SPECIAL MONITORING OF APPLIED RESPONSE TECHNOLOGIES

RADIOLOGICAL MONITORING STRATEGIES FOR OFF-SITE CONSEQUENCE MONITORING OF RADIATION INCIDENTS

(SMART-RAD)

NY/NJ Area Contingency Plan Annex

Sector New York

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APPENDICES: SMART RESOURCES

I. INTRODUCTION

The need for a common framework to monitor possible impacts to public health and safety following a radiological event was recognized before the events of September 11th. These events have made more urgent the need for rapid coordination of response and sharing of information at all levels of government so each can carry out its emergency response plan to ensure public safety. However, subsequent meetings, tabletops, field exercises, and responses to actual events have shown these plans are not well coordinated. This reaffirms the need for developing a common framework for standardized monitoring to serve as guidance for federal, state and local monitoring efforts during events.

The National Response Plan (NRP) calls for an all-discipline, all-hazards approach to domestic incident management that ensures all levels of governments have the capability to work efficiently and effectively together. Federal agencies and departments will be revising their respective plans to conform with the NRP. To be consistent with the NRP, wherever possible, the NRP=s emergency response structure and terminology have been incorporated into this document.

In 2003, a workgroup of radiological scientists and emergency responders from the U.S. Coast Guard, the National Oceanic and Atmospheric Administration, the U.S. Environmental Protection Agency, the U.S. Department of Energy, the Department of Homeland Security, New York City, New York and New Jersey, convened in New York City to draft guidelines for generating this framework. The workgroup built upon currently available programs and procedures, mainly the Federal Radiological Monitoring and Assessment Center (FRMAC), and lessons learned during response operations and drills. The result of this collaboration is the Special Monitoring of Applied Response Technologies (SMART) Radiological (RAD) Monitoring Module.

The focus of this Module is the radiological environmental monitoring considerations for the first few days (up to 100 hours) of a radiological incident. As a result, this document will not address environmental monitoring of groundwater impacts nor cleanup standards. Furthermore, this document does not address the monitoring of individual members of the public for radiological contamination nor does it address decontamination protocols. Finally, this document does not address the health and safety protocol for emergency responders which is the responsibility of the responding organizations.

As originally conceived, SMART established a monitoring system for rapid collection and reporting of real-time, scientifically based information, in order to assist the Unified Command with decision-making during in situ burning or dispersant operations. SMART recommends monitoring methods, equipment, personnel training, and command-and-control procedures that strike a balance between the operational demand for rapid response and the Unified Command's need for feedback from the field in order to make informed decisions. For our purposes here, SMART-RAD is intended to adopt aspects of the SMART format for monitoring radiological releases. SMART-RAD is not limited to use in a specific geographical area. It is intended for use in any radiological response, whether it is a single agency or multi-agency/multi-jurisdictional event.

A. Overall SMART Radiation Incident Monitoring Mission

Homeland Security Presidential Directive 5 (HSPD-5) called for the creation of a National Response Plan (NRP). The NRP establishes the basis for all federal response operations, regardless of the initiating event or hazard, and covers the entire life cycle of incident management from pre-incident phases of (1) awareness, (2) prevention and (3) preparedness through incident phases of (4) response and (5) recovery. Most existing emergency response plans focus on the preparedness and response phases, and to a lesser extent the recovery phase. The primary focus of this document is to identify available assets for off-site consequence monitoring. It is expected, however, that federal, state and local agencies will continue to enhance their existing assets and acquire new assets which will improve surveillance in the pre-incident phases.

In each geographic area of the country, there are a number of federal, tribal, state, county and local agencies that have the responsibility to protect public health and the environment. These organizations have different approaches to meeting this responsibility because of the different statutory and regulatory bases under which they operate. All of the agencies need information to determine the potential impacts to public safety. The greater the potential or actual radiation exposure, the more urgent is the need for information.

B. General Information on SMART Modules

General Considerations and Assumptions:

1. SMART **should not** be construed as a regulatory requirement. It is an option available for the Unified Command to assist in decision-making. While every effort should be made to implement SMART, or parts of it, in a timely manner, **response activities should not be delayed** to allow the deployment of teams.

2. SMART is designed for use at responses both inland and in coastal zones.

3. SMART does not directly address the health and safety of responders or personnel monitoring. This will be covered by the general site safety plan for the incident (as required by 29 CFR 1910.120).

4. SMART does not provide complete training on monitoring for a specific technology. Rather, the program assumes that monitoring personnel are fully trained and qualified to use the equipment and techniques mentioned and to follow the SMART guidelines.

5. SMART attempts to balance feasible and operationally efficient monitoring with solid

scientific principles.

6. In general, SMART guidelines are based on the roles and capabilities of available Federal, state, local resources, and NOAA's Scientific Support Coordinators (SSC). The SSC is often referred to in the document as Technical Specialist. Users may adopt and modify the modules to address specific needs.

7. SMART uses the best available technology that is operationally feasible. The SMART modules represent a living document and will be revised and improved based on lessons learned in the field, advances in technology, and developments in techniques.

8. SMART is not intended to supplant plans already in place for nuclear power plants, but is written for adoption and adaptation by any private or public agency. Furthermore, users may choose to tailor the modules to specific regional needs.

9. It is important that the Unified Command agree on the monitoring objectives and goals during the early phase of an incident. This decision, like all others, should be documented.

C. Organization

The SMART-RAD module is comprised of five sections and ten appendices. The sections are:

- *Initiating Conditions* - Describes the types of situations or events that may lead to the need for Off-Site Consequence Monitoring.
- *Incident Command Structure* - Describes the functions that are to be filled to obtain and evaluate monitoring data in an efficient and effective command structure.
- *Monitoring Priorities* - Describes the strategy to obtain Off-Site Consequence Monitoring data for determining the need for actions to protect public health and the environment.
- *Direct Radiation Monitoring* - Describes the equipment and procedures for direct measurement of external radiation in the environment.
- *Air, Surface, Environmental and Water Monitoring and Sampling Operations* - Describes the equipment and procedures for determining radionuclide levels in the environment.

This module is meant to be generic and applicable to any region. The *SMART-RAD Resources* appendices provide region-specific information that is critical for successful implementation of off-site consequence monitoring. Optimal protection of public health and the environment will not be possible without cooperation and assistance of the regional assets. Appendices C, D, and E identify federal, state and local agencies with radiation responsibilities and assets that can be used when responding to radiological incidents.

The appendices provide information on who to contact and what radiological emergency monitoring and laboratory assets are available in a specific region. In addition, the generic forms that would be used by the Federal Radiological Monitoring and Assessment Center (FRMAC), which may be requested for assistance in the event of a radiological incident, are also provided. These forms provide a common basis for various agencies to report data and information to one recording entity from which data would be evaluated and provided to decision makers, regardless of FRMAC participation in the incident response.

II. INITIATING CONDITIONS FOR OFF-SITE CONSEQUENCE MONITORING

A. OVERVIEW

The intent of this section is to explore possible initiating conditions for off-site consequence monitoring activities. SMART-RAD consequence monitoring will take place during or following a radiological incident. This incident may evolve from a radiation monitoring event or group of circumstances which lead to the precautionary monitoring of public and environmental areas. Generally speaking, the *events* leading to off-site monitoring can result from any unexplained, unexpected, or suspicious detection of radioactive materials. Likewise, the events leading to off-site monitoring could result from intelligence or situations concerning radioactive materials. These events/situations may develop at any place and at any time during any of the five phases of response.

For the purposes of this document, the *initiating condition* is an *event* (detection or occurrence of a release) or *circumstance* (information/intelligence) leading to agreement that there is a credible potential for a release of radioactive materials to the environment that warrants consideration of offsite impacts.

B. DETECTION EVENTS AND CIRCUMSTANCES

1. GENERAL CONSIDERATIONS

This section will give specific examples of events and conditions that could lead to the decision for offsite monitoring. As will be seen, this decision may result from an event or from situational circumstances that indicate preparations for offsite monitoring would be beneficial. These conditions will be explored within the context of two (of five) NRP emergency response phases: Awareness and Prevention[1].

2. EVENTS DURING THE AWARENESS PHASE

Awareness, the first phase of incidence response, matches very well with surveillance operations. Effective surveillance allows one to know whether a hazard exists long before an emergency situation develops. In most cases of non-deliberate radiological loss of control, basic gamma radiation monitoring allows for responders to detect the presence of a radioactive material long before it becomes a hazard to the public. Basic survey detectors are sensitive enough for most routine surveillance activities. If unexpected radiation levels are detected and verified, more specialized expertise can be tapped, if needed, and it is entirely possible that the problem can be quickly addressed. This same detection event, however, could be an indication of a larger problem.

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[1] It is not appropriate to evaluate an initiating event within the context of the preparedness, response, or recovery phases of emergency response. The preparedness phase is a training and exercise function. Likewise, during the response and recovery phases the initiating event is considered to have already occurred at an earlier time.

There are numerous examples of areas where routine radiation detection takes place as a matter of surveillance. Some locations or situations where the detection of radiation levels above background may lead to further investigation are:

- Bridge/Tunnel monitoring
- Site entry activities (hazardous release site)
- Real time environmental monitoring
- Private/public building entrances
- Radiation/nuclear facility site boundary and/or effluent monitoring
- Law enforcement detection
- Passive monitoring at major public gatherings (sporting events, celebrations, etc.)

All awareness phase incidents begin with an initiating event or detection. As will be seen in the next section, circumstances developing from intelligence/information automatically moves monitoring activities into the prevention stage.

3. EVENTS AND CIRCUMSTANCES DURING THE PREVENTION PHASE

A good example of monitoring in the prevention phase is what takes place at locations that screen incoming packages and materials for radioactivity as a precaution. Some industries are vulnerable to impacts from lost/discarded radioactive items and perform precautionary monitoring to avoid costly cleanup and disposal of these items. Locations of this sort expect periodic detection events and have in-house procedures for rejecting suspicious deliveries and notifying local authorities.

This sort of precautionary screening can be applied in situations where intelligence indicates a known or suspected item will be arriving at a specified location. In this case, items/persons will be screened as a precaution against a known or suspected hazard before it becomes a problem.

Some facilities/conditions where precautionary radiation screening may take place are:

- United States Coast Guard (USCG) vessel inspections
- Ports of entry from foreign countries (US Customs)
- Points of entry from foreign countries (border crossings)
- Scrap metal recycling plants
- Intelligence-based interdiction activities of any sort
- Solid waste facilities

C. INITIATING EVENTS AND CIRCUMSTANCES

1. GENERAL CONSIDERATIONS

This section will explore, in general terms, the situations which give rise to the decision for offsite monitoring. As has been stated before, this decision may result from an event or from situational circumstances that indicate preparations for offsite monitoring would be beneficial. This decision can occur in any of the five NRP phases of emergency response.

2. NON-INITIATING EVENTS

Not all radiological events or circumstances escalate to the level where offsite monitoring is a consideration. Locations that perform radiation surveillance routinely contact appropriate radiation offices. Typically, notification occurs as a matter of procedure or in situations that are out of the ordinary. These are the situations where professional contractors or local response personnel may be called in for regulatory or technical assistance. This is the stage, represented within the dotted lines of the Initiating Event Conceptual Model Flow Chart (Figure 1), where the consideration for offsite consequence monitoring will take place.

Radiation detection events take place every day under a variety of circumstances. These events are routinely addressed by the monitoring plans and procedures of the location. In these stable situations, the consultation takes place in-house and some Aother action@ brings the situation under control.

In some cases, the site plan calls for the notification of local authorities if/when a detection is made. In other cases, the site radiation safety officer will be notified. It is possible, however, that subsequent consultations and investigations lead only to more questions and concerns. These are the cases in where site operators are expected to notify local authorities and request consultation and/or assistance. (See area of flow chart within the dotted lines.)

3. INITIATING EVENTS

It is entirely possible that any given radiation detection event could escalate into a response that leads to concerns about offsite consequences. Some conditions that could cause a simple radiation detection to escalate into an incident are:

- Accidental release (industrial)
- Intentional release (radiological dispersal devices, improvised nuclear devices)
- Extraordinary circumstances (unexplained explosion)
- Credible intelligence
- Unexpected measurements (high levels, conflicting readings, neutron flux)
- Terrorist event

Events can go in one of four directions:

a. **It may be determined that the detection is normal or made in error.** There is no risk of offsite consequences. The incident will follow the site plan for detection events and the investigation will be concluded.

b. **It may be determined that site conditions are abnormal, but can be handled without risk of offsite consequences.** The complicating factors leading to the consultation will be discussed and a solution agreed upon in-house or with site

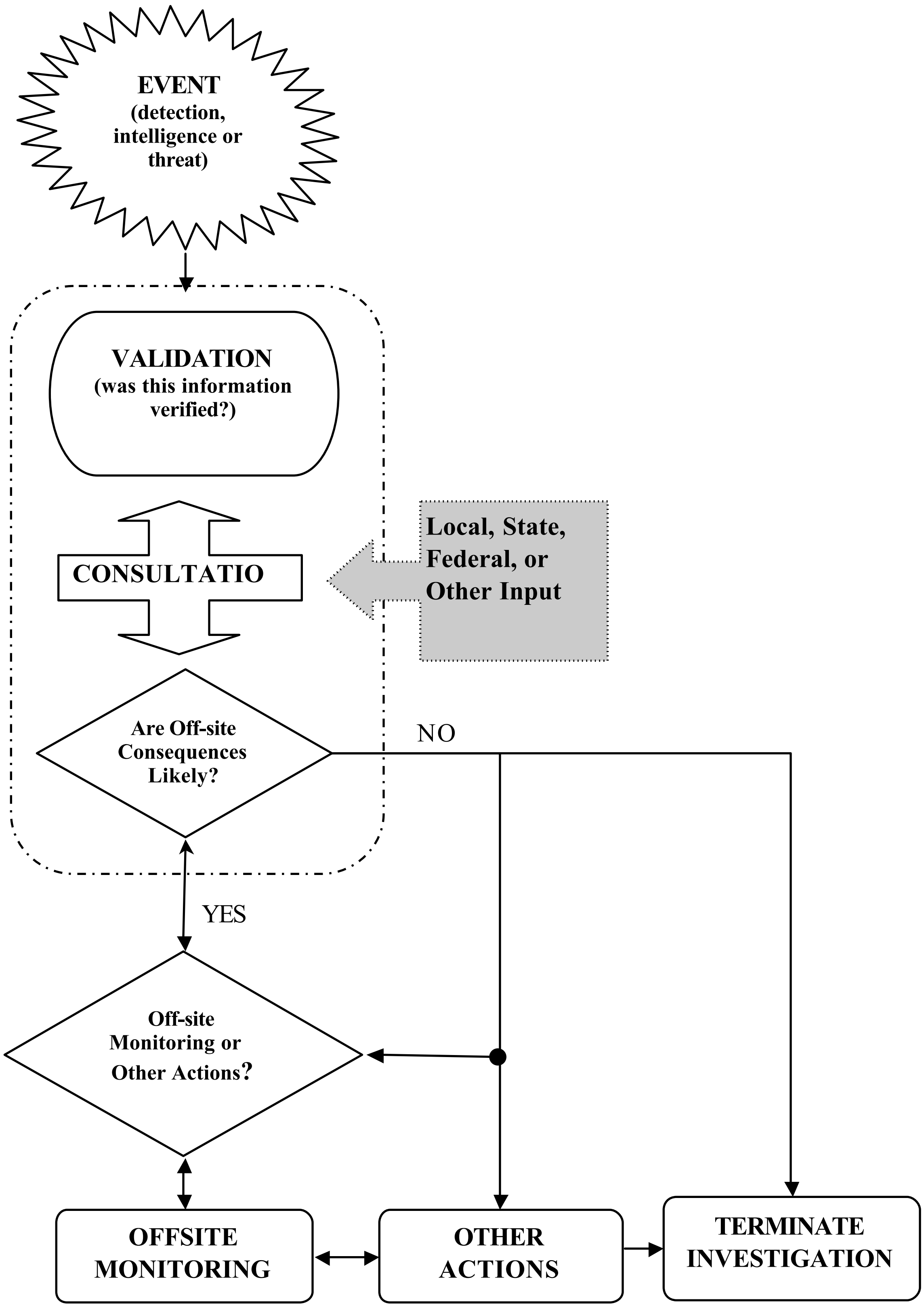

FIGURE 1: INITIATING EVENT CONCEPTUAL MODEL FLOW CHART

radiation support. Some Aother action@ will take place (securing the source, accepting the source, rejecting the shipment, disposal, etc.). Ultimately, the investigation will be concluded without the need for offsite monitoring.

c. **It may be determined that conditions are such that there exists a possibility of a release and offsite impacts.** Once this determination is made, an attempt to contain the incident ("other actions") may follow. Also, the decision may be made for offsite monitoring in conjunction with those actions. The decision for offsite monitoring can be concurrent with the other actions, or it may follow the other actions if the situation deteriorates.

d. **A release is taking place or has likely occurred.** Once this determination is made, the decision for offsite monitoring will be immediate.

The decision for "other actions" is never precluded in any decision process. When the decision is made for offsite monitoring, SMART-RAD will come into play.

D. EVENT TERMINOLOGY

The *Draft* Radiological and Nuclear Emergency Preparedness Guide prepared by the City of New York Office of Emergency Management categorizes radiological events into four classes, each increasing in potential impact to offsite locations. SMART-RAD adopts these terms for describing the various types of radiological events that may lead to offsite consequence monitoring. In each situation (class), there will be a need for impact assessment and/or verification from monitoring and/or sampling activities. The four classes are:

- **Radiological Incident Emergency (RIE)** is a radiological event that does not involve a significant release or loss of control of a radiological material that would approach or exceed EPA PAGs[2].

- **Radiological Release Emergency (RRE)** is a radiological event that involves a significant release or loss of control of radiological material that may exceed EPA PAGs.

- [3]**Nuclear Incident Emergency (NIE)** is a category of nuclear event (detection or occurrence) so named because it, like the RIE, is not expected to escalate and result in a nuclear detonation *or* public exposure that exceeds the EPA PAGs.

[2] As described in the Manual of Protective Action Guides and Protective Actions for Nuclear Incidents, EPA 400 R 92-001.

[3] Nuclear events are a special category of radiological emergency that, should they occur, would require highly specialized assessment expertise and enhanced regulatory control that are outside of the scope of SMART-RAD. Some examples of nuclear events are nuclear power plant emergencies, accidents involving special nuclear materials, and detonation of improvised nuclear devices. Aspects of the monitoring capabilities presented in SMART-RAD may prove useful in providing additional information for the total assessment of impacts of public health and the environment in these cases.

- **Nuclear Release Emergency (NRE):** is a category of nuclear event that involves an actual or imminent substantial nuclear incident which will result in a release of material that causes exceedances of EPA PAGs *or* lead to nuclear detonation.

Once the initiating event (or chain of events) has occurred, the decisions must be made (1) **what** to monitor,(2) **where** to monitor, (3) **when** to monitor and (4) **how** to monitor. The remainder of the SMART-RAD module sets forth a framework for answering these questions.

III. INCIDENT COMMAND (IC) STRUCTURE FOR SMART-RAD RESPONSE

A. OVERVIEW

Pursuant to the mandate in Homeland Security Presidential Directive (HSPD) - 5, on March 1, 2004, the Department of Homeland Security released the National Incident Management System (NIMS). This system is intended to provide a consistent national approach for federal, state, local and tribal governments to work effectively and efficiently together to prepare for, prevent, respond to, and recover from domestic incidents, regardless of cause, size or complexity. The NIMS adopts the basic tenets of the Incident Command System on which the response structure contained in this document is based.

B. SMART-RAD AS PART OF THE ICS ORGANIZATION

SMART-RAD activities are directed by the *Operations Section Chief* in the Incident Command System (ICS). A *Branch* should be formed in the Operations Section to direct the monitoring effort. The head of this group is the *Monitoring Branch Director.*

Under this *Branch* are functional *Strike Teams/ Task Forces* to deal with Reconnaissance/Assessment, Monitoring/Sampling, Fixed Facility Monitoring, Evidence Collection and Remediation and Decontamination Monitoring.

Each team will have a minimum of two members, with one acting as Team Leader. In the event that there is a need for operations to be conducted simultaneously in more than one geographic area, *Divisions* will be set up under the control of a *Division Supervisor.* When the number of field teams exceeds the span of control limits, a *Group Supervisor position* should be added in all affected areas.

Monitoring/sampling data will flow from the individual team to the *Division Supervisor* (if this position is filled) to the *Monitoring Branch Director* who forwards data directly to the *Radiological Technical Evaluation Unit* in the *Planning Section*. This unit will support the Planning section on matters of Alarm Resolution, Action Level Settings and Plume Trajectory Modeling and is under the control of the Radiological Technical Specialist.

