



April 14, 2023

Brent Paul
Director of Facility Operations
Lake Oswego School District

Via email: paulb@loswego.k12.or.us

Regarding: Indoor Air Quality Report
Lakeridge High School
1235 Overlook Drive
Lake Oswego, Oregon 97034
PBS Project 21600.026 Phase 0015

Dear Mr. Paul:

On March 22, 2023, PBS Engineering and Environmental Inc. (PBS) performed indoor air quality testing services at the Lakeridge High School located at 1235 Overlook Drive in Lake Oswego, Oregon. Testing and investigation services were provided in response to staff complaints of poor air quality and were performed in both the F-wing and counselor's area.

The indoor air quality investigation included the following scope items:

- Visually inspect interior building materials and conditions
- Collect and analyze airborne fungal particulate samples
- Collect and analyze surface tape-lift samples from suspect areas and surfaces
- Take moisture readings of accessible building finishes

Below is a summary of our findings.

VISUAL OBSERVATIONS AND INSPECTION

Lakeridge High School is a single-story metal- and masonry-framed building in Lake Oswego, Oregon. Interior finishes in the investigated areas consist of carpet and resilient floor coverings, gypsum board walls, and suspended grid ceiling system with lay-in tiles. Conditioned air is provided by above ceiling heating, ventilation, and air conditioning (HVAC) equipment.

In F-Wing, PBS noted stained ceiling tiles scattered throughout. Additionally, PBS noted visual evidence of water dripping from the ceiling on gypsum walls in several locations. Two ceiling tiles were missing in the commons area, one of which was underneath an active leak. The leak appeared to be from a faulty pipe fitting and was dripping into bins below. A second ceiling tile was missing with bins below, but the bins were dry and no active water source was identified. Three dehumidifiers were in use at the time of PBS' investigation, all in the commons area. No odors were noted anywhere in F-Wing.

The counselor's area was also investigated at the request of district personnel. In the counselor's area, a few very small stains were noted on ceiling tiles, but staining was not as prevalent as in F-Wing. No active leaks or odors were noted in the area during the investigation.

AIRBORNE FUNGAL PARTICULATE SAMPLING

PBS collected eight airborne fungal particulate samples using Allergenco impactor cassettes and a high-volume vacuum pump. Six samples were collected inside the building and two were collected outdoors to establish background conditions. Each sample was collected at a flow rate of 15 liters per minute for 5 minutes (75 liters) from an elevation of approximately 4 feet above ground level. The samples were submitted to Lab/Cor, Inc., in Seattle, Washington, for fungal and nonfungal particulate identification under chain of custody.

Table 1 below summarizes the findings of this phase of the investigation.

Table 1. Air Sample Laboratory Results: Fungal

Sample Number	Location	Fungal Spore Concentration*	Concentration Breakdown	
S1	F-Wing; Commons	15	15	Ascospores, non-specified
S2	F-Wing; Commons	5	5	Cladosporium
S3	F-Wing; Classroom F2	5	5	Ascospores, non-specified
S4	F-Wing; Classroom F6	ND	ND	No Fungi Detected
S5	Counselor Area; Wellness	30	25	Ascospores, non-specified
			5	Basidiospores-like
S6	Counselor Area; At Records	40	20	Ascospores, non-specified
			20	Cladosporium
S7	Exterior; South of F-Wing	95	40	Ascospores, non-specified
			35	Basidiospores-like
			20	Cladosporium
S8	Exterior; South of F-Wing	140	70	Ascospores, non-specified
			45	Basidiospores-like
			25	Cladosporium

*Spore concentrations are presented in total count per sample.

ND = None detected

In reviewing airborne fungal spore data, two main considerations in each sample are the total number of spores and the relative proportions of the various spore types. These two considerations are then compared for samples collected from indoor test areas and for samples collected outdoors or from control areas. Based on review of the laboratory data, concentrations of fungal spores in the samples collected indoors were overall significantly lower than the concentrations observed in the samples collected outdoors. Additionally, the predominant fungal types found in the indoor samples were consistent with the types found outdoor. Based on these results, there does not appear to be a significant or measurable fungal concern in the indoor test areas.

Please refer to the attached laboratory reports for more detailed information regarding the results of these analyses.

