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FEDERAL RADIOLOGICAL MONITORING
AND ASSESSMENT CENTER

**FRMAC OPERATIONS MANUAL
EMERGENCY PHASE**



U.S. DEPARTMENT OF ENERGY
NEVADA OPERATIONS OFFICE
LAS VEGAS, NEVADA

MAY 1997

Bechtel Nevada

REMOTE SENSING LABORATORY

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**FEDERAL RADIOLOGICAL
MONITORING AND ASSESSMENT CENTER
FRMAC OPERATIONS MANUAL
EMERGENCY PHASE**

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PREFACE

The primary reference for this manual is the Federal Radiological Emergency Response Plan, revised and published in May 1996. The contributors and reviewers have been members of the DOE FRMAC community, other participating federal agencies, the FRMAC Management Panel, and the Operations Working Group. They have reviewed this document in detail as well as from the broad perspective of the Federal Radiological Preparedness Coordinating Committee. This publication is the result of lessons learned from exercises, drills, and workshops.

This document is approved by DOE for use in a radiological emergency. In accordance with the Federal Radiological Emergency Response Plan, this *FRMAC Operations Manual, Emergency Phase*, is designed to be compatible with plans of the Lead Federal Agencies and states. Therefore, a wide review is recommended before the next revision. Readers and users are encouraged to provide comments, corrections, and suggestions for improvements.

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1.0 INTRODUCTION

The *FRMAC Operations Manual, Emergency Phase*, describes the operational processes and resources that will be used to provide a timely and effective response to a major radiological emergency and to assist the Lead Federal Agency (LFA) and the state(s) in protecting the public. This manual covers the emergency phase of the response when the Federal Radiological Monitoring and Assessment Center (FRMAC) is managed by the U.S. Department of Energy (DOE). The emergency phase is defined as the period when consequences resulting from the radiological accident or incident are assessed and actions are taken to protect the public.

1.1 Radiological Response in Perspective

When a radiological emergency exists, the highest priority is protecting the public, and all federal response activities are focused on assisting the state(s) in accomplishing this goal. The processes for achieving this are common to all response phases from alert to recovery. First, facts are gathered and translated into projections. The projections are used to make recommendations, and recommendations are the basis for determining actions taken to prevent or minimize hazards to the public. The FRMAC is in full operation in the emergency phase where facts about the radiation situation are gathered and translated into dose projections. The LFA takes the facts and projections and makes protective action recommendations (PARs) to the state(s). In turn, the state(s) take actions to protect the public. In all cases, concern for the health and safety of the public will dominate the processes.

The term "radiological emergency" is used throughout this report. It is applicable to an accident; an incident; a potential accident; or a potential, perceived, or deliberate act to disperse radioactivity in the environment.

1.2 Purpose – Intended Users

The primary purpose of this document is to establish plans and procedures to ensure effective and timely FRMAC field operations. All FRMAC managers, staff, agency representatives, supervisors, and leaders should be familiar with its content. The content will inform the intended users about FRMAC operations and functions so that they can understand the tasks and functions of other participants as well as the overall FRMAC operation.

The following personnel comprise the intended users for this document:

- FRMAC managers, supervisors, and leaders.
- FRMAC staff members.
- FRMAC liaisons to other emergency centers.
- Senior managers of federal agencies, program managers, and FRMAC representatives.
- State and local representatives in the FRMAC.
- State, tribal, and local representatives at other locations interfacing with the FRMAC.

The secondary purpose of this document is to facilitate training. The document can be used in training FRMAC personnel and others in the overall functions of the FRMAC.

1.3 Overview of the *FRMAC Operations Manual, Emergency Phase*

When the Federal Radiological Emergency Response Plan (FRERP) is implemented, the agency responsible for the overall federal response is referred to as the LFA. However, because of the complexity of collecting, analyzing, evaluating, assessing, and interpreting off-site radiological data, the

FRERP specifies that a technical operations center must be established where these activities will be conducted. This center is the FRMAC.

The FRMAC coordinates the federal resources used in responding to the off-site radiological monitoring and assessment needs at the emergency site. The FRERP refers to "on-site" as the area inside the facility fence line or property line where the emergency has occurred. If a nuclear weapon is involved, "on-site" is the area inside a federal, government-defined National Defense Area (NDA)¹ or National Security Area (NSA)² where the emergency has occurred. "Off-site" applies to all other areas.

The primary goal of the FRMAC is to collect off-site, environmental radiological data and provide the data and assessments as rapidly as possible, in an understandable and/or requested format, to the LFA and state(s). This manual describes the step-by-step process by which this is done. It covers the FRMAC's relationship with other federal agencies and the state(s) and discusses the interfaces necessary to achieve the objectives. This manual also discusses the internal operations of the FRMAC from initial notification through data collection and distribution of the data and assessments for the LFA and state(s) to turnover of the FRMAC responsibility to the Environmental Protection Agency (EPA). After reading this manual, FRMAC participants should understand their tasks in relation to others and in relation to the overall mission and objectives of the FRMAC. A simplified FRMAC organizational chart is shown in Figure 1. A more detailed chart and discussion of functions is provided in Section 4 (see page 25).

1.4 Background and History of the FRERP and FRMAC

Following the accident at the Three Mile Island Nuclear Power Plant in March 1979, the President and Congress directed federal agencies to develop a plan to deal with such an event. The federal agencies responded and developed the FRERP for use in any kind of large, radiological emergency. The FRERP describes the roles of various federal agencies involved in the response and the coordination of federal activities with those of the states and responsible agency.

It was recognized that when a major radiological emergency impacts the public, the state(s) will need federal assistance to characterize and assess the radiological conditions. The FRERP establishes the FRMAC to fulfill this function. Because of its history and capabilities in radiological monitoring and assessment, DOE was assigned the responsibility to establish and initially manage the FRMAC. The FRERP also assigns long-term management responsibility of the FRMAC to the EPA following the emergency phase of the accident.

The following list contains examples of emergencies involving radioactive materials.

- Accident at a nuclear power plant.
- Nuclear weapons transportation accident.
- Radioactive material transportation accident.
- Vent or seep following an underground nuclear weapons test at the Nevada Test Site (NTS).
- Weapons-production facility accident.
- Global airborne material resulting from a weapons detonation or other type of emergency originating outside the borders or territories of the United States.

¹ NDA – Term used by DoD

² NSA – Term used by DOE

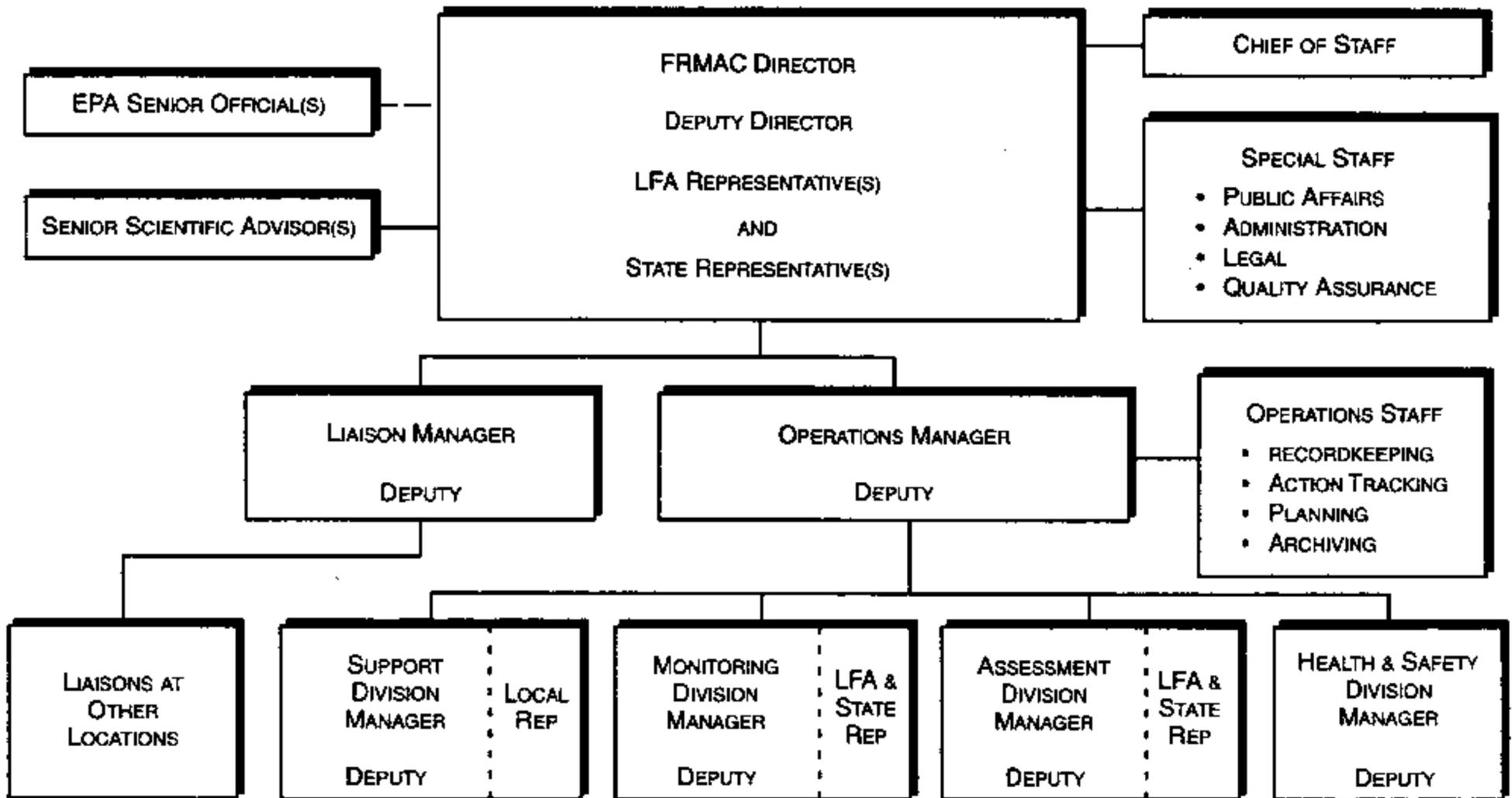


FIGURE 1. FRMAC ORGANIZATION

- Loss or breach of a sealed radioactive source.
- Launch-pad accident involving a space vehicle.
- Reentry accident involving a space vehicle.
- Terrorist activity involving the threat or deliberate release of radioactive material.

The previous list is not intended to be all inclusive; however, responses to many emergencies have been implemented in the past. In general, any type of accident involving radioactive materials will require an emergency response to protect public health and safety.

The FRMAC has participated in the following major exercises including deployment:

- FFE³ 1 (St. Lucie) (Reactor) 1984
- Mighty Derringer (Nuclear Emergency Search Team [NEST]) 1986
- FFE 2 (Zion) (Reactor) 1987
- Compass Rose (NEST, Accident Response Group [ARG]) 1988
- Distinct Action (ARG) 1989
- Galileo Launch (National Aeronautics and Space Administration [NASA]) 1989
- Diget Prime (ARG) 1990
- Ulysses Launch (NASA) 1990
- Plutonium Valley (NTS) (ARG) 1992
- FRMAC-93 (Ft. Calhoun)(FRMAC only) 1993
- Fremont (DOE Hanford) 1993
- Handshake I (NTS) (FRMAC only) 1994

³ Federal Field Exercise (FFE)

- Display Select (ARG) 1995
- Dial Flinty (ARG) 1996
- Handshake II (Savannah River Site) (FRMAC and the Radiological Assistance Program [RAP]) 1996

NEST is the DOE program element that responds to a nuclear threat situation. ARG is the DOE program element that responds to a nuclear weapons accident. RAP is the DOE program element that responds to requests for assistance from any state or local agency.

State or local governments have primary responsibility for protecting life, property, and the environment in the public domain. The LFA will oversee federal radiological activities, and the Federal Emergency Management Agency (FEMA) will oversee federal, nonradiological activities in support of state(s) activities. The FRMAC's primary role is to support the LFA and state(s) in managing and coordinating off-site, environmental, radiological monitoring and assessment activities.

1.5 FRMAC Activation and Response

The first responders to a radiological emergency are usually state officials and local police or fire authorities, and these jurisdictions have direct responsibility for identifying public protective actions. In many instances, state and local resources are sufficient to successfully implement the desired actions. If not, federal assistance will be requested.

For a small radiological emergency, the resources of one federal agency may be sufficient for the needed response. An example is a call for advice or for a DOE RAP team response. In these cases, the responding agency is expected to manage the resources used for the response without needing additional resources. In other emergencies, the expertise and resources of several federal agencies might be required. The personnel resources could be large or small, but coordinated management of the combined federal resources to support the LFA would be required.

The federal government will respond when a state, other governmental entity with jurisdiction, or a regulated entity requests federal support or when federal agencies must respond to meet their statutory responsibilities (*i.e.*, when an emergency significantly affects federal missions, personnel, property, or resources). A FRMAC may be activated when a major radiological emergency exists. Depending on the nature of the radiological emergency, the first federal off-site monitoring responders could be DOE RAP teams, EPA monitors, or a Department of Defense (DoD) response unit. These teams provide their own management. If additional federal monitoring resources are needed, DOE Headquarters (DOE/HQ) is notified.

A major radiological emergency would exist if significant impact to the public occurred or could potentially occur. An airborne release or a release into a major drinking water supply (potential or real) could be considered primary factors that define a major radiological emergency. Such an emergency exists if a request for DOE assistance has been received from a DOE-owned facility, a state or local government, or other federal agency that requires capabilities exceeding those of the first federal responders. A declaration to respond to a major radiological emergency will be made by DOE/HQ in consultation with the cognizant DOE Regional Coordinating Office (RCO) and DOE Nevada Operations Office (DOE/NV). Once the decision to establish a FRMAC is made, DOE/NV management will take the following actions.

- A. Designate a FRMAC Director from the DOE/NV staff (with DOE/HQ concurrence).

- B. Identify and request deployment needs and resources.
- C. Establish contact with the LFA, state(s), or local jurisdiction and with the RAP Coordinator of the cognizant DOE RCO.
- D. Deploy a FRMAC Advance Party to the scene of the emergency.
- E. Deploy the FRMAC Main Party.

1.6 FRMAC Mission

The FRMAC becomes a coalition of all federal offsite monitoring and assessment efforts to assist the LFA, states(s), and local authorities in a timely manner. A FRMAC provides an operational framework for coordinating and managing these offsite radiological activities during a response to a radiological emergency. State and local agencies are invited to collocate and prioritize monitoring efforts in the FRMAC.

Because the DOE is assigned initial management of the FRMAC, it is the DOE's responsibility to choose the FRMAC site, ensure timely deployment of personnel and equipment, and satisfactorily establish, manage, and coordinate FRMAC activities.

The FRMAC field organization must accomplish the following specific tasks.

- A. Provide, in cooperation with other federal components, the personnel and equipment to coordinate and perform environmental monitoring and assessment activities. Request supplemental assistance and technical support from other federal agencies when needed and when considered necessary to maintain the credibility of the off-site assessment.
- B. Manage the responding FRMAC resources in the most time-effective and efficient manner possible to support the needs of the LFA and state(s).
- C. Manage and direct the federal, off-site, environmental, radiological monitoring, assessment, and evaluation activities. Maintain a FRMAC liaison with state and local authorities who have similar responsibilities.
- D. Maintain a common set of off-site, environmental, radiological monitoring data in an accountable and retrievable form and ensure the technical integrity of the data.
- E. Provide data and interpretations as well as exposure-rate contours, dose projections (including future radiation levels and potential dose commitments), and other requested radiological assessments to the LFA, state(s), or other designated agencies or jurisdictions as quickly as possible.
- F. Support the LFA in providing off-site monitoring, analysis, and assessment to meet LFA requirements. Provide data to the LFA for developing PARs and promote the involvement of other federal agencies in this process.
- G. Provide technical and medical advice for handling radiological contamination.
- H. Assist in planning the recovery of the off-site area and promote the involvement of agencies having radiological expertise in participating with the federal, state, and local agencies. This recovery may involve planning for decontamination, reentry, relocation, and return.

1.7 State and Local Emergency Responsibilities

1.7.1 Public- and Private-Sector Response

Tribal, state, county, and city governments have primary responsibility for determining and implementing measures to protect life, property, and the environment in areas that are outside the boundaries of a fixed nuclear facility or not under the control of a federal agency. The owner or operator of a nuclear facility has primary responsibility for responding to occurrences taking place within the boundaries of that facility, for providing notification and advice to off-site officials, and for minimizing the radiological hazard to the public.

For emergencies involving areas under federal control, the responsibility for on-site actions belongs to a federal agency while responsibility for off-site actions belongs to the tribal, state, and/or local government. For all other emergencies, the tribal, state, and/or local government has the responsibility for on-site and off-site actions.

Because the assignment of specific responsibilities for protecting the public varies between states and because tribal, county, and city interests are involved as well, this manual employs the term "local authorities" to generically address the group in the public sector that has responsibilities for radiological protection of the public.

1.7.2 Role of the State and Local Governments

State or local authorities are, in most circumstances, the primary decision makers for all off-site activities including all public protective actions and releases of information to the public. They will assess the situation and issue instructions to implement the necessary protective actions. The state receives PARs from the facility operator or the LFA who acts as the primary federal channel for such recommendations.

If home rule exists in the involved jurisdiction during the emergency phase, the local senior elected official such as a county administrator or chair of the county board of supervisors is responsible for the health, safety, and welfare of individuals within the jurisdiction's geographical boundaries. The governor of the involved state is responsible during emergencies or crises and will be expected to direct measures to satisfy that responsibility. The local and/or state off-site radiological emergency response plan will identify the responsible agencies for the recovery phase of the emergency.

It is important to recognize that for nuclear weapon component accidents, land may be temporarily placed under federal control by establishing an NDA or NSA to protect U.S. government-classified materials. These lands will revert back to state or local control when the NDA or NSA is disbanded.

The primary purpose for off-site monitoring and assessment (FRMAC's role) is to protect the public. Because the state(s) and/or local authorities are directly responsible for decisions related to public protection, the FRMAC must coordinate and interface with them in operational functions. The LFA and state(s) are both customers of the FRMAC.

2.0 FEDERAL EMERGENCY RESPONSE RESPONSIBILITIES

Notwithstanding the primacy of the state and local governments for protecting off-site public health and safety, some federal agencies have statutory authority to respond to certain situations affecting public health and safety without a request from the state. Section 2.0 discusses these issues as well as the overall federal assistance for a major radiological emergency.

2.1 FRERP

The FRERP sets forth the federal government's operational concept of radiological emergency response. It is used by federal agencies in wide-range, peacetime, and radiological emergencies. The FRERP cites the relevant legislative and executive authorities and provides a framework for coordinating federal actions within those authorities; it does not create new authorities. It primarily addresses the off-site, federal response in support of the state and local authorities having jurisdiction over the emergency site.

2.2 Role of the FRMAC in the FRERP

The FRERP calls for a FRMAC to coordinate federal agencies in monitoring and assessing off-site, environmental, radiological conditions to support the impacted state(s). The FRMAC is implemented as soon as possible after the radiological emergency and continues operations until the LFA and the state(s) agree that the FRMAC is no longer needed. DOE will initially manage the FRMAC. The EPA will manage the FRMAC after the emergency phase is over. For continuity and long-term retention of records, the FRMAC will maintain a comprehensive, accountable, and traceable database of off-site, environmental, radiological data.

2.3 Federal Roles

2.3.1 Role of the LFA

The LFA is the federal agency that owns, authorizes, and regulates the facility or is otherwise deemed responsible for the facility or radiological activity causing the emergency and has authority to take on-site action. When it is necessary for a federal agency to assume the LFA role and to deploy to the site, the LFA will manage federal actions on-site; assist in developing, evaluating, or recommending off-site protective actions to be taken by the state(s) based on federal Protective Action Guides (PAGs); provide advice on issues such as reentry; and help implement those actions if requested by the state(s).

2.3.1.1 RESPONSIBILITIES OF THE LFA

Consistent with its role, the LFA will perform the following duties.

- A. After receiving the emergency notification specifying the location, severity, and potential consequences and initial response actions from the emergency site, the LFA will take the following actions:
 1. Verify notification with the state(s).
 2. Notify FEMA and other federal agencies.

- B. Activate and deploy resources as follows:
 - 1. Deploy a response team to provide liaison to the state and local authorities.
 - 2. Designate a federal On-scene Commander (OSC) to manage on-site activities and coordinate the overall federal response.
 - 3. Establish the Joint Operations Center (JOC) and the Joint Information Center (JIC).
- C. Provide on-scene activities as follows:
 - 1. Lead and coordinate all federal on-scene actions to assure state and local governments that federal activities are compatible with state and local governmental activities and goals for protecting life, property, and the environment.
 - 2. Oversee the on-site response and provide information about on-site conditions and assessments that might have significant off-site impact.
 - 3. Coordinate the overall federal monitoring and assessment activities to assure the state(s) that their needs are addressed; approve the release of official, federal, off-site data; and provide other data to the state and FRMAC.
 - 4. Coordinate, develop, evaluate, and present PARs to the state and local authorities, including federal positions based on PAGs and consultation with the Advisory Team for Environment, Food, and Health (Advisory Team) to obtain their recommendations.
- D. Collect information regarding status of the overall federal response and on-site conditions as follows:
 - 1. Coordinate timely public information releases with the facility owner/operator and state and local authorities.
 - 2. Provide public information releases through the JIC by coordinating the collection of information from federal agencies and various media centers.

2.3.1.2 POTENTIAL LFAs AND FEDERAL SUPPORT

The currently identified potential LFAs are shown in Table 1.

2.3.2 Role of FEMA

FEMA's primary responsibilities in the federal emergency response are to immediately notify participating federal agencies and to serve as a focal point for coordinating the federal, nonradiological, response activities at the national level and at the emergency site. The director of FEMA will designate and deploy the Senior FEMA Official (SFO) to coordinate FEMA response activities at the emergency site.

2.3.2.1 ROLE OF THE EMERGENCY SUPPORT TEAM AT FEMA HEADQUARTERS

FEMA will take the following actions through its emergency support team.

- A. Notify participating federal agencies of the emergency situation and supply the information they need to take appropriate actions.

Table 1. Identification of LFAs for Radiological Emergencies

Type of Emergency	LFA
Nuclear Facilities 1. Licensed by NRC or an agreement state ^a 2. Owned or operated by DoD or DOE 3. Not licensed, owned, or operated by a federal agency or an agreement state	NRC DoD or DOE EPA
Transport of Radioactive Materials 1. Shipment of materials licensed by NRC or an agreement state 2. Materials shipped by or for DoD or DOE 3. Shipment of materials not licensed or owned by a federal agency or an agreement state	NRC DoD or DOE EPA
Domestic Satellites Containing Radioactive Materials	NASA or DoD
Impact from Foreign or Unknown Sources	EPA
Other Types of Emergencies	LFAs confer

^a An agreement state is a state that holds agreements with the Nuclear Regulatory Commission (NRC) to license and have regulatory authority over nuclear materials in its state.

- B. Coordinate federal, nonradiological, emergency response activities at the national level.
- C. Receive information at the Emergency Information and Coordination Center from the LFA headquarters or from other public and private organizations about the impact of the emergency and the organizations' responses.
- D. Prepare periodic reports on the federal response for the White House.
- E. Provide staff support and other resources to the SFO, as required.

2.3.2.2 ROLE OF THE EMERGENCY RESPONSE TEAM AT THE EMERGENCY SITE

The FEMA response at the emergency site is carried out through its emergency response team headed by the SFO. This process takes place at the Disaster Field Office (DFO) managed by FEMA.

2.3.2.3 ROLE OF THE SENIOR FEMA OFFICIAL

Acting on behalf of FEMA, the SFO's role is to perform the following actions.

- A. Promote coordination among federal agencies and the state(s) in conjunction with the LFA to include providing federally developed or evaluated protective actions and recovery recommendations to the responsible state(s) or local off-site authorities. Open interaction among federal, state, and local authorities is encouraged. The SFO will not intervene in the relationships and communication channels that already exist between federal and state agencies; rather, the SFO provides an additional means for facilitating federal-state interactions.

-
- B. Coordinate nonradiological, off-site activities with on-site emergency response activities of federal and state agencies.
 - C. Serve as an information source on the status of the overall federal response efforts.

2.3.3 Role of the DOE

The DOE could have two significant roles in a major radiological accident. It will manage and coordinate the FRMAC, and it could also be the LFA.

2.3.3.1 ROLE OF THE DOE AS THE LFA

Because the DOE transports nuclear materials and operates national laboratories and facilities, the DOE is the LFA for a radiological emergency involving DOE-owned nuclear materials. In addition, the DOE would provide direct assistance and advice to the DoD or the Federal Bureau of Investigation (FBI), if requested, regarding certain on-site activities.

2.3.3.2 ROLE OF THE DOE IN PREPARING FOR A FRMAC

The DOE has the initial responsibility for preparing for a FRMAC. Some specific DOE tasks include, but are not limited to, the following.

- Preparing plans, procedures, and training materials for FRMAC operations.
- Preparing plans and procedures for FRMAC interfaces with LFA, state(s), local agencies, and other federal agencies.
- Identifying resources that can be used by the FRMAC and developing plans for deploying these resources.
- Identifying and training personnel for 24-hour FRMAC operations.
- Informing potential LFAs, state(s), and other federal agencies about DOE plans to implement and operate a FRMAC.
- Participating in drills and exercises related to FRMAC operations.

2.3.3.3 ROLE OF THE DOE AS MANAGER OF THE FRMAC

The DOE has a major role in a federal emergency response by coordinating the federal, radiological monitoring and assessment activities at the FRMAC. Several responsibilities are described below.

- Coordinating off-site, radiological monitoring, assessment, evaluation, and reporting of federal agencies according to the provisions of the FRERP.
- Maintaining a common set of off-site, environmental, radiological monitoring data.
- Maintaining a liaison with the LFA, state, and local authorities having similar responsibilities.
- Providing monitoring data and related assessments to the LFA and state(s).

Responsibilities include coordinating federal assistance for radiological monitoring and assessment during the emergency response. Some specific DOE tasks include, but are not limited to, the following.

- Providing an operational framework used by federal agencies to coordinate their off-site, emergency, radiological monitoring and assessment activities in support of the LFA and other federal, state, and local authorities.
- Providing the off-site, radiological monitoring and assessment services in support of primary, on-site DOE missions such as NEST and ARG.

The DOE concept of a fully staffed and operational FRMAC includes the following characteristics.

- Directed by a single manager working hand in hand with the LFA and state representatives.
- Integrates management of personnel and assets.
- Establishes specific priorities and plans and standard methods and procedures.
- Promotes cooperative participation among supporting agencies.
- Uses standard forms, units, and processes for data collection, laboratory analyses, and assessments.
- Implements appropriate quality control (QC) procedures for data collection, laboratory analyses, and assessments.
- Conducts appropriate reviews and distributes results.
- Holds regular briefings, both internal and external to the FRMAC.
- Identifies and integrates support requirements.

2.3.3.4 ROLE OF THE DOE AFTER THE EMERGENCY PHASE

After the emergency phase, the DOE will transfer FRMAC responsibility to the EPA at a mutually agreeable time. The DOE will continue to support the EPA for as long as needed.

2.3.4 Role of the EPA

The EPA shares the major federal responsibility with DOE for managing federal resources provided for off-site, radiological monitoring and assessment activities associated with the FRMAC. Initially, EPA assists DOE during the emergency phase and then assumes responsibility for managing the FRMAC during the intermediate and recovery phases. Additionally, the EPA could be the LFA.

2.3.4.1 ROLE OF THE EPA AS THE LFA

The EPA is the LFA for an emergency involving radiological materials not licensed or owned by a federal agency or an agreement state. The EPA is also the LFA when a radiological emergency occurs outside the boundaries of the United States or its territories but impacts the United States or its territories through airborne transport or through water or other media. The EPA operations center would probably be located in Washington, D.C. Data collected from national monitoring networks maintained by EPA, DOE, and NRC licensees is assessed to determine if health advisories to impacted states, reservations, or territories are recommended. Furthermore, the EPA assumes LFA responsibilities for domestic accidents involving nonlicensed radioactive material.

2.3.4.2 ROLE OF THE EPA AS A SUPPORT AGENCY

EPA provides members to the FRMAC management team and trained personnel to participate in field monitoring, sample collection, sample analyses, assessment, and evaluation activities. Also, EPA provides environmental and water-supply monitoring, interprets PAGs, assists in making PARs, and

assesses the consequences of radioactivity released to the environment. These services may be provided at the request of the LFA or state, or the EPA may respond to an emergency unilaterally to fulfill its statutory responsibility. The EPA actively participates with the U.S. Department of Agriculture (USDA) and the U.S. Department of Health and Human Services (HHS) on the Advisory Team for Environment, Food, and Health, when convened.

2.3.4.3 ROLE OF THE EPA AS FRMAC MANAGER

After the emergency phase when the accident site or facility has been stabilized, the environment has been characterized, and the participating federal agencies have agreed to continue to provide the necessary resources (personnel, equipment, and funding), the DOE transfers the FRMAC management responsibility to the EPA Office of Radiation and Indoor Air (ORIA) at a mutually agreeable time. The EPA then works with the LFA to coordinate the development of long-term monitoring and recovery plans and manages the federal radiological resources to accomplish the necessary intermediate and long-term recovery tasks to support the needs of the LFA and state(s).

2.3.5 Role of Other Federal Agencies

Authority for each agency's role during a radiological emergency is contained within the authorities cited in an appendix to the FRERP. Several agencies, such as the EPA, USDA, and HHS, have statutory responsibilities related to radioactivity. Several interagency agreements have been signed that pertain to the off-site monitoring and assessment activities covered by the FRERP. Other agencies such as the NRC and DoD have monitoring and assessment assets that could be a part of FRMAC operations.

Interfaces regarding activities where two or more federal agencies have related responsibilities have been identified. These interfaces are determined in large part by the nature and severity of given emergencies. The contact points for notification and interfacing, plan references, and sources of authority are provided in each agency's mission statement.

2.4 Public Information Releases

In some emergency situations, it may be necessary to release public information prior to establishing federal operations at the JIC. When this is the case, federal agencies must coordinate the release of public information through their headquarters with the LFA headquarter's public information officer (PIO). The LFA headquarter's PIO serves as the single point of contact at the national level for federal agency PIOs as well as for the media. The LFA headquarter's PIO, in conjunction with FEMA headquarters, will establish procedures for coordinating the release of public information with the state(s) before it is released to the media. The FRMAC does not release information to the public.

Before establishing federal operations at the JIC, federal agencies will coordinate releases of public information both at the regional level and near the site of the emergency through their headquarter offices in Washington, D.C. The points of contact for public information at agency headquarters will continue to operate throughout the emergency, but once the JIC is established, all information that was coordinated through Washington, D.C., must now be coordinated through the JIC prior to release. The Washington, D.C., centers may, however, handle overflow news media inquiries and serve as a

platform where carefully selected Washington, D.C., specialists supply background information as required.

2.5 White House and Congressional Relations

2.5.1 White House Responses

The LFA will report to the President and keep the White House informed on all aspects of the emergency. An initial report will be issued to include the cause of the emergency and the off-site radiological impact. Subsequent reports will cover the status, corrective actions, and protective measures and the overall federal response. All other federal agencies will submit information to the White House through the LFA. FEMA will provide information related to the nonradiological response, and other federal agencies will submit information on the technical and radiological aspects of the federal response.

2.5.2 Congressional Responses

Federal agencies will coordinate their responses to congressional requests for information with the LFA. If Congress requests information directly from a federal agency, that agency should inform the LFA of the request as soon as possible and coordinate its response with the LFA.

2.6 Coordinating International Responses

Although the geographical scope of the FRERP is limited to the United States and its territories, possessions, and territorial waters, it is recognized that radiological emergencies occurring near international borders (*i.e.*, near Canada and Mexico) could require international cooperative response efforts. If there is a potential foreign impact, the LFA will immediately inform the U.S. Department of State (DOS). The DOS will coordinate notification and information-gathering activities with foreign governments except in cases where existing bilateral agreements permit direct communication. If bilateral agreements are activated, those agencies will keep the DOS informed. The LFA will ensure that requests from foreign governments or offers to assist foreign governments are coordinated with the DOS.

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3.0 FRMAC NOTIFICATION, ACTIVATION, AND DEPLOYMENT

A radiological emergency is defined in the FRERP as “a radiological incident that poses an actual, potential, or perceived hazard to public health or safety or loss of property.” A major radiological emergency is one which exceeds the capabilities of state and/or initial federal response teams. Directions to activate the FRMAC will be issued by DOE/HQ when a major radiological emergency is imminent or has occurred. The *Interim Activation Plan, National Response Assets (NEST, FRMAC, RAP, ARG)*, provides guidance to DOE/NV personnel and DOE/NV contractors in the event a FRMAC is activated. Personnel notifications will be made according to the DOE/NV Emergency Operations Center (EOC) emergency response procedures.

Examples of requests requiring a FRMAC activation include a radiological emergency at a nuclear power plant or facility having the potential for, or resulting in, an off-site release; a nuclear weapons accident; a rocket liftoff or reentry accident involving a satellite carrying radioactive material; or a transportation accident resulting in a significant release of radioactive materials. A FRMAC may also be deployed in situations involving nuclear threats or terrorist activities.

3.1 Callup Procedures and Authorities Within DOE

DOE/HQ or a DOE RCO will likely be the first DOE organization to receive information concerning a major radiological emergency (see Figure 2). If a DOE RCO receives the call first, they will contact the DOE/HQ EOC. This section summarizes the notification processes for activating a FRMAC. DOE/HQ Defense Programs (DP) has a Duty Officer on call 24 hours a day. This Duty Officer will connect the organization requesting assistance with the appropriate DOE/HQ personnel authorized to activate and deploy DOE emergency response assets.

