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Cleanup After Hurricane Katrina: Environmental Considerations

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Summary

Local, state, and federal responders face numerous cleanup challenges associated with Hurricane Katrina. In Mississippi, Alabama, and parts of Louisiana, much of the focus has been on restoring infrastructure and managing debris and waste. In New Orleans, where most damage was due to floodwaters, the immediate tasks were “unwatering” and evaluation of potential risks from contaminated water, sediment, and air. As floodwaters receded, debris management and infrastructure repair began. Monitoring and analysis of air, water, and residual sediment and soil continues to inform decisions about whether neighborhoods are safe for returning residents. Local authorities, with assistance from federal agencies, have worked to determine how and where disaster-related wastes would be gathered, separated, and disposed. This report provides an overview of the immediate and intermediate cleanup tasks and the federal role supporting these tasks.

State, county, and local municipalities have jurisdiction with regard to cleanup after any natural catastrophe. However, because the President issued a major disaster declaration, at the governors’ requests, under the Robert T. Stafford Disaster Relief and Emergency Assistance Act in response to Hurricane Katrina, federal agencies have been broadly authorized to provide assistance. Federal cleanup assistance efforts are being coordinated by the Army Corps of Engineers (the Corps), the U.S. Coast Guard, and the Environmental Protection Agency (EPA). The Corps has coordinated unwatering of New Orleans, assessment and repair of water and wastewater systems, and nonhazardous debris removal, in conjunction with other emergency response activities, such as filling levee breaches. EPA and the U.S. Coast Guard have primary responsibility for assessing and managing releases of oil and other hazardous substances. EPA is also overseeing the collection and disposal of electronic wastes (e.g., computers and televisions) and household hazardous wastes (e.g., household cleaners, pesticides). Many other federal agencies have also been contributing various expertise and assistance to the cleanup effort.

The greatest portion of Katrina-related disaster debris was generated in coastal Mississippi and Louisiana. Removal of that debris and waste continues to be a major concern. The sheer volume of the debris and scope of the destruction, together with the inability of a significant percentage of the affected residents to return to their homes to address potential demolition and debris removal decisions, ensures that the debris removal process will continue for many months to come.

Throughout the Katrina-affected region, drinking water and sewage treatment plants were damaged. Most are operating again now; however, many require substantial repair or reconstruction, which will likely take many months. In New Orleans, some Katrina-generated waste was contaminated, making the potential for toxic chemical exposure of returning residents a significant concern. Sampling results of residue sediments and air have indicated some sediment contamination with bacteria and chemicals. Possible health risks from contact with deposited sediment, or with contaminants in dust as the sediments dry, remain a concern. Mold is another issue of concern. This report will not be updated.

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Cleanup after Hurricane Katrina: Environmental Considerations

Introduction

Local, state, and federal responders face numerous cleanup challenges associated with the effects of Hurricane Katrina,¹ many of them unique, due to the magnitude of events and specific features of communities affected. The immediate need was to clear debris and control releases of hazardous substances that might have posed a health and safety threat or hampered emergency response activities. Subsequently, authorities initiated efforts to determine how and where the huge quantities of Hurricane Katrina-related waste and debris (hazardous and nonhazardous), would be gathered, separated, and ultimately disposed.

The 109th Congress has been working to address the devastation wrought by Hurricane Katrina in the Gulf States, which is on a scale larger than any experienced by the United States in a single natural disaster incident. In addition to supplemental funding,² a number of legislative proposals regarding procedures and requirements for the response and recovery from “super catastrophes” are being debated and considered. This report aims to provide an overview of environmental considerations raised by the immediate and intermediate cleanup tasks across the diverse communities in the affected region, and of federal legal authorities and plans for tackling those tasks. The report also discusses coordinated roles and activities among local, state, and federal agencies and officials. Finally, the report serves to reference other, more detailed CRS reports and other sources on particular Katrina cleanup activities. Public health and environmental concerns associated with Hurricane Katrina span a wide variety of issues, including air and water quality and hazardous chemical releases. Katrina’s impacts also have environmental implications for other major issue areas, such as energy, transportation, and defense. While this report addresses selected cleanup concerns receiving post-Katrina attention, it is not

¹ Unless otherwise noted, the discussion in the remainder of this report addresses environmental impacts and cleanup from Hurricane Katrina only. While other hurricane events in 2005 struck the breadth of the Gulf Coast and caused significant damage (including some of the same locations damaged by Katrina), the brunt of the hurricane-related damage in the region resulted from Hurricane Katrina, which thus has been at the center of the public’s and policymakers’ attention.

² The 109th Congress enacted two FY2005 emergency supplemental appropriations bills (P.L. 109-61 and P.L. 109-62) which appropriated \$62.3 billion for immediate relief and response needs. An additional request of \$19.8 billion in supplemental FY2006 funding for recovery assistance submitted by the Administration on Feb. 16, 2006, is pending before Congress. See CRS Report RS22239, *Emergency Supplemental Appropriations for Hurricane Katrina Relief*, by Keith Bea.

intended to provide comprehensive coverage of all public health and environmental issues associated with Hurricane Katrina, nor is it within the scope of this report to analyze ongoing legislative and appropriations considerations related to the hurricane disaster response efforts.

There are many elements and phases of cleanup in response to natural disasters. Elements of cleanup often undertaken during the initial and intermediate phases following a disaster include the following:

- activation of state, local, and federal disaster response plans and delegation of authorities;
- debris removal, including collection, separation (of nonhazardous and hazardous materials), storage, transport, and disposal (e.g., landfilling, burning) or reclamation (e.g., recycling or reuse) of debris and hazardous wastes;
- oil (and oil by-products) and hazardous materials assessment, containment, and disposal, as well as mitigation of public health risks;
- assessment and containment of existing Superfund sites;
- unwatering of nonreceding floodwaters and managing potentially contaminated soil and sediment;
- cleanup and repair of water and other infrastructure systems;
- monitoring, sampling, and analysis to identify and reduce potential public health and environmental risks.

These tasks and the federal government's role are the primary focus of this report.

In response to the impacts of Hurricane Katrina, a joint task force of the Environmental Protection Agency (EPA) and the Centers for Disease Control and Prevention (CDC) issued an initial assessment of the environmental health and supporting infrastructure challenges facing one part of the affected region, New Orleans. The September 2005 EPA/CDC report set the tone for the broader scope of response actions required in that city and throughout the region affected by Hurricane Katrina by observing, "The most striking feature of the disaster is the array of key environmental health and infrastructure factors affected all at once."³

³ The joint task force identified several specific environmental health issues and supporting infrastructure concerns to address, categorizing them according to time (short-term and long-term) and complexity. Joint Taskforce Centers for Disease Control and Prevention and U.S. Environmental Protection Agency, "*Environmental Health Needs and Habitability Assessment*," Sept. 17, 2005. Online at [<http://www.bt.cdc.gov/disasters/hurricanes/katrina/envassessment.asp>].

Federal Disaster Cleanup Response Authorities and Activities

States, counties, and local municipalities have primary jurisdiction with regard to natural catastrophe cleanup. To the extent they are capable, these entities initiate cleanup activities operating under their own statutes⁴ and their various emergency operation and/or incident response plans, often in coordination with various federal agencies, as needed.⁵ However, in the event that state and local governments are overwhelmed by a natural hazard, the President, at the request of the governor, may issue a major disaster declaration under the Robert T. Stafford Disaster Relief and Emergency Assistance Act (the Stafford Act) and invoke federal authorities,⁶ as occurred in response to Hurricane Katrina.

A major disaster declaration in response to a governor's request generally specifies, among other things, the type of incident covered, the time periods covered for specific activities,⁷ the types of disaster assistance available, and the counties affected by the declaration. The Stafford Act broadly authorizes the President to direct federal agencies to provide "essential assistance" as needed, including cleanup and disposal of waste and debris.⁸ Although this declaration initiates the federal

⁴ For an overview of emergency management and homeland security statutes in the 50 states and the District of Columbia see CRS Report RL32287, *Emergency Management and Homeland Security Statutory Authorities in the States, District of Columbia, and Insular Areas: A Summary*, by Ronald O'Rourke. That summary report is supported by companion reports on each state, the District of Columbia, and the insular areas. See profiles for Louisiana (CRS Report RL32678); Mississippi (CRS Report RL32316); and Alabama (CRS Report RS21777). These three reports are all authored by Keith Bea, L. Cheryl Runyon, Kae M. Warnock.

⁵ For example see "State of Louisiana, Office of Homeland Security and Emergency Preparedness Emergency Operation Plan," Apr. 2005, at [<http://www.ohsep.louisiana.gov/plans/eopindex.htm>].

⁶ 42 U.S.C. 5121 et seq. See CRS Report RL33090, *Robert T. Stafford Disaster Relief and Emergency Assistance Act: Legal Requirements for Federal and State Roles in Declarations of an Emergency or a Major Disaster*, by Elizabeth B. Bazan; and CRS Report RL33053, *Federal Stafford Act Disaster Assistance: Presidential Declarations, Eligible Activities, and Funding*, by Keith Bea.

⁷ FEMA, 2005 Federal Disaster Declarations, available at [<http://www.fema.gov/news/disasters.fema?year=2005>].

⁸ Sec. 403 (a) of the Stafford Act (42 U.S.C. §5170(b)(a)) authorizes "assistance essential to meeting immediate threats to life and property resulting from a major disaster." This is defined to include "any work or services essential to saving lives and protecting and preserving property or public health and safety," including debris removal; search and rescue; emergency medical care; emergency shelter and transport; provision of food, water, medicine, and other essential needs; clearance of roads and construction of temporary bridges; provision of temporary facilities for schools; demolition of unsafe structures; warning of further risks and hazards; dissemination of public information; provision of technical advice to state and local governments; and reduction of immediate threats. Sec. 407 of the Stafford Act, 42 U.S.S. 5173. Note that debris removal grants authorized by
(continued...)

response coordination and support activities, state and local governments maintain primary jurisdiction, particularly with regard to cleanup.

The following section briefly describes the Stafford Act, the December 2004 National Response Plan (NRP),⁹ and presidential directives that provide general authority and direction to federal agencies responding to incidents of national significance. For a complete listing of statutory, Homeland Security Presidential Directives (HSPDs), and other authorities for agency actions in response to an incident of national significance, see Appendix 3 of the National Response Plan.