C. INFORMATION FLOW AND DATA HANDLING

Communication of monitoring results should flow from the field *Team Leader* to the *Radiological Technical Evaluation Unit* who can interpret the results and use the data. The operational control of the monitoring groups remains with the Operations Section Chief, but the reporting of the information is to the *Radiological Technical Evaluation Unit* in the *Planning Section.*

The *Radiological Technical Specialist* or his/her representative reviews the data and, most importantly, formulates recommendations based on the data. The *Radiological Technical Specialists* communicates these recommendations to the *Planning Section Chief* and *ultimately* to the Unified Command.

Quality assurance and control should be applied to data at all levels. The *Radiological Technical Specialist* in the *Planning Section* is the custodian of the data during the operation. The data belongs to the *Unified Command / Incident Command.* The *Unified Command* should ensure that the data are properly stored, archived, and accessible for the benefit of future monitoring operations.

D. INCIDENT COMMAND STRUCTURE FOR RADIOLOGICAL MONITORING

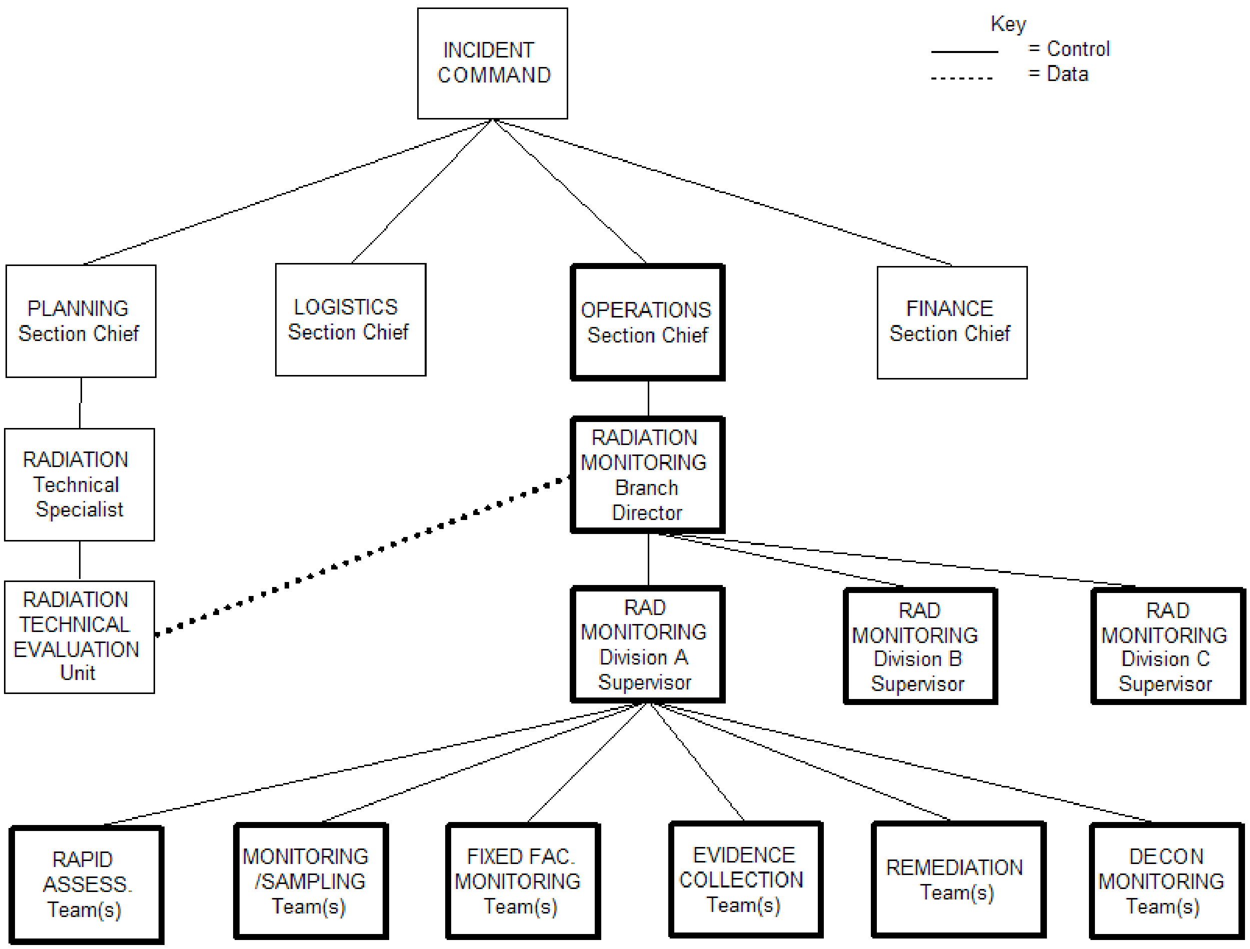

FIGURE 2: DIAGRAM OF CONTROL AND DATA FLOW FOR RADIATION MONITORING

The solid lines between Supervisor and Teams in Figure 2 illustrate the flow of instruction from the Radiation Monitoring Supervisor to field team(s) and the return flow of information/data. These information and data are transmitted by the Radiation Monitoring Branch Director to the Radiation Technical Evaluation Unit for analysis. The Evaluation Unit forwards its evaluation of the data to the Incident Command through the Planning Section. Depending on the complexity and magnitude of field needs, there may be more than one Rad Monitoring Supervisor and more than one of each kind of team.

E. DESCRIPTION OF POSITION RESPONSIBILITIES

Appendix B is a matrix that identifies agency resources that may be available to fill positions in the incident command structure for responding to a radiological emergency.

1. OPERATIONS SECTIONS

Radiation Monitoring Branch Director - Responsibilities are as described on page 8-2 of the Incident Management Handbook (IMH) under Operations Branch Director.

Radiation Monitoring Division/Group Supervisor - Responsibilities are as described on pages 8-3, 8-4 of the IMH under Operations Division/Group Supervisor.

Radiation Monitoring Strike Teams and/or Task Forces[4] - Each of the following Strike Teams and/or Task Forces will be made up of at least two members with one filling the position of Team or Task Force Leader. The Strike Team/Task Force Leader has the following general responsibilities:

> The Strike Team/Task Force Leader reports to a Division/Group Supervisor and is responsible for performing tactical assignments assigned to the Strike Team or Task Force. The Leader reports work progress, resource status, and other important information to a Division/Group Supervisor, and maintains control and work records on assigned personnel.

The major responsibilities of the Strike Team/Task Force Leader are:

- Review Common Responsibilities (IMH, page 2-1).
- Review Common Unit Leader Responsibilities (IMH, page 2-2).
- Review assignments with subordinates and assign tasks.
- Monitor work progress and make changes when necessary.
- Coordinate activities with adjacent Strike Teams, Task Forces, and Single Resources.
- Travel to and from active assignment areas with assigned resources.
- Maintain control of assigned resources while in available or out-of-service status.
- Submit situation and resource status information to Division/Group Supervisor.
- *Maintain custody of, or transmit field data through Division/Group Supervisor to Radiation Technical Evaluation Unit.*
- Maintain Unit/Activity Log (ICS Form 214).

Rapid Assessment Strike Team/Task Force- When an initiating event is known or believed to have occurred from information gathered by detection, intelligence, or threat, this Strike Team/Task Force will deploy to confirm and validate this information. This Strike Team/Task

[4] Strike Teams and Task Forces, as per ICS definition.

Force will have transportation, instrumentation, communications, and logistical supplies to be self-sustained in the field for at least 12 hours. It is anticipated that this Strike Team/Task Force will provide data to the Incident Commander for purposes of defining the geographic boundaries of any and all effected areas and describing the scope, type, and concentrations of radiological impact. It is further anticipated that this Strike Team/Task Force may assist local authorities with initial evacuation or isolation of effected populations.

Monitoring/Sampling Strike Team/Task Force- When an initiating event has occurred and initial assessment has identified areas of contamination, this Strike Team/Task Force will deploy to maintain and further define zones of contamination by the use of radiation detection instrumentation and sampling of the air, water, and environment. This Strike Team/Task Force will have transportation, instrumentation, communications, and logistical supplies to be self-sustained in the field for at least 12 hours. Data from this Strike Team/Task Force will be sent to the Radiation Technical Evaluation Unit (when activated) to assist in planning for the next operational period.

Fixed Facility Monitoring Strike Team/Task Force- This Strike Team/Task Force will gather and transmit data from pre-established fixed facility monitoring instruments identified by the local Area Contingency Plan. In addition, this Strike Team/Task Force will install, re-supply, and maintain additional instrumentation as determined by operational requirements in downwind areas, etc. This Strike team/Task Force will have transportation, instrumentation, communications, and logistical supplies to be self-sustained in the field for at least 12 hours. Data from this Strike Team/Task Force will be sent to the Radiation Technical Evaluation Unit (when activated) to assist in planning for the next operational period.

Evidence Collection Strike Team/Task Force- When an initiating event is suspected to have been the result of a deliberate act; the Evidence Collection Strike Team/Task Force will deploy to facilitate the process of evidence collection and preservation. It is anticipated that members of this Strike Team/Task Force will have specialized criminal investigative skills and the authority of local, state, or federal law enforcement. This Strike team/Task Force will have transportation, instrumentation, communications, and logistical supplies to be self-sustained in the field for at least 12 hours.

Remediation Strike Team/Task Force- This Strike Team/Task Force will deploy to provide guidance and expertise in the remediation of sites contaminated by radiation. It is anticipated that guidance provided by this team will aid in determining feasibility of cleanup methods, removal procedures, and disposal of contaminated waste products. Data from this Strike Team/Task Force will be sent to the Radiation Technical Evaluation Unit (when activated) to assist in planning for the next operational period.

Decon Monitoring Strike Team/Task Force- When operations include decontamination of contaminated areas, this Strike Team/Task Force will deploy to monitor effectiveness of decontamination procedures. This will include determination of effectiveness of decontamination methods and application. Data from this Strike Team/Task Force will be sent to the Radiation Technical Evaluation Unit (when activated) to assist in planning for the next operational period.

This Strike Team/Task Force will have transportation, instrumentation, communications, and logistical supplies to be self-sustained in the field for at least 12 hours.

2. PLANNING SECTION

Radiation Technical Evaluation Unit - This Unit is established in the Planning Section to be the repository of all radiation data gathered in the field from the Radiation Monitoring Branch in the Operations Section. This Unit will consist of members having the technical expertise needed to interpret and handle radiological data and will be under the control of the Radiation Technical Specialist. The Radiation Technical Specialist will provide input to the Planning Section Chief and Incident Commander for inclusion in the Incident Action Plan.

For larger incidents covering two or more jurisdictions, the Radiation Technical Evaluation Unit should encompass members from all affected jurisdictions. Because it is unlikely these members will be able to convene at a single location during the first 12 hours of the incident, this unit can assume a virtual status whereby members can converse and evaluate remotely via cellular/telephone or other means of simultaneous communications. It is very important that these members are pre-identified to ensure rapid coordination.

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IV. MONITORING PRIORITIES

A. OVERVIEW

Information on direct radiation exposure and radionuclide concentrations in ambient air, deposited on ground surfaces and/or impacting surface/marine waters may be needed for determining the extent of radiological impacts to the public and environment. The results of field monitoring activities and/or dose projections may result in protective action recommendations to public officials for use in decision-making. The information demands of the incident to address the following endpoint questions will drive the field monitoring needs.

- **Are the amount and type of actual or projected radioactivity in the environment such that prompt actions need to be taken to protect the public?** This usually means taking action when the projected dose to members of the public during the early phase of an incident approaches the EPA Protective Action Guides (PAGs) of 1-5 rem total effective dose equivalent (TEDE), warranting consideration of sheltering/evacuation or other protective measures. This question usually demands results in a matter of minutes to hours.

- **Are there radionuclide concentrations present in the environment that are above background radiation levels during the early and intermediate phases of the incident?** This question usually requires continuing sampling over several hours to days with results available in a day.

- **After the incident is under control and the recovery phase is well underway, are there any residual radiation or impacts to the environment that are above normal background radiation levels?** This question usually requires obtaining a continuous sample over several days to a week, with results available in a few days. This type of monitoring program could continue for several weeks, months, to years until the recovery phase is completed.

B. MONITORING STRATEGY

The primary purpose of the first few days of consequence monitoring is to obtain information to address the first two questions. The most direct information can be obtained by sending in field teams to take measurements and collect samples. Appendix H contains checklists that identify key information that Incident Command will need in order to direct response operations and examples of field team mission objectives for off-site consequence monitoring.

In certain cities or areas, early information can be obtained from existing environmental monitors located in areas of public or regulatory concern to detect abnormal radiation levels.

In order of priority, the following information is needed.

Identify areas that have significantly increased radiation levels that will likely result in doses exceeding the EPA protective action guides (PAGs) of 1-5 rem total effective dose equivalent.

These data can be obtained by sending field teams to locations close to the radiological release. Field monitoring teams can use direct reading radiation instruments to rapidly identify areas with gamma radiation levels that are many times background (e.g., 1 mR/hr) and obtain grab air samples which can be screened in the field to rapidly identify inhalation hazards. Portable gamma spectrometers can provide quick identification of gamma-emitting radionuclides and portable instruments can verify the presence of beta- and/or alpha-emitting radionuclides.

Readings are reported promptly so immediate decisions can be made concerning any protective actions that need to be taken such as evacuation, sheltering and/or restricting access/occupancy.

Identify areas of significant radionuclide deposition in order to control spread of contamination.

Field teams can identify contaminated areas, building interior and exterior surfaces, cars, sidewalks, etc., using portable radiation instruments.

Identify areas with above background radiation levels in order to define the maximum geographical extent of the problem.

Continuous air samples and environmental samples (surface water, vegetation and crops, etc.) can be collected and analyzed to address questions of potential long-term risk from the radiation incident. Results from environmental sampling may lead to consideration of food and water interdiction. An aerial radiological flyover can assist in rapidly identifying unimpacted areas and prioritizing where to collect samples in the impacted area.

Obtain measurements and samples in background or upwind locations for comparison to measurements and samples collected in the downwind, impacted areas.

Obtain information/measurements to verify areas with high population densities or sensitive populations that are believed to have not been impacted.

C. DEPLOYMENT CONSIDERATIONS

State, county and local agencies involved in nuclear power plant emergency preparedness have written procedures and participate in FEMA-evaluated exercises. Field monitoring equipment is generally kept in prepackaged kits and periodically checked for inventory, calibration and operation. The kit also contains Standard Operating Procedures (SOPs) covering equipment inventory, function and operation of equipment, sampling, analysis, and data recording. Although the SOPs and equipment used by field monitoring teams from different jurisdictions will likely be consistent with the generic procedure in the Federal Radiological Monitoring and Assessment Center (FRMAC) Monitoring and Analysis Manual, Volume 1, September 2002, there should be a review and agreement before deployment on how the measurements/samples will be taken and recorded. FRMAC forms for use by field monitoring teams are contained in Appendix I.

In addition to field teams trained to respond to nuclear power plant emergencies, as a consequence of September 11th, there is increasing emphasis on training and providing radiation equipment to additional state, county and local agencies to develop capability to respond to radiation incidents unrelated to nuclear power plants. The federal, state and local capabilities and contacts are listed in Appendices D (federal) and E (state and local).

Before teams can be deployed, field team safety needs to be addressed. A Hazard Checklist is provided in Appendix I to note major safety concerns in the incident area. An operative health and safety plan needs to be in place that addresses other hazards, personnel dosimetry, dose and dose rate limits, personal protective equipment (PPE), communication support, emergency medical procedures, etc. If multiple jurisdictions are assisting, the differences among the health and safety plans may affect how these teams are used in the field.

In addition to providing guidance on projected doses for considering protective actions for members of the general public, the "Manual of Protective Action Guides and Protective Actions for Nuclear Incidents" also provides guidance on dose limits for emergency workers. This guidance may assist in the development of specific health and safety plans for the incident.

Guidance on Dose Limits for Workers Performing Emergency Services [5]

Dose Limit (rem) [a]	Activity	Condition
5	all	
10	protection of valuable property	lower dose not practicable
25	life saving or protection of large populations	lower dose not practicable
> 25	life saving or protection of large populations	only on a voluntary basis to persons fully aware of the risks involved [b]

[a] Sum of external effective dose equivalent and committed effective dose equivalent to nonpregnant adults from exposure and intake during an emergency situation. Workers performing services during emergencies should limit dose to the lens of the eye to three times the listed value and doses to any other organ (including skin and body extremities) to ten times the listed value. These limits apply to all doses from an incident, except those received in unrestricted areas as members of the public during the intermediate phase of the incident.

[b] Worker lifetime dose and age may be a consideration in the selective acceptance of volunteers for high dose operations in emergency situations.

5 Table based on: *Manual of Protective Action Guides and Protective Actions for Nuclear Incidents*, EPA 400-R-92-001, United States Environmental Protection Agency, May 1992.

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V. DIRECT RADIATION MONITORING

A. OVERVIEW

Emissions from radioactive materials can be detected without taking a sample of the hazardous substance. In addition, exposure to high levels of these emissions can cause harm without being in contact with the radioactive material.

B MONITORING PROCEDURES

1. GENERAL CONSIDERATIONS

The most basic of radiation measurement devices measure gamma radiation in terms of exposure rate, ions produced in air. Exposure rate is conventionally expressed in units of roentgens per hour (R/h). Exposure rate measurements can be measured directly with a device known as an ion chamber. For most purposes, however, handheld survey meters (which measure exposure rates indirectly) work well in the field. Detectors of this type include pressurized ion chambers, Geiger-Muller detectors and scintillation crystal detectors. Sometimes detectors of this type are configured to read in units of dose: rem or Sievert.

There are also variations of the aforementioned detector types that are effective in alerting users to the presence of alpha and/or beta radioactivity. These detectors will typically express alpha or beta radiation levels in terms of counts per minute (cpm). These detectors used in combination with the exposure rate meters are useful in characterizing the nature of a radiation hazard and useful in contamination control.

For identifying the radiation source itself, a number of federal, state, county and local agencies have portable instruments that can identify radioactive materials based on the energy(s) of its gamma emissions. The sensitivity, accuracy and response characteristics of these instruments will vary depending upon their type and usage.

2. FIELD INSTRUMENTS

Field monitoring teams use portable instruments to rapidly determine the presence, or absence, of unusual levels of alpha, beta and/or gamma radiation. These field measurements will provide early information for dose assessment and protective action considerations.

Field teams can be deployed to identify plume boundary, centerline (highest reading), and/or radiation levels of particular interest for decision-making to protect the public. Obtaining a series of readings to quickly identify areas with exposure rate readings exceeding 1 mR/hr, for example, will facilitate prompt decision-making to protect the public from radiation exposure during a radiation incident.

3. AERIAL RADIOLOGICAL SURVEYS

Another means of identifying the plume is using aerial radiological monitoring. The fixed wing and rotary wing aircrafts are equipped with gamma radiation detectors to obtain data for plotting radiation level in isopleths onto aerial color or infrared photographs. The Aerial Measuring System (AMS) based in Las Vegas, NV and Andrews Air Force Base, near Washington, D.C., is operated by the DOE Nevada Operations Office's Remote Sensing Lab. In four hours, the AMS can be dispatched from its base and can provide aerial radiological data within 24 hours of performing the flyover. If there is adequate time to pre-position this asset, it can track the movement of a plume in progress. Depending on the radionuclide(s) involved, this technology is particularly useful in surveying and mapping large areas to identify subsequent deposition or ground contamination resulting from a plume release.

4. FIXED FACILITY RADIATION MONITORS

A number of nuclear power plants throughout the country are ringed with a series of pressurized ionization chambers (PIC). These detectors provide readings of ambient gamma radiation levels on an hourly basis and can be set to automatically notify the pre-designated state agency(ies) when gamma levels exceed a set point, usually about three to five times the normal background level.

Some solid waste management facilities such as landfills and recycling facilities have installed gamma radiation monitors to detect elevated radiation levels in shipments or loads of scrap metal, solid waste, or debris entering their facilities for smelting, incineration, or other processing. The monitors are set to alarm if there are any levels a few times above ambient background radiation levels. Radiation/environmental agencies are notified for guidance or response.

In addition to commercial facilities, there are monitoring stations throughout the country established by governmental agencies to obtain radiation data for research, national network, and surveillance purposes to detect gamma-emitting radionuclides and small changes in background radiation levels.

5. THERMOLUMINESCENT DOSIMETERS

Major facilities such as nuclear power plants, DOE facilities, radiopharmaceutical facilities and radioactive disposal facilities have a series of environmental Thermoluminescent Dosimeters (TLDs) located near their site boundaries that are usually collected and analyzed on a quarterly basis to determine any changes in ambient radiation levels. In the event of a radiological incident, these TLDs can be collected and analyzed promptly.