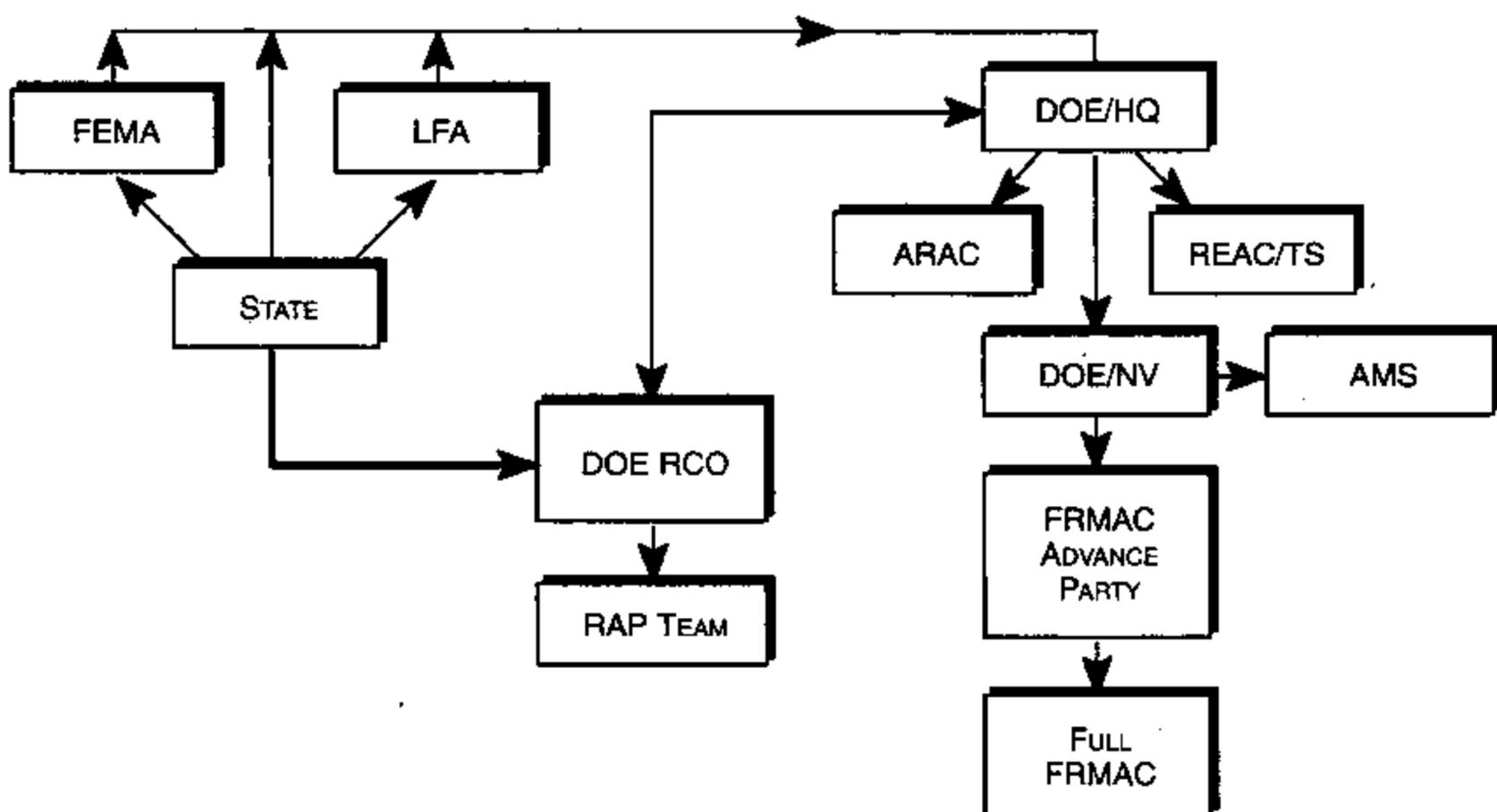


FIGURE 2. DOE ALERT, ACTIVATION, AND DEPLOYMENT

3.1.1 Responsibilities of the DOE/HQ Operational Emergency Management Team (OEMT)

Notification that a radiological emergency requiring deployment of a FRMAC will be made by DOE/HQ. DOE/DP has the final authority to activate DOE emergency response assets.

The DOE/HQ EOC will determine when the FRMAC has been authorized to deploy as follows.

- A. Normal Duty Hours Alert. OEMT will alert DOE/NV Emergency Management Division (EMD) during normal duty hours (7:30 a.m.–4:30 p.m. Pacific Time).
 1. The OEMT will communicate information to DOE/NV as it becomes available.
 2. The OEMT may call the DOE/NV Manager instead of, or in addition to, the DOE/NV/EMD.
 - a. Should this occur, the DOE/NV Manager will notify DOE/NV/EMD and/or the Assistant Manager for National Security.
 - b. DOE/NV/EMD will ensure that all required notifications are completed.
- B. Off-Duty Hours Alert. During off-duty hours, DOE/HQ will notify the DOE/NV EOC (on duty 24 hours). The person receiving the call will immediately notify the following.
 1. The DOE/NV Duty Officer.
 2. The DOE/NV Remote Sensing Laboratory (RSL) Duty Officer.

3.1.2 DOE/NV Responsibilities

The DOE/NV Duty Officer will alert DOE/NV management as outlined in the Duty Officer's procedures. If notification is received by DOE/NV from a source other than DOE/HQ, the Duty Officer will contact DOE/HQ. The DOE/NV Duty Officer, using the FRMAC EOC Notification Checklist, will notify personnel to activate the DOE/NV EOC. Other members of DOE/NV will be notified that a FRMAC will be activated. When DOE/NV/EMD receives the alert, key DOE/NV managers will be notified that the FRMAC will be activated. The DOE/NV Manager will designate a FRMAC Director with concurrence from DOE/HQ.

The DOE/NV EOC staff will immediately notify other FRMAC-responding agencies and organizations according to DOE/NV EOC procedures. The DOE/NV EOC will also establish communications with the LFA point of contact and provide the estimated time of arrival for the following elements at the emergency site as soon as the information is available.

- Aerial Measuring System (AMS) aircraft
- FRMAC Advance Party
- FRMAC Main Party

The DOE/NV EOC will also discuss possible locations of the FRMAC with the LFA point of contact and provide the names of DOE FRMAC liaison personnel for the Emergency Operations Facility (EOF), JOC, DFO, and state and local EOCs.

The initial DOE/NV EOC staff will include the designated Director, staff, and support coordinators.

- The DOE/NV EOC staff will alert DOE/NV contractors and manage deployment preparation and overall operation of the EOC.
- DOE/NV/EMD will designate and notify the personnel who comprise the EOC and backup staff.

- The Director will meet with the staff and determine required staffing levels, equipment needs, logistical support, other assets, and deployment procedures and determine other issues essential to meet anticipated needs in the field and the availability of the required resources.
- Once the Director is designated, the staff coordinators will notify personnel selected for the FRMAC management staff from the list of personnel in the *Interim Activation Plan, National Response Assets (NEST, FRMAC, RAP, ARG)*.
- DOE/NV will coordinate with DOE/HQ and with the DOE RCOs when a radiological emergency has occurred to determine the status of RAP team deployment.
- If the FRMAC is activated in conjunction with NEST and/or ARG, the composition of the DOE/NV EOC may be modified based on the existing situation and requirements.

3.2 Primary DOE Assets Accessible to FRMAC

DOE emergency response assets will be activated and deployed, as needed. DOE/HQ will coordinate the activities with the appropriate DOE RCOs and with DOE/NV. DOE/NV will coordinate activities related to predeployment such as logistics and support.

3.2.1 Radiological Assistance Program (RAP)

The RAP provides rapid initial response and assessment of radiological emergencies ranging from mislabeled packages or minor transportation accidents to radiological releases from nuclear power plants. Eight DOE RCOs can dispatch one or more RAP teams to the scene quickly with radiological monitoring equipment and protective clothing. DOE personnel, utilized for RAP responses, come from DOE facilities. Teams are staffed with experts in radiological monitoring and assessment and are equipped with instrument kits, radiological protective equipment, and vehicles. The RAP Team Leader at the emergency scene will act as the DOE Energy Senior Official (ESO) unless replaced by the FRMAC Director or other appropriate DOE personnel.

3.2.1.1 ACTIVATING THE RAP

Each of the eight DOE RCOs maintains a 24-hour emergency telephone number for response to requests for radiological assistance. The requestor can also call the 24-hour DOE/HQ EOC telephone number. The DOE/HQ EOC ensures notification to the appropriate DOE RCO.

This 24-hour capability ensures that the RAP teams will quickly reach the location to coordinate with local authorities in protecting the health and safety of the general public. If the magnitude of the emergency is beyond the scope of the RAP, additional federal resources can be deployed to enhance this crucial, first response force. The RAP is designed to augment other federal, state, and local assets when the scope of the emergency exceeds their capabilities.

The RAP mission includes making initial radiological monitoring assessments; identifying radioactively contaminated personnel, equipment, vehicles, or property; determining the need for additional technical resources; providing advice on personnel monitoring, decontamination, and recovery; and recommending sources of medical advice for treating injuries due to radiation exposure or complications from radioactive contamination.

3.2.1.2 RAP PRODUCTS

RAP teams document the radiological assessments and are prepared to provide this data to other federal, state, or local authorities at the scene. RAP is also prepared to request and include assessments and/or products from and interface with the other DOE emergency response assets (e.g., Atmospheric Release Advisory Capability [ARAC], AMS, and Radiation Emergency Assistance Center/Training Site [REAC/TS]) who may be asked to provide data. RAP teams are aware that this data is crucial and an integral part in the success of the response, especially if the FRMAC has been requested.

3.2.1.3 RAP INTERFACE WITH FRMAC

The RAP team begins interfacing with the FRMAC when deployment is authorized. The RAP team communicates with the FRMAC Director, directly or through the DOE RCO, during FRMAC predeployment activities. During these discussions, the Director and the RAP Team Leader can determine the initial FRMAC Advance Party arrival location and share the most current assessment data. The RAP Team Leader assists the on-scene authorities in preparing for the Advance Party but, at the same time, must continue and maintain focus with the on-scene, radiological monitoring and assessment activities. The RAP Team Leader will coordinate with the on-scene LFA representative, as necessary, until the Director arrives. If the AMS resources arrive before the Advance Party, the RAP Team Leader will assist in planning the AMS first mission in response to the LFA and state needs. The RAP teams' assessments are vital components of the state and RAP transitions with the FRMAC.

3.2.2 Atmospheric Release Advisory Capability (ARAC)

The ARAC at Lawrence Livermore National Laboratory is a centralized, real-time emergency response system that uses computerized models to estimate downwind consequences resulting from an atmospheric release of radioactive material.

3.2.2.1 ACTIVATING THE ARAC

ARAC is a DOE emergency response asset available to the FRMAC and can be activated independently. It provides plume and deposition predictions for RAP teams prior to FRMAC activation. ARAC can be activated at the request of the RAP team, DOE RCO, DOE/NV, or DOE/HQ EOC. The DOE/HQ EOC coordinates emergency requests and approvals to use ARAC.

ARAC requires the following information to perform computer calculations of the radioactive material dispersion in the atmosphere.

- Time and duration of the atmospheric release.
- Location of the release.
- Type of release (e.g., fire, explosion, stack venting, etc.).
- Nuclides and source strength. (If actual source strength is unknown, ARAC can use a normalized, unit-release rate.)
- On-site wind data, if available. (ARAC has real-time access to all National Weather Service [NWS] and military standard weather observations.)

ARAC can be contacted directly with accident information and requests for products, but the DOE/HQ EOC should be notified concurrently.

3.2.2.2 ARAC PRODUCTS

ARAC products include contour plots of air concentration, air immersion dose, ground deposition, or ground exposure rates overlaid on a map of the radiological emergency site. They are based on available source-term information and may be normalized if source strength is initially unknown.

A. Product Types

- Air concentration contours
- Air immersion dose
- Ground deposition
- Ground exposure rates

B. Product Availability

- ARAC-supported site Notification + 15–30 minutes (normal duty hours)
Notification + 30–60 minutes (off-duty hours)
- Other U.S. locations Notification + 1–1.5 hours (normal duty hours)
Notification + 1–2 hours (off-duty hours)

After initial products are generated, ARAC calculations are updated hourly or more often for changing radiological emergency or meteorological conditions. ARAC calculations are also updated, as needed, based on actual ground deposition measurements made by RAP and/or FRMAC teams.

C. Product Uses

- Assessing downwind areas receiving significant dose and deposition
- Aid in deploying field teams
- Aid in developing an AMS survey plan

By comparing calculated air concentrations and ground deposition values with those measured in the field, ARAC can estimate source strength.

3.2.2.3 DISSEMINATION OF ARAC PRODUCTS

Copies of ARAC products are transmitted to the DOE organization at the radiological emergency site, LFA, and DOE/HQ EOC (through fax or established computer-to-computer links) as well as to other DOE organizations involved in the emergency response, as needed.

3.2.3 Aerial Measuring System (AMS)

AMS is a unique fleet of fixed-wing aircraft and helicopters equipped with radiological detectors. AMS is designed to respond to radiological incidents and perform plume tracking, radiation surveys, and radiation-mapping over large areas around the incident site. The DOE/NV RSL operates AMS for DOE. The aerial monitoring assets are located at the Nellis Air Force Base in Las Vegas, Nevada, and at Andrews Air Force Base near Washington, D.C.

3.2.3.1 ACTIVATING AMS

Before deploying AMS, DOE/HQ/DP must approve the release of assets. This authorization is initiated by a request for assistance from the LFA, state(s), or other participating DOE emergency response group. A requester must provide a callback telephone number for the FRMAC Director. The Director or designee will call back within one hour to coordinate the initial AMS flight. AMS flights will be coordinated by the DOE ESO. AMS will be absorbed in the FRMAC Monitoring Division once the FRMAC is in place.

3.2.3.2 AMS PRODUCTS

AMS includes a field-portable computer system that converts the data collected by the aircraft and produces contour plots of exposure rates and/or isotopic concentrations. These plots can be overlaid on any map of the affected region to easily identify contaminated areas. The AMS computer system can also produce gamma-ray energy spectra for identifying radionuclides.

The sensitivity of the AMS helicopter is very good when using eight 4- × 4- × 16-inch sodium iodide detectors. For example, a helicopter flying 150 feet above ground level will have a minimum detectability of 0.05 microcuries per square meter ($\mu\text{Ci}/\text{m}^2$) for cesium-137; 0.05 $\mu\text{Ci}/\text{m}^2$ for iodine-131; and 0.2 $\mu\text{Ci}/\text{m}^2$ for americium-241. An additional factor of three in sensitivity can be gained with area averaging. The resolution of the AMS detectors is approximately ten percent of the photopeak energy. The minimum detection level of exposure rate is lower than 1 $\mu\text{R}/\text{h}$ above background.

3.2.3.3 OTHER AMS USES

The AMS aircraft may also be used by the FRMAC for aerial photography and infrared scanning. AMS has a complete inventory of precision cameras and support equipment to provide vertical and oblique aerial image-acquisition services. Additionally, a staff of photographers, trained in field operations, is available to document accidents and other emergency situations. Infrared scanning can be used to detect changes in surface temperature.

3.2.4 Radiation Emergency Assistance Center/Training Site (REAC/TS)

The REAC/TS, located in Oak Ridge, Tennessee, provides deployable medical and health physics personnel. These trained personnel specialize in providing advice concerning individuals who have been exposed to radiation.

REAC/TS and other emergency medical coordinators work within the FRMAC Health and Safety (H&S) Division and furnish information to the FRMAC Director. In addition to emergency response situations such as the FRMAC, REAC/TS is designated as a World Health Organization Collaboration Center for radiological emergency assistance. REAC/TS personnel are on 24-hour call to provide responders with consultative or direct medical and radiological assistance. REAC/TS also provides medical assistance for FRMAC workers.

3.3 FRMAC Deployment

The FRMAC is activated through DOE/HQ in concurrence with DOE/NV. The FRMAC is deployed to a major radiological emergency when a request is received from a local or state government or a federal agency that requires capabilities exceeding those provided by the initial federal response. The

FRMAC will assist the LFA and the state(s) with personnel, equipment, and technical resources, as needed.

3.3.1 FRMAC Advance Party

The FRMAC Advance Party is led by DOE/NV. In an emergency response, the Advance Party will depart for the accident site within two to six hours of the order to deploy and should arrive at the site within two to eight hours after departure.

3.3.1.1 STAFFING

The FRMAC Director, appointed by DOE/NV with concurrence of DOE/HQ, is the DOE ESO.⁴ The Director, Operations Manager, and technical resource specialists are expected to make up the key members of the Advance Party. Depending on the extent of the accident, other staff members such as the Support Manager, communications specialists, and photographer could be deployed as part of the Advance Party with the Director. Depending on transportation and the extent of the emergency, the Advance Party could deploy six to twenty personnel.

3.3.1.2 INTERFACES

When the FRMAC Advance Party is on-scene, the area RAP Team Leader will brief the FRMAC Director on the status of the incident. DOE radiological assistance will support the state and local authorities, not supersede them. Response personnel (e.g., RAP teams, AMS, etc.) will cooperate with federal, state, local, or private officials who have jurisdiction over the activities at the scene. If AMS is deployed, it will be under the direction of the RAP Team Leader until the Director, or equivalent authority, arrives.

The Advance Party will meet with the LFA and state representatives to obtain the status of the emergency, public protective actions that have been initiated, and available monitoring data and other pertinent information. During this meeting, the FRMAC, LFA, and state liaisons will be identified and the initial FRMAC radiological monitoring and sampling plan will be agreed upon. This plan will reflect the LFA and state requirements and emphasize public safety by (a) monitoring where people are located, (b) providing monitoring data to estimate the validity of the dispersion and deposition models in use, (c) providing data that can be used to plan for protective actions, and (d) characterizing the radiological deposition of the off-site area. An Advance Party checklist is given in Appendix A.

3.3.1.3 RESOURCES AND EQUIPMENT

The FRMAC Advance Party and the AMS aircraft equipped with radiation monitoring systems may be simultaneously deployed. DOE/NV will deploy the minimum personnel and equipment necessary as part of the Advance Party. Depending on the severity of the emergency, the Advance Party will assist in recommending the equipment and number of personnel to deploy with the FRMAC Main Party. In addition, each member will be carrying personal luggage necessary for two weeks in the field.

⁴ DOE will appoint both an ESO and a FRMAC Director during a nuclear weapon accident or a nuclear terrorist threat or when DOE is the LFA.

3.3.1.4 TRAVELING OPTIONS

Advance Party personnel may be deployed in DOE-owned, military, or commercial aircraft from the DOE/NV RSL facility at Nellis Air Force Base located in Las Vegas, Nevada, or from the RSL Washington Aerial Measurements Organization located at Andrews Air Force Base in Washington, D.C.

3.3.1.5 LOGISTICAL ACTIVITIES

Upon arrival at the site, the Advance Party will establish a command post and begin preparing for the full FRMAC. If an AMS aircraft is deployed, an adjacent airport or helicopter pad should be located to facilitate rapid data turnaround and field-based operations for the aircraft. Critical supplies such as jet fuel, liquid nitrogen, etc., need to be identified. Communication requirements need to be identified early because full installation may be lengthy. Availability of telephone lines and suitable radio repeater locations should be ascertained, and an initial on-site, hand-held radio network should be established.

All other major logistical considerations such as acquiring appropriate maps and continuing monitoring and assessment plans will be implemented. Establishing communication with ARAC is necessary so that ARAC personnel can access applicable meteorological and radiological information necessary for making projections.

3.3.1.6 FRMAC SITE SELECTION

Selecting a FRMAC site may be a complex process that is significantly driven by the scenario of the radiological emergency. Many variables must be considered, not only the FRMAC site but also major peripheral support facilities such as housing, airplane arrival, and vehicle availability. In addition, interaction with state and local monitoring activities and the emergency operations facility at the crisis site must also be considered in selecting a FRMAC location. All of these choices may be affected by the magnitude of the accident, protective action status, presence of an airborne radioactive plume, and other factors that will only be known at the time of the radiological emergency. Although possible FRMAC locations may be pre-identified, actual conditions at the time will dictate the selection of a site.

The RAP Team Leader may make a preliminary assessment of possible FRMAC locations. Upon arrival, members of the FRMAC Advance Party, in consultation with the LFA representatives and the state and local authorities, will make the final selection of a FRMAC site. For a large field exercise or actual emergency, the FRMAC site must provide environmentally protected space for 200 or more personnel (per shift) and associated equipment.

All of the FRMAC support resources are designed around the belief that a FRMAC operating site will not be finally selected until a crisis occurs. This is partly because the FRMAC may be responding to the aftermath of a disaster such as an earthquake, hurricane, flood, or significant radiation release that may preclude access to preselected FRMAC sites due to damage or contamination. Because of this basic operating premise, preselection of FRMAC sites is limited to simply identifying potential FRMAC locations. The DOE RCOs should be informed of the identity and location of these potential FRMAC sites. A more detailed discussion of FRMAC site selections as well as a typical FRMAC floor plan is given in Appendix B.

3.3.2 FRMAC Main Party

The goal of the FRMAC Main Party is to have the FRMAC activated and fully functional within 24 to 36 hours after initial notification of a radiological emergency. The Main Party will deploy with the majority of the FRMAC assets. After arrival at the FRMAC site, the Main Party will assist in setting up the FRMAC for full operation.

3.3.2.1 INITIAL INTERFACES

After the Main Party arrives, a status briefing is given by the FRMAC Director. Liaison personnel are exchanged. FRMAC liaison personnel will be provided to the other emergency response centers. The involved states are encouraged to provide representatives to the FRMAC. LFA representatives should be in the FRMAC facility to ensure that information flows promptly to the LFA and the state and that the FRMAC is apprised of any change in status at the radiological emergency site.

The EPA provides a senior representative to the FRMAC to provide continuity for the eventual transfer of the management responsibility for the FRMAC from the DOE to the EPA. Other signatory agencies to the FRERP are provided space and support in the FRMAC. These agencies ensure that their areas of concern are correctly addressed and that appropriate areas are considered. Local government officials, as requested by the state(s), will be invited to interact directly with the FRMAC, as appropriate.

3.3.2.2 RESOURCES AND EQUIPMENT

The DOE, EPA, and other federal agencies are prepared to provide significant radiation monitoring and assessment equipment and highly skilled personnel (response may vary from 200 to 500 personnel or more). In addition, the DOE FRMAC team brings essential communication, photo/video, computer network, and mechanical/electrical support to establish a FRMAC. Selection of these resources is based on the available information that describes the technical conditions and severity of the radiological emergency. Technical personnel are available to ensure that data products are provided to the LFA and state emergency centers as required. Depending upon the magnitude of the radiological emergency, some job functions would be combined to implement FRMAC objectives.

3.3.2.3 EQUIPMENT TRANSPORT

Equipment may be transported by military airlift, commercial aircraft, or other appropriate vehicles. A data van from DOE/NV RSL may also be deployed for infield aircraft data analysis. Mobile laboratories may be deployed by aircraft or may be driven to the FRMAC location. Choice of transportation also depends on the urgency, location, and magnitude of the deployment.

3.3.2.4 PERSONNEL TRANSPORT

Transportation arrangements for personnel traveling with the Main Party are made either through commercial airlines, military aircraft, and/or ground transportation.

3.3.2.5 FRMAC SETUP

The location and setup of a FRMAC is always off-site and usually at some distance from the immediate emergency location. In addition to the necessary administrative equipment, logistical support is also

required at the FRMAC. Database, audio/video, and other technical support are also needed as well as personnel who are trained in the various FRMAC functions. A complete FRMAC setup may take 24 to 36 hours after notification to be fully functional.

3.3.3 Arrival Times for DOE Assets

When notified that a FRMAC response is required, the DOE/NV Manager, with DOE/HQ concurrence, designates a FRMAC Director and initiates FRMAC deployment. A FRMAC Advance Party can be expected to arrive at the emergency site within two to eight hours after departure. The full FRMAC will be established within 24 to 36 hours. Figure 3 identifies the approximate arrival times of various DOE assets.

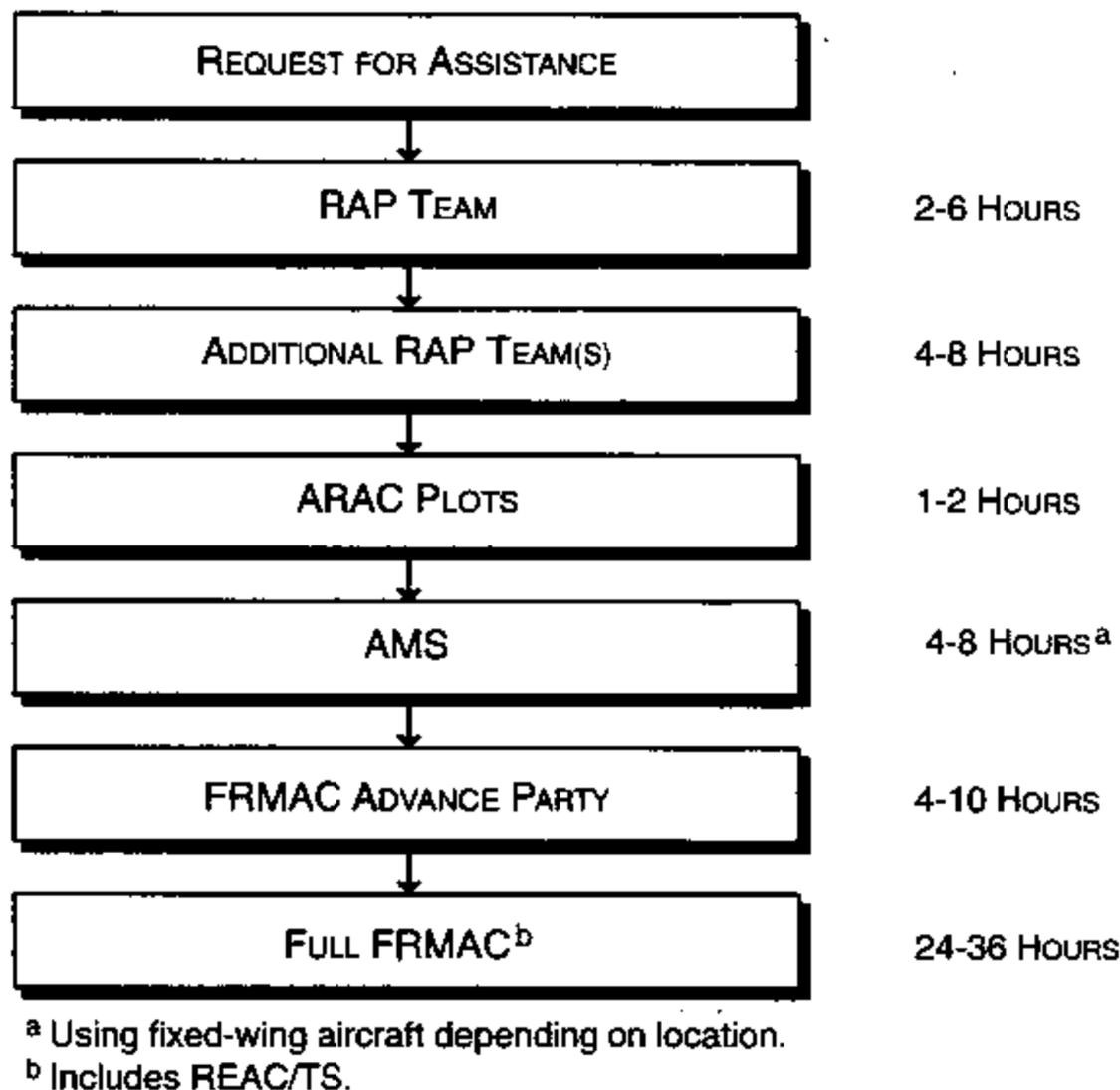


FIGURE 3. APPROXIMATE ARRIVAL TIMES FOR VARIOUS DOE ASSETS AFTER AUTHORITY TO ACTIVATE

4.0 FRMAC FIELD ORGANIZATION

4.1 FRMAC Organizational Structure

Key personnel needed to implement FRMAC operations for a large, full-scale deployment are shown on the FRMAC organization chart (Figure 4).

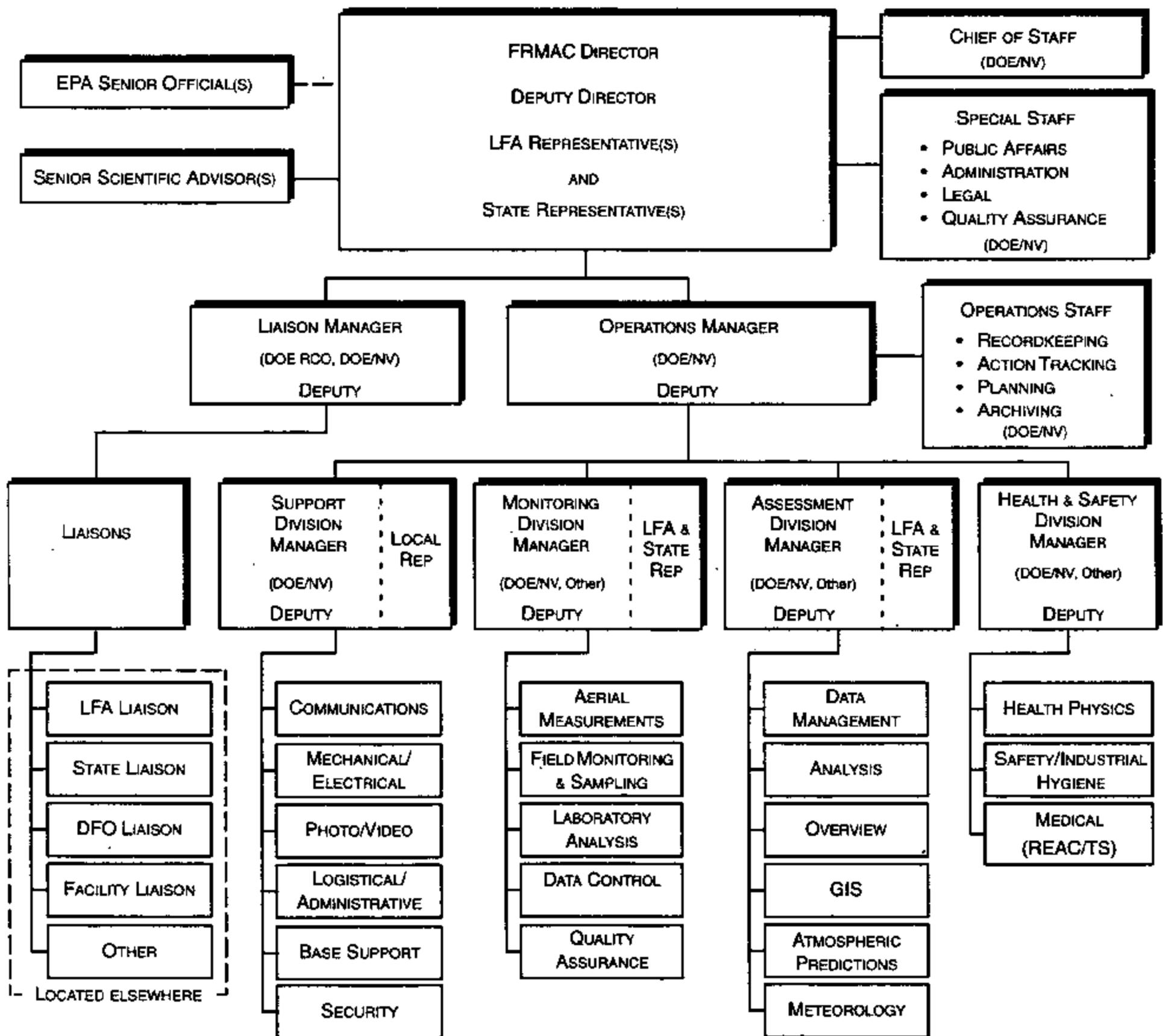


FIGURE 4. FRMAC ORGANIZATION CHART

The organizational structure has been adapted from lessons learned in many exercises including full-field, tabletop, and other exercises. In a less significant radiological emergency, the FRMAC concept would remain the same; however, some job functions might be combined and other functions would require fewer personnel.

The parenthetical notes on the organization chart indicate facilities where personnel may be drawn to fulfill the various positions. The notation "DOE/NV" means that, for a full deployment, DOE/NV and/or contractors will most likely fill the designated slots. The notation "DOE RCO, DOE/NV" means

that the slots will most likely be filled by the DOE RCOs, DOE/NV, and/or contractors. The notation "DOE/NV, Other" means the position(s) may be filled by DOE/NV, DOE RCO, or other federal agencies. Many agencies will have participants in FRMAC operations. These individuals become FRMAC participants, working together to accomplish the FRMAC mission as defined by the FRMAC management team.

Because the FRMAC is established to assist the LFA, state(s), and local authorities, their representatives interface closely with the FRMAC Director and staff. These representatives request FRMAC products and services and are responsible for delivering requests to the Director and staff. Also, technical representatives from these organizations are located in key positions at the FRMAC to help identify their parent organizations' needs.

The organization chart shows extensive participation by the LFA and state(s). Because the LFA and state(s) are the customers of the FRMAC, they play a major role in setting overall priorities.

4.2 FRMAC Management

The following paragraphs contain brief descriptive profiles of key personnel. Complete position descriptions are included in Appendix C. FRMAC functions are discussed in more detail later in this section.

4.2.1 FRMAC Director

The FRMAC Director is a senior manager from DOE/NV, appointed by the DOE/NV Manager with concurrence from DOE/HQ, and the senior DOE official managing the FRMAC during the emergency phase of the radiological emergency. This official directs the activities of personnel who are provided by DOE RCOs, DOE national laboratories, DOE contractors, or participating federal or state agencies. The Director is responsible for the overall execution and success of the emergency response. The Director is also responsible for establishing and maintaining communications with the LFA, state(s), and participating federal agencies in carrying out the objectives and operations of the FRMAC.

4.2.2 FRMAC Deputy Director

The FRMAC Deputy Director serves as the Director, when the Director is not available, with special emphasis on (a) ensuring information flow within the FRMAC and the completion of all requests and (b) reviewing the overall FRMAC activities and schedules.

4.2.3 LFA and State Representatives

The LFA and state representatives work directly with the FRMAC Director and Deputy in establishing priorities and in reviewing overall activities. The LFA representative coordinates requests from the participating federal agencies and, with the state(s) representative, provides input to the Director about overall needs for off-site monitoring and assessment to fulfill the priorities of the LFA and state(s).

4.2.4 EPA Senior Official

The EPA plays a major role in the FRMAC operations because this agency becomes responsible for managing the FRMAC when the emergency phase is over. The EPA Senior Official, who is from the EPA ORIA, functions as a senior staff liaison and interfaces directly with the FRMAC Director.

