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Concept Plan for Ambient Air Monitoring After Hurricane Katrina

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This document is an initial description of a proposed general concept for ambient air monitoring in the areas affected by Hurricane Katrina. The proposed monitoring system is aimed at providing air quality data in situations in which air quality may be adversely affected by the direct storm effects (flooding, destruction of building and their contents, damage to industrial facilities, etc.) or by activities aimed at clean up, start-up of industrial facilities, infrastructure restoration, rebuilding, and resettlement.

This document identifies certain situations which appear to be priority candidates for ambient air monitoring, types of monitoring that will obtain appropriate data about air quality in these situations, and possible uses of the ambient data collected. The scope of this document at this time does not include implementation steps such as specific sites, funding, sources of new monitoring hardware, etc. This document itself is not a Quality Assurance Project Plan (QAPP) for the monitoring it contemplates, but it does reference related existing QAPPs and similar documents that will be the models for the QAPPs that will be written and adopted as plans become more definite.

The purpose of this document is to support a consultation with a workgroup of EPA's Science Advisory Board regarding the plans described herein. Also, this document will allow EPA and state/local staff to begin to address implementation issues.

I. Air Quality and Public Health Situations Addressed

Flooded Areas

The air quality in New Orleans and other areas in the three-state region that experienced flooding may be adversely affected by a mix of fuels and chemicals that have been spilled as a result of flood and wind damage. Many people who have visited the area have reported strong volatile organic odors that are detectable over large areas in and around New Orleans. This situation is immediate but likely to be relatively short term as flood waters drain, volatile material evaporates away, and industrial facilities stabilize their operation.

In the longer term after flood waters are gone, there will be many workers in the three-state area doing restoration/demolition and other recovery and clean up work, particularly in New Orleans. The air quality may be affected by flood-contaminated dust that is re-entrained by vehicle traffic, construction/demolition equipment, etc. This situation will develop more slowly as the ground dries out and the number of people and equipment active in these areas grows, and then continue for an extended period before contaminated dust is washed away naturally, removed, or otherwise stabilized. This dust may contain biological organisms, metals, and low volatility compounds from spills.

Areas Damaged by Flood or Winds – Other Considerations

As chemical plants and refineries resume operation there may be high start-up emissions. While initial emergency response efforts will address known spills and continuing leaks, there is a possibility of less obvious fugitive leaks in pipes and tanks taking longer to identify and repair.

Air quality may also be affected by other pollutants created by recovery activity including SO2, H2S, and VOCs from combustion sources and chemical plants. Building demolition and debris loading may release lead from paint, asbestos from building materials, and other pollutants. Transport of building and other non-biomass debris may also release contaminated dust from the transported loads.

Open Burning of Biomass, Building Debris, and Other Debris

As of this time, plans for clean up and disposal of debris from Hurricane Katrina are in development in each affected state. This draft plan for air monitoring during the clean up effort assumes that some number of fixed open burning facilities are established for disposal of wastes that will not be recycled or disposed of by other means. These facilities are assumed to be operated or closely supervised by federal, state, and/or local government agencies. It is assumed that these facilities will remove from the burn stream any designated hazardous wastes where feasible, but that this exclusion will not be entirely effective. The burn stream will therefore contain some amount of such hazardous wastes as well as biomass from downed trees, dead animals, and various other anthropogenic wastes such as building demolition debris, commercial and household materials and products, etc. It is presumed that best practices, such as forced air curtains, will be used where feasible to reduce emissions but that the degree of control may vary from site-to-site and day-to-day. It is presumed that the first of these burning facilities may begin operation very soon, and that such facilities may be in operation for as much as a year.

The complex mix of material to be burned means that emissions from the fixed-site facilities may contain pollutants not typically encountered in more normal types of open burning that have been sampled in the past, such as burning of pure biomass wastes or burning of everyday household garbage in backyard burn barrels. EPA anticipates that the organic compounds in smoke from open burning after Katrina will be the same as observed in these previous open burning studies but the relative amounts may be different. Because of the possible presence of metals and asbestos in building debris, these may be present in smoke from open burning after Katrina.

There may also be situations in which large quantities of a single type of material are burned, for example to dispose of wholesale quantities spoiled foodstuff and other ruined merchandise and materials. This may happen soon, but be of short term duration.

Some burning of fairly pure biomass by households or small businesses in areas with less destruction of buildings can be expected, whether legally allowed or not. This burning is expected to happen early in the clean up period, to be diffuse geographically, and have limited duration. This monitoring plan does not address this type of burning, due to timing, feasibility, and risk prioritization reasons.

