

**NRT Quick Reference Guide:
Bacillus anthracis PPE Wash Water Decontamination**

For reference, please see "Key References Cited/Used in National Response Team (NRT) Quick Reference Guides (QRGs) for Bacterial 2012 Revision." QRGs are intended for Federal On-Scene Coordinators (OSCs) and Remedial Program Managers (RPMs).

Background	<p>CAUTION/NOTE: This QRG only provides guidance on disinfecting and disposing of PPE wash water generated from the decontamination of personal protective equipment (PPE). This QRG isn't meant to imply a quick "disinfect and dispose" methodology. Verification of disinfection will be required before disposal. Specific release scenarios, health effects, effect levels, personnel safety, field detection, and decontamination of areas contaminated with and sampling for spores are found in the <i>Bacillus anthracis</i> QRG.</p>																																																						
	<p>PPE Wash water produced from decontamination of PPE may contain viable <i>B. anthracis</i> spores. This water must be disinfected prior to disposal. Disinfectant concentration, exposure time, pH and temperature are important parameters in the disinfection process. Large numbers (four to five orders of magnitude) of <i>B. anthracis</i> spores in suspension may be killed by exposure to 5,000-6,000 ppm hypochlorite at a neutral pH, room temperature (70° F; 21°C), and an exposure time of 1-2 hours. Household bleach contains approximately 6.0% hypochlorite which is equivalent to 60,000 ppm. Thus, a 10% solution of household bleach which has been adjusted to near neutrality (pH 7) by the addition of an acid (e.g. white vinegar) can kill <i>B. anthracis</i> spores suspended in contaminated PPE wash water.</p>																																																						
Decontamination/Cleanup	<p>Activate™ High-level Chlorine Test Strips measures higher levels of available chlorine in bleach solutions. Easy to read, 30-second test provides results in the following ranges - 0, 1000, 2500, 5000, 7500 and 10000 parts per million. Desiccant-lined vial keeps strips fresh.</p> <ul style="list-style-type: none"> ✓ Containerized PPE Wash Water: All liquid waste should be collected in DOT-approved containers. Once disinfection is complete, the PPE wash water may require additional treatment for removing residual chlorine prior to being accepted by the wastewater treatment plant. ✓ An approach for disinfecting <i>B. anthracis</i> spores in PPE wash water using 5-6% hypochlorite liquid bleach (i.e., typical household bleach) and white vinegar is provided below. Note: Only use vinegar that has a minimum of 4% acidity, and only use 5-6% unscented hypochlorite concentrations for the "recipes" below. Also, there is a SHELF-LIFE associated with bleach. Its hypochlorite concentration can degrade over time. The degradation rate of white vinegar is comparatively slow. The procedure assumes there is no free chlorine residual present in the PPE wash water. The procedure may be modified if the wastewater already contains chlorine residual. This modification would be done on a case by case basis. <p>The amount of 5-6% hypochlorite bleach required to make a 10% solution is calculated as follows:</p> <ul style="list-style-type: none"> ✓ Multiply the volume of PPE wash water to be treated by 0.125. Add this volume of 5-6% hypochlorite bleach. ✓ The amount of white vinegar to be added is the same as the amount of bleach. <p>Table 1: Examples of volumes needed to prepare a 10% acidified bleach solution Caution: Allow enough head space (i.e. 10-20%) for mixing, (e.g., 50 gallons total liquid vol. in a 55 gallon drum)</p> <table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <thead> <tr> <th colspan="2">Liquid Wastewater</th> <th colspan="2">5-6% hypochlorite (Household) Bleach</th> <th colspan="2">White Vinegar (min. 4% acidity)</th> <th colspan="2">Total Liquid Volume: PPE Wash Water + 5-6% Hypochlorite Bleach + White Vinegar</th> </tr> <tr> <th>(Gallons)</th> <th>(Liters)</th> <th>(Gallons)</th> <th>(Liters)</th> <th>(Gallons)</th> <th>(Liters)</th> <th>(Gallons)</th> <th>(Liters)</th> </tr> </thead> <tbody> <tr> <td>10</td> <td>37.9</td> <td>1.25</td> <td>4.73</td> <td>1.3</td> <td>4.7</td> <td>12.5</td> <td>47.3</td> </tr> <tr> <td>40</td> <td>151.4</td> <td>5</td> <td>18.9</td> <td>5</td> <td>18.9</td> <td>50</td> <td>189.3</td> </tr> <tr> <td>100</td> <td>378.5</td> <td>12.5</td> <td>47.3</td> <td>12.5</td> <td>49.3</td> <td>125</td> <td>473.2</td> </tr> <tr> <td>500</td> <td>1,892.7</td> <td>62.5</td> <td>236.6</td> <td>62.5</td> <td>236.6</td> <td>625</td> <td>2,365.9</td> </tr> </tbody> </table> <p>Table 2: Directions for disinfecting vessels with a 10% acidified bleach solution</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 20%;">Ingredients</td> <td> <ul style="list-style-type: none"> ✓ Liquid Bleach (5-6% hypochlorite) ✓ White vinegar (min. 4% acidity) </td> </tr> <tr> <td>Mixing directions:</td> <td> <ul style="list-style-type: none"> ✓ Transfer known volume of PPE wash water to vessel (55 gallon drum, tank, etc.)