VI. INDIRECT MONITORING AND SAMPLING

A. AIR MONITORING AND SAMPLING

Sampling the air will provide information on airborne radioactive particulates that can be inhaled, transported or deposited. This information will assist decision makers in determining if protective actions are needed to protect the public from airborne radionuclides released from the radiological event.

1. MONITORING/SAMPLING PROCEDURES

a. Grab Air Sampling

Instantaneous or grab air samples are taken as a way to verify plume modeling, determine the composition of the airborne radioactive materials and estimate dose from a radiological release. Although their value is limited by the volume of air that can be sampled quickly, they can provide valuable information on whether there is a need to take prompt actions to protect against a serious inhalation hazard. When a field monitoring team determines with portable gamma detecting instruments that it may be within the radioactive plume, an air sample is taken. The sample is drawn for several minutes to obtain the particulate contents of a known volume of air (e.g., 10-50 cubic feet) at a constant flow-rate (e.g., 1-3 cfm). The sampling head consists of a particulate filter for collecting particulates and a charcoal or silver zeolite air cartridge for collecting iodines. The sampling team will typically have an independent power supply to run the air sampler, portable counting equipment for field screening, and radio communications to report results and take direction.

b. Continuous Air Sampling

Fixed air monitoring and sampling stations are designed to provide baseline environmental data and to detect the presence of above background levels or small changes in air pollutants. In a number of major population centers such as the New York - New Jersey area, there are stations specifically designed to detect radiation. Also, in times of a radiological emergency/incident, air sampling stations designed for non-radiological purposes can supplement the fixed radiological air sampling systems to extend monitoring coverage.

i. *Radiological Air Monitoring/Sampling Stations*

Since the 1970s, EPA has maintained a national network of environmental monitoring stations to follow trends in ambient radionuclide concentrations due to fallout from above ground nuclear weapons testing. This network is called the Environmental Radiation Ambient Monitoring System (ERAMS). The stations are positioned in major population centers and also provide geographical coverage. Appendix F provides information about and the locations of the monitoring stations maintained by the DHS's Environmental Measurements Laboratory and EPA's ERAMS network. These long-term air samplers are capable of detecting radioactive fallout from events such as atmospheric weapons testing and the Chernobyl accident. These instruments use high volume air pumps with a flow rate of about 1-3 cubic meter per minute to sample ambient air and collect particulate matter onto filter media. The filters are normally changed once or twice each week and then analyzed in a laboratory using shielded high-energy resolution germanium gamma-ray spectrometers.

ii. *Non-Radiological Air Monitoring/Sampling Stations*

The air quality monitoring stations in major metropolitan areas can be used in the event of a radiation emergency. These stations already have electrical power and security for installing temporary radiological monitoring stations, and/or the particulate filters from these stations can be analyzed for the presence of radionuclides. See Appendix G for the locations of air pollution monitoring stations in New Jersey and New York.

iii. *Deployable Radiological Air Sampling Units*

To address whether there are radionuclide concentrations present in the environment that are above background radiation levels, greater monitoring/sampling sensitivity is needed. This usually means obtaining large volume samples for analysis. A sampling unit consists of a gamma radiation monitor, low-volume air sampler (~2 cfm), high-volume air sampler (~20 cfm), glass fiber filter sampling heads, portable electric generator (AC and gasoline-operated), and data logging and telemetry. The system is intended to be transportable and quickly reassembled upon arrival.

B. SURFACE MONITORING AND SAMPLING

To determine the presence of radioactive materials on surfaces, portable radiation instruments are used to detect alpha and/or beta radiation. Surface wipes can be taken to determine if there are removable radioactive materials. Rapid identification of contaminated areas will assist in preventing further spread of contamination by restricting access to these areas.

Wipes can be sent to a field or permanent laboratory for more detailed analyses. Federal, state and other laboratories that can analyze samples for radionuclide content are discussed in Appendix J.

The data from surface monitoring will provide information to determine whether the projected doses from deposited radionuclides warrant further protective actions such as relocation, occupancy limitations or land use restrictions.

1. MEASUREMENT/SAMPLING PROCEDURES

a. Surface Activity Measurements

Field teams using portable radiation instruments capable of detecting direct radiation can determine whether a radioactive release has deposited radioactive materials on building surfaces, soil, pavement, etc. Alpha and beta measurements are made with the applicable instruments held close to but not in contact with the surface.

b. Removable Activity Monitoring and Smear Samples

In order to measure the amount of radionuclide deposited on surfaces that is removable, an area of 100 square centimeters of surface is lightly wiped once with a paper filter to collect the deposited material. The filter paper can be quickly counted in a low background area while in the field to obtain a quick estimate of the amount of deposition that can be resuspended or otherwise mobile. The paper filter is retained for submission for laboratory analyses to identify the specific radionuclides present.

C. ENVIRONMENTAL SAMPLING

Specific SOPs used by various federal, state and local agencies are typically based on FRMAC SOPs. FRMAC sampling SOPs are available for soil, sediment, raw milk, and vegetation (human food and animal feed). FRMAC SOPs provide guidance on what to consider in order to obtain a representative sample.

Environmental samples (building surfaces, soil, grass, vegetation, raw milk, e.g.) can be screened and/or analyzed in a field or mobile laboratory for quicker response time. These samples are typically sent to a laboratory for more detailed and rigorous analyses. Federal, state and other laboratories that can analyze samples for radionuclide content are discussed in Appendix J.

1. SAMPLING PROCEDURE

About a pound of soil taken with a sampling template (4" by 4" by 1"depth), two pounds of vegetation, or one gallon of raw milk is usually sufficient for laboratory analysis. See FRMAC Monitoring and Analysis Manual, Volume 1: Radiation Monitoring and Sampling, DOE/NV/11718-181-Vol.1 for FRMAC SOPs.

D. WATER MONITORING AND SAMPLING

Specific SOPs used by various federal, state and local agencies are typically based on FRMAC SOPs. FRMAC SOPs are available for obtaining water samples such as rain, surface and well water. Sampling points of particular interest would be potable water sources, inlets to water treatment facilities, and water collection drains. Consideration of the impact of water quality on the commercial fishing and shellfish industries needs to be considered as well. These samples must be sent to a laboratory for detailed analyses. Federal, state and other laboratories that can analyze samples for radionuclide content are discussed in Appendix J.

1. SAMPLING PROCEDURE

FRMAC SOPs provide guidance on considerations for obtaining representative samples. For radionuclide analyses, the typical sample size is no less than a gallon. See FRMAC Monitoring and Analysis Manual, Volume 1: Radiation Monitoring and Sampling, DOE/NV/11718-181-Vol.1 for FRMAC SOPs.

The data from water monitoring/sampling will be used to determine if dose projections warrant further protective actions such as restricting water ingestion or water use such as recreational and/or commercial fishing.

APPENDIX A

ACRONYMNS

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AMS	Aerial Measuring System
ARG	Accident Response Group
AST	Atlantic Strike Team
CBRNE	Chemical, Biological, Radiological, Nuclear, or Explosive
CDC	Centers for Disease Control and Prevention
CST	Civil Support Team
DHS	United States Department of Homeland Security
DEC	Department of Environmental Conservation
DEP	Department of Environmental Protection
DMNA	Division of Military and Naval Affairs
DOE	United States Department of Energy
DOI	United States Department of Interior
DOT	Department of Transportation
DQO	Data Quality Objective
EML	Environmental Measurements Laboratory (DHS)
EPA	United States Environmental Protection Agency
ERAMS	Environmental Radiation Ambient Monitoring System
ERT	Environmental Response Team
FBI	United States Federal Bureau of Investigation
FDA	United States Food and Drug Administration
FDNY	Fire Department of the City of New York
FEMA	Federal Emergency Management Agency (DHS)
FERN	Food Emergency Response Network
FMT	Field Monitoring Team
FRMAC	Federal Radiological Monitoring and Assessment Center
HSPD	Homeland Security Presidential Directive
IC	Incident Command
ICS	Incident Command System
IMH	Incident Management Handbook
IND	Improvised Nuclear Device
LFA	Lead Federal Agency
mR	milli-Roentgen
NARAC/LINC	National Atmospheric Release Advisory Center/Local Integration of NARAC with Cities
NCP	National Contingency Plan
NEST	Nuclear Emergency Search Team
NIE	Nuclear Incident Emergency
NIIMS	National Interagency Incident Management System
NIMS	National Incident Management System
NRE	Nuclear Release Emergency
NRP	National Response Plan
NJ DEP	New Jersey Department of Environmental Protection
NJSP-OEM	New Jersey State Police – Office of Emergency Management
NOAA	National Oceanic and Atmospheric Administration

NRC	National Response Center
NRC	United States Nuclear Regulatory Commission
NYC DOHMH	New York City Department of Health and Mental Hygiene
NYC OEM	New York City Office of Emergency Management
NYPD	New York City Police Department
NYS DEC	New York State Department of Environmental Conservation
NYS DOH	New York State Department of Health
NYSEMO	New York State Emergency Management Office
ORH	Office of Radiological Health
PAGs	Protective Action Guides
pCi	pico-Curie
PPE	Personal Protective Equipment
QA/QC	Quality Assurance/Quality Control
RAP	Radiological Assistance Program (DOE)
RDD	Radiological Dispersal Device
REAC/TS	Radiation Emergency Assistance Center/Training Site
RERT	Radiological Emergency Response Team
RIE	Radiological Incident Release
RRE	Radiological Release Emergency
SMART-RAD	Special Monitoring of Applied Response Technologies Program - Radiological Monitoring Protocols for Off-Site Consequence Monitoring of Radiation Incidents
SOP	Standard Operating Procedure
SSC	Scientific Support Coordinator
TEDE	Total Effective Dose Equivalent
TLD	Thermoluminescent Dosimeter
USCG	United States Coast Guard
USDA	United Stated Department of Agriculture
WMD	Weapons of Mass Destruction

APPENDIX B

MATRIX FOR IDENTIFYING

AGENCY RADIATION MONITORING RESOURCES

FOR A

UNIFIED RESPONSE

IN THE

NY-NJ METROPOLITAN AREA

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RADIATION MONITORING CAPABILITIES[1]

AGENCY	Rapid Assessment Capability	Monitoring and/or Sampling Capability			Pre-existing Monitoring Locations	Radiation Technical Specialist	Evidence Collection	Remediation	Modeling	Branch Direct Capability
		Water	Air	Land						
FEDERAL										
Department of Energy									X	
DHS - Environmental Measurements Lab	X		X	X	X	X				
Department of Interior										
EPA – Regional Response Center	X	X	X	X				X		
EPA - Radiation and Indoor Air Branch		X		X	X	X				X
Federal Bureau of Investigation							X			
NOAA									X	
USCG - Atlantic Strike Team	X	X	X	X						X
STATE										
NEW JERSEY										
DEP - Bureau of Emergency Response	X					X	X			X
DEP - Bureau of Environmental Radiation	X	X	X	X	X	X		X	X	X
County CBRNE	X									
DMNA	X	X	X	X						
NEW YORK										
DEC - Environmental Radiation Section		X	X	X	X	X	X	X	X	
DOH - Bur. Of Env. Radiation Protection	X	X	X	X	X	X			X (NARAC)	
DMNA – 2nd WMD Civil Support Team	X	X	X	X						
MUNICIPAL										
NEW YORK CITY										
Department of Health and Mental Hygiene	X		X	X		X			X (NARAC)	X
Fire Dept. of the City of New York (FDNY)										
New York City Police Dept. (NYPD)										
Office of Emergency Management (OEM)									X (NARAC)	
OTHER										
Port Authority of New York/New Jersey	X				X		X			

[1] Method of activation appears in appendices D and E. Federal agencies coordinate with state and local authorities. All resources are "as available."

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APPENDIX C

DESIGNATED LEAD FEDERAL

RESPONDING AGENCY

FOR

SPECIFIC RADIOLOGICAL EMERGENCIES

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Designated Lead Federal Agency (LFA) for Specific Radiological Emergencies

(source: Table 2 of the U.S. National Response Team Report: Reconciliation Coordination Issues Between the Federal Radiological Emergency Response Plan and the National Oil and Hazardous Substances Pollution Contingency Plan)

Type of Emergency	Designated FRERP LFA	Designated NCP LA	Designated Lead Responding Organization
1. Nuclear Facility a. Owned or Operated by DOD or DOE[1]	DOD or DOE	DOD or DOE	DOD or DOE
b. Licensed by NRC or Agreement State[2]	NRC	EPA[3]	NRC
c. Not Licensed, Owned, or Operated by a Federal Agency or an Agreement State[4]	EPA	EPA	EPA
2. Transportation of Radioactive Material a. Materials Shipped by or for DOD or DOE	DOD or DOE	DOD or DOE	DOD or DOE
b. Shipment of NRC or Agreement State-licensed Materials **in the inland zone**	NRC	EPA	NRC
c. Shipment of NRC or Agreement State-licensed Materials **in the coastal zone**	NRC	USCG	NRC
d. Shipment of Materials, **in the inland zone**, that are not licensed or owned by a Federal agency or Agreement State	EPA	EPA	EPA
e. Shipment of Materials, **in the coastal zone**, that are not licensed or owned by a Federal agency or Agreement State	EPA	USCG	EPA
3. Satellites Containing Radioactive Materials a. Radioactive materials owned by DOD	DOD	DOD	DOD
b. Radioactive materials owned by DOE	DOE	DOE	DOE
c. Radioactive materials controlled by NASA (inland)	NASA	EPA	EPA
d. Radioactive materials controlled by NASA (coastal)	NASA	USCG	USCG
4. Impact from Foreign or Unknown Sources of Radioactive Materials[5]	EPA	EPA	EPA
5. Other Types of Emergencies	LFAs confer	per NCP	Per NCP until Conference[6]

[1] The emergencies at these facilities may involve reactor operations, nuclear material and weapons production, radioactive material from nuclear weapons, or other radiological activities.

[2] These facilities include, but are not limited to, commercial nuclear power reactors, fuel cycle facilities, DOE-owned gaseous diffusion facilities that are operated under NRC regulatory oversight, and radiopharmaceutical manufacturers.

[3] EPA is not the designated NCP LA if a release, resulting from a nuclear incident, is subject to the financial protection requirements established by the Nuclear Regulatory Commission under the Price-Anderson amendments to the Atomic Energy Act. Releases of this type are excluded from CERCLA and NCP requirements.

[4] These facilities possess, handle, store, or process radium or accelerator-produced radioactive material.

[5] A foreign or unknown source may refer to a reactor (e.g., Chernobyl), a spacecraft containing radioactive material, radioactive fallout from atmospheric testing of nuclear devices, imported radioactive contaminated material, or a shipment of foreign-owned radioactive material. Unknown sources of radioactive material refer to that material whose origin and/or radiological nature is not yet established. These types of sources include contaminated scrap metal or abandoned radioactive material.

[6] The pre-designated OSC under the NCP will lead the response until the Lead Federal Agencies and the NCP OSC can confer to recommend which Federal organization should be designated to lead the overall response. In the event that the conferees recommend a change, the overall lead for the response will transfer to the organization recommended by the conferees.

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APPENDIX D

FEDERAL

RADIOLOGICAL EMERGENCY RESPONSE

MONITORING ASSETS

Overview of Federal Radiological Emergency Response Assets
USCG – National Strike Force
DOE – RAP Team
DHS – Environmental Measurements Lab
DOI
EPA – Region 2
NOAA

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OVERVIEW OF FEDERAL RADIOLOGICAL EMERGENCY RESPONSE ASSETS

Pursuant to Homeland Security Presidential Directive 5 (HSPD-5), the Secretary of Homeland Security is the Principal Federal Official for domestic incident management. The Secretary can designate Department of Homeland Security (DHS) components and other departments and agencies as Supporting Agencies to provide capabilities and resources. The National Response Plan provides the framework for federal departments and agencies to revise their respective plans. The following summarizes some of the existing federal assets.

Department of Energy: State, county, city and other federal agencies may request the assistance of the Department of Energy Radiological Assistance Program (RAP) located at each DOE national laboratory for prompt response. RAP Teams can be deployed in a matter of hours to assist the Incident Commander by conducting radiological monitoring and assessment activities, including radiation measurement and air sampling. Depending on the initial assessment by the RAP team, additional DOE assistance can be obtained. Brookhaven National Laboratory (BNL) in Upton, New York covers the Northeast Region.

At the request of the Lead Federal Agency or Incident Commander, the Department of Energy will establish the Federal Radiological Monitoring and Assessment Center (FRMAC) to organize and structure the radiological monitoring and assessment efforts and activities of all involved agencies. This provides the Lead Federal Agency and the state, tribal or local authorities with a single source of compiled, quality controlled monitoring and assessment data. Upon mutual agreement that certain conditions have been met, the management of the FRMAC is transferred to the Environmental Protection Agency for management of long-term federal monitoring efforts.

DHS - Environmental Measurements Laboratory: The Department of Homeland Security (DHS) Environmental Measurements Laboratory (EML), formerly with the DOE, is located in lower Manhattan. Although primarily a research and development organization within the Science and Technology Directorate of DHS, EML is prepared to provide technical advice and measurement assistance during the course of a radiological event. DHS-EML has technical staff and both portable and laboratory equipment for radiation and radioactivity measurements. The Laboratory maintains a monitoring station on its roof that includes aerosol sampling and real time gamma-ray measurements. Additional monitoring stations are planned for other sites in the New York area.

DHS - Federal Emergency Management Agency: Most disasters, whether natural or technological, are handled by local or state governments. When the devastation is especially serious and the capability and resources of local and state governments are exceeded, States can request federal assistance. The Federal Emergency Management Agency (FEMA) coordinates the federal agencies' response to the request for federal assistance in response and recovery. FEMA works with state and local governments during non-disaster periods to plan for disasters, develop mitigation programs, provide training for emergency responders, etc. To plan for response to radiological incidents, FEMA provides training, reviews radiological emergency response plans and evaluates the capabilities of local and state governments to protect the general public and the environment should there be a nuclear power plant accident.

DHS - U.S. Coast Guard (USCG) National Strike Force – The USCG National Strike Force (NSF) is comprised of highly trained US Coast Guard professionals who maintain and rapidly deploy with specialized equipment and incident management skills to oil, chemical and Weapons of Mass Destruction incidents. Designated as a Special Force under the National Contingency Plan (NCP), the NSF is currently comprised of three strike teams, including the Atlantic Strike Team in New Jersey, the Gulf Strike Team in Alabama, and the Pacific Strike Team in California. The NSF is mandated under the NCP to assist and support federal On-Scene Coordinators (OSCs) in their response and preparedness activities. The Strike Teams are WMD/Level-A capable and can perform site entry, assessment and site safety and action plan development and documentation. While the NSF consists of USCG personnel, they support either EPA, or USCG OSCs and other Lead Federal agencies when requested.

Environmental Protection Agency: Any governmental or private entity may request assistance of the Environmental Protection Agency's On-Scene Coordinators (OSCs) for off-site releases of hazardous substances, including radioactive materials. The notification of an incident is usually provided to the National Response Center, which is staffed by the U.S. Coast Guard. The Regional Response Center in the EPA's Edison (NJ) facility can be notified directly or by the National Response Center. Upon notification, the OSC on duty will assess the assistance needed and respond with technical and scientific support as needed. For radiation incidents, technical and scientific support is provided by Regional radiation staff and/or EPA-HQ led Radiation Emergency Response Team (RERT), and/or the ERT.

In addition, during a radiological incident, an Advisory Team for Environment, Food, and Health can be convened by the Lead Federal Agency to provide timely interagency advice and recommendations. The team comprises representatives of the EPA, Health and Human Services, the US Department of Agriculture, and representatives of other Federal agencies as necessary. An Advisory Team is usually established to address intermediate phase issues such as interdiction of contaminated milk, food and water, relocation and reentry, health and safety advice for the general public, use of radio-prophylaxis substances (e.g., KI), cleanup recommendations, etc.

Nuclear Regulatory Commission: The Nuclear Regulatory Commission regulates the use and possession of source, by-product and special nuclear materials by its licensees. In the event of a radiological incident involving nuclear power plants or other licensed facilities, the NRC is the Lead Federal Agency in ensuring its licensee responds to the incident. If there is no licensee, the NRC will refer the incident to other federal or state/local radiation/hazardous materials response agencies for appropriate action. The NRC maintains a continuously staffed Operations Center that can be contacted at 301-816-5100. The Operations Center can provide technical advice and contact with NRC inspectors.