4.2.5 Senior Scientific Advisor

The SSA is a national expert in radiation health effects and environmental impacts of the involved radioactive material. The SSA (with staff if needed) provides an overview to the Director about the health effects and environmental impacts of the emergency. The SSA advises the Director about operational activities to meet the overall FRMAC objectives and works closely with the technical managers in the field organization.

4.2.6 Chief of Staff

The FRMAC Chief of Staff will oversee all Special Staff functions and will assist the FRMAC Director in other activities.

4.2.7 Special Staff

The special staff assists and advises the Director concerning administrative, legal, quality assurance, and public affairs issues. The legal coordinator provides legal advice to the Director concerning FRMAC operations and personnel. The PIO advises the Director about news media activities associated with the emergency, provides a liaison at the JIC, and interfaces with the LFA and state PIOs and media personnel, where appropriate. The quality assurance coordinator will oversee all FRMAC activities as related to quality assurance to "ensure the technical integrity of the FRMAC data" as defined by the FRERP.

4.2.8 Operations Manager

The Operations Manager assists and advises the Director in implementing and executing field operations and coordinating use of FRMAC resources. This manager advises the Director about staff and emergency functions and monitors the implementation and status of requests and events flowing through the FRMAC.

The Operations Manager is responsible for internal management of the FRMAC and reviews the overall safety and associated risks of specific operations before they are implemented. This manager is assisted by the Deputy Operations Manager and the FRMAC senior division managers.

4.2.9 Operations Staff

The status of all FRMAC activities, DOE assets (personnel, equipment, supplies, and files), and needs for additional resources, if applicable, will be recorded. Requests and actions will be documented, tracked, and maintained on a status board for the Director during the emergency phase. In addition to handwritten records, all status records are kept in a traceable and retrievable database for archiving purposes. Assurance that FRMAC activities are consistent with long- and short-range planning will also be provided.

4.2.10 Liaison Manager

The Liaison Manager coordinates information through FRMAC liaisons to the LFA, state(s), local authorities, FEMA DFO, and participating federal agencies and/or emergency response centers, as

needed. The liaison function ensures timely transmittal of critical monitoring and assessment information to the LFA, state(s), facility owner/operator (if there is one), and participating federal agencies, as approved by the LFA and the state(s). Data and information from these participating organizations and centers are transmitted to the FRMAC, as needed. The resolution of conflicts in data from other sources is facilitated and expedited through the FRMAC liaison personnel who are assigned to the response facilities. Liaisons are located in other response centers (not the FRMAC). They communicate with the FRMAC by telephone, fax, modem, and still video.

4.2.11 Support Division Manager

The Support Division Manager is responsible for providing administrative, communications, facilities, and mechanical systems support; photo and video support; logistical support (aviation and transportation); security; and general supplies (base support) and other support services to FRMAC participants, as needed.

4.2.12 Monitoring Division Manager

The Monitoring Division Manager coordinates and directs data-acquisition personnel, including those responsible for aerial radiological surveying, field monitoring, sampling, sample analysis, and environmental dosimetry. Environmental monitoring teams working out of the FRMAC (including DOE, EPA, participating federal agencies, and the state[s]) are coordinated by this manager. In conjunction with the SSA and the Assessment Division Manager, the Monitoring Division Manager evaluates the need for field information and radioanalytical data and establishes priorities for the Monitoring Division resources. The Monitoring Division Manager ensures that monitoring measurements, collected samples, and derived analytical data are scientifically defensible and of acceptable known quality and meet FRMAC requirements.

4.2.13 Assessment Division Manager

The Assessment Division Manager oversees the handling, processing, evaluating, assessing, reporting, and archiving of data; reviews and assembles the environmental data to develop a status overview and to provide technical interpretation of the radiological situation; and ensures that the appropriate documents exist to ensure the technical integrity of the data.

The Assessment Division Manager works closely with the SSA to identify monitoring and radioanalytical data needed to meet assessment requirements. Both work closely with the Monitoring Division Manager in establishing priorities for monitoring and laboratory resources that most efficiently meet these data requirements.

4.2.14 H&S Division Manager

The H&S Division Manager is responsible for health and safety issues affecting FRMAC personnel. This includes radiation protection, industrial hygiene, general safety, and medical care or treatment at the FRMAC and for all federal and federal contractor participants. This manager coordinates and directs all health and safety efforts in conjunction with the other FRMAC division managers and

ensures that personnel radiation exposures are maintained at levels as low as reasonably achievable (ALARA) within the appropriate exposure standards. The safety coordinator (within this division) works with the FRMAC managers to ensure that operations (both inside the FRMAC facility and outside in field operations) are conducted in a safe manner and in compliance with all DOE orders, Occupational Safety and Health Association (OSHA) standards, or other applicable federal regulations. Within the H&S Division, personnel from the REAC/TS and/or the regional medical coordinator provides medical support to FRMAC workers and will also provide information to the FRMAC Director if radiological medical support is requested by a federal agency or the state(s).

4.2.15 Other Key Personnel at FRMAC Facilities

Other key personnel at FRMAC facilities who are not a part of the FRMAC operations are described below.

4.2.15.1 REPRESENTATIVES FROM OTHER AGENCIES

Federal agencies that need information to fulfill their statutory and/or regulatory obligations are represented at the FRMAC facilities but are not part of FRMAC operations. Their agency representatives channel information to and from their headquarters. They cannot, however, send radiological data to their headquarters without LFA approval. DOE also provides a representative in the FRMAC. The DOE representative provides FRMAC operational information to DOE/HQ, DOE/NV, and DOE RCOs. Other local agencies within the state(s) may also be represented at the FRMAC.

4.2.15.2 ADVISORY TEAM FOR ENVIRONMENT, FOOD, AND HEALTH

This Advisory Team, composed of representatives from EPA, USDA, and HHS, directly supports the LFA in evaluating and recommending protective actions.

4.3 FRMAC Operational Functions

In the event of a radiological emergency, federal agencies having various statutory responsibilities have agreed to coordinate their efforts at the scene under the umbrella of the FRERP. This cooperative effort will ensure the LFA and the state(s) that federal technical assistance is fully supporting their efforts to protect the public and will provide the monitoring results in a working data center for immediate use by the LFA and state(s) decision makers. The federal agencies do not relinquish their statutory responsibilities; however, mandated federal cooperation ensures that each agency can obtain validated data critical to its specific responsibility.

Requests for information are received at the FRMAC from the LFA and the state(s) and from other federal agencies through the LFA. These requests will be prioritized and transmitted to the appropriate FRMAC manager. Field monitoring teams or others will collect the requested data. The data will be reviewed by appropriate staff, and the results will be evaluated, processed, and reported in the desired format. The data are provided, as soon as possible, simultaneously to the LFA and state(s) representatives.

The FRMAC coordinates off-site, federal, monitoring efforts and provides the following information without request and as needed.

- Plume and deposition predictions, as appropriate
- Air and ground concentrations
- Deposition patterns of isotopic concentrations, exposure rates, and dose projections
- Isotopic concentrations in environmental media
- Assurance of data quality
- Results of data collection, analysis, and evaluation
- Evaluations, assessments, and interpretation of data, as applicable
- Technical assistance to the LFA and state(s) decision-making officials, as requested
- Meteorological reports and weather forecasts

The FRMAC database also contains the documentation to provide assurance of data quality and provides retrievable documentation of environmental contamination.

When the emergency phase is concluded, the source of radioactivity is determined to be stable, the environment has been characterized, and the participating federal agencies have agreed to continue providing appropriate resources, the DOE will transfer the FRMAC management to the EPA at a mutually agreeable time. The EPA will then manage the FRMAC federal resources to accomplish the intermediate and long-term, recovery-phase needs of the LFA and the state(s). It is expected that the long-term recovery phase will only be concluded after consultation with the LFA and the state(s).

To accomplish this, the FRMAC is staffed with experts in the fields of radiation protection, radiation biology, emergency response, and other areas where effective measurement and evaluation of hazards to people and the environment are required. The FRMAC staff will ensure that the data and assessments provided to the LFA, state(s), and local authorities are of known quality and scientifically defensible.

4.4 Setting FRMAC Priorities

The FRMAC reports monitoring data and assessments to the LFA and the state(s). In turn, the LFA and state(s) use this information to determine if new or additional protective actions are necessary. The highest priority for FRMAC activities is protecting public health and safety. Therefore, setting priorities for monitoring and assessment activities will be dictated by the needs of the LFA and the state(s). There will be times, particularly in the early stages of an emergency response, when the need for information and assistance may exceed FRMAC resources. Priorities must then be established. The process for setting FRMAC priorities when resources are exceeded is described in this section.

4.4.1 LFA and State Requests

As shown on the FRMAC organization chart in Figure 4 (page 25), the LFA and the state(s) have representatives collocated with the FRMAC Director. As needs for FRMAC services arise, the LFA and state(s) representatives complete a FRMAC Action Request form and submit it to the Director. Examples of requests might include monitoring data from a specific location or projected dose estimates of the inside and outside areas of a specific building for one year.

LFA and state requests are tracked at the FRMAC by the Operations Staff of the Operations Manager. The status and progress of each request are always available.

4.4.2 Setting Overall Priorities

As the need arises, the FRMAC Director will call meetings to review current and future priorities. The overall priorities will be determined by a four-person group: (a) Director, (b) Operations Manager, (c) LFA representative(s), and (d) state representative(s). This group will consider the overall FRMAC activities and responsibilities as well as the immediate needs of the LFA and the state(s) to protect the public. The group will also decide, on a continuing basis, the overall priorities of activities. However, implementing and managing FRMAC resources will be determined by management. The group may, as needed, obtain input from the SSA, Assessment Division Manager, Advisory Team, or others within the FRMAC. This group will meet if the requests exceed FRMAC resources. Otherwise, the Operations Manager and the Operations Staff will handle the requests.

It is understood that the FRMAC has overall responsibilities for monitoring and assessing the off-site radiological situation without being specifically requested by the LFA or the state(s). Section 5 discusses anticipated FRMAC products that the LFA and the state(s) will receive without specifically requesting them.

4.4.3 Implementation Plan for Priorities

When the overall FRMAC priorities have been established, the Operations Manager will meet with appropriate division managers to draft the details for implementing priorities and determining impacts on current FRMAC operations. The primary managers will be the Assessment Division Manager and the Monitoring Division Manager. If the impact on FRMAC operations is large, the SSA may also be involved. If priorities involve support functions or the health and safety of FRMAC personnel, respective division managers would also be involved. This implementation plan will also contain a timeline.

4.4.4 Approval of the Implementation Plan for Priorities

The Operations Manager will meet with the Director to approve the plan for implementing operational priorities. The Director tasks the appropriate managers to implement priority activities. The Operations Manager and staff will track the activities through the FRMAC and keep a status of the progress.

4.4.5 LFA and State Acknowledgement

The Operations Manager will relay the priorities implementation plan and completion schedule to the LFA and the state(s). This manager will also keep the LFA and state(s) informed of the progress on previous and new priority requests.

4.5 Liaison and Interfacing Functions

4.5.1 DOE/HQ, DOE/NV, and DOE RCO

During the emergency phase when DOE is managing the FRMAC, the DOE representative will keep DOE/HQ, DOE/NV, and the DOE RCOs informed about use of DOE assets, status of activities, and

needs for additional resources. Radiological data and results, as approved by the LFA, will also be transmitted by the DOE representative.

4.5.2 LFA

The FRMAC Director initiates discussions with the LFA staff as soon as radiological assistance is requested. These discussions address the conditions and status of the emergency and possible off-site consequences. Once the FRMAC is established, the LFA will provide appropriate emergency status updates to the FRMAC through the LFA liaison located at the FRMAC. This liaison will be the primary channel for transmitting the LFA's off-site monitoring and assessment requirements to the FRMAC and distributing assessed data to the LFA.

4.5.3 State(s)

During a major radiological emergency, the FRMAC will assist the state(s) in off-site, environmental monitoring and assessment. Liaison personnel facilitate submission of requests from the state(s) to the FRMAC and transmission of the assessed data from the FRMAC to the state(s). Also, state and local advisors are collocated with the Director's senior staff and with personnel from the Monitoring, Assessment, and Support Divisions. Because of their local and professional knowledge, these state and local advisors provide valuable assistance in the efficient and optimal operation of the FRMAC to meet the requirements of the LFA and state(s).

4.5.4 Advisory Team for Environment, Food, and Health

The LFA will be assisted by the Advisory Team composed of EPA, HHS, and USDA representatives. This team will use FRMAC data and assessments to assist the LFA in developing federal PARs. The Advisory Team will work with the LFA to request FRMAC monitoring and assessment information.

The Advisory Team will likely collocate with the FRMAC to have easy access to the FRMAC data and assessments and to accommodate the needs of the LFA and state(s). The managers of the Monitoring and Assessment Divisions and the SSA interface with the Advisory Team, as needed.

4.5.5 EPA

The EPA is notified that a FRMAC has been requested for a radiological emergency. The EPA ORIA provides the EPA Senior Official at the FRMAC to ensure that the data collected for the database will provide the necessary information for long-term reentry and recovery considerations and serve as a basis for developing a long-term monitoring plan. As the emergency situation is brought under control, the EPA and DOE managers prepare the necessary agreements to transfer management of the FRMAC from the DOE to EPA.

4.5.6 Other Emergency Response Centers

As an initial operational priority, FRMAC liaisons with state and federal centers established during the emergency phase of a radiological emergency are identified. DOE/NV will request assistance from the DOE RCO to assist in implementing the liaison function under the direction of the FRMAC Director.

Liaison functions provide direct communication from the FRMAC to the various state and federal centers. FRMAC will ensure that communications are established with other key emergency response centers located near the emergency scene.

When available, other federal, state, utility, and local emergency response centers will have the opportunity to provide liaison staff at the FRMAC. The FRMAC will provide telephones and other support equipment to the liaison personnel. These liaisons will receive current collection and assessment information regarding the radiological data.

4.5.7 Other Agencies

Other signatory agencies to the FRERP are provided space and support to integrate their monitoring and assessment activities into the FRMAC operations. Many of these agencies provide key specialists in technical areas of importance to the FRMAC monitoring and assessment mission. Included are specialists in food crops, milk production, water supplies, and critical industries. As full participants in the FRMAC, these agencies become part of the monitoring and assessment technical teams to ensure that their concerns are addressed. These federal agencies may include the EPA, NRC, DoD, USDA, HHS, National Oceanic and Atmospheric Administration (NOAA), and others, as needed. The responsible facility owner/operator may also be represented at the FRMAC to provide updates on facility status.

Due to the close working relations between the FRMAC elements and the surrounding communities, county and local government officials as well as emergency service liaison personnel will interact directly with the FRMAC personnel, as appropriate.

4.6 Support Division Functions

The DOE/NV RSL furnishes the majority of the personnel and equipment to support the FRMAC for DOE. State-of-the-art equipment is used, and trained personnel provide the necessary expertise to support radiological emergencies. Through many years of field experience and training programs, the FRMAC field staff can efficiently and expeditiously meet these demands. Some of the support areas are summarized in the following subsections.

4.6.1 Badging and Security

4.6.1.1 SCOPE

Badging and security are essential at the FRMAC. The following discussion provides generic guidance for operations and procedures designed to ensure effective security of sensitive, high-value, or unique equipment and the protection of personnel during FRMAC deployments. It is not all-inclusive due to the unpredictability of the potential deployment environment. All personnel directly or indirectly involved with FRMAC support and deployment activities are responsible for implementing and enforcing the applicable security procedures. If a FRMAC is deployed to support a NEST and/or ARG operation, their security plans, as related to FRMAC operations, will be followed.

4.6.1.2 BADGING

The Support Division provides badging for authorized FRMAC participants. This assures the FRMAC Director that unauthorized personnel are not present in the FRMAC. The primary purpose of badging

is to eliminate access to radiological data without authorization by the LFA and state(s). Authorization for badging can be given by the Operations Manager. The basis for authorizations will be requests from federal, state, and local agencies participating in the FRMAC.

At the deployment site, the use of existing personnel identification badges, such as DOE security badges, may be acceptable as FRMAC badges depending on the size and complexity of the operation. Accordingly, deploying personnel affiliated with the FRMAC should bring their existing personnel identification badges for potential identification and access-control uses. If needed, access to classified matter will only be allowed by those persons having security badges. FRMAC badges may be fabricated in various colors to denote access to certain areas as may be prudent. These badges may or may not have a photograph. Badges will be conspicuously worn above the waist and clearly visible.

4.6.1.3 PROPERTY PROTECTION

Physical security will be provided for FRMAC equipment assets. A property protection plan is required whenever large shipments of government property must be moved by surface transportation to and from a deployment site. This plan addresses the physical protection of high-value government equipment and material while it is transported by surface transportation and stored under the control of authorized personnel. The plan also addresses equipment control, local monitoring, transportation, personnel, trip duration, vehicle security, communications, and reporting procedures during travel. The property protection plan for FRMAC deployment will be accomplished by the DOE/NV RSL security representative.

At the deployment site, a protective force will provide around-the-clock security for the equipment. This protection may be provided by the DOE/NV contractor security personnel, participating federal agency such as the DoD, or contracted local security forces depending on the circumstances. Full-scale deployments will include a DOE/NV and/or contractor (RSL) security representative to coordinate appropriate security measures.

4.6.1.4 OPERATIONS SECURITY

The FRMAC facility will always be an unclassified area where uncleared state and local personnel may participate. However, there is a possibility that a FRMAC may be required to support an operation that requires special security, for instance, to support a NEST or ARG operation. In these cases, additional security requirements will be considered. The location, nature of the operation, and other information may have to be treated as classified information. These additional security requirements will be specified during the initial call-out to activate the FRMAC staff.

4.6.1.5 CLASSIFIED MATTER

Even though the FRMAC is not a classified facility, some events may occur that may generate classified information, or FRMAC personnel may require the use of classified information generated elsewhere. If classified information is required in these cases, a special room will be set aside in the FRMAC and declared a classified working area. The classified working area used to store classified material will be kept secure by lock and/or security guard at all times. Classified documents that are generated as part of the FRMAC will be assigned a classification level (normally SECRET or below)

and marked accordingly. These documents will be considered classified "Working Papers" and marked as such. An Authorized Derivative Classifier (ADC) will review the document for appropriate classification as soon as practical. This review will occur before the document is released outside of the DOE or before the "Working Papers" have been retained for more than 180 days. The review by the ADC will include assignment of permanent markings.

4.6.1.6 GENERAL

In addition to the information contained in the preceding sections, pertinent details known about the deployment site, security responsibilities, and applicable procedures will be provided to deploying members. While acknowledging that specific details and procedures often cannot be determined before on-site assessment, every effort will be made to keep deployed personnel informed as information becomes available and decisions are made regarding necessary security procedures.

4.6.2 Communications Support

The DOE RAP teams provide the initial DOE response for radiological emergencies. These teams bring communications equipment used for coordinating and directing activities near the emergency site. The FRMAC Advance Party is equipped with on-scene communications equipment to include clear/secure telephones and radios, data-transfer capabilities, and a satellite terminal that can be connected to international telephone networks.

At a full-FRMAC setup, the DOE FRMAC communications system provides more sophisticated telephone equipment as extensive, air-transportable emergency communications are available at the FRMAC. This equipment provides in-field communications at multiple locations and is independent of local, fixed communications facilities. Unique configurations consist of very high frequency (VHF) radio systems, local and long distance telephone service, data networks, video systems, and secure voice/data operations, most of which may be interconnected through protected microwave links.

The VHF radio network is configured around portable repeaters and includes hand-held radios capable of operating over 17 selectable frequencies. A tone/voice pager system, cellular telephones, telephone communications center and operator, and fax machines are part of the communications support functions at the FRMAC.

4.6.3 Photo/Video Support

The DOE/NV RSL is capable of fielding several teams of photographers equipped with digital cameras and electronic, still video cameras. Still video images can be printed at the FRMAC or can be transmitted to remote centers having similar equipment. Other photographic capabilities include rapid copying of maps, preparing photographs for press releases, and performing long-lens and low-light photography. A complete photo minilab is contained in one aircraft pod with rapid film processing and color printing equipment. Capabilities to take aerial, direct vertical, and oblique photographs will depend on the availability of aircraft at the site.

Real-time video documentation of the FRMAC response can be acquired by mobile video teams using broadcast-quality video equipment. Video photography can be acquired from most environments

including oblique aerial acquisition. Videos can be edited on-scene by using portable video editing units and then duplicated to both broadcast and consumer videotape formats. In addition to documentation, video tapes can be used for training and briefing purposes. Edited videos can also be made available for news media. Video teams also contribute technical support for video press conferences and video information distribution systems.

4.6.4 Mechanical/Electrical Support

To adequately furnish power and set up the FRMAC, DOE/NV RSL provides mechanical/electrical engineering support. Portable equipment is readied for deployment by air or ground transport. This support includes providing generators and power sources for equipment if needed, heating and air conditioning, and mechanically fabricated tools and loading and unloading equipment. Trained and certified heavy equipment operators for trucks and forklifts stand ready to support the FRMAC.

4.6.5 Logistical/Administrative Support

In addition to the technical assets, the DOE/NV RSL is prepared to deploy administrative personnel, equipment, and materials required to support and maintain a full FRMAC. This includes computers, printers, software, copiers, office supplies, display boards, first-aid kits, identification badges, reference manuals, and dry food staples. These items are kept in a ready state for deployment. Logistics personnel secure hotel arrangements, rental cars, and rental equipment of any type that may be required to support the FRMAC. Also, maps of the affected areas are provided as well as other materials that may need to be procured locally.

4.6.6 Base Support

The DOE/NV RSL is developing and maintaining a database where personnel and equipment capable of supporting a FRMAC are identified. This database will be expanded to include FRMAC job descriptions and the names of personnel from all federal agencies and contractors who have appropriate experience to match a job description and, therefore, may be potentially called to support a FRMAC. The DOE/NV RSL also provides field graphics, computer maintenance, and other base support necessary to ensure an effective operational FRMAC.

4.7 Monitoring Division Functions

The Monitoring Division coordinates and directs FRMAC assets involved in conducting a comprehensive program of environmental, radiological monitoring, sampling, radioanalysis, and quality assurance. The Monitoring Division is responsible for a significant portion of the assistance provided to the LFA and state(s). This assistance includes airborne and ground-based radiation monitoring; environmental dosimetry; environmental sampling of air, water, soil, vegetation, and various dairy and food products; and preparing and radioanalyzing samples. The monitoring techniques and analytical procedures are designed for emergencies where large numbers of samples must be processed in the shortest possible time. In some cases, therefore, these monitoring techniques represent a compromise between precise analytical determinations and satisfactory results for emergency response activities. In addition, the techniques and procedures must be adaptable to meet the requirements for particular emergency situations.

State and local agencies are encouraged to join the FRMAC in their monitoring and analysis efforts. If they choose to function independently, detailed coordination is required to avert duplication of monitoring efforts and/or incompatibility of resulting data.

The details of monitoring and sampling during a radiological emergency depend on the emergency, but there are commonalities in all emergency responses. Appendix D contains the general philosophy for environmental monitoring, sampling, priorities, and other considerations.

4.7.1 Monitoring Organization and Functions

4.7.1.1 ORGANIZATION

Early in a radiological emergency, monitoring data will be limited but urgently needed as a basis for determining protective actions. The flow of data is expedited so that decision makers have data as quickly as possible. The Monitoring Division must ensure that monitoring, sampling, and laboratory activities meet FRMAC requirements and that monitoring measurements, sample collections, and derived analytical data are scientifically defensible, of acceptable known quality, and expressed in consistent units. To meet these requirements, the Monitoring Division is organized along functional lines (see Figure 5). The following functional areas are included:

- Aerial radiological monitoring—fixed-wing and helicopter
- Field monitoring and sampling
- Laboratory analysis—mobile and fixed laboratories
- Data control
- Integrated quality assurance (QA) program

4.7.1.2 MANAGER AND STAFF

The Monitoring Division Manager is responsible for the overall management and direction of the Monitoring Division. LFA and state(s) representatives to the Monitoring Division will be valuable. Because of their local and professional knowledge and their personal relationships, they provide great assistance in the efficient operation of the Monitoring Division.

Priorities for monitoring, sampling, and analysis in consultation with the LFA, state(s), and cognizant local authorities are established and constantly reevaluated by the FRMAC SSA, the Assessment Division Manager, and the Monitoring Division Manager. These three individuals continually evaluate the FRMAC requirements identified by the LFA and the state(s) against the resources and adjust priorities accordingly. If a conflict arises, it is referred through the FRMAC Director to the LFA and the state(s) for resolution.

Monitoring instructions are transmitted by radio to the field monitoring teams through net control. The field monitoring teams transmit the radiological data to the data-acquisition officer who transcribes the data on preestablished forms. The data forms are quickly reviewed by the field data specialist for completeness, reasonableness, and proper units. The data are hand plotted by the status map coordinator of the Monitoring Division.

Radioanalytical laboratory data are managed similarly to field monitoring data. Environmental samples are received and managed by sample control. Analytical data are reviewed for completeness,

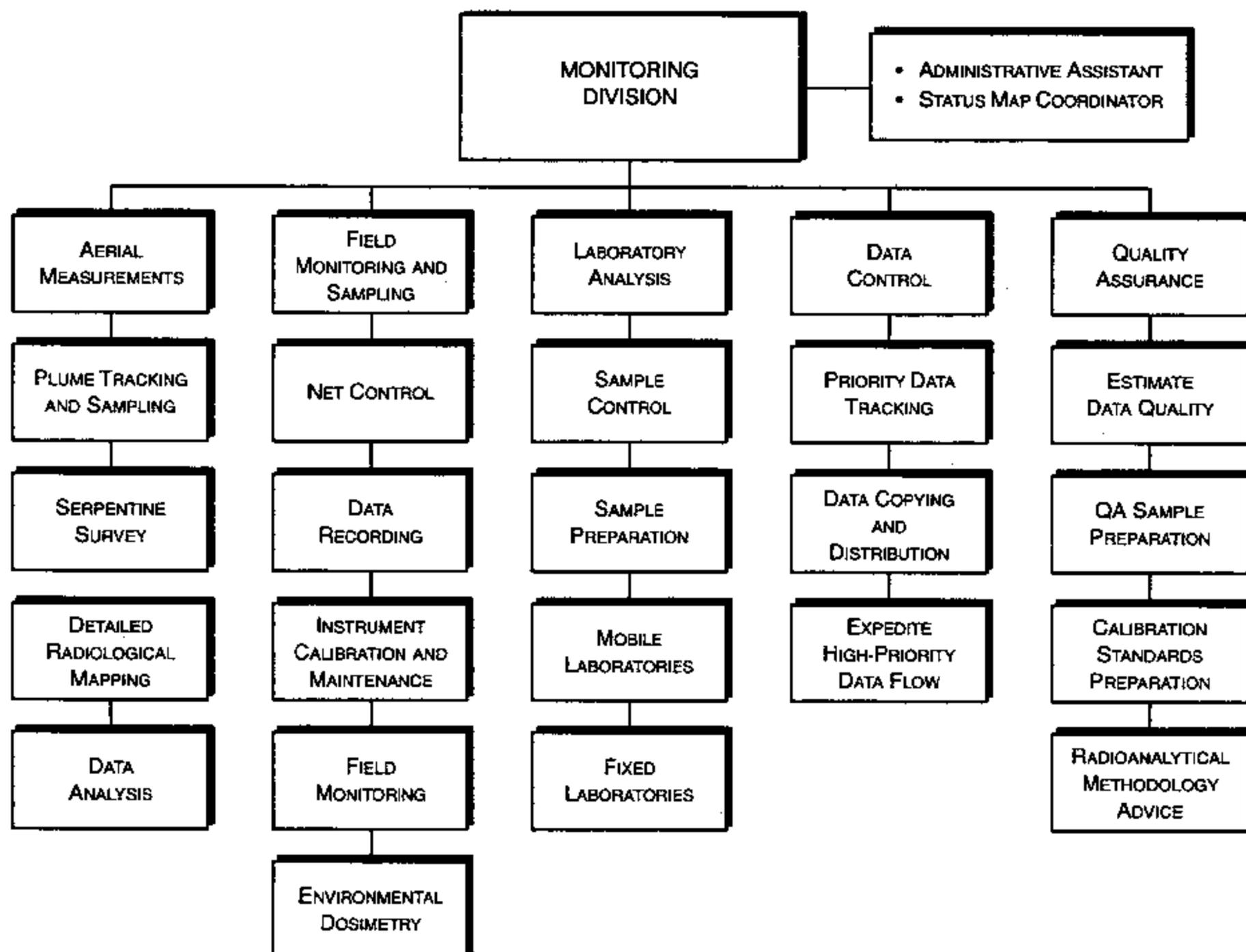


FIGURE 5. MONITORING DIVISION FUNCTIONS

reasonableness, and proper units by the analysis specialist before distributing to the Assessment Division and the FRMAC.

4.7.1.3 AERIAL MEASUREMENTS

Both fixed-wing aircraft and helicopters can be used for radiological monitoring. Conceptually, the radiological monitoring aircraft initially will fly a serpentine pattern traversing the predominant plume footprint and a circle with a radius of 16 kilometers (10 miles) centered on the emergency site (see Figure 6). During flight, cursory radiological data such as the spectral summation count rate relative to the background and dominant isotopes can be identified and radioed to ground control. The data tapes are transferred from the aircraft to an on-scene mobile computer laboratory for processing. Data processing requires approximately one to three hours to complete. The mission for this initial flight is to determine the (a) outline of the contamination footprint and approximate exposure rates and (b) presence of major isotopes.

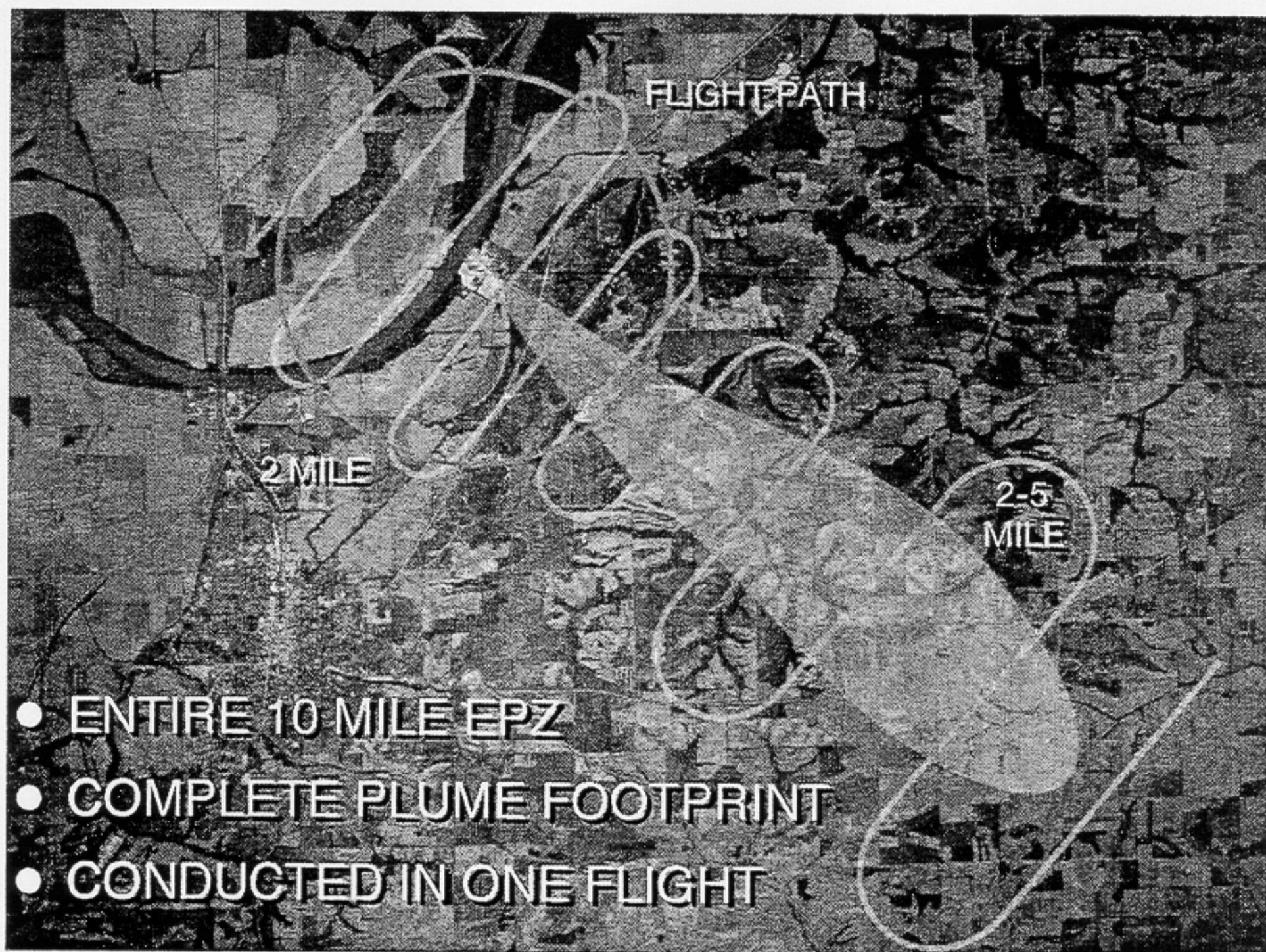


FIGURE 6. AERIAL RADIOLOGICAL SURVEY FIRST RESPONSE

Fixed-Wing Aircraft

To map radioactive deposition, fixed-wing aircraft are equipped with two 4- × 4- × 16-inch sodium iodide thallium activated (NaI[Tℓ]) gamma detectors. The gamma spectral data are acquired by a radiation and environmental data acquisition and recording (REDAR) system that is a portable multi-microprocessor-based, data-acquisition, and real-time analysis system. It will operate under severe environmental and physical conditions as experienced aboard helicopters, fixed-wing aircraft, and off-road vehicles. The REDAR system acquires a gamma spectrum each second, approximately 40 thousand to 3 million electron volts, and simultaneously records the latitude, longitude, altitude, date and time of day, barometric pressure, and temperature. The data are partially analyzed on board and stored on magnetic tape cartridges for detailed analysis. The fixed-wing aircraft are instrument rated, capable of all-weather operation, and equipped to penetrate a contaminated air mass, if required. Depending on the mission objectives, a precision optical camera, a thermal infrared scanner, and other radiation detectors could also be mounted on the aircraft.