SURFACE TAPE-LIFT SAMPLING

PBS performed surface tape-lift sampling in three locations where suspect fungal growth was observed. PBS used Zefon-brand Bio Tape slides to collect samples. Results confirmed the presence of Fungal growth in two of the three test locations. See Table 2 below for results.

Table 2. Surface Tape-Lift Results: Fungal

Sample Number	Surface Material	Location	Concentration Breakdown	
T1	Lay-In Ceiling Tile	F-Wing Commons; At Classroom F9	High	Ulocladium
			High	Hyphal Fragments
			Trace	Basidiospores-like
T2	Lay-In Ceiling Tile	F-Wing Commons; At Classroom F3	ND	No Fungi Observed
T3	Metal Framing	Counselors Reception Area; Above Ceiling Grid	Trace	Basidiospores-like
			Trace	Ulocladium

ND = None detected

Trace = <10 counts in examined area

Low = <30% coverage of examined area

Medium = 30%–70% coverage of examined area

High = >70% coverage of examined area

MOISTURE METER READINGS

PBS utilized a Delmhorst BD-2100 2 pin moisture meter to check moisture levels in gypsum walls and ceiling tiles in F-Wing and the counselor's area. Generally speaking, gypsum should have a moisture content of less than 1%; anything above 1% can be a sign of a potential issue. Despite seeing gypsum with water staining in several locations in F-Wing, PBS did not observe any moisture readings above 0.1%.

CONCLUSIONS

- Indoor airborne fungal particulate results were found to be acceptable. Indoor fungal particulate levels were below levels found outdoors.

- Tape-lift sampling confirmed the presence of fungal activity on lay-in ceiling tiles. Results were mixed, but high concentrations of fungal activity were found to exist on at least one tile. PBS recommends replacing all stained ceiling tiles throughout F-Wing. Please refer to the attached floor plan showing mold-impacted ceiling tile and other water-stained ceiling tiles.
- At the time of PBS' visit, there was an active leak in the F-Wing commons. The source of the leak appeared to be a faulty pipe fitting. Additionally, it appeared that another leak may exist in the commons that was not active at the time of PBS' visit. It is unclear what the source of that particular leak is, though custodial staff was under the impression that it was a roof leak. Once the leaks are repaired, PBS recommends making sure that all surrounding finishes are dry before replacing ceiling tiles.

LIMITATIONS OF SCOPE

This study was limited to the tests and locations as indicated above. The site as a whole may have other environmental concerns that will not be characterized by this study. The findings and conclusions of this work are not scientific certainties but probabilities based on professional judgment concerning the significance of the data gathered during the course of this investigation. PBS is not able to represent conditions on the site or adjoining sites beyond those detected or observed by PBS.

PBS respectfully submits these results of our indoor air quality investigation. Please feel free to contact me at 503.417.7607 or bob.kleckner@pbsusa.com with any questions or comments.

Sincerely,

Bob Kleckner
Senior Project Manager

Attachments: Laboratory Reports
Floor Plan HS1

Nonviable Air Report

Job Number: 230270

Client: PBS Engineering + Environmental

**Address: 4412 South Corbett Ave
Portland, OR 97239**

Project Name: Lakeridge HS IAQ

Project No.: 21600.026/0015

PO Number:

Sub Project:

Reference No.:

Report Number: 230270R01

Report Date: 3/27/2023

Enclosed please find results for samples submitted to our laboratory. A list of samples and analyses follows:

Lab/Cor Num.	Client Sample Number	Analysis	Analysis Notes	Date Sampled:	Date Received:
230270 - S1	S1	NV, Air, Fungal ID		3/21/2023	3/23/2023
230270 - S2	S2	NV, Air, Fungal ID		3/21/2023	3/23/2023
230270 - S3	S3	NV, Air, Fungal ID		3/21/2023	3/23/2023
230270 - S4	S4	NV, Air, Fungal ID	No Fungi Observed	3/21/2023	3/23/2023
230270 - S5	S5	NV, Air, Fungal ID		3/21/2023	3/23/2023
230270 - S6	S6	NV, Air, Fungal ID		3/21/2023	3/23/2023
230270 - S7	S7	NV, Air, Fungal ID		3/21/2023	3/23/2023
230270 - S8	S8	NV, Air, Fungal ID		3/21/2023	3/23/2023

Nonviable Air Air samples follow preparation and analysis techniques outlined in Method 5 of the laboratory SOP; this method is based on guidelines from the Pan-American Aerobiology Association Standardized Protocol and ASTM Method 7391-09. Samples were collected using either an Air-O-Cell, Cyclex-D, Allergenco-D, or M2 Multi-Mold nonviable air sampling cassette. Characteristic morphologies were observed by optical microscopy at a magnification of 600x. For each individual particle type observed, data was reported in particles per cubic meter of air (m3).