U.S. COAST GUARD
NATIONAL STRIKE FORCE

Method of Activation

National Response Center	1-800-424-8802
National Strike Force Coordination Center	252-331-6000
Atlantic Strike Team (Fort Dix, NJ)	609-724-0008
Sector New York (Staten Island, NY)	718-354-4121

Capabilities

In the event of a potential or an actual post-release radiological case, the Coast Guard On-Scene Coordinators (OSCs) will carry out their existing responsibilities, under the National Oil and Hazardous Substances Pollution Contingency Plan "*NCP*", the Federal Radiological Emergency Response Plan "*FRERP*" and Homeland Security Presidential Directive Five *"HSPD 5*".

Coast Guard field personnel will be grouped into two levels, each with differing equipment and training. Determination of teams to be deployed will be based on prior intelligence and activity level.

Level I- Detection

These teams will serve as first level detection.

Level II - Localization & Characterization

These teams are designed to detect, localize and characterize radiation sources. Coast Guard assets that have Level II capabilities include designated Captain of the Ports, Marine Safety and Security Teams, and the Pacific, Gulf and Atlantic Strike Teams.

The Atlantic Strike Team (AST) has capabilities for Alpha, Beta, Gamma, and Neutron detection: nuclide identification via direct survey instrument reading, personnel contamination monitoring, real time dosimetry, and dose rate monitoring. They can develop and enforce site safety plans, isolate contaminated areas, and support efforts to deny entry to unauthorized personnel. In addition, they can conduct initial response action management to include time, distance and shielding protocols.

The Atlantic Strike Team will directly assist the Federal On Scene Coordinator and be requested/activated through the National Contingency Plan or the Federal Response Plan.

Equipment Inventory

4 Radiation Detection Kits
(Ludlum Model 12 and a Model 19. Detects Alpha, Beta, Gamma)
8 Canberra Dover Radiacs UDR-13BR
(Neutron and Gamma detection)
2 Dosimeter Kits
5 Alarming Rate meter PM1703GN
(Neutron and Gamma detection)
1 Identifinder-U
(Digital Spectrometer and dose rate meter with nuclide identification and neutron probe)
1 RADPACK
(Neutron and Gamma detection)
2 APD 2000
(High Gamma/Neutron radiation)

U.S. DEPARTMENT OF ENERGY
RADIOLOGICAL ASSISTANCE PROGRAM (RAP)

Method of Activation

Steve Centore	Office	631-344-7309
(Brookhaven National Lab)	Cell	631-987-6063
For off hours emergencies		631-344-2200

Capabilities

The teams from the DOE's Radiological Assistance Program, RAP Teams, have full monitoring capability for alpha, beta, gamma and neutron both overtly and covertly. Mobile search capability, airborne search platform, decontamination capability, gamma spectroscopy, isotope identification capability, and medical assistance for over-exposure or uptake can be provided. They can provide small-scale to large-scale plume modeling, dose assessment, and consequence assessment.

In addition to the Radiological Assistance Program, the DOE can provide the following additional capabilities

- Accident Response Group (ARG): The ARG is composed of a cadre of weapons designers and other technical specialists from DOE's weapon complex to provide assistance for incidents involving nuclear weapons.
- Aerial Measuring System (AMS): The AMS is an aerial detection system designed to locate and track airborne radiation and deposition. Computer-generated maps can identify areas with elevated radiation levels.
- Federal Radiological Monitoring and Assessment Center (FRMAC): The FRMAC provides the organization and structure to coordinate all federal agency radiological monitoring and assessment efforts and activities to provide a single source of compiled, quality-controlled monitoring and assessment data.
- National Atmospheric Release Advisory Center (NARAC): NARAC provides rapid prediction of the transport, diffusion and deposition of radionuclides released to the atmosphere and dose projections.
- Nuclear Emergency Search Team (NEST): NEST can respond within four hours to assist the FBI in addressing nuclear/radiological threats to search for ionizing radiation-producing materials.
- Radiation Emergency Assistance Center/Training Site (REAC/TS): REAC/TS provides medical advice specialized training and on-site assistance for the treatment of people exposed to radiation accidents.

Equipment inventory

The following equipment is maintained in a ready status at the BNL Calibration facility (Bldg. 348), Safety & Environmental Protection Divisions Counting Room (Bldg. 535), the Brookhaven Graphite research reactor (Bldg. 703) or the RAP Mobile laboratory.

Instrument Kits (4)
Eberline Model PIC-6B
Ludlum Model 3
- Pancake GM probe
- Compensated GM probe
- Waterproof GM probe
- Beta check source on instrument

Ludlum Model 3
- Alpha scintillator probe
- Alpha check source on probe cover

Ludlum Model 12S micro R meter
Xetex model 415B digital dosimeters (2)
Dosimeter charge
- 200mR self reading dosimeters (4)
- 10 R self reading dosimeters (4)
- 200 R self reading dosimeters (4)

TLD badges Li7 (6)
Badge sign out sheets (6)

U.S. DEPARTMENT OF HOMELAND SECURITY ENVIRONMENTAL MEASUREMENTS LABORATORY

Method of Activation

EML, located in lower Manhattan (New York, NY), does not plan to have 24-hr operational capability. However, technical assistance can generally be requested from Monday to Friday, 7am to 7pm, at 212-620-3573.

DHS Command Center (Washington, DC) 202-282-8300

Capabilities

As an R&D laboratory, areas of expertise include air sampling, direct radiation measurements, field gamma-ray spectrometry, and laboratory-based sample preparation and analyses.

EML's real time monitoring data is viewable at www.eml.doe.gov/homeland. Data includes gamma exposure rate updated every minute; gamma-ray spectrum and radionuclide analysis updated every 15 minutes; temperature, humidity, pressure and wind speed and direction updated every minute.

Equipment Inventory

Field:	*Quantity*	*Item*
	2	portable HPGe gamma-ray spectrometers
	2	NaI hand-held radioisotopic identifiers
	4	pressurized ionization chamber gamma exposure rate monitors
	6	assorted survey meters for alpha, beta, gamma measurements
	2	FIDLER probes
	4	portable air samplers
	8	electronic pocketsize alarming radiation detectors

Laboratory:	*Quantity*	*Item*
	8	shielded HPGe gamma-ray spectrometers
	2	8 detector alpha spectrometer system
	1	liquid scintillation counter
	1	alpha/beta proportional counter
	11	alpha scintillation counters
	1	automated TLD reader system
	2	fixed air sampling stations
	5	wet chemistry labs each with 4 acid-fume hoods
	2	sample preparation areas

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U.S. DEPARTMENT OF THE INTERIOR

Method of Activation

Andrew Raddant
Regional Environmental Officer
U.S. Department of the Interior
408 Atlantic Avenue, Room 142
Boston, MA 02210-2209

Office 617-223-8565
Fax 617-223-8569
Cell 617-592-5444

Capabilities

U.S. Fish and Wildlife Service (FWS): Potential response capabilities are similar to what is done for oil spills. FWS would involve its headquarters based Chief, Division of Environmental Contaminants, Everett Wilson, and implement the FWS' National Spill Plan. The Region 5 (Northeast) Spill Response Coordinator, Tim Fannin, is contacted, and Environmental Contaminants specialists from Point Pleasant, NJ can be dispatched. Aircraft to survey the scene from the air can be supplied. DOI can also provide expertise on wildlife haz-mat vectors/control (sea birds, etc). For situations of a terrorist nature, FWS' regional chain-of-communication will involve its Law Enforcement staff.

Minerals Management Service (MMS): Transportation resources - helicopters, boats (based in the Gulf area)

National Park Service (NPS): Incident Management Teams. NPS can deploy All-Risk Incident Management Teams. These teams can be used to coordinate and manage all levels of response activities. One commonly utilized function is managing a resource staging area. The NPS can also provide Special Event Teams (SET) - these teams are law enforcement focused. They could be utilized anywhere as long as they are provided with legal authorities (usually coming from the US Marshals).

U.S. Geological Survey:

Radiation:

USGS has about a dozen scientists and technicians who are have radiological expertise and practical experience in measuring radiation emissions:

* The Reston, VA, office has a small cadre of staff with experience (and equipment) in measuring radiation in the soils, the air, and in water. One or two staff are present in New Jersey with similar skills.

* The Denver, CO, office has a team of experienced people who run a small research reactor and, consequently, are knowledgeable in the nuclear and radiation field.

*	USGS has a team in Menlo Park, CA, who has been monitoring the radiation output from the drums deposited near the Farallon Islands west of San Francisco. These skills would apply directly to a problem of a sunken vessel with inventory on board.

Sea floor imaging

Full seabed imaging capability (real-time geographically correct imaging at sea) is available at the USGS/Woods Hole, MA, facility (e.g., side scan sonar). For details on capabilities, the following website is useful:
www.woodshole.er.usgs.gov/operations/sfmapping/default.htm

U. S. ENVIRONMENTAL PROTECTION AGENCY
REGION 2 RADIOLOGICAL RESPONSE

Method of Activation

National Response Center (24-hr)		800-424-8802
Regional Response Center	Fax	732-906-6865
Radiation & Indoor Air Branch		212-637-4010
(during normal office hours)	Fax	212-637-4942

Regional Capabilities

Radiation Office (New York, NY)
In the event of a radiological response, EPA has three full-time health physicists to provide radiological consultation. EPA's personnel are qualified to perform field monitoring activities, with equipment that spans the entire spectrum of ionizing radiation to varying degrees.

Regional Response Center (Edison, NJ)
If the NCP is invoked (depending upon the initiating event), EPA can provide a federal On-Scene Coordinator to manage onsite or offsite response activities. In this event, the EPA OSC=s resources can be called upon for the response. In addition, the OSCs are qualified to perform field monitoring activities.

Regional Equipment

Equipment Category	Number of Instruments and Location
Gamma Survey Meters	8 (5 – Edison, 3 – New York City)
Contamination Control (alpha/beta/gamma)	3 (1 – Edison, 2 – New York City)
Alpha Probes	4 (1 – Edison, 3 – New York City)
Gamma Spectrometers	2 (Edison)

Additional Non-Regional Radiation Response Resources

Radiological Emergency Response Team (RERT): EPA=s regional radiation office can call for assistance from EPA=s Radiological Emergency Response Team (RERT). The teams are based at EPA=s radiation laboratories with offices/membership in Las Vegas, NV and Montgomery, AL. In addition to fixed laboratory capabilities, the RERT has mobile labs that can be deployed to accident scenes.

Environmental Response Team (ERT) Cincinnati, Las Vegas, Edison: The ERT Cincinnati (OH) assets consist of one EPA and two contractor health physicists, and one contractor radiation equipment technician located at the counter-terrorism equipment warehouse facility in northern Kentucky. The facility houses many types and large numbers of radiation survey instruments, GPS instruments and air sampling instruments. The team is available for rapid deployment in support of Regional OSCs, and/or rapid deployment of backup instrumentation. The ERT Las Vegas (NV) facility has one resident health physicist, and numerous pieces of radiation survey instrumentation and GPS instrumentation. The ERT Edison (NJ) facility has REAC contractors trained in radiation survey procedures, as well as instrumentation.

Radiation Laboratory Support: EPA has two laboratory locations, the National Air and Radiation Environmental Laboratory (NAREL) in Montgomery, AL and the Radiation and Indoor Environments Laboratory in Las Vegas, NV. The regional radiation office can access EPA=s radiation labs for rapid turnaround sample analyses of all types.

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION (NOAA)

Method of Activation

Ed Levine	24-hr	206-526-4911
NOAA / SSC (Scientific Support Coordinator)	Office	212-668-6428
USCG Battery Park Building	Fax	212-668-6370
1 South Street, Room 321		
New York, NY 10004-1466		

Capabilities

The NOAA Air Resources Laboratory (ARL) is organized to provide meteorological services and related research to NOAA and to other Federal agencies, as needed, to help predict the consequences of atmospheric releases of radioactivity and other potentially harmful trace materials.

Since 1991, NOAA has provided meteorological assistance and scientific oversight to the Nuclear Regulatory Commission (NRC) at exercises, events, weather emergencies, and technical meetings.

The assistance provided by NOAA is designed to place the NRC or other Federal Agency in a "proactive" mode, in the event of an emergency; that is, to provide the capacity to anticipate response actions that are found to be appropriate and to predict the consequences of actions as they are taken. Assistance is provided largely by drawing on the current capabilities of NOAA and ARL.

Equipment

HYSPLIT Description

The HYSPLIT (HYbrid Single-Particle Lagrangian Integrated Trajectory) model is the newest version of a complete system for computing simple air parcel trajectories to complex dispersion and deposition simulations. As a result of a joint effort between NOAA and Australia's Bureau of Meteorology, the model has recently been upgraded. New features include improved advection algorithms, updated stability and dispersion equations, a new graphical user interface, and the option to include modules for chemical transformations. Without the additional dispersion modules, HYSPLIT computes the advection of a single pollutant particle, or simply its trajectory.

The dispersion of a pollutant is calculated by assuming either puff or particle dispersion. In the puff model, puffs expand until they exceed the size of the meteorological grid cell (either horizontally or vertically) and then split into several new puffs, each with its share of the pollutant mass. In the particle model, a fixed number of initial particles are advected about the model domain by the mean wind field and a turbulent component. The model's default configuration assumes a puff distribution in the horizontal and particle dispersion in the vertical direction. In this way, the greater accuracy of the vertical dispersion parameterization of the particle model is combined with the advantage of having an ever expanding number of particles represent the pollutant distribution.

The model can be run interactively on the Web through the READY system on our site or the code executable and meteorological data can be downloaded to a Windows PC. The Web version has been configured with some limitations to avoid computational saturation of our web server. The registered PC version is complete with no computational restrictions, except that user's must obtain their own meteorological data files. The unregistered version is identical to the registered version except that it will not work with forecast meteorology data files.

APPENDIX E

STATE, COUNTY AND MUNICIPAL

RADIOLOGICAL MONITORING ASSETS

NJ, NY AND NYC Radiological Emergency Response Assets
NJ DEP – Bureau of Emergency Response
NJ DEP – Radioactive Materials Radiological Assessment Team
NYS DEC – Bureau of Hazardous Waste and Radiation Management
NYS DOH – Bureau of Environmental Radiation
NYC OEM – Radiological Defense System
NYC DOHMH – Office of Radiological Health

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NEW JERSEY, NEW YORK STATE, AND NEW YORK CITY RADIOLOGICAL EMERGENCY RESPONSE ASSETS

The National Response Plan recognizes that state and local governments are often the first responders to an incident. The level of response to pre-incident radiological information can range from a telephone consultation to full deployment of field monitoring personnel to take additional measurements and samples. If warranted, these agencies will make recommendations to their respective political leadership on actions to protect public health and the environment.

Prior to September 11, the New Jersey Department of Environmental Protection, the New York State Departments of Environmental Conservation, Health and Military & Naval Affairs, and the New York City Department of Health & Mental Hygiene were the primary departments with personnel trained in responding to and assessing radiation incidents. Since September 11, the need for continual monitoring and assessment to identify potential radiological incidents during pre-incident phases of awareness and prevention has resulted in adding radiological assets to other departments and agencies such as Fire, Police, Office of Emergency Management, Sanitation, the NY-NJ Port Authority, and the Metropolitan Transit Authority.

The pages following contain brief summaries of equipment and how to contact the primary New Jersey, New York and New York City agencies with personnel trained and equipped to perform field monitoring activities. Additionally, provided below is a brief description of other state/local assets that may be utilized as needed.

New York State Division of Military & Naval Affairs - 2nd Weapons of Mass Destruction (WMD) Civil Support Team (CST)

The 2nd WMD CST is one of 32 teams authorized by Congress who are specially trained and equipped to provide advice on a weapons of mass destruction (WMD) situation and are identified as State assets. The 2nd WMD CST consists of 22 full-time members from the State's Army and Air National Guard. The CST's mission is to assess a suspected chemical, biological, radiological, nuclear, or explosive (CBRNE) event in support of the local incident commander; advise civilian responders regarding appropriate actions; and work to both facilitate and expedite the arrival of additional military forces, if needed. They will support a State's response under the direction of the Governor.

County Field Monitoring Teams (FMT) for Response to Nuclear Power Plant Incidents

The counties surrounding nuclear power plants have monitoring teams trained to respond to nuclear power plant incidents involving a radiological release.

Nuclear Plant Site	Local FMT Coverage
Oyster Creek at Forked River, NJ	Ocean County, NJ
Salem 1 & 2, Hope Creek at Salem, NJ	
Indian Point (1), 2 & 3 at Buchanan, NY	Westchester County, NY

	Orange County, NY
	Putnam County, NY
	Rockland County, NY
Robert F. Ginna at Ontario, NY	Wayne County, NY
	Monroe County, NY
FitzPatrick and Nine Mile Point 1 & 2 at Scriba, NY	Oswego County, NY

NEW JERSEY
DEPARTMENT OF ENVIRONMENTAL PROTECTION
Bureau of Emergency Response

Method of Activation

Notification can be made, 24 hours, by calling 877-927-6337 and asking to speak to the Duty Officer.

Capabilities

Information on NJDEP's air monitoring network is located in the appendices of this SMART-RAD document. Although this network does not have radiation monitoring capability, there is room to install radiation equipment at many of these locations. However, they do particulate monitoring via telemetry and by collecting the filters. These filters are collected on a regular basis and stored in Trenton, where they can be screened if needed.

In addition to State resources NJDEP Bureau of Emergency Response has contractual agreements under the County Environmental Health Act with the 21 counties. Under those agreements the county Haz-Mat teams have been augmented and enhanced into full CBRNE teams (Chemical, Biological, Radiological, Nuclear and Explosive.). They can be deployed 24/7 by the NJDEP Bureau of Emergency Response duty officer as independent units or to augment State resources. They are equipped with the same "White kits" listed in the NJDEP Bureau of Emergency Response equipment inventory along with additional equipment which varies from county to county.

Equipment Inventory

Region-1 (West Orange, NJ). Each Responder (6 per Region)

- One, White Kit which includes the following:
  Ludlum Model 19 – Gamma detector
  Ludlum Model 3 – Gamma, Beta Detector
  Victoreen CDV-700 – Gamma, Beta Detector
  Dosimeter Charger
  Dosimeters: 20 R and 200 mR.
- One, Canary-3, Solid State Digital Dosimeter
- One, SEMA Technologies, Exploranium GR-135 miniSPEC w/ Docking Station Portable Gamma-Dose-Neutron, Radiation Survey / Spectrometer System
- Two, SAIC Model Ap-2, Alpha Radiation Analyzer.

Region-2 (Robbinsville, NJ). Each Responder (6 per Region)

- One, White Kit same as above.
- One, Canary-3, Solid State Digital Dosimeter
- One, SAIC Model PD-31, Cricket, Integrated Alarming Dosimeter for Primary and Secondary Dose Measurement
- One, SEMA Technologies, Exploranium GR-135 miniSPEC w/ Docking Station Portable Gamma-Dose-Neutron, Radiation Survey / Spectrometer System
- Two, SAIC Model Ap-2, Alpha Radiation Analyzer

Bureau Owned. Not individually assigned and for use in either office.

- One, SAIC RADSMART, Handheld Gamma-Ray Spectrometer
- One, SAIC Model AP-2, Alpha Radiation Analyzer.

For Bureau of Emergency Response & Bureau of Environmental Radiation Purchase under DOJ-2002 Grant.

- Five, Portable Gamma Spectrometer System
- Five, Hand Held Gamma / Neutron Detector
- Twenty-two, Gamma/ Neutron Passive Pager Detection System
- Four, Walk-Through Transportable Decontamination System
- Five, Portable Ion Chamber Meter for Short Half-Life and Spent Nuclei
- Five, Telescopic G.M. Detector for Low Range Energy
- Five, Telescopic Micro-R-Meter for High Range Energy.

