April 4, 2016

Clemson University
310 Klugh Avenue
Clemson, South Carolina 29634

Attn: Mr. W. Robert Newberry, IV
E-mail: wnewber@clemson.edu

Re: Limited Mold Investigation Report
Long Hall Rooms 201 & 203
Clemson, South Carolina
Terracon Project No. 86127158 – Task 57

Dear Mr. Newberry:

Terracon Consultants, Inc. (Terracon) conducted a limited mold investigation at Long Hall in Rooms 201 & 203 on the Clemson University campus in Clemson, South Carolina. The offices are currently occupied by Dr. David Knox and his staff who have concerns of mold. This service was conducted in general accordance with our Master Service Agreement with Clemson University.

PROJECT DESCRIPTION

Scope of Services

At the request of Clemson University, Terracon representative Mr. Benjamin Hestir conducted a limited mold investigation in Long Hall Rooms 201 & 203 on March 29, 2016. Specifically, our efforts focused on the air quality in the office and the immediate vicinity based on concerns expressed to the University facilities staff regarding apparent mold growth on pipe insulation in one of the rooms in the suite occupied by Dr. David Knox of the Office of Undergraduate Studies and his staff. The rooms observed include Dr. Knox's office in Room 203, an adjoining office in Room 201A occupied by his assistant and a laboratory in Room 201.

Long Hall was originally constructed in 1937 for the College of Agriculture. Terracon conducted airborne mold sampling which consisted of collecting air samples in four locations inside Rooms 201, 201A and 203 and the collection of two additional samples outside for comparison.

Standard of Care

This sampling was conducted in a manner consistent with the level of care and skill ordinarily exercised by members of the profession currently practicing under similar conditions in the same locale. Terracon did not attempt to identify every potential exposure or hazard present in the subject building. The results, findings, conclusions, and recommendations expressed in this report

are based on conditions observed during our sampling. Many factors, such as weather conditions, building occupancy, ventilation patterns, and seasonal variations in fungal/bacterial concentrations or local sources of volatile chemicals, can affect the conditions observed. The information contained in this report should not be relied upon to represent conditions that existed prior to or after this sampling. Terracon does not warrant the services of regulatory agencies, laboratories, or other third parties supplying information that may have been used in the preparation of this report.

SAMPLING CRITERIA AND METHODS

Physical Assessment

The physical assessment was conducted to determine whether building materials were impacted by moisture intrusion or condensate formation, and to identify the presence of visible fungal growth. The assessment focused primarily on collecting observational data (i.e., information obtained by physical assessment of the building and interviews with the building management and maintenance staff). The physical assessment can help to formulate plans for more in-depth investigation.

The physical assessment included:

- an examination in the area of concern of the physical structure and potential indoor and outdoor sources of moisture intrusion; and,
- the identification of any discoloration or odor that could indicate moisture intrusion, water damage, and/or fungal growth.

Moisture Content in Building Materials

Excess moisture in building materials may result in the growth of fungi or bacteria. There are no regulations or standards for moisture content in installed building materials. Moisture content will vary building-to-building and across geography, depending largely on relative humidity and indoor environmental conditions. Terracon applied industry best practices and equipment manufacturer guidelines to determine the moisture content of materials in this facility.

A moisture meter was used to identify suspect water-impacted materials. Building materials have different absorptive and moisture retention properties and will come into equilibrium with environmental moisture (as indicated by relative humidity levels) or become wet by contact with water.

Our investigation was limited to accessible surfaces. A Protimeter® Mini Moisture Meter, Model BLD2000 direct-reading instrument was used to measure the moisture content of the building

materials included in this investigation. The moisture meter works via the measurement of electroconductivity through the material being tested via two penetrating probes.

According to Protimeter®, readings above 16% on wood components should generally be considered excess moisture that may indicate moisture intrusion and the early stages of wood-deteriorating organism growth. Wood Moisture Equivalent (%WME) readings on materials other than wood components (e.g. drywall) above 16% WME would also be considered moisture impacted.

