
01	61130-01G-1, Mason, 1st Floor, Kitchen sink, 10:39	<1	<i>Legionella pneumophila</i> serogroup 1
02	61130-01G-2, Mason, 2nd Floor, Bottle filling station, Outside Rm 203, 10:46	<1	<i>Legionella</i> species (fluorescent)

## FOOTNOTES

<sup>1</sup> Colony forming units of *Legionella* per milliliter of sample. Limits of the test were approximately 1 colony forming unit of *Legionella* per milliliter of sample.

This report must be copied and distributed in its entirety. No portions of this report may be copied or distributed without the expressed written approval of PathCon Laboratories.

April 12, 2021

Final Report EE0550

Scott Chandler  
Testing Engineers and Consultants  
1343 Rochester Road  
Troy, MI 48083  
Re: 61130-01H

Dear Mr. Chandler,

Environmental samples submitted to PathCon Laboratories have been analyzed for *Legionella* bacteria by the culture procedure. Samples were received on April 2, 2021 and analysis initiated on April 2, 2021. Samples received in acceptable condition were analyzed and reported herein. Results are presented in the attached table(s). Results in this report are based on samples submitted by the on-site investigator.

There are no governmental regulations concerning permissible numbers of *legionellae* bacteria in water systems. Based on the numbers of *Legionella* organisms that we find in the environment, the numbers reported by other laboratories, and the numbers found to have caused outbreaks, we have developed suggested criteria for use by our clients as to the level at which it would be advisable to take corrective actions. A copy of PathCon Technical Bulletin No. 1.5 describing our criteria is enclosed. The recommendations would not be applicable in areas with the presence of immunocompromised individuals or people with *legionellosis*. In this situation, more stringent limits would apply. The result does not predict the future safety of the water systems; it only represents the count in the sample on the test day.

A negative result does not indicate that the source of the sample was free of *Legionella*. A negative result indicates only that if present, the number of *Legionella* in the sample was below detection limits of the test.

Sincerely,

PATHOGEN CONTROL ASSOCIATES, INC.

By:



Brian G. Shelton, M.P.H.  
President/CEO

Table 1: Identification of Samples & Results of Microbiological Analysis

Sample #	Description	Concentration <sup>1</sup>	Results
01	61130-01H-1, Monteith, 1st Floor, Bottle filling station, Across Rm 101, 9:08	1	<i>Legionella</i> species (fluorescent)
02	61130-01H-2, Monteith, 2nd Floor, Faculty lounge sink, 9:19	Not detected	

## FOOTNOTES

<sup>1</sup> Colony forming units of *Legionella* per milliliter of sample. Limits of the test were approximately 1 colony forming unit of *Legionella* per milliliter of sample.

This report must be copied and distributed in its entirety. No portions of this report may be copied or distributed without the expressed written approval of PathCon Laboratories.

April 12, 2021

Final Report EE0551

Scott Chandler  
Testing Engineers and Consultants  
1343 Rochester Road  
Troy, MI 48083  
Re: 61130-01J

Dear Mr. Chandler,

Environmental samples submitted to PathCon Laboratories have been analyzed for *Legionella* bacteria by the culture procedure. Samples were received on April 2, 2021 and analysis initiated on April 2, 2021. Samples received in acceptable condition were analyzed and reported herein. Results are presented in the attached table(s). Results in this report are based on samples submitted by the on-site investigator.

There are no governmental regulations concerning permissible numbers of *legionellae* bacteria in water systems. Based on the numbers of *Legionella* organisms that we find in the environment, the numbers reported by other laboratories, and the numbers found to have caused outbreaks, we have developed suggested criteria for use by our clients as to the level at which it would be advisable to take corrective actions. A copy of PathCon Technical Bulletin No. 1.5 describing our criteria is enclosed. The recommendations would not be applicable in areas with the presence of immunocompromised individuals or people with *legionellosis*. In this situation, more stringent limits would apply. The result does not predict the future safety of the water systems; it only represents the count in the sample on the test day.

A negative result does not indicate that the source of the sample was free of *Legionella*. A negative result indicates only that if present, the number of *Legionella* in the sample was below detection limits of the test.

Sincerely,

PATHOGEN CONTROL ASSOCIATES, INC.