NEW JERSEY
DEPARTMENT OF ENVIRONMENTAL PROTECTION
Bureau of Environmental Radiation
Radioactive Materials Radiological Assessment Team (RAMRAT)

Method of Activation

During normal office hours	609-984-5462
For off hours emergencies	1-877-WARNDEP (1-877-927-6337) Ask to speak to a representative of the Bureau of Environmental Radiation

Capabilities

RAMRAT Team (located in Trenton, NJ)

- Assume responsibility for providing technical expertise in evaluating and ameliorating radiation incidents.
- Perform Health Physics evaluation of situations including: dose assessment, contamination assessment, potential for escalation of situation, collection and evaluation of samples, and recommendation of protective actions.
- Contact other agencies needed to control or eliminate the situation. If NRC licensed materials are involved, contact the NRC.
- Identify violations of NJSA Title 26:2D, NJAC 7:28 and 10 CFR20. Where appropriate, issue administrative orders or notices of prosecution and contact the NRC.
- The supervisor of the radioactive materials section is responsible for the annual review and update of this manual and for ensuring that necessary changes and revisions are prepared, coordinated, approved and distributed.
- Members of the team:
  - Supervisor:
    - Keep management informed of incident
    - Provide decision making to the team
    - Coordinate team activities with other agencies
    - Provide or acquire assistance to the team leader as necessary
    - Assure that access to the spill fund is available, if needed
  - Leader:
    - Ensure team members are appropriately equipped/dressed
    - Coordinate on-site RAMRAT activities
    - Control team members to ensure their safety
    - Perform or supervise the performance of field surveys and sample collection

Member:

Assume responsibility for one's safety and their team's safety
Perform field surveys
Collect samples
Perform gamma-ray spectrometry analysis in the field (at least 2 members from each team should be capable of performing this analysis)

Equipment Inventory

Instrument	Detection Capabilities		
Eberline Model ASP-1 with LEG-1	Low energy X/Gamma rays (20-100 KeV)	1	
Eberline Model E-520 with HP-260 pancake probe	Alpha, Beta, and X/Gamma rays For Low radiation fields (0-24kcpm)	2	
Eberline Model E-520 with HP-270 with sliding beta shield	Gamma (closed), Beta + Gamma (open)higher energy gamma, high emission rates (0-2000uR/hr)	2	
Ludlum Model 19 (microR meter)	Gamma only. Higher energy gamma (>80 KeV), low emission rates (0-5000uR/hr)	2	
Ludlum Model 77-6 (telescopic uR meter)	X/Gamma rays in remote locations. As low as 35 KeV (I-125) (0-5000uR/hr)	3	
Eberline Model ESP-1 with Alpha Scintillation Probe AC-3	Alpha only	2	
Victoreen 450P	Pressurized ionization chamber	2	
Victoreen 471	Ionization chamber		
Scout	Portable gamma spec	2	
Exploranium	Portable gamma spec	2	
Eberline	Neutron detector	1	
Reuter Stokes	Pressurized ion chamber	1	
Total Teletector	High range GM telescopic	1	

NEW YORK STATE
DEPT. OF ENVIRONMENTAL CONSERVATION
Environmental Monitoring for Radioactive Materials

Method of Activation

The New York State Emergency Management Office (SEMO) is responsible for coordinating the activation of state resources to assist local government at an emergency. SEMO can be contacted by calling the State Warning Point. The Department of Conservation also has specific points of contact in an emergency.

State Warning Point	**(518) 457-2200**
Department of Environmental Conservation	
Spills Hotline	(800) 457-7362
Emergency Response Coordinator	(518) 228-0480 (pager)
Deputy Emergency Response Coordinator	(518) 228-0342 (pager)

Capabilities

The State's emergency response capabilities are described in the *Comprehensive Emergency Management Plan,* which is the State's counterpart to the *National Response Plan*. Within this Plan, the New York State Department of Health is identified as the State Lead agency for a radiological incident. The New York State Department of Environmental Conservation is identified as a supporting agency.

The New York State Department of Environmental Conservation has the capability to collect soil and surface water samples for radioanalysis, perform environmental radiation surveys to measure radiation levels and detect contamination (alpha, beta, gamma, radiation), and deploy environmental thermoluminescent dosimeters to measure ambient radiation. NYSDEC has two high-purity germanium gamma spectroscopy systems in their Rensselaer facility for identifying gamma-emitting radionuclides in environmental samples (soils) and estimating the concentrations of those radionuclides. The Department also has the radiation detection equipment identified in the table below.

Equipment Inventory

Division of Solid & Hazardous Materials
Bureau of Hazardous Waste & Radiation Management

Instrument	Number Available
Ludlum Model 3 meter with Bicron A-100 probe	1
Ludlum Model 12 meter with Ludlum 44-6 and Ludlum 44-9 probes	2
Ludlum Model 19 microR meter	2
Ludlum Model 2221 meter with Ludlum 44-10, Eberline PG2 and Bicron G5 probes	1
Ludlum Model 2221 meter with Ludlum 44-10, Bicron G5 and Bicron probes	1
Ludlum Model 2221 meter with Ludlum Model 44-10 probe	3
Ludlum Model 77-3 (telescoping probe)	1
Ludlum Model 61 detector	2
Bicron Microrem Meter	2
Ludlum Model 18 with Alpha probe, Eberline SPA-3, and Ludlum 44-9 probes	1
Ludlum 2401-EC	1
Canberra EasySpec	1
Exploranium	1
NRC NP-2 (AN/PDR-70)	1

NEW YORK STATE
DEPARTMENT OF HEALTH
Bureau of Environmental Radiation Protection

Method of Activation

During normal office hours	518-402-7550
State Warning Point (24 hours)	518-457-2200

Capabilities

The Bureau has approximately 20 Radiological Health Specialists, located throughout the state, who are available to provide technical assistance. There is also limited monitoring capability using hand held instruments and portable air sampling equipment, and isotope identification using portable gamma spectrometers. Regional surveillance monitoring (TLDs, water and air samples) is provided around the state's nuclear utilities.

The department also has a nuclear chemistry laboratory located at the Wadsworth Center in Albany, NY. This laboratory has the capability to analyze environmental samples through nuclear chemistry and gamma spectroscopy.

Equipment Inventory

The following list of equipment is available at the Bureau's main office in Troy, NY. Additional equipment can be found in regional offices located in Buffalo, Rochester, Syracuse, and Hauppauge.

Emergency Response Equipment (Kit and Equipment Cabinet Contents)			
Instrument	**Purpose**	**Model No.**	**Quantity**
Ludlum 14C w/ 44-9 GM Pancake Probe	gamma/beta/alpha	14C & 44-9	3
Eberline GM Pancake Probe	gamma/beta/alpha	HP-260	1
Ludlum Model 19	Exposure Rate	19	1
Innovision PIC	Exposure Rate	451P	1
Bicron Micro Rem Meter	Dose Rate	Low Energy	1
Innovision 451P	Radiation Measurement	451P	1
Radeco Air Sampler and sample head w assorted cartridges and filters	Air Samples	1-809C	
Ludlum Stretch Scope	Radiation measurement	78	1
Ludlum scaler	_/_ wipe counting	2200 43-10-1	1
Eberline survey meter	Rad. Measurement Low energy gamma probe Gamma scint. probe	PRM-6 PG-2 SPA-3	1
Exploranium	Gamma spec analysis	GR-130 mini-SPEC	1
Exploranium	Gamma spec analysis	GR-135	1
ThermoElectron Neutron Meter	Neutron detection/ measurement		1
Canberra Portable GeLi Detector with Inspector MCA	Gamma Spectroscopy		1

NEW YORK CITY
OFFICE OF EMERGENCY MANAGEMENT
Radiological Defense System

Method of Activation

Office of Emergency Management (24 hours)	718-422-8700 (Watch Command)
City-wide Emergency Number	9-1-1

Capabilities

Detection, Monitoring, Surveillance (Awareness)

The goal will be to use existing equipment, established interagency responsibilities, and communication systems as a base for building in new equipment to accomplish a linked and layered radiological monitoring and detection system within the jurisdiction and region of New York City. The New York City system will integrate with and expand the capabilities of systems such as those already under development by the Port Authority of New York and New Jersey (PANYNJ) with the Environmental Measurements Lab (EML), the Urban Dispersion Program (UDP), National Atmospheric Release Advisory Center/Local Integration of NARAC with Cities (NARAC/LINC), DOHMH Syndromic Surveillance and other projects by expanding monitoring and detection capability in the region.

As radiological monitoring will be achieved at key choke points such as airports, seaports, tunnels and some bridges through the PANYNJ / EML project, the New York City system will be designed to integrate with that system through links to all regional emergency management organizations with accompanying communication and response protocols.

OEM, NYPD, FDNY, DOHMH and DEP will agree on appropriate detection action levels with a view toward limiting response activations for false alarms.

Portable Detection Equipment

Currently the City of New York has radiological detection, monitoring and surveillance capabilities in the following agencies: New York City Police Department (NYPD), Fire Department New York (FDNY), Department of Environmental Protection (DEP), Department of Health and Mental Hygiene (DOHMH), Office of Emergency Management (OEM) and a very limited capability in Department of Sanitation New York (DSNY). All of this capability is concentrated in commercial off-the-shelf (COTS) portable equipment.

Existing portable COTS radiological detection equipment does not generally incorporate more than two functions (e.g., detection and dosage). Near-term development of multifunctional, portable COTS radiological detection equipment standards will result from new equipment standards that are being drafted in conjunction with DHS National Laboratories.

Acquisition of new detection equipment and expansion of the portable elements of this system will be achieved through field-testing and validation leading to progressive equipment installation. New equipment to be incorporated into this system will be multi-functional (e.g., measure radiological levels, dosage, indicate global positioning system (GPS) information, provide two-way voice communications, and integrate into networks in single unit configurations).
Vehicle-based portable systems for use at large gatherings will also be integrated into the system.

Fixed Sensor Equipment

Fixed equipment in New York City will augment existing detection capabilities and mirror the PANYNJ / EML approach to radiological monitoring.

Radiological detection, monitoring, surveillance and air particulate sampling equipment ("the equipment ") will be installed in proximity to high profile and sensitive locations in the City and throughout the region. The equipment will be based on current COTS and new devices being developed from the EML and PANYNJ pilot projects and studies and other proven technologies.

Optimized locations for the equipment will be determined from a contracted study* coordinated by OEM that will reference at least five sets of geographic information system (GIS) mapping data together with meteorological data (such as prevailing wind direction). The intention will be to position the equipment in a network so that it is configured appropriately around sensitive locations. The study will determine the optimum number of sites needed, but scientists contributing to this concept estimate that approximately 100 locations will be sufficient. GIS data sets that will be used include, but are not limited to:

1. "Signature sites" (**NYPD TO PROVIDE**)
2. DOHMH and NY State Department of Labor (**TO BE PROVIDED**) licensed facilities where radiological materials are used, stored, or transported in the City.
3. City-owned and public/private partner property sites to assist in limiting property acquisition costs.
4. FDNY alarm box sites
5. National intelligence threat data and target lists (JTTF…TBD)

RECOVERY AND MITIGATION (RECOVERY)

FDNY will augment its existing decontamination equipment. DSNY and the Department of Design and Construction (DDC) will work with OEM to integrate all Federal response agencies, NY State DOH, NY State DEC, Stony Brook University, and BNL in developing a contaminated debris management system with accompanying consequence management protocols. DOHMH will develop criteria for containing and removing small sources. Additionally:

- Air monitoring capability will be developed, expanded and linked to existing systems
- DOHMH will provide dose management equipment and protocols for first responders.
- Public dose management protocols will be established
- Consideration will be given to equipping hospitals with radiation detection capability
  (TBD)

Equipment Inventory

Office of Emergency Management (OEM)

- 1 Portal – portable
- Ludlum 14C 52-1-1 + probes
- 30 Pagers

New York City Police Department (NYPD)

- 200 Rad Pagers (500 more on order)
  Deployed in Precincts, Emergency Services Offices, Bomb Squad and JTTF.
  A number are on patrol as well.
- Emergency Services and the Bomb Squad also have roughly 20 Field Spec isotope identifiers and approximately 30 Ludlum 14C and probes.
- Roughly a dozen pagers are in Police vehicles and are moved around to checkpoints throughout the city – mainly bridges and tunnels.
- One gamma portal mounted up in front of One Police Plaza.
- 2 Gamma Portals – ESU
- 12 ThermoEberline 40 G with Blue Sausage

Fire Department of the City of New York (FDNY)

Total

- 1 Radioactive Isotope Identifier
- 2 Portable Portals
- 100 Civil Defense Portable Survey Kits (Need Calibration)
- 450 Portable Radiological Alarming Meters
- 45 Portable Survey Meters
- 500 Electronic Pagers
- 2500 Dosimeters

I. Citywide

- 143 Ladder Companies equipped with Portable Radiological Alarming Meters and 6 Dosimeters

- 197 Engine Companies equipped with Portable Radiological Alarming Meters and 6 Dosimeters
- 49 Battalions equipped with Portable Radiological Alarming Meters and 2 Electronic Pagers
- 9 Divisions equipped with Portable Radiological Alarming Meters and 2 Electronic Pagers

Haz-Mat Co. 1

- 2 Portable Survey Meter
- 8 Electronic Pager
- 1 Radioactive Isotope Identifier
- 12 Dosimeters
- 1 Portable Radiological Alarming Meter

Randall's Island – Haz-Mat Operations – Training

- 2 Portable Portals
- 20 Portable Survey Meter
- 150 Dosimeters
- 50 Electronic Pagers
- 100 Civil Defense Portable Survey Kits (Need Calibration)

Rescue, Squads & SOC Support Ladder Companies –

All Equipped with the Portable Survey Meter, 6 Electronic Pagers, and 6 Dosimeters

Queens	1 Rescue, 2 Squads & 5 Rescue Support Trucks
Manhattan	1 Rescue, 1 Squads & 5 Rescue Support Trucks
Bronx	1 Rescue, 2 Squads & 3 Rescue Support Trucks
Brooklyn	1 Rescue, 2 Squads & 5 Rescue Support Trucks
Staten Island	1 Rescue, & 2 Rescue Support Trucks

10 NYS Level "A" Equipment Trailers with portable survey kits.

Grant Funding has been obtained to equip EMS Units with the following:

- 400 Ambulances with Electronic Pager and 1 Dosimeter
- 80 Supervisor Vehicles with Electronic Pager

NEW YORK CITY
DEPARTMENT OF HEALTH AND MENTAL HYGIENE
OFFICE OF RADIOLOGICAL HEALTH

Method of Activation

During normal office hours	*212-676-1572*
For off hours emergencies	Poison Control Center (24-hr) 1-800-POISONS

Capabilities

The DOHMH's Office of Radiological Health provides technical consult for first responders at known or suspected radiological emergencies. There are currently 5 technical incident responders (TIRs) that are deployable for all such incidents in the City. The TIRs primary mission is to provide the Incident Commander (IC) on scene with information regarding the type, strength, and extent of radiation at a scene. This information is obtained by employing radiation detection equipment such as survey meters, portable gamma spectroscopy units and portable liquid scintillation counters. In addition to the 5 TIRs, an additional 4 personnel are available to act as Radiological Technical Specialists (RTS) to oversee the activities of the TIRs and advise the DOHMH IMS and OEM on radiation public health aspects. The Office of Radiological Health is currently in the process of hiring 3 additional qualified dedicated radiation emergency response staff to add to its resources (anticipated within next 3 months).

The TIRs will advise the IC on the boundaries of hot zones, warm zones and cold zones. They will also advise on the amount of time to be spent in the hot zone and any turn back levels. Information obtained will also be forwarded to the ORH Radiological Technical Specialist (RTS) who will in turn advise the DOHMH IMS section Chiefs on evacuation, sheltering in place for the public, and short- term remedial measures. The RTS will also communicate this information to other Federal and State agencies.

Equipment Inventory (as of February 2004)

- 26 Ludlum 14C with probes, most deployed around the city, some at ORH Headquarters (Each has a GM Probe 44-7 and NaI probe 44-3 associated with it)
- Ludlum Model 19
- 2 Neutron Meters
- 3 Exploranium GR 130
- 5 Exploranium GR 135
- 2 Low Energy Canberra SM –400 Ionization Chambers
- 2 Triathler Portable Scintillation Counters

- 6 Staplex personal air sampling pumps
- One stretch probe Automess Model 6112B will extend a GM meter up to about 15 feet for remote measurements. Reads at 2 mR/hr, 50mR/hr, 2 R/hr, 50 R/hr, and 1000 R/hr (this would enable emergency personnel to conduct remote measurements of a suspicious "item" that is in locations inaccessible to personnel or in potentially hazardous locations)
- 30 Radiation Dosimeters (SAIC PD-10i Gamma Dosimeter)
- Dosimeter interface unit + software
- GR 135 Neutron Detection Capability Upgrade
- Continuous Radioactivity Ambient Air Monitor
- 3 Ludlum 2241-2 with EPA chip

APPENDIX F

ENVIRONMENTAL RADIOLOGICAL

AIR MONITORING STATIONS

IN

NEW YORK AND NEW JERSEY

Environmental Measurements Laboratory (EML)
Environmental Protection Agency (EPA)

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EML'S RADIOLOGICAL MONITORING CAPABILITY

The Department of Homeland Security (DHS) Environmental Measurements Laboratory (EML), formerly with the DOE, is located in lower Manhattan. The Laboratory maintains a variety of monitoring instruments on the roof of the 12-story Federal building at 201 Varick Street, New York, NY. In addition to high volume aerosol samplers, it operates a series of instruments to detect gamma-emitting radionuclides. A Pressurized Ionization Chamber (PIC) continuously records the exposure rate every minute and is capable of detecting small changes in background radiation levels. A Comprehensive Radiation Sensor (CRS) consisting of a 3x3 inch NaI crystal collects gamma-ray spectra every 15 minutes and can identify the presence of radionuclides such as cesium-137 and cobalt-60. Meteorological data collected include temperature, humidity, pressure, precipitation and wind speed and direction. The radiation and met data are posted to the Lab's public web site (www.eml.doe.gov). The data are archived and past time periods may be selected for viewing. A second monitoring station incorporating a CRS operates in the Times Square midtown area and data from that station can be viewed on the same web site as well.

EML, in concert with the New York City OEM, proposes to establish additional real-time monitoring sites that would make up a network of radiation sensors in NYC in conjunction with the DHS Directorate of Science and Technology's Urban Dispersion Program (UDP).

Initially, 15 to 20 sites will be equipped with radiation detectors. All sites will be equipped with a simple GM detector that will provide a reading of the gamma exposure rate. Some of the sites will have the added feature of the CRS detector to provide isotope identification. Expansion of this test-bed network may occur in the future, based on lessons learned from the initial deployment.

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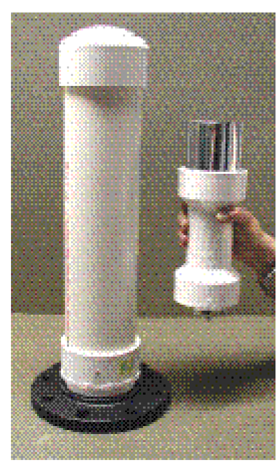
EML Roof Monitoring Station

The U.S. Department of Homeland Security Environmental Measurements Laboratory (EML) operates a variety of monitoring instruments on the roof of the 12-story Federal Building at 201 Varick Street. This set of instrumentation is the first node in an envisioned network of sensors throughout the New York City area. This monitoring network would be a key asset during a radiological event providing real-time information on the location, movement and level of radioactive contamination. The data can be viewed on the Laboratory's web page: www.eml.doe.gov.

Exposure Rate Monitor

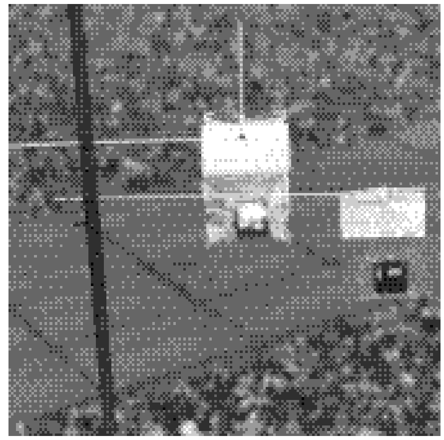
A Pressurized Ionization Chamber (PIC) continuously records the exposure rate from the penetrating component of the environmental radiation field (gamma and cosmic). Readings are integrated over one minute periods. The PIC is a high precision instrument capable of detecting 0.1 μR/h changes in background radiation levels. High-level exposure rates that are in the range of 1 to 100 mR/h are measured with a GM tube instrument.



Gamma-Ray Spectrometer

The EML Comprehensive Radiation Sensor (CRS) is a gamma-ray spectrometer system that consists of a 3x3 inch NaI crystal and a 1000 channel pulse height analyzer. Spectrum analysis is performed with a fitting routine to examine spectral shape and check for the presence of specific radionuclides such as ^{137}Cs and ^{60}Co. The CRS collects spectral data and updates results every 15 minutes

TLDs



Aerosol Samplers

These instruments use high volume pumps with a flow rate of about 1 m^3 per minute to sample the ambient air and collect any particulate matter on filter media. The filters are normally changed on a weekly basis and then analyzed in the laboratory using shielded high-energy resolution germanium gamma-ray spectrometers. This analysis provides unambiguous identification of gamma-emitting radionuclides at very low concentrations. Filters may also be analyzed for gross alpha and beta radioactivity or submitted for nuclide-specific radiochemical analysis.

Meteorological Instrumentation

A suite of meteorological sensors is mounted on a small tower. Data collected include wind speed and direction, atmospheric pressure, air temperature and relative humidity. Updates are provided every minute. This information is useful for predicting trajectories of debris clouds and what areas would be affected.