General Disaster Management Authorities

The Stafford Act authorizes the President “to establish a program of disaster preparedness that utilizes services of all appropriate agencies,” ... “direct any Federal agency, with or without reimbursement, to utilize its authorities and the resources granted to it under Federal law (including personnel, equipment, supplies, facilities, and managerial, technical, and advisory services) in support of State and local assistance efforts;” coordinate provision of “technical and advisory assistance” to states and communities; and assist in distributing supplies and emergency assistance.¹⁰ Congress appropriates money to the Disaster Relief Fund (DRF) to ensure that such federal assistance is available to help individuals and communities stricken by severe disasters.¹¹ Presidents have delegated responsibility for administering the major provisions of the Stafford Act to the Federal Emergency Management Agency (FEMA) through executive orders since 1979.¹²

The Homeland Security Act created the Department of Homeland Security (DHS) and incorporated FEMA within the new department. Section 502(6) of the Homeland Security Act directs the DHS Under Secretary of Emergency Preparedness and Response to consolidate federal emergency response plans into “a single, coordinated national response plan.” FEMA coordinates disaster assistance provided by 27 federal agencies as outlined in the NRP. The NRP establishes a comprehensive all-hazards approach to federal interventions, and a framework to coordinate activities of the federal government with those of state, local, and tribal governments

⁸ (...continued)

Section 407 are provided to states and are separate from the Category A debris removal “Public Assistance” authorized by Section 403.

⁹ Section 502(6) of the Homeland Security Act of 2002 (P.L. 107-296). The current NRP was finalized in December 2004 and may be viewed or downloaded from [http://www.dhs.gov/interweb/assetlibrary/NRP_FullText.pdf].

¹⁰ 42 U.S.C. §§ 5131, 5170(a).

¹¹ Funds appropriated to the DRF remain available until expended. Supplemental appropriations acts generally are required to meet the urgent needs of particularly catastrophic disasters, as has been the case with Hurricane Katrina.

¹² Primarily President Jimmy Carter, “Federal Emergency Management” (E.O. 12148, July 20, 1979), as amended, and President George W. Bush, “Amendment of Executive Orders, and Other Actions, in Connection with the Transfer of Certain Functions to the Secretary of Homeland Security (E.O. 13286, Sec. 52, Feb. 28, 2003).

and the private sector. The plan establishes the coordinating structures, processes, and protocols required to integrate the specific statutory and policy authorities of various federal departments and agencies. As with the Stafford Act, the President has designated FEMA as the implementing agency for the NRP. While the NRP is the core plan for managing domestic incidents and coordinating federal actions, other supplemental agency and interagency plans provide details on authorities, response protocols, and technical guidance for responding to and managing specific contingency situations (such as hazardous materials spills, wildfires, etc.).¹³

The NRP is organized functionally by 15 Emergency Support Functions (ESFs). Under these ESFs, federal departments and agencies (and the American Red Cross¹⁴) are grouped according to their capabilities and assigned various tasks. Each ESF has a designated coordinator, primary agency(ies), and a number of support agencies, which together are responsible for planning, supporting, providing resources, implementing programs, and providing emergency services related to their respective tasks to state, local, and tribal governments. When the President declares a major disaster or emergency, DHS/FEMA “activates” and assigns missions to relevant ESFs as deemed necessary.

The ESFs primarily addressing cleanup activities are ESF #3-*Public Works and Engineering*, and ESF #10-*Oil and Hazardous Materials Response*.¹⁵ The primary focus of ESF #3 is infrastructure protection and emergency repair, infrastructure restoration, engineering services, construction management, and critical infrastructure liaison. The U.S. Army Corps of Engineers (the Corps) is designated the coordinator of ESF #3 missions and shares with FEMA the responsibilities of being a primary agency. The primary focus of ESF #10 is oil and hazardous materials (chemical, biological, radiological, etc.) response and environmental safety, and short- and long-term cleanup. EPA is the designated coordinator, as well as a designated primary agency for ESF #10. The U.S. Coast Guard (the Coast Guard) is the other primary agency responsible for ESF #10 missions. ESF #8-*Public Health and Medical Services Annex*, also includes certain activities related to cleanup in coordination with ESF #3 and ESF #10.¹⁶ ESF #8 is coordinated by the Secretary of

¹³ NRP, 2004, p. 16, [http://www.dhs.gov/interweb/assetlibrary/NRP_FullText.pdf]. See CRS Report RL32803, *The National Preparedness System: Issues in the 109th Congress*, by Keith Bea.

¹⁴ Congressional Charter of 1905, 36 U.S.C. §§ 300101-300111 (2002), mandates that the American Red Cross maintain a system of domestic and international disaster relief. Under the NRP, the American Red Cross functions as an Emergency Support Function (ESF) primary organization in coordinating the use of mass care resources in a presidentially declared disaster or emergency (ESF #6).

¹⁵ See the Emergency Support Function (ESF) Annexes to the National Response Plan at [http://www.dhs.gov/interweb/assetlibrary/NRP_FullText.pdf].

¹⁶ “HHS, in coordination with ESF #3 and ESF #10 as appropriate, may task its components, and request assistance from other ESF #8 organizations as appropriate, to assist in assessing potable water, wastewater, solid waste disposal issues, and other environmental health issues; conducting field investigations, including collection and laboratory analysis of relevant samples; providing water purification and wastewater/solid waste disposal (continued...) ”

the Department of Health and Human Services (HHS), principally through the Assistant Secretary for Public Health and Emergency Preparedness (ASPHEP).

Following Hurricane Katrina, multiagency task forces of environmental response experts, including representatives from virtually all federal agencies, were deployed throughout the Gulf region. In addition to those agencies with primary or coordination responsibilities, such as the Corps, the Coast Guard, and EPA, key agencies represented include the U.S. Department of Agriculture, U.S. Fish and Wildlife Service (Department of the Interior), Centers for Disease Control and Prevention (CDC) (Department of Health and Human Services), and National Oceanic and Atmospheric Administration (Department of Commerce). These and other federal agencies have been working in cooperation with Louisiana, Alabama, Mississippi and Florida municipalities and state agencies, to address countless cleanup issues. **Table 1** in **Appendix 1** briefly outlines roles and activities that federal agencies often undertake related to disaster cleanup under the NRP.

Several Homeland Security Presidential Directives (HSPDs) also shape the federal cleanup role after natural catastrophes such as Hurricane Katrina, including HSPD-5 (Management of Domestic Incidents) and HSPD-8 (National Preparedness).¹⁷ Generally, these directives have been issued to clarify responsibilities of various governmental agencies when a catastrophe occurs. Executive orders and presidential directives do not alter statutory authority.

Cleanup activities undertaken by federal agencies, and state and local governments or contractors under their jurisdiction, generally must comply with federal laws, including environmental laws, as well as state and local statutes and ordinances. Individual statutes offer varying flexibility by authorizing enforcement discretion. Temporary or emergency exemptions or waivers under certain statutes allow limited relief from certain requirements. For a more detailed discussion see CRS Report RL33107, *Emergency Waiver of EPA Regulations: Authorities and Legislative Proposals in the Aftermath of Hurricane Katrina*, by James E. McCarthy and Claudia Copeland; and CRS Report RL33104, *NEPA and Hurricane Response, Recovery, and Rebuilding Efforts*, by Linda Luther.

The remainder of this report provides an overview of some of the elements of immediate and intermediate disaster cleanup, including roles of primary federal agencies and references to relevant statutes and other authorities.

¹⁶ (...continued)

equipment and supplies; and providing technical assistance and consultation on potable water and wastewater/solid waste disposal issues,” Dec. 2004 NRP, Annex, p. ESF #8-6. [http://www.dhs.gov/interweb/assetlibrary/NRP_FullText.pdf].

¹⁷ The Department of Homeland Security has these directives on its website at [<http://www.dhs.gov/dhspublic/display?content=4331>] and [<http://www.whitehouse.gov/news/releases/2003/12/text/20031217-6.html>].

Disaster Cleanup Response and Waste Management Tasks

Debris Management

Disaster debris is a highly visible reminder of the scope of a disaster, and debris management accounts for as much as 40% of all disaster-related costs.¹⁸ The level of destruction to homes, businesses, industries (e.g., oil refining and chemical manufacturing), public utilities and structures, and vegetation after Hurricane Katrina is unprecedented in the United States. Proper management of this disaster debris continues to be an important step in protecting public health and safety and the environment, and in recovery and rebuilding efforts in affected areas.

The Volume and Type of Disaster Debris. The greatest debris-generating natural disaster to occur in the United States before Hurricane Katrina was in 1992, when Hurricane Andrew generated 43 million cubic yards (CY) of debris in Florida's Metro-Dade County.¹⁹ When the entire debris removal process is complete, disaster debris generated as a result of Hurricane Katrina will be more than twice that amount. The Corps estimates that debris for Louisiana alone is 46 million CY. This estimate does not include the construction and demolition debris that will be generated when the demolition of private properties begins (estimated at 12.5 million CY) or the nearly 650,000 "white goods" (e.g., refrigerators, freezers) collected in the state. Approximately 70% of the debris in Louisiana, not including demolition debris in New Orleans, has been collected to date. Debris in Mississippi is estimated to be approximately 46 million CY (approximately 90% of which has been collected). Debris in Alabama was approximately 2 million CY (collection there is complete).

The primary types of disaster debris being removed in the wake of Hurricane Katrina fall into the following categories:

- Municipal solid waste — general household trash.
- Construction and demolition (C&D) debris — building materials (which may include asbestos-containing materials), drywall, lumber, carpet, furniture, mattresses, plumbing.
- Vegetative debris — trees, branches, shrubs, and logs.
- Household hazardous waste — oil, pesticides, paints, cleaning agents.
- White goods — refrigerators, freezers, washers, dryers, stoves, water heaters, dishwashers, air conditioners.
- Electronic waste — computers, televisions, printers, stereos, DVD players, telephones.

¹⁸ "Disaster Debris Planning," materials presented by FEMA at EPA's Aug. 2003 "RCRA National Meeting," see [<http://www.epa.gov/epaoswer/osw/meeting/pdf02/ward.pdf>].

¹⁹ U.S. Environmental Protection Agency, *Planning for Disaster Debris*, available online at [<http://www.epa.gov/epaoswer/non-hw/muncpl/disaster/disaster.htm>].

Initially, debris activities primarily involved removal from public land or rights of way (such as roads or canals). Most ongoing debris removal activities involve waste on private property. In such cases, the removal process generally entails collecting waste that has been left at the curbside of a private property,²⁰ hauling the waste to a staging area to segregate materials (when the different types of waste are not separated by the individual leaving it curbside), and hauling the waste to a landfill, reclamation facility (i.e., a site where it will be recycled or reused in some manner), or burning site.²¹ Debris is currently being separated with metals recycled; white goods and electronic wastes having hazardous components removed, then recycled; clean vegetative debris mulched and used for landfill cover in most areas, and some vegetative debris burned; and construction and demolition debris going to approved landfills. Of the debris collected so far in all areas, no comprehensive data are available delineating the percentage of debris that has been landfilled, burned, or reclaimed.

