1.0 Purpose

The purpose of this SOP is to outline proper methods for cleanup and disposal following an indoor water release (flood), which may result in damaged building materials. The prompt cleanup of water is necessary to minimize property loss and prevent microbial growth. This SOP also details proper methods for mold remediation if cleaning and drying was not successful or if mold is identified during initial inspection. It is also essential to identify and eliminate the source of moisture that has contributed to the water damage or mold growth as part of the remediation process.

2.0 Scope

The procedures outlined in this document are provided as general guidance for use throughout university facilities, excluding those with their own plan (i.e., The Ohio State University Medical Center). These procedures are based on several relevant remediation guidelines, which categorize water damage restoration and mold remediation strategies based on the extent (i.e., square footage) of contiguous mold growth observed. While contiguous areas of mold growth and the extent of water damage are useful values, many situations require incident specific judgment and expertise to ensure successful restoration. Whenever the following conditions are present or suspected, the Ohio State University (OSU) Office of Environmental Health and Safety (EHS) must be contacted for consultation and cleanup assistance, prior to, or concurrent with initiating response activities outlined in this SOP:

- If the source of the water is NOT clean (e.g., not potable) or is suspected of being contaminated (i.e., with chemical, radiological, or biological sources), such as sewage, wastewater from food preparation or other similar areas, drainage from sinks or toilets, and/or effluent from laboratory and/or medical settings.

- Large areas of mold growth (greater than approximately 10 contiguous square feet).

- Substantial water leaks, such as those that impact more than a localized, limited area.

- Events that occur in occupied areas, particularly in situations that involve concerned occupants or where spaces may need to be vacated for remediation/restoration.

- Any water leak or mold growth situations in sensitive indoor environments, including all healthcare settings, research laboratories and animal research spaces.

- If water and/or mold-damaged building materials are suspected to contain asbestos or other regulated materials.

- If the water and/or mold remediation work presents the potential for physical or other health and safety concerns, such as electrical hazards.

- If the extent of wet and/or mold-impacted materials may not be fully characterized, such as when situations where damage could be present in inaccessible areas (e.g., inside walls) or when the appropriate remediation/restoration strategy may not be clear.

- Any events or conditions that may require the use of outside resources (i.e., remediation contractors or environmental consultants).

- Events where specific documentation and/or testing (i.e., moisture or relative humidity levels) may be required to verify effectiveness of the response action, such as insurance claims.

Although the items listed above require EHS involvement, there may be other instances where EHS should be consulted.

3.0 Responsibilities

It is the responsibility of all OSU Facilities Operations and Development (FOD) employees who respond to indoor floods (releases) to review and follow guidelines established in this SOP and share it with all other responders.

4.0 Procedures

4.1 FLOWCHART: Follow the established Emergency Call Work Request Processing Flow Chart (attached – Appendix A). A necessity of an effective cleanup requires a timely response to the water release.

4.2 HEALTH & SAFETY: Water damaged buildings and materials and the investigation and performance of water damage restoration work can create and expose workers to a wide range of health and safety concerns. Potential hazards include, but are not limited to: exposure to microbial contaminants, chemicals, lead and asbestos; electrical shock and slip-and-fall hazards. Appropriate safety procedures and personal protective equipment (PPE) shall be used to protect employees. Building occupants should be notified of, and protected from, similar health and safety issues.

4.3 INSPECTIONS: Upon initial inspection, the affected area should be evaluated documenting the source and time of the water release, visible material deterioration, pre-existing damage and suspect mold. EHS can be requested to evaluate and document the extent of water migration using moisture-detection equipment.

4.4 WATER RELEASE AND LEAK CLEANUP STRATEGIES: The following Table 1 presents strategies to respond to water damage. These guidelines are designed to help avoid the need for remediation of mold by taking quick action before growth starts. It is essential that water-impacted materials be dried and/or removed as soon as possible following a leak event to minimize the possibility for mold growth. The EPA suggests materials be dried and/or removed within 48-hours following a water release event to minimize the potential for mold growth. It is also important to visually monitor materials for mold growth during the drying period. Depending on the size of the area involved and resources available, professional assistance may be needed to dry an area quickly and thoroughly.