Incineration of Dead Livestock

Dead livestock needs to be disposed of through burial and/or incineration. This plan does not presently address emission monitoring or ambient monitoring near possible incineration operations. EPA is still in the process of assessing the situation in this area.

II. Monitoring Program Objectives

1. Quickly determine the air quality now present in New Orleans and other areas affected by contaminated flood waters.

2. Characterize dust concentrations and constituents in New Orleans and other areas affected by contaminated flood waters, after the ground is dry enough for dust generation to be significant.

3. Characterize the chemical constituents of the plumes from several of the fixed-site burning facilities that are of greatest public health interest due to burn volume and proximity to populations. Both the chemicals present and their approximate relative concentrations should be determined.

4. Provide on a daily basis predictions of the likely trajectory of the plumes from all or selected open burning facilities. This information will be provided to the state or local agencies with responsibility for notifying the public, regulating burning activity, or otherwise managing public health consequences.

This information will have several uses.

- EPA will provide information on air quality conditions so people living and working in the areas damaged by Katrina can understand how they may be affected
- EPA, states and local agencies will use the data to make decisions related to cleanup and recovery, such as decisions related to waste burning
- These data also will be useful to assess the health and ecosystem impacts of the storm and in planning for future disasters.

While the data from the monitoring program may have the uses just described, is it not part of the ambient monitoring program described here to employ the data for those purposes. The

data will be made accessible to other EPA offices, other agencies, or other organizations which may use it to achieve these purposes.

III. Objectives Not Addressed

1. This program is not specifically designed to provide all appropriate information on the occupational exposure of workers. While the measurement of chemical constituents in ambient air and/or in the plume of burning facilities give some information on constituents to which workers may be exposed, this monitoring program is not intended to determine or manage the concentrations workers are actually exposed to. It is presumed that the authorities operating the burning facilities and other recovery activities will take appropriate steps to characterize and manage worker exposure. EPA plans to deploy passive monitoring badges for organic compounds to obtain air quality data where power and conventional monitoring equipment are not yet available. The data from these badges may be useful to those responsible for occupational hygiene of recovery workers.

2. This monitoring plan is not aimed at estimating absolute concentrations except at the specific times and places monitored, or at providing data sufficient for such estimation by others. Absolute concentrations will vary widely with distance, burn volume, wind conditions, etc.

3. This program is not intended to provide ambient data for SIP or regulatory purposes comparable to that previously reported by conventional ambient monitoring sites that were destroyed or disrupted by the storm or flooding. The best way to obtain that data is by restoring those conventional sites, which EPA and the affected states are pursuing.

4. This program is not specifically designed to provide data to assess whether monitored concentrations of criteria pollutants (ozone, $PM_{2.5}$, etc.) in the affected or downwind states have been significantly affected by open burning activity and other disaster recovery activities in the affected states, such that the monitoring data for criteria pollutants should be excluded or adjusted for regulatory purposes.

IV. Ongoing and Proposed Approaches

In general, the following approaches are based on monitoring and data management approaches currently in routine use by EPA or state/local agencies or which are in final field trials, to allow rapid start up and to avoid novel issues of method, quality control, etc.

Emergency Response to Spills

EPA's Emergency Response Team is active in the affected areas. As in any emergency response incident, EPA's on-site coordinators (OSCs) have been doing source specific air sampling on the ground. The effort also includes the use of equipment mounted in a small aircraft that can obtain detailed chemical information from a safe distance. The equipment — Airborne Spectral Photometric Environmental Collection Technology (ASPECT) — is an emergency response sensor package operated by EPA. It provides first responders —

emergency workers on scene — with information on possible chemical releases. ASPECT sensors are mounted in an AeroCommander 680 twin-engine aircraft. They can detect chemicals and several different radiological materials. ASPECT is also capable of collecting high-resolution digital photography and video and can take thermal and night images by using instruments that track differences in heat below the airplane.

More information on the capabilities of this system is available at http://www.epa.gov/naturalevents/flyinglab.htm

This system is not designed to monitor ambient air quality per se, and is mentioned and described here to avoid misunderstanding of its purpose.

Monitoring of Air Quality Above and Near Contaminated Flood Waters

EPA's Trace Atmospheric Gas Analyzer (TAGA) is being deployed to New Orleans. TAGA is a self-contained mobile laboratory capable of real-time sampling and analysis in the low parts per billion level of outdoor air or emissions from various environmental sources and concerns. This will provide information on how contaminated flood waters and other pollutant releases are affecting air quality in New Orleans at present. TAGA's initial deployment will last two weeks. More information is available at http://www.epa.gov/earth1r6/6lab/taga.htm.