Mold Sampling

Total non-viable (non-culturable) fungal spore trap samples were collected using Air-O-Cell™ spore trap cassettes specifically designed for the collection of airborne mold spores. Air samples were collected using a calibrated Zefon Bio-Pump™ at a flow rate of 15 liters per minute (LPM) for 5 minutes at each location. Indoor sample locations are shown on Figure 1 (attached).

After air sample collection, the samples were hand delivered to Southeast Environmental Microbiology Laboratories, Inc. (SEEML), accredited by the American Industrial Hygiene Association (AIHA®) Laboratory Accreditation Programs, LLC under the Environmental Microbiology Laboratory Accreditation Program (EMLAP), Accreditation #173667. Air samples were analyzed by direct microscopic examination and are reported in spores per cubic meter of air (spores/m^3).

To help interpret the sampling results, we compared indoor air and outdoor air measurements. High variability in airborne fungal spore concentrations can exist in different geographic locations, during different seasons, and weather patterns, and over the course of a given day. As a general rule, indoor air fungal spore concentrations in an HVAC-supplied building are typically less than, but qualitatively similar to, fungal spore concentrations found in the outside environment.

There are no state or federal exposure limits established for fungal aerosols. There are currently no regulatory standards or medically based threshold limit or dose-response relationships for exposure to airborne or surface concentrations of mold spores. Terracon relies upon experience, professional judgment, current scientific literature, guidelines and recommendations made by professional organizations and experts, and statistical methods in interpreting mold sampling results.

FINDINGS

Physical Assessment

Long Hall is a 4-story building originally constructed in 1937 and has a brick and masonry exterior with interior finishes including metal and plaster walls and vinyl flooring. The rooms observed include Dr. Knox's office in Room 203, an adjoining office in Room 201A occupied by his assistant

and a laboratory in Room 201. Evidence of mold growth was observed on several exposed pipes at ceiling level in Room 201 during our visual assessment.

Moisture Content in Building Materials

One location of suspect fungal growth on pipe insulation wrap was metered and the insulation was found to be wet. See Photo #2 in the attached Photo Log.

Mold Air Sampling

On the afternoon of March 29, 2016 Terracon collected four (4) non-viable mold spore trap samples in Long Hall and in two (2) outdoor locations for comparison.

The air samples were collected at the following locations:

- Lab bench in Room 201;
- Table on the south end of Room 201;
- Desk in Pam's office in Room 201A;
- Center table in Dr. Knox's office in Room 203; and,
- Outside the building for comparison (2 samples).

Indoor sample locations are shown on Figure 1 (attached). The results of the total spore count samples analyses are summarized in Table 1 below:

Table 1: Summary of Total Spore Count Analyses – March 29, 2016

Sample #	LH-1	LH-2	LH-3	LH-4	LH-5	LH-6
Location Description	**Lab bench in Room 201**	**Table on south end of Room 201**	**Pam's desk in Room 201A**	**Center table in Dr. Knox's office in Room 203**	**Outside west entrance to Long Hall**	**Outside north entrance to Long Hall**
Spore Type	**Spores/m^3**	**Spores/m^3**	**Spores/m^3**	**Spores/m^3**	**Spores/m^3**	**Spores/m^3**
Alternaria	---	---	---	---	13	---
Ascospores	39	---	39	39	234	234
Basidiospores	156	312	169	195	429	---
Cladosporium	403	208	208	312	598	702
Aspergillis / Penicillium	---	39	39	---	130	---
Smuts/Periconia/ Myxomy	13	13	13	26	39	13
Total	**611**	**572**	**468**	**572**	**1,440**	**949**

All of the four indoor total spore counts were lower than the results from the two outdoor samples. The dominant genera indoors and outdoors were *Basidiospores* and *Cladosporium*. The weather on the day we sampled was clear and sunny, warm (69º F) with a light breeze (winds less than 10 mph).

The laboratory analytical report is attached. Photos from the sampling event are attached.