Table 1 Water Damage – Cleanup and Microbial Growth Prevention (http://epa.gov/mold/table1.html)	
Guidelines for response to clean up water damage and to help prevent microbial growth.	
Water-Damaged Material:	***Action(s):***
Books & Papers	• For non-valuable items, discard books and papers. • Photocopy valuable/important items, discard originals. • Freeze (in frost-free freezer or meat locker) or freeze-dry.
Carpet & Backing (dry within 24-48 hours)	• Remove water with water extraction vacuum. • Reduce ambient humidity levels with dehumidifier. • Accelerate drying process with fans. • Steam clean. • Ensure the subfloor under the carpet is clean and dry.
Ceiling Tiles	• Discard and replace.
Cellulose Insulation	• Discard and replace.
Concrete or cinder block surfaces	• Remove water with water extraction vacuum. • Accelerate drying process with dehumidifiers, fans, and/or heaters.
Fiberglass Insulation	• Discard and replace.
Hard surface, porous flooring (Linoleum, ceramic tile, vinyl)	• Vacuum or damp wipe with water and mild detergent and allow to dry; scrub if necessary. • If suspected to be in need of attention, check to make sure sub-flooring is dry; dry sub-flooring if necessary.
Non-porous, hard surfaces (Plastics, metals)	• Vacuum or damp wipe with water and mild detergent and allow to dry; scrub if necessary.
Upholstered furniture	• Remove water with water extraction vacuum. • Accelerate drying process with dehumidifiers, fans, and/or heaters. • May be difficult to completely dry within 48 hours. If the piece is valuable, you may wish to consult a restoration/water damage professional who specializes in furniture.

Wallboard (Drywall and gypsum board)	• May be dried in place if there is no obvious swelling and the seams are intact. If not, remove, discard, and replace. "When in doubt, tear it out." • Ventilate the wall cavity, if possible and safe to do so. Do not direct fans toward contaminated (i.e. asbestos, mold, etc.) building materials.
Window Drapes	• Follow laundering or cleaning instructions recommended by the manufacturer.
Wood Surfaces	• Remove moisture immediately and use dehumidifiers, gentle heat, and fans for drying. (Use caution when applying heat to hardwood floors.) • Treated or finished wood surfaces may be cleaned with mild detergent and clean water and allowed to dry. • Wet paneling should be pried away from wall for drying.
If mold growth has occurred or is suspected, consult Table 2 for proper guidelines for mold remediation/prevention. *Note: mold growth can occur sooner than and after 48 hours; the EPA provides this time as a suggestion only. If there is doubt, a professional should be consulted. *Note: these guidelines are for damage caused by **clean water**. If contamination (i.e., chemical, radiological or biological) is suspected, contact the **Office of Environmental Health & Safety** for consultation and cleanup assistance. In this case, proper Personal Protective Equipment and adherence to OSHA Standards are required. Do not use fans before determining that the water is clean or sanitary. Also, if damaged building tiles are suspected to contain asbestos or other regulated materials, contact the Office of Environmental Health & Safety for analysis / consultation prior to disrupting the regulated building material. Further remediation information is available in the IICRC S500-2006 *Standard and Reference Guide for Professional Water Damage Restoration.* If a particular water-damaged item(s) has high monetary or sentimental value, consultation with a restoration / water damage specialist may be necessary.	

4.5 MOISTURE CONTROL: Moisture problems should be identified, located and corrected or controlled as soon as possible.

4.6 REMOVE EXCESS WATER: Excess water should be collected and removed from structural components, contents and systems at the beginning of the restoration process.

4.7 REMOVING WET MATERIALS: After excess water is cleaned-up, remove unsalvageable wet materials from the affected areas. If this process may create dust and/or debris in occupied or sensitive areas (e.g., wallboard removal), measures should be taken to control and isolate the work areas from surrounding spaces.

4.8 DRYING STRATEGIES: The objective of drying is to minimize the amount of time materials spend in an abnormally wet state and to return affected materials to an acceptable level of dryness as quickly and safely as practical. Once excess water is collected and removed, evaporation of the remaining water in materials should be promoted (Table 1).

4.9 DEHUMIDIFICATION / VENTILATION / AIR CIRCULATION: To avoid secondary damage, moisture evaporating into the air should be exchanged with less humid air from other sources, and/or it should be collected and removed from the air through dehumidification. Fans should also be used to direct air towards wet materials to circulate air and promote drying. Consider opening small holes along the bottom of walls (e.g., behind the cove base) to promote air circulation inside wall cavities. In addition, consider operating air-conditioning equipment serving the areas being dried continuously (i.e., 24-hours a day) to promote dehumidification and ventilation. Care should be taken to protect openings to HVAC-equipment in any area when dust generating activities may occur as a result of restoration work. Temperatures in the drying environment should be maintained to enhance the evaporation rate and effectiveness of dehumidification.