† ✓ Add bleach to PPE wash water ✓ Add vinegar to PPE wash water/bleach mixture ✓ Stir or agitate until completely mixed. <p>†After stirring, allow a minimum reaction time of two hours at a minimum temperature of 70° F/ 21°C.</p> </td> </tr> <tr> <td>Important Notes:</td> <td> <ol style="list-style-type: none"> 1. 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General Rule - for every decrease of 18°F/10°C, the reaction time may need to be doubled. </td> </tr> </table>	Liquid Wastewater		5-6% hypochlorite (Household) Bleach		White Vinegar (min. 4% acidity)		Total Liquid Volume: PPE Wash Water + 5-6% Hypochlorite Bleach + White Vinegar		(Gallons)	(Liters)	(Gallons)	(Liters)	(Gallons)	(Liters)	(Gallons)	(Liters)	10	37.9	1.25	4.73	1.3	4.7	12.5	47.3	40	151.4	5	18.9	5	18.9	50	189.3	100	378.5	12.5	47.3	12.5	49.3	125	473.2	500	1,892.7	62.5	236.6	62.5	236.6	625	2,365.9	Ingredients	<ul style="list-style-type: none"> ✓ Liquid Bleach (5-6% hypochlorite) ✓ White vinegar (min. 4% acidity) 	Mixing directions:	<ul style="list-style-type: none"> ✓ Transfer known volume of PPE wash water to vessel (55 gallon drum, tank, etc.)† ✓ Add bleach to PPE wash water ✓ Add vinegar to PPE wash water/bleach mixture ✓ Stir or agitate until completely mixed. <p>†After stirring, allow a minimum reaction time of two hours at a minimum temperature of 70° F/ 21°C.</p>	Important Notes:	<ol style="list-style-type: none"> 1. 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	<p>Verification of Decon: Site and situation specific. Please contact ERT (732-321-6660) and/or NDT (800-329-1841) for further assistance.</p>																																																						
Waste Disposal	<p>CAUTION: Hazardous waste transportation & disposal are regulated federally; however, more stringent regulations may exist under state authority. These regulations differ from state-to-state. Detailed state regulations can be found at www.envcap.org.</p> <p>Coordination with the local authorities should occur prior to beginning activities that generate PPE wash water to determine acceptance criteria. The wastewater treatment facility will provide valuable information regarding the specifics of the local sanitary and storm water collection system (e.g., sanitary sewer, surface water, combined, etc.) as well as authorizing the release of any PPE wash water to that system.</p> <p>Discharge Authorization Letter/Discharge Permit: When the PPE wash water has been successfully disinfected and the relevant parameters are within the appropriate limits, a formal request (in writing) must be made to seek approval for discharge to the local wastewater treatment facility. The following are examples of conditions which may need to be stipulated prior to authorization for the discharge of the containerized PPE wash water:</p> <ul style="list-style-type: none"> ➤ A statement specifying that the PPE wash water was treated using an appropriate chlorine disinfection procedure ➤ A statement that "analyses did not reveal the presence of viable <i>B. anthracis</i> in the samples tested," (or similar wording) accompanied by a copy of the laboratory results. ➤ Documentation that guidelines for de-chlorination procedures were approved by the wastewater treatment facility ➤ Quantity – The approval should indicate the total amount of PPE wash water to be released (e.g. twenty, 55-gallon drums of disinfected PPE wash water) ➤ Documentation of water parameters such as pH (i.e. must be greater than 5), total suspended solids (TSS) and chlorides ➤ Time/Date – The approval should establish a date and time for the discharge to commence. Wastewater treatment facilities may wish to time their receipt of containerized PPE wash water during certain periods (e.g. they may not be able to handle the discharge during low flow periods when sufficient volume is not available for dilution). ➤ Discharge Point – The approval should indicate where the discharge is to take place. ➤ Flow Rate – The wastewater treatment facility may stipulate a specific flow or discharge rate. ➤ Weather condition requirements for discharge. ➤ Consideration of other hazardous materials which may be present in the PPE wash water (i.e. decon solutions). <p>The ultimate decision to allow the discharge of the PPE wash water lies with the wastewater treatment facility.</p>																																																						