Due to various factors that influence uncertainty (media type, particle loading, staining, instrumentation and other variable aspects of the method), only the first two figures reported are considered to be significant. The area analyzed on each sample is 20%.

Disclaimer The results reported relate only to the samples tested or analyzed; the laboratory is not responsible for data collected by personnel who are not affiliated with the laboratory. Results reported in both structures/cm3 and structures/mm2 are dependent on the sample volume and area. These parameters are measured and recorded by non-laboratory personnel and are not covered by the laboratory's accreditation. Interpretation of these results is the sole responsibility of the client.

If further clarification of these results is needed, please call us. Thank you for allowing the staff at Lab/Cor, Inc. the opportunity to provide you with the analytical services.

Sincerely,


Shauna Bjornson
Analyst

Nonviable Air - Final Report

Job Number: 230270

Client: PBS Engineering + Environmental

Project Name: Lakeridge HS IAQ

Project No.: 21600.026/0015

Reference No.:

Report Number: 230270R01

Date Received: 3/23/2023

Lab/Cor ID:	S1			S2		
Sample No.:	S1			S2		
Sample Measure:	75 L			75 L		
Media Type:	Fungal-AllergencoD			Fungal-AllergencoD		
Analyst - Analysis Date:	SB - 3/24/2023			SB - 3/24/2023		
MRL:	67			67		
Scope - Magnification:	Olympus BHT-BH2 - 600			Olympus BHT-BH2 - 600		
Notes:						
Fungal Identification	Raw Count*	Total Count**	Total/m ³	Raw Count*	Total Count**	Total/m ³
Ascospores, non-specified	3	15	200			
Basidiospores - like						
Cladosporium				1	5	67
Summary Total:	3	15	200	1	5	67

Lab/Cor ID:	S3			S4		
Sample No.:	S3			S4		
Sample Measure:	75 L			75 L		
Media Type:	Fungal-AllergencoD			Fungal-AllergencoD		
Analyst - Analysis Date:	SB - 3/24/2023			SB - 3/24/2023		
MRL:	67			67		
Scope - Magnification:	Olympus BHT-BH2 - 600			Olympus BHT-BH2 - 600		
Notes:				No Fungi Observed		
Fungal Identification	Raw Count*	Total Count**	Total/m ³	Raw Count*	Total Count**	Total/m ³
Ascospores, non-specified	1	5	67			
Basidiospores - like						
Cladosporium						
Summary Total:	1	5	67			

* - Raw Counts per 20% of Sample

** - Total Count per Sample

Nonviable Air - Final Report

Job Number: 230270

Client: PBS Engineering + Environmental

Project Name: Lakeridge HS IAQ

Project No.: 21600.026/0015

Reference No.:

Report Number: 230270R01

Date Received: 3/23/2023

Lab/Cor ID:	S5			S6		
Sample No.:	S5			S6		
Sample Measure:	75 L			75 L		
Media Type:	Fungal-AllergencoD			Fungal-AllergencoD		
Analyst - Analysis Date:	SB - 3/24/2023			SB - 3/24/2023		
MRL:	67			67		
Scope - Magnification:	Olympus BHT-BH2 - 600			Olympus BHT-BH2 - 600		
Notes:						
Fungal Identification	Raw Count*	Total Count**	Total/m³	Raw Count*	Total Count**	Total/m³
Ascomspores, non-specified	5	25	333	4	20	267
Basidiospores - like	1	5	67			
Cladosporium				4	20	267
Summary Total:	6	30	400	8	40	534

Lab/Cor ID:	S7			S8		
Sample No.:	S7			S8		
Sample Measure:	75 L			75 L		
Media Type:	Fungal-AllergencoD			Fungal-AllergencoD		
Analyst - Analysis Date:	SB - 3/24/2023			SB - 3/24/2023		
MRL:	67			67		
Scope - Magnification:	Olympus BHT-BH2 - 600			Olympus BHT-BH2 - 600		
Notes:						
Fungal Identification	Raw Count*	Total Count**	Total/m³	Raw Count*	Total Count**	Total/m³
Ascomspores, non-specified	8	40	533	14	70	933
Basidiospores - like	7	35	467	9	45	600
Cladosporium	4	20	267	5	25	333
Summary Total:	19	95	1267	28	140	1866