4.10 DOCUMENTATION: Upon initial evaluation and throughout the restoration project, notes should be kept documenting all steps taken to correct the problem. Pictures should be taken prior to, during and after all cleanup procedures. In many instances, more extensive or specific documentation may be required or warranted; EHS should be contacted with any questions regarding documentation requirements.

4.11 MOLD GROWTH: Water damaged building materials, especially those that are porous such as wallboard and/or ceiling tiles, that have been wet for an extended period of time or have been chronically wet can develop mold contamination. If mold growth is encountered during the course of the restoration project, water damage restoration activities should stop until such time that the area of existing or suspected mold contamination is contained. Table 2 presents strategies to respond to mold growth when found or suspected on indoor materials, including those mentioned in Table 1. These remediation guidelines are for building materials that have or are likely to have mold growth. These guidelines are designed to protect the health of occupants and cleanup personnel during remediation and are based on the size and type of material affected by water damage and/or mold growth. If possible, remediation activities should be scheduled during off-hours when building occupants are less likely to be affected.

Although the level of personal protection suggested in these guidelines is based on the total surface area contaminated and the potential for remediator and/or occupant exposure, professional judgment should always play a part in remediation decisions. These remediation guidelines are based on the size of the affected area to make it easier for remediators to select appropriate techniques, not on the basis of health effects or research showing there is a specific method appropriate at a certain number of square feet.

In cases when extensive or hidden mold is expected, when remediation may involve demolition of moldy materials that could generate elevated airborne mold sources, or when sensitive individuals are present, a more cautious approach to remediation may be required. Always ensure the safety and protection of remediators and building occupants from exposure to mold. In all of these cases, among others (refer to section 2.0), EHS must be involved to evaluate the nature and extent of damage; to help determine the appropriate response actions and control methods; and to document the effectiveness of remediation.

<table>
<tr><th colspan="4">Table 2: Guidelines for Remediating Building Materials with Mold Growth Caused by Clean Water (http://epa.gov/mold/table2.html)</th></tr>
<tr><th>Material or Furnishing Affected</th><th>Cleanup Methods (See Key Below)</th><th>Personal Protective Equipment (PPE)</th><th>Containment</th></tr>
<tr><td colspan="4">SMALL – Total Surface Area Affected Less Than 10 square feet</td></tr>
<tr><td>Books & Papers</td><td>3</td><td rowspan="9">Minimum
N-95 Respirator / Gloves / Goggles</td><td rowspan="9">None Required</td></tr>
<tr><td>Carpet & Backing</td><td>1, 3</td></tr>
<tr><td>Concrete or cinder block</td><td>1, 3</td></tr>
<tr><td>Hard surface, porous flooring (Linoleum, ceramic tile, vinyl)</td><td>1, 2, 3</td></tr>
<tr><td>Non-porous, hard surfaces (Plastics, metals)</td><td>1, 2, 3</td></tr>
<tr><td>Upholstered furniture & Drapes</td><td>1, 3</td></tr>
<tr><td>Wallboard (Drywall and gypsum board)</td><td>2, 3</td></tr>
<tr><td>Wood Surfaces</td><td>1, 2, 3</td></tr>
</table>

<table>
<tr><th>Material or Furnishing Affected</th><th>Cleanup Methods (See Key Below)</th><th>Personal Protective Equipment (PPE)</th><th>Containment</th></tr>
<tr><td colspan="4">MEDIUM – Total Surface Area Affected Between 10 and 100 square feet</td></tr>
<tr><td>Books & Papers</td><td>3</td><td rowspan="8">Limited or Full
Use professional judgment, consider potential for remediator exposure and size of contaminated area</td><td rowspan="8">Limited
Use professional judgment, consider potential for exposure and size of contaminated area</td></tr>
<tr><td>Carpet & Backing</td><td>1, 3, 4</td></tr>
<tr><td>Concrete or cinder block</td><td>1, 3</td></tr>
<tr><td>Hard surface, porous flooring (Linoleum, ceramic tile, vinyl)</td><td>1, 2, 3</td></tr>
<tr><td>Non-porous, hard surfaces (Plastics, metals)</td><td>1, 2, 3</td></tr>
<tr><td>Upholstered furniture & Drapes</td><td>1, 3, 4</td></tr>
<tr><td>Wallboard (Drywall and gypsum board)</td><td>2, 3, 4</td></tr>
<tr><td>Wood Surfaces</td><td>1, 2, 3</td></tr>
<tr><td colspan="4">LARGE – Total Surface Area Affected Greater Than 100 square feet or Potential for Increased Occupant or Remediator Exposure During Remediation Estimated to be Significant</td></tr>
<tr><td>Books & Papers</td><td>3</td><td rowspan="8">Full
Use professional judgment, consider potential for remediator exposure and size of contaminated area</td><td rowspan="8">Full
Use professional judgment, consider potential for remediator / occupant exposure and size of contaminated area</td></tr>
<tr><td>Carpet & Backing</td><td>1, 3, 4</td></tr>
<tr><td>Concrete or cinder block</td><td>1, 3</td></tr>
<tr><td>Hard surface, porous flooring (Linoleum, ceramic tile, vinyl)</td><td>1, 2, 3, 4</td></tr>
<tr><td>Non-porous, hard surfaces (Plastics, metals)</td><td>1, 2, 3</td></tr>
<tr><td>Upholstered furniture & Drapes</td><td>1, 3, 4</td></tr>
<tr><td>Wallboard (Drywall and gypsum board)</td><td>2, 3, 4</td></tr>
<tr><td>Wood Surfaces</td><td>1, 2, 3, 4</td></tr>
<tr><td colspan="4">Use professional judgment to determine prudent levels of PPE and containment for each situation, particularly as the remediation site size increases and the potential for exposure and health effects rises. Assess the need for increased PPE if during the remediation, more extensive contamination is encountered than was expected.