EPA'S RADIOLOGICAL AIR MONITORING CAPABILITY

The EPA's Environmental Radiation Ambient Monitoring System (ERAMS) was initially established by the Public Health Service in the late1950s to detect radioactivity from fallout resulting from the numerous atmospheric nuclear weapons testing of the 1950s - 1960s. Responsibility for collecting, analyzing and interpreting environmental radiation levels was transferred to the EPA in 1970. Today, the system tests for radioactivity in air, precipitation, drinking water and milk samples nationwide. More information on ERMAMS may be found at www.epa.gov/narel/erams .

Presently, there are 52 active air particulate sampling stations nationwide. As budget permits, EPA is planning to expand these stations to a total of 120 by FY-2005 to expand the U.S. population coverage from 25% to 60%. An air sampling station consists of a high volume air sampler that is run continuously with filter changes twice weekly. These filters are counted locally then mailed to the EPA laboratory in Montgomery, AL for more detailed analyses such as gamma spectroscopy when the Gross Beta activity exceeds a certain level. Filter changes are done by volunteers usually associated with federal, state or local radiation, environmental or public health organizations. Stations can be instructed to change filters daily as needed such as during a major atmospheric nuclear weapons testing/detonation or a nuclear power plant accident.

ERAMS Stations in the New York-New Jersey Metropolitan Area

The active ERAMS stations in New York State are located in lower Manhattan (New York City), Yaphank (Long Island), Albany and Syracuse with a standby station located in Niagara Falls. New Jersey's station is located in Trenton. Another ERAMS station in the Mid-Atlantic area is located in Wilmington, DE. A station in Philadelphia is planned to be on-line in FY-2004. Additional new stations will be added along the Great Lakes and in Puerto Rico in FY-2005.

Deployable Radiological Air Sampling Units

EPA's Environmental Response Team (ERT) maintains air monitoring/sampling units that can be deployed to support a response. These units are maintained in the ERT facility in Cincinnati, OH.

EPA's Office of Radiation and Indoor Air is planning to have available in FY-2004, 40 deployable air sampling units to respond to two separate major radiological incidents. These units will be maintained at the EPA national labs in Montgomery, AL and Las Vegas, NV. Twenty air sampling units were deployed to New Mexico in May 2000 to monitor for any radiological impact from the fire that involved portions of the Los Alamos National Laboratory. Both EPA labs, NAREL and RIENL maintain deployable air sampling units and have personnel who can be deployed to assist regions.

ERAMS Stations in Region 2 (New York and New Jersey)

New Jersey

Trenton

Air Particulate, Drinking Water, Milk

Waretown

Drinking Water

New York

Albany

Air Particulate, Precipitation, Drinking Water

Buffalo

Milk

New York City

Air Particulate, Drinking Water

Niagara Falls

Drinking Water

Syracuse

Air Particulate, Drinking Water, Milk

Yaphank

Air Particulate, Precipitation

U.S. EPA Environmental Radiation Ambient Monitoring Stations (ERAMS) Sampling Programs

Air

The ERAMS Air Program consists of 50 sampling locations. Continuously operating samplers collect airborne particulates on filters that are collected twice weekly and sent to NAREL for analysis. A gross beta analysis is performed on each air filter, and a gamma scan is done if the beta activity is greater than 1 pCi per cubic meter. Annual composites of the air particulates filters are analyzed for plutonium (Pu-238, Pu-239, Pu-240) and uranium (U-234, U-235, U-238).

Analytical Scheme and Primary Rationale for Routine Operations

Air Particulates Analyses	Primary Rationale
Individual Samples: Gross Beta. A Gamma Analysis Is Performed If Elevated Gross Beta Levels Are Found	Screening Analyses Employed To Detect Elevated Levels Of Radioactivity
Annual Composite Samples: Isotopic Pu And U (Performed On Composite Samples From All Sites)	Radionuclides Of Concern For Facility And Site Monitoring Activities

Milk

The ERAMS Pasteurized Milk Program consists of 43 sampling locations that represent a significant portion of the milk consumed in major population centers. Milk is sampled because it is a readily available food source consumed by a large portion of the population; because it is consumed by children in relatively large quantities, which provides a good indication of children's exposure to nuclear events; and, finally, because it is a good indicator of radionuclides present in the environment. Primary functions of this program are to obtain reliable monitoring data about current radionuclide concentrations and to monitor long-term trends. The quarterly samples are analyzed by gamma spectrometry, looking for fission products such as iodine 131 (I-131), barium 140 (Ba-140), and cesium 137 (Ce-137), which could become present in the event of a nuclear accident. On a less frequent schedule, strontium 90 (Sr-90) is determined.

Analytical Scheme and Primary Rationale for Routine Operations

Milk Analyses	Primary Rationale
Individual Samples: Gamma	Detection Of Radionuclides With A High Probability Of Release Into The Environment
Sr-90 Performed On Selected Stations	Radionuclides Of Concern For Facility And Site Monitoring Activities

Drinking Water

The ERAMS Drinking Water Program obtains quarterly drinking water samples from 76 sites, which are primarily major population centers. The samples are analyzed for tritium (H-3) quarterly, for gross alpha and beta on annual composite samples from each station, for iodine-131 (I-131) on one sample per year from each station, and for strontium-90 (Sr-90) on one-fourth of all the individual station annual composite samples. All of the annual composite samples are also analyzed by gamma spectrometry. Analyses for radium-226 (Ra-226), plutonium (Pu-238, Pu-239, and Pu-240), and uranium (U-234, U-235, and U-238) are performed if a sample shows elevated gross alpha radioactivity. If the radium-226 result is between 3 and 5 pCi/L, then a radium-228 analysis is performed.

Analytical Scheme and Primary Rationale for Routine Operations

Drinking Water Analyses	Primary Rationale
Individual Samples: H-3 And I-131 Performed On One Sample Per Station Per Year	National Primary Drinking Water Regulation (40CFR, Part 141.26)
Composites: Gross Alpha And Gamma Performed On All Samples	National Primary Drinking Water Regulation (40CFR, Part 141.26)
Sr-90 Performed On Selected Stations	
U, Pu, And Ra226 Analyses Are Performed If There Are Elevated Levels Of Gross Alpha Beta	
Ra228 Is Performed If There Are Elevated Levels Of Ra226	

Precipitation

The ERAMS Precipitation Program consists of sampling stations at 37 locations. All stations routinely submit precipitation samples as rainfall, snow or sleet occurs. The precipitation samples are composited at NAREL into single monthly samples for each station. Each month that precipitation occurs, an aliquot of each monthly precipitation sample is analyzed for tritium (H-3), gross beta, and gamma emitting nuclides. Also, a composite of the March, April and May monthly composites is analyzed.

Analytical Scheme and Primary Rationale for Routine Operations

Precipitation Analyses	Primary Rationale
Individual Samples: H-3, Gross Beta And Gamma	Screening Analyses Employed To Detect Elevated Levels Of Radioactivity

APPENDIX G

ENVIRONMENTAL <u>NON-RADIOLOGICAL</u>

AIR MONITORING STATIONS

IN

NEW YORK AND NEW JERSEY

New Jersey Department of Environmental Protection
New York State Department of Environmental Conservation

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STATE AIR POLLUTION (NON-RADIOLOGICAL) MONITORING CAPABILITY

New Jersey

The New Jersey Department of Environmental Protection's Bureau of Air Monitoring maintains 47 sites to monitor for non-radiological air pollutants. The Continuous Monitoring Network consisting of 30 stations provides meteorological and air quality data once every minute that is transmitted to a centralized computer system in Trenton, NJ. The 28 stations that comprise the Manual Sampling Network, some of which are co-located with the continuous stations, collect particulate on a filter. The filter is collected on a regular basis for subsequent analyses in a laboratory.

New York

The New York State Department of Environmental Conservation's Bureau of Air Quality Surveillance has a network of 79 sites throughout New York State. The Northern Monitoring Operations consists of 42 stations monitoring upstate New York air quality. The Southern Monitoring Operations covers the New York City metropolitan area including Nassau and Suffolk counties with 37 stations. Meteorological and air quality data are collected continuously and electronically reported on an hourly basis. Particulates are collected on a filter that is manually exchanged every sixth day. The following tables and maps provide information on specific types of monitoring and sampling occurring at each location.

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2001 Air Monitoring Network

New Jersey Department of Environmental Protection

Network Summary

The Bureau of Air Monitoring maintains 47 Ambient Air Monitoring Sites in New Jersey. The Air Monitoring Sites can be divided into two primary networks; the Continuous Monitoring Network and the Manual Sampling Network. The data collected by the program is used to provide the public with information on pollutant levels and are collected in accordance with state and federal regulations. Monitoring data is provided to various public and media outlets and are used to provide hourly updates on air quality to the Bureau's web page www.state.nj.us/dep/airmon).

Figure 1: Air Monitoring Trailer located at Rutgers University Ambient Air Monitoring Site

Figure 2: Continuous Monitoring Equipment located within an Air Monitoring Trailer

Figure 3: Manual Particulate Samplers located atop an Air Monitoring Trailer

The Continuous Monitoring Network

The Continuous Monitoring Network consists of automated sites which measure carbon monoxide (CO), oxides of nitrogen (NOx), ozone (O_3), sulfur dioxide (SO_2), particulate matter, and meteorological data (not all pollutants are measured at all sites). The data is transmitted to a centralized computer system in Trenton, New Jersey, once every minute, thus providing near real-time data. A map showing the location of the continuous monitoring sites is shown in Figure 4 and the parameters recorded at each site are displayed in Table 1. Many of these locations are also part of the manual monitoring network, which is described later in this section.

Figure 4

2001 Continuous Network

Monitoring Site Locations

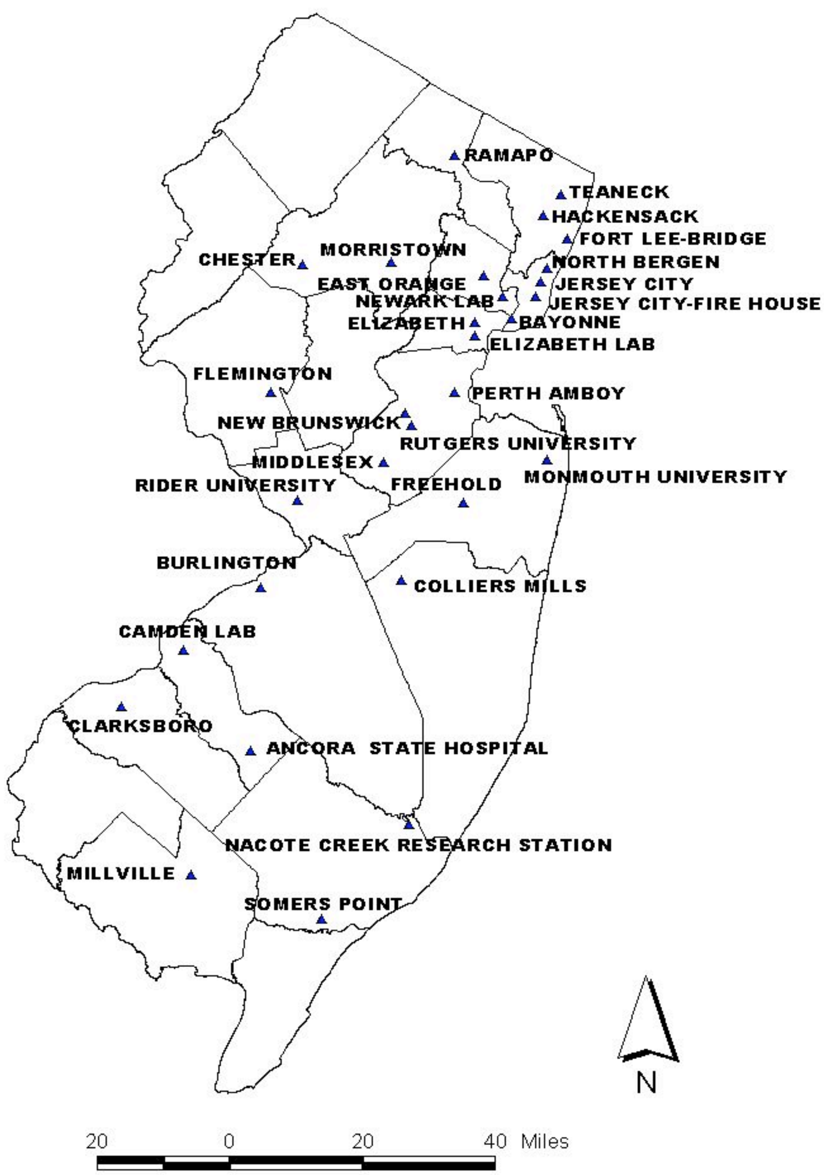

Table 1
Continuous Network Parameters Measured

Continuous Parameter Codes

CO - Carbon Monoxide
NOx - Nitrogen Dioxide and Nitric Oxide
O3 - Ozone
SO2 - Sulfur Dioxide
SS - Smoke Shade
TEOM - Continuous PM2.5 Analyzer
MET - Meteorological Parameters

SITE	CO	NOx	O_3	SO_2	SS	TEOM	MET
Ancora State Hospital	X		X	X	X		
Bayonne		X	X	X			
Burlington	X			X	X		
Camden Lab	X	X	X	X	X	X	X
Chester		X	X	X			X
Clarksboro			X	X			
Colliers Mills			X				
East Orange	X	X					X
Elizabeth	X			X	X		
Elizabeth Lab	X	X		X	X	X	X
Flemington			X		X		X
Fort Lee-Bridge	X					X	
Freehold	X				X		
Hackensack	X			X	X		
Jersey City	X			X	X		
Jersey City-Fire House						X	
Middlesex	X						
Millville		X	X	X			
Monmouth University			X				
Morristown	X				X		
Nacote Creek Research Station			X	X			
Newark Lab	X	X	X	X	X	X	
New Brunswick						X	
North Bergen	X						
Perth Amboy	X			X	X		
Ramapo			X				
Rider University		X	X				X
Rutgers University		X	X				X
Somers Point		X		X			
Teaneck		X	X				
TOTAL	15	11	15	15	12	6	7

MANUAL MONITORING NETWORK

The Manual Monitoring Network does not transmit data in near real-time like the Continuous Monitoring Network. The manual network consists primarily of equipment that collects samples for subsequent analysis in a laboratory. The network provides data on fine particulates (particles smaller than 2.5 micrometers in diameter or $PM_{2.5}$), inhalable particulates (PM_{10}), lead (Pb), several parameters associated with atmospheric deposition, pollutants important in the formation of ground level ozone (ozone precursors), and numerous toxic pollutants. Sites that measure ozone precursors are part of the national Photochemical Assessment Monitoring Station (PAMS) program. While some ozone precursors are automatically measured every hour, the data are usually only retrieved once a day. A map of the manual sampling sites is shown in Figure 5 and a list of the pollutants measured at each location in shown in

Figure 5

2001 Manual Network

Monitoring Site Locations

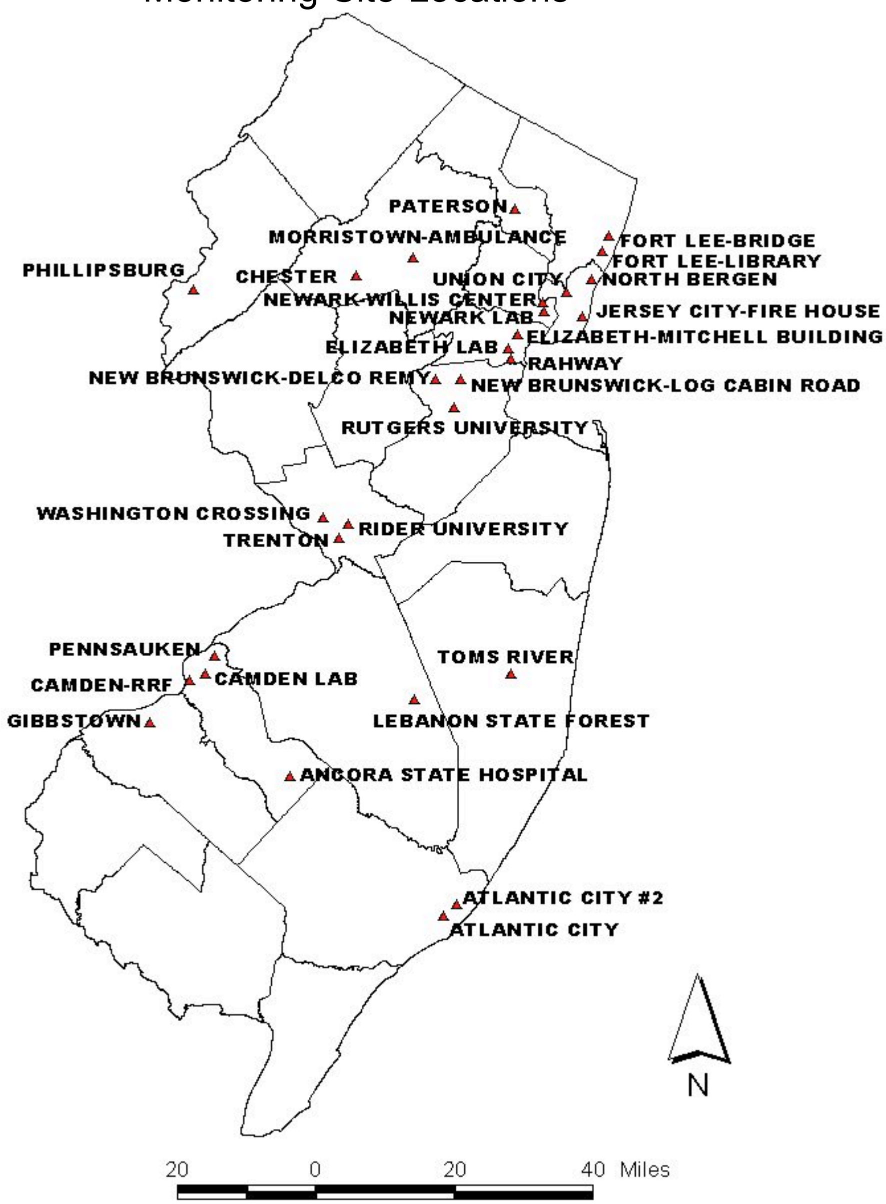

Table 2
Manual Network
Parameters Measured

Parameter Codes

PM2.5 -	FRM (Federal Reference Method) Manual PM2.5 Sampler	PAMS -	Photochemical Assessment Monitoring Station (Photo-Chemical Volatile Organic Compounds)
PM10	FRM Manual PM10 Sampler	CARB -	Carbonyls
PB	Lead	VOCs -	Volatile Organic Compounds
TSP	Total Suspended Particulate	SVOCs -	Semi-Volatile Organic Compounds
PM2.5 Spec	FRM Manual PM2.5 Speciation		

SITE	PM2.5	PM10	PB	TSP	PM2.5 Spec	PAMS	CARB	VOCs	SVOCs	Acid Deposition	
										Dry Deposition	Wet Deposition
Ancora State Hospital											X
Atlantic City		X									
Atlantic City #2	X	X									
Camden Lab	X	X			X	X	X	X	X	X	
Camden-RRF		X									
Chester	X				X		X	X	X		
Elizabeth Lab	X	X			X		X	X	X	X	
Elizabeth-Mitchell Building	X										
Fort Lee-Bridge		X								X	
Fort Lee-Library	X										
Gibbstown	X										
Jersey City-Fire House	X	X									
Lebanon State Forest											X
Morristown-Ambulance	X										
New Brunswick-Log Cabin Road	X				X		X	X	X		
New Brunswick-Delco Remy			X	X							
Newark Lab	X	X									
Newark-Willis Center	X										
Paterson	X										
Pennsauken	X	X	X	X							
Phillipsburg	X										
Rahway	X										
Rider University						X					
Rutgers University						X					
Toms River	X										
Trenton	X	X									
Union City	X										
Washington Crossing	X										X
TOTAL	**20**	**10**	**2**	**2**	**4**	**3**	**4**	**4**	**4**	**3**	**3**