Besides the tremendous volume of debris, another complicating factor in the debris removal process has been the scope of Katrina's destruction. Most natural disasters in the United States have involved destruction over a relatively small area (e.g., 500 square miles for Hurricane Andrew). Typically, residents evacuate the area during an emergency and return afterward to assist with the cleanup (e.g., remove debris from their property and leave it for curbside pickup). The declared disaster area for Hurricane Katrina covered 90,000 square miles and included a major metropolitan area (New Orleans) and the entire coast of Mississippi. The destruction to homes and infrastructure was so great that many residents have been unable to return, meaning that a substantial amount of debris on private property has yet to be removed.

Laws Governing Debris Removal. Most of the debris generated as a result of Hurricane Katrina must be managed in accordance with certain provisions of the federal Resource Conservation and Recovery Act (RCRA)²² and the Clean Air Act.²³ RCRA applies to the management of solid and hazardous waste. Solid waste is defined broadly under the law as "any garbage, refuse ... and other discarded

²⁰ Waste collectors/haulers are prohibited by law from entering private property to remove debris unless that debris poses an imminent threat to public health or safety. For more information, see FEMA press release "Mississippi Debris Cleanup Continues At 100 Percent Federal Funding," Mar. 14, 2006, Release Number: 1604-285, available online at [<http://www.fema.gov/news/newsrelease.fema?id=24218>].

²¹ Most states, including Alabama, Mississippi, and Louisiana, prohibit open burning as a means of waste disposal. That prohibition does not apply to disposal of debris from emergency cleanup operations. In the past, debris from major disasters was most often buried or burned in the community (much of the Katrina-generated debris that was handled in the immediate aftermath of the hurricane was burned). Burning is a limited option, however, since only "clean" (i.e., uncontaminated) debris can be burned. Also, citizens do not want to inhale the smoke from open burning. Further, even if the smoke from burning operations is controlled, it is not an option for waste containing hazardous constituents (e.g., contaminated structures and their contents in New Orleans or asbestos-containing wastes).

²² 42 U.S.C. § 6901-6991k.

²³ 42 U.S.C. § 7401-7671.

material.” Hazardous waste, a subset of solid waste, is defined as a solid waste that is either specifically listed in regulations or meets specific criteria that make it toxic, ignitable (i.e., burns readily), corrosive, or reactive (e.g., explosive). Solid wastes that are not reused or recycled are generally sent to state-permitted landfills; hazardous wastes are required to be sent to specially constructed hazardous waste landfills. Louisiana, Mississippi, and Alabama are authorized by EPA to implement RCRA’s provisions.

RCRA requires states to adopt and implement permit programs to ensure that landfills in their states comply with relevant federal standards. In addition to disposal requirements, RCRA authorizes states implementing their own RCRA programs to set environmental standards applicable to municipal solid waste landfills that are at least as stringent or more than federal requirements. The law requires EPA to determine whether state permit programs are adequate to ensure compliance.²⁴

With regard to the Clean Air Act, Section 112 of the law requires the establishment of national emissions standards for hazardous air pollutants (NESHAP), including asbestos. Individual states and the Corps, in coordination with EPA, must manage asbestos-containing debris in compliance with the asbestos NESHAP when removing and disposing of asbestos during building destruction and renovation.²⁵ Both Mississippi and Louisiana have authority for their asbestos programs and have published protocols for complying with their own state-implemented version of the asbestos NESHAP.²⁶ EPA is working closely with them and is providing debris management guidance to ensure minimization of exposures while expediting cleanup. For example, EPA has advised states to make efforts to segregate asbestos and certain other types of waste for proper disposal in landfills prior to burning the debris.²⁷

²⁴ An issue related to landfill permitting that has generated some controversy in Louisiana has been the reopening of the previously closed Old Gentilly Landfill. This report does not address issues associated with the reopening of the Gentilly Landfill. For background, current information, and a discussion of issues associated with the Old Gentilly Landfill, see the Louisiana DEQ website [<http://www.deq.louisiana.gov/portal/Default.aspx?tabid=2403>]. In particular, see the memorandum from George Pavlou, Senior Federal Official, New Orleans Field Office, EPA to John Connolly, Infrastructure Branch Chief, FEMA, regarding “Potential Federal CERCLA Liability for use of the Gentilly Landfill for debris operations from Hurricane Katrina, FEMA-1603-DR-LA, ESF #10 Task Order,” Nov. 11, 2005.

²⁵ 40 CFR §§61.140-61.160.

²⁶ See Mississippi Department of Environmental Quality (DEQ) “Policy for Handling Demolitions of Structures to Address Potential Asbestos,” Jan. 3, 2006; Louisiana Department of Environmental Quality, “LDEQ Protocol to Comply with the LESHAP Regulations,” Mar. 16, 2006 available online at [<http://www.deq.louisiana.gov/portal/Default.aspx?tabid=2251>]; and the Feb. 24, 2006, letter from Granta Nakayama, EPA Assistant Administrator, Office of Enforcement and Compliance, to Mike McDaniel, Secretary, Louisiana Department of Environmental Quality specifying EPA’s agreement with the Department of Environmental Quality with regard to “Asbestos Issues in Hurricane-affected Areas,” available online at [<http://www.deq.louisiana.gov/portal/>].

²⁷ U.S. EPA, Hurricane Katrina Response, Frequent questions, “Asbestos,” available online (continued...)

Mississippi and Louisiana had disaster debris management plans that were updated after Hurricane Katrina to reflect requirements applicable to the disaster.²⁸ Among other criteria, those plans delineate the types of disaster debris to be handled under the specified emergency conditions and existing laws that apply to the handling and disposal of different types of waste (i.e., hazardous waste, nonhazardous waste, asbestos-containing materials). The plans also specify requirements regarding the selection of debris storage and staging sites and waste handling methods (e.g., chipping/grinding, burning, or landfilling) for certain types of waste.

Debris Removal Responsibilities. Debris removal may be done entirely by the local government, and reimbursed by FEMA, or it may be entirely the mission of the Corps. The Stafford Act authorizes debris removal by federal agencies from publicly owned and privately owned (under certain conditions) lands and water when state and local governments are overwhelmed and request assistance, as was the case following Katrina. Debris management by the Corps falls under ESF #3, Public Works and Engineering, under the NRP. The Corps is tasked with managing, monitoring, and providing technical assistance in the clearance, removal, and disposal of debris and the clearing of ground and water routes into the affected areas. The actual collection and disposal of debris is done by contractors. FEMA plans to reimburse local governments 100% of the cost of debris removal on public and private property, in counties that are eligible for assistance, until June 30, 2006.²⁹

There are many physical risks for workers in the recovery and rebuilding efforts in disaster areas. These include exposure to toxic materials, infectious agents, and mold; structural instability; falls; and the dangers of using equipment in unfamiliar situations or with inadequate training, including heavy equipment, chain saws, and generators.³⁰ EPA, CDC, and OSHA continue to advise state and local governments and cleanup workers on proper health and safety measures when entering structures and handling commingled debris.

²⁷ (...continued)

at [<http://www.epa.gov/katrina/faqs.htm>].

²⁸ See Louisiana Department of Environmental Quality, Hurricane Katrina Debris Management Plan, revised Oct. 14, 2005, available online at [<http://www.deq.louisiana.gov/portal/Default.aspx?tabid=2245>]; and Mississippi Department of Environmental Quality, Emergency Order 5062 05, Sept. 13, 2005, regarding Solid Waste Management, Hazardous Waste Management, and Asbestos, at [[http://www.deq.state.ms.us/MDEQ.nsf/pdf/Main_MDEQEmergencyOrderNO.506205/\\$File/EmergencyOrder506205.pdf?OpenElement](http://www.deq.state.ms.us/MDEQ.nsf/pdf/Main_MDEQEmergencyOrderNO.506205/$File/EmergencyOrder506205.pdf?OpenElement)].

²⁹ 71 *Fed. Reg.* 2261, FEMA Notice: “Louisiana; Amendment No. 10 to Notice of a Major Disaster Declaration,” Jan. 13, 2006; 71 *Fed. Reg.* 13861, FEMA Notice: “Mississippi; Amendment No. 13 to Notice of a Major Disaster Declaration,” Mar. 17, 2006.

³⁰ Detailed information on these hazards and protective measures are posted on several government websites: Occupational Safety and Health Administration (OSHA) at [<http://www.osha.gov/OshDoc/hurricaneRecovery.html>]; National Institute on Occupational Safety and Health (NIOSH) at [<http://www.cdc.gov/niosh/topics/flood>]; and Centers for Disease Control at [<http://www.bt.cdc.gov/disasters/hurricanes/index.asp>].

Releases of Oil and Hazardous Substances

The oil and chemical manufacturing industries have a significant presence in the Gulf region, particularly in Louisiana. As Hurricane Katrina approached the Gulf states, authorities expressed concern, anticipating an unprecedented level of oil and hazardous substance contamination, especially in and around New Orleans. In addition to the logistical challenge of managing a large volume of releases, unlike more common wastestreams (e.g., solid waste, debris), oil and hazardous substances require special handling and disposal techniques in order to reduce risks to public health and the environment.

Congress has provided response and cleanup authorities for oil and hazardous substances primarily in two environmental statutes. Section 311 of the Clean Water Act (CWA)³¹ provides authority to EPA and the Coast Guard to respond to oil and hazardous substance discharges that occur within U.S. navigable waters. Section 104 of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA or Superfund)³² authorizes the President to respond directly to (1) releases or threatened releases of hazardous substances and (2) pollutants or contaminants that may endanger public health or the environment. CERCLA also authorizes EPA to conduct long-term, remedial work at sites on the National Priorities List (NPL).

The government's response to oil and hazardous substance releases generally is governed by the National Contingency Plan (NCP).³³ EPA leads the response to spills on land and in inland waters, whereas the Coast Guard leads the response to spills into coastal waters of the United States. If the President declares a major disaster or emergency and FEMA activates ESF #10 (as occurred after Hurricane Katrina), the National Response Plan (NRP) becomes the government response protocol. In such a situation, the NCP continues to operate but is placed within the broader NRP coordination structure.

Pursuant to the NCP, an EPA On-Scene Coordinator (OSC) is the predesignated federal official and exclusive manager for responses to releases of oil and hazardous substances. The OSC has the responsibility for ensuring an immediate and effective response to a discharge or release. The OSC makes early (and subsequent) judgments about the extent of the incident, what resources will be required, and which scientific advisory teams will be needed. A major duty of the OSC is to coordinate with state and local organizations at the site, who may have been the first responders. In response to Hurricane Katrina, many of EPA's 250 OSCs nationwide were sent to the affected region.