By:



Brian G. Shelton, M.P.H.  
President/CEO

Table 1: Identification of Samples & Results of Microbiological Analysis

Sample #	Description	Concentration <sup>1</sup>	Results
01	61130-01J-1, North HS, 1st Floor, Faculty lounge, Sink across from B133, 11:43	1	<i>Legionella pneumophila</i> serogroup 1 <i>Legionella</i> species (fluorescent)
02	61130-01J-2, North HS, 1st Floor, Green room, Sink, 11:52	Not detected	
03	61130-01J-3, North HS, 2nd Floor, Bottle filling station, Outside room B216, 12:09	<1	<i>Legionella pneumophila</i> serogroup 1 <i>Legionella</i> species (fluorescent)
04	61130-01J-4, North HS, 3rd Floor, Bottle filling station, Outside room B320, 12:15	1	<i>Legionella pneumophila</i> serogroup 1

## FOOTNOTES

<sup>1</sup> Colony forming units of *Legionella* per milliliter of sample. Limits of the test were approximately 1 colony forming unit of *Legionella* per milliliter of sample.

This report must be copied and distributed in its entirety. No portions of this report may be copied or distributed without the expressed written approval of PathCon Laboratories.

April 12, 2021

Final Report EE0552

Scott Chandler  
Testing Engineers and Consultants  
1343 Rochester Road  
Troy, MI 48083  
Re: 61130-01K

Dear Mr. Chandler,

Environmental samples submitted to PathCon Laboratories have been analyzed for *Legionella* bacteria by the culture procedure. Samples were received on April 2, 2021 and analysis initiated on April 2, 2021. Samples received in acceptable condition were analyzed and reported herein. Results are presented in the attached table(s). Results in this report are based on samples submitted by the on-site investigator.

No viable *Legionella* were detected in the submitted samples (see Table 1).

A negative result does not indicate that the source of the sample was free of *Legionella*. A negative result indicates only that if present, the number of *Legionella* in the sample was below detection limits of the test.

Sincerely,

PATHOGEN CONTROL ASSOCIATES, INC.

By:



Brian G. Shelton, M.P.H.  
President/CEO

Table 1: Identification of Samples & Results of Microbiological Analysis

Sample #	Description	Concentration <sup>1</sup>	Results
01	61130-01K-1, Parcels, 1st Floor, Bottle filling station near Rm 157, 10:03	Not detected	
02	61130-01K-2, Parcels, 2nd Floor, Bottle filling station outside Rm 220, 10:16	Not detected	

## FOOTNOTES

<sup>1</sup> Colony forming units of *Legionella* per milliliter of sample. Limits of the test were approximately 1 colony forming unit of *Legionella* per milliliter of sample.

This report must be copied and distributed in its entirety. No portions of this report may be copied or distributed without the expressed written approval of PathCon Laboratories.

April 12, 2021

Final Report EE0536

Scott Chandler  
Testing Engineers and Consultants  
1343 Rochester Road  
Troy, MI 48083  
Re: 61130-01L

Dear Mr. Chandler,

Environmental samples submitted to PathCon Laboratories have been analyzed for *Legionella* bacteria by the culture procedure. Samples were received on April 1, 2021 and analysis initiated on April 1, 2021. Samples received in acceptable condition were analyzed and reported herein. Results are presented in the attached table(s). Results in this report are based on samples submitted by the on-site investigator.

No viable *Legionella* were detected in the submitted samples (see Table 1).

A negative result does not indicate that the source of the sample was free of *Legionella*. A negative result indicates only that if present, the number of *Legionella* in the sample was below detection limits of the test.

Sincerely,

PATHOGEN CONTROL ASSOCIATES, INC.

By:



Brian G. Shelton, M.P.H  
President/CEO

Table 1: Identification of Samples & Results of Microbiological Analysis

Sample #	Description	Concentration <sup>1</sup>	Results
01	61130-01L-1, Pierce location, Bottle filling station outside gym, 8:55	Not detected	
02	61130-01L-2, Pierce location, Bottle filling station across from room 201, 9:03	Not detected	

## FOOTNOTES

<sup>1</sup> Colony forming units of *Legionella* per milliliter of sample. Limits of the test were approximately 1 colony forming unit of *Legionella* per milliliter of sample.