Helicopters

For detailed, radiological deposition mapping, helicopters are equipped with two instrument pods mounted to the skid struts (see Figure 7). Each pod contains four 2- x 4- x 16-inch NaI(Tl) gamma detectors plus two shielded, upward-looking detectors. The large detector array is exposed to the entire gamma radiation field and the shielded detectors are upward looking to provide a measure of the airborne and cosmic radiation. As the REDAR system acquires the spectra multiplexed from all eight detectors, one of the eight detectors is also routed to a separate analog-to-digital converter. This independent spectral acquisition provides the ability to acquire spectra in radiation fields that are sufficiently intense to overload the eight-detector array. Table 2 lists approximate helicopter and fixed-wing aerial survey sensitivities.

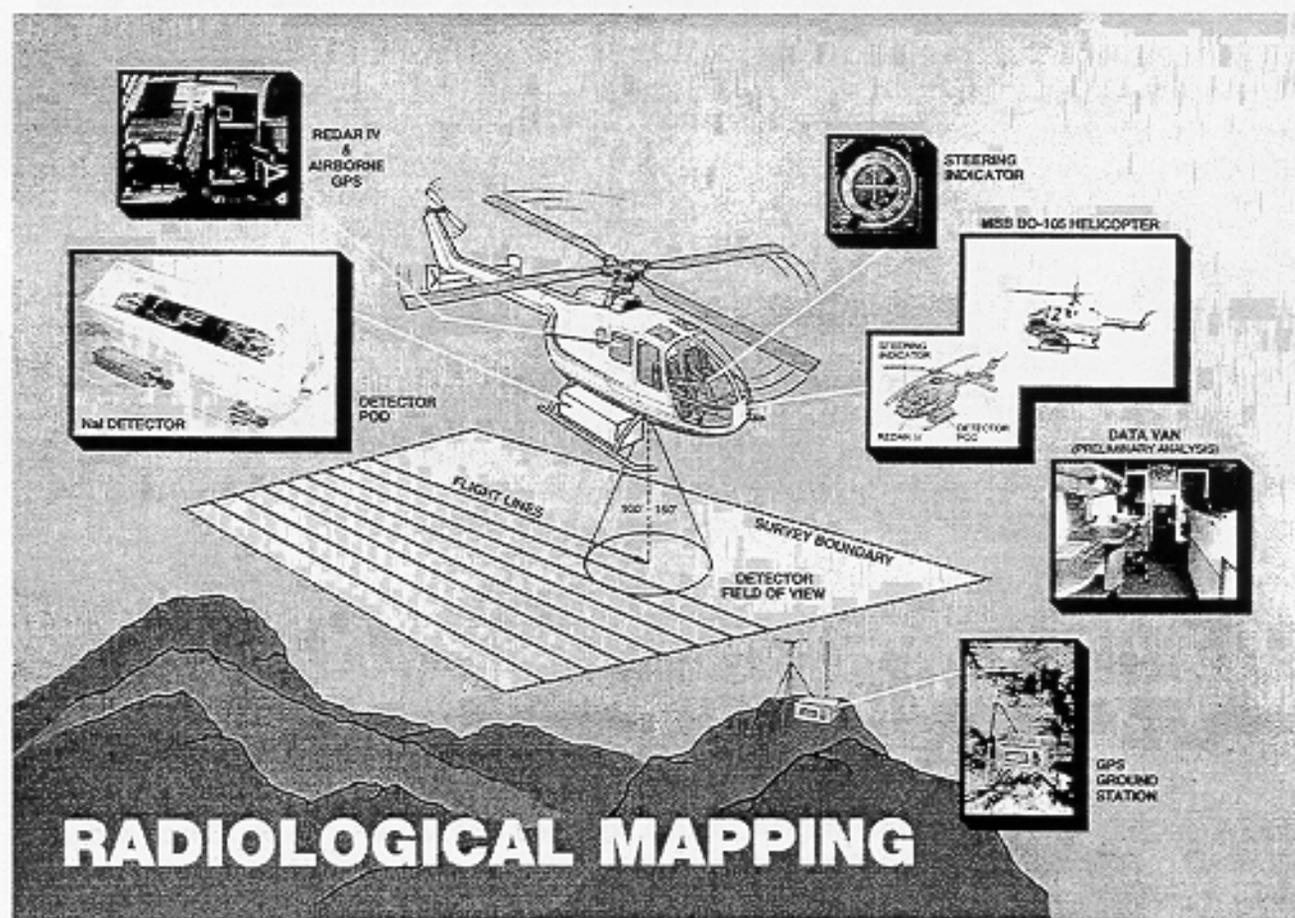


FIGURE 7. RADIOLOGICAL MAPPING HELICOPTER

Normally, the helicopter will fly at an approximate altitude of 46 meters (150 feet) and a speed of 36 meters per second (70 knots) to radiologically map an area. Parallel flight lines are separated by approximately 76 meters (250 feet). Flying at an altitude of 46 meters (150 feet) provides a monitoring window on the ground of approximately 92 meters (300 feet) in width. In this manner, the helicopter can map the ground deposition at a rate of about 10 square kilometers per hour (4 square miles per hour).

Table 2. AMS Minimum Detectable Activities

Radionuclide	Photopeak Energy (keV)	Surface Area Deposition ^a ($\mu\text{Ci}/\text{m}^2$)	
		Fixed-Wing Aircraft ^b	Helicopter ^c
Americium-241 (^{241}Am)	60 keV	7.3	0.20
Cesium-137 (^{137}Cs)	662 keV	0.30	0.06
Cobalt-60 (^{60}Co)	1,173-1,333 keV	0.05	0.02
Iodine-131 (^{131}I)	365 keV	0.50	0.07
Plutonium-239 (^{239}Pu)	375 keV	25,600.	3,600.

^aMinimum detectable activity value is the three-sigma value due to the counting statistics in the spectral-energy window of the photopeak of interest.

^bFixed-wing systems are equipped with two 4- x 4- x 16-inch NaI(Tl) logs flown at an altitude of 152 meters (500 feet) above ground level, a flight line spacing of 305 meters (1,000 feet), and an average ground speed of 76 meters per second (150 knots). Flying at higher altitudes (*i.e.*, 1,500 feet) will reduce detectability by a factor of three or more.

^cHelicopter systems are equipped with eight 2- x 4- x 16-inch NaI(Tl) logs flown at an altitude of 46 meters (150 feet) above ground level, a flight line spacing of 76 meters (250 feet), and an average ground speed of 36 meters per second (70 knots). Processing the data using a nine-second averaging routine may enhance the detectability by a factor of three or more.

The following products are available from aerial mapping:

- Isodose and exposure-rate contours applicable to one meter above the ground
- Surface deposition of specific radionuclides
- Gamma-ray energy spectra

The Monitoring Division provides these products to the Assessment Division for inclusion in the assessment process, digitization, and the GIS and for distribution to users.

4.7.1.4 FIELD MONITORING AND SAMPLING

FRMAC monitoring personnel will arrive on-scene with the appropriate instrumentation for monitoring the type of radiological emergency at hand. For a release of mixed fission products or unknown radionuclides, the intrinsic germanium *in situ* gamma spectroscopic systems provide a fast, accurate method for determining isotopic ratios and deposition concentrations. Intrinsic germanium gamma detectors are equipped with beryllium windows to allow the acquisition of photons with energies as low as ten thousand electron volts (keV). This makes the detection of transuranics such as plutonium-238, plutonium-239, and americium-241 possible. Specialized instruments such as field instruments for detecting low-energy radiation (FIDLERs) are available for emergencies involving nuclear weapons or spacecraft using plutonium-238 radiation thermal generators.

Instrument repair equipment plus an irradiator and various traceable radioactive sources are deployed for calibration and maintenance of the radiation detection instruments. To maximize the comparability of the radiological data acquired by the various organizations, this calibration capability is available to the LFA, the state(s), and other groups involved in radiological monitoring.

Environmental sampling supplies and equipment, which will arrive with the FRMAC Main Party, include the following.

- Low- and high-volume air samplers for particulates and reactive gases
- Whole air samplers for noble gas analysis
- Specialized sampling tools for reproducible, well-defined soil and sediment samples
- Equipment for sampling vegetation and produce
- Equipment for sampling water and milk

For most radiological emergencies, thermoluminescent dosimeters (TLDs) provide a convenient, easily deployable method for measuring and documenting integrated radiation exposure levels at various locations and radiation doses to individuals. The FRMAC has caches of TLDs available for deployments. In most instances, exposed TLDs would be shipped to a fixed facility for processing.

Chain-of-custody procedures are followed during sample collection and handling activities. The integrity and accountability of every sample is ensured by documenting that the sample is in the possession of a responsible person or is secured in an acceptable manner.

Knowing the physical locations where field measurements were made and samples collected is critical to a meaningful characterization of the radiological emergency. All locations are identified in three ways: the latitude and longitude is determined, the street orientation is noted, and the sector/distance is defined. To determine the latitude and longitude, the field monitoring teams are equipped with global positioning system (GPS) units. The street orientation is defined by the street address, street intersections, mile markers, or odometer readings from a well-defined landmark. Sector refers to the partitioning of the area about the emergency site into sixteen 22.5-degree sectors. The distance is calculated as the distance from the emergency site to the monitoring location. The sector/distance information allows the status map coordinator to rapidly locate and identify a monitoring or sampling site on the status map.

4.7.1.5 LABORATORY ANALYSIS

FRMAC has access to both mobile and institutional (fixed) radioanalytical laboratories for analyzing environmental samples. Although FRMAC does not possess mobile laboratories, they are provided with trained staff by various federal agencies (EPA, NRC, DoD) and the DOE national laboratories. The mobile laboratories associated with a FRMAC provide a rapid, initial, qualitative and quantitative estimate of the radionuclides of interest. For more detailed analyses beyond the capability of the mobile laboratories, samples are shipped to fixed laboratories. The following analytical techniques are available from most mobile laboratories.

- Gamma spectroscopy
- Gross alpha and beta counting
- Liquid scintillation counting

4.7.1.6 DATA CONTROL

The Data Control Group keeps status of all collected data. The status includes keeping track of the data from receipt in the FRMAC to entry in the database. High-priority data are tracked carefully so that these data can be expedited as quickly as possible.

The Data Control Group receives the reviewed data forms. Upon receipt, the forms are stamped "RAW DATA," photocopied, and distributed to the Assessment Division and others including the LFA, state, local, and federal representatives. The original form is documented and stamped with the date and time of receipt and assigned a unique serial number. These documented forms are archived as permanent records.

4.7.1.7 QUALITY ASSURANCE

The quality of the data used as a basis for protective actions is of paramount importance. The resources devoted to QA depend largely on the stage of the emergency. In the early stages of a radiological emergency when the impact on public health and safety is not well defined, the number of FRMAC resources devoted to QA will be sufficient to ensure that data of acceptable quality is available in a timely manner. As the emergency stabilizes, the resources dedicated to QA will increase to approximately 20 percent. QA considerations include the following.

- A. Authenticity and/or traceability of radiological standards
 - Calibration
 - Quality control (QC) of instrumentation
 - QA samples
- B. Authenticity and validity of environmental samples and monitoring processes
 - Collection
 - Analysis
 - Archiving
- C. Accountability of related documentation
 - Collection methods
 - Field monitoring and sample collection forms
 - Sample control forms
 - Standard operating procedures
 - QA/QC records
 - Instrumentation and equipment serial numbers
- D. QA/QC verification activities
 - Matrix Spiked Samples—The analyst will analyze representative environmental samples containing known amounts of radionuclides of interest.
 - Blind Samples—Representative environmental samples containing known amounts of radionuclides of interest are injected into the normal sample stream without the knowledge of the analyst.
 - Blank Samples—Representative environmental samples containing no added radionuclides of interest are included for analysis.
 - Replicate Sample Analysis—The same sample is analyzed more than once by the same laboratory.
 - Collocated Samples—More than one sample is collected in the field at the same location and under identical conditions.
 - Round Robins—The same representative samples containing known amounts of radionuclides of interest are submitted to the participating laboratories without the knowledge of the analysts.

- Cross-Calibration of Field Instruments—Identical calibration techniques, using the same radiological standards, are applied to all instruments used to monitor the environment.
 - QC Instrument Check (beginning and end of each shift)—Calibration checks, using standard radiological materials, are made to ensure that instruments are functioning within prescribed limits.
 - Calibration and Instrument QC—Standard radiological solutions will be provided for daily laboratory instrumentation, calibration, and instrument-response checks.
- E. As the emergency stabilizes, approximately 20 percent of the resources dedicated to QA will consist of the following.
- Blind samples submitted at the rate of 1 per 20 samples.
 - Blank samples submitted at the rate of 1 per 20 samples.
 - Replicate samples submitted at the rate of 1 randomly selected per 20 samples (independently analyzed twice).
 - Collocated samples submitted at the rate of 1 per 20 samples.

4.7.2 Staffing, Qualifications, and Tasks

The typical staffing requirements for the Monitoring Division are listed in Section 5. The number of personnel shown is the expected requirement for this division. For a particular FRMAC response, the actual deployment level will depend on the nature, magnitude, and location of the radiological emergency. The following subsections comprise a brief description of the desired qualifications and tasks for Monitoring Division personnel.

4.7.2.1 MONITORING DIVISION MANAGER

- A. **Desired qualifications:** Experienced manager of technical radiological monitoring personnel. Possesses a thorough knowledge of field monitoring techniques and radioanalytical processes. Trained in all phases of FRMAC operations. Knowledgeable of FRMAC interfaces with other emergency response programs, facilities, and missions.
- B. **Tasks:** Coordinates and directs all monitoring, sampling, and analysis resources. In coordination with the SSA and the Assessment Division Manager, evaluates the need for field information, develops plans for obtaining measurements and samples, and defines priorities. Provides monitoring measurements and derived analytical data of acceptable quality and in a time frame that meets FRMAC requirements. Responsible for identifying needed equipment, personnel, and other resources and coordinating the availability of these resources.

4.7.2.2 MONITORING DIVISION DEPUTY MANAGER

- A. **Desired qualifications:** Same as the Monitoring Division Manager.
- B. **Tasks:** Assists the manager in coordinating the functions of the Monitoring Division. Functions as the Monitoring Division Manager when the manager is unavailable.

4.7.2.3 ADMINISTRATIVE ASSISTANT

- A. **Desired qualifications:** Must be organized and knowledgeable of FRMAC operations in general and the Monitoring Division operations in particular.

- B. **Tasks:** Coordinates and tracks requests for Monitoring Division responses. Keeps the Monitoring Division Manager briefed on the status of these requests. Prepares activity/status reports and maintains the status display board for action requests. Provides administrative support.

4.7.2.4 STATUS MAP COORDINATOR

- A. **Desired qualifications:** Possesses knowledge of FRMAC and Monitoring Division functions and procedures and familiar with field monitoring and radioanalysis techniques and data.
- B. **Tasks:** Manually plots, in real time, radiation monitoring measurements and field team locations on the Monitoring Division status map. Maintains the status board on activities of the field monitoring team.

4.7.2.5 AERIAL MEASUREMENTS GROUP SUPERVISOR

- A. **Desired qualifications:** Must be knowledgeable in all phases of the aerial measurements radiological instrumentation, functions, procedures, and data-analysis techniques.
- B. **Tasks:** In coordination with the Monitoring Division Manager, plans and executes the aerial measurement missions to maximize the radiological data acquisition to best meet FRMAC requirements.

4.7.2.6 FIELD MONITORING AND SAMPLING GROUP SUPERVISOR

- A. **Desired qualifications:** Experienced supervisor of field monitoring personnel. Knowledgeable of FRMAC field monitoring and environmental sampling techniques and procedures for all areas.
- B. **Tasks:** Supervises the FRMAC field monitoring teams. Assigns monitoring and sampling tasks to the various field teams to most efficiently meet FRMAC priorities and requirements.

4.7.2.7 NET CONTROL RADIO DISPATCHER

- A. **Desired qualifications:** Must be organized and experienced in radio communications with multiple field teams. Knowledgeable of FRMAC radio procedures and equipment, Monitoring Division's line of authority, and field data flow.
- B. **Tasks:** Communicates to the FRMAC field monitoring teams information and monitoring and sampling instructions provided by the field team supervisor. Maintains complete records of all radio transmissions. Works closely with the data-acquisition officer.

4.7.2.8 DATA-ACQUISITION OFFICER

- A. **Desired qualifications:** Familiar with FRMAC radiological monitoring procedures, techniques, tasks, instrumentation, and units of measurement.

-
- B. **Tasks:** Works closely with net control. Responsible for recording incoming information and monitoring data from the FRMAC field teams.

4.7.2.9 FIELD DATA SPECIALIST

- A. **Desired qualifications:** Possesses complete and detailed familiarity with FRMAC field monitoring procedures, techniques, instrumentation, and units of measurement.
- B. **Tasks:** Receives field monitoring data from the data acquisition officer and performs a cursory QA check. This QA check focuses on verifying that the units associated with each monitoring data point are consistent with the instrument used, data are consistent with past data, and data are consistent with the mission.

4.7.2.10 INSTRUMENT CALIBRATION AND MAINTENANCE OFFICER

- A. **Desired qualifications:** Possesses complete and detailed knowledge of FRMAC radiological monitoring instrumentation including maintenance and calibration procedures and FRMAC operational specifications.
- B. **Tasks:** Maintains the radiological monitoring instrumentation used in FRMAC activities in proper working order and within FRMAC operational specifications. Maintain calibration and service documentation and related QA/QC records.

4.7.2.11 FIELD MONITOR

- A. **Desired qualifications:** Experienced in all phases of FRMAC field monitoring and sampling procedures, completed radiation worker training, and completed the 40-hour hazardous materials course as specified by the Occupational Safety and Health Act.
- B. **Tasks:** Executes monitoring and sampling duties according to FRMAC standard operating procedures in an efficient and timely manner.

4.7.2.12 LABORATORY ANALYSIS GROUP SUPERVISOR

- A. **Desired qualifications:** Experienced supervisor of laboratory personnel and knowledgeable of standard radioanalytical procedures as applied to environmental samples and radiological emergency response activities. Possesses detailed knowledge of FRMAC sample control, sample preparation, and mobile laboratory procedures. Possesses working knowledge of the FRMAC Laboratory Information Management System (LIMS).
- B. **Tasks:** Supervises the FRMAC sample control and radioanalysis groups. Per guidance from the Monitoring Division Manager, defines sampling and analyzing priorities, assigns laboratory resources, and monitors the status of high-priority samples.

4.7.2.13 SAMPLE CONTROL COORDINATOR

- A. **Desired qualifications:** Experienced in FRMAC sample control procedures and the FRMAC LIMS. Possesses understanding of FRMAC sample and data flow.

-
- B. **Tasks:** Follows FRMAC standard operating procedures, documents incoming environmental samples, and verifies that sample information and analytical data are correct and contained in the LIMS. Follows documented practices to minimize cross-contamination of samples. Maintains status and location of samples and sample aliquots; prepares samples for shipments to institutional laboratories; and identifies sampling priorities and analyses and assigns laboratories to perform analyses per guidance from the laboratory analysis supervisor.

4.7.2.14 MOBILE LABORATORY CHEMIST/TECHNICIAN

- A. **Desired qualifications:** Possesses working knowledge of radioanalytical procedures for varied environmental sample media and radiological emergency response activities.
- B. **Tasks:** Efficiently and timely performs radioanalytical procedures according to FRMAC requirements.

4.7.2.15 ANALYSIS SPECIALIST

- A. **Desired qualifications:** Possesses detailed familiarity with standard radioanalytical methodology, instrumentation, and FRMAC units.
- B. **Tasks:** Receives radioanalytical data from the mobile and institutional laboratories through sample control. Performs cursory QA check which focuses on the reasonableness of the data (*i.e.*, Are the radioanalytical results, associated error terms, and minimum detectable values consistent with the analytical method, counting time, and size of aliquot?).

4.7.2.16 DATA CONTROL GROUP SUPERVISOR

- A. **Desired qualifications:** Possesses detailed knowledge and familiarity with FRMAC operations and data flow. Must be very organized and capable of simultaneously tracking many requests with varying priorities.
- B. **Tasks:** Receives data from the field data specialist and analysis specialist, stamps the data forms as "RAW DATA," assigns a unique serial number, copies the stamped data forms, and distributes the copies throughout the FRMAC. Forwards the original data forms to the Assessment Division for archiving in the FRMAC database. Tracks all high-priority data requests in the Monitoring Division and delivers the high-priority data to the requesting group as expeditiously as possible.

4.7.2.17 QUALITY ASSURANCE OFFICER

- A. **Desired qualifications:** Possesses complete and detailed knowledge of QA practices and procedures as applied to field and laboratory operations. Understands the FRMAC mission and radiological emergency response activities.
- B. **Tasks:** Estimates the quality of the data produced by the Monitoring Division. In coordination with the Monitoring Division Manager, the laboratory analysis supervisor, and the field monitoring and sampling supervisor, defines the level of QA/QC activities for replicate sample collections, replicate sampling analyses, instrument QC checks, preparing representative sample

media containing known amounts of specific radionuclides, and preparing blank samples for analysis.

4.7.2.18 QUALITY ASSURANCE CHEMIST

- A. Desired qualifications: Senior radioanalytical chemist with experience in synthesizing various environmental media samples containing known amounts of radioactive materials. Possesses complete and detailed knowledge of the FRMAC radioanalytical procedures.
- B. Tasks: Prepares QA/QC environmental samples containing known amounts of specific radionuclides, prepares calibration standards for radioanalytical and environmental monitoring instrumentation, and provides advice on radioanalytical methodology.

4.7.2.19 QUALITY ASSURANCE TECHNICIAN

- A. Desired qualifications: Knowledgeable radiochemistry technician with experience in the formulation of environmental samples containing known amounts of various radionuclides for QA programs.
- B. Tasks: Assists the QA chemist in preparing QA/QC environmental samples and calibration standards.

4.7.3 *FRMAC Monitoring and Analysis Manual*

To ensure consistency, completeness, and quality of monitoring and analytical data produced by the FRMAC, a methodologies and procedures manual has been prepared. It is contained in two volumes: Volume 1 concerns radiation monitoring and sampling and Volume 2 concerns sample preparation and analysis. The manual addresses the following areas:

- Field monitoring procedures applicable to radiological emergencies
- Environmental sample collection procedures
- Environmental sample preparation and analysis procedures applicable for mobile laboratories
- Standard reporting units
- Monitoring instrumentation, calibration, and maintenance
- Quality assurance

Initially, methods and procedures were obtained from many different sources. These sources included the DOE, EPA, national laboratories, and various states. An attempt was made to identify the "best" methods available. The criteria for "best" are as follows:

- Scientifically defensible
- Simple
- Applicable to a FRMAC deployment
- Most likely to be adopted by all users

It should be emphasized that the procedures are intended for use in radiological emergencies where large numbers of samples will be processed in the shortest possible time. In some cases, therefore,

these procedures represent a compromise between precise analytical determinations and satisfactory determinations for timeliness.

4.8 Assessment Division Functions

Environmental radiological data gathered or received by the FRMAC flow through the Assessment Division. This division is responsible for handling, processing, evaluating, assessing, maintaining, and reporting data. This division also provides advice to the FRMAC Monitoring Division for collecting and analyzing samples appropriate for current priorities. These environmental data are reviewed and assembled to provide an overview of the off-site radiological situation. The technical integrity of the data is ensured and the data are placed in proper perspective and formatted and/or plotted, so they are easily understandable to FRMAC management, the LFA, states(s), and local authorities. This division works closely with the SSA.

4.8.1 Definition of Assessment

Assessment is defined as the evaluation and interpretation of environmental radiological data obtained during or following a radiological emergency. Biological assessments of off-site individuals (including internal dosimetry, bioassay data, etc.) are *not* FRMAC responsibilities. The FRMAC assessment results, ensured for quality both in detail and as an overview, are provided to the LFA, states(s), local authorities (and participating federal agencies as appropriate) to form a basis for recommending public protective actions and/or to develop an estimate of the radiological impact. The FRMAC assessments include evaluations of radiation levels that have occurred, are occurring, or are predicted to occur as a result of a radiological emergency. The consequences of these radiation levels to the public and the environment are assessed in terms of actual or projected individual doses. Priorities can then be established to minimize radiological consequences.

4.8.2 FRMAC Assessments for the LFA, State(s), and Local Authorities

4.8.2.1 INTRODUCTION

In a major radiological emergency, appropriate responses will require numerous technical assessments for use by FRMAC management and the LFA, state(s), and local authorities. The FRMAC will play a significant part in most of these assessments. This section provides a description of the various types of assessments that may be provided and the role of the FRMAC in providing these assessments.

4.8.2.2 PLUME DISPERSION

The FRMAC may be requested to calculate the effective dose commitments to individuals off-site using the following information.

- Measured, calculated, or projected source term and release rate
- Historical, current, and forecast meteorology
- Appropriate dose conversion factors

This assessment may also be useful in defining the extent of actual or potential off-site contamination and guiding the deployment of field monitoring teams. In some cases, these dispersion predictions may have been completed by the facility owner/operator, state(s), and/or federal agencies prior to establishing the FRMAC. However, the predictive capabilities of the ARAC or other groups at the FRMAC may be called on to assist in defining the plume dispersion and deposition, especially in prolonged emergency situations. Field monitoring data will assist in refining the plume dispersion calculations.

4.8.2.3 PROJECTED OFF-SITE RADIOLOGICAL IMPACTS

The LFA and/or state(s) will assess potential radiological impact in addition to, or in conjunction with, calculating impacts based on known releases. In these assessments, they will use their technical expertise to determine possible exposure scenarios (including projected source terms). Using weather predictions, dispersion models, and appropriate dose conversion factors, they will determine the magnitude of potential off-site consequences. In some cases, these assessments may have been conducted before the FRMAC was established or by organizations outside the FRMAC. However, in a prolonged release situation, it is anticipated that the FRMAC technical expertise will be requested to assist in predicting weather, creating dispersion models, and calculating doses.

4.8.2.4 ACTUAL OFF-SITE RADIOLOGICAL IMPACTS

As soon as field monitoring data are available, decision makers will want to know the significance of those values and how they compare with predicted values. Initial scoping assessments, and subsequently more complex assessments, will be needed to convert the measured radiation values into projected, effective dose-commitment values. These projections will allow proper judgement in determining kinds and needs of additional protective actions beyond those already adopted. These assessments will be primarily conducted at the FRMAC where quality-assured data and a diverse group of technical experts are available. This is expected to be the major FRMAC assessment activity during the initial phase and will require an extensive and well-coordinated interface among on-site and off-site decision-making groups.

4.8.2.5 PROTECTIVE ACTION RECOMMENDATIONS (PARS)

The LFA will continually advise and recommend protective actions to the state(s) and local authorities during the initial emergency phase and shortly thereafter. These PARs may apply to large segments of the population, selected individuals, businesses, or individual homes depending on the circumstances. The FRMAC will not prepare PARs. However, because a comprehensive database resides in the FRMAC, it will be used to prepare and interpret the appropriate technical data as an authoritative technical basis for the PARs.

4.8.2.6 PUBLIC EXPOSURE RESULTING FROM THE RADIOLOGICAL EMERGENCY

Shortly after the emergency phase of a major radiological emergency, an authoritative, interorganizational assessment of the actual doses to members of the public may be developed. Such an assessment will need to use the best estimates of the source term, available environmental measurements,

assumptions about public actions, appropriate dose conversion factors, resuspension factors, and estimated food consumption rates. FRMAC responsibilities neither include the measurement/assessment of specific or collective doses to individuals or groups nor include appraisals or guidance regarding significance, risks, or potential health effects. However, the FRMAC is expected to be the best source of the environmental, radiological, and predictive data and technical base for such an assessment.

4.8.3 Assessment Division—Organization and Functions

4.8.3.1 ORGANIZATION

Figure 8 shows an organizational and functional chart for the Assessment Division. Under each of the five groups are shown functional areas that may be applicable, depending on the radiological emergency.

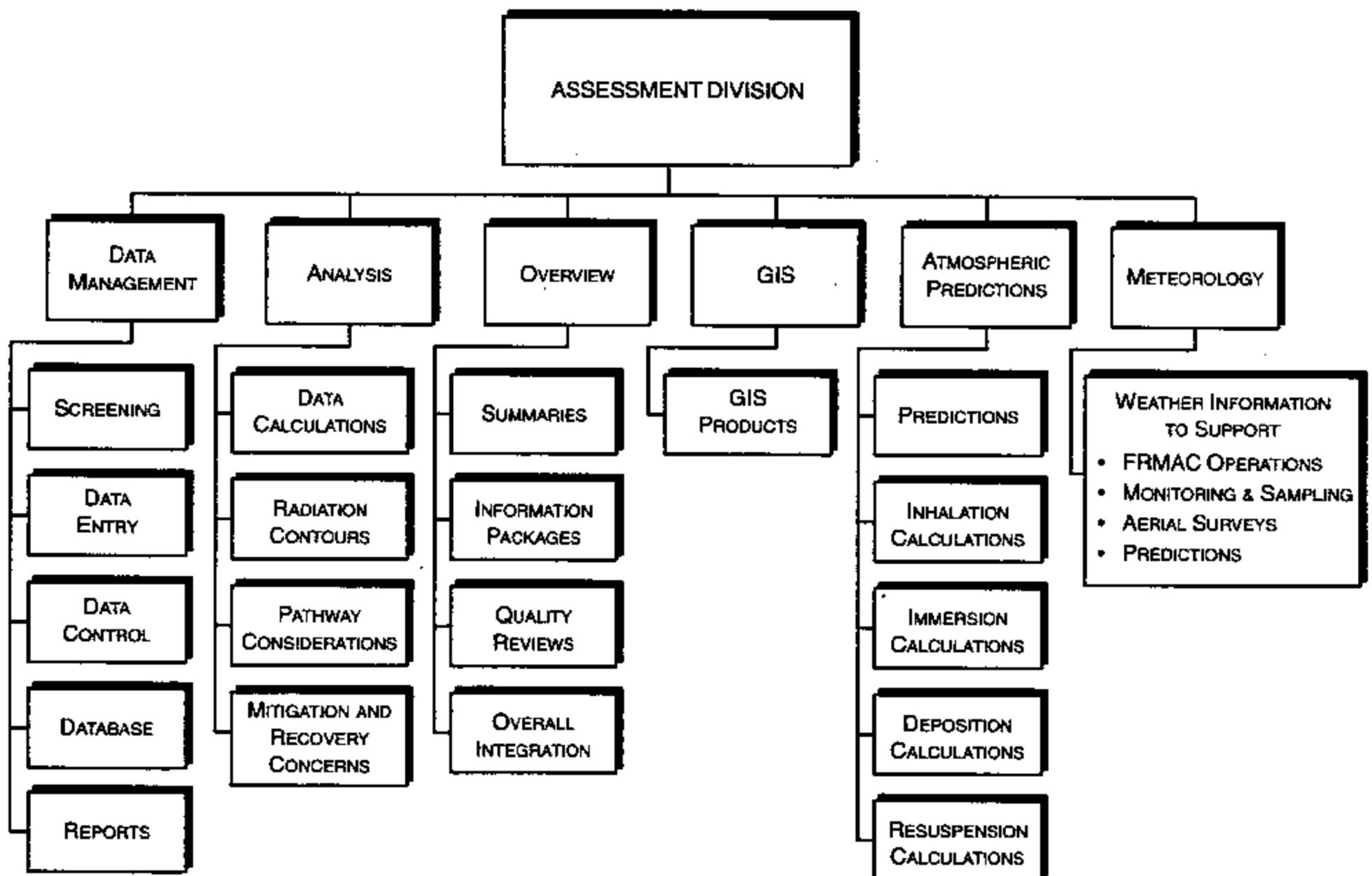


FIGURE 8. ASSESSMENT DIVISION FUNCTIONS (Scenario-Dependent)

4.8.3.2 MANAGER AND STAFF

The Assessment Division Manager and staff will coordinate all evaluation and assessment functions within the Assessment Division. This manager will work closely with the SSA and the Monitoring Division Manager. A full-time liaison to the Monitoring Division may be assigned, as needed.

4.8.3.3 DATA MANAGEMENT GROUP

The Data Management Group reviews all incoming data from the Monitoring Division, as well as all available non-FRMAC-generated, environmental, radiological data. These data are screened for consistency and completeness (times, locations, units, exponents, instruments, etc.); entered into a comprehensive, computerized database; and provided immediately to the GIS and to the appropriate FRMAC personnel for evaluation and assessment. The database is accessible for use in multi-user/multitask environments and compatible with third-party hardware. Data are readily accessible for producing reports of key data sets, summaries, and graphics, as requested. This group also maintains other related information such as source-term data, meteorological data and forecasts, and on-site radiological status information and prognoses for use and review by the FRMAC staff. In addition, records are maintained of environmental, radiological data and assessments released by the FRMAC to the LFA and state(s) and to outside groups after approval by the LFA.

Specific responsibilities of the Data Management Group may include the following:

- Collecting, screening, and organizing data and promptly distributing to appropriate FRMAC assessment personnel.
- Assisting in ensuring and maintaining the technical integrity of data.
- Maintaining a common, consistent, comprehensive, and traceable set of measurement data, predictive information, status summaries, and assessments.
- Preparing data sets, reports, and data summaries as requested by the Assessment Division Manager and group leaders.
- Preparing the database for long-term accountability and transfer to the EPA.
- Creating and maintaining the Data Center.

The Data Center consists of both physical and computer files. Environmental data will exist on hard-copy data sheets that will be retained in the Data Center. Data will also be entered into a computer database and cross-referenced to the physical files. The database will be designed to produce data reports at any time. Reports can be compiled by the following data categories:

- Media type
- Organization and/or survey team
- Location
- Time of measurement, sample collection, or analysis
- Level of results
- Specific instrument
- Laboratory performing the analysis

The information in the Data Center will be comprehensive, traceable, and accountable. It will be comprehensive because it is intended to include every off-site, environmental, radiological data point. Every data point will be traceable back to individual instruments, survey teams, calibration processes, and procedures. The information is accountable because the FRMAC will stand behind the integrity of the results. The Data Center provides a means of accomplishing this by gathering environmental, radiological information into a central spot and compiling it in a common format with complete information on each measurement and/or sample.

The long-term design objectives of the Data Center are to (a) build a comprehensive and traceable compilation of off-site environmental radiological data for long-term retention and use by the EPA, LFA, and state(s) and (b) archive information to allow reconstruction of the radiological situation in the future. A list of archived information is given in Appendix E.