Reviewed by:

Shauna Bjornson
Shauna Bjornson
Analyst

* - Raw Counts per 20% of Sample

** - Total Count per Sample

Nonviable Surface Report

Job Number: 230270
Client: PBS Engineering + Environmental
Address: 4412 South Corbett Ave
Portland, OR 97239
Project Name: Lakeridge HS IAQ
Project No.: 21600.026/0015
PO Number:
Sub Project:
Reference No.:

Report Number: 230270R02
Report Date: 3/27/2023

Enclosed please find results for samples submitted to our laboratory. A list of samples and analyses follows:

Lab/Cor Num.	Client Sample Number	Analysis	Analysis Notes	Date Sampled:	Date Received:
230270 - S9	T1	NV, Surface, Fungal ID Qual.		3/21/2023	3/23/2023
230270 - S10	T2	NV, Surface, Fungal ID Qual.	No Fungi Observed	3/21/2023	3/23/2023
230270 - S11	T3	NV, Surface, Fungal ID Qual.		3/21/2023	3/23/2023

Nonviable Surface Surface samples (Swab or Tape) follow preparation and analysis techniques outlined in Method 7 and Method 9 of the laboratory SOP; these methods are based on guidelines from the Pan-American Aerobiology Association Standardized Protocol and ASTM Method 7391-09. Swab samples were suspended in a Peptone/ Tween buffered solution and stained using lacto-cotton blue. A 0.05 ml sub-sample of the buffered solution was then examined. Tape samples were mounted on a slide and stained using lacto-cotton blue.

Qualitative Analysis:

Characteristic morphologies were observed using optical microscopy at a magnification of 600x. Fungal and Particulates counts were reported in Relative Abundance (High, Moderate, Low, and Trace). The Minimum Reporting Limit (MRL) is 1 Fungal/ Particulate count (Trace Relative Abundance).

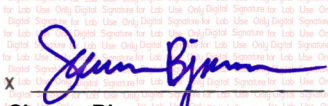
Quantitative Analysis:

Characteristic morphologies were observed using optical microscopy at a magnification of 600x. Fungal and Particulates counts were reported as the Total Concentration for each Fungal and Particulate type. The Minimum Reporting Limit (MRL) is 4 Fungal/ Particulate Counts/ cm² for Swab Samples and 6 Fungal/ Particulate Counts/ cm² for Tape Samples.

Disclaimer The results reported relate only to the samples tested or analyzed; the laboratory is not responsible for data collected by personnel who are not affiliated with the laboratory. Results reported in both structures/cm³ and structures/mm² are dependent on the sample volume and area. These parameters are measured and recorded by non-laboratory personnel and are not covered by the laboratory's accreditation. Interpretation of these results is the sole responsibility of the client.

If further clarification of these results is needed, please call us. Thank you for allowing the staff at Lab/Cor, Inc. the opportunity to provide you with the analytical services.

Sincerely,


X **Shauna Bjornson**
Analyst

Nonviable Surface - Final Report

Job Number: 230270

Client: PBS Engineering + Environmental

Project Name: Lakeridge HS IAQ

Project No.: 21600.026/0015

Reference No.:

Report Number: 230270R02

Date Received: 3/23/2023

Lab/Cor ID:	S9	S10
Sample No.:	T1	T2
Sample Measure:	1 each	1 each
Media Type:	Fungal-BioTape	Fungal-BioTape
Analyst:	SB	SB
Analysis Date:	3/24/2023	3/24/2023
Notes:		No Fungi Observed

Fungal Identification	Relative Abundance	Relative Abundance
Basidiospores - like	Trace	
Hyphal Fragments	High	
Ulocladium	High	

Lab/Cor ID:	S11	
Sample No.:	T3	
Sample Measure:	1 each	
Media Type:	Fungal-BioTape	
Analyst:	SB	
Analysis Date:	3/24/2023	
Notes:		

Fungal Identification	Relative Abundance	Relative Abundance
Basidiospores - like	Trace	
Hyphal Fragments		
Ulocladium	Trace	