³¹ Section 311 of the Federal Water Pollution Control Act, as amended (commonly termed the Clean Water Act), 33 U.S.C. §1321.

³² 42 U.S.C. § 9601-9675

³³ The National Oil and Hazardous Substances Pollution Contingency Plan (or NCP) established by the CWA and amended by CERCLA, is codified in 40 CFR Part 300.

Oil Releases. The Coast Guard reported³⁴ that it responded to 6 major, 3 medium, and 132 minor oil spills in southern Louisiana alone,³⁵ where approximately 8 million gallons of oil were released from above-ground storage tank facilities. To put this amount in perspective, the 1989 *Exxon Valdez* spill was around 11 million gallons. The first of the major oil spills was cleaned up in early November 2005. Of the 8 million gallons spilled, the Coast Guard reported that by December 8, 2005, approximately:

- 3.8 million gallons were recovered;
- 4 million gallons had evaporated or naturally dispersed;
- 130,000 gallons were contained (e.g., afloat and surrounded by booms); and
- 4,000 gallons were burned.³⁶

This total reported by the Coast Guard does not take into account gasoline from gas stations and the estimated hundreds of thousands of flooded cars in the New Orleans area. The joint CDC/EPA taskforce report (issued September 17, 2005) noted that underground storage tanks of gasoline pose a potential threat of “unknown proportions.”³⁷

One of the largest and most publicized spills occurred at Murphy Oil refinery in St. Bernard Parish, Louisiana. Flood waters from Hurricane Katrina damaged a 10 million gallon oil storage tank, spilling just over 1 million gallons of crude oil. The released oil affected more than 1,800 homes in an adjacent residential community, as well as canals in the area. EPA and the Coast Guard have divided cleanup responsibility. EPA reports that more than 750,000 gallons (approximately 75%) of the oil has been recovered.³⁸

EPA is working with the Louisiana Department of Environmental Quality (LDEQ) to oversee Murphy’s sampling and cleanup activity. Murphy has collected 7,230 sediment samples from 4,271 properties. Murphy’s most recent assessment indicates that 92% of the indoor samples and 97% of the outdoor samples are below LDEQ’s Risk Evaluation/Corrective Action (RECAP) screening standards for soil.³⁹ According to EPA, the RECAP screening standards are intended to be protective levels based on long-term (i.e., 30-year) exposures in a residential setting. EPA will continue to oversee Murphy’s sampling efforts to ensure that the RECAP standards

³⁴ U.S. Coast Guard. Personal communication, Mar. 21, 2006.

³⁵ Per Coast Guard definitions, in coastal areas, a major spill is over 100,000 gallons, medium is between 10,000-100,000 gallons, and minor is less than 10,000 gallons.

³⁶ U.S. Coast Guard. Personal communication, Mar. 21, 2006.

³⁷ EPA/CDC Joint Taskforce, p. 7 and 24 of the assessment, available online at [http://www.epa.gov/katrina/reports/envneeds_hab_assessment.pdf].

³⁸ U.S. EPA, Murphy Oil Spill Information, available online at [<http://www.epa.gov/katrina/testresults/murphy/index.html>].

³⁹ U.S. EPA Region VI. Personal communication, Mar. 22, 2006.

are met.⁴⁰ The Natural Resources Defense Council (NRDC), an environmental interest group, has been critical of EPA's presentation of the sampling results.⁴¹ (See the "Sediment Contamination" section for more discussion of this issue.)

Hazardous Substance Releases. Hurricane Katrina led to numerous releases — both large and small — of hazardous substances. EPA Region IV reported that emergency response personnel have conducted more than 5,237 incident responses in Mississippi and Alabama (Louisiana is located EPA Region VI).⁴² An incident response can involve investigation of reports from the National Response Center (NRC),⁴³ contacting facilities, and reporting hazardous material debris while conducting land or water assessment in the affected areas.

In the New Orleans area, there is the added element that household hazardous materials have been soaking in contaminated waters. As of February 16, 2006, cleanup teams have collected more than 2 million hazardous material containers in southern Louisiana. Most were from flood-damaged households and were relatively small: several ounces to less than 55 gallons. In addition, recovery groups have gathered approximately:

- 31,000 drums (55 gallons or more),
- 29,000 propane tanks,
- 36,000 cylinders, and
- 4,700 large containers.

EPA estimated that these storage devices contained hundreds or even thousands of gallons of hazardous materials.⁴⁴

The Gulf Coast region contains a large concentration of industrial operations, including chemical manufacturing. Authorities were concerned that the hurricane and related flooding may have caused releases of hazardous substances at these types of facilities. In coordination with the Mississippi Department of Environmental Quality, EPA Region IV analyzed soil and sediment samples at certain facilities in

⁴⁰ U.S. EPA Region VI, Murphy Oil Spill Fact sheet available online at [http://www.epa.gov/region6/katrina/pdfs/murphy_oil_ftsht_2_2006.pdf].

⁴¹ NRDC, Contaminants in New Orleans Sediment: An Analysis of EPA Data, Feb. 2006, available online at [<http://www.nrdc.org/health/effects/katrinadata/sedimentepa.pdf>].

⁴² U.S. EPA Region IV. Personal communication, Mar. 22, 2006.

⁴³ The NRC is the federal communications center staffed by the Coast Guard, which receives all reports of releases involving hazardous substances and oil that trigger the federal notification requirements under several laws. Reports to the NRC activate the National Contingency Plan and the federal government's response capabilities, available online at [<http://www.nrc.uscg.mil/nrcback.html>].

⁴⁴ U.S. EPA. "Two Million Hazardous Material Containers Collected in Southern Louisiana." Feb. 16, 2006, News Release. Available online at [<http://www.epa.gov/katrina/newsroom/>].

the storm surge impact zone.⁴⁵ EPA concluded, based on test results, that none of the sites were affected by Hurricane Katrina.⁴⁶

All oil and hazardous substance releases throughout the Hurricane Katrina area have not been determined or assessed. EPA expects that “it will take some time before we know the full extent of the impacts of oil spills resulting from Hurricane Katrina.”⁴⁷ The CDC/EPA joint taskforce report stated that the potential for toxic chemical exposure of returning residents is highly uncertain.⁴⁸

Previously Contaminated Sites (Superfund)

As Hurricane Katrina approached, authorities worried about severe weather impacts to the locations that were contaminated prior to Hurricane Katrina. Of particular concern were the sites currently on (or recently removed from) the Superfund National Priorities List (NPL), EPA’s list of the most contaminated sites in the United States. There are 15 NPL sites in the Katrina-affected area of Louisiana (including five in New Orleans), six in Alabama, and three in Mississippi.⁴⁹

⁴⁵ EPA focused on facilities subject to Risk Management Plans, Tier II reporting, and Toxic Inventory Release reporting requirements.

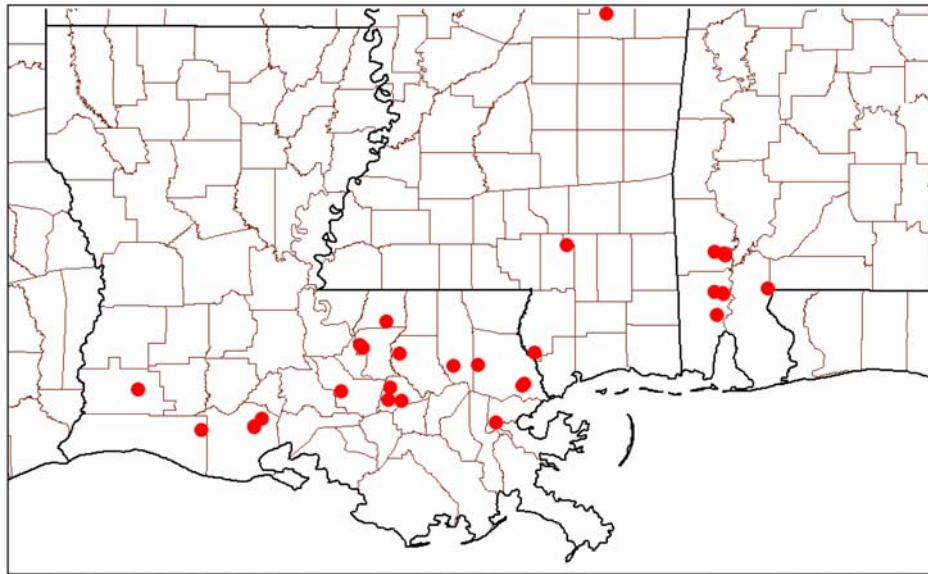
⁴⁶ U.S. EPA, Region IV Hazardous Site Investigations, available online at [<http://www.epa.gov/katrina/testresults/r4hazsites.html#1>]. EPA’s website does not report analogous information for Region VI.

⁴⁷ U.S. EPA, Frequent Questions, available online at [<http://www.epa.gov/katrina/faqs.htm>].

⁴⁸ Joint Taskforce, p. 38. Available from the EPA website at [http://www.epa.gov/katrina/reports/envneeds_hab_assessment.html].

⁴⁹ U.S. EPA, Summary of Assessments at Superfund National Priority List Sites, available online at [<http://www.epa.gov/katrina/superfund.html>].

Figure 1. U.S. Environmental Protection Agency Superfund National Priority List (NPL) Sites in Areas Affected by Hurricane Katrina: Alabama, Louisiana, and Mississippi



Source: National Priority List Superfund Sites in Impacted Areas for Hurricane Katrina as of 9/27/05. U.S. Environmental Protection Agency.

EPA reported that all NPL sites had initial assessments and that samples were collected at each facility. Sampling results for all of the sites are available on EPA's website [<http://www.epa.gov/katrina/testresults/index.html#Superfund>]. EPA concluded that many of the sites were not compromised by the hurricane. However, sampling findings at several sites in Louisiana continue to cause public concern. For example:

- Delatte Metals, Tangipahoa Parish, LA — Sampling from one monitoring well collected in October 2005 indicated that the concentrations of four metals (arsenic, lead, manganese, and nickel) have increased above the levels reported in May 2005.
- PAB Oil, Abbeville, LA — Groundwater samples taken in October 2005 indicated that concentrations of arsenic and chromium exceeded applicable drinking water standards.
- Bayou Bonfouca, Slidell, LA — Three substances (naphthalene, fluorine, and acenaphthene) were detected through groundwater sampling in October 2005. Although their concentrations did not exceed screening levels for tap water, their detection raises questions regarding migration of hazardous constituents.
- Central Wood Preserving, East Feliciana Parish, LA — EPA does not believe that the site was affected by the hurricanes. However, EPA reported that soil sampling results from the southern half of the site exceeded the site's action level for arsenic and are inconsistent with

the sampling conducted before the hurricanes. This inconsistency raises questions regarding potential hurricane effects.