CONCLUSIONS AND RECOMMENDATIONS

The following conclusions and recommendations are provided based on our assessment:

- Visual evidence of mold growth was observed on exposed pipe wrap at ceiling level in Room 201 (the laboratory). Total mold impacted materials are estimated at 25 linear feet.
- One pipe that was accessible was found to have insulation that was considered wet with a Protimeter Model BLD 2000 “Mini” moisture meter.
- Indoor airborne total spore levels were lower than total outdoor spore levels. In addition, the types of mold spores identified indoors were also identified in the outdoor samples.
- Visual indication of mold growth indoors should be rectified. Removal of pipe wrap and pipe insulation impacted by mold growth is recommended. The system should be re-evaluated to determine if the pipe has corroded and is leaking or if the amount/type of insulation is sufficient to prevent condensation. Asbestos testing should be also performed to determine asbestos content prior to any disturbance of pipe insulation.

Terracon appreciates the opportunity to provide this service to Clemson University. If you have any questions regarding this limited mold investigation report, please contact the undersigned at 864-292-2901.

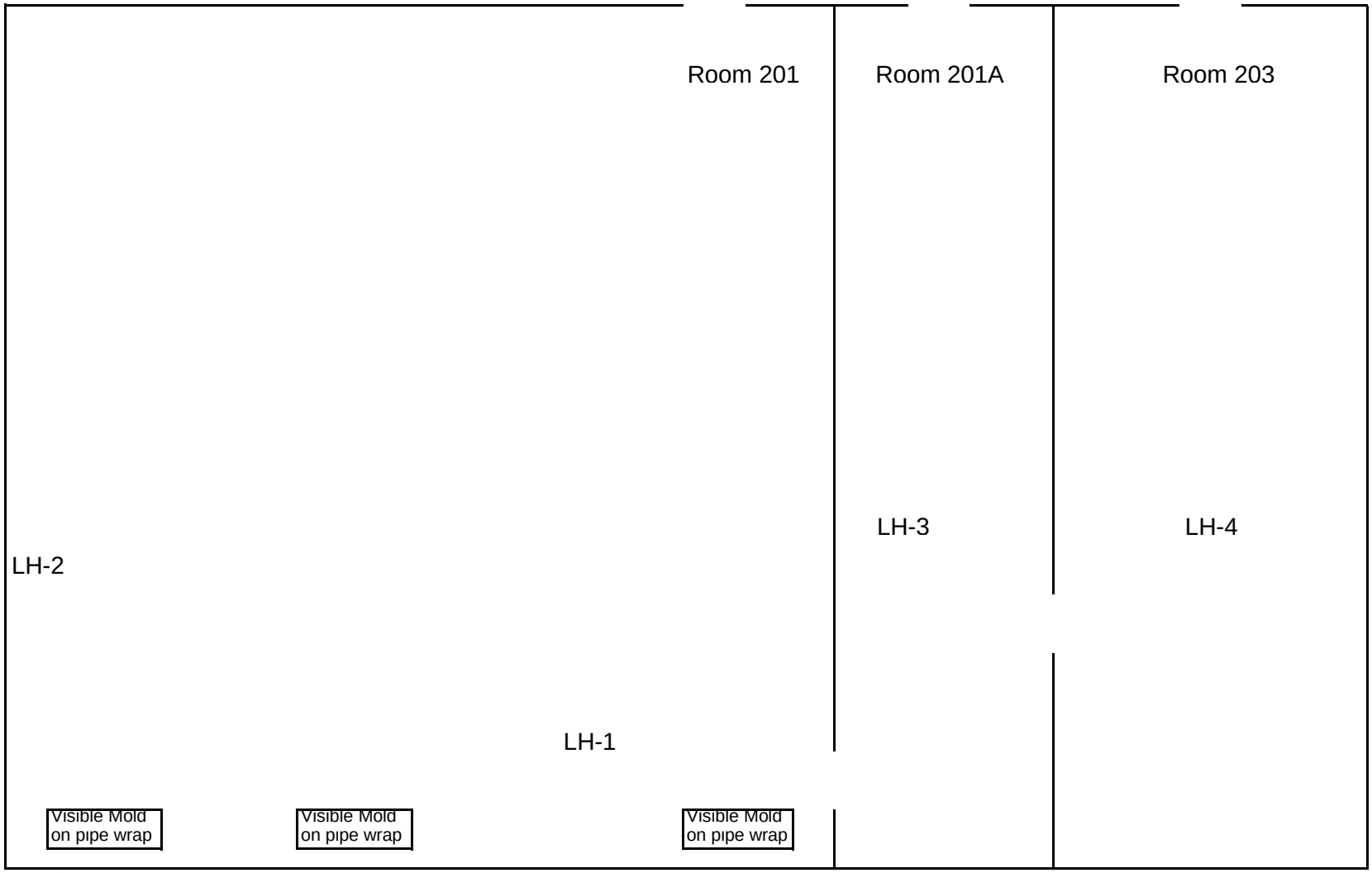
Sincerely,
Terracon Consultants, Inc.