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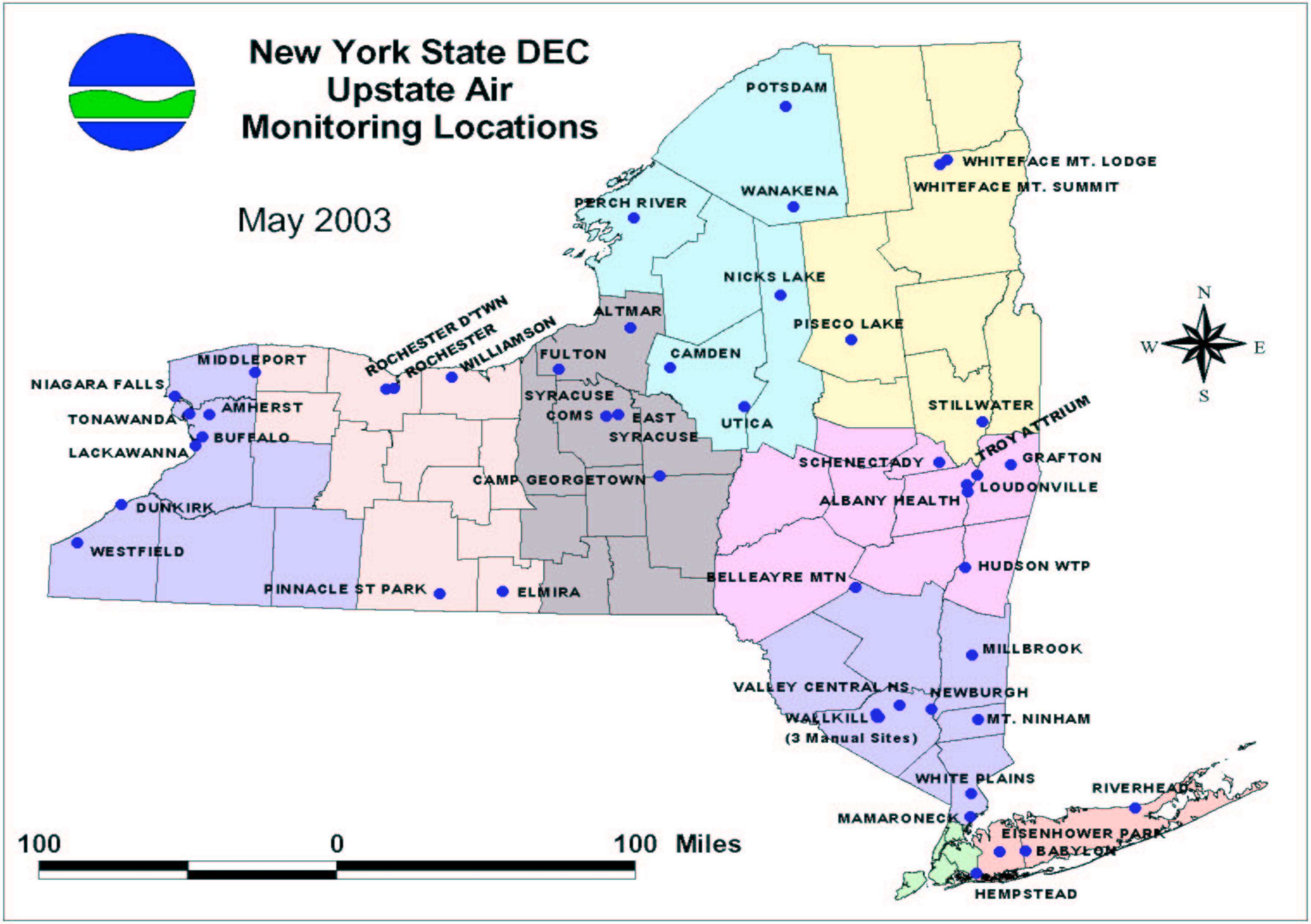
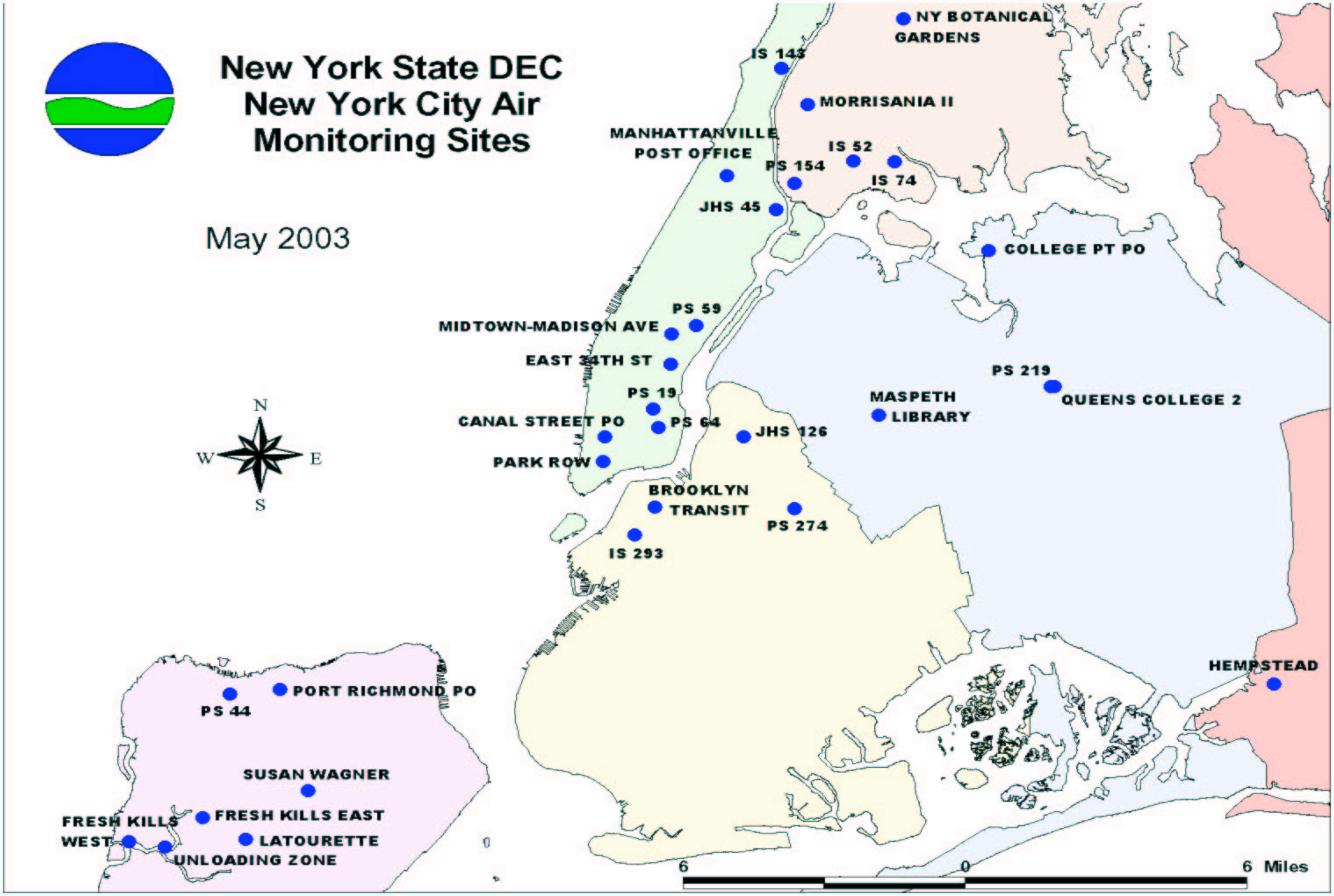

New York State DEC
Upstate Air
Monitoring Locations
May 2003
POTSDAM
WHITEFACE MT. LODGE
WHITEFACE MT. SUMMIT
WANAKENA
PERCH RIVER
NICKS LAKE
ALTMAR
PISECO LAKE
ROCHESTER D'TWN
ROCHESTER
WILLIAMSON
FULTON
CAMDEN
MIDDLEPORT
NIAGARA FALLS
AMHERST
TONAWANDA
BUFFALO
LACKAWANNA
SYRACUSE
COMS
EAST
SYRACUSE
UTICA
STILLWATER
TROY ATTRIUM
GRAFTON
SCHENECTADY
LOUDONVILLE
ALBANY HEALTH
CAMP GEORGETOWN
DUNKIRK
WESTFIELD
HUDSON WTP
BELLEAYRE MTN
PINNACLE ST PARK
ELMIRA
MILLBROOK
VALLEY CENTRAL HS
NEWBURGH
WALLKILL
(3 Manual Sites)
MT. NINHAM
WHITE PLAINS
RIVERHEAD
MAMARONECK
EISENHOWER PARK
BABYLON
HEMPSTEAD
N
S
E
W
100
0
100 Miles


New York State DEC
New York City Air
Monitoring Sites
May 2003
N
W
E
S
NY BOTANICAL
GARDENS
IS 143
MORRISANIA II
MANHATTANVILLE
POST OFFICE
IS 52
PS 154
IS 74
JHS 45
COLLEGE PT PO
PS 59
MIDTOWN-MADISON AVE
EAST 34TH ST
PS 219
QUEENS COLLEGE 2
MASPETH
LIBRARY
PS 19
CANAL STREET PO
PS 64
JHS 126
PARK ROW
BROOKLYN
TRANSIT
PS 274
IS 293
HEMPSTEAD
PORT RICHMOND PO
PS 44
SUSAN WAGNER
FRESH KILLS
WEST
FRESH KILLS EAST
LATOURETTE
UNLOADING ZONE
6
0
6 Miles

NYSDEC BAQS Air Monitoring Sites & Parameters Southern Monitoring Operations (SMO)					Ozone	Sulfur Dioxide	Nitrous Oxides	Carbon Monoxide	Manual PM2.5	Continuous PM2.5	Manual PM10	Continuous PM10	Speciation (PM2.5)	Acid Deposition	Lead	Metals	Sulfate & Nitrate	Methane/ Non-Meth	Toxics	Carbonyls	PAMS (Precursors)	Meteorological	Precipitation	Wind
Rg.	Site #	Type	County	Municipality	O3	SO2	NOX	CO	M2.5	C2.5	M10	C10	SPC	AD	Pb	MT	S/N	Meth	TX	CAR	PAMS	MET	PRC	WSD
1	2950-10	MC	Nassau	Eisenhower Pk		C	C			C	W			O			PM10					O	B	O
1	2950-18	M	Nassau	Hempstead					M															
1	5150-02	MC	Suffolk	Babylon	C				M															
1	5155-01	C	Suffolk	Riverhead	Cx																			
2	7094-05	M	Bronx	Morrisania II					M															
2	7094-06	MC	Bronx	NY Bot. Gardens	C	C	C	C	M				M	O				O	O	O	O	O	T	O
2	7094-07	MC	Bronx	IS #52	C	C	C		M1 C	C	W	C	M				PM10 C		O	O				
2	7094-08	C	Bronx	IS #74						C														
2	7094-09	C	Bronx	PS #154						C														
2	7095-07	C	Kings	PS 314						C														
2	7095-43	M	Kings	JHS #126					M		W				TSP		PM10							
2	7095-44	C	Kings	IS #293						C														
2	7095-98	C	Kings	PS #274						C									O					
2	8100-03	C	Kings	Brklyn Transit				C																
2	7093-08	M	New York	JHS #45					M															
2	7093-10	MC	New York	PS #59		C	C	C	MC										O					
2	7093-12	M	New York	Madison Ave							R									O				
2	7093-15	C	New York	IS #143						C														
2	7093-16	C	New York	PS #64						C														
2	7093-17	C	New York	Manhattanville PO						C														
2	7093-18	C	New York	Park Row						C		C												
2	7093-21	M	New York	PS #19					M															
2	8100-02	MC	New York	Canal St PO					M	C	R		M											
2	8100-06	C	New York	34th Street				C																
2	7096-09	MC	Queens	College Point PO	C		C												O					
2	7096-13	C	Queens	Maspeth Library						C														
2	7096-14	MC	Queens	PS #219	Continuous Carbon				M1	C		CC	M						O			O		O
2	7096-15	C	Queens	Queens College 2	C	C	C	C										O		O	O			
2	7097-01	MC	Richmond	S. Wagner HS	Cx				M		W				TSP	TSP	PM10	O				O		O

2	7097-03	M	Richmond	Port Richmond						M															
2	7097-13	MC	Richmond	Unloading Zone								W				PM10	PM10		O	O	O				
2	7097-17	MC	Richmond	Fresh Kills West 2							C	W				PM10	PM10		O	O	O				CL
2	7097-18	C	Richmond	PS #44							C														
2	7097-19	MC	Richmond	Fresh Kills East								W				PM10	PM10		O	O	O				
2	7097-20	MC	Richmond	Latourette								W				PM10	PM10			O	O				
3	5902-04	MC	Westchester	White Plains		C					C				O								CL	B	CL
3	5956-01	M	Westchester	Mamaroneck						M															
SMO Totals		37 Sites out of 80 Sites		M =	22																				
				C =	29	9	5	6	5	14	17	10	3	4	3	6	5	4	6	10	8	2	5	3	6
BAQS Grand Totals				Tot M =	53																				
		46% of all sites		Tot C =	59	33	23	8	12	26	25	16	3	8	19	10	6	10	6	14	9	2	24	19	22
SMO Percentages																									
				% of parameter grand totals		*27*	*22*	*75*	*42*	*54*	*68*	*63*	*100*	*50*	*16*	*60*	*83*	*40*	*100*	*71*	*89*	*100*	*21*	*16*	*27*

Legend:	CL - Climatronics Sonic	W - Wedding PM10	B - Belfort Rain Gauge		Subscript 1- Daily Sampling
	M - Met One Sonic	R - R&P PM10 Sampler	T - Tipping Bucket		Subscript C – Collocated
	S* - Low Level Instrument	O - Other Instrument			Subscript X – Seasonal
December 2003					December 2003

NYSDEC BAQS Air Monitoring Sites & Parameters Northern Monitoring Operations (NMO)					Ozone	Sulfur Dioxide	Nitrous Oxides	Carbon Monoxide	Manual PM2.5	Continuous PM2.5	Manual PM10	Continuous PM10	Speciation (PM2.5)	Acid Deposition	Lead	Metals	Sulfate & Nitrate	Methane/ Non-Meth	Toxics	Carbonyls	PAMS (Precursors)	Meteorological	Precipitation	Winc
Rg.	Site #	Type	County	Municipality	O3	SO2	NOX	CO	M2.5	C2.5	M10	C10	SPC	AD	Pb	MT	S/N	Meth	TX	CAR	PAMS	MET	PRC	WS
3	1328-01	C	Dutchess	Millbrook	CX																	M		M
3	3502-04	M	Orange	Newburgh					M	C														
3	3527-01	C	Orange	Montgomery	Cx																			
3	3566-02	M	Orange	Wallkill											TSP C									
3	3566-09	M	Orange	Wallkill											TSP									
3	3566-11	M	Orange	Scotchtown											TSP									
3	3951-01	MC	Putnam	Mt. Ninham	Cx	C*								O								O	B	
3	5565-03	MC	Ulster	Belleayre Mt.	C	C*					W			O			PM10					CL	B	Cl
4	0101-13	M	Albany	Albany					MC	C														
4	0101-33	MC	Albany	Loudonville	C	C		C						O								CL	B	Cl
4	1001-02	M	Columbia	Hudson							W						PM10							
4	4102-09	M	Rennselaer	Troy															OC					
4	4153-04	MC	Rennselaer	Grafton	C	C*								OC								O	BC	Cl
4	4601-05	MC	Schenectady	Schenectady	C	C		C														O		O
5	1567-03	C	Essex	Whiteface	C																			
5	1567-04	MC	Essex	Whiteface	C	C*			M1	C	W		M	O			PM10		O	O		O	B	
5	2050-01	MC	Hamilton	Piseco Lake	C	C*								O								CL	B	
5	4567-01	C	Saratoga	Stillwater	C																			
6	1655-01	MC	Franklin	Paul Smiths																				
6	2167-03	MC	Herkimer	Nick's Lake	C	C*					W			O			PM10					CL	B	Cl
6	2223-01	C	Jefferson	Perch River	Cx																			
6	3202-01	M	Oneida	Utica					M	C														
6	3255-01	C	Oneida	Camden	Cx																			
6	4458-05	M	St. Lawrence	Wanakena										O									T	
6	4477-01	M	St. Lawrence	Potsdam					M															

7	2655-01	MC	Madison	Camp G'Town	C	C*								O								O	B	
7	3301-22	C	Onondaga	Syracuse				C																
7	3353-09	MC	Onondaga	E. Syracuse	C	C			M					O								CL	B	Cl
7	3720-01	M	Oswego	Altmar										O									T	
7	3754-01	C	Oswego	Fulton	Cx																			
8	0701-05	MC	Chemung	Elmira	C	C								O								CL	B	Cl
8	2701-01	MC	Monroe	Roch D'town		C		C	M	C			M											M
8	2701-08	MC	Monroe	Rochester Pri	C	C		C						O								O	O	O
8	5001-04	M	Steuben	Addison					M1	C			M											
8	5863-01	C	Wayne	Williamson	Cx																			
9	1451-03	MC	Erie	Amherst	C		C															CL		Cl
9	1472-04	C	Erie	Tonawanda		C																CL		Cl
9	3102-25	MC	Niagara	Niagara Falls		C		C	M	C	W R			O	TSP	TSP	PM10		O			CL	B	Cl
9	3120-02	C	Niagara	Middleport	Cx																			
9	0601-04	C	Chautauqua	Dunkirk	C	C																O		O
9	0675-01	MC	Chautauqua	Westfield	C	C*			M		W			O			PM10					CL	B	Cl
9	1401-18	MC	Erie	Buffalo		C	C	C	M	C			M	O								CL	B	Cl
9	1402-14	M	Erie	Lackawanna					M										O					
NMO Totals		43 Sites		M = 31																				
		out of		C = 30	24	18	2	7	12	8	6	0	4	16	4	1	6	0	4	1	0	19	16	16
BAQS Grand Totals		80 Sites		Tot M = 53																				
		54% of all sites		Tot C = 59	33	23	8	12	26	25	16	3	8	19	10	6	10	6	14	9	2	24	19	22
NMO Percentages																								
				% of parameter grand totals	*73*	*78*	*25*	*58*	*46*	*32*	*38*	*0*	*50*	*84*	*0*	*17*	*60*	*0*	*29*	*11*	*0*	*79*	*84*	*73*

Legend:	CL - Climatronics Sonic	W - Wedding PM10	B - Belfort Rain Gauge	Subscript 1 - Daily Sampli
	M - Met One Sonic	R - R&P PM10 Sampler	T - Tipping Bucket	Subscript C - Collocat
	S* - Low Level Instrument	O - Other Instrument		Subscript X – Seasonal
December 2003				December 200

APPENDIX H

FEDERAL RADIOLOGICAL MONITORING AND ASSESSMENT CENTER (FRMAC) CHECKLISTS FOR REQUESTING ASSISTANCE

Advance Party Meeting Checklist
Advance Party Monitoring Division's Checklist
Sample FRMAC Monitoring Implementation Plan

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Federal Radiological Monitoring and Assessment Center (FRMAC) Advance Party Meeting Checklist

INTRODUCTIONS

Identify Lead Federal Agency (LFA), state, tribal, and local response leaders, and introduce FRMAC leaders

FRMAC ORGANIZATION, CAPABILITIES, AND OPERATIONS BRIEFING (FRMAC Director)

1. Identify U.S. Department of Energy Senior Energy Official ___________________________

2. Provide **brief** overview of FRMAC operations _______________________________________

3. Relationship with Advisory Team on Environment, Food, and Health___________________

STATUS OF EMERGENCY ON-SITE (LFA and/or facility owner/operator)

1. Status of Release

   a. Has release terminated? ____

   b. How many releases have occurred? ____

   c. What is estimated source term(s)? ____

   d. What are dominant isotopes? ____

   e. What were the meteorological conditions during release(s)? _____________________

   ____

   f. What on-site monitoring/sampling results are available? _______________________

2. What actions have been taken to stop and/or mitigate the release(s)? ________________

   ____

3. Is situation stable? ____

4. Are current problems likely to affect off-site operations? _________________________

   ____

5. Status of Emergency Operations Centers (state, local government) _________________

   ____

STATUS OF EMERGENCY OFF-SITE (state and/or local response organizations)

1. What protective actions have been taken and/or are pending?

   a. Estimate of population directly effected. ____________________________________

   b. Evacuations in progress/ordered. ____

   c. Shelter locations. ____

   d. Location of decontamination facilities. ____________________________________

   e. Status of hospitals.____

2. Who has the responsibility for initiating /amending public protective actions (i.e., state, tribal, county, local authorities)? _______________________________________

3. Are the protective action guides in use the same as those for U.S. Environmental Protection Agency/U.S. Department of Agriculture/U.S. Food and Drug Administration?
   ____

4. Are atmospheric prediction plots available? ________ Types?_____________________

5. What off-site monitoring/sampling results are available?__________________________
   ____

6. Are there significant confounding conditions which could impact field operations (i.e., other hazardous materials associated with release(s), flood or earthquake damage, utility disruptions, traffic conditions, personnel security concerns)?
   ____

ESTABLISHMENT OF COMMUNICATIONS AND LIAISONS (FRMAC Director)

1. Identify

   a. Primary state radiological decision-maker ___________________________________

   b. Lead state, local and tribal representatives to FRMAC__________________________

   ____

   c. Lead LFA representative to FRMAC _______________________________________

d. Other federal agency representatives, as appropriate___________________________

e. State and local contacts to assist FRMAC support and logistic functions (locating facilities for FRMAC, operations center, air cargo delivery, field staging areas, Aerial Measuring System (AMS) landing sites, fuel availability, etc.)