- The Agriculture Street Landfill, Orleans Parish, LA — This landfill was submerged under three feet of water and is located in an area that was extensively damaged. Officials were concerned the landfill liner had been compromised. October 2005 sampling indicates that initial contaminants of concern (e.g., lead) remain below the site's cleanup levels. However, sediments deposited from flooding show levels of benzo(a)pyrene that exceed LDEQ standards.

EPA will continue to monitor these sites to determine if future action is necessary. As with the oil sampling, environmental interest groups have criticized EPA's analysis and presentation of its Superfund site sampling data as inadequate.⁵⁰ The extent of the potential contamination from these sites will not be known until sampling is complete and the results fully evaluated, a process likely to continue for some time.

Contaminated Floodwaters in New Orleans

Outside of Louisiana, large highly urbanized or industrialized areas did not remain flooded for an extended period after Hurricane Katrina passed. In Mississippi and Alabama, the primary damage resulted from the storm surge, high winds, and rainfall accompanying the hurricane.

In New Orleans, however, floodwaters breached the city's existing system of levees and floodwalls that is designed to provide a certain level of protection from storms and intense precipitation. Because flooded portions of the city are below sea level and have little natural drainage, the first task there was to remove the trapped water, estimated by the Corps to have been 114 billion gallons at the maximum,⁵¹ through intentional levee breaks and the existing complementary system of pumps and canals. (For additional information, see CRS Report RL33188, *Protecting New Orleans: From Hurricane Barriers to Floodwalls*, by Nicole Carter.) While the surge of storm water from Hurricane Katrina that engulfed the city was not contaminated initially, it became so when the trapped water mixed with human and animal sewage, decaying bodies, oil and gas from ruptured tanks and pipes, and myriad chemicals that leached from damaged properties and vehicles. Managing the floodwaters raised several issues, including how to control immediate public health and environmental impacts due to direct exposure to the water. Longer-term, the massive flooding raised many additional concerns, such as how to identify and manage releases of toxic chemicals into the water and deposition into the muck and sediment that remain after the water receded, and how to assess and manage the impacts of discharging the floodwaters into Lake Pontchartrain (discussed below).

⁵⁰ Natural Resources Defense Council (NRDC), "Contaminants in New Orleans Sediment, An Analysis of EPA Data," Feb. 2006. Available online at [<http://www.nrdc.org/health/effects/katrinadata/sedimentepa.pdf>].

⁵¹ Stacey Brown, U.S. Army Corps of Engineers. Personal communication, Sept. 14, 2005.

As mentioned above, the National Contingency Plan, prescribed under both the Clean Water Act (33 U.S.C. §§1251-1387) and CERCLA (Superfund; 42 U.S.C. §§9601-9675), gives EPA specific responsibility to respond directly to releases or threats of releases of hazardous substances and pollutants or contaminants that may present an imminent and substantial danger to public health or welfare and to discharges of oil, all of which have been contaminating waters that flooded New Orleans. In addition, under the National Response Plan, EPA generally has the lead federal role in addressing hazardous materials and oil, and in ensuring environmental safety and short- and long-term cleanup. The Coast Guard often acts as co-lead, with responsibility for coastal incidents.

Assessing Floodwaters. The Army Corps of Engineers was responsible for pumping the floodwaters out of New Orleans.⁵² As of October 11, 2005, the Corps reported that the unwatering of the New Orleans metropolitan area was completed, although some areas required additional pumping of floodwater.⁵³ The unwatering effort for Hurricane Katrina was temporarily delayed by additional floodwaters from Hurricane Rita at the end of September and reoccurrences of breaches to sections of the canal levees.

“Unwatering” New Orleans was critical to the public health response to Hurricane Katrina in order to remove water that posed a direct risk to public health and the environment, and also could provide a breeding area for vectors of illnesses such as West Nile Virus. Once the unwatering was complete, floodwater was no longer a source of contaminant exposure to persons (residents and responders) in affected areas. Biological and chemical tests of the floodwaters conducted by EPA and the Louisiana Department of Environmental Quality, beginning immediately after the hurricane, showed concentrations of fecal bacteria at least 10 times in excess of EPA’s recommended levels for human contact. The initial sampling in flooded neighborhoods identified total coliforms and *E. coli* (bacteria found in high numbers in the feces of humans and other warm-blooded animals) that are indicators of potential human pathogens in the floodwaters. Because of the risk of intestinal and other illness from exposure to the contaminated water, EPA and CDC advised the public and all responders about the possible hazards of contact with floodwaters and cautioned that floodwater should not be swallowed.⁵⁴ Further testing continued to show greatly elevated *E. coli* levels, higher than EPA’s recommended levels for contact, even several weeks after Hurricane Katrina. The level of contamination was similar to normal stormwater runoff, however.⁵⁵

⁵² The Corps of Engineers’ authority to unwater New Orleans derives from the Robert T. Stafford Disaster Relief and Emergency Assistance Act (42 U.S.C. §5170b) and P.L. 84-99, Flood Control and Coastal Emergencies, Section 216 (33 U.S.C. §701n).

⁵³ U.S. Department of the Army, Corps of Engineers, Public Affairs Office, Press Release, Oct. 11, 2005, [http://www.mvd.usace.army.mil/hurricane/news/news_release_1011.pdf].

⁵⁴ U.S. Environmental Protection Agency, Hurricane Response: Katrina/Rita, “Test Results: Water,” [<http://www.epa.gov/katrina/testresults/water/index.html>], visited Oct. 12, 2005.

⁵⁵ J.H. Pardue et al., “Chemical and Microbiological Parameters in New Orleans Floodwater Following Hurricane Katrina,” *Environmental Science & Technology*, Nov. 15, 2005, (continued...)

In addition, EPA conducted daily sampling through mid-October to analyze floodwaters for more than 100 pollutants, including a number of volatile organic compounds (VOCs), metals, pesticides, and polychlorinated biphenyls (PCBs). The data were compared with EPA's drinking water standards and action levels or to health guidance values calculated by the Agency for Toxic Substances and Disease Registry (ATSDR, an agency of the Department of Health and Human Services⁵⁶) to protect people who are exposed to those levels over a period of time longer than floodwaters persisted in New Orleans. Lead was commonly detected at levels exceeding the EPA drinking water action level. Arsenic, barium, thallium, chromium, benzene, selenium, and cadmium were detected in some samples at levels that exceeded EPA drinking water standards. Several other chemicals, such as manganese, toluene, nickel, and zinc, were detected in floodwater and compared with ATSDR health guidance values⁵⁷ but were determined not to be immediately hazardous to human health.

Concentrations of toxic substances found in the floodwaters were not high enough to pose a human health threat or produce overt, immediate illness, unless a great deal of floodwater were swallowed. According to EPA, "These compounds would pose a risk to children only if a child were to drink a liter of flood water a day. Long-term exposure (a year or longer) to arsenic would be required before health effects would be expected to occur."⁵⁸ Nevertheless, EPA and CDC advised the public and emergency responders to avoid contact with the water, when possible.

Overall, EPA and other officials appear to believe that the floodwaters were less hazardous than some had originally feared — at least in terms of toxic chemicals whose risks are more long-term than immediate — but that high levels of bacteria did pose a significant short-term risk to public health. However, they acknowledged that the levels of contamination found are typical of urban floodwaters.

Post-Katrina Environmental Sampling and Monitoring

After the hurricanes departed and floodwaters in New Orleans receded, federal and state agencies began what are likely to be long-term efforts to assess and analyze impacts of the storms and restoration activities on the region's water, air, and land. A number of environmental sampling and monitoring projects and programs began almost immediately after the storms and are expected to continue for some time.

⁵⁵ (...continued)
vol. 39, no. 2, pp. 8591-8599.

⁵⁶ ATSDR was created by Congress in 1980 to implement the health-related sections of laws that protect the public from hazardous wastes and environmental spills of hazardous substances. See [<http://www.atsdr.cdc.gov/congress.html>].

⁵⁷ ATSDR Minimum Risk Levels (MRLs) exist for some chemicals, and levels measured were compared to MRLs, when available. For hazardous substances for which there are no MRLs, ATSDR developed exposure models based on current available toxicity information.

⁵⁸ U.S. Environmental Protection Agency. "EPA Response Activity — September 14," [<http://www.epa.gov/katrina/activities/week3.html#sep14>].

Contaminated Sediment and Structures. As the floodwaters in New Orleans receded, some pollutants settled in a layer of sediment ranging in depth from less than an inch to several feet, complicating the cleanup. On September 10, 2005, EPA began sampling residue sediments from locations in Orleans and St. Bernard Parishes, testing for fecal coliform bacteria and about 200 chemicals. According to EPA, “sediment, for the purposes of the hurricane response sampling effort, is being defined as residuals deposited by receding flood waters which may include historical sediment from nearby water bodies, soil from yards, road and construction debris, and other material.”⁵⁹

Preliminary results indicated that some sediment was contaminated with bacteria and fuel oils, and human health risks could exist from contact with deposited sediment, EPA said. However, because no standards exist for determining human health risks from bacteria in soils or sediment, EPA officials could only generally recommend that contact or exposure to sediment be limited if possible.

Testing has continued in the months since the hurricanes. According to EPA, a variety of chemicals have been detected in the sediments. Those most frequently detected include some metals, petroleum hydrocarbons, and pesticides. The majority of chemicals detected were below levels of health concern and are similar to the historical levels found in the region. However, EPA also reported that there were some localized areas with levels of arsenic, polycyclic aromatic hydrocarbons (PAHs, pollutants associated with burning activities), and diesel and oil range organics that exceeded both EPA risk criteria (based on long-term, 30-year residential exposure assumptions) and Louisiana Risk Evaluation/Corrective Action Program (RECAP) criteria. State officials believe, in general, that the sediments in previously flooded areas would not be expected to cause adverse health effects, provided that people adhere to good health and safety practices. EPA and Louisiana have continued to resample a number of sites to determine next steps.⁶⁰

The extent of contamination of sediments — and the potential risk posed to the public, as a result — has been the focus of many scientists’ attention, and some findings have been controversial. In January, one group of researchers reported results of sediment, water, and soil samples collected in mid-September in and around New Orleans to determine immediate health hazards and serve as baseline information for follow-on studies. Concentrations of the pesticide aldrin, arsenic, lead, and seven semi-volatile organic compounds in sediments exceeded one or more EPA thresholds for human health screening levels (pertinent to chronic exposure and adverse health effects) and high priority “bright line” screening levels (which indicate prioritization of hazard cleanup in EPA Region VI). These scientists stated that the

⁵⁹ U.S. Environmental Protection Agency, Hurricane Response: Katrina/Rita, “Test Results: Sediment from Flood Water, Including Resampling,” [<http://www.epa.gov/katrina/testresults/index.html#sediment>].

⁶⁰ U.S. Environmental Protection Agency, Hurricane Response 2005, “Summary of Sediment Testing: Hurricanes Katrina and Rita,” [<http://www.epa.gov/katrina/testresults/sediments/index.html>].

high lead concentrations in post-Katrina soil samples may pose a significant health risk, particularly to children returning to highly contaminated areas.⁶¹

Interpreting the significance of these findings is complicated by the fact that at least some of the contamination existed before Katrina flooded New Orleans. In 2004, researchers analyzed nearly 5,000 soil samples from across the city and found that 40% of New Orleans soils exceed EPA's lead cleanup standard (400 parts per million/ppm), with some lead concentrations above 1,000 ppm. As a result, even before Hurricane Katrina, 20-30% of children in the inner city had blood lead levels greater than the CDC health guideline of 10 micrograms per deciliter.⁶²

In February, a public interest group issued a report that reexamined EPA's sediment sampling data and criticized EPA for releasing the data on its website without providing any analysis. It concluded that federal and Louisiana officials are misleading New Orleans residents by saying that most of the New Orleans neighborhoods are safe, because the group's analysis of EPA's data found that

most districts in New Orleans contain concentrations of arsenic, lead, diesel fuel or cancer-causing benzo(a)pyrene above levels that would normally trigger investigation and possible soil cleanup in the state of Louisiana. Some hot spots in residential neighborhoods have levels of contamination that are ten times, or even more than a hundred times normal soil cleanup levels.⁶³

Louisiana officials responded to the group's report by saying that it misrepresents EPA and state data by using state *screening* standards that indicate if detected concentrations in soil require further evaluation or management, and presenting them as *health-based* standards. A concentration greater than the state's screening level does not mean the levels are going to pose an unacceptable health risk, especially because health risk levels are based on assuming that individuals are continuously exposed to that concentration for a 30-year period, rather than the shorter-term generally associated with post-hurricane exposures.⁶⁴

The controversy about sediment contamination highlights the difficulty that public officials face in trying to inform the public about potential risks from short-term exposure to pollutants, when health-based standards that regulators use to establish emission controls or discharge limitations are based on risks from long-term exposure.

⁶¹ Steven M. Presley et al., "Assessment of Pathogens and Toxicants in New Orleans, LA Following Hurricane Katrina," *Environmental Science & Technology*, Jan. 15, 2006, vol. 40, no. 2, pp. 468-474.

⁶² Pelley, Janet, "Lead a Hazard in Post-Katrina Sludge," *Environmental Science & Technology*, Jan. 15, 2006, vol. 40, no. 2, pp. 414-415.

⁶³ Natural Resources Defense Council, "Contaminants in New Orleans Sediment, An Analysis of EPA Data," Feb. 2006, p. 3.

⁶⁴ State of Louisiana, Department of Environmental Quality, "Arsenic Sampling Results Explained," Jan. 10, 2006. See [<http://deq.louisiana.gov/portal/portals/0/news/pdf/arsenicexplainedjan10.pdf>]

Air Quality, Mold, and Vector Concerns. EPA scientists are concerned that air pollution may result not only from chemical spills and releases at industrial plants, but also may emanate from contaminated sediments. As contaminated sediments dry, they may release pollutants that can be re-suspended as dust. For example, vehicular traffic that disrupts sediments on previously flooded roadways can resuspend or aerosolize fine, powdery dust that presents an inhalation hazard. In addition, some scientists are concerned that, as flooded areas dry out, some of the pathogens in the contaminated water will become airborne.

EPA began screening air quality in hurricane-affected areas on August 30 to provide an initial assessment of air quality. In coordination with Louisiana and Mississippi, EPA has been monitoring air quality since the storms to assess damage from the hurricanes, as well as problems that could occur as a result of cleanup and restoration activities. EPA and state officials continue to work to restore the stationary air quality monitoring network sites in Louisiana and Mississippi, which were heavily damaged. Portable and mobile collection devices (an EPA helicopter, buses, and an Air Force plane) continue to be used to monitor air quality where stationary networks have not been restored. Sampling has been done to test for metals (e.g., lead and arsenic), VOCs, PAHs, particulate matter, and other pollutants.

Early screening results indicated that chemical concentrations in the air were below ATSDR health standards and that long-term exposure (a year or more) at the levels detected would be required for health effects to be of concern. The sampling identified particle pollution at levels considered moderate (meaning that unusually sensitive people should consider avoiding vigorous exercise). However, samples were not collected with standard monitors, meaning that the mix of particles in the screening samples cannot easily be compared to EPA standards. EPA cautioned that initial sampling did not represent air quality conditions throughout the region, and should not be used to make general characterizations.

While measurements for most pollutants reported were below EPA's health-based screening levels for chemicals, monitoring at certain sites showed elevated levels of some pollutants (acrolein and formaldehyde, for example). At the concentrations measured, temporary irritation of the eyes, nose, and throat could result. EPA said that elevated exposures would not be acceptable on a regular basis extended over weeks at a time, but isolated exposures to such concentrations are not believed to be associated with long-term health problems.⁶⁵

A significant concern associated with the cleanup is the potential for health hazards due to the presence of molds, mildew, and other fungi in soggy, damaged structures. The excess moisture and standing water resulting from Katrina contributed to the growth of molds in homes and other buildings, particularly in the New Orleans area, where 60%-80% of residential structures sustained severe flood damage and experienced conditions conducive to mold — damp, warm environments — and where a large number of people are likely to be exposed to mold and other microbial agents. Outside of New Orleans, prolonged flooding did not occur. In those areas, more typical patterns of wind and rain also can result in problems with

⁶⁵ For information, see [<http://www.epa.gov/Katrina/testresults/#air>].

mold, but not as extensive as in New Orleans. Mold and other fungi can cause a number of health conditions, including allergic reactions, toxic effects, and infections. All persons in the region have been cautioned about the effects of mold, especially those with weakened immune systems and those with respiratory illnesses/allergies. However, CDC also said that there are no criteria for using either the concentration or type of mold in buildings to make informed decisions.⁶⁶ Health authorities remain alert to the fact that mold may emerge as one of the environmental health challenges in coming months.

A related issue is an increase of rodents and insects that might carry diseases such as West Nile Virus. Hurricane Katrina compounded Louisiana's insect problem on several levels, including forcing the evacuation of standard vector control personnel, destroying vector disease control equipment, and dramatically increasing the number of stagnant bodies of water throughout New Orleans and surrounding parishes, which serve as ideal breeding grounds for insects like mosquitoes. Medical personnel from the U.S. Navy worked with the CDC and Louisiana Department of Public Health to eliminate vector-borne disease and other insect-related problems associated with mosquitoes. However, because spraying for mosquito control can affect workers in the region, spraying was used conservatively, according to the Navy. EPA worked with state agencies, FEMA, and others to expedite any requests needed for pesticide use and also worked with manufacturers to make sure that adequate supplies of pesticides were available.

Water Discharged into Lake Pontchartrain. While necessary to the overall cleanup from the Hurricane Katrina, the water removal from New Orleans raised a number of concerns. Removal involved pumping the floodwater into Lake Pontchartrain, an option that was necessarily expedient, but not necessarily ideal, because contamination in the lake could harm aquatic plants and animals. As noted above, because of geography, the city lacks sufficient natural drainage for the water to remove itself. Pumping it into the Mississippi River was not a viable option, as the floodwater could contaminate river water which is the source of the city's drinking water supply. Treatment of the contaminated floodwaters prior to discharge was not possible because of the need to unwater the city rapidly, and the unavailability of full treatment technology. Nor was it possible to hold the pumped water somewhere to filter out pollution. The Corps took some steps to remove wastes prior to discharge into the lake, such as putting booms and skimmers in place at outfalls to trap floating material and debris, and installing aeration units in canals. In unwatering New Orleans, the Corps pumped the equivalent of 5% of the lake's volume back into the lake. The contaminated floodwaters were low in dissolved oxygen, because of the presence of oxygen-consuming matter in sewage and decaying plant material. The Corps' aeration units were intended to restore oxygen levels before the water entered the lake. Otherwise, the oxygen-deprived floodwaters would likely harm fish and other organisms in the lake which need oxygen to survive.

⁶⁶ For more information about molds and mildew related to the hurricanes, see "Mold: Prevention Strategies and Possible Health Effects in the Aftermath of Hurricanes Katrina and Rita," Oct. 2005, available at the DHHS/CDC website [<http://www.bt.cdc.gov/disasters/mold/report/>]. For general information regarding mold, also see the EPA website [<http://www.epa.gov/katrina/healthissues.html#floodmold>].

The lake is a 630-square mile waterbody that already is impaired by a number of known sources of water pollution, including stormwater runoff (the largest contributor to pollution of the lake), agricultural discharges from animal operations, chemical use, discharges from wastewater treatment plants and individual septic systems, oil and gas production, and saltwater intrusion from the Mississippi River Gulf Outlet (a navigation channel that links the Gulf of Mexico to the Port of New Orleans as an aid to shipping).⁶⁷ The lake is partly rimmed by cypress and tupelo swamps, which could be damaged by saltwater that Hurricane Katrina introduced. But restoration activities had been underway for several years, and aquatic life in the lake, including manatees, an endangered species, have been observed; sportfishing occurs; and certain species of clams, crabs, and shrimp are harvested from the lake.

The Corps' prevention efforts (e.g., booms, skimmers, aerators) likely had little effect on limiting any toxic chemicals, metals, or pesticides in the discharged water. Consequently, the lake received the equivalent of several years of urban runoff in only a few weeks. Sudden loads of toxic chemicals and low dissolved oxygen levels might cause considerable harm to sensitive species of aquatic life over the short-term, but long-term effects are more difficult to predict. Whether toxic chemicals will be diluted, degraded by bacteria, and flushed out of the lake by tides, as some scientists believe, or will remain in the lake and accumulate in its sediments, as others believe, will not be known for some time, perhaps years.

Soon after the hurricanes, the Louisiana Department of Environmental Quality, assisted by such federal partners as the U.S. Geological Survey (USGS), began testing Lake Pontchartrain to assess short-term and long-term effects of discharging pumped water into the lake, and the lake's outlets and inlets. The state wanted to know whether pollutants exceeded expected levels (as compared with historical site data) and whether water quality standards were being exceeded. Early test results have been confirmed in subsequent testing that continued more than four months after the storms. Overall, large fish, possibly tarpon, and other fish have been observed, and shrimp and crab harvesting in the lake has resumed. Tests of surface waters on the south shore of the lake indicated dissolved oxygen, fecal coliforms, and turbidity all meet water quality standards, and water quality parameters in general have remained at or near values expected for the fall and winter seasons. USGS monitoring indicated very low levels of fecal and enterococci levels in the lake, well within safe limits for full body contact (however, a state advisory to avoid swimming and other primary contact sports has been in effect for the south shore of the lake since 1985). Detected contaminant levels generally were lower than what is commonly found in urban storm water but higher than the federal drinking water standard. However, Lake Pontchartrain is not a drinking water source for New Orleans or other communities because it is brackish water.

Standards for organic compounds have not been exceeded, and very few samples have had detectable concentrations on the south shore of the lake. Likewise, on the north shore of Lake Pontchartrain, there have been no exceedences of

⁶⁷ U.S. Geological Survey, "Environmental Atlas of the Lake Pontchartrain Basin, Water Quality," [<http://pubs.usgs.gov/of/2002/of02-206/index.html>]; Lake Pontchartrain Basin Foundation, "Wetlands," Online at [<http://www.saveourlake.org/wetlands.htm>].

Louisiana water quality standards for organic compounds. However, the north shore of the lake and tributary streams continue to be affected by low dissolved oxygen levels, which were responsible for early reports of fish kills.⁶⁸

Coastal Water Impacts. Another concern was whether or not fecal or chemical pollution from New Orleans and other inundated areas had spread into coastal waters. Federal and state agencies sampled and analyzed water and sediment quality in the river channels and near shore waters surrounding the Mississippi Delta. Ocean survey and research vessels operated by EPA, the National Oceanic and Atmospheric Administration (NOAA), and the National Science Foundation tested for pathogens. Early and followup tests did detect indicators of fecal contamination, but at levels below applicable standards. Public officials determined that the water was safe for primary contact recreation, including swimming. However, they cautioned that the data should not be used to assess the safety of consuming raw or undercooked molluscan shellfish such as oysters, because ingestion of water presents different risks from eating raw or undercooked shellfish.

NOAA also conducted chemical contaminant analyses of sediments, water, and fish tissues. NOAA officials reported in October that some chemicals were detected, but at levels below threshold limits for contaminants in seafood. Thus, they concluded that they had not found significant threats to the region's seafood supply.

Nevertheless, because the effects of a large hurricane on water are not all immediate, monitoring by EPA, NOAA, and others will continue regularly through the year to identify any new impacts.

Impacts on Drinking Water Sources. Another area of interest has been possible effects of Hurricane Katrina on waters that are sources of drinking water supplies throughout the area. Outside of New Orleans, public and private drinking water supplies are drawn from groundwater sources. The U.S. Geological Survey and the State of Louisiana undertook a small groundwater reconnaissance effort to look for impacts from the storm surge, such as saltwater mixing or elevated bacteria levels, but they have not reported adverse results. Also, EPA distributed drinking water test kits in the New Orleans area so that private well owners could test for possible contamination by floodwaters and overflowing sewers. Privately owned wells that provide drinking water are regulated by states, not EPA, and the number of such wells in the affected Gulf Coast area is unknown. In most states, owners of private wells are responsible for testing for contamination.

The source of public drinking water supply for New Orleans is the Mississippi River. State and federal partners have assessed possible impacts to the river, such as saltwater and sediment dumped during Katrina's storm surge and chemical and bacteria contamination released from damaged facilities, structures, and sewers. In October, one test for fecal coliform was detected above the state's standard for

⁶⁸ Louisiana DEQ, Water Quality Assessment Division, "Post-Hurricane Water Quality Assessments: Katrina Monitoring (Report #10)." Jan. 24, 2006. [<http://www.deq.louisiana.gov/portal/portals/0/news/pdf/Post-Katrina%20Water%20Quality%20Assessment%201-24-06.pdf>].

recreation contact (swimming), but well below the drinking water standard. More recently, according to the state, test results for fecal coliform contamination have been below health-based standards. The state also has worked to reestablish its Early Warning Organic Chemicals Detection System (EWOCDS) to help evaluate the quality of the river as the city's drinking water supply. This system, a cooperative agreement among the state, five industries along the river, and the New Orleans Sewerage and Water Board, tests for volatile organic compounds (VOCs) in the ambient water. Several of the system's seven sampling sites along the river were damaged by Hurricane Katrina. Since the storms, six of these seven analysis sites have been restored to varying operational condition.⁶⁹

Water Infrastructure Facilities in the Affected Region⁷⁰

Throughout the Katrina-affected region, high winds and water damaged a wide range of public service facilities, including drinking water supply and treatment and sewage treatment plants, and restoring those facilities is part of the overall cleanup and restoration process. Under authority of the National Response Plan, especially ESF #10, EPA and Corps of Engineers staff have conducted assessments, providing assistance to state and local government personnel to evaluate damages. Steps involved in actually restoring service include drying out and cleaning engines; testing and repairing waterlogged electrical systems; testing for toxic chemicals that may have infiltrated pipes and plants; restoring pressure (drinking water distribution lines); activating disinfection units; restoring bacteria needed to treat wastes (wastewater plants); and cleaning, repairing, and flushing distribution and sewer lines.

Damages at many facilities included loss of electric power to pump, process, and treat raw water supply and wastewater. As electric power was restored, many of the affected systems were able to restore needed services, although some drinking water facilities are still operating under boil-water notices pending test results to ensure that the water has been restored to standards safe for public consumption. The number of sites that were off-line changed frequently. By October 10, 2005, EPA reported that more than 85% of drinking water and 95% of wastewater treatment facilities in the affected region were operational. However, EPA estimated that facilities not operating or with unknown status normally served about 200,000 drinking water customers and more than half a million wastewater customers. By December, EPA reports indicated that all wastewater treatment plants in Mississippi and Alabama were considered to be operational. In Louisiana, a small number of wastewater treatment plants were not yet operational, including three large facilities serving about 150,000 customers. Nearly all drinking water treatment plants throughout the region also had restored at least partial service, although about 5% remained under boil water advisories. Efforts continue throughout the region to assess facilities to determine their operating status, including needs to repair or

⁶⁹ David Wagenecht, Louisiana Department of Environmental Quality, Personal communication, Mar. 17, 2006.

⁷⁰ For additional information, see CRS Report RS22285, *Hurricane-Damaged Drinking Water and Wastewater Facilities: Impacts, Needs, and Response*, by Claudia Copeland.

rebuild. Staff of EPA's Water Program are assessing all drinking water and wastewater plants in the region.

EPA cautions that evaluations are on-going, and the status of many facilities is unclear (especially small systems). Facilities determined to be operational may still require repair or reconstruction. Facility restorations, full or partial, may take many months, and, even six months after the hurricanes, costs of needed repairs are unknown or, where available, are considered preliminary. In 2006, the EPA Inspector General reported that Louisiana and Mississippi officials estimate that about \$615 million will be needed in those two states for public water system replacements and repairs due to Hurricane Katrina.⁷¹ In Louisiana and Mississippi, officials estimated in February that costs to repair those states' damaged wastewater infrastructure exceed \$1.3 billion, with about \$1.2 billion needed just in New Orleans. As noted, however, all such estimates are very rough.

Impacts on New Orleans's water systems were particularly severe. In the central portion of the city, in addition to electric power impairments, extensive damage occurred from flooding of treatment plants, drinking water distribution lines, and collector and interceptor sewers, and the water system's power plant. Even after restoration of electricity, cleanup and recovery at flooded water and sewage treatment plants are taking considerable time. The first task was to remove excess stormwater, which required extensive repair of the city's stormwater system, including levees and drainage pumps. Once floodwaters were addressed, drinking water restoration became the next priority. The largest of the city's two drinking water plants, located where the worst flooding took place, was completely underwater for nearly two weeks. It was repaired sufficiently to provide flow (i.e., for fire fighting), but may not be capable of providing potable water for some time, officials say. The issue with regard to drinking water in this area is large numbers of waterline breaks resulting from house connections that were damaged when trees fell, fire hydrants that were damaged by debris or debris cleanup efforts, and lines that were crushed or fractured by the weight of floodwaters. Affected areas remain under boil water advisories or are receiving drinking water from tanker trucks and emergency pilot-scale treatment plants.

For flooded areas, sewage treatment often is the last thing back online, because plants are at the lowest point of the city, to take advantage of gravity, and thus were under the deepest water. New Orleans's two wastewater treatment plants were damaged: the larger facility, which serves 1.2 million customers, was flooded until the end of September, and standing water significantly damaged pumps and electrical equipment. This plant partially restored service in October and was able to provide secondary treatment of wastes by mid-November, but numerous continuing operational problems persist, including power disruptions, leaks, and equipment difficulties. The city's public works officials reportedly believe that much of the

⁷¹ U.S. Environmental Protection Agency, Office of Inspector General, "Evaluation Report: EPA's and Mississippi's Efforts to Assess and Restore Public Drinking Water Supplies after Hurricane Katrina," Report No. 2006-P-00011; Feb. 14, 2006, "Evaluation Report: EPA's and Louisiana's Efforts to Assess and Restore Public Drinking Water Systems after Hurricane Katrina," Report No. 2006-P-00014, Mar. 7, 2006.

sewer system has probably been damaged, and cracks, leaks, and breaks will need to be fixed by tearing up roads (although road repairs already may be required, as part of the overall cleanup effort), a potentially lengthy repair process.

Ironically, one problem facing New Orleans and a number of other communities that were extensively damaged by the hurricanes is a lack of customers. Although the majority of water and sewer facilities have been able to resume operations, some are not in use because displaced citizens have been unable to return. Some of the systems considered to be operational are serving only a small percentage of their pre-Katrina customers. Thus, there is little or no population present for utilities to serve, meaning that there is insufficient demand for drinking water or waste flowing into wastewater treatment plants for normal operations, and utilities are unable to collect revenues needed to pay existing bills, repair or maintain their facilities, or make payments on bonds.

Potential Challenges and Issues

The enormity of the tasks associated with cleaning up from a natural disaster on the scale of Hurricane Katrina is probably unprecedented, and likely to exceed others in this country's history in terms of scope, duration, and cost. An overriding issue concerns the effectiveness of current federal roles and whether existing federal cleanup authorities are adequate to address the damage caused by a disaster as large scale as Hurricane Katrina.

The range of tasks described in this report have occurred, and will continue to occur, over varying periods of time — from the immediate responses of reducing threats to public health and safety; to assessing Hurricane Katrina's impacts; to removing, repairing, and rebuilding; and to long-term monitoring of the impacts of actions that are taken to mitigate the storm's damages. Each of these phases of cleanup, which reflect a continuum more than discrete steps, presents numerous challenges and issues. Some of these issues are listed below.

- The scale of the cleanup (both geographic and volume) represents a huge management challenge for all levels of government and the private sector. Potential concerns include adequacy of landfill capacity; health and safety of cleanup workers; and capability of, or community resistance to, applying "best practices" for waste management.
- Potential long-term ecological effects, if any, that may result from recovery measures, such as discharging contaminated floodwaters from New Orleans into Lake Pontchartrain.
- The volume of storm-related waste containing hazardous materials, and the difficulty in separating hazardous and nonhazardous wastes.
- The limited number of homeowners that have returned to New Orleans stretches the debris removal process out indefinitely.

Except under certain conditions, property owners will be responsible for debris removal and decisions to demolish private properties.

- The potential for homes to contain asbestos slows the demolition and renovation process for those homes that have been cleared for demolition. Moreover, human remains are still being found in the rubble; demolition of a structure cannot be undertaken quickly if it is determined that it is possible that human remains are inside.
- The ongoing need to balance public health protection with allowing access to homes and businesses.
- Public involvement in cleanup decisions. The public — especially residents of the affected region — has a strong interest in the cleanup, since they will experience impacts of those actions. Keeping the public well informed and involved is critical, but also has been difficult, especially in the early aftermath of the storm events.
- Understanding and communicating the nature and degree of risks to public health and the environment associated with contaminants identified in water, soil, and air. This issue is complicated by the difficulty in knowing whether contaminant levels represent pollution generated solely by the hurricane (from leaks or spills, for example) or if they are legacy problems that preexisted in the environment before the storm occurred. Further, public officials are unable to effectively assure residents that the post-hurricane environment is safe because the standards being applied do not clearly distinguish between long-term health concerns and screening determinations to identify necessary remediation.

Appendix 1

Table 1. Federal Department/Agency Cleanup Functions and Responsibilities as Indicated in the Emergency Support Functions of the National Response Plan (NRP)

Agency	National Response Plan (NRP) Responsibilities and Functions (text <i>italicized</i> to emphasize cleanup elements; page # indicates where function is located in the NRP)
Department of Agriculture	Provides engineering and contracting/procurement personnel and equipment to assist in emergency removal of <i>debris</i> , demolition, repair of roads and bridges, temporary repair of essential public facilities, and water supply. (p. ESF#3 - 5)
	Provides support for <i>public health</i> matters for radiological incidents as a member of the Advisory Team for Environment, Food, and Health. (p. ESF#8 - 8)
	Support coordination of animal issues such as <i>disposal of animal carcasses</i> . (p. ESF#8 - 8)
	Food Safety Inspection Service: includes proper <i>disposal</i> of contaminated products in order to protect public health and the environment in affected area. (p. ESF#11 - 8)
	Provides for the inspection, fumigation, <i>disinfection</i> , <i>sanitation</i> , <i>pest extermination</i> , and destruction of animals or articles found to be so infected or <i>contaminated</i> as to be sources of dangerous infection to human beings and takes such other measures as necessary. (p. ESF#11 - 6)
	Assists with the prevention, control, and eradication of any highly <i>contagious/zoonotic disease</i> involving wildlife; and <i>carcass disposal facilities</i> , as appropriate. (p. ESF#11 - 11)
Department of Homeland Security / U.S. Coast Guard	The Coast Guard is designated the primary agency with EPA for interagency incident management under ESF #10 supporting assessment, mitigation, <i>cleanup</i> , <i>containment</i> , and <i>disposal of oil and hazardous materials</i> ; the Coast Guard is the primary agency for coastal incidents; EPA is primary agency for inland areas and incidents affecting both. (pp. ESF#10 - 1-3)
	Coordinates the marking and <i>removal of obstructions</i> declared to be <i>hazards to navigation</i> . (p. ESF#3 - 6)
	Assists in debris and contaminated <i>debris</i> management activities when debris or runoff impacts navigable waters. This includes coordinating and/or providing resources, assessments, data, expertise, technical assistance, monitoring, and other appropriate support. (p. ESF#3 - 6)
Department of Commerce/ National Oceanic and Atmospheric Administration	Provides expertise on natural resources and coastal habitat, the environmental effects of <i>oil and hazardous materials</i> , and appropriate <i>cleanup</i> and restoration activities. (p. ESF#10 - 10)
	Conducts emergency hydrographic surveys, search and recovery, and <i>obstruction</i> location to assist safe vessel movement. (p. ESF#10 - 10)

Agency	National Response Plan (NRP) Responsibilities and Functions (text <i>italicized</i> to emphasize cleanup elements; page # indicates where function is located in the NRP)
Department of Defense /U.S. Army Corps of Engineers	The U.S. Army Corps of Engineers (the Corps) is designated as the coordinator for ESF #3 dealing with infrastructure protection and emergency repair, <i>infrastructure restoration</i> , engineering services, construction management, and critical infrastructure liaison. (p. ESF#3 - 5)
	Provides contracting services through ESF #3 to urban and rural firefighting forces to obtain heavy equipment and/or <i>demolition services</i> as needed to suppress incident related fires. (p. ESF#4 - 4)
	Provides available military medical personnel to assist HHS in the protection of public health (such as food, water, wastewater, <i>solid waste</i> disposal vectors, hygiene, and other environmental conditions). (p. ESF#8 - 9)
	The Department of Defense (not the Corps) provides On-Scene-Coordinators and directs response actions for releases of <i>hazardous materials</i> from its vessels, facilities, vehicles, munitions and weapons. (p. ESF#10 - 10)
	Provides expertise and resources to assist in the removal and disposal of <i>contaminated and noncontaminated debris</i> , to include animal carcasses and <i>debris</i> affecting NCH resources. (p. ESF#11 - 10)
	Supports the development of national strategies and plans related to housing and permanent housing, <i>debris</i> management and the restoration of <i>public facilities and infrastructure</i> . (p. ESF#14 - 5)
Department of Energy	Enables <i>radiologically contaminated debris</i> management activities by coordinating and/or providing resources, assessments, data, expertise, technical assistance, monitoring, and other appropriate support. (p. ESF#3 - 6)
	Provides regional resources to evaluate, <i>control and mitigate radiological hazards</i> to workers and the public. (p. ESF#8 - 10)
	Provides an On-Scene-Coordinator and directs response actions for releases of <i>hazardous materials</i> from its vessels, facilities, and vehicles. (p. ESF#10 - 10)
	Provides advice in identifying the sources and extent of <i>radioactive releases</i> relevant to the National Contingency Plan, and in <i>removal and disposal</i> of radioactive contamination. (p. ESF#10 - 10)
	Provides technical advice in <i>radioactive debris</i> management. (p. ESF#14 - 5)
General Services Administration	Provides personnel and contractors to assist in damage assessment, structural inspections, <i>debris</i> clearance monitoring and restoration of facilities in general, construction inspection, and environmental and archeological assessments. (p. ESF#3 - 8)

Agency	National Response Plan (NRP) Responsibilities and Functions (text <i>italicized</i> to emphasize cleanup elements; page # indicates where function is located in the NRP)
U.S. Environmental Protection Agency	EPA is designated as the coordinator and primary agency (with the Coast Guard) for interagency incident management under ESF #10 supporting assessment, mitigation, <i>cleanup, containment, and disposal of oil and hazardous materials</i> . EPA is primary agency for inland and incidents affecting both inland and coastal zones; the Coast Guard is the primary agency for coastal incidents. (pp. ESF#10 - 1-3)
	Supplies sanitary engineers to assess wastewater and <i>solid waste</i> facilities. (p. ESF#3 - 8)
	Assists in locating <i>disposal sites for debris</i> clearance activities. (p. ESF#3 - 8)
	Assists contaminated <i>debris</i> management activities by coordinating and/or providing resources, assessments, data, expertise, technical assistance, monitoring and other appropriate support. (p. ESF#3 - 8)
	Identifies location and provides safety guidance for areas affected by <i>hazardous materials</i> . Ensures the protection and <i>cleanup</i> of these areas. (p. ESF#3 - 8)
	Provides technical assistance and environmental information for the assessment of the health/medical aspects of situations involving <i>hazardous materials</i> . (p. ESF#8 - 13)
	Provides technical assistance, subject-matter expertise and support for biological, chemical, and other <i>hazardous agents</i> on contaminated facility remediation, environmental monitoring and <i>contaminated agriculture (animal/crops) and food product decontamination and disposal</i> . (pp. ESF#11 - 12)
	Provides technical assistance for planning for <i>contaminated debris</i> management and environmental remediation. (p. ESF#14 - 5)
Department of Health and Human Services	Enables <i>contaminated debris</i> management activities by coordinating and/or providing resources, assessments, data, expertise, technical assistance, <i>monitoring</i> and other appropriate support. (p. ESF#3 - 6)
	Supplies engineering and environmental health personnel to assist in assessing the status of wastewater and <i>solid waste</i> facilities. (p. ESF#3 - 6)
	Provides technical assistance for shelter operations related to food, vectors, water supply and <i>waste disposal</i> . (p. ESF#6 - 6)
	Works in cooperation with EPA and USDA to ensure the <i>proper disposal</i> of contaminated food or animal feed. (p. ESF#10-11)
Department of Homeland Security/FEMA	DHS/FEMA is the primary agency for providing ESF #3 recovery resources and support; provides supplemental Federal disaster grant assistance for <i>debris removal and disposal</i> . (p. ESF#3 - 3)
Department of the Interior	Provides personnel to assist in damage assessment, structural inspections, <i>debris</i> clearance monitoring, and restoration of facilities in general. (p. ESF#3 - 7)

Agency	National Response Plan (NRP) Responsibilities and Functions (text <i>italicized</i> to emphasize cleanup elements; page # indicates where function is located in the NRP)
Department of Labor/OSHA	Provides <i>worker safety</i> advice, assistance, and policy support for <i>debris removal</i> , building demolition, and other ESF #3 activities. (p. ESF#3 - 7)
Nuclear Regulatory Commission	Assist radiological <i>contaminated debris</i> management activities by coordinating and/or providing resources, assessments, data, expertise, technical assistance, <i>monitoring</i> , and other appropriate support. (p. ESF#3 - 8)
	The NRC and EPA coordinate their responses to an emergency involving both <i>radiological and chemical release</i> in accordance with joint NRC/EPA implementing procedures. (p. ESF#10 - 13)
Department of State	Facilitate an integrated response between nations when a <i>discharge or release</i> crosses international boundaries or involves foreign flag vessels. (p. ESF#10 - 2)
Department of Transportation	Provides engineering personnel and support to assist in <i>damage assessment</i> , <i>debris</i> clearing, and restoration of the Nation's transportation infrastructure. (p. ESF#3 - 7)

Source: Prepared by the Congressional Research Service using data from the National Response Plan, December 2004, downloaded from [<http://www.dhs.gov/interweb/assetlibrary/NRPbaseplan.pdf>]; visited March 23, 2006.