These guidelines are for damage caused by clean water. If you know or suspect the water source is contaminated with sewage or chemical or biological pollutants, notify the EHS for consultation and cleanup assistance.</td></tr>
</table>

Select the method most appropriate to the situation. Since molds gradually destroy the things they grow on, if mold growth is not addressed promptly, some items may be damaged such that cleaning will not restore their original appearance. If mold growth is heavy and items are valuable or important, consulting a restoration/water damage/remediation expert may be necessary.

*Note: these are guidelines; other cleaning methods may be preferred by some professionals.

CLEANUP METHODS

Method 1: Wet vacuum (in the case of porous materials, some mold spores/fragments will remain in the material but will not grow if the material is completely dried). After drying, steam cleaning should be used for carpets and some upholstered furniture.
Method 2: Damp-wipe surfaces with a 10:1 solution of water to bleach (except wood—use wood floor cleaner); scrub as needed. In some cases, the use of a spray bottle containing the 10:1 solution of water to bleach may be necessary with several applications.
Method 3: High-efficiency particulate air (HEPA) vacuum after the material has been thoroughly dried. Dispose of the contents of the HEPA vacuum in well-sealed plastic bags.
Method 4: Discard – remove water-damaged materials and seal in plastic bags while inside of containment, if present. Dispose of as normal waste. HEPA vacuum area after it is dried.

PERSONAL PROTECTIVE EQUIPMENT (PPE)

Minimum: Gloves, N-95 particulate respirator, goggles/eye protection
Limited: Gloves, N-95 particulate respirator or half-face respirator with HEPA filter, disposable overalls, goggles/eye protection
Full: Gloves, disposable full body clothing (i.e., Tyvek coverall, etc.), head gear (protection), foot coverings, full-face respirator with HEPA filter

CONTAINMENT

Limited: Use polyethylene sheeting ceiling to floor around affected area with a slit entry and covering flap; maintain area under negative pressure with HEPA filtered fan unit. Block supply and return air vents within containment area. Consideration should be given to consulting a qualified professional at this level.
Full: Use two layers of fire-retardant polyethylene sheeting with one airlock chamber. Maintain area under negative pressure with HEPA filtered fan exhausted outside of building. Block supply and return air vents within containment area. A qualified professional should be consulted at this level.

Mold remediation should be performed following the IICRC S520 *Standard Reference Guide for Professional Mold Remediation.*

Some information in this document was taken from literature and remediation documents including *Bioaerosols: Assessment and Control* (American Conference of Governmental Industrial Hygienists, 1999); *IICRC S500, Standard and Reference Guide for Professional Water Damage Restoration* (Institute of Inspection, Cleaning and Restoration, 2006); and Environmental Protection Agency Guidelines.

5.0 HEALTH CONCERNS

If building occupants or remediators report health concerns, they should be advised to seek medical attention / advice from OSU Employee Health Services.