____

____

f. State/local contact to assist AMS flight operations, for landing sites, fuel availability, radio frequencies, etc. ____

g. Identification of state and local contacts to assist FRMAC in obtaining transportation, lodging, subsistence, and other logistical support for FRMAC personnel.

____

____

INTEGRATION OF TECHNICAL RESPONSE (FRMAC Director)

1. Intent of state regarding integration of technical resources into FRMAC

   ____

2. State/LFA/local personnel to aid in development of initial FRMAC Monitoring and Sampling Plan ____

   ____

3. Identify state/local and LFA personnel to work with FRMAC Dose Assessment

   ____

4. Identify state/local and LFA personnel to work with FRMAC Health and Safety

   ____

5. Determine placement needs for liaison personnel

   ____

AREAS OF CONCERN (state, LFA, local)

(Operational problems, greatest needs/resource shortfalls)

1. State (tribal) ____

____

____

2. LFA ____

____

____

3. Local ____

____

PRIORITIES (state, LFA, local [prioritize state, county, and local concerns]**)**_____________

____

____

____

____

____

____

____

FRMAC ADVANCE PARTY MEETING
MONITORING DIVISION'S CHECKLIST

INTRODUCTIONS

1. Identify state(s) advisor(s) to the Monitoring Division._________________________

2. Identify LFA advisor to the Monitoring Division._____________________________

3. Identify state/local counterparts.____

4. Identify state, local, and LFA personnel to work with FRMAC in developing the initial FRMAC Monitoring and Sampling Plan.______________________________________

STATUS OF EMERGENCY

1. Has release terminated?____

2. Are additional releases expected?____

3. How many releases have occurred?____

4. Is the situation stable?____

5. What are the dominant isotopes?____

6. What was the meteorology during each release?_______________________________

- Wind speed and direction?____

- Precipitation?____

- Stability class?____

- Other?____

7. What is the current status of the plume(s)?___________________________________

April 2004
OFFSITE ACTIVITIES

1. Identify offsite protective actions and their status.______________________________

- Implemented?____
- Underway?____
- Pending?____
- Other?____

2. Are maps delineating the protective actions available?_________________________

3. Identify state(s) and local offsite monitoring resources._________________________

4. Identify state(s) and local radioanalytical capability.___________________________

5. Identify monitoring and sampling activities that will be completed by the time FRMAC is operational.____

6. Identify radioanalytical activities that will be completed by the time FRMAC is operational.____

7. Are monitoring and analytical results available to FRMAC?____________________

- If YES, when and how?____

8. Are atmospheric prediction plots available?________________________________

9. Identify location of preestablished offsite monitoring locations.__________________

10. Identify unevacuated local populated areas and special needs populations such as hospitals, nursing homes, and prisons.____

11. Identify institutions, facilities, and residences located in the evacuated areas which were not evacuated or must be reentered.___________________________________

12. Identify locations of surface drinking water supplies and open-air water treatment facilities.____

13. Will state and local monitoring personnel join the FRMAC? ___________________

- If NO, identify state/local contact for coordinating monitoring and analytical activities.____

- If YES, identify state/local personnel radiation exposure turn-back levels and dose commitment limitations.____

14. When and how will federal responders operating prior to an operational FRMAC (i.e., RAP) be integrated into the FRMAC?______________________________

15. Identify local and/or facility personnel familiar with the area that are available to drive FRMAC monitoring vehicles.________________________________

16. Obtain maps for FRMAC monitoring teams and the Monitoring Division's Status Map Coordinator.____

17. How can FRMAC monitors pass through road blocks to perform monitoring duties?____

18. Identify any confounding conditions which could impact FRMAC monitoring activities such as hazardous materials associated with the emergency, flood damage, earthquake damage, major road work, etc.______________________________

PRIORITIES FOR INITIAL FRMAC MONITORING AND SAMPLING PLAN

1. Identify state/local requirements.____

2. Identify LFA requirements.____

3. If release is ongoing or projected, determine the presence of radioiodines.__________

4. Monitor close to evacuated areas where people are located.______________________

5. Identify areas that have not been evacuated, but where early health effects are possible (100 rem in four days; i.e., 1 rem/h).__________________________________

6. Identify areas that have not been evacuated, but where the federal protective action guide (PAG) for evacuation may be exceeded (greater than 1 rem in four days; i.e., without knowing isotopic ratios, 10 mrem/h).__________________________________

7. After deposition, determine isotopic ratios.___________________________________

8. Provide a measure of the validity for the dispersion models in use._________________

9. Establish air sampling stations to measure resuspension and future plume releases.____

10. Monitor institutions, facilities, and/or residences located in the evacuated areas which were not evacuated or where people must reenter.________________________________

11. Identify hot spots.____

12. Characterize the offsite area.____

13. Monitor areas for possible return of residents._________________________________

14. Sample surface drinking water supplies and open-air water treatment facilities.____

April 2004

Sample FRMAC Monitoring Implementation Plan

Team 1: Characterize the edge of the deposition area in Emergency Response Planning Area 2.

Team 2: Characterize the area of deposition along a ten mile arc using the following roads; Fort Mott Road to Lighthouse Road, Lighthouse Road to State Highway 49, State Highway 49 to Toll Road and then characterize Pennsville to include Penns Grove.

Team 3: Characterize the area of deposition along a ten mile arc using the following roads; Jericho Road northwest from Macanippuck Road, to Quinton- Marlboro Road, to North Bunden Hill Road, to Quinton-Elmer Road, to Welchville-Alloway Road, to State Highway 540, to Salem-Woodstown Road north on Sharptown Road, to Pointers-Swedesboro Road and then to the New Jersey Turnpike.

Team 4: Characterize the deposition within the buffer zone defined by the BNE TAC

Team 5: Characterize the area of deposition using the following roads; US Highway 130 from US Highway 40 north, to State Highway 44, to Broadway Street, to Crown Point Road then to Interstate Highway 295.

Team 6: Characterize the area of deposition using the following roads; Pedricktown Road from US Highway 130, to Auburn Woodstown Road, to State Highway 45, to Mariton Road, to Pointers-Swedesboro Road, to US Highway 40, to Harding Road, to Pennsville-Auburn Road, to Pointers-Auburn Road, to Haines Neck Road, to Cheney Road, to Mannington-Yorktown road then to Yorktown Road

Team 7: Characterize the area of deposition using the following roads; State Highway 322 east from Conchester Highway (Delaware), to Main Street, to State Highway 45, to Salem-Woodstown Road then to State Highway 540.

Team 8: Characterize the area of deposition using the following roads in Delaware; New Castle Avenue from US Highway 40 to Interstate 495, to Post Road, to West Second Street, to East Fourth Street, to Industrial Highway then to Philadelphia International Airport.

Team 9: Characterize the area of deposition using the following roads in Delaware, New Castle Avenue from US Highway 40 south to Wilmington Road, to West Seventh Street, to River Road, to State Highway 9, to Saint Augustine Road, to Silver Run Road, to Taylors Bridge Road, to Fleming Landing Road and then to Road 317.

Team 10: Characterize the area of deposition using the following roads; the New Jersey Turnpike from State Highway 322 to Camden. Characterize the Camden area.

FIGURE E-1. SAMPLE FRMAC MONITORING IMPLEMENTATION PLAN

In Situ Team: Characterize the area of deposition using the following roads; south on the New Jersey Turnpike from State Highway 322 to Deepwater-Slopes Corner Road, to State Highway 540 to Salem-Woodstown Road, to Walnut Street. Continue south on Walnut Street until administrative turnback values are reached (20 mR/hour or 100 mRem on self reading dosimetry).

Helicopter: Perform a thirty-mile transit of the deposition area with 250 foot line spacing.

Helicopter: Perform a radial transit away from and then toward the plant on an 11.25 - degree radial to a thirty mile arc then radial away from and toward the plant from Oyster Cove to Woodbury City.

Monitoring And Sampling: Monitoring locations should include pre-established State, local, and utility fixed monitoring sites. Soil and vegetation samples should be collected upon contact with deposition (twice background) and then every order of magnitude change in exposure level unless instructed otherwise.

State Concurrence: ______________________________
Print Name

____
Signature

LFA Concurrence: ______________________________
Print Name

____
Signature

FRMAC Concurrence:______________________________
Print Name

____
Signature

Date: ____________________ Time:____________________

FIGURE E-1. *SAMPLE FRMAC MONITORING IMPLEMENTATION PLAN (continued)*

APPENDIX I

RADIOLOGICAL

MONITORING AND ASSESSMENT

REPORTING FORMS

Hazard Checklist
Team, Instrument and Equipment Information Log
Daily Instrument QC Checks
Radiation Survey Report Form
Data Acquisition Log
Field Monitoring Log
Sample Control and Chain of Custody Form
Local Area Monitoring (LAM) TLDs

Form Source: Federal Radiological Monitoring and Assessment Center (FRMAC) Reporting Forms

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HAZARD CHECKLIST

Date and time: ____

Location: ____

Type of Response (Brief Explanation): ____

____

Type of Hazard	Yes	No	Description (if yes)
Confined Spaces	_	_	______________________
Lockout/Tagout	_	_	______________________
Electric/Power Lines	_	_	______________________
Work near Heavy Traffic	_	_	______________________
Work on/near Water	_	_	______________________
Temperature Extremes	_	_	______________________
Open Flames or Fire	_	_	______________________
Any Explosive Materials	_	_	______________________
Pressurized Vessels	_	_	______________________
High Noise Areas	_	_	______________________
Airborne Contaminants	_	_	______________________
Biohazard Concerns	_	_	______________________
Non-Ionizing Radiation	_	_	______________________

Radiation Levels

Exposure Rates____

Surface Contamination Levels____

Airborne Radioactivity Levels ____

Additional Remarks: ____

Checklist completed by: Date:

____ ____________________

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TEAM, INSTRUMENT, & EQUIPMENT INFORMATION LOG

Field Team Supervisor Initials ________

Team Number			
Today's Date		Start Time	
Team Leader (Last, First, M.I.)			
Team Leader Organization			

TEAM MEMBERS

	Name (Last, First, Middle Initials)	Organization
1		
2		
3		
4		
5		

INSTRUMENT AND EQUIPMENT INFORMATION

Instrument/Equipment Number	Instrument/Equipment Type	Instrument/Equipment Number	Instrument/Equipment Type
Cellular Phone			Radio Number
Serial Number	Phone Number		
Vehicle Information			
License Plate Number	State	License Plate Number	State

This form must be completed and turned in to the Field Team Supervisor prior to field deployment

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DAILY INSTRUMENT QC CHECKS

Event ____ Team #__________________________________

Reviewed By__________________Performed By__________________________ Page ____ of _______

Instrumen t Number	Instrument Type	Depart Date/Time DDMMYYYY 0000 (Military)	QC Check Source Type	Check Source ID #	Check Source Activity	Acceptable Operating Range	Depart Actual Reading	Return Date/Time DDMMYYYY 0000 (Military)	Return Actual Reading

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RADIATION SURVEY REPORT FORM

Organization	Radiation Survey Report	Number ____ Page___ of ___
Surveyor(s)	Date	Time
Signature	Supervisor	

Results	Results	Results	Results	Results
Type No.	Type No.	Type No.	Type No.	Type No.
Efficiency / MDA	Efficiency / MDA	Efficiency / MDA	Efficiency / MDA	Efficiency / MDA
alpha /	alpha /	alpha /	alpha /	alpha /
beta /	beta /	beta /	beta /	beta /
Count Time	Count Time	Count Time	Count Time	Count Time
Tritium CF	Tritium CF	Tritium CF	Tritium CF	Tritium CF

	Results 1	Results 2	Results 3	Results 4	Results 5
Purpose	Type __	Type __	Type __	Type __	Type __
	Unit___	Unit___	Unit___	Unit___	Unit___
	__Portable Instrument	__Portable Instrument	__Portable Instrument	__Portable Instrument	__Portable Instrument
All readings meet unrestricted release limits? _ Yes _ No	_Removable DPM/100cm^2	_Removable DPM/100cm^2	_Removable DPM/100cm^2	_Removable DPM/100cm^2	_Removable DPM/100cm^2

Number of Points	TIME	DESCRIPTION OF SURVEY					
		BACKGROUND All readings recorded are net above					

Comments:	Footnotes:
Follow-up required? _ YES _ NO Map Attached? _ YES _ NO	

Revised 4/04

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DATA ACQUISITION LOG

Date ______________ Page ____ of ____

Event ____

Data Acquisition Officer ____

Data Entry Operator ____________________________ Reviewed By _____________________

Entry #	Team # (1)	Time (military) (2)	Location Description (3)	Latitude (4)	Longitude (5)	Inst ID (6)	Measure-ment (7)	Units (8)	Radiation Type/ Energy (9)	Measurement Surface (10)	Remarks: If samples are collected at this site; Note sample ID and type here **(11)**

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FIELD MONITORING LOG

(l) Team Number: ____________________________ Date (MM/DD/YYYY):________________

Monitor's Names: ____________________________ Reviewed By: ________________________

Instr ID:	Instrument and Probe model & Type:			Entry & Exit QC checks: ______________(initial on return) QC Check Logbook Page #:					**GPS Information (if used)** Instrument ID: Manufacturer/Model:
Instr ID:	Instrument and Probe model & Type:			Entry & Exit QC checks: ______________(initial on return) QC Check Logbook Page #:					**Deployment Site QA/QC checks:** Site: Lat:_______ Long.:_______
Instr ID:	Instrument and Probe model & Type:			Entry & Exit QC checks: ______________(initial on return) QC Check Logbook Page #:					**Remarks:** Include ALL pertinent measurement factors. **Environmental:** Ground Conditions, mist, rain, etc. **If samples are collected at this site;** Note Sample ID and type here (11)
Time (Military) (2)	Location Description (Location/Flag ID if used) Attach map/drawing, if necessary (3)	Latitude (4)	Longitude (5)	Inst ID (6)	Measurement (7)	Units (8)	Radiation Type/ Energy (9)	Measure-ment Surface (10)	

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SAMPLE CONTROL FORM & CHAIN OF CUSTODY

"Sample Control Barcode"

Sampling Information (*to be filled out by the Field Team*)			
Collection Team ID: Collector's Name: Org:			
Location: _ GPS Latitude______________________ Longitude______________________ Description____________________________			
Collection Date: _______Collection Time (Military): ________# of Containers ______________Contact Dose Rate:____________			
Remarks: ____			
Sample Type (Use only once)	**Air**	Sampler ID # Type Filter Size & Type	
		Date ON: Time ON: Date OFF: Time OFF:	
		Start Flow: Stop Flow: **OR** Total Volume: Unit:	
	Milk	_ Cow _ Goat _ Other____________	_ Stored Feed _ Pasture _ Other________
		Milking Date: Milking Time: Number of Animals Sampled:	
	Ground	Depth of soil sample: cm	Vegetation collected with soil samples? _ Yes _ No
		Sample surface area:	If vegetation in separate container, provide sample #
	Water	_ Surface _ Ground/Well _ Portable/Tap _ Other:	
	Other	_ Vegetation _ Feed _ Produce _ Swipe _ Other:	
		Describe	
Sample Receiving (*to be filled out by sample receiving technician*)			
Processing Priority: Dup sample #: Split Sample #:			
Screening Value:		_ **Contamination Check:** Forms and sample bags surveyed	
Sampling Remarks:			
Analysis Requested:		_ **Sample Preparation Required:** send to sample preparation area before laboratory	
Laboratory Assignment:			
Special Instructions:			

Relinquished By:	Date	Time	Received By:	Date	Time
Relinquished By:	Date	Time	Received By:	Date	Time
Relinquished By:	Date	Time	Received By:	Date	Time

Original with Sample **Copy to Data Center Copy to Courier** **April 2004**

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LOCAL AREA MONITORING (LAM) TLDs

STATION				**TLDs**				**Remarks**
#	**Description**	**Latitude**	**Longitude**	**Number 1**	**Number 2**	**Deployed** **Date/Time Initials**	**Retrieved** **Date/Tim e Initials**	

CHAIN OF CUSTODY		**DATE**
Relinquished By:	Received By:	
Relinquished By:	Received By:	
Deployment Transit Control TLD Numbers	1)	2)
Retrieval Transit Control TLD Numbers	1)	2)
FOR LABORATORY USE ONLY		
FRMAC-To-Laboratory Transit Control TLD Numbers		

Original to Data Center **Yellow Copy to Field Monitoring** **Pink Copy to Laboratory** **April 2004**

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APPENDIX J

LABORATORIES FOR RADIOANALYSIS

OF ENVIRONMENTAL SAMPLES

Federal Laboratory Resources
State Laboratory Resources
Other Laboratory Resources

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LABORATORY ANALYSES OF ENVIRONMENTAL SAMPLES

In response to a radiological incident, in addition to obtaining instrument readings in the field, samples may be collected and counted in the field and later by a mobile or field laboratory and/or a permanent laboratory facility. These environmental samples provide reproducible data to support further decision-making to protect the public and the environment.

Federal Laboratory Resources

Field Radiological Laboratories

The FRMAC Monitoring and Analysis Manual, Volume 2: Sample Preparation and Analysis (DOE/NV/11718-181-Vol.2), provides Standard Operating Procedures (SOPs) for sample processing and radioanalysis that will be used during a FRMAC response to a radiological incident. Recognizing that there is a need to process a relatively large number of samples in the shortest possible time, the SOPs are at times a compromise between precise analytical determinations and determinations for emergency response activities.

Part of the FRMAC assets is the ability to transport and establish a radiation laboratory to analyze environmental samples collected during the radiation incident. One of the reasons for accepting the use of FRMAC SOPS to collect samples and FRMAC forms for recording data/information is to maintain consistent data quality regardless of which agency collects and/or analyzes the samples.

Permanent Laboratory Facilities

The EPA laboratory in Montgomery, AL, analyzes the particulate filters, water and milk samples collected under the ERAMS program. Filters from deployable long-term air monitors and environmental samples collected by the EPA Radiological Emergency Response Team (RERT) can be analyzed by EPA laboratories in Montgomery, AL, and Las Vegas, NV.

The DHS-EML facilities in lower Manhattan consist of sample preparation areas and a variety of analytical labs including some for wet chemistry. Instrument systems for sample analysis include several shielded high energy resolution HPGe gamma-ray spectrometers, a liquid scintillation counter, and alpha spectrometers.

The Princeton Plasma Physics Laboratory (PPPL) and the Brookhaven National Laboratory (BNL) are operated by the Department of Energy. PPPL has special expertise in analyzing tritium in environmental and biological samples. BNL has the capability to do whole body counting for presence of internally deposited radionuclides in humans.

State Laboratory Resources

Field Radiological Laboratories

To support nuclear power plant radiological emergency response preparedness, New Jersey maintains a mobile laboratory that can provide gamma spectroscopy and gross alpha/beta analyses of field samples. The mobile lab would be located in an un-impacted area nearby to the incident. New York is in the process of procuring a mobile laboratory.

Permanent Laboratory Facilities

Both New Jersey and New York maintain State laboratories in Trenton and Albany, respectively. The laboratories can analyze air (particulate filters and canister cartridges), land (vegetation, soil, building material, etc.) water (surface, marine and ground-water), milk, and other environmental and food samples.

Other Laboratory Resources

Food Emergency Response Network (FERN)

FERN is a network of state and federal laboratories that are committed to analyzing food samples in the event of a biological, chemical, or radiological terrorist attack in this country. The federal partners in the FERN are the FDA, USDA, CDC and EPA.

The focus of the network will be to organize and utilize the nation's laboratory infrastructure for the detection of hazardous agents in foods at the federal, state, and local level, with the understanding that no single segment has sufficient resources to do the job alone.

The FERN consists of federal laboratories (FDA and USDA) and state public health, agriculture (food), and veterinary diagnostic laboratories. The FERN project coordinators are currently developing the chemical and radiological laboratory networks and hope to have laboratories in each state capable of analyzing biological, chemical, and radiological agents participating in the network in the near future.

Radiological Laboratory Coordinator: Martin Finkelson, Director, FDA Winchester Engineering and Analytical Center (WEAC), 109 Holton St., Winchester, MA 01890, 781-729-5700 x749, martin.finkelson@.fda.gov.

Academic, Medical, Private and Commercial Laboratory Resources

In addition to laboratory facilities operated by state and federal agencies, there are academic, medical, private and commercial laboratories that can perform radiochemical and spectroscopic analyses on environmental samples. Reports listing commercial and government/national labs that have participated in past performance testing by the EML under the DOE Quality Assessment Program can be found at www.eml.doe.gov/qap. Use of these laboratories can be coordinated by the federal, state and/or local agency contacts working within the Incident Command System.

END PAGE