Reviewed by:

Shauna Bjornson
X
Shauna Bjornson
Analyst

Trace = <10 counts in examined area
Low = <30% coverage of examined area
Medium = 30% - 70% coverage of examined area
High = >70% coverage of examined area

Fungal / Particulate Sample Chain of Custody Record

230270 1/2

Lab/Cor, Inc
7619 6th Ave NW
Seattle, WA 98117
Office (206) 781-0155
Fax (206) 789-8424
mail@labcor.net
www.labcor.net

Client: PBS
Address: 4412 S Lockett Ave
City, State, Zip: POERTLAND, OR 97239
Contact: SEAN GABRIEL
Phone: _____ Fax: _____
Email: SEAN.GABRIEL@PBS.ORG
Other Info: _____

Analysis Type: Nonviable Options:
☒ Fungal ID
☐ Fungal & Particulate ID
☐ Particulate ID
☐ Quantitative Analysis
☐ (Total Count)
☐ Qualitative Analysis
☐ (Relative Abundance)
☐ Viable Options:
☐ Complete Analysis
☐ Genera Only ☐ Stachy Only

Turnaround Time:
6 hr RUSH*
24 hours*
48 hours
☒ 3 days
(NY Std)
5 days
Viable
(7-10 days)

Project Name: LABORATORY H5 T42

Project Number: 21600.026/2015 P.O. Number: _____

Sample Information																	Sampling Information						
Sample #	Sample Description	Sample Type						Media Type			Sample Date	Sample Time				Sample Flow Rate	Total Volume / Area						
		Air	Swab	Bulk	Dust	Tape	MEA	Stachy	Other	On		Off	Start	End	Avg								
S1	AKL - ~~BIF~~ Commons, WEST	✓									3/21/23						75 L						
S2	AKL - ~~BIF~~ Commons, EAST	✓																					
S3	AKL - Classroom F2	✓																					
S4	AKL - Classroom F6	✓																					
S5	AKL - Commons WELLNESS Room	✓																					
S6	AKL - West MEETING ROOM ^{Commons}	✓																					
S7	AKL - SOUTH Extension of Wing	✓																					
S8	AKL - " " " "	✓																					

Internal Lab Use Only:

F.O. Number:

Internal Lab Use Only:

Prelim Released:

By: ☐ Fax ☐ Phone ☐ E-mail ☒ Verbal

Final Results Released:

By: ☐ Fax ☐ Phone ☐ E-mail

Hardcopy / Invoice Mailed: _____
QC & Data Reviewed By: _____

By signing below you are agreeing to comply with Lab/Cor's Requests, Tenders and Contracts.

Relinquished by: SEAN Date: 3/22/23 Time: 3:00

Received by: SEAN Date: 3/23/23 Time: 9:40 AM

Relinquished by: _____ Date: _____ Time: _____

Received by: _____ Date: _____ Time: _____

S:\Laboratory\QC\Master Documents\Chain of Custody\CURRENT CHAINS\Fungal Particulate Chain of Custody Record V06.doc

* Call ahead for TATs of 24hrs or less

230210 2/5

Client: PBS
Address: 4412 S. WARETT
City, State, Zip: PORTLAND, OR 97239
Contact: SEAN GARRINGER
Phone: _____ Fax: _____
Email: SEAN.GARRINGER@PBS.ORG
Other Info: _____

Turnaround Time:

_____	6 hr RUS ^a *
_____	24 hours*
_____	48 hours
☒ _____	3 days
_____	(NY Std)
_____	5 days
_____	Viable
_____	(7-10 days)

Project Number: 21600-026 / 0015 P.O. Number: _____

[illegible]

Final Results Released: _____
 By: ☐ Fax ☐ Phone ☒ E-mail: ☐ Verbal ☒ _____
 By: ☒ Fax ☐ Phone ☐ E-mail: ☐ Verbal ☐ _____

Hardcopy / Invoice Mailed:
QC & Data Reviewed By:

Relinquished by: ~~22~~ 22
Date: 3/17/12

Date: 2/6/63 Time: 2:00

Received by: [Signature] Date: 3/18/3 Time: 9:40

S. Laboratory OC/Master Document/Chain of Custody form 0001-0001

Journal of Custody Chain of Custody Record Y06.doc

* Call ahead for TATs of 24hrs or less