6.0 REMEDIATION RESOURCES

6.1 EPA 2001 *Mold Remediation in Schools and Commercial Buildings*. Washington, DC: U.S. Environmental Protection Agency Office of Air and Radiation, Indoor Environments Division.
http://www.epa.gov/mold/mold_remediation.html

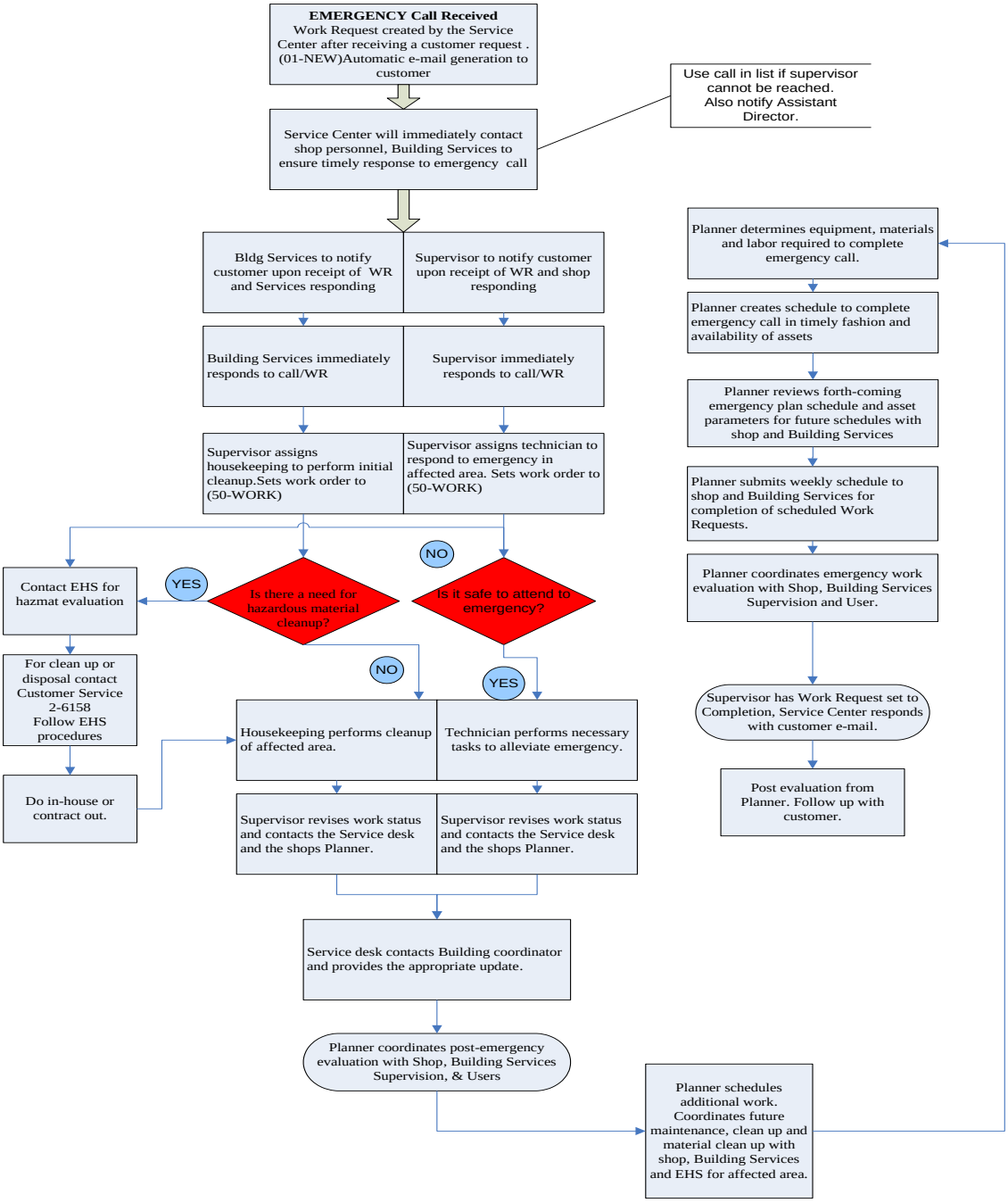
6.2 NYDOH 2008 *Guidelines on Assessment and Remediation of Fungi in Indoor Environments.* New York City Department of Health, Bureau of Environmental & Occupation Disease Epidemiology.
http://www.ci.nyc.ny.us/html/doh/html/epi/moldrpt1.shtml

6.3 OSHA 2003 Safety and Health Information Bulletin: *A Brief Guide to Mold in the Workplace.* SHIP 03-10-10. Washington, DC: U.S. Occupational Safety and Health Administration.
http://www.osha.gov/dts/shib/shib101003.html

This SOP was created by the Office of Environmental Health & Safety at The Ohio State University.

Appendix A:

Emergency Call Work Request Processing Flow Chart



Page 1