This report must be copied and distributed in its entirety. No portions of this report may be copied or distributed without the expressed written approval of PathCon Laboratories.

April 12, 2021

Final Report EE0537

Scott Chandler  
Testing Engineers and Consultants  
1343 Rochester Road  
Troy, MI 48083  
Re: 61130-01N

Dear Mr. Chandler,

Environmental samples submitted to PathCon Laboratories have been analyzed for *Legionella* bacteria by the culture procedure. Samples were received on April 1, 2021 and analysis initiated on April 1, 2021. Samples received in acceptable condition were analyzed and reported herein. Results are presented in the attached table(s). Results in this report are based on samples submitted by the on-site investigator.

There are no governmental regulations concerning permissible numbers of *legionellae* bacteria in water systems. Based on the numbers of *Legionella* organisms that we find in the environment, the numbers reported by other laboratories, and the numbers found to have caused outbreaks, we have developed suggested criteria for use by our clients as to the level at which it would be advisable to take corrective actions. A copy of PathCon Technical Bulletin No. 1.5 describing our criteria is enclosed. The recommendations would not be applicable in areas with the presence of immunocompromised individuals or people with *legionellosis*. In this situation, more stringent limits would apply. The result does not predict the future safety of the water systems; it only represents the count in the sample on the test day.

A negative result does not indicate that the source of the sample was free of *Legionella*. A negative result indicates only that if present, the number of *Legionella* in the sample was below detection limits of the test.

Sincerely,

PATHOGEN CONTROL ASSOCIATES, INC.

By:



Brian G. Shelton, M.P.H.  
President/CEO

Table 1: Identification of Samples & Results of Microbiological Analysis

Sample #	Description	Concentration <sup>1</sup>	Results
01	61130-01N-1, Richard, 1st Floor, Right, Bottle filling station across from receiving, 10:08	1	<i>Legionella</i> species (fluorescent)
02	61130-01N-2, Richard, 1st Floor, Kitchen area, Kitchen sink, 10:14	Not detected	

## FOOTNOTES

<sup>1</sup> Colony forming units of *Legionella* per milliliter of sample. Limits of the test were approximately 1 colony forming unit of *Legionella* per milliliter of sample.

This report must be copied and distributed in its entirety. No portions of this report may be copied or distributed without the expressed written approval of PathCon Laboratories.

April 12, 2021

Final Report EE0533

Scott Chandler  
Testing Engineers and Consultants  
1343 Rochester Road  
Troy, MI 48083  
Re: 61130-010

Dear Mr. Chandler,

Environmental samples submitted to PathCon Laboratories have been analyzed for *Legionella* bacteria by the culture procedure. Samples were received on April 1, 2021 and analysis initiated on April 1, 2021. Samples received in acceptable condition were analyzed and reported herein. Results are presented in the attached table(s). Results in this report are based on samples submitted by the on-site investigator.

There are no governmental regulations concerning permissible numbers of *legionellae* bacteria in water systems. Based on the numbers of *Legionella* organisms that we find in the environment, the numbers reported by other laboratories, and the numbers found to have caused outbreaks, we have developed suggested criteria for use by our clients as to the level at which it would be advisable to take corrective actions. A copy of PathCon Technical Bulletin No. 1.5 describing our criteria is enclosed. The recommendations would not be applicable in areas with the presence of immunocompromised individuals or people with *legionellosis*. In this situation, more stringent limits would apply. The result does not predict the future safety of the water systems; it only represents the count in the sample on the test day.

A negative result does not indicate that the source of the sample was free of *Legionella*. A negative result indicates only that if present, the number of *Legionella* in the sample was below detection limits of the test.

Sincerely,

PATHOGEN CONTROL ASSOCIATES, INC.

By:



Brian G. Shelton, M.P.H.  
President/CEO

Table 1: Identification of Samples & Results of Microbiological Analysis

Sample #	Description	Concentration <sup>1</sup>	Results
01	61130-01O-1, South HS, 1st Floor, Bottle filling station across from cashiers, 10:40	Not detected	
02	61130-01O-2, South HS, 1st Floor, Bottle filling station adjacent Rm 166, 10:57	10	<i>Legionella pneumophila</i> serogroup 1
03	61130-01O-3, South HS, 2nd Floor, Cafeteria area, West food prep sink, 11:40	Not detected	
04	61130-01O-4, South HS, 2nd Floor, Faculty lounge sink, Rm 275, 11:21	30	<i>Legionella pneumophila</i> serogroup 1

## FOOTNOTES

<sup>1</sup> Colony forming units of *Legionella* per milliliter of sample. Limits of the test were approximately 1 colony forming unit of *Legionella* per milliliter of sample.