4.8.3.4 ANALYSIS GROUP

Prioritized requests for assessments received by the Assessment Division Manager from the LFA and state(s) are provided to the Analysis Group for action. This group, with the supervisor, determines the type and quantity of available data and additional data that must be gathered and assists in setting priorities for taking additional measurements. Data received from field and laboratory teams, as well as from other agencies and groups, are promptly provided to the Analysis Group by the Data Management Group as soon as the data are screened for completeness.

The Analysis Group is composed of skilled specialists; the number and type are accident- and response-phase specific. Analysis is conducted by one or more of the specialist subgroups relative to the request. Data received by the FRMAC are provided to these specialists to complete the analysis and assessment requests. They complete the analysis in their areas and coordinate them with other related specialty areas. The completed results are also provided, as needed, to the Overview Group, which reviews the products from an overall perspective.

Specific responsibilities may be the function of a single specialist or may be shared with others. Most tasks are scenario-dependent. Responsibilities and tasks may include the following:

- For ongoing releases, providing ARAC with data for basing projections of whole-body and thyroid effective dose commitments to individuals off-site.
- Providing dose and predictive information to the FRMAC radiation safety officer in considering radiological protection of FRMAC personnel.
- Providing preliminary and final radiation contours of (a) exposure rates at approximately one meter above ground from ground deposition and/or (b) surface concentrations of major isotopes from ground deposition.
- Providing preliminary and final contours of the projected 0.1, 0.5, 1.0, 2.0, 5, and 10 rem whole-body dose for four-day, first-year, second-year, and fiftieth-year intervals (outside and unprotected) and/or other protective action levels, as requested.
- Providing an estimate of doses that could occur from resuspension of radioactive materials.
- Providing technical predictions regarding the appropriate modifications to environmental radiation fields and dose projections that may be caused by weathering; resuspension; structural shielding; decontamination of roofs, driveways and pavement; indoor contamination; and other modifications, as appropriate.
- Providing preliminary impact evaluation and dose assessment of specific areas and specific situations, as requested by the LFA and state(s).
- Translating, compiling, and summarizing data into actual and/or projected doses, if requested.
- Providing technical planning and resource information that can be used to assist the mitigation and recovery processes. Proposing dose mitigation options and predicting effectiveness in terms of minimizing doses, if requested by the LFA and/or state(s).
- Examining sample data related to isotopic deposition concentration and evaluating and/or calculating projected ingestion-pathway doses. Determine PAG contours related to ingestion-pathway preventative levels.
- Preparing resource information concerning the fixing of high-level radioactivity in place as a temporary means to prevent spread by winds or rains.
- Ensuring that the technical integrity, verification, and accuracy of the data are reflected in the analyses and assessments.
- Providing and assembling appropriate data as a basis for PARs.

- Anticipating additional analysis and assessment needs throughout the process so that they can be smoothly integrated in the system.
- Assisting in developing strategies so that environmental measurements meet assessment requirements.

4.8.3.5 OVERVIEW GROUP

The Overview Group has three primary functions: (a) reviewing and preparing the data from a perspective of the overall radiological situation, (b) assisting in developing an overall strategy for collecting data, and (c) reviewing data and assessments for overall consistency and integrity.

The Overview Group provides input to the Analysis and Data Management Groups relative to output format, graphics, GIS products, and overall assessment perspectives. FRMAC products are prepared by the Overview Group and released by the Assessment Division Manager. This group reviews the overall environmental data (such as ground data, aerial data, and predictions) for consistency and assessment of public impact and to develop priorities for collecting additional data. The group also reviews assessments in light of other products already processed to ascertain consistency with the overall situation and to check data points/units that appear questionable. The group also reviews FRMAC data summaries, data sets, GIS products, and graphics to assist in verifying the quality of FRMAC output.

While the specific overview responsibilities and tasks will be scenario-dependent, they may include the following:

- Reviewing incoming data for consistency and flagging apparent anomalous data/information.
- Tracing anomalous data points to certify validity or to locate errors.
- Evaluating predictive data, ground-based data, and aerial survey data for consistency and assisting in resolving significant differences.
- Providing guidance to the Data Management Group in preparing data sets and summaries for review and external distribution so that the results reflect the proper overall perspective.
- Preparing appropriate graphics and reviewing data and summary results for external use as requested by the LFA or state(s).
- Using existing information to assist the Assessment Division and Monitoring Division managers in planning and setting priorities for field monitoring and sampling missions.
- Supporting periodic briefings to FRMAC personnel relative to environmental assessments to ensure general awareness of the overall radiological situation.
- Reviewing FRMAC products (assessments, data sets, GIS products, graphics, etc.) for consistency within the product and with the current knowledge of the overall radiological situation.
- Providing overviews of the radiological situation, as needed.
- Displaying radiation data using the GIS overlaid on appropriate bases or maps for ease in assessing the overall radiological situation.

4.8.3.6 GEOGRAPHIC INFORMATION SYSTEM (GIS) GROUP

The GIS is a computerized database management system that captures, stores, retrieves, analyzes, and displays spatial (locationally defined) data. Layers of information can be displayed on a computer screen simultaneously, allowing the relationships between pieces of information to be seen. The GIS

is also a database where attributes of specific data can easily be referenced. For example, a particular school can be located on a map and applicable information can be extracted from the database. The GIS can also calculate areas of interest. For example, a land-use data layer can be overlaid on a radiation plot to calculate the area of a particular land use that lies within a given radiation zone. The GIS may include the following layers of information:

- Geographic base data
- Administrative data
- Emergency response data
- Land cover/land use
- Critical industries
- Radiation data
- Dispersion-model output
- Image data

For example, emergency response data could include locations of evacuation routes, police and fire stations, hospitals and clinics, emergency operating centers, shelters, and institutions (schools, prisons, and nursing homes). Radiation data could include baseline levels of background radiation, TLD locations, locations of survey teams, AMS data, and locations of measurements and samples by type, exposure-rate contours, integrated one-year dose projection contours, and/or isotopic concentration contours by dominant isotope.

4.8.3.7 PREDICTIONS GROUP

The Predictions Group prepares predictions of plume concentrations, ground deposition, exposure rates, and potential doses to individuals and populations resulting from releases of radioactive materials. This group also contributes to the FRMAC plans for initial deployment of monitoring teams so that critical areas are addressed first. Information obtained by this group is provided to other groups in the FRMAC.

This group has the following responsibilities:

- Reviewing available predictive results. If inconsistent, search out reasons for differences.
- Coordinating the combined use of ARAC and the predictive capabilities of other agencies in support of the FRMAC operations.
- Providing quality-assured, predictive assessments or calculations from ARAC and/or other agencies.
- Interacting with the Assessment Division and Monitoring Division managers to plan initial field monitoring missions.
- Refining predictions based on monitoring data obtained in the field.
- Providing preliminary and final radiation contours of whole-body and thyroid doses (if applicable) from cloud passage (outside and unprotected).
- Assisting in predicting air concentrations from resuspended radioactive material, as applicable.

4.8.3.8 METEOROLOGY GROUP

The meteorology group provides a broad spectrum of data, advice, and forecast services to support the FRMAC. This support is primarily supplied by the NOAA Air Resources Laboratory, Special Operations and Research Division (ARL/SORD). The support ranges from providing area climate data for

predeployment operations to on-scene surface and upper atmospheric weather observations and includes providing weather warnings, watches, advisories, and forecasts tailored for FRMAC operations. The Meteorology Group consolidates meteorological data from existing National Weather Service (NWS) offices, other ARL/SORD facilities, and DoD resources. Detailed FRMAC operations-area data and forecasts, produced by the Meteorological Group, are used by the Predictions Group for atmospheric modeling, by the Monitoring Division for aerial surveys and field monitoring, and by other FRMAC staff for general operations.

4.8.4 Staffing, Qualifications, and Tasks

The typical staffing requirements of the Assessment Division are listed in Section 5. In a given emergency situation, staffing will be based on the deployment level, which in turn is related to the scenario and the magnitude of the radiological emergency. The required number of people is tied to the number and type of field monitoring and sampling teams. The Assessment Division works with monitoring data and, therefore, the amount of data collected will dictate the required staffing levels. In this section, a brief discussion of the desired qualifications and tasks is given for personnel in the Assessment Division.

4.8.4.1 ASSESSMENT DIVISION MANAGER

- A. **Desired qualifications:** Experienced manager of technical radiological personnel. Knowledgeable in radiological protection principles and dose assessment. Trained in FRMAC management operations. Knowledgeable about FRMAC interfaces with other emergency response centers and needs of state and federal agencies.
- B. **Tasks:** Manages the FRMAC Assessment Division. Interfaces with other FRMAC managers, Director, staff, and SSA.

4.8.4.2 ASSESSMENT DIVISION DEPUTY MANAGER

- A. **Desired qualifications:** Experienced manager of technical radiological personnel. Trained in FRMAC operations.
- B. **Tasks:** Assists the manager in coordinating functions of the Assessment Division. Relays division activities and decisions to the Operations Manager for requests and documentation.

4.8.4.3 ASSESSMENT DIVISION STAFF

- A. **Desired qualifications:** Knowledgeable in operations of the Assessment Division and in administrative management.
- B. **Tasks:** Provides administrative support and recordkeeping for the division. Assists in tracking data and assessment requests and the corresponding results and products.

4.8.4.4 DATA MANAGEMENT GROUP SUPERVISOR

- A. **Desired qualifications:** Knowledgeable in FRMAC operations and the Data Center and database operations. Familiar with technical radiological terminology. Health physics, environmental, and/or computer background. Experienced in managing projects.

- B. **Tasks:** Manages the Data Center. Interfaces with managers of the (a) Assessment Division, (b) Monitoring Division, (c) GIS operations, and (d) corresponding on-site Data Center operations.

4.8.4.5 DATA MANAGEMENT GROUP STAFF

- A. **Desired qualifications:** Knowledgeable of the Data Center and database operations. Experienced in specific job assignment.
- B. **Tasks:** Performs specific job assignments such as data entry and report preparation.

4.8.4.6 ANALYSIS GROUP SUPERVISOR

- A. **Desired qualifications:** Possesses a health physics and/or radiation science background. Experienced in managing the assessment of emergency response, radiological data. Knowledgeable of LFA and state(s) needs in using FRMAC products.
- B. **Tasks:** Manages the detailed analysis and assessment of FRMAC data. Assigns tasks to other assessors in specialty groups, as needed.

4.8.4.7 ANALYSIS GROUP STAFF

- A. **Desired qualifications:** Possesses health physics and/or radiation science background. Experienced in analyzing and assessing emergency response, radiological data and radiation monitoring techniques.
- B. **Tasks:** Provides the detailed evaluations, analyses, assessments, and/or interpretations of FRMAC data.

4.8.4.8 OVERVIEW GROUP SUPERVISOR

- A. **Desired qualifications:** Possesses health physics and/or radiation science background. Experienced in managing the assessment of emergency response, radiological data. Knowledgeable of LFA and state(s) needs for FRMAC products.
- B. **Tasks:** Prepares overview status reports of radiological situation. Interfaces with Assessment Division Manager, SSA, LFA, and state(s) representatives on needs and use of FRMAC products. Works with the Field Monitoring and Sampling Group Supervisor on priorities for measurements.

4.8.4.9 OVERVIEW GROUP STAFF

- A. **Desired qualifications:** Possesses health physics and/or radiation science background. Experienced in assessing emergency response, radiological data and specific job assignments.
- B. **Tasks:** Reviews predictions, AMS results, ground-based measurements, and sampling results for consistency. Assists in resolving differences. Assists Overview Supervisor in producing

reports, maps, and other FRMAC products to meet users' needs. Performs specific job assignments such as producing GIS products, etc.

4.8.4.10 PREDICTIONS GROUP SUPERVISOR

- A. Desired qualifications: Possesses health physics, meteorology, and radiation science background. Experienced in predicting radiological atmospheric transport in emergency response situations.
- B. Tasks: Reviews available predictive results. If inconsistent, searches out reasons for differences. Provides predictions of radiological deposition patterns and air and ground concentrations resulting from the radiological emergency.

4.8.4.11 PREDICTIONS GROUP STAFF

- A. Desired qualifications: Possesses health physics, meteorology, and radiation science background. Experienced in radiological predictions and emergency response. (ARAC and/or others, as needed.)
- B. Tasks: Assists the Predictions Supervisor in providing radiological predictions.

4.8.4.12 METEOROLOGY GROUP SUPERVISOR

- A. Desired qualifications: Experienced in meteorology, weather forecasting, and predicting radiological atmospheric transport in emergency situations.
- B. Tasks: Provides weather information and forecasts to FRMAC personnel as related to FRMAC operations, atmospheric transport predictions, field monitoring activities, and aerial surveys.

4.8.4.13 METEOROLOGY GROUP STAFF

- A. Desired qualifications: Experienced in meteorology and weather forecasting.
- B. Tasks: Assists in providing weather information and forecasts.

4.8.5 *FRMAC Assessment Manual*

To ensure consistency, completeness, and the highest quality of assessed data, the most appropriate assessment methods and values available were compiled in the *FRMAC Assessment Manual*. The criteria for selecting appropriate methods and values included (a) scientifically defensible, (b) simplicity, (c) applicability to FRMAC deployment, and (d) those most likely to be adopted by others. Uses of the manual include the following:

- Facilitate assessment of consequences resulting from a radiological emergency, including *comparison of projected doses to preestablished PAGs*.
- Document assessment procedures used by the Assessment Division.

- Provide consistency in assessments performed by the Assessment Division during around-the-clock FRMAC operations.
- Serve as a training document for Assessment Division personnel as well as for other FRMAC members and federal and state participants.
- Provide a sound technical basis for conducting assessments accepted by the technical community before a radiological emergency occurs.

The document contains models for directly determining radiation doses based on measured environmental radiation, a brief summary of the EPA and Food and Drug Administration (FDA) PAGs, and information on the effectiveness of dose mitigation techniques. The appendices contain environmental transport models, information on default parameter values, dose coefficients, and example dose calculations for each pathway discussed in the manual.

The *FRMAC Assessment Manual* has been prepared by representatives from three federal agencies: DOE, NRC, and EPA. All three agencies authorize the release of this manual.

4.8.6 Steps in the Data-Evaluation and Data-Assessment Processes

- A. Receive the environmental survey data from the Monitoring Division.
- B. Log, label, and enter data into the database.
- C. Transfer data to GIS.
- D. Assist in validating data by determining if the results are compatible with other results obtained in the area.
- E. Examine data in the GIS and/or plot on an overlay map of the area.
 1. Plot the ground data by media (separate overlays for each type of environmental data to include soil, exposure rate, isotopic content, air, and water).
 2. Examine predictions in relation to ground-based data.
 3. Examine aerial survey results.
- F. Evaluate data for consistency and completeness.
- G. Advise Monitoring Division where further measurements are needed.
- H. Evaluate data for public impact. Note location of hospitals, schools, populated areas, etc.
- I. Summarize the results for management review.
 1. Ideally, summarize map data in GIS every four hours.
 2. Determine colors for plotting and contouring data.
 3. Determine contour intervals and the appropriate type of contours.
 4. Determine map details needed for management information.
 5. Determine internal and/or external distribution of data.
 6. Determine graphical information.
 - a. Final output format (still video, GIS, photographs, etc.).

- b. Type of map base (U.S. Geological Survey, photo, etc.).
 - c. Trace or redraw data, as appropriate.
- J. Present summary information (situation status) to FRMAC managers, etc.
- K. Continue evaluation of the total information and continue updating the summary graphics.

4.9 H&S Division Functions

The H&S Division will ensure that health and safety risks associated with FRMAC operations are identified, controlled, and documented according to the appropriate health and safety requirements that govern emergency actions undertaken by the FRMAC. This division is responsible for developing, maintaining, and administering the health and safety program at a FRMAC.

4.9.1 Administration and FRMAC Interfaces

Health and safety issues at the FRMAC are the responsibility of the H&S Division Manager. These responsibilities focus primarily on the areas of health physics or radiological safety control for FRMAC personnel; however, responsibilities also include providing medical care or treatment and industrial hygiene services and ensuring general safety. The H&S Division Manager has a staff of health physicists, industrial hygienists, and medical and general safety professionals who provide the necessary expertise.

4.9.2 Health Physics

Health physics personnel are responsible for overall radiation safety of FRMAC personnel regarding radiation protection, personnel dosimetry, contamination control, radioactive waste management, and shipment of radioactive materials.

4.9.2.1 RADIATION PROTECTION

Annual radiation exposure limits for FRMAC field personnel (who are considered to be radiation workers) are 5 rem total effective dose equivalent (TEDE) for the whole body; 15 rem for the lens of the eye; and 50 rem for extremities, skin, and other tissues. General FRMAC support personnel (who are not radiation workers) will be limited to an annual maximum exposure of 0.1 rem TEDE.

FRMAC radiation workers will be restricted from working in radiologically controlled areas when their radiation exposure has exceeded 50 percent of the annual limit. As emergency workers, doses in excess of these limits, but in line with federal emergency exposure limits, may be authorized to work by the FRMAC Director upon recommendation of the H&S Division Manager.

4.9.2.2 PERSONNEL DOSIMETRY

TLDs may be issued to FRMAC personnel at time of check-in. These must be worn at all times or as directed by the H&S Division Manager. Self-reading pocket dosimeters may also be issued to certain

field personnel. Records of serial numbers and integrated measurements will be kept of all issued TLDs and pocket dosimeters.

4.9.2.3 CONTAMINATION CONTROL

All work at the FRMAC response site will be performed to minimize the risk of contamination of personnel and equipment. Radiological areas with specific entry/exit points ("hot lines") will be established, posted, and controlled. Personnel and equipment entering or leaving a radiological area must be monitored for contamination. Contamination limits established in the *FRMAC Health and Safety Manual* will be used by the FRMAC.

Entry/exit points will be established at each radiological area as directed by the H&S Division Manager. Contamination monitoring will be conducted at the "hot line." Decontamination of personnel and/or equipment exiting the radiological area will also be conducted at the "hot line."

Personnel exiting a radiological area will be monitored (hands, feet, and clothing) at the "hot line." Monitoring may be performed with portal monitors and hand-held survey instruments. Documentation of personnel contamination and decontamination efforts will be submitted to the H&S Division Manager.

Equipment, materials, and vehicles exiting a radiological area must be surveyed for contamination at the "hot line." This will be accomplished by using approved methods and procedures. If necessary, contaminated equipment, materials, and vehicles will be segregated while awaiting decontamination. The location of the "hot line" should not interfere with FRMAC operations. It should be located near the contamination zone.

4.9.2.4 RADIOACTIVE WASTE MANAGEMENT

Large amounts of solid and liquid radioactive waste may be accumulated after a radiological emergency that involves the FRMAC. Radioactive wastes will be packaged, labeled, and handled according to the *FRMAC Health and Safety Manual*. The health physics staff of the H&S Division will supervise radioactive waste packaging, labeling, handling, and transport.

4.9.2.5 RADIOACTIVE MATERIAL SHIPMENT

Radioactive material, including wastes, transported from the FRMAC site by any form of transportation must be packaged and labeled according to Department of Transportation (DOT) regulations. Packages must be labeled; vehicles carrying the packages must be placarded, when required; and the proper paperwork must be completed. If these requirements cannot be fulfilled by a responsible licensee, then the health physics staff of the H&S Division will ship the radioactive material.

4.9.2.6 FRMAC RESPIRATORY EQUIPMENT

The H&S Division Manager will ensure that FRMAC participants, who may need to wear respiratory protective equipment, have been trained in respirator use, are medically qualified to wear a respirator, and have been fit-tested for the appropriate respirator.

4.9.3 Industrial Hygiene and General Safety

Potential exposure to industrial hygiene hazards (chemicals, biological agents, and environmental stressors) and general safety hazards (fire, electrical, etc.) will be minimized and controlled in the FRMAC. The industrial hygienist and safety professional will determine the extent of these hazards and prepare procedures to control them.

4.9.3.1 HAZARD COMMUNICATION

All participants will receive a briefing about potential hazards that may be encountered at the FRMAC. This briefing is presented by the industrial hygienist and should be coordinated with the initial FRMAC personnel briefing.

4.9.3.2 INDUSTRIAL HYGIENE MONITORING AND SAMPLING

It is expected that monitoring and sampling for chemical or other hazards at the FRMAC will be minimal. The H&S Division Manager will consult with the industrial hygienist and determine if this type of monitoring is needed.

4.9.3.3 ENVIRONMENTAL STRESSORS

Depending on the time of year and geographic location of the radiological emergency, the weather may be a health and safety factor. If extreme environmental conditions are expected, appropriate clothing could be prescribed by the H&S Division Manager and provided, if necessary.

4.9.3.4 GENERAL SAFETY

General safety issues such as fire and electrical safety, use of compressed gas cylinders and cryogenic materials, and confined space entry will be identified and supervised by the H&S Division Manager and staff.

4.9.4 Medical

The FRMAC emergency medical provider will be a medical technician, physician, nurse practitioner, or other medical professional qualified to provide medical treatment to FRMAC personnel. The medical provider is responsible for emergency medical care of FRMAC personnel when local medical services may not be readily available (*e.g.*, in remote locations or at full FRMAC responses). The medical provider is expected to be a REAC/TS staff person. Additional medical staff may be acquired through the local economy (if available) when the service is deemed necessary by the H&S Division Manager. In addition, medical personnel will be available to counsel local medical personnel on treating individuals who have been exposed to radiation.

4.9.5 H&S Division Key Staffing and Qualifications

Table 3 shows a list of FRMAC H&S Division personnel staffing and their qualifications.

Table 3. FRMAC H&S Division Staffing and Qualifications

Title	Experience	Education/Training
H&S Division Manager	Broad health and safety experience; broad management experience	M.S. degree or certification in health physics
Deputy H&S Division Manager	Broad health and safety experience; organizational skills	M.S. degree or certification (health physics, industrial hygiene, or safety)
Clerk	Data management experience	Training in word processing, spread sheets, and FRMAC databases
Radiological Protection Coordinator	Broad radiological control (RADCON) experience	B.S. degree or certification in health physics
Dosimetry Chief	Dosimetry management experience	B.S. degree or equivalent experience
Contamination Control Chief	Extensive field experience in RADCON (10 years plus)	Board-qualified Radiological Control Technician (RCT) Supervisor
Contamination Control Staff	Field RCT experience	Board-qualified RCT
Deputy Radiological Protection Coordinator	RADCON and waste management experience	Radioactive waste handling training
Medical Coordinator	Broad medical experience	M.D.
Safety/Industrial Hygiene Coordinator	Broad safety and industrial hygiene experience	B.S. degree and certification in safety or industrial hygiene or M.S. degree
Safety/Industrial Hygiene Staff	Field monitoring experience	

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5.0 FRMAC STAFFING, INFORMATION FLOW, AND OUTPUT PRODUCTS

5.1 Staffing Levels

The number of personnel required to manage and operate the FRMAC will depend on the location, severity, and classification of the radiological emergency, as well as the type of assistance requested by the LFA, state(s), and/or local authorities. The staffing estimates (for planning purposes) to support three levels of FRMAC activities are presented in this section: staffing required to support 10, 20, and 50 field monitoring and sampling teams per shift. The number of monitoring teams was chosen as the basis for staffing because the basic functions of the FRMAC depend on the number of monitoring teams gathering data. It is estimated that each team can obtain one data set about every 15 to 20 minutes. Thus, 20 teams are expected to obtain and report a data set about once every minute.

The numbers of 10 and 50 field monitoring teams per shift for a 24-hour operation represent small and large levels, respectively, of FRMAC staffing. If less than 10 teams are required, DOE RAP teams can augment support unless around-the-clock operations are required. The 50-team level was chosen to respond to a very large radiological emergency, such as a Chernobyl-type reactor accident or a nuclear detonation. In these cases, simultaneous monitoring may be required in several states. Staffing levels are given in Tables 4–11 (see pages 65–70).

The 10-team level per shift is considered the minimum required for a FRMAC response to support the LFA and state(s) requests. FRMAC preparations, planning, and training programs use this level as the basis of operational readiness.

The staffing levels presented in this section are only estimates for planning, training, and preparation purposes. Actual deployment will strongly depend on the severity of the radiological emergency and the needs of the LFA and state(s). Levels shown for state and other federal agencies are expectations, not requirements.

The Advisory Team for Environment, Food, and Health (Advisory Team) and other agency representatives are not included in the tables because they are not part of the FRMAC. However, they are expected to reside at the FRMAC location. Therefore, space, tables, chairs, phones, and other support will be provided.

It is noted that the minimum FRMAC staffing expected for a 20-team level is 226 participants per shift, of which 29 are LFA and state representatives and local participants. This leaves a total of 197 FRMAC participants per shift and a total of 394 participants per day.

Table 4. FRMAC Director's Staff

Function	Per Shift		
	10-Team Level	20-Team Level	50-Team Level
FRMAC Director	1	1	1
FRMAC Deputy Director	1	1	1
LFA Representative	1	2	3
State Representative	1	2	3
EPA Senior Official	1	1	1
Senior Scientific Advisor	1	2	2
Chief of Staff	1	1	1

Table 4. FRMAC Director's Staff (continued)

Function	Per Shift		
	10-Team Level	20-Team Level	50-Team Level
Special Staff			
Public Information Officer	2	2	3
Administrative Staff	1	3	3
Legal Coordinator	0	1	1
Quality Assurance Coordinator	1	1	2
Total	11	17	21

Table 5. Operations Manager and Staff

Function	Per Shift		
	10-Team Level	20-Team Level	50-Team Level
Operations Manager	1	1	1
Deputy Manager	0	1	1
Administrative/Clerical Staff	1	2	3
Operations Staff			
Recordkeeping	1	1	2
Action Tracking	0	1	2
Planning	0	1	2
Archiving	1	1	2
Total	4	8	13

Table 6. Liaison Manager and Staff

Function	Per Shift		
	10-Team Level	20-Team Level	50-Team Level
Liaison Manager	1	1	1
Deputy Manager	0	1	1
LFA Liaison	1	1	2
State Liaison	1	2	3
DFO Liaison	1	1	1
Facility Owner/Operator Liaison	1	1	1
Other Liaisons	0	1	3
Total	5	8	12

Table 7. Support Division Manager and Staff

Function	Per Shift		
	10-Team Level	20-Team Level	50-Team Level
Support Division Manager	1	1	1
Deputy Manager	1	1	1
Local Representative	1	1	1
Communications Supervisor	1	1	1
Communications Engineer	1	2	2
Communications Technician	1	4	6
Telephone Operator	1	2	2
Mechanical/Electrical Supervisor	1	1	1
Mechanical/Electrical Engineer	1	1	1
Mechanical/Electrical Technician	1	2	2
Photo/Video Supervisor	1	1	1
Photo Technician	2	4	6
Still Video Technician	2	4	6
Logistical/Administrative Supervisor	1	1	1
Administrative Assistant	1	1	2
Administrative/Clerical Staff	0	3	4
Material Handler	1	2	3
Janitorial Staff	1	1	1
Base Support Supervisor	1	1	1
Badging Staff	1	2	2
Administrative Assistant	1	2	3
Security Supervisor	1	1	1
Security Assistant	0	1	1
Equipment Security Guards	1	2	3
Total	24	42	53

Table 8. Monitoring Division Manager and Staff

Function	Per Shift		
	10-Team Level	20-Team Level	50-Team Level
Monitoring Division Manager	1	1	1
Deputy Manager	1	1	1
LFA Representative	1	1	2
State Representative	1	1	2
Administrative Assistant	1	1	2
Status Map Coordinator	1	1	2
Field Monitoring Supervisor	1	1	1
Deputy Monitoring Supervisor	0	1	1
Net Control Radio Dispatcher ^a	1	2	5
Data Acquisition Officer (Recorder) ^a	1	2	5
Field Data Specialist	1	1	3
Instrument Calibration Maintenance Officer	1	2	4
Field Monitors ^b	30	60	150
Environmental Dosimetry Technician	1	1	2
Aerial Measurements Supervisor	1	1	1
Data Analysis (Scientist/Technician)	1	3	5
Electronic Technicians	2	4	6
Pilot	2	2	6
Aircraft Mechanic	1	2	3
Laboratory Analysis Supervisor	1	1	1
Deputy Laboratory Supervisor	0	1	1
Sample Control Coordinator	1	2	4
Sample Preparation Coordinator	2	2	4
Analysis Chemist/Technician	1	2	4
Analysis Specialist	1	3	6
Data Control Supervisor	1	2	4
Quality Assurance Officer	1	1	1
Quality Assurance Technician	1	2	4
Quality Assurance Chemist	1	1	1
Total	59	105	232

^a One individual for every ten field teams.

^b Three persons per team; two federal and one state or local.

Table 9. Assessment Division Manager and Staff

Function	Per Shift		
	10-Team Level	20-Team Level	50-Team Level
Assessment Division Manager	1	1	1
Deputy Manager	1	1	1
LFA Representative	1	1	1
State Representative	1	1	1
Division Staff	1	1	2
Data Center Supervisor	1	1	1
Data Center Staff	3	6	12
Analysis Supervisor	1	1	1
Analysis Staff	2	4	6
Overview Supervisor	1	1	1
Overview Staff	1	4	8
GIS Supervisor	1	1	1
GIS Staff	2	3	6
Predictions Supervisor	1	1	1
Predictions Staff	1	1	1
Meteorology Supervisor	1	1	1
Meteorology Staff	0	2	2
Total	20	31	47

Table 10. H&S Division Manager and Staff

Function	Per Shift		
	10-Team Level	20-Team Level	50-Team Level
H&S Division Manager	1	1	1
Deputy Manager	1	1	2
Health Physicist	1	2	2
Safety/Industrial Health Officer	1	3	5
Medical Staff	1	2	3
Contamination Control Staff	3	6	10
Total	8	15	23

Table 11. Summary of FRMAC Staffing Guidelines

Function	Per Shift		
	10-Team Level	20-Team Level	50-Team Level
Director's Staff	11	17	21
Operations Staff	4	8	13
Liaison	5	8	12
Support Division	24	42	53
Monitoring Division	59	105	232
Assessment Division	20	31	47
Health and Safety Division	8	15	22
Total	131	226	400

5.2 Technical Information Flow and Tracking

For any major radiological emergency, the FRMAC is prepared to produce standard products and respond to specific requests from the LFA and state(s). This section discusses the flow and tracking of technical information, both internal and external.

5.2.1 External Information Flow

The operational structure for an emergency response, as related to FRMAC, is shown in Figure 9. FRMAC operations support the LFA and state(s). Other key functions, located in the FRMAC facilities, contribute to but are not a part of FRMAC operations. These functions include the Advisory Team and other agency representatives (federal and local), as needed. Figure 9 depicts the information flow of requests/responses for radiological data and assessments.

Information that has been approved for external release by the FRMAC Director is transmitted by three pathways.

- To the LFA, state, and local authorities through their FRMAC representatives.
- To other emergency response centers, such as the JIC and DFO, after authorization by the LFA and state representatives.
- To other federal agencies after authorization by the LFA representative.

5.2.2 Internal Information Flow

Information may reach the FRMAC by radio transmission, telephone, hand delivery, facsimile, U.S. mail, or other delivery channels. The internal information-flow patterns have been designed to ensure that environmental data can be effectively passed to the LFA and state(s) as efficiently as possible. Three principles are utilized in planning and implementing the information flow: timeliness, integrity, and priority.

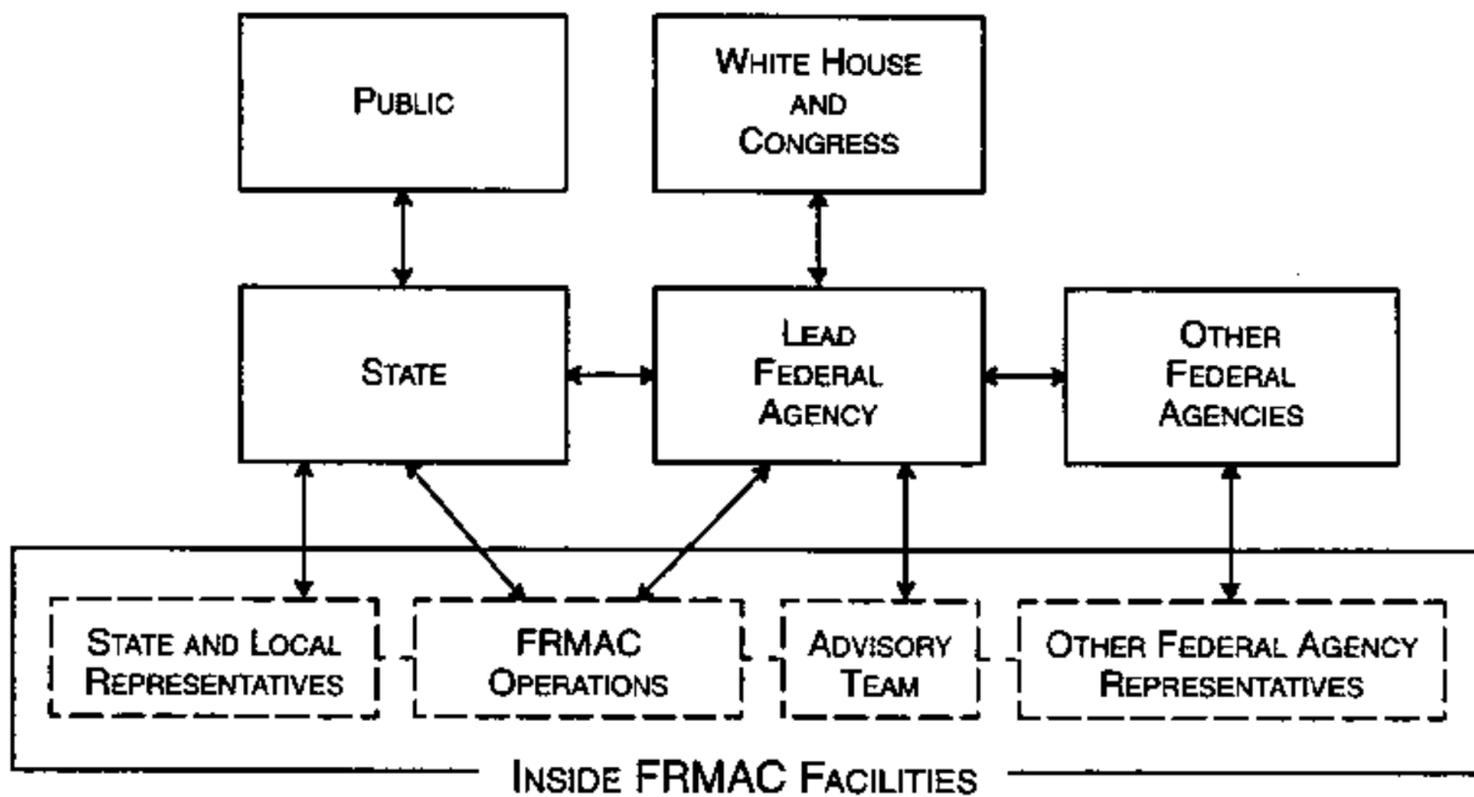


FIGURE 9. FRMAC RESPONSE OPERATIONAL STRUCTURE

Data are received by the FRMAC from many sources. Much of these data are transmitted to specific groups. For instance, on-site information comes from the LFA directly to the FRMAC Director or to the Monitoring Division, depending on the type of information; information regarding aerial measurements goes directly to the Monitoring Division or the Assessment Division. This process is shown in Figure 10 (see page 72).