Benjamin Hestir, P.E.
Project Industrial Hygienist

Jeffrey A. Gurrie
Senior Industrial Hygienist

Attachments: Indoor Sample Locations
Photographs
Laboratory Results

Indoor Sample Locations





Project Manager: BDH	Project No. 86127158
Drawn By: BDH	Scale: N.T.S.
Checked By: JAG	File Name:
Approved By: JAG	Date: 4/1/2016

Terracon
Consulting Engineers & Scientists
72 Pointe Circle Greenville, SC 29615
PH. (864) 292-2901 FAX. (864) 292-6361

General Layout / Approximate Sample Locations

Long Hall - Clemson University
Rooms 201, 201A and 203
Clemson, South Carolina

Figure 1

Photographs



Photo #1 View of west side of Long Hall – Clemson University



Photo #2 View of suspect fungal growth on pipe wrap in Room 201 – Long Hall



Photo #3 View of additional suspect fungal growth on pipe wrap in Room 201 – Long Hall



Photo #4 Additional suspect fungal growth on pipe wrap in Room 201 – Long Hall



Photo #5 Partially abated asbestos surfacing material in the ceiling in Room 201 – Long Hall



Photo #6 Area of previous water damage observed in southwest corner of Room 201 – Long Hall

Laboratory Results

SEEML Reference Number:
160330011

Southeast Environmental Microbiology Laboratories
506 Laurens Rd
Greenville, SC 29607
Phone: (864) 233-3770
FAX: (864) 233-6589

The information and data for **Terracon** has been checked for thoroughness and accuracy. The following reports are contained within this document:

- ☐ Direct Exam Report
- ☒ Spore Trap Report
- ☐ Quantitative Fungal Report
- ☐ Andersen Fungal Report
- ☐ Quantitative Direct Exam Report

Lab Manager Review: Rafael Berrios Date: 03/30/16

Thank you for using SEEML laboratories. We strive to provide superior quality and service.
SEEML laboratories are AIHA (American Industrial Hygiene Association) Environmental Microbiology Accredited laboratory for only fungal analysis Air-Direct Examination (EMLAP # 173667).

The data within this report is reliable to three significant figures. The third significant figure is technically unjustified. In this instance, the third figure is reported as an estimate to facilitate the interpretation by the customer.

Confidentiality Notice:
The document(s) contained herein are confidential and privileged information, intended for the exclusive use of the individual or entity named above. If the reader of this message is not the intended recipient, or the employee or agent responsible for delivering it to the intended recipient, you are hereby notified that any dissemination, distribution or copying of the document(s) is strictly prohibited. If you have received this document in error, please immediately notify us by telephone to arrange for its return. Thank you.

Guidelines for Interpretation:
No accepted quantitative regulatory standards currently exist by which to assess the health risks related to mold and bacterial exposure. Molds and bacteria have been associated with a variety of health effects and sensitivity varies from person to person.
Several organizations, including: the American Conference of Government Industrial Hygienists (ACGIH); the American Industrial Hygiene Association (AIHA); the Indoor Air Quality Association (IAQA); the United States Environmental Protection Agency (USEPA); the Centers for Disease Control (CDC), as well as the California Department of Health Services (CADHS), have all published guidelines for assessment and interpretation of mold resulting from water intrusion in buildings.