This report must be copied and distributed in its entirety. No portions of this report may be copied or distributed without the expressed written approval of PathCon Laboratories.

April 12, 2021

Final Report EE0538

Scott Chandler  
Testing Engineers and Consultants  
1343 Rochester Road  
Troy, MI 48083  
Re: 61130-01P

Dear Mr. Chandler,

Environmental samples submitted to PathCon Laboratories have been analyzed for *Legionella* bacteria by the culture procedure. Samples were received on April 1, 2021 and analysis initiated on April 1, 2021. Samples received in acceptable condition were analyzed and reported herein. Results are presented in the attached table(s). Results in this report are based on samples submitted by the on-site investigator.

There are no governmental regulations concerning permissible numbers of *legionellae* bacteria in water systems. Based on the numbers of *Legionella* organisms that we find in the environment, the numbers reported by other laboratories, and the numbers found to have caused outbreaks, we have developed suggested criteria for use by our clients as to the level at which it would be advisable to take corrective actions. A copy of PathCon Technical Bulletin No. 1.5 describing our criteria is enclosed. The recommendations would not be applicable in areas with the presence of immunocompromised individuals or people with *legionellosis*. In this situation, more stringent limits would apply. The result does not predict the future safety of the water systems; it only represents the count in the sample on the test day.

Sincerely,

PATHOGEN CONTROL ASSOCIATES, INC.

By:



Brian G. Shelton, M.P.H.  
President/CEO

Table 1: Identification of Samples & Results of Microbiological Analysis

Sample #	Description	Concentration <sup>1</sup>	Results
01	61130-01P-1, Trombly, Location 1, Kitchen sink, 8:13	3	<i>Legionella pneumophila</i> serogroup 6 <i>Legionella</i> species (fluorescent)
02	61130-01P-2, Trombly, Location 3, 2nd Floor, Faculty lounge, Sink, 8:27	<1	<i>Legionella pneumophila</i> serogroup 6 <i>Legionella</i> species (fluorescent)

## FOOTNOTES

<sup>1</sup> Colony forming units of *Legionella* per milliliter of sample. Limits of the test were approximately 1 colony forming unit of *Legionella* per milliliter of sample.

This report must be copied and distributed in its entirety. No portions of this report may be copied or distributed without the expressed written approval of PathCon Laboratories.

April 12, 2021

Final Report EE0553

Scott Chandler  
Testing Engineers and Consultants  
1343 Rochester Road  
Troy, MI 48083  
Re: 61130-01Q

Dear Mr. Chandler,

Environmental samples submitted to PathCon Laboratories have been analyzed for *Legionella* bacteria by the culture procedure. Samples were received on April 2, 2021 and analysis initiated on April 2, 2021. Samples received in acceptable condition were analyzed and reported herein. Results are presented in the attached table(s). Results in this report are based on samples submitted by the on-site investigator.

No viable *Legionella* were detected in the submitted samples (see Table 1).

A negative result does not indicate that the source of the sample was free of *Legionella*. A negative result indicates only that if present, the number of *Legionella* in the sample was below detection limits of the test.

Sincerely,

PATHOGEN CONTROL ASSOCIATES, INC.

By:



Brian G. Shelton, M.P.H  
President/CEO

Table 1: Identification of Samples & Results of Microbiological Analysis

Sample #	Description	Concentration <sup>1</sup>	Results
01	61130-01Q-1, Admin, 1st Floor, Room 108, Sink, 8:37	Not detected	
02	61130-01Q-2, Admin, 2nd Floor, Room 212, 8:41	Not detected	

## FOOTNOTES

<sup>1</sup> Colony forming units of *Legionella* per milliliter of sample. Limits of the test were approximately 1 colony forming unit of *Legionella* per milliliter of sample.

This report must be copied and distributed in its entirety. No portions of this report may be copied or distributed without the expressed written approval of PathCon Laboratories.