Data received from state, federal, and/or owner/operator off-site monitoring teams or from fixed or mobile laboratories must be screened, recorded, evaluated, plotted, and archived. The flow as shown in Figure 10 allows the FRMAC to ensure that data is transmitted from a field radiation monitor to a decision maker in a timely manner. It also allows the FRMAC to maintain a complete, comprehensive, and verifiable database.

Figure 11 (see page 72) details the internal flow of environmental radiological data. Provisions will be made in the information-flow process for promptly reporting monitoring results that represent an immediate threat to public health. Raw data coming into the FRMAC are quickly reviewed, stamped as raw data, and distributed to the LFA, state(s), local representatives, and interested participants within the FRMAC facilities. Processed, evaluated, and summarized data from the Assessment Division are approved by the Director. These evaluated technical data are distributed formally to the LFA and state(s) simultaneously.

5.2.3 FRMAC Action Requests

FRMAC's highest priority is to provide monitoring results and other relevant information as requested by the LFA, state(s), and local authorities. Generally, the LFA and the state(s) submit their requests to the Director using the FRMAC Action Request form. Local authorities submit their requests through their state representatives.

The FRMAC Director, Operations Manager, and LFA and state representatives will review new requests, the status of previous requests, and the status of current activities to determine the priority

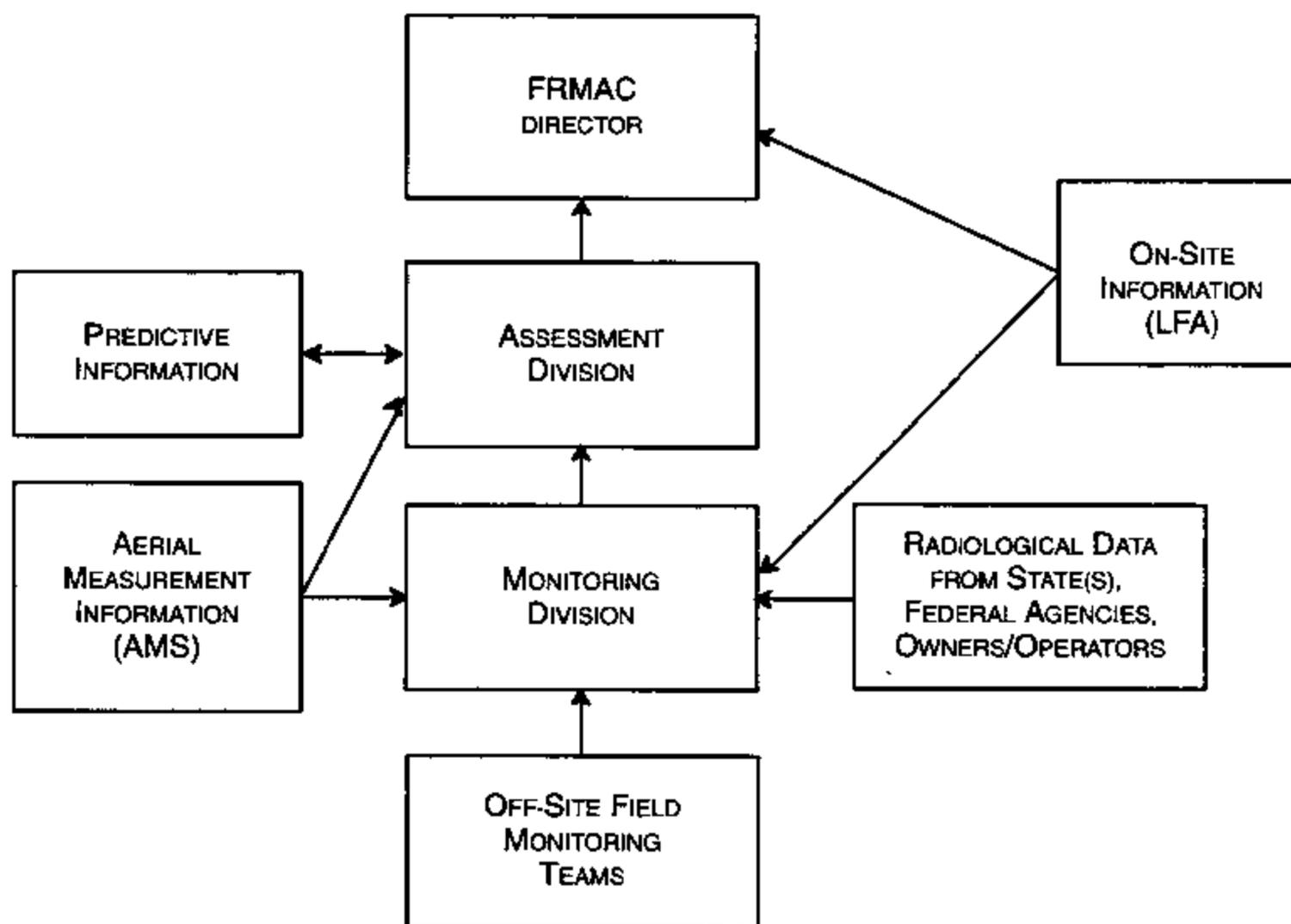


FIGURE 10. FRMAC TECHNICAL DATA INFORMATION FLOW

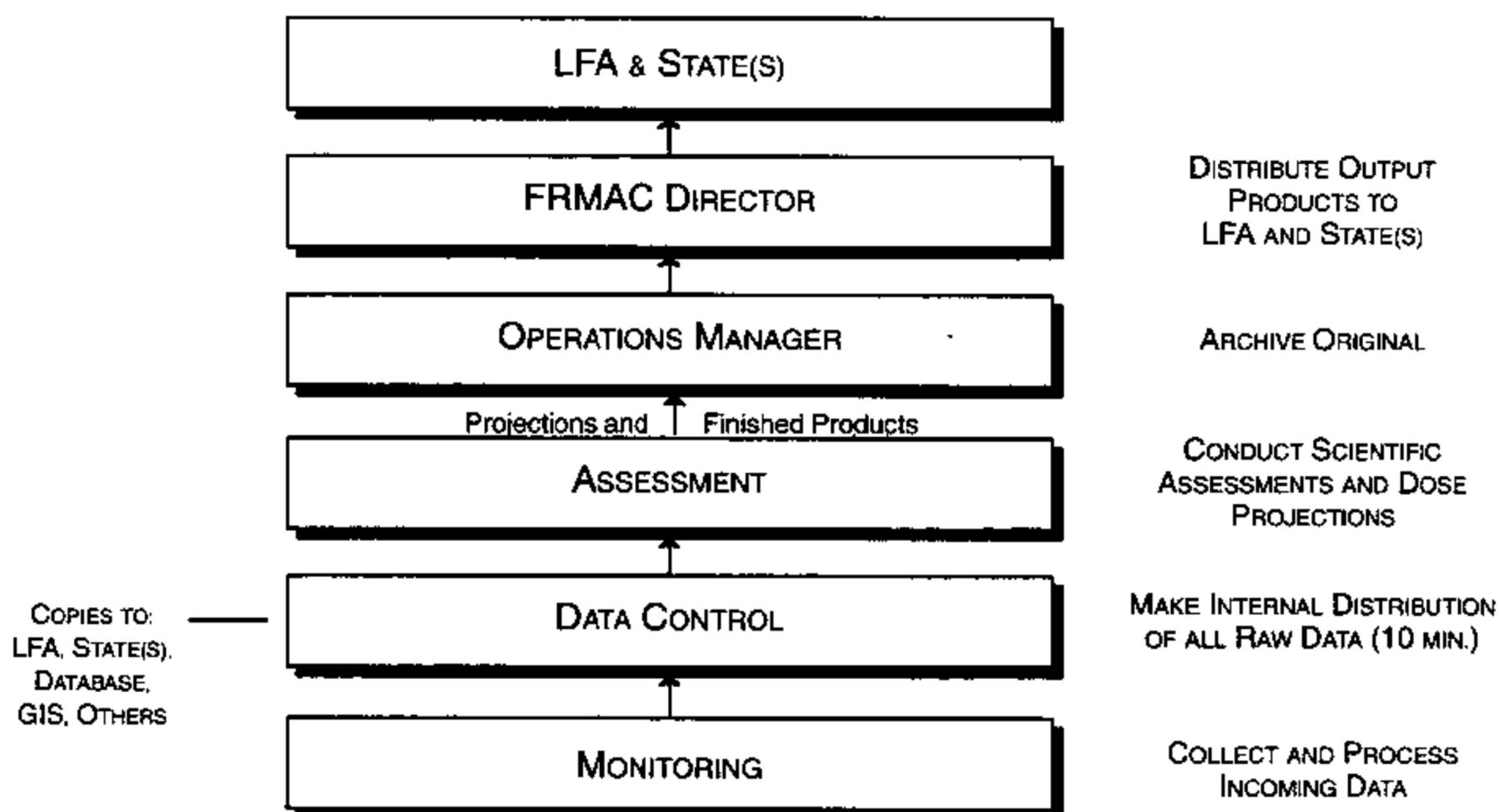


FIGURE 11. FRMAC RADIOLOGICAL DATA INFORMATION FLOW

of new requests. The Operations Manager will meet with the appropriate FRMAC managers to draft implementation details, consider the impact on operations and project schedules, and make assignments to one or more action groups. After reviewing the drafted plan, the Director will approve and

authorize the implementation of requests and reprioritize operations, if necessary. The Operations Manager will convey the implementation plan and schedule to the LFA and state(s).

The Operations Manager will direct and submit approved requests to the FRMAC tracker for implementation, distribution, tracking, and archiving (Figure 12). The tracker is responsible for monitoring and providing the current disposition of FRMAC Action Requests to the Operations Manager.

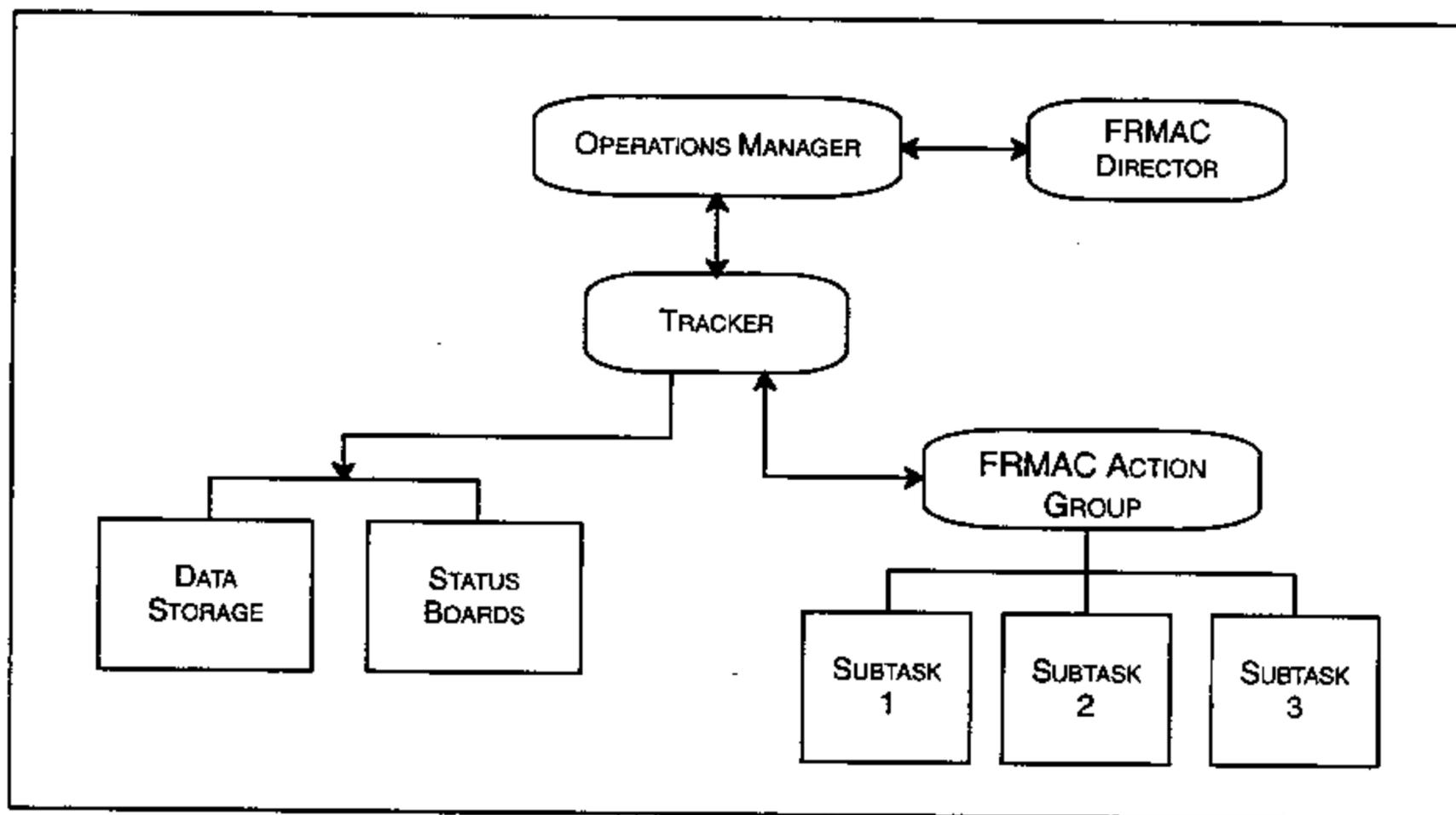


FIGURE 12. TRACKING FRMAC ACTION REQUESTS

The tracker will assign a request reference number to the FRMAC Action Request form, log the request, and place a copy in the tracker's FRMAC Action Request Logbook. The action request will be listed in the index/contents page of the logbook and future correspondence will be cross-referenced and catalogued using the request reference number.

The original FRMAC Action Request form will be placed in a color-coded folder (red = emergency, yellow = urgent, green = routine) and forwarded by the tracker to the appropriate action group(s) or recipient(s). The responsible action group will distribute additional copies of the request with pertinent work instructions to the various personnel who will perform the task or subtask. The responsible action group will obtain periodic status reports from the various personnel working on each subtask and will relay the overall status to the FRMAC tracker (every four hours or until the task has been completed) using the Action Request Progress Status form. The responsible action group is also required to initiate and maintain a log of the work being performed. Copies of the logbook, completed Action Request Progress Status forms, and other pertinent instructions will be included in the color-coded folder.

Additional working copies of the FRMAC Action Request form will be distributed by the tracker to specified mail stops. The tracker will provide a copy to the Director's staff. This copy will be placed in an archival, data storage media and entered in a FRMAC Action Request Logbook for reference. To denote a first generation copy of the FRMAC Action Request form, two stamps will be used: a "Distribution" stamp and a RED arrow stamp. If the recipient's name is not highlighted by a red arrow, then the form is a duplicate copy. Also, a letter "A" (immediate action requested) or "C" (reference copy only)

will be denoted after the recipient's name. If the letter "A" is denoted, then the recipient must complete a task or action and may be required to provide an Action Request Progress Status report to the tracker. The generation of this report will depend on the requested task or action.

The FRMAC tracker will also maintain and update every two hours an action request status board. At a minimum, the action request status board will provide the following information.

- A. Date and time of the request
- B. Request reference number
- C. Priority authorization that may be indicated by the following:
 - Color-coded folders
 - Code numbers (1 = emergency; 2 = urgent; 3 = routine)
 - Direction of the FRMAC Director
- D. Description of the requested task/action
- E. Estimated completion time or time when the request must be completed
- F. Current status:
 - Time of update
 - Action group or person reporting
 - Brief description of current task
- G. Percentage of task completed

A working copy of each FRMAC Action Request will also be maintained as a reference and kept next to the action request status board. The status board can be shown with an overhead projector, a tripod-mounted or full-length display board, or a computer-generated display screen, whichever is deemed more suitable at the FRMAC work location.

5.2.3.1 TRACKING FRMAC ACTION REQUESTS

- A. The LFA and/or state(s) will submit the action request to the FRMAC on a standard FRMAC Action Request form.
- B. The LFA and state(s) representatives, FRMAC Director, and Operations Manager will review new action requests, the status of previous requests, and the status of current FRMAC activities to determine the priority of a new request. This group will meet if the requests exceed FRMAC resources. Otherwise, the Operations Manager and the Operations Staff will handle the requests.
- C. The Operations Manager will meet with the appropriate FRMAC action groups and managers to draft details for implementation, impact on current operations, and projected completion schedules.
- D. The Director will meet with the Operations Manager to approve and authorize the implementation of a new request and reprioritize FRMAC operations, if necessary.
- E. The Operations Manager will inform the LFA and/or state(s) of the implementation plan and schedule.
- F. The Operations Manager will direct and submit the approved FRMAC Action Request form to the tracker for implementation, distribution, tracking, and archiving.

- G. The tracker will log the FRMAC Action Request form in the FRMAC Action Request Logbook and in the archival, data storage media.
- H. The tracker will place the original FRMAC Action Request form in a color-coded folder and distribute to the appropriate action group or recipient.
- I. The tracker will update the action request status board every two hours, as appropriate.
- J. The tracker will secure a detailed Action Request Progress Status report from the responsible action group every four hours or until the request is completed.
- K. The tracker will log all Action Request Progress Status reports and correspondence in the FRMAC Action Request Logbook and in the archival, data storage media.

5.2.4 Recordkeeping

The general responsibility of the FRMAC is to manage and direct the federal resources in monitoring and assessing the off-site environmental radiological situation. The FRMAC will establish and maintain an accountable and retrievable set of off-site radiological monitoring and assessment data, correspondence, records, and other pertinent information resulting from the radiological emergency.

5.2.4.1 REPORTING FRMAC TASK/EVENT STATUS

FRMAC managers are responsible for maintaining a log of on-going activities under their direct supervision. Furthermore, they are responsible for performing periodic status reviews and informing the Operations Manager about the current status of tasks, events, or other ongoing activities. Status updates are provided every four hours, or as directed by the Operations Manager, and shall include the following information.

- Type of action or task
- Responsible organization or point of contact
- Percentage completed
- Estimated completion time
- Personnel status
- Resource status

If an unusual event or situation should occur, the affected or responsible manager will document the event and inform the Operations Manager as soon as possible. The responsible manager should provide the following information, at a minimum.

- Date and time the event will occur or has occurred
- Description of the event
- Date and time the event was reported to the FRMAC
- Source of the information
- Points of contact both at the FRMAC and off-site
- Impact on FRMAC operations if known

5.2.4.2 TASK/EVENT TRACKING

The Operations Manager will meet with the FRMAC Director and other managers, as applicable, to review the current status of activities or to inform them of an event or situational update. After the meeting, the Operations Manager will be responsible for briefing the LFA and state representatives.

The Operations Manager will distribute a copy of the Manager's Status Report or event notification form to the tracker for implementation, distribution, tracking, and archiving. The tracker will assign a task/event reference number to the report and will distribute copies to interested parties. A copy will be distributed to the FRMAC Director's staff, and the data will be entered into the archival, data storage media.

The tracker will also maintain and update a task/event summary status board every two hours where the following information, as a minimum, will be displayed.

- Time the event was reported or updated at the FRMAC
- Task/event reference number
- Description of the task or event
- Date and time that the task or event will occur or has occurred
- Current status to include percent complete, in progress, on hold, etc.
- Comments

All managers will be responsible for informing the trackers within their purview about the content of key phone calls, meetings, events, and discussions.

5.2.4.3 SITUATION REPORTS

FRMAC situation reports will be prepared and sent to the appropriate locations, as needed. Types of situation reports are listed below.

- Four-hour reports
- Daily reports
- Special/unusual occurrence reports

Special forms are available for these situation reports. Each operational manager will prepare situation reports of activities occurring in their area of responsibility and submit them to the Operations Manager. The Operations Manager will summarize and condense these situation reports into one report and send to the appropriate distribution.

The purpose of situation reports is to inform others of the status of FRMAC activities and needs. Situation reports may contain (a) status summaries of major requests from the LFA and/or state(s), (b) status of resources, and (c) requirements for additional resources. Situation reports will not include radiological data points. Distribution may include other emergency response centers, participating FRERP agencies, and DOE RCOs as well as DOE/HQ.

5.2.5 Data Monitoring and Documentation

Figure 13 illustrates the expected information flow for monitoring data. Generally, technical information is gathered by the field teams, recorded on standard data forms, and reported by radio or telephone or hand-delivered to the field monitoring dispatcher. The dispatcher/recorder will log the data entry by team number or name, equipment used, and the time and location where the data were acquired. If the data were transmitted, the dispatcher/recorder will record the data results to standard forms.

All data forms, hand-delivered or transcribed, are reviewed by the field data specialist for completeness, reasonableness, and proper units. The reviewed forms are photocopied, stamped as raw data,

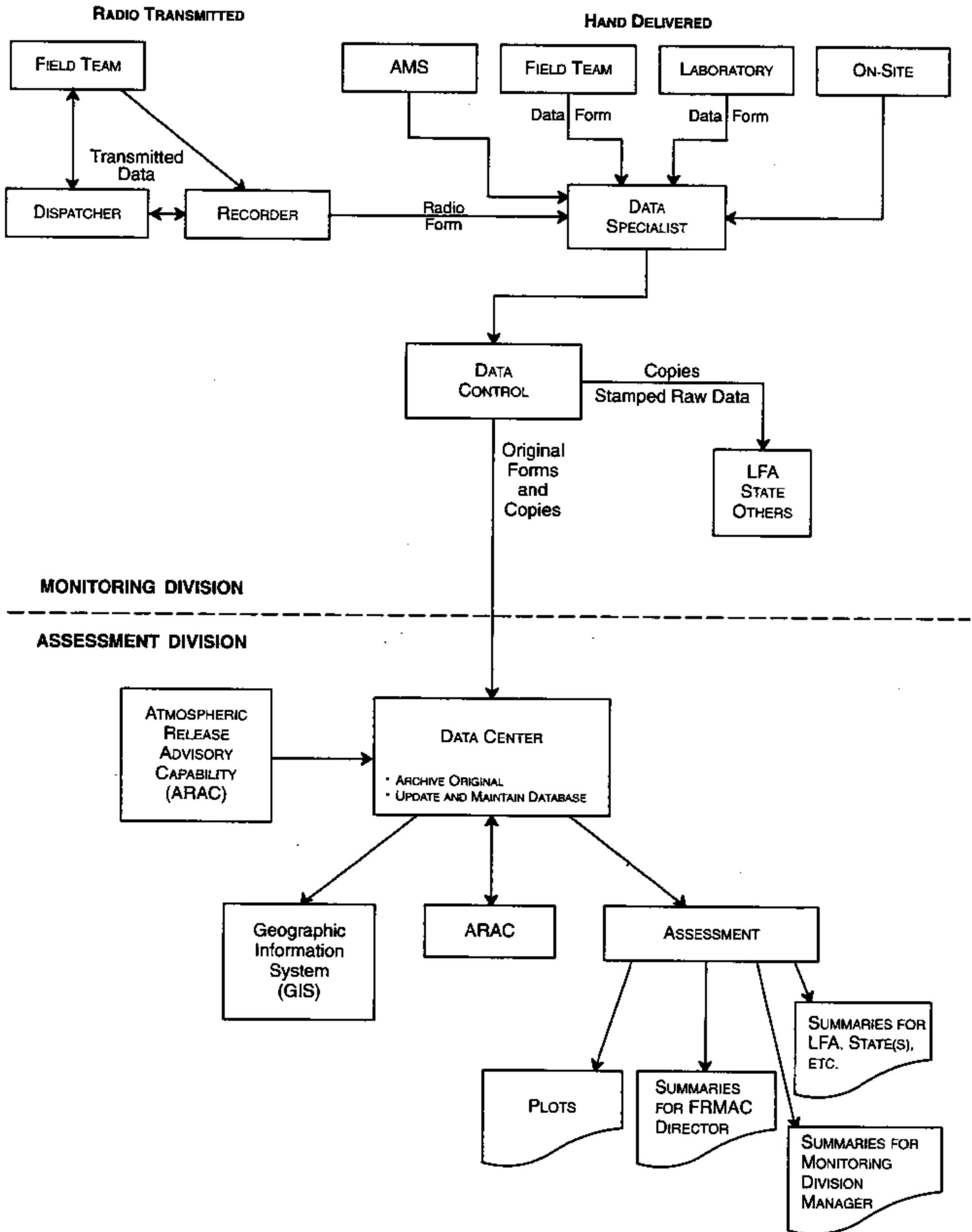


FIGURE 13. MONITORING DATA FLOWCHART

and distributed to the Assessment Division, the GIS group, and others including the LFA, federal, state, and local representatives located at the FRMAC. The original copy of all data forms is documented and archived in the database. The data are then entered into the data storage system. After entry, the data are reviewed and evaluated by qualified personnel. Cross-reference checks between transmitted and hand-delivered data are compared and reviewed for consistency. Discrepancies are rechecked and standardized verification procedures are implemented.

5.3 Data Output Products

5.3.1 Introduction

The general responsibility of the FRMAC is to effectively and efficiently manage the federal resources in monitoring and assessing the environmental impacts of the off-site radiological situation. The monitoring and assessment results are provided to the LFA and state(s). The FRMAC will produce some common products, as well as respond to specific requests made by the LFA and/or the state(s). These products are described in the following sections. The FRMAC will produce these products without a specific request within the priorities set by the LFA and state(s). Most of these products will be produced by the Assessment Division. Where possible, these products will be presented in perspective to the radiological situation, as known at the time, in a form understandable by managers and decision makers.

5.3.2 Plume Dispersion and Dose Projections

The ARAC provides plume projections quickly after receiving notice of a radiological emergency. In the event of an incident at a fixed facility, the ARAC predictions would complement those made by the facility owner/operator and/or the state(s). For a radiological transportation emergency, the ARAC predictions may be the only ones available. In the early stage of an emergency response, these predictions may be the only information regarding the possible direction and extent of the radiological contamination. These early projections will contain uncertainties regarding quantification of the radiological release and meteorological conditions. Projections will be revised as verified field-measurement data become available.

5.3.3 Aerial Survey Data

Because aerial surveys can be conducted over large areas in a relatively short time, these results can be very useful in projecting an early overview of the radiological situation after an emergency. Aerial surveys are expected to be conducted in various stages with several missions. The order and priority of the missions will depend on the termination or the on-going status of an atmospheric release. In most situations, the release is expected to terminate by the time of the first aerial survey, which is flown in a serpentine pattern to expeditiously cover the entire deposition area. The results of this first mission are used to identify (a) the extent of the measurable contaminated area, (b) the major isotopes contributing to the aerial results, and (c) an estimated level of contamination (exposure rates or isotopic concentration).

Later missions will involve more detailed surveys. Each mission or flight takes from two to three hours with the results available in one to three hours after the mission is completed. These results will be

reviewed and issued to the LFA, state(s), and local authorities as soon as possible after each survey mission. AMS flights may involve the use of both helicopter and fixed-wing aircraft utilizing large sodium iodide gamma detectors. Sensitivities are such that small changes in background can be detected (less than $\pm 1 \mu\text{R/h}$).

5.3.4 Raw Data

Key ground-based radiation data (including exposure rates; isotopic concentrations of deposited activity; and air, soil, and vegetation sampling data) will be reviewed and provided to the LFA and the state(s) as soon as possible after collection and analysis. In some cases, specific data points will be needed, particularly in the initial stages of a radiological emergency when little is known. Later, or in other cases, data summaries will be required. The data are screened for consistency and completeness (times, locations, units, exponents, instruments, etc.). The review will also provide some assurance for consistency within the product and with the current knowledge of the overall radiological situation. Raw data may also include data from samples of water, soil, vegetation, food, and other media consistent with potential health hazards.

5.3.5 Summarized Data

Environmental radiation data from field teams and laboratories will be entered into a database for both short-term and long-term retrieval. As needed, the data can be condensed and summarized to show the radiation situation in specific areas or sample media from different types of surveys. For example, a summarized data sheet could be generated to show all of the external exposure-rate data taken in certain sectors, districts, or population areas over a given time.

5.3.6 Exposure Rate and/or Contamination Contours

Radiation contours are among the most useful kinds of products that are provided by the FRMAC during a major radiological emergency. The contours show, in an easily comprehensible format, where the contamination is and what the radiation levels are. Initially, projections of radiation patterns from calculations are likely to be the only ones available. As environmental surveys are conducted, these contours will be refined or changed to be consistent with data from actual measurements. Contamination contours will most likely be confirmed or updated every few hours to represent the latest information received in the FRMAC. The contour levels will include those applicable to the PAGs as well as other levels of interest. Where appropriate, the contours will be color-coded for ease of interpretation. The contour levels may be in exposure rates and/or isotopic concentrations, depending on the type of emergency and needs of the LFA, states(s), and local authorities.

5.3.7 Dose Projections from Actual Measurements

After environmental radiological data are available, more realistic projections of doses to individuals and/or groups of individuals can be produced in response to requests by the LFA and the state(s). Contour levels will include those applicable to the PAGs as well as other levels of interest. For example, in outdoor and/or sheltered locations, it may be appropriate to produce contours of the projected four-day, first-year, second-year, and fiftieth-year whole-body effective dose equivalents from external radiation. A variety of assumptions or modifying factors may be included in these dose projections including but not be limited to weathering, resuspension, structure shielding, occupancy rates, dilution,

consumption rates, etc. Dose projections will be as realistic as possible, using reasonable assumptions and transfer values consistent with the existing uncertainties. Such assumptions will be documented, or their sources referenced, and included with the assessments.

5.3.8 Data Center

The FRMAC Data Center is designed to be comprehensive in that it contains all of the off-site, environmental, radiological data and associated details making the information traceable and accountable. The data are traceable back to individual teams, team members, measurement locations, instruments, calibrations, standards, etc., so that the integrity of the data will be of the highest standard. The data are accountable in that the FRMAC is responsible for its integrity and will stand behind the data. Additionally, the data will be supported and interpreted by the FRMAC.

Services provided by the Data Center include (a) capture, retention, and protection of data and assessments; (b) rapid, controlled distribution of data and assessments; and (c) creation of a comprehensive data archive on an electronic database. Features of the electronic archival database are (a) manageable access and selective retrieval from voluminous data sets, (b) ability to apply corrections and conversions to select data sets, (c) convenient electronic export of select data outside the FRMAC, and (d) ability to trace measurements forward or backward.

All of the environmental, radiological data handled by the FRMAC will be accumulated in the Data Center. The following short-term and long-term requirements will be implemented.

- Quick summaries of data required to help assess the radiological situation
- Long-term requirements for EPA retention
- Complete information to allow future reconstruction of the radiological situation

5.3.9 Tailored Format for Users

It is the FRMAC's responsibility to present the off-site, environmental, radiological data to the LFA, state(s), and local authorities in a recognizable and usable format and in a perspective understandable by managers and decision makers. These formats will be presentation-quality graphics summarizing data and effects as much as practical. Discrete data will be presented in clear, concise tables organized specifically for a particular purpose. Radiation levels in commonly used units and/or values relative to recognizable PAG levels will be used. Where possible, plotted or contoured radiation levels will be in standard FRMAC color schemes. Information transmitted by fax, still video, or the GIS will be in an easily readable and concise format while containing sufficient information to properly present the required data. When appropriate, the presentation will be tailored to meet the intended users' purposes.

5.3.10 GIS Products

The GIS is a computerized database management system used to store, retrieve, and display emergency response information. By showing layers of information on a computer screen and/or maps, the relationship among pieces of information can be seen. GIS products include displays on computer screens and maps in the FRMAC and other emergency response centers. GIS products may include but are not limited to combinations of the following types of information.

-
- Background or baseline radiological data.
 - Locations of monitoring teams.
 - Sampling locations.
 - Monitoring locations.
 - Environmental TLD locations.
 - Radiation levels related to monitoring and/or sampling locations.
 - Radiation contours of exposure rates, projected doses, etc.
 - AMS results.
 - Prediction results.
 - Geographical data such as roads, streams, lakes, and population density.
 - Administrative data such as state, county, and city boundaries.
 - Emergency response data such as evacuation routes and locations of police and fire stations, hospitals and clinics, operations centers, shelters, and schools.
 - Land-cover data such as forests, agricultural areas, housing areas, wetlands, industrial areas, and rangelands.
 - Critical industries such as dairies and farms, recreational areas, water treatment plants, and wells.
 - Image data such as aerial photographs.

An example of using these data is to relate contours of one-year, integrated, projected doses to locations of schools, factories, and hospitals and to population density.

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6.0 TRANSFER OF FRMAC MANAGEMENT FROM DOE TO EPA

6.1 Introduction

The FRERP states that the DOE will transfer responsibility for managing the FRMAC to EPA at a mutually agreeable time after consulting with the LFA and state(s). This section discusses the processes and conditions by which this transfer takes place.

6.2 Phases of Response

Federal response to a radiological emergency involves three phases regarding assets, personnel, and identified responsibilities. These phases include the (a) emergency phase, (b) intermediate phase, and (c) post-emergency or long-term recovery phase.

6.2.1 Emergency Phase

During the emergency phase, the DOE activates and manages the FRMAC. The primary concern is to define the radiological situation as instructed by the LFA and the affected state(s) so that the state(s) can address public health concerns.

During the emergency phase, the EPA provides a Senior Official to assist in operations as soon as a FRMAC is deployed. The EPA Senior Official or other representatives may participate on the Advisory Team or other groups established to support the LFA.