Other interim monitoring approaches for New Orleans are also being considered based on the TAGA findings and the schedule outlook for re-establishing the conventional monitoring sites (see below). This will include passive monitoring of volatile organics in New Orleans. EPA is ordering a supply of 3M brand volatile organic monitors for this purpose. Also, Louisiana Department of Environmental Quality has already conducted some sampling for organic compounds in New Orleans using Summa canisters. EPA will work with Louisiana to ensure these data are available to EPA and the public

Restoration and Enhancement of Pre-storm Ambient Monitoring Systems

Five conventional monitoring sites in New Orleans that were destroyed in the storm and flood will be re-established with additional monitoring capabilities relevant to the dust, combustion emissions, industrial start-up and lingering fugitive emissions, and other exposures that may face clean-up and recovery workers once the flood waters are gone. This monitoring will include ozone, SO2, H2S, CO, $PM_{2.5}$, PM_{10}, PM coarse, NOx/NO2, VOCs, and PM in various combinations at these five sites.[1] None of these sites hosted a $PM_{2.5}$ speciation sampler prior to Katrina. However, PM filters from one or more of these sites can be analyzed for metals and other elements. These sites cannot resume operation until power is restored and new

[1] The tentative plan is to establish the following combinations of monitoring capabilities in New Orleans:
Kenner site: PM2.5, NOx/NO2, SO2, H2S, CO, PMcoarse, VOCs, meteorology.
City Park: NOx/NO2, CO, PM2.5, PM10, SO2, VOCs, meteorology.
Tulane: None.
Arabi: SO2, CO, PMcoarse, VOCs, meteorology.
Meraux: PM2.5.
Chalmette: VOCs

equipment obtained. Maps indicating the location of these monitoring sites in relationship to other landmarks are posted at www.epa.gov/ttn/amtic/katrina.

Conventional monitoring sites will also be restored in the coastal area of Mississippi. Some of the previous equipment survived, but some needs to be replaced.[2] Maps indicating the location of these monitoring sites in relationship to other landmarks are posted at www.epa.gov/ttn/amtic/katrina.

Conventional monitoring sites in Alabama were not significantly harmed by the storm.

Smoke from Open Burning

Three sets of ambient air toxics monitoring equipment of the types used at the existing National Air Toxics Trends Sites (NATTS) will be deployed.[3] One will be in or near New Orleans, if one or more open burning facilities are located there. The other two will be deployed near two fixed-site open burning facilities within the three-state area, based on expected burn volume and proximity to populations. These NATTS-style sites will be located in the generally downwind direction of the burning operations, so that they are frequently in the plume. This equipment is not suitable for moving on a daily basis. The following websites provide information on the type, capabilities, and operation of this equipment: http://www.epa.gov/ttn/amtic/natts.html and http://www.epa.gov/ttn/amtic/airtoxqa.html.

NATTS sampling equipment will collect hydrocarbons, aldehydes, and particulate matter samples for 24-hour periods. These samples will be sent to a laboratory for analysis of multiple air toxics constituents. The laboratory will posted the results to the Air Quality System (AQS), the EPA data base for ambient air monitoring data, from which it can be obtained by any interested organization or individual.

Three fixed-site $PM_{2.5}$ monitors will be placed around each of the three selected open burning facilities, oriented so that the plume is likely to impact a site under prevailing winds. Some of these sites will also have PM_{10} monitors. Filters from these monitors will be analyzed for PM mass and for metals and other elements. Initially all filters from these monitors will be analyzed for PM mass and for the metals and other elements typically analyzed in the existing $PM_{2.5}$ speciation program.[4] This intensity will be reconsidered periodically. This builds on a Louisiana DEQ plan for source specific monitoring developed prior to the hurricane.

At least six portable $PM_{2.5}$ continuous monitors (based on beta attenuation) with real-time satellite-based data upload capability will also be deployed. One monitor will be co-located

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[2] The following equipment needs to be obtained for sites in coastal Mississippi:
Pascagoula – SO_2, NO_2, PM_{10}, $PM_{2.5}$–FRM, [Carbonyls, VOCs] – toxics via ERG
Port Bienville – NO_2, O_3, $PM_{2.5}$–FRM
Waveland – O_3, $PM_{2.5}$–FRM
Gulfport – O_3, $PM_{2.5}$–FRM+ Continuous + Speciation
Pearlington – $PM_{2.5}$–FRM

[3] Of the three affected states, only Alabama currently operates a NATTS site, in Birmingham.