Interpretation of the data and information within this document is left to the company, consultant, and/or persons who conducted the fieldwork.

Spore Trap Report

Attention: Ben Hestir	Date Sampled: 03/29/2016
Terracon	Date Received: 03/30/2016
72 Pointe Circle	Date Analyzed: 03/30/2016
Greenville, SC 29615	Date Reported: 03/30/2016
	Date Revised:
	Project Name: 86127158
	Project Address: Long Hall 203
	Project City, State, ZIP: Clemson, SC
	SEEML Reference # : 160330011

TEST METHOD: DIRECT MICROSCOPY EXAMINATION AT 400X (100% OF TRACE ANALYZED) SEEML SOP 7

Client Sample ID	LH-1			LH-2			LH-3		
Location	Room 201 Lab Bench			Room 201 South End			Room 201A Pam's Desk		
Lab Sample ID	160330011-044			160330011-045			160330011-046		
Detection Limit (spores/m^3)	13			13			13		
Hyphal Fragments	17	221		6	78		9	117	
Pollen	13	169					3	39	
Spore Trap Used	AOC			AOC			AOC		
	raw ct.	spores/m^3	%	raw ct.	spores/m^3	%	raw ct.	spores/m^3	%
Alternaria									
Ascospores	3	39	6				3	39	8
Basidiospores	12	156	26	24	312	55	13	169	36
Bipolaris/Drechslera									
Chaetomium									
Cladosporium	31	403	66	16	208	36	16	208	44
Curvularia									
Epicoccum									
Cercospora									
Fusarium									
Memnoniella									
Nigrospora									
Penicillium/Aspergillus				3	39	7	3	39	8
Polythrincium									
Rusts									
Smuts/Periconia/Myxomy	1	13	2	1	13	2	1	13	3
Spegazzinia									
Stachybotrys									
Stemphylium									
Tetraploa									
Torula									
Ulocladium									
Colorless/Other Brown 2									
Oidium									
Zygomycetes									
Pithomyces									
Background debris (1-5)3	3			3			3		
Sample Volume(liters)	75			75			75		
TOTAL SPORES/M^3	47	**611**		44	**572**		36	**468**	

Comments: Condition of the sample(s) upon receipt: Acceptable.

1=Total % may not equal 100 due to rounding.

2 = Colorless,other Brown are spores without a distinctive morphology on spore traps and non-viable surface samples.

3 = Background debris is the amount of particulate matter present on the slide and is graded from 1-5 with 1 = very light, 2= Light, 3 = Medium, 4 = Heavy, 5 = Very Heavy. The higher the rating the more likelihood spores may be underestimated. A rating of 5 should be interpreted as minimal counts and may actually be higher than reported.

The reporting limit is 1 Spore/sample.

Disclaimer: This report relates only to the samples tested

Respectfully submitted, SEEML

Rafael Berrios

Rafael Berrios, Approved Laboratory Signatory

506 Laurens Road
Greenville, SC 29607
Phone: (864) 233- 3770
Fax: (864) 233-6589
AIHA-LAP, LLC EMLAP # 173667

Spore Trap Report

Attention: Ben Hestir	Date Sampled: 03/29/2016
Terracon	Date Received: 03/30/2016
72 Pointe Circle	Date Analyzed: 03/30/2016
Greenville, SC 29615	Date Reported: 03/30/2016
	Date Revised:
	Project Name: 86127158
	Project Address: Long Hall 203
	Project City, State, ZIP: Clemson, SC
	SEEML Reference # : 160330011