6.2.2 Intermediate Phase

At a mutually agreeable time following the emergency phase and under set conditions, the DOE in coordination with the LFA, EPA, involved states, and FEMA will transfer FRMAC management responsibilities to the EPA Office of Radiation and Indoor Air (ORIA). The EPA/ORIA will assume the responsibility for coordinating the intermediate and long-term, off-site, radiological monitoring, sampling, and assessment activities.

When the EPA/ORIA accepts control of the FRMAC, the DOE and other federal agencies will continue to commit the equipment, personnel, and funds for the duration of the federal response, as necessary. The LFA will continue to coordinate the overall activities of the federal agencies involved in this phase.

6.2.3 Post-Emergency Phase

During the post-emergency phase, EPA will address matters such as long-term health effects, environmental concerns, long-term staffing, recovery processes, and long-term commitment of assets and resources. EPA may relocate the FRMAC to another location and will release FRMAC assets as they are no longer required. This phase lasted several years after the Three Mile Island accident.

6.3 FRMAC Management Transfer

6.3.1 Initiating Conditions

As stated in the FRERP, the following conditions will be met prior to transferring management of the FRMAC from DOE to EPA.

-
- A. Immediate emergency condition has been stabilized.
 - B. Off-site releases of radioactive material have ceased, and there is little or no potential for further off-site releases.
 - C. Off-site radiological conditions have been characterized and the immediate consequences have been assessed.
 - D. An initial, long-range monitoring plan has been developed in conjunction with the affected state(s) and appropriate federal agencies.
 - E. EPA has received adequate assurances from other federal agencies that they will commit the required resources, personnel, and funds for the duration of the federal response.

6.3.2 FRMAC Transfer Agreement

Many details must be worked out between the DOE and the EPA when responsibility for the FRMAC is transferred. The details of the transfer will be incident-specific. All participating federal agencies will have the opportunity to provide input into the transfer agreement. The LFA and involved states will concur on the transfer agreement. Final approval is required from DOE and EPA headquarters. Additionally, EPA senior field personnel may sign on behalf of their agencies.

6.4 Long-Term Monitoring Plan

The primary conditions for the DOE-to-EPA transfer revolve around the development and commitment of a long-term monitoring plan.

6.4.1 Long-Term Planning

The LFA, state(s), FRMAC, and interested federal agencies will work together to develop and commit to a long-term monitoring plan. Many planning meetings will be conducted before the actual transfer of responsibility from the DOE to the EPA occurs. Planning should begin as soon as the radiological emergency occurs with additional planning occurring throughout the entire emergency phase.

6.4.2 Reentry, Recovery, and the Long-Term Monitoring Plan

The following key elements are included in the long-term monitoring plan.

- Placement of permanent air sampling and TLD stations
- Collection of soil, water, meat, fish, food, and other items from the affected area
- Calculation of projected, long-term doses and consequences

The LFA will coordinate with the EPA-managed FRMAC, the state(s), other participating agencies, and the facility owner/operator (if applicable) to plan a thorough, permanent, and safe recovery.

6.4.3 Long-Term Dose Mitigation

The EPA will use its model and codes to make predictions about long-term doses. Input from the EPA Science Advisory Board and other groups will be sought. In cases where doses exceed guidance, the

EPA will work with other federal and state agencies to limit access or develop innovative technology to address cleanup issues.

6.4.4 Site Restoration Working Group

The FRMAC Director under the EPA will participate in the Site Restoration Working Group or analogous counterpart. This working group prioritizes and recommends decontamination, reentry, and recovery activities. The FRMAC can provide monitoring and dose estimates for recovery schemes but does not direct the recovery effort. The Director and staff can provide professional advice on monitoring systems to meet long-term, recovery objectives.

6.5 Archival Information

The Operations Manager, archival coordinator within the Operations Staff, Monitoring and Assessment Division Managers, and the SSA will meet and work with EPA personnel to determine the archived information of all applicable FRMAC activities to be assembled for long-term retention. A complete set of copies will be made for retention by the post-emergency-phase FRMAC.

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APPENDIX A

FRMAC ADVANCE PARTY ISSUES

A1.0 Introduction

FRMAC plans include the deployment of an Advance Party to the emergency site as soon as possible after notification to deploy. The primary purpose is to prepare for the arrival of the FRMAC Main Party in order to ensure an effective and timely FRMAC operation in support of the LFA and the state(s). This Appendix contains FRMAC Advance Party issues including a meeting agenda. These issues should be used as a guide for planning purposes. Actual FRMAC Advance Party actions and meeting agendas may be modified to meet the emergency conditions.

A2.0 Prior to Departure for the Emergency Site

The DOE/NV will:

- Identify the DOE official who will meet the Advance Party.
 - If not upon arrival at the airport, when and where?
- Identify the LFA official who will meet the Advance Party.
 - If not upon arrival at the airport, when and where?
- Notify the LFA, state, local, and/or facility representatives of the tentative arrival schedule of the Advance Party and establish a tentative date, time, and location for the Advance Party Meeting.
- Fax the Advance Party Meeting agenda to the LFA, state, local, and/or facility representatives.
- Obtain ARAC plot.

A3.0 Upon Arrival On-Scene

The Advance Party will:

- Notify the DOE/NV, DOE/HQ, LFA, and state of your arrival and get updates.
- Obtain specifics for the Advance Party Meeting.
- Meet with an on-scene DOE official, RAP Team Leader, and AMS Team Leader.
 - Identify status, activities, and problem areas.
 - Are the DOE/HQ and DOE/NV being kept up-to-date?
 - Which DOE and other federal assets have been activated, are en route, or are on-site?
 - Provide suggestions for locating the FRMAC.
- Obtain updated ARAC plot.
- Meet with the LFA official to identify status, activities, and problem areas.

A4.0 Advance Party Meeting Agenda

- Introductions.
- Status of emergency by LFA and/or facility owner/operator.
 - Status of release:
 - Has the release terminated?

- How many releases have occurred?
- Estimate of source term.
- Dominant isotopes.
- Wind direction during releases.
- On-site and off-site monitoring results.
- Is the situation stable?
- Atmospheric prediction plots.
- Significant actions in the past 12 hours.
- Major activities planned for the next 12 hours.
- Status of emergency from state and/or local perspective.
 - What protective actions have been implemented and/or are pending?
 - Who has the responsibility for initiating public protective actions (*i.e.*, state, tribal, county, or local authorities)?
 - Are the protective action guides that are in use the same as those of the EPA, USDA, or FDA?
 - Problem areas.
 - Are there any significant, confounding conditions which could impact FRMAC operations (*e.g.*, hazardous materials associated with the emergency, flood damage, earthquake damage, major road work, etc.)?
 - Significant actions in the past 12 hours.
 - Major activities planned for the next 12 hours.
- Identify LFA, state, and local concerns and highest FRMAC priorities.
- Establish communication channels.
 - Identify primary LFA and state/local contacts and radiological decision makers.
 - Identify LFA and state/local individuals to work with FRMAC Director.
- FRMAC Director's briefing.
 - Identify the DOE Energy Senior Official.
 - Explain the DOE command structure.
 - Provide an overview of FRMAC operations and organizational structure to include the following:
 - Function
 - Resources and operations
 - Time line for arriving resources and an operational FRMAC
 - Decision-making and priorities
 - Data flow
 - Expected products
- Placement of LFA, state, local, and FRMAC liaisons.
- Will the state/local monitoring effort fold into the FRMAC?
- Concerns and suggestions from the LFA, state, and/or local authorities regarding FRMAC location.
 - Can the state/local representatives identify an individual to assist FRMAC in securing a site and becoming operational?
- Define the initial AMS radiological survey mission.
- Identify state/local individual to assist flight operations. (Issues: Where will the aircraft land? Is fuel available? What frequencies will be used? Have FAA [Federal Aviation Administration] clearances been obtained, etc.?)

- Identify LFA and state/local individuals to work with FRMAC in developing the initial FRMAC Monitoring and Sampling Plan.
- Identify LFA and state/local individuals to work with the FRMAC Dose Assessment Group.
- FRMAC activities planned for the next 12 hours.
- Future meetings?
- Other issues.

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APPENDIX B

FRMAC SITE SELECTION

The FRERP designates the DOE as the federal agency responsible for establishing a FRMAC near the crisis site and for coordinating the use of technical resources from federal agencies involved in the off-site radiological monitoring and assessment activities.

B1.0 FRMAC MISSION CONSIDERATIONS

The FRMAC is an operational field center for federal, radiological monitoring and assessment resources. Radiation-measurement and sample-collection teams will be dispatched from the FRMAC and will return for debriefing, sample analysis, and reassignment. The FRMAC Director and supporting technical personnel from the other participating federal agencies working with state and local monitoring teams will provide coordinated, off-site, radiation-measurement results.

Because of the required participation of the DOE AMS assets at a FRMAC, the FRMAC location should be convenient to an airport or a helicopter pad to facilitate rapid data turnaround. A nearby airport will also serve as the base for fixed-wing aircraft missions and convenient equipment transport.

B2.0 FRMAC LOCATION SPECIFICATIONS

To effectively carry out the FRMAC mission, the location should be accessible to the incident site. In choosing a location, consideration should be given to the location of state EOCs and other emergency response centers (DFO, EOF, JIC, etc.). Ideally, a state would collocate its off-site measurement coordination staff within the FRMAC. The DOE helicopters equipped with radiation-measurement equipment will plan to operate from this site. RAP teams from the DOE laboratories and the EPA and specialists from other FRERP-member agencies will assemble at the FRMAC to staff the various technical functions and operate the field monitoring instruments and mobile analysis vans.

The FRMAC site must provide a working environment for 200 or more personnel per shift. Figure B-1 (see page 92) provides a generic overview of a FRMAC site including a staging area for five to seven 40-foot trucks, several analysis vans, and parking for team members' vehicles. Figure B-2 (see page 93) is a suggested layout inside the FRMAC facility for the Director and functional elements.

These configurations are flexible and can be tailored to fit available facilities. Experience has shown that the FRMAC Director, LFA representative, state senior liaison person, and a small staffing element require separate work space adjacent to a large central work area. Peripheral rooms or partitioned spaces will be needed for communications, equipment setup and calibration, photo and still video preparation, and other functions.

The dimensions of the work space must yield 10,000 to 20,000 square feet of working space. In addition, a fenced staging area of 5,000 to 10,000 square feet is required for unloading and breaking down equipment shipping pallets and for storing consumable supplies. Uncovered space is needed for operating power generators, setting up and operating satellite communications equipment, operating mobile analysis vans, and possibly for parking state and county communications vehicles. Electrical service to the facility of 600 amps, 208 volts, 3-phase 60-hertz power is needed.

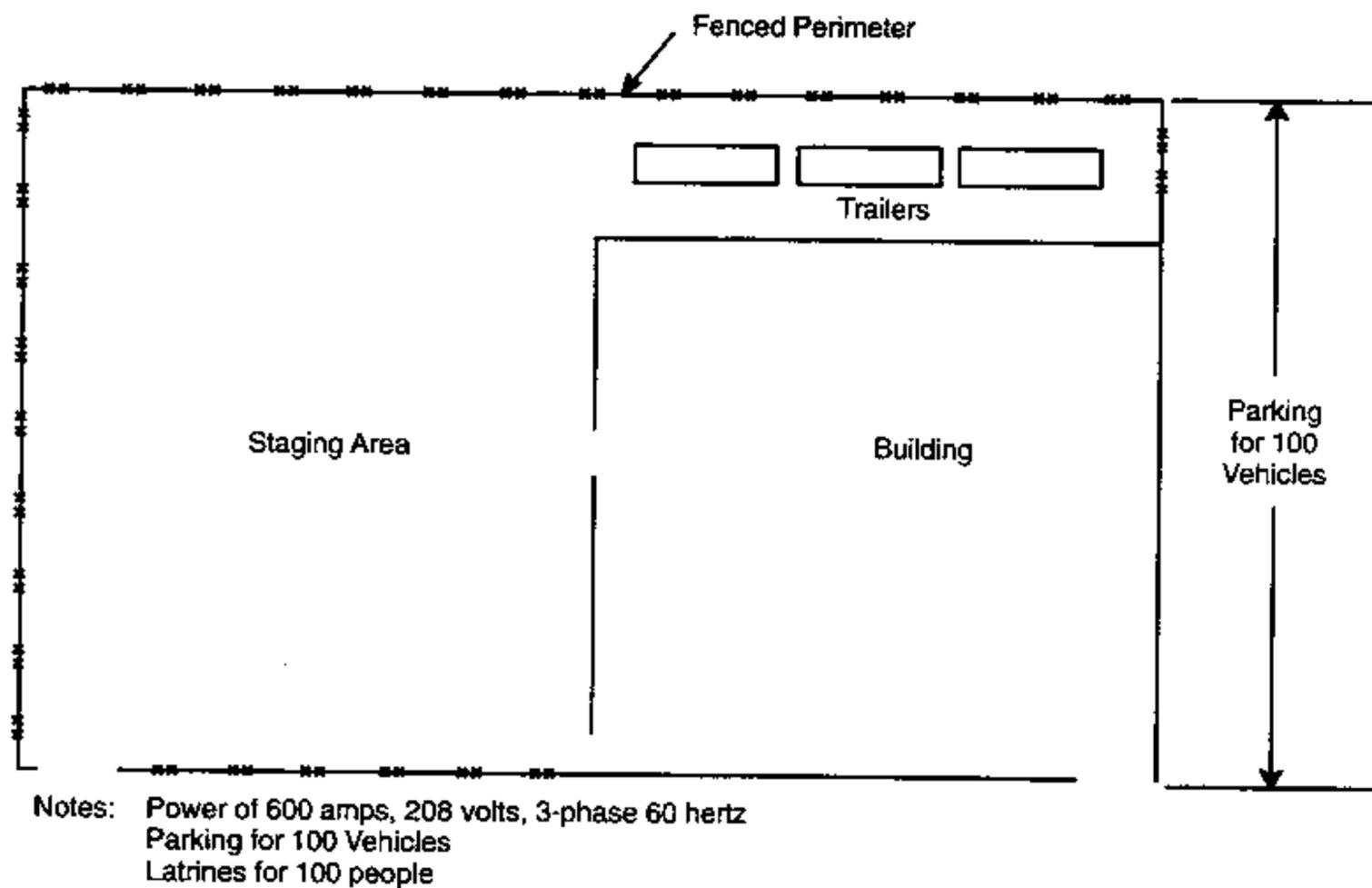


FIGURE B-1. IDEAL LAYOUT FOR THE FRMAC

B3.0 SITE SELECTION OVERVIEW

The selection of a FRMAC site is a complex process that is significantly driven by the actual scenario occurring at the time of a major radiological emergency. Many variables must be considered—not only the location of the FRMAC site but also the location of major peripheral support facilities such as housing, an airport, and vehicle availability. In addition, interaction with state and local monitoring activities and the emergency operations facility at the crisis site must also be considered in selecting a FRMAC location. All choices may be affected by the magnitude of the emergency, evacuation status, presence and direction of an airborne radioactive plume or deposition pattern, and other factors that will only be known at the time of the incident. Therefore, it may be prudent to consider more than one FRMAC site location for each major, fixed nuclear facility in order to accommodate major potential scenario differences. Actual conditions at the time will dictate the selection.

All of the FRMAC support resources are designed around the philosophy that a FRMAC operating site will not be finally selected until a crisis occurs. This is due partly to the fact that the FRMAC may be responding to the aftermath of an earthquake, hurricane, flood, or a significant radiation release that may preclude access to preselected FRMAC sites due to damage or contamination. Because of this basic operating premise, preselection of FRMAC sites is limited to simply identifying potential FRMAC locations. The DOE RCOs should be advised of the locations of potential FRMAC sites. The FRMAC Advance Party, in consultation with LFA representatives and state(s) and local authorities, will make the final selection of a FRMAC site based on the current conditions and knowledge of the emergency.

B4.0 SUPPORTING FACILITY CONSIDERATIONS

The following facilities and resources will be required to support a FRMAC field deployment.

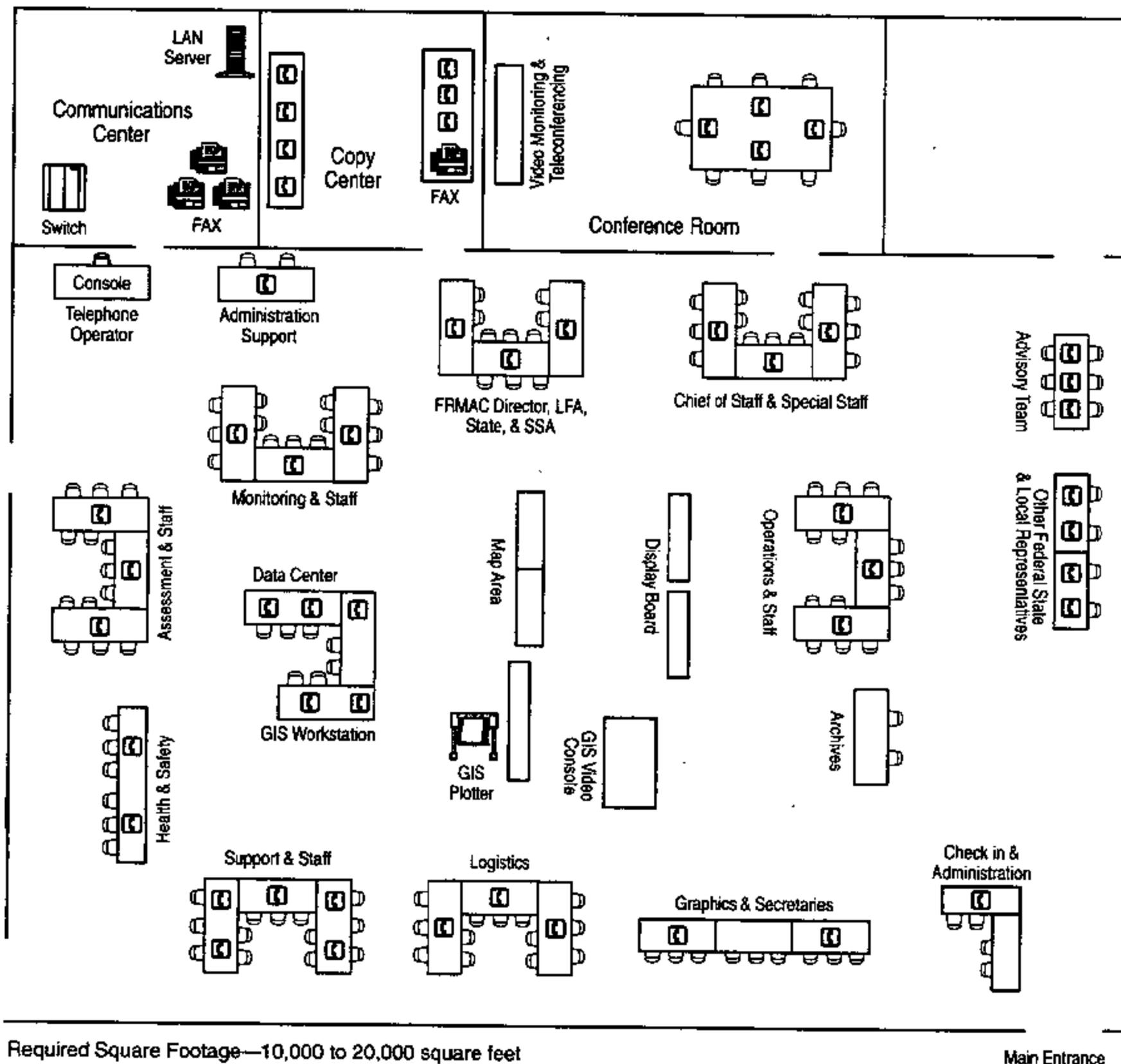


FIGURE B-2. GENERIC FLOOR PLAN FOR THE FRMAC FACILITY

B4.1 FRMAC Access

If the FRMAC site is not located at the airport where the major FRMAC resources will arrive by U.S. Air Force Air Mobility Command (AMC) transport, then the FRMAC site must be accessible by major highways or roads that can accommodate 40-foot lowboy trucks and large motor-home vans. The site should also be able to accommodate around-the-clock helicopter operations.

B4.2 Communications Considerations

The FRMAC site must have certain characteristics to facilitate the operation of a complex array of communications equipment. The full system includes a four-meter satellite dish, VHF and microwave repeaters, and navigational transponders. Hence, the site must provide adequate equipment space clear of interference from other communications or industrial sources of electronic signals.

B4.3 Telephone Connection

Access to adequate telephone trunk lines is highly desirable; however, this is not an absolute requirement. The FRMAC is prepared to provide microwave repeaters and satellite telephone communications including a standard telephone interface system that can be connected directly to a telephone company trunk. All telephone instruments in the FRMAC are provided by the support team. If telephone lines are not directly available, a delay of several hours will be encountered while the support team sets up the microwave repeaters and satellite telephone communications. Cellular telephones and single-channel satellite service will provide immediate, limited service.

B4.4 Radio/Microwave Repeaters

The FRMAC support team will require local assistance in securing access to towers, building roofs, or mountain peaks for repeater installation and service. Frequency coordination and harmonic interference are always considered by the FRMAC communication staff during site selection.

B4.5 Airport

Because the major FRMAC support resources could arrive by commercial wide-body jet or by AMC airlift utilizing C-141 or C-130 cargo planes, an airport must be selected that can accommodate these aircraft. A military base would be a first choice, but it may not be close to the incident site. Jet fuel must be available for the DOE survey aircraft. Hangar space is desirable but is required only in the event of serious weather problems.

B4.6 Housing

The 200 or more federal and contractor employees arriving at the site will require nearby housing in hotels or military quarters. The FRMAC support staff will make all subsistence arrangements in order to ensure appropriate government reimbursement.

B4.7 Vehicles

Rental vehicles including cars, vans, four-wheel-drive vehicles, high-volume trucks, stakebed trucks, and 40-foot lowboy trucks may be needed as well as one or two forklifts capable of handling 10,000 pounds.

B4.8 Medical Facilities

Access to a nearby hospital or dispensary is desired for normal medical emergencies. Medical personnel from the Oak Ridge REAC/TS staff will accompany the FRMAC to offer consulting services to the local medical services concerning serious radiological exposures, if necessary.

B4.9 Food Services

For extended, around-the-clock operations, catered food services are desired. The FRMAC support staff will make arrangements if a vendor can be located. In the worst case, a military team could be requested through federal channels.

B4.10 Materials and Services

The FRMAC logistical support staff will procure needed consumable items such as office supplies and equipment, minor repairs to computer equipment, and construction materials through the local economy. Space made available for the FRMAC will be returned in good condition, and reimbursement for the facility, utilities, and other services will be made directly to the provider. In the event security services are needed, the FRMAC staff will address its first request to local law-enforcement personnel. A contract will be drawn to reimburse these personnel.

B4.11 Summary

FRMAC support staff are prepared to deal with the response to radiological emergencies and to provide personnel with the necessary means to complete the mission. The task of providing and caring for a substantial number of FRMAC participants is a significant effort. Through many years of field experience and countless training programs, the FRMAC field staff can efficiently and expeditiously meet these demands. The response team is prepared to be totally self-supporting so as not to overburden local resources.

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APPENDIX C

FRMAC POSITION DESCRIPTIONS

C1.0 FRMAC DIRECTOR

C1.1 Functional Description

The FRMAC Director, appointed by the DOE/NV, is the DOE Energy Senior Official (ESO)¹ managing the federal technical response at the FRMAC during the emergency phase of the radiological emergency or until the FRMAC management is transferred to the EPA. The Director provides direction and oversight of the activities of FRMAC personnel who may be provided by any DOE RCO; DOE laboratories; DOE contractors; or federal, state, or local agencies. The Director is responsible for the overall execution of the FRMAC response and ensures that FRMAC activities reflect the prioritized needs of the LFA and state(s). The Director is also responsible for facilitating communication with the LFA; state; local authorities; and the DOE/NV, DOE/HQ, and other federal agencies in carrying out the objectives and operations of the FRMAC. The responsibilities of the Director are described in the following paragraphs.

C1.2 Ongoing Duties

- A. **Predesignation.** Potential FRMAC Directors are predesignated from the full-time staff members of the DOE/NV management team and listed in the *Interim Activation Plan, National Response Assets (NEST, FRMAC, RAP, ARG)*. The potential Directors are responsible to the DOE/NV Manager and ensure compliance with DOE orders.
- B. **FRMAC Knowledge.** Potential Directors must stay current in their knowledge of the FRMAC documents applicable to managing and interfacing the FRMAC organization (*FRMAC Operations Manual, Emergency Phase; Overview of FRMAC Operations*; etc.) and maintain a personal copy of the *FRMAC Director's Handbook*.
- C. **FRMAC Management Panel.** Potential Directors should participate whenever possible on the DOE/NV FRMAC management panel, be familiar with FRMAC working group charters, review the Operations Working Group meeting minutes, and review working group documents, as applicable.
- D. **Training.** Potential Directors should participate in at least one FRMAC training course every three years.
- E. **Exercises.** If scheduled, potential Directors should participate at least every two years in FRMAC tabletops, other drills, and exercises. Participation could be as a player, planner, evaluator, or controller. If participation is not possible, obtain notes or a briefing from the Director. Potential Directors should be fully involved with lessons-learned activities following each exercise.

¹ During a nuclear weapons accident or a nuclear terrorist threat or when DOE is the LFA, DOE will appoint both an ESO and a FRMAC Director

- F. **Readiness.** Potential Directors should periodically receive status briefings on FRMAC readiness, activities, funding, and support and participate in documentation reviews that affect FRMAC.

C1.3 Activation Duties

Upon designation by the DOE/NV Manager and with concurrence by DOE/HQ, the duties of the FRMAC Director or his designated representative will depend on the scenario and anticipated level of FRMAC involvement. The following duties are guidelines.

- A. Contact DOE/HQ to obtain situation reports and directions. If the radiological emergency requires an ESO, obtain the name of the designated individual and contact the ESO to coordinate overall DOE response.
- B. Determine which agency has been designated as the LFA.
- C. Contact the LFA, obtain information regarding the radiological emergency, determine the current LFA requests for a FRMAC response, and exchange deployment-scheduling information and the names of key contacts.
1. If the radiological emergency occurred at a commercial nuclear power plant, the NRC will be the LFA.
 2. If the radiological emergency occurred at a DOE facility or if DOE-controlled material is involved, the DOE will be the LFA.
 3. Other possible LFA's are DoD, NASA, or EPA.
- D. Contact the DOE RCOs involved in the radiological emergency and determine the status of RAP activities. Designate points of contact and phone numbers pending FRMAC Advance Party and/or FRMAC Main Party deployment and arrival and obtain the following information, as applicable.
1. Who are the state and local points of contact (radiological health and emergency management), and what are their normal duty and off-duty telephone numbers?
 2. Which offices and personnel were notified at federal, state, or local agencies?
 3. What are the LFA Joint Operations Center (JOC) location and phone numbers?
- E. Verify that DOE/NV and contractor organizations have been notified. In addition, verify that contact has been established with ARAC, REAC/TS, EPA/HQ, EPA/NV, and EPA/Montgomery.
- F. Designate the FRMAC management team (two 12-hour shifts), provide the name of the FRMAC Deputy Director and the Chief of Staff to the DOE/NV Manager for concurrence, select the SSA, determine the availability of the SSA, and provide the names of the selected FRMAC management team members to the designated DOE/NV EOC personnel for alert and notification.
- G. Determine the composition of the Advance Party and oversee the deployment organization and arrangements.
1. The Advance Party composition may be highly scenario-dependent.
 2. If the Director decides to lead the Advance Party, the Deputy Director will manage the deployment of the Main Party.
 3. Ensure that the Advance Party kit is deployed with the Advance Party (located at DOE/NV).

-
- H. Schedule a DOE/NV EOC briefing for FRMAC managers (Deputy Director; Chief of Staff; Operations Manager and Deputy Manager; the Support, Monitoring, Assessment, and H&S Division Managers; and the Liaison Manager). Provide guidance on staffing levels, equipment, logistics, other assets, deployment, and other subjects deemed essential to meet the anticipated field needs. The Support Division Manager and RSL and DOE/NV logistical coordinators will arrange transportation, logistical, and communications support. They will prepare and provide a list of assets designated for deployment and provide the deployment plans.
 - I. Deploy the Advance Party. This team of 6–20 personnel (depending on the size of the aircraft) should be ready to depart in 2–4 hours during normal duty hours and within 4–6 hours during off-duty hours. An Advance Party from Las Vegas or Andrews Air Force Base could be on scene within 4–10 hours after the original FRMAC activation notification. The goal is to have the Main Party deployed and a full FRMAC operating within 24–36 hours after the original DOE/HQ FRMAC activation notification.
 - J. The leader of the Advance Party will perform the following duties.
 - 1. Immediately meet with the RAP Team Leader and then with representatives from the LFA, state(s) and/or local agencies, the facility owner/operator, etc., as applicable. (Refer to the Advance Party issues addressed in Appendix A.)
 - 2. Immediately identify the data, personnel, and resources that are available.
 - 3. Ensure that the initial FRMAC Monitoring and Sampling Plan is established and becomes operational when the Main Party arrives.
 - 4. Coordinate the AMS missions with RAP, LFA, and state representatives.
 - 5. Ensure that the FRMAC location is compatible with the needs of the LFA and state(s).
 - 6. Transmit Advance Party observations as soon as possible to DOE/NV to ensure that the composition of the Main Party is based on these observations and that specific requests for special resources are included in the Main Party personnel and equipment.
 - 7. If an airborne, radioactive release is in progress, ensure that FRMAC support program elements are cognizant of this release and ensure that the decisions regarding transportation terminals and the FRMAC location are not finalized without the Advance Party leader's consent.

C1.4 Operational Duties

- A. Establish the FRMAC at the designated location.
- B. Continue discussions started by the Advance Party with the LFA and state and local authorities. Ensure their continued participation as members of the FRMAC management team. Ensure resources are available for them.
- C. At the FRMAC site, continue communication channels established by the Advance Party or establish new communication pathways with the following entities.
 - 1. LFA
 - 2. State, county, and/or local authorities
 - 3. DOE RAP Team Leader

4. DOE/NV EOC
 5. DOE/HQ
 6. DOE RCO
 7. FRMAC technical liaison locations (including the LFA JOC, state and local EOCs, FEMA DFO, and JIC)
- D. Ensure that the FRMAC activities reflect the priority needs established with the LFA and state(s).
- E. If the Director is unavailable, ensure that an acting Director has been delegated, the FRMAC management team members are aware of this action, and the scheduled return of the Director is known.
- F. Request briefings for the FRMAC management team. Initial briefings may be set up with the following entities.
1. LFA liaison
 2. State and/or local authorities
 3. RAP Team Leader
 4. Other on-scene responders
- G. Ensure that the Monitoring Division Manager and the Assessment Division Manager are coordinating and implementing the established FRMAC Monitoring and Sampling Plan with the LFA, state, and RAP representatives.
- H. Assist the division managers in obtaining replacements for FRMAC staff, if necessary.
- I. Ensure that a shift-change schedule has been established.
- J. Ensure that the FRMAC management team's briefing procedures and a briefing order are established, and the results of the briefing are recorded. The first briefing will include the following items of discussion.
1. Status of FRMAC deployment.
 2. Internal communications, procedures, forms, etc.
 3. External communication systems and procedures.
 4. Status of the JOC, DFO, and the JIC.
 5. LFA needs (assign to the Operations Manager or staff).
 6. Immediate state needs (assign to the Operations Manager or staff).
 7. Next briefing time (establish the schedule for briefings, determine where the schedule will be posted, and advertise the location).
- K. Ensure that data are transmitted PROMPTLY to the LFA and state and local authorities.
- L. Ensure that the FRMAC staff maintains management- and staff-level communications with the LFA, state and local authorities, EPA, FEMA, and participating federal agencies.
- M. If there is a radiological release in progress, ensure that the Monitoring Division Manager with the LFA and state(s) authorities has determined where to deploy the field monitoring teams. Ensure that the H&S Division Manager is consulted regarding the safety (emergency worker exposure limits) of FRMAC field and facility personnel.

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- N. As soon as possible, obtain, review, and provide the AMS flyover data. Ensure that the data are discussed with the LFA and state and/or local authorities and used as a basis to update or modify the FRMAC Monitoring and Sampling Plan.
 - O. Ensure that requested briefings to the LFA, state, JIC, or DFO are presented.
 - P. Ensure that briefings, both new-shift status briefings and on-shift debriefings, are provided at shift changes.

C1.5 Closeout Duties

- A. Coordinate transfer of management responsibility for the FRMAC to the EPA. The FRMAC Director and the EPA Senior Official will develop a plan for transferring authority. This plan must be approved by appropriate DOE and EPA officials.
- B. Ensure that each FRMAC manager provides a thorough briefing and discussion with the new corresponding management team.
- C. Continue to provide assistance as requested by the EPA.
- D. Transmit final action items to DOE/NV or DOE/HQ.
- E. Ensure that the DOE FRMAC management team has provided information necessary to complete DOE FRMAC records, management logbooks, or the database.
- F. Ensure with DOE legal representatives that signatory requirements to transfer or loan DOE capital resources are accomplished.
- G. Schedule and manage a lessons-learned critique for the FRMAC management team.
 - 1. Ensure that minutes are taken.
 - 2. Ensure that the management team submits a written report including operations, evaluations, and recommendations.
 - 3. Ensure that the final lessons-learned report is prepared for review.
 - 4. Submit the lessons-learned report to DOE/HQ, DOE/NV, and others, as directed.

C2.0 FRMAC DEPUTY DIRECTOR

C2.1 Functional Description

The FRMAC Deputy Director is appointed by the FRMAC Director and functions as the Director when the Director is unavailable. The Deputy will report directly to the Director and become the immediate assistant. The Deputy assists the Director in ensuring that the FRMAC is operated according to the *FRMAC Operations Manual, Emergency Phase*, and other subsequent agreements established specifically to the ongoing event. The Deputy ensures that the activities reflect the priorities of the LFA and state(s); that information is collected, reviewed, and transmitted to the LFA and state(s) in a timely manner consistent with the *FRMAC Operations Manual, Emergency Phase*; and that subsequent protocols are established with the state, local, or federal officials. The following are responsibilities of the Deputy Director.

