



OFFICE OF INSPECTOR GENERAL

Catalyst for Improving the Environment

Evaluation Report

EPA's and Louisiana's Efforts to Assess and Restore Public Drinking Water Systems after Hurricane Katrina

Report No. 2006-P-00014

March 7, 2006



Report Contributors:

Carolyn Blair
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Jim Hatfield
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Abbreviations

CDC	Centers for Disease Control and Prevention
EPA	Environmental Protection Agency
LDHH	Louisiana Department of Health and Hospitals
OIG	Office of Inspector General
PCIE	President's Council on Integrity and Efficiency

Cover Photo: In the aftermath of Hurricane Katrina, floodwaters covered this St. Bernard Parish pumping station. The water tower was not damaged. EPA OIG Photo.



At a Glance

Catalyst for Improving the Environment

Why We Did This Review

This review was conducted in conjunction with the President's Council on Integrity and Efficiency as part of its examination of relief efforts provided by the Federal Government in the aftermath of Hurricanes Katrina and Rita. We conducted this evaluation to assess the Environmental Protection Agency's (EPA's) and Louisiana's efforts to ensure that the public was provided with safe drinking water after Katrina.

Background

On August 29, 2005, Hurricane Katrina, a Category 3 hurricane on the Saffir-Simpson scale, devastated parts of Louisiana and rendered many drinking water systems inoperable. By August 31, 2005, the Louisiana Department of Health and Hospitals issued boil order advisories for 15 parishes affected by the hurricane.

For further information, contact our Office of Congressional and Public Liaison at (202) 566-2391.

To view the full report, click on the following link:
www.epa.gov/oig/reports/2006/20060307-2006-P-00014.pdf

EPA's and Louisiana's Efforts to Assess and Restore Public Drinking Water Systems after Hurricane Katrina

What We Found

Our review indicated that the Louisiana Department of Health and Hospitals and drinking water systems operators provided the public with timely and accurate information about the safety and proper treatment of drinking water. According to EPA staff, 59,260 drinking water flyers were distributed in parishes affected by the hurricane. Two publications related to drinking water protection, *What to Do after the Flood* and *Emergency Disinfection of Drinking Water*, were published in English, Spanish, and Vietnamese.

Louisiana's process for determining the safety of drinking water appeared adequate to support the determinations made. EPA Region 6 provided critical assistance to Louisiana in making these determinations. This assistance included assessing water systems, collecting and analyzing drinking water samples, and providing information to the public about drinking water quality. Disease monitoring after Hurricane Katrina indicated that drinking water supplies were not a source of bacteriological infection. Neither EPA, the Louisiana Department of Health and Hospitals, nor local water system operators we spoke with had identified or heard of occurrences of waterborne illnesses or diseases from drinking contaminated water in the 2 months following Hurricane Katrina.

With assistance from EPA and others, the Louisiana Department of Health and Hospitals had assessed the operational capacity of 600 public water systems in areas affected by the hurricane by September 20, 2005, and all systems by the end of October 2005. While there has been considerable progress in assessing the operational status of 1,591 drinking water systems in Louisiana and bringing damaged facilities back on-line, substantial work remains to restore the drinking water infrastructure to pre-Katrina conditions. Louisiana officials are in the process of tabulating the estimated cost of replacements and repairs. The most recent public water system recovery estimates for Hurricane Katrina are about \$380 million. Three of the four water systems in our study account for approximately \$360 million of this estimate.

Our review did not identify any conditions requiring corrective actions and no recommendations are made.



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

THE INSPECTOR GENERAL

March 7, 2006

MEMORANDUM

SUBJECT: EPA's and Louisiana's Efforts to Assess and Restore
Public Drinking Water Systems after Hurricane Katrina
Report No. 2006-P-00014

TO: Benjamin H. Grumbles
Assistant Administrator for Water

Richard Greene
Regional Administrator, EPA Region 6

This memorandum transmits the results of an Environmental Protection Agency (EPA) Office of Inspector General (OIG) evaluation regarding our observations of EPA's and Louisiana's efforts to assess and restore public drinking water supplies after Hurricane Katrina. The evaluation did not identify any conditions requiring corrective actions and no recommendations are made. This report represents the opinion of the OIG and the findings in this report do not necessarily represent the final EPA position. Our observations regarding the effectiveness of the process used by EPA and Louisiana to ensure safe drinking water is limited to the public water systems we reviewed.

The Agency agreed with our observations and provided only technical comments to our draft report. We incorporated the technical comments in the final report as appropriate. The comments from EPA's Office of Water are in Appendix A and the comments from EPA's Region 6 are in Appendix B. Since our report made no recommendations, no further action is required.

We appreciate the efforts of EPA and Louisiana officials and staff in working with us to develop this report. If you or your staff have any questions regarding this report, please contact me at (202) 566-0847 or Carolyn Copper, Acting Assistant Inspector General for Program Evaluation, at (202) 566-0829.

Sincerely,

A handwritten signature in black ink, appearing to read "Bill A. Roderick", is written over a horizontal line.

Bill A. Roderick
Acting Inspector General

Attachment

cc: Stephen L. Johnson, Administrator
George M. Gray, Ph.D., Assistant Administrator for Research and Development
Ann Klee, General Counsel
Mike Mason, Audit Followup Coordinator, Office of Water
Helen Swan, Audit Followup Coordinator, EPA Region 6
Rick Linthurst, Acting Deputy Inspector General for Planning, Audit, and Evaluation, OIG
Carolyn Copper, Acting Assistant Inspector General for Program Evaluation, OIG
Mark Bialek, Counsel, OIG

Purpose

The President's Council on Integrity and Efficiency (PCIE), a group of Federal audit and investigative organizations, is conducting multiple audits, evaluations, and investigations of the Federal Government's response to Hurricanes Katrina and Rita. This review was conducted in conjunction with the PCIE as part of its examination of relief efforts provided by the Federal Government in the aftermath of Hurricanes Katrina and Rita. As such, a copy of the final report will be forwarded to the PCIE Homeland Security Working Group, which is coordinating Inspectors General reviews of this important subject. As a member of the PCIE, the Environmental Protection Agency (EPA) Office of Inspector General evaluated several issues related to EPA's response. One of these evaluations was to assess EPA's efforts to ensure that the public was provided with safe drinking water after Katrina. Our objectives were to answer the following questions:

1. Were people in areas affected by Hurricane Katrina provided with timely and accurate information about the safety and proper treatment of their drinking water?
2. What is EPA's process for determining that water treatment facilities are providing safe drinking water, and does this process appear adequate to support these determinations?
3. Have any waterborne illnesses or diseases from drinking contaminated water been identified, and if so, what steps were taken to identify and mitigate the contaminated water source?
4. What progress has been made in assessing the operational status of drinking water systems and what is the process for getting damaged facilities back on-line?
5. Did EPA follow its emergency response protocols, including those lessons learned from the World Trade Center and its responsibilities as delineated in the National Response Plan, to ensure the public had access to safe drinking water?

This report addresses questions 1-4 for actions in the State of Louisiana. Another report addressed questions 1-4 for actions in the State of Mississippi. We plan to address question 5 in a future report.

Scope and Methodology

We interviewed staff and managers from EPA Region 6 and the Louisiana Department of Health and Hospitals (LDHH). We reviewed documents relevant to the status of water systems provided by EPA and LDHH.

On November 16 and 17, 2005, we visited four judgmentally selected Louisiana water systems impacted by Hurricane Katrina. These four systems include one of the systems for the City of New Orleans and systems for St. Bernard, Lafourche, and Jefferson Parishes. We interviewed drinking water staff and managers; toured facilities; and reviewed water quality sampling data, emergency operating procedures, and public communications concerning the safety of the

drinking water. To select our sample of four systems, we categorized community water systems (i.e., public water systems that serve at least 25 year-round residents) by the type of impact suffered from Hurricane Katrina, ranging from a loss of power and water pressure to significant structural damage. From these different categories we selected systems serving a large population relative to the other systems in the same damage category. Prior to the hurricane, these four systems served about 16 percent of Louisiana’s population that relied on community water systems for their drinking water. We did not review the effectiveness of operations to provide alternative water systems (e.g., bottled water) while the public water systems were inoperable. Details on the four systems we reviewed are in Table 1.

Table 1: Summary of Impacted Drinking Water Systems Selected for Review

Water System (and City or Parish)	Damage Incurred	Population Served *
St. Bernard (St. Bernard Parish)	Loss of power and pressure, 3.5 feet of water in treatment facility, and damage to distribution system	67,900
Carrollton (New Orleans) **	Loss of power and pressure, extensive flood damage to treatment facility and distribution system, loss of 350 vehicles	429,000
Lafourche Water District #1 (Lafourche Parish)	Loss of pressure and leaks in distribution system	78,760
West Jefferson (Jefferson Parish)	Initial loss of power (operated on generators) and pressure, and approximately 112 pipe breaks in distribution system	209,972

* Numbers represent pre-Katrina population served.

** New Orleans is served by two water treatment facilities. Residents on the west bank of New Orleans are served by the Algiers water system.

Since the drinking water systems we reviewed were not randomly selected, our observations regarding the effectiveness of the process used by Louisiana and EPA to ensure safe drinking water is limited to the four drinking water systems we visited.

We conducted this evaluation in accordance with *Government Auditing Standards*, issued by the Comptroller General of the United States.

Observations

EPA Region 6 drinking water staff, their Louisiana counterparts, and local water systems’ staff undertook extraordinary efforts to ensure that public water service was restored under difficult circumstances in the aftermath of Hurricane Katrina (a Category 3 hurricane on the Saffir-Simpson scale). Louisiana State officials contacted water systems to assess the damage and assist systems in recovering operations as quickly as communications and travel conditions allowed. Water system staff and others at the sites we visited remained at their facilities during and after the hurricane despite being personally impacted by the storm. The State drinking water staff responded with the public’s safety in mind by issuing boil order notices for systems impacted by the storm. The State did not lift the boil order notices until bacteriological analyses conducted in accordance with EPA requirements confirmed that the water was safe to drink. Since we did not identify any issues requiring the immediate attention of EPA or Louisiana

officials, this report does not contain any recommendations. Details on what we found regarding each of the four questions addressed follow.

1. Were people in areas affected by Hurricane Katrina provided with timely and accurate information about the safety and proper treatment of their drinking water?

The information we reviewed indicated that the LDHH and drinking water system operators provided the public with timely and accurate information about the safety and proper treatment of the drinking water.

A standard mechanism for alerting the public to a potential problem with the public water supply is a boil water notice. By following the boil water notice, consumers reduce exposure to potential bacteriological contamination that can cause nausea, diarrhea, and for some susceptible populations, death.

On August 29, 2005, the day Hurricane Katrina hit the Gulf Coast, LDHH issued a news release warning consumers in four water districts to boil their water. The Jefferson Parish water system was part of that first advisory. By August 31, LDHH issued boil order advisories for 15 parishes affected by the hurricane, which included the other three systems in our sample. LDHH also issued news releases that contained instructions for treating water (boiling, bleach, or iodine) to remove possible pathogens. Consumers could learn about the status of their water system through daily public notices issued by LDHH through radio and television stations, daily press briefings, LDHH's Web site, and other methods.

Water system managers and EPA staff described their efforts to inform the public about drinking water. Because of power outages, a manager at the Lafourche water system drove to a nearby local radio station with information about the boil order. In St. Bernard Parish, staff said information on the system's status was provided to the public via newspaper notices, the Internet, and public information officers. Staff pointed out that most of the parish population was not able to return to their homes during that time period. According to EPA staff, 59,260 drinking water flyers were distributed in parishes affected by the hurricane. Two publications related to drinking water protection, *What to Do after the Flood* and *Emergency Disinfection of Drinking Water*, were published in English, Spanish, and Vietnamese.

The LDHH has detailed procedures for issuing and lifting boil order notices. The four systems we reviewed had met the State's requirements before the boil order notice was lifted. The requirements for lifting boil water notices are discussed in more detail in the following section.

2. What is EPA's process for determining that water treatment facilities are providing safe drinking water, and does this process appear adequate to support these determinations?

Under the 1974 Safe Drinking Water Act, States may apply to EPA for "primacy, or authority to implement and enforce the Act within their jurisdictions, if they can show that their drinking water standards will be at least as stringent as the national standards." EPA granted Louisiana primacy for its drinking water program in 1977. Therefore, responsibility for water treatment facilities to provide safe drinking water primarily resides with the State rather than EPA.

The State's process for determining the safety of drinking water following Hurricane Katrina appeared adequate to support the determinations made. LDHH hurricane recovery procedures require boil order advisories for public water systems that lose power or pressure during a hurricane or flood. The boil order advisory continues until water system operators notify LDHH that the system has power and pressure, has been flushed to remove potentially unsafe water, is properly disinfecting the source water supply, and has passed bacteriological sampling. Only LDHH may lift a boil water notice.

Bacteriological sample collection and analyses were conducted by generally following the requirements of EPA's Total Coliform Rule, which requires public water systems to test for total coliform bacteria on a monthly basis at pre-determined sampling sites throughout the distribution system. Under the Total Coliform Rule, the size of the population served by the system determines the amount of sampling required. After Hurricane Katrina, LDHH allowed variations in the number of samples required and used alternative sample locations due to damage or inaccessibility to pre-determined sample sites. A system's boil order was lifted only if all samples tested negative for total coliform. This requirement was more restrictive than the Total Coliform Rule, which allows 5 percent or less positive samples. If samples tested positive for total coliform, additional sampling was required with direct LDHH staff involvement.

In some cases, LDHH may partially lift boil order notices. LDHH approved a partial boil order lifting for two of the drinking water systems we evaluated – St. Bernard Parish and Carrollton – when damaged sections were valved off and tests indicated the water was safe to drink in certain locations:

- The St. Bernard Parish water system manager noted that the partial boil order was lifted for one street, which served temporary schools, hospitals, and housing sites. Most of St. Bernard Parish had not been repopulated at the time of our visit in November 2005. At that time, only 100 customers were relying on this water system, mostly related to emergency operations. Before the hurricane the system had served 67,900 people.
- The Carrollton treatment facility, which serves a large portion of the City of New Orleans, gradually opened portions of the distribution system, with most of the Carrollton facility serving the city by December 8. While many sections of the city were devastated by Katrina, some sections were only minimally impacted, and partial boil water lifts allowed those areas to continue to operate. Prior to Katrina, the Carrollton treatment facility served about 429,000 people.

Table 2 shows when boil order notices were issued, the results of water testing, the dates systems were inspected, and the dates the boil water notices were lifted for the four water systems we reviewed.

Table 2: Progress of Four Water Systems through Early December 2005

Water System	Boil Water Notice Issued	Water Sampling Results for Lifting Boil Notice	Dates of Physical Inspections	Date Boil Notice Lifted
St. Bernard	08/31/05	Total Samples = 39 Total Positive = 1 An additional 35 samples were analyzed and all tested negative for total coliform	9/15/05 9/20/05	12/07/05
Carrollton	08/31/05	Total Samples = 247 Total Positive = 1 An additional 3 samples were collected from the positive sample site and all tested negative for total coliform	9/12/05 9/17/05 9/20/05	10/06/05 (partial) 12/08/05 (partial)
Lafourche Water District #1	08/31/05	Total Samples = 23 Total Positive = 0	9/11/05 9/19/05	09/03/05
West Jefferson	08/29/05	Total Samples = 301 Total Positive = 3 An additional 9 samples were analyzed and all tested negative for total coliform	9/13/05 9/20/05	09/13/05

Five of the 610 samples collected by these water systems tested positive for total coliform. This represents less than 1 percent of the samples taken (0.8 percent). For the three systems with positive samples, these systems collected and tested additional samples, all of which tested negative for total coliform.

St. Bernard Parish was also the site of an oil spill, as approximately 1,050,000 gallons of mixed crude oil escaped from a dislodged above-ground storage tank on September 3, 2005. The St. Bernard water system managers reported that, based on visual inspections, they saw no evidence of oil in the drinking water system. As a further precaution, all surface water systems in the New Orleans area that rely on the Mississippi River for source water underwent additional chemical testing. While this was not required, staff from LDHH believed it was important to determine whether chemical contaminants were affecting drinking water quality. There were initial positive readings for acetone, but additional testing indicated these were false positives. LDHH reported its greatest concern was related to short-term exposure to bacteria rather than short-term exposure to other contaminants. For the drinking water systems we reviewed, over 99 percent of the initial samples taken did not identify the presence of total coliform. When testing indicated the presence of total coliform, additional sampling and analyses were required from the original sampling locations that produced the positive samples. The boil water notices were not lifted until this additional testing was negative for total coliform.

EPA provided logistical and technical support to the State during this process. This support included, but was not limited to, EPA staff working in teams with staff from LDHH and the Louisiana Rural Water Association to assess damaged water systems. Between September 8

and 20, these teams assessed the operational capacity of 600 public water systems in the areas affected by the hurricane. EPA also provided two mobile labs to analyze bacteriological samples from public water systems and staff to courier samples to the labs for analysis. Additionally, sample kits were provided by EPA to Parish Health Units where private well owners could obtain them. Results were communicated back to the well owners after analyses were completed.

3. Have any waterborne illnesses or diseases from drinking contaminated water been identified, and if so, what steps were taken to identify and mitigate the contaminated water source?

None of the staff from EPA, LDHH, or local water systems that we spoke with identified or had heard of occurrences of waterborne illnesses or diseases from drinking contaminated water in the 2 months following Hurricane Katrina. In mid-November, Louisiana's State Epidemiologist reported to us that there have been no illnesses attributed to contaminated drinking water. In accordance with its role and responsibilities under the National Response Plan, the U.S. Department of Health and Human Services, Centers for Disease Control and Prevention (CDC), monitors areas for outbreaks of disease and illnesses after a disaster. A CDC dispatch dated September 30, 2005, noted that CDC had received reports of clusters of diarrheal disease among persons in evacuation centers, but "three weeks after the initial displacement caused by Katrina, few cases of diarrheal disease were being reported."

Additionally, in a further effort to reduce potential exposure to contaminated drinking water, LDHH developed special procedures for reopening restaurants under a boil order advisory. Restaurants are usually closed when boil water notices are issued, but the widespread damage caused by Hurricane Katrina required LDHH to modify some of its long-standing policies. Food establishments that sought approval to reopen after the hurricane had to undergo an inspection by LDHH and have access to potable water for food preparation and cleaning.

4. What progress has been made in assessing the operational status of drinking water systems and what is the process for getting damaged facilities back on-line?

EPA and LDHH staff developed a database of assessments conducted by teams in the immediate aftermath of Hurricane Katrina. After Hurricane Rita made landfall in Texas on September 24, 2005, the database was expanded to include systems affected by Hurricane Rita as that storm impacted more water systems and caused re-flooding in the New Orleans area. In September and October 2005, these teams had assigned status codes for 1,591 public water systems (see Table 3).

Table 3: Water System Status Codes and Descriptions

Status Code	Description
OUT	Out of Contact – under boil order advisory.
INOP	Contact Made with System – no power and off-line. It is assumed that pressure is lost and is under a boil order.
GENLP	Generator with Lost Pressure – currently operating on emergency power/generator and system lost pressure and/or treatment. Under a boil order advisory.
GENOK	Generator and No Pressure Loss – currently operating on emergency power/generators but system did not lose pressure and/or treatment.
OK	Normal power restored (or never lost) and system never lost pressure and/or treatment (No Problem with System).
NEED	System Operating – disinfected and flushed and is ready for bacterial sampling.
CLEAR	System online and bacterial samples came back clear. Boil notice lifted.

LDHH staff updated the database between September 6 and December 7. This information allowed LDHH officials to track the operational status of water systems. As of December 7, 2005, LDHH reported that of the 1,591 public water systems tracked, 1,490 were operating without boil order notices. The remaining 101 systems were on boil order notices, deactivated, or in another status (see Table 4).

Table 4: Status of Systems Not Operating

Status	No. of Systems
Boil Order Notices	24
Deactivated	62
In Process of Being Cleared for Service	9
Closed to Business but Still Active in Inventory	3
Rebuilt	2
Consolidated with Larger System	1

Challenges to reestablishing full operations continue. Within our sample, water system staff and others described challenges to recovery. For example, cleanup crews in the St. Bernard Parish water system inadvertently damaged fire hydrants when lifting debris stacked next to

the hydrants, forcing water lines to shut down and be flushed. Water system officials said this will likely continue until the cleanup is finished. Additionally, the loss of almost the entire 67,900-customer fee base also presents problems for the water system’s recovery; a planned replacement of a 50-year-old portion of the treatment facility is now uncertain because of the loss of this fee base.

Outside assistance helped water systems recover from the hurricane. The Sewerage and Water Board of New Orleans’ Executive Director noted that the city received assistance from other water systems. Thirty-five staff from the drinking water plant in Portland, Oregon, assisted in efforts to assess damage caused by the hurricane. LDHH officials said the Louisiana Rural Water Association helped small systems acquire power generators and assisted in assessments that were necessary for reopening.

Under the Federal Emergency Management Agency’s Public Assistance Program, water systems could apply for funds to replace equipment damaged in the hurricane. On February 24, 2006,

LDHH provided an estimate of \$380 million for the cost of water system recovery attributed to Hurricane Katrina. Three of the four water systems in our study (Carrollton, St. Bernard, and West Jefferson¹) account for approximately \$360 million of this estimate.

¹ West Jefferson and East Jefferson Water Districts share a combined estimate.

EPA Office of Water Comment

FEB 23 2006

MEMORANDUM

SUBJECT: Response to Draft Evaluation Report on *EPA's and Louisiana's Efforts to Assess and Restore Public Drinking Water Supplies after Hurricane Katrina*, Assignment No. 2005-001748

FROM: Benjamin H. Grumbles
Assistant Administrator

TO: Nikki L. Tinsley
Inspector General

Thank you for the opportunity to comment on your Office's draft report, *EPA's and Louisiana's Efforts to Assess and Restore Public Drinking Water Supplies after Hurricane Katrina*. The hurricanes which struck the Gulf Coast region last fall were significant, not only in their effects, but in the response they required from the local to the federal levels. We are proud of the efforts made by personnel from utilities, state programs, non-governmental organizations and our own employees in working to restore drinking water services after the storm.

The Agency is very appreciative of the cooperative approach used by the Inspector General's (IG) Louisiana Drinking Water Team during the investigation of Region 6's response to Katrina. The many details of the Agency's response to assist the State of Louisiana and its public water systems, along with the duration of the response, made it critically important for Region 6 to actively participate in the investigation. It was clear that Region 6's presence with the IG Team enabled them to fully understand the context and significance of the information being conveyed. The end result of your cooperative approach is a report that accurately reflects the Agency's activities and successful response to this unfortunate and significant event in the lives of the citizens of Louisiana.

We appreciate the ability to provide comment on this draft report. We have some minor technical corrections to recommend, which have been forwarded via email to Carolyn Blair and Tim Roach of your staff. We do not believe that any additional points need to be raised for inclusion in the final report. We will continue to provide support to the state as needed to address long-term recovery needs for communities and public water supplies in the affected area.

Thank you again for the opportunity to comment on this final report. If you have further questions, please contact Cynthia Dougherty, Director of the Office of Ground Water and Drinking Water at (202) 564-3750 or Miguel Flores, Director of the Water Division in EPA's Region 6 office at (214) 665-7101.

EPA Region 6 Comment

Region 6 has reviewed the draft February 7, 2006, OIG Evaluation Report entitled EPA's and Louisiana's Efforts to Assess and Restore Public Drinking Water Systems after Hurricane Katrina. The report accurately reflects our collective (local, state, federal) response. We do not believe any additional points need to be raised for inclusion in the final report, but we recommend the following technical corrections for your consideration:

1. In the second paragraph on the page labeled "At a Glance," make the following change: "Disease monitoring after Hurricane Katrina indicated that drinking water supplies were not a source of bacteriological contamination infection."
2. In the third paragraph on page 4, we suggest changing the sentence to read "In some cases, LDHH staff members may partially lift boil order notices", since it is an Agency action.
3. Table 2, page 5. The LDHH website indicates the dates the Boil Water Advisories were lifted for portions of the areas served by the New Orleans Carrollton water system were October 6, 2005 and December 8, 2005. Two additional dates that Boil Water Advisories were partially lifted for St. Bernard Parish are November 22, 2005 and December 7, 2005, per the LDHH website.
4. In the last paragraph under the response to question 2 (top of page 6), add Louisiana Department of Health and Hospitals before Louisiana Rural Water Association - ...EPA staff working in teams with staff from the Louisiana Department of Health and Hospitals and the Louisiana Rural Water Association to assess....
5. Last paragraph on page 7. Sewerage and Water Board of New Orleans is the title the agency uses on their letterhead.
6. In the last paragraph on page 7 (second to last paragraph overall), change Portland, Louisiana to Portland, Oregon.

Distribution

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