TEST METHOD: DIRECT MICROSCOPY EXAMINATION AT 400X (100% OF TRACE ANALYZED) SEEML SOP 7

Client Sample ID	LH-4			LH-5			LH-6		
Location	Room 203 Center Table			Outside West Entrance			Outside North Entrance		
Lab Sample ID	160330011-047			160330011-048			160330011-049		
Detection Limit (spores/m^3)	13			13			13		
Hyphal Fragments	8	104		6	78		9	117	
Pollen	14	182		79	1027		97	1261	
Spore Trap Used	AOC			AOC			AOC		
	raw ct.	spores/m^3	%	raw ct.	spores/m^3	%	raw ct.	spores/m^3	%
Alternaria				1	13	<1			
Ascospores	3	39	7	18	234	16	18	234	25
Basidiospores	15	195	34	33	429	30			
Bipolaris/Drechslera									
Chaetomium									
Cladosporium	24	312	55	46	598	42	54	702	74
Curvularia									
Epicoccum									
Cercospora									
Fusarium									
Memnoniella									
Nigrospora									
Penicillium/Aspergillus				10	130	9			
Polythrincium									
Rusts									
Smuts/Periconia/Myxomy	2	26	5	3	39	3	1	13	1
Spegazzinia									
Stachybotrys									
Stemphylium									
Tetraploa									
Torula									
Ulocladium									
Colorless/Other Brown 2									
Oidium									
Zygomycetes									
Pithomyces									
Background debris (1-5)3	3			3			3		
Sample Volume(liters)	75			75			75		
TOTAL SPORES/M^3	44	**572**		111	**1440**		73	**949**	

Comments: Condition of the sample(s) upon receipt: Acceptable.

1=Total % may not equal 100 due to rounding.

2 = Colorless,other Brown are spores without a distinctive morphology on spore traps and non-viable surface samples.

3 = Background debris is the amount of particulate matter present on the slide and is graded from 1-5 with 1 = very light, 2= Light, 3 = Medium, 4 = Heavy, 5 = Very Heavy. The higher the rating the more likelihood spores may be underestimated. A rating of 5 should be interpreted as minimal counts and may actually be higher than reported.

The reporting limit is 1 Spore/sample.

Disclaimer: This report relates only to the samples tested

Respectfully submitted, SEEML

Rafael Berrios

Rafael Berrios, Approved Laboratory Signatory

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Southeast Environmental Microbiology Laboratories
Chain of Custody

506 Laurens Rd, Greenville, SC 29607
Phone : 864-233-3770, Fax: 864-233-6589, www.seeml.com, AIHA-LAP, LLC. (EMLAP) #173667

For Lab Use Only			
Condition of samples is acceptable	☑ YES ☐ NO	SEEML Ref #: 160330011	Lab ID: 044 -049

Company Information		Client Information		Environmental Conditions	
(Project Manager)	Ben Hestir	Date Sampled:	3-29-16	Precipitation in last 16hrs:	None
(Company Name)	Terracon	Project Name:	86127158	Relative Humidity I/O:	— / —
(Address)	72 Pointe Circle	Project Address:	Long Hall 203	Temperature I/O:	— / —
(City, State, Zip)	Greenville, SC	City, State, Zip:	Clemson, SC	Wind Conditions	breezy 69° F
(Phone)	864-293-7348				
(Email)	ben.hestir@terracon.com				

Sample Type Abbreviations:
A- Allergenco S-Swab AP-Andersen Plate
AOC- Air O Cell T-Tape W- Water
M5- Micro 5 B- Bulk D- Dust

Analysis Type:
1. SporeTrap, Air Sample Analysis-Same Day
2. Direct Exam Surface Sample Analysis -Same Day
3. Culturable Air / Surface Samples -7-10 days

Sample ID	Sample Location	Sample Type	Analysis Type	*Area	**Volume (L)	Notes
LH-1	Room 201 Lab bench	AOC	1		75	
LH-2	Room 201- south end	"	"		"	
LH-3	Room 201A - Pam's desk	"	"		"	
LH-4	Room 203 - center table	"	"		"	
LH-5	Outside - west entrance	"	"		"	
LH-6	Outside - north entrance	"	"		"	

Reliquished By:	Date/Time	Recieved By:	Date/Time
Brad Hester	3-30-16 0913	Carmen Bruno	3-30-16

* Area is only required for culturable surface samples.
** Volume = Pump setting (L/min) x minutes