[4] These are aluminum, silicon, sulfur, chlorine, potassium, calcium, titanium, vanadium, chromium, manganese, iron, nickel, copper, zinc, arsenic, selenium, bromine, cadmium, and lead.

with each fixed-site air toxics monitoring suite. Three other monitors (one per air toxics site, but not at the air toxics site) will be moved from day-to-day based on predicted trajectory of the plume, with the goal of sampling the center of the plume at various downwind distances up to several miles. Alternatively, the other portable monitor at each location may be placed and remain at a high interest receptor point, for example a population center. Data from these monitors will be uploaded continuously to EPA's AIRNOW Tech data system, which is designed for such rapid continuous upload of hourly concentration data. The ratio of the $PM_{2.5}$ concentrations at the fixed and portable monitors provides a way to roughly estimate the concentration of air toxics at the location(s) of the portable monitors. In addition, Summa canisters will be collocated with some or all of the plume-oriented $PM_{2.5}$ monitors and analyzed for VOCs.

Additional portable $PM_{2.5}$ monitors may be deployed at other open burning facilities (ones without air toxics monitoring) for plume sampling, depending on availability of equipment and personnel and state/community interest. These will be able to report the mass of $PM_{2.5}$, from which concentrations of air toxics might be qualitatively if not quantitatively inferred based on the chemical-specific sampling work at the above three sites.

Each NATTS-style air toxics monitoring site will also measure wind speed, wind direction, temperature, and relative humidity to help determine retrospectively whether and how often during the day the site was in the plume of the burning facility. Additional meteorological monitoring equipment may be deployed based on the characteristics of the sites involved.

A system will be developed for linking the ambient monitoring data to whatever information is available, if any, on the burning facility operations (burn volume, source and nature of material burned, control type, etc.).

Daily predictions of the trajectory of the plume from all or selected burning facilities will be developed using the NOAA HYSPLIT4 modeling tool. The trajectories will be made available to the operators of the burning facilities and to state/local agencies responsible for public notification. Information on HYSPLIT4 is available at http://www.arl.noaa.gov/ready/hysplit4.html.

EPA is considering the possibility that biological pathogens may be released from open burning of material contaminated by flood waters, and is considering monitoring options for this situation.

Asbestos, Mercury, and Dioxins/Furans

EPA will work with state and local agencies to assist with asbestos sampling as necessary.

Given the age of the architecture and the amount of demolition that may be needed in New Orleans, there is the possibility of significant release of asbestos. If open burning takes place in New Orleans itself, that could also increase release of asbestos if asbestos-containing materials are not well separated. This situation may also exist in other affected areas to some degree.

EPA proposes to put one asbestos-dedicated filter sampler at one of the conventional monitoring sites in New Orleans, and one asbestos-dedicated filter sampler at one of the open burning sites described above. The exact locations will be based on which monitors have the highest PM mass concentrations and/or which appear most likely to detect asbestos based on the patter of demolition/burning in New Orleans and elsewhere. Initially, asbestos will be monitored on a one-in-three-days sampling schedule. This plan for asbestos sampling will be reviewed after a period of operation to consider whether the sampling should be made more or less intense depending on the amount of demolition, its apparent degree of control for asbestos releases, whether open burning is occurring, and concentrations observed so far. Asbestos sampling in other affected areas will be considered as more information becomes available on the nature of demolition and open burning activities.

In addition, some PM filter samples from the criteria pollutant monitoring sites or the special ring sites maybe analyzed for particulate mercury. If measurable mercury is found, next steps will be considered.

EPA has not yet coordinated internally regarding dioxin/furan sampling. Open burning can produce these pollutants, but their production depends on the temperature and residency time during combustion.

V. Responsibilities of Involved Offices and Agencies

EPA's Office of Air Quality Planning and Standards (OAQPS) will coordinate the development, review, and evolution of the multi-region monitoring plan based on state-specific planning lead by the two Regional Offices. OAQPS will facilitate resolution of roadblocks to implementation that cannot be resolved at the Regional Office level. OAQPS will also manage contracts for some or all needed laboratory analysis. If OAQPS's level-of-effort contracts are the only or best way to accomplish some other portions of the plan, OAQPS will serve as project officer for those activities. OAQPS will also arrange for, or perform if necessary, the trajectory analyses if the states themselves are unable. OAQPS will operate the AQS and AIRNOW data systems.

EPA's Regional Offices 4 and 6 will be responsible for coordination with state and local agencies and with EPA's on-site emergency response coordinators to implement the plan.

EPA's Office of Research and Development will continue to advise OAQPS and the Regional Offices on more detailed monitoring plans, and arrange for Science Advisory Board Review when appropriate.