C2.2 Ongoing Duties

- A. **Predesignation.** Potential Deputy Directors are predesignated from the full-time staff members of the DOE/NV management team and listed in the *Interim Activation Plan, National Response Assets (NEST, FRMAC, RAP, ARG)*. The potential Deputy Directors are responsible to the DOE/NV Manager and ensure compliance with applicable DOE orders and agency directives.
- B. **FRMAC Knowledge.** Potential Deputy Directors must stay current in their knowledge of the FRMAC documents applicable to managing and interfacing the FRMAC organization (*FRMAC Operations Manual, Emergency Phase; Overview of FRMAC Operations; etc.*) and maintain a personal copy of the *FRMAC Director's Handbook*.
- C. **FRMAC Management Panel.** Potential Deputy Directors should participate whenever possible on the DOE/NV FRMAC management panel, be familiar with the FRMAC working group charters, review the Operations Working Group meeting minutes, and review working group documents, as applicable.
- D. **Training.** Potential Deputy Directors should participate in at least one FRMAC training course every three years.
- E. **Exercises.** If scheduled, potential Deputy Directors should participate at least every two years in FRMAC tabletops, other drills, and exercises. Participation could be as a player, planner, evaluator, or controller. If participation is not possible, obtain notes or a briefing from the FRMAC Director. All potential Deputy Directors should be fully involved with lessons-learned activities following each exercise.
- F. **Readiness.** Potential Deputy Directors should periodically receive status briefings on FRMAC readiness, activities, funding, and support. Annually, receive notices from the DOE/NV regarding the documentation reviews that affect FRMAC (*FRMAC Operations Manual, Emergency Phase; Interim Activation Plan, National Response Assets [NEST, FRMAC, RAP, ARG]; etc.*) and participate, if possible.

C2.3 Activation Duties

After receiving notice for FRMAC alert and activation, the Deputy Director will perform the following duties.

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- A. Verify the message or report, as directed.
 - B. Directly assist the Director and other senior DOE managers in the activation process.
 - C. Personally ensure that he/she and the Director are aware of all information pertaining to the situation.
 - D. Lead the team (Advance Party or Main Party) not led by the Director. (It is expected that the Director will usually lead the Advance Party.)
 - E. Assist in determining the composition of the Advance Party and assist in organizing the deployment and making arrangements. (The composition and size of the Advance Party may be highly scenario-dependent.)
 - F. If leading the Advance Party, perform the duties as listed in the Director's position description and the Advance Party Checklist.
 - G. If leading the Main Party, assist as directed in deploying the Advance Party.
 - H. Schedule a DOE/NV EOC briefing for the FRMAC division managers deploying with the Main Party and oversee the organization of the Main Party resources and deployment. (The goal is to have the Main Party deployed and a full FRMAC operating in 24–36 hours after the original notification from DOE/HQ to activate a FRMAC.)
 - I. Coordinate the deployment of the Main Party with the Support Division Manager.
 - J. Provide scenario-specific guidance on staffing levels, equipment, logistics, other assets, deployment, and other subjects deemed essential to meet the anticipated field needs. (The Support Division Manager will arrange for transportation, logistical, and communications support.)
 - K. Request, review, and personally ensure that (a) the Director is apprised of the organization and planning for the Main Party and (b) the Advance Party assessments and suggestions for the Main Party composition and/or special resources are included before the Main Party deployment plan is approved.

C2.4 Operational Duties

- A. Assist the FRMAC Director in establishing the FRMAC.
 - B. Discuss with the Director and understand Advance Party agreements for FRMAC interfaces with the LFA and state(s) and determine if specific data formats were requested.
 - C. For a 24-hour FRMAC, become the Director during the night shift.
 - D. Become the Director's assistant for all aspects of FRMAC operations with special emphasis on the following areas.
 1. Arranging a FRMAC all-hands briefing.
 - a. Establish schedules
 - b. Determine subjects for discussion
 - c. Brief participants
 2. Ensuring that communication channels external to the FRMAC are initiated and continued with the following entities:
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- a. LFA
 - b. State, county, and/or local authorities
 - c. DOE RAP Team Leader
 - d. DOE/NV EOC
 - e. DOE/HQ
 - f. DOE RCO
 - g. FRMAC technical liaison locations (including the LFA JOC, state and local EOCs, FEMA DFO, and JIC)
3. Ensuring that an appropriate information flow is occurring within the FRMAC and through the liaisons to other emergency response centers. Review information, as appropriate, before external distribution.
 4. Ensuring that FRMAC activities reflect the priorities established with the LFA and state(s). Meet with the Operations Manager and division managers, as appropriate, and provide direction and/or assistance in areas needing special attention and bring items that cannot be resolved to the Director's attention.
 5. Serving as the Director whenever the Director is unavailable.
- E. Assist the Director with coordinating the transfer of management responsibility of the FRMAC to the EPA at a mutually agreeable juncture upon termination of the emergency phase of the radiological emergency. The Director and the EPA Senior Official will develop a plan for transferring authority. This plan must be approved by the appropriate DOE and EPA officials.

C2.5 Closeout Duties

- A. Continue to provide assistance to the EPA, as directed.
- B. Assist, as directed, with preparing and transmitting final, emergency-phase action items to the DOE/NV or DOE/HQ.
- C. Complete FRMAC management logbooks or other records.
- D. Coordinate and schedule lessons-learned critiques for the FRMAC emergency-phase management team, as directed.
- E. Oversee the preparation of a lessons-learned report and include successes, issues (observations and problems), solutions, and suggestions.

C3.0 SENIOR SCIENTIFIC ADVISOR

C3.1 Functional Description

The SSA is a nationally recognized expert in radiation health effects and environmental impacts that could result from the released radioactivity. The SSA will provide assessments and overviews to the Director about the health effects and environmental impacts of the radiological emergency and will provide advice and assistance to the Director in determining the best technical basis for elements of the operational activities to meet the overall FRMAC objectives. The SSA is selected by the FRMAC Director. The prospective SSAs may have expertise in different radiation areas because different radiological emergencies could involve different hazards, health effects, and impacts.

C3.2 Ongoing Duties

- A. Provide emergency contact numbers, when requested.
- B. Provide expert advice to FRMAC working groups, DOE, or participating agencies, if requested.
- C. Review FRMAC documents, as applicable.
- D. Request FRMAC training schedules and obtain training in FRMAC activities and procedures.
- E. Attend applicable FRMAC exercises and drills at least once every three years.
- F. Be familiar with the *FRMAC Operations Manual, Emergency Phase*; the *FRMAC Monitoring and Analysis Manual*; and the *FRMAC Assessment Manual*.
- G. Be familiar with the monitoring, sampling, and analytical equipment that a FRMAC may use and with the AMS resources.
- H. Be familiar with the following EPA PAGs in the *EPA Protective Action Manual*, (EPA 400-R-92-001), May 1992.
 1. Emergency Phase PAGs: Whole-Body and Thyroid Doses
 2. Intermediate Phase PAGs: Relocation and Ingestion PAGs

C3.3 Activation Duties

After receiving notice for FRMAC alert and activation and appointment to this position, the SSA will take the following actions.

- A. Confirm availability with management and report the results to the Director.
- B. Assess available radiological emergency information and determine if special staff members are needed; advise the Director.
- C. Provide an estimated time of arrival at the projected or actual designated FRMAC location to the Director or to a DOE/NV representative.
- D. Bring personal resource documents and lists of nationwide technical expertise (scientists, laboratories, etc.).

C3.4 Operational Duties

- A. If arrival at the FRMAC facility location coincides with the FRMAC activation process, assist the Director and/or FRMAC staff as appropriate.

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- B. Upon arrival at the FRMAC or as soon as possible, discuss the Advance Party activities and LFA or state(s) operational agreements with the Director. Advise the Director on the best course of action.
 - C. Provide technical oversight of FRMAC activities. Advise the Director on equipment, procedures, analyses, and assessment processes so that the FRMAC products have a sound technical base.
 - D. Provide advice and alternatives to the Director regarding the following areas.
 - 1. Technical activities to meet the overall FRMAC objectives of effective, efficient management of federal and other resources to reflect the prioritized needs of the LFA and state(s).
 - 2. Best use of assets to obtain the technical goals, including a technical review of the activities to assess procedures used for a sound technical base.
 - 3. Location of additional assets, if needed.
 - E. Assist in preparing overviews of the health effects and environmental impacts for the radiological emergency from the available data with the Monitoring, Assessment, and H&S Division Managers and the Operations Manager. Discuss the intended presentation with the Director/Deputy Director and provide the assessment to the LFA, state(s), and others, as directed.
 - F. Interpret scientific information. Discuss differences in interpretations with the Assessment Division Manager. Also, identify options, estimate risks and benefits, and recommend appropriate courses of action.
 - G. Serve as the FRMAC scientific contact with other agencies.

C3.5 Closeout Duties

- A. Provide assistance in transferring management of the FRMAC to the EPA, as directed.
- B. Assist in preparing a lessons-learned report and submit to the Director.
- C. If requested, provide assistance in preparing and/or reviewing general population exposure reports, health-effects reports, or other FRMAC-event reports.

C4.0 CHIEF OF STAFF

C4.1 Functional Description

The Chief of Staff is appointed by the FRMAC Director and functions primarily as a senior staff person to oversee the activities of the Special Staff and other activities as needed and as assigned by the FRMAC Director. The Chief of Staff will report directly to the FRMAC Director.

C4.2 Ongoing Duties

- A. **Predesignation.** Potential Chiefs of Staff are predesignated from the full-time staff members of the DOE/NV management team and listed in the *Interim Activation Plan, National Response Assets (NEST, FRMAC, RAP, ARG)*. The potential Chiefs of Staff are responsible to the DOE/NV Manager and ensure compliance with applicable DOE orders and agency directives.
- B. **FRMAC Knowledge.** Potential Chiefs of Staff must stay current in their knowledge of the FRMAC documents applicable to managing and interfacing the FRMAC organization (*FRMAC Operations Manual, Emergency Phase; Overview of FRMAC Operations; etc.*) and maintain a personal copy of the *FRMAC Director's Handbook*.
- C. **FRMAC Management Panel.** Potential Chiefs of Staff should participate whenever possible on the DOE/NV FRMAC management panel, be familiar with the FRMAC working group charters, review the Operations Working Group meeting minutes, and review working group documents, as applicable.
- D. **Training.** Potential Chiefs of Staff should participate in at least one FRMAC training course every three years.
- E. **Exercises.** If scheduled, potential Chiefs of Staff should participate at least every two years in FRMAC tabletops, other drills, and exercises. Participation could be as a player, planner, evaluator, or controller. If participation is not possible, obtain notes or a briefing from the FRMAC Director. All potential Chiefs of Staff should be fully involved with lessons-learned activities following each exercise.
- F. **Readiness.** Potential Chiefs of Staff should periodically receive status briefings on FRMAC readiness, activities, funding, and support. Annually, receive notices from DOE/NV regarding the documentation reviews that affect FRMAC (*FRMAC Operations Manual, Emergency Phase; Interim Activation Plan, National Response Assets [NEST, FRMAC, RAP, ARG]; etc.*) and participate, if possible.

C4.3 Activation Duties

- A. Upon receiving notice for FRMAC alert and activation and appointment to this position, the Chief of Staff will report to the DOE/NV EOC and perform the following duties.
 - 1. Obtain the status and details of the real or potential radiological situation.
 - 2. Assist the Director and Deputy Director as needed and as assigned.
 - 3. Assign personnel to the Special Staff, as needed and as appropriate, with concurrence by the Director as follows:

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- a. PIO to be assigned in the FRMAC
 - b. Public Information Liaison to be assigned in the JIC
 - c. Legal Officer
 - d. Quality Assurance Coordinator (DOE or contractor personnel)
 - e. Administrative staff
- B. Work with the PIO and the FRMAC Director on any public releases from the DOE/NV and/or DOE/HQ during alert and activation.
 - C. Deploy with the Advance Party or the Main Party as directed by the FRMAC Director.

C4.4 Operational Duties

- A. Assist the FRMAC Director and/or the Deputy Director in establishing the FRMAC.
- B. Coordinate with the Support Manager in identifying space and communications support for the Special Staff.
- C. Work with the FRMAC Director, PIO, and FRMAC JIC Liaison in all public information aspects of the FRMAC and in establishing communications with the JIC and the DOE/HQ.
- D. Oversee all activities of the Special Staff as follows.
 1. Public information
 2. Legal aspects of all FRMAC activities
 3. Quality assurance of all products, initial and final, produced by the FRMAC
- E. Assist the FRMAC Director and others, as appropriate, in maintaining the flow of information both within and outside the FRMAC.
- F. Coordinate special tours and the presence visitors within the FRMAC.
- G. Serve as the FRMAC Director when the Director and Deputy Director are unavailable.

C4.5 Closeout Duties

- A. Assist the FRMAC Director with the transfer of FRMAC management to the EPA.
- B. Coordinate and schedule a lessons-learned report and include successes, issues (observations and problems), solutions, and suggestions for all activities of the Special Staff.
- C. Complete FRMAC management logbooks or other records.
- D. Assist, as directed, in preparing and transmitting final, emergency-phase action items to the DOE/NV or DOE/HQ.
- E. Continue in travel status to assist EPA as directed.

C5.0 LIAISON MANAGER

C5.1 Functional Description

The Liaison Manager reports to the FRMAC Director and/or Deputy Director and interacts with FRMAC representatives from the LFA, state(s), and local and federal agencies participating in the FRMAC. The Liaison Manager also implements and manages the FRMAC liaisons located at other emergency response centers.

The liaison function ensures timely transmittal of critical monitoring and assessment information to facilitate the interpretation of data and expedite the resolution of conflicts in data. The Liaison Manager will detail personnel to serve as FRMAC liaisons at other centers. These liaisons will be assigned to the following emergency response locations where the FRMAC results are received.

- A. LFA command facilities such as the JOC
- B. State and/or local (county, city) EOCs
- C. FEMA DFO
- D. Facility owner/operator EOFs
- E. Other facilities as necessary and as requested

C5.2 Ongoing Duties

- A. Attend FRMAC training courses, as applicable.
- B. Maintain familiarity with the FRERP, specific DOE response modes, and emergency response documents.
- C. Attend appropriate tabletops, drills, and exercises, as appropriate, every three years.
- D. Identify new staff members for training and provide names to DOE/NV.

C5.3 Activation Duties

Upon receiving notice for FRMAC alert and activation and appointment to this position, the Liaison Manager will take the following actions.

- A. Complete applicable verification procedures.
- B. Confirm availability with management.
- C. Provide estimated time of arrival to the FRMAC Director.
- D. Provide assistance, as needed.
- E. Deploy to the designated FRMAC location, as directed.

C5.4 Operational Duties

Upon arrival at the FRMAC facility, the Liaison Manager will take the following actions.

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- A. In consultation with the Operations Manager and the Monitoring and Assessment Division Managers, determine phone numbers and a point of contact and establish communications with the following
 1. State EOC(s)
 2. Local (county/city) EOC(s)
 3. LFA response headquarters (JOC)
 4. FEMA DFO
 5. Facility owner/operator EOF
 - B. In consultation with the FRMAC Director, identify personnel who could serve as liaisons in appropriate facilities, determine their availability, make selections, and provide each liaison with a point of contact at their assigned facility.
 - C. Make arrangements for second-shift personnel to report to the FRMAC for briefing and training before reporting to their assigned locations.
 - D. Advise the FRMAC Director as soon as possible concerning the estimated time of arrival for liaisons at the various facilities.
 - E. Advise agency representatives and liaisons regarding FRMAC briefing schedules as soon as the times are established.
 - F. Provide copies of the FRMAC Monitoring and Sampling Plan to the agency representatives and the liaisons and determine if agencies have unmet needs. Direct these needs to the Operations Manager and report the results to the agency representatives and liaisons.
 - G. Determine if communications problems exist and attempt to find solutions.
 - H. Determine what GIS links can be established to facilitate the flow of information to the liaison locations (GIS import/export files, transmission by downloading to still video, etc.). Coordinate with the Support Division Manager to establish communications links with remote locations (outside the FRMAC).
 - I. Attend and participate, as directed, in briefings.
 - J. Submit requests from agency representatives or liaisons to the tracker and maintain an up-to-date copy of the event status report. Ensure that requests are addressed in a timely manner. Discuss problems with the FRMAC Director and other managers, as needed.
 - K. Provide briefing reports to the agency representatives and liaisons as soon as practical.
 - L. Provide constant attention to requests from agency representatives and liaisons to ensure the following.
 1. Liaison functions are expedited and completed.
 2. Technical information flows to and from the FRMAC in a timely manner,
 3. The LFA, state and local jurisdictions, and participating federal agencies receive full FRMAC support in a timely manner.
 - M. Ensure that pertinent technical information received from remote locations is promptly provided to the FRMAC Director and other divisions, as applicable.
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C5.5 Closeout Duties

- A. Assist the FRMAC Director in transferring FRMAC management to the EPA.
 - 1. Assist with transfer briefings.
 - 2. Provide requested reports or contacts.
- B. Remain in travel status to assist EPA, as directed.
- C. Hold a closeout critique for the agency representatives and FRMAC liaisons.
- D. Participate in the closeout critique.
- E. Prepare a lessons-learned report and include successes, issues (observations and problems), solutions, and suggestions.

C6.0 OPERATIONS MANAGER

C6.1 Functional Description

The Operations Manager reports to the FRMAC Director and/or the Deputy Director. This manager assists and advises the Director in implementing FRMAC activities and ensures the Director that activities reflect the prioritized needs of the LFA and state(s). Through the FRMAC information systems, this manager assures the Director that the LFA, state(s), and/or local authorities are receiving full-FRMAC support in a timely manner and the federal agencies are receiving FRMAC information to assist them in completing their FRERP responsibilities. The Operations Manager is responsible for executing and coordinating resources and activities both internal and external to the FRMAC. The Operations Manager advises the Director about requests and events flowing through the FRMAC and appropriate events that are external to the FRMAC. The following four senior FRMAC division managers report to the Operations Manager.

- A. Support Division Manager
- B. Monitoring Division Manager
- C. Assessment Division Manager
- D. Health and Safety Division Manager

In addition, the Operations Staff who is responsible for recordkeeping, action tracking, short- and long-range planning, and archiving information also reports directly to the Operations Manager.

C6.2 Ongoing Duties

- A. Be familiar with the FRERP and FRMAC documents and DOE response modes and ensure that personnel readiness is sufficient for 24-hour cycles.
- B. Be familiar with the position descriptions for the four FRMAC senior division managers and the Operations Staff.
- C. Ensure that the field operations organization is prepared to provide support to the four senior division managers and the Operations Staff.
- D. Assist in identifying other DOE and federal agencies having response capabilities and coordinate their availability.
- E. Review FRMAC working group meeting minutes and documents and ensure that the actions and procedures of the working groups reflect operationally achievable goals.
- F. Obtain training to improve personal knowledge and ability to manage the various facets of FRMAC operations.
- G. Participate in applicable FRMAC tabletops, drills, or exercises at least every three years. Participation could be as a player, planner, evaluator, or coordinator.
- H. Annually, determine that a training schedule has been developed and that FRMAC training needs can be met. Ensure that new staff members are trained and that present staff members are provided refresher training.
- I. Obtain final FRMAC plans and procedures; review the *FRMAC Operations Manual, Emergency Phase*, and other applicable documents; and provide updated documents, as appropriate, to the DOE/NV or others, as directed.

C6.3 Activation Duties

Upon receiving notice for FRMAC alert and activation and appointment to this position, the Operations Manager will take the following actions.

- A. Complete applicable verification procedures.
- B. Report to the DOE/NV EOC and obtain information about the radiological emergency.
- C. Appoint or notify, as appropriate, the Operations Deputy Manager, the four senior division managers, and the Operations Staff. In addition, determine their estimated time of arrival at the DOE/NV EOC or other assembly point.
- D. Ensure that arrangements to deploy personnel and equipment are updated and implemented.
- E. Travel to the designated FRMAC location with the Advance Party or deploy with the Main Party, as directed. (It is expected that the Operations Manager will be a member of the Advance Party.)

C6.4 Operational Duties

- A. Facilitate the activation of the FRMAC and the establishment of the following operational divisions at the FRMAC site.
 1. **Support Division.** This division is responsible for providing security, communications, mechanical and electrical systems support, photo/video support, and logistical and administrative support including shipping and transporting equipment and personnel.
 2. **Monitoring Division.** This division will coordinate and direct data-acquisition personnel including those responsible for field monitoring, sampling, and sample analysis. Monitoring teams working out of the FRMAC will be coordinated by the Monitoring Division. This division evaluates the need for field information, develops plans for obtaining measurements and samples, and coordinates the deployment of monitoring teams.
 3. **Assessment Division.** All environmental radiation data gathered or received by the FRMAC flow through the Assessment Division to the FRMAC Director. This division is responsible for overseeing the handling, processing, evaluating, assessing, and reporting of data. The Assessment Division reviews and assembles the environmental data to obtain an overview status of the radiological situation and ensures the technical integrity of the data.
 4. **Health and Safety Division.** This division is responsible for all health and safety issues regarding FRMAC personnel. These issues include radiation, contamination control, industrial hygiene, general staff, and medical services at the FRMAC to protect federal and contractor participants.
 5. **Operations Staff.** This group documents FRMAC (internal and external) activities, status-board entries to report requests and events and the continued followup to determine status. This group also maintains an archive of all FRMAC documents and key information.
- B. Manage the internal operations of the FRMAC.
- C. Ensure effective implementation of DOE resources in coordination with other federal agencies.
- D. Assist the Director in staffing.

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- E. Assist the four senior division managers, if necessary, to replace staff members due to sickness, personal emergencies, or other circumstances.
 - F. Obtain a copy of the FRMAC Monitoring and Sampling Plan and ensure that the Monitoring and Assessment Division Managers are using this plan so that FRMAC activities reflect the priorities of the LFA and state(s).
 - G. Brief the Director, as required, on the status of the DOE response and the availability of resources.
 - H. Advise the Director and the staff on the availability of plans, procedures, and protocols with regard to the FRMAC response.
 - I. Obtain the Director's schedule and order of briefings and ensure that the four senior division managers know the briefing times.
 - J. Ensure that concerns about changing FRMAC priorities as presented by the Monitoring and/or Assessment Division Managers are brought to the Director's attention for presentation to the senior representatives of the LFA and state(s).
 - K. Oversee the documentation and tracking of requests and events and monitor the responses to requests through the FRMAC tracking system.
 - L. Facilitate the maintenance of FRMAC status reports and logbooks.
 - M. Provide situation or status reports to the Director including sections from each of the four senior division managers. Provide these reports according to the daily schedule established by the Director.
 - N. Ensure the efficient and effective utilization of FRMAC resources to meet the needs of the LFA and state(s).
 - O. Ensure that the overall safety and associated risks of specific FRMAC operations are reviewed by the H&S Division Manager before the operations are implemented.
 - P. Ensure that the divisions effectively coordinate activities with state(s) and federal agencies.
 - Q. Assist the Liaison Manager in facilitating the external FRMAC communications. Liaison is maintained with the LFA, state(s), and local authorities. The FRMAC liaisons are detailed and managed.

C6.5 Closeout Duties

- A. Assist the FRMAC Director with the transfer of FRMAC management to the EPA.
 - 1. Assist with transfer briefings.
 - 2. Assist with the transfer of the FRMAC database.
 - 3. Provide requested reports, etc.
 - 4. Assist with DOE/HQ or DOE/NV closeout functions.
 - B. Remain in travel status to assist EPA, as directed.
 - C. Ensure that the division managers conduct a critique with their management teams.
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- D. Conduct a critique for the Operations Deputy Manager and staff.
- E. Participate in the Director's response critique.
- F. Prepare a lessons-learned report and include successes, issues (observations and problems), solutions, and suggestions.
- G. Ensure all FRMAC documents and databases are copied and available for EPA turnover.

C7.0 OPERATIONS DEPUTY MANAGER

C7.1 Functional Description

The Operations Deputy Manager is appointed by the Operations Manager and functions as the manager's immediate assistant. This deputy will assist the manager in overseeing the flow of FRMAC information and achieving FRMAC objectives. In the manager's absence, the deputy will act as the Operations Manager. The deputy receives direction from the manager, determines FRMAC needs, and accomplishes the necessary tasks to ensure that the FRMAC is operated according to the *FRMAC Operations Manual, Emergency Phase*. By managing the internal flow of FRMAC information through the Operations Staff and coordinating information with the Assessment Division, the deputy ensures the manager that activities reflect the priorities established in the FRMAC Monitoring and Sampling Plan by the LFA and state(s). By managing the external flow of information, the deputy ensures the manager that the FRMAC is responding to the prioritized needs of the LFA and state(s) and providing the informational needs at the various emergency response facilities. The management of internal and external information includes the following.

A. Internal Information

1. Documentation and Status
 - a. FRMAC tracking system
 - b. Situation and status reports
 - c. Minutes recorded for the FRMAC Director's meetings
2. Status boards
3. Information distribution system
4. Raw data flow
5. Completed data summaries
6. Archiving of key information
7. Short- and long-range planning, documentation, and followup

B. External Information Flow

1. Distribution of data signed and released by the Director to the following entities:
 - a. LFA and state FRMAC representatives working with the Director and the Monitoring and Assessment Divisions
 - b. Federal agency representatives
 - c. FRMAC liaisons
2. Receipt of information requests
3. FRMAC technical briefings

C7.2 Ongoing Duties

- A. Be familiar with the FRERP and FRMAC documents and the DOE response modes and ensure that personnel readiness is sufficient for 24-hour cycles.

- B. Be familiar with the position descriptions for the Operations Deputy Manager, the four senior division managers, and the Operations Staff.
- C. Ensure that the field operations organization is prepared to provide support to the four senior division managers and the Operations Staff.
- D. Assist in identifying other DOE and federal resources, which have response capabilities, and coordinate their availability.
- E. Review the minutes and documents of FRMAC working groups and ensure that the actions and procedures of these groups reflect operationally achievable goals.
- F. Obtain training to improve personal knowledge and ability to manage the various facets of FRMAC operations.
- G. Participate in applicable FRMAC tabletops, drills, or exercises at least every three years. Participation could be as a player, planner, evaluator, or coordinator.
- H. Annually, determine that a training schedule has been developed and that FRMAC training needs can be met. Ensure that new staff members are trained and that the present staff is provided refresher training.
- I. Obtain final FRMAC plans and procedures; review the *FRMAC Operations Manual, Emergency Phase*, and other applicable documents; and provide updated documents, as appropriate, to DOE/NV or others, as directed.

C7.3 Activation Duties

After receiving notice for FRMAC alert and activation and appointment to this position, the Operations Deputy Manager will take the following actions.

- A. Complete verification procedures, if necessary.
- B. Report to the DOE/NV EOC or as directed.
- C. Ensure that the boxed copies of the *FRMAC Operations Manual, Emergency Phase*, and other documentation, as appropriate, have been manifested for shipment.
- D. Assist the Operations Manager or others, as directed.
- E. Deploy as directed.

C7.4 Operational Duties

- A. Coordinate the layout of work space for the Operations Manager and the Operations Staff. Ensure that event status boards and data-distribution systems are established, updated, and operating in a timely manner and that correct information is posted.
- B. Ensure that the FRMAC information flow is occurring as planned and designed.
- C. Provide copies of the *FRMAC Operations Manual, Emergency Phase*; floor plans; flowcharts; or other organizational aides, as needed, to ensure that the plans are used appropriately.
- D. Observe the overall FRMAC and federal response processes and advise the Operations Manager regarding progress, completion, or problems. If progress is not adequate, identify the areas that need attention. This continuing observational process should include the following.

1. FRMAC activation process
 2. FRMAC operations within the facility
 - a. Observe operations and briefings.
 - b. Discuss observations with the four senior division managers and the Operations Staff.
 3. FRMAC field monitoring operations
- E. Prepare situation reports for review by the Operations Manager to meet the Director's established daily schedule.
- F. Provide the FRMAC special staff with copies of plans, documents, or other information, as requested.

C7.5 Closeout Duties

- A. Retrieve the copies of the *FRMAC Operations Manual, Emergency Phase*, and arrange to have them shipped to DOE/NV.
- B. Prepare a lessons-learned report and include successes, issues (observations and problems), solutions, and suggestions.

C8.0 SUPPORT DIVISION MANAGER

C8.1 Functional Description

The Support Division Manager reports directly to the Operations Manager. This manager is responsible for providing communications support, mechanical/electrical systems, photo/video support, facility support, logistical/administrative support including general supplies and services (base support), and security for the FRMAC facility and equipment. This manager's staff is organized into six support groups.

- A. Communications
- B. Mechanical/Electrical
- C. Photo/Video
- D. Logistics/Administration
- E. Base Support (general supplies and services)
- F. Security

C8.2 Ongoing Duties

- A. Ensure that staff members are trained to operate the various equipment necessary to provide communications, photo/video, mechanical, aviation, transportation, logistical, and electrical services.
- B. Identify other DOE resources and other federal agencies having response capabilities.
- C. Participate in applicable FRMAC drills or exercises every three years. Participation could be as a player, planner, evaluator, etc. Obtain a briefing from the participating Support Division Manager after each major exercise.
- D. Participate in the FRMAC Operations Working Group.
- E. Participate as a member in other FRMAC working groups, as directed.
- F. Obtain minutes and progress reports from all working groups.
- G. Assist the operations and training working groups to establish and submit a training schedule for approval or determine that a training schedule has been developed and the Support Division Manager's staff requirements can be met.
- H. Ensure that the Support Division is prepared, in depth, to fulfill the division's responsibilities. (See Section 4.0.)
- I. Participate in efforts to update applicable FRMAC documents; review the *FRMAC Operations Manual, Emergency Phase*, and other applicable documents annually; and provide updated documents as appropriate or as directed by DOE/NV or others.
- J. Attend FRMAC training courses, as applicable, and obtain training to improve personal knowledge and ability to manage the various facets of the Support Division's mission.
- K. Ensure that the procedures of the support groups reflect technically sound and operationally acceptable practices based on acceptable guidelines.
- L. Ensure that supplies necessary to support field activities are available and maintain planned, comprehensive administrative records as well as a map library of the United States.

C8.3 Activation Duties

Upon receiving notice for FRMAC alert and activation and appointment to this position, the Support Division Manager will take the following actions.

- A. Complete applicable verification procedures.
- B. Report as directed and obtain information about the emergency.
- C. Appoint and notify the Support Division Deputy Manager and the six support group leaders.
- D. Alert members of the support groups necessary to provide dual shifts for the expected staffing levels associated with the specific emergency scenario, as follows.
 1. Provide travel instructions, as needed.
 2. Provide emergency site telephone numbers, if possible.
- E. Determine the specific number of equipment pods that will be necessary and ensure that arrangements to deploy personnel and equipment are updated but implemented only as directed.
- F. Manage and direct the assembly and deployment of supporting FRMAC assets for the Advance Party.
- G. Manage and direct the assembly and deployment of supporting FRMAC assets for the Main Party.
- H. Travel to the designated FRMAC site, as directed.

C8.4 Operational Duties

Upon arrival at the designated FRMAC facility, the Support Division Manager will take the following actions.

- A. Establish areas as designated in the *FRMAC Operations Manual, Emergency Phase*.
- B. Establish and manage the Support Division functions as follows.
 1. **Communications**
 - a. Provide and obtain communications equipment and services, as required.
 - b. Provide communications support for the Advance Party.
 - c. Coordinate the use of radio frequencies.
 - d. Arrange for telephone services.
 - e. Provide telecommunications systems to connect the FRMAC with other emergency operations centers.
 - f. Provide a communications network of radios, telephones, and pagers to support the facility and field operations.
 - g. Provide secure communications for voice, data, facsimile, and teletype transmissions, as required.
 2. **Mechanical/Electrical**
 - a. Operate trucks and forklifts for loading and unloading equipment.
 - b. Provide electrical power, as required. This includes portable generator systems (if needed) and the distribution of local power.

- c. Construct, maintain, and repair support equipment and supplies, as required.
 - d. Modify and maintain the facility, as necessary.
3. **Photo/Video**
- a. Document all phases of operation.
 - b. Assist in acquiring required images using optical aids and photo/video recording.
 - c. Provide on-site film processing and printing.
 - d. Provide video recording capability and on-site editing and dubbing capability to enable rapid production of video tapes in support of public affairs activities.
4. **Logistics/Administration**
- a. Arrange on-scene surface transportation.
 - b. Arrange for billeting.
 - c. Provide on-scene procurement for equipment, supplies, and labor.
 - d. Provide food when required.
 - e. Provide offices, furniture, and work space required to support the FRMAC.
 - f. Provide secretarial and administrative personnel according to the *FRMAC Operations Manual, Emergency Phase*.
5. **Security**
- a. Provide badging and logging systems for FRMAC personnel.
 - b. Provide security for the FRMAC facility and equipment.
 - c. Provide for other security needs as identified by the FRMAC Director.
6. **Base Support**
- a. Maintain a database of personnel and equipment.
 - b. Provide computer maintenance.
 - c. Provide graphics support.
- C. Maintain accountability and audit requirements for DOE-owned equipment.
- D. Provide information to the Director and management team, as requested.
- E. In conjunction with the H&S Division Manager, provide briefings for Support Division personnel who have to enter hazardous areas to accomplish their required tasks.
- F. Ensure that Support Division personnel operate within the applicable dose guidance and always practice ALARA (as low as reasonably achievable).
- G. Coordinate field activities with the Monitoring and H&S Division Managers, as appropriate.

C8.5 Closeout Duties

- A. Assist the Director in transferring FRMAC management to the EPA.
 - 1. Assist with transfer briefings.
 - 2. Assist with transferring or assigning capital equipment to EPA.
 - 3. Continue to provide support functions, as directed.

- B. Ensure that each group leader conducts a critique.
- C. Conduct a critique with the group leader of the support team.
- D. Participate in the Director's critique.
- E. Prepare a lessons-learned report and include successes, issues (observations and problems), solutions, and suggestions.

C9.0 MONITORING DIVISION MANAGER

C9.1 Functional Description

The Monitoring Division Manager reports to the Operations Manager and will coordinate and direct FRMAC personnel including those of the DOE, EPA, state(s), and participating federal agencies involved in aerial radiological monitoring, field monitoring, sampling, radioanalysis (mobile and fixed laboratories), and data control. In coordination with the SSA and the Assessment Division Manager, the Monitoring Division Manager evaluates the need for field monitoring, environmental sampling, and radioanalytical data; develops strategies and plans for obtaining the data; and establishes priorities. The Monitoring Division Manager is