## **APPENDIX B**

# PathCon<sup>®</sup> Laboratories

## TECHNICAL BULLETIN 1.5

### ***Legionella* Bacteria in Environmental Samples: Hazard Analysis and Suggested Remedial Actions**

GEORGE K. MORRIS, PH.D., AND BRIAN G. SHELTON, M.P.H.  
*PathCon Laboratories, Peachtree Corners, Georgia 30092*

#### **THE DISEASE**

The diseases caused by *Legionella* bacteria, or legionellosis, are currently recognized to occur in two distinct clinical forms: Legionnaires' disease and Pontiac fever.

Of the two, Legionnaires' disease is the more serious condition, causing a multi-system disease including pneumonia with fatality rates of about 15%. When outbreaks occur, usually less than 5% of exposed individuals develop disease, commonly within 3 to 9 days after exposure.

Pontiac fever is a non-fatal flu-like disease of short duration which does not cause pneumonia. Approximately 95% of exposed individuals develop disease, usually within 2 to 3 days. The number of cases of Legionnaires' disease occurring in the United States each year has been estimated by the Centers for Disease Control and Prevention (CDC) at 10,000 to more than 100,000 per year.

#### **THE BACTERIUM**

Legionellosis is caused by *Legionella* bacteria which occur naturally in surface waters including lakes, streams, and mud. There are at least 60 known species of *Legionella*. Many of them have not yet been implicated in human disease. *Legionella pneumophila* serogroup 1 is most frequently implicated in disease and is most frequently found in the environment. It is possible that some species have not yet been associated with human disease because they occur so rarely in nature; therefore, all strains should be considered potentially pathogenic.

#### **RISK OF INFECTION**

To cause disease several factors must occur: the organism must be virulent, it must be in sufficient number to cause disease, the water source must be aerosolized and distributed to the human host, the legionellae must be inhaled by the potential host deeply into the lungs, and the human host's defenses must be unable to stop the infection.

The infectious dose has not been determined, but the larger the dose, the more likely an infection will occur. The risk of infection will be greater if the dose of *Legionella*-containing water is in direct, close contact with the target person (as is the case with humidifiers and foggers) than if the water is distant from the target person (as with cooling towers, (CT), and evaporative condensers, (EC)). Potable water systems may represent an intermediate category.

The risk of infection is greater and a lower dose is required in those individuals who are older, smokers, heavy drinkers, immunocompromised with other diseases or on immunosuppressive therapy.

#### **BUILDING AND INDUSTRIAL SOURCES**

Water in many natural or man-made systems serves as an amplifier of *Legionella* bacteria by providing suitable conditions for growth. Potential sources include cooling towers, evaporative condensers, humidifiers, potable water heaters and holding tanks, pipes containing stagnant warm water, shower heads, faucet aerators, decorative fountains, nebulizers, mister reservoirs, and whirlpool baths. *Legionella* apparently survives in low numbers in routine water treatment used to treat potable water and can be carried in the treated drinking water into buildings, where the bacteria can colonize in the plumbing fixtures, especially in hot water systems.

Therefore, cooling towers and other systems may become contaminated through the make-up water. Well-maintained systems are less likely to be colonized with legionellae than systems that are poorly maintained. Continued vigilance in terms of excellent preventive maintenance and an excellent water treatment program are required to minimize the risk of *Legionella*.

#### **HEALTH HAZARD ANALYSIS**

The mere presence of legionellae either in heat rejection systems or water services will not by itself cause disease. High numbers of legionellae have been noted in cooling towers and other sources with no associated disease. However, an epidemiologic link has been established between the legionellae in the environment and the occurrence of legionellosis. Best and co-workers (1983) found that the reduction of legionellae in the environment was linked to a reduction in the incidence of clinical Legionnaires' disease.

Most outbreaks from cooling towers and evaporative condensers have been associated with high numbers of legionellae, at least 1,000 colony-forming units per milliliter (CFU/ml) or more in the implicated source (Shelton and co-workers, 1994). At PathCon Laboratories, we have found numbers of *Legionella* averaging 160 CFU/ml (range <1 to 1,500) in a potable water system associated with an outbreak; and as few as 10 CFU/ml of fogger reservoir water that may have caused disease in people in immediate direct contact with the mist. Of utmost importance, most cases of legionellosis occur as sporadic cases, not epidemics, and it is not known how many organisms in a water source may represent an infectious risk for sporadic cases to occur.

Many people with responsibility for maintaining air quality in buildings and industrial settings require programs designed to detect potential problems with legionellae. For this reason, we have developed quantitative legionellae criteria and

corresponding remedial actions. These quantitative *Legionella* data are based on numbers of viable legionellae because health risk from nonviable *Legionella* has not been documented. Although there is honest disagreement among informed scientists on the risks associated with legionellae in the environment, the degree of remedial action suggested in Table 1 is expected to err on the side of safety. Many health authorities discourage the notion of

completely eliminating *Legionella* bacteria from environmental waters. Other workers have recommended that immunocompromised patients be completely protected from waters containing *Legionella* (Helms, et al., 1983). It is our opinion that these data in Table 1 are not applicable in areas with immunocompromised individuals or for waters used for therapeutic purposes. In these situations, no level of *Legionella* organisms is acceptable.

**Table 1: Suggested *Legionella* Remedial Action Criteria**

<i>Legionella</i> (CFU/ml)	CT/EC*	Remedial Action if Detected in:	
		Potable Water	Humidifier/Fogger
Detectable			
But <1	1	2	3
1 to 9	2	3	4
10-99	3	4	5
100-999	4	5	5
≥ 1,000	5	5	5

\*Cooling Tower / Evaporative Condenser

## REMEDIAL ACTIONS

**Action 1.** Review routine maintenance program recommended by the manufacturer of the equipment to ensure that the manufacturer's recommended program is being followed. The presence of barely detectable numbers of legionellae represents a low level of concern.

**Action 2.** Implement Action 1 (see above). Conduct follow-up legionellae analysis after a few weeks for evidence of further amplification. This level of legionellae represents little concern, but the number of organisms detected indicates that the system is a potential amplifier for legionellae.

**Action 3.** Implement Action 2. Conduct review of premises for direct and indirect bioaerosol contact with occupants and health risk status of people that may come in contact with the bioaerosols. Depending on the results of the review of the premises, action related to cleaning and/or biocide treatment of the equipment may be indicated. This level of legionellae represents a low but increased level of concern.

**Action 4.** Implement Action 3. Cleaning and/or biocide treatment of the equipment is indicated. This level of legionellae represents a moderately high level of concern. The level is approaching levels that may cause outbreaks. It is uncommon for samples to contain numbers of legionellae which fall into this category.

**Action 5.** Immediate cleaning and/or biocide treatment of the equipment is definitely indicated. Conduct post-treatment legionellae analysis to ensure effectiveness of the corrective action. The level of legionellae represents a high level of concern. These numbers are at a level that has the potential for causing an outbreak. It is very uncommon

for samples to contain numbers of legionellae which fall in this category.

## ANALYTICAL LIMITATIONS

The microbiological analysis may be influenced by many factors including the possibility that *Legionella* bacteria may be harbored and amplified inside the cells of aquatic protozoa or in slime or biofilm. Therefore, a negative test result does not necessarily indicate that the environmental source of a sample is free of *Legionella*. The only way to ensure that legionellosis does not occur is to eliminate *Legionella* bacteria from the environment, but research has shown that, because of the ubiquitous nature of the bacteria, it is unlikely that a water source will always remain free of legionellae. A negative result indicates only that if present, the number of *Legionella* in the sample, at the time the sample was taken, was less than the detection limits of the test. The finding of low numbers of *Legionella*, or even negative findings, does not ensure that an environment will not be the source of legionellosis.

## REFERENCES

- Best, M., V.L. Yu, J. Stout, et al. 1983. Legionellaceae in the hospital water supply. Epidemiologic link with disease and evaluation of a method for control of nosocomial Legionnaires' disease and Pittsburgh pneumonia. *Lancet*, ii: 307-310.
- Helms, C.M., R.M. Massanari, R. Zeitler, et al. 1983. Legionnaires' disease associated with a hospital water system: a cluster of 24 nosocomial cases. *Ann. Int. Med.* 99: 172-178.
- Shelton, B.G., W.D. Flanders and G.K. Morris. 1994. Legionnaires' disease outbreaks and cooling towers with amplified *Legionella* concentrations. *Current Microbiol.* 28:359-363.