VI. Pollutants To Be Measured

NATTS pollutants:

Metals and other elements (see footnote above)
Gases – Benzene, 1,3-butadiene, carbon tetrachloride, chloroform, 1,2-dichloropropane, dichloromethane, tetrachloroethylene, trichloroethylene, vinyl chloride, formaldehyde, acetaldehyde and acrolein.

PM10
PM2.5
NAAQS gases: CO, SO2, NOx/NO2, Ozone
Speciated VOCs
Dioxin & Furans (not yet addressed in this plan)
PCBs
Asbestos
Particulate mercury

Section IV describes what pollutants will be sampled in each part of the planned monitoring network.

VII. Monitoring Equipment

Summa Canister samplers
Carbonyl/Aldehyde sampler
PM10 – Hi-Vol sampler
PUF plugs for use with PM10 Hi-Vol
E-Bam continuous PM monitor
$PM_{2.5}$ filter-based FRM (some may be portable and/or battery powered)
Asbestos Sampling -- Filter sampler plus microscopic electro-analysis (NIOSH asbestos method)
Meteorological equipment (Wind speed, Wind direction, temperature, RH)
Need to consider: specialized sampling equipment for dioxins/furans

Other equipment mentioned in Section IV above will be standard equipment typically used for conventional NAAQS pollutant monitoring.

This plan is based on the assumption that the fixed burning facilities will be able to provide electrical power for the fixed monitoring equipment and to recharge batteries for the portable monitors.

VIII. Laboratory Analysis

Louisiana DEQ's PM filter weighing laboratory was destroyed in the storm. PM filters can be weighed and analyzed for metals and other elements by laboratories under contract to OAQPS.

All NATTS pollutants can also be analyzed by laboratories under contract to OAQPS. DEQ's organics laboratory may be able to analyze Summa canisters.

Dioxins, Furans, PCBs – to be addressed. OAQPS maintains a flexible contract with at least one laboratory with this capability.

Asbestos analysis should be conducted by an American Industrial Hygiene Association (AHIA) asbestos-accredited lab.

IX. Sites To Be Monitored

The sites near burning facilities will be identified based on prevailing wind direction and the availability of secure sites with power.

The specific burning facilities to be monitored will be determined by EPA Regions 4 and 6 based on expected feed rate and proximity to population resident at the time of burning. Site selection will be reviewed at 3, 6, and 9 months in light of current burning practices.

X. Monitoring Schedule

NATTS pollutants can be sampled at 24-hour intervals, on a daily basis, given sufficient lead time to assemble required numbers of canisters.

The portable continuous $PM_{2.5}$ analyzer will operate continuously, reporting mass measurements every 15 minutes.

Filter based $PM_{2.5}$ and PM_{10} measurements can be run at 24-hour intervals, with results available after laboratory gravimetric analysis.

Dioxins, furans, and PCBs can be collected on a 24-hour interval, on a daily basis, with laboratory analysis results lagging by 5 to 7 days.

Asbestos can be sampled at a variety of frequencies, typically 24 hours for ambient exposure. Laboratory results are typically available within 72 hours from time of laboratory receipt of sample.

XI. Quality Assurance Activities

To the extent feasible given field conditions, the model Quality Assurance Project Plan (QAPP) for the NATTS will be followed for the air toxics monitoring component.

To the extent feasible given field conditions, the Quality Assurance Project Plan (QAPP) and Standard Operating Procedures (SOPs) for the $PM_{2.5}$ and PM_{10} monitors will be followed.

All laboratory analysis will follow method specific standard operating procedures and quality control requirements.

Site-specific QAPPs will be developed by the organizations operating the monitoring sites and will be reviewed by the EPA Regional Offices, with special issues referred to OAQPS.

XII. Data Management

EPA along with Regions and States will continue to work details to submit sampling data into the EPA's central data system SCRIB. In addition, routine air quality measurements and meteorology data will continue to be submitted to AQS or AIRNOW.

EPA will provide status reports and data from ambient monitoring through the Agency's Hurricane Katrina Response web site. EPA's intention is to make monitoring data from all environmental media available to the public through one data system or access point.

XIII. Wind Trajectory Development

NOAA's HYSPLIT4 model will be used to provide wind analysis forecast products to aid in plume tracking and public notification efforts.

XIV. References and Related Information

See www.epa.gov/ttn/amtic/sabreview.html for documents relevant to this plan which may assist Science Advisory Board workgroup members in reviewing this plan. The materials posted there include maps of the pre-storm monitoring sites in New Orleans and coastal Mississippi, method descriptions, model QAPPs, and other technical documents that EPA will draw form in preparing more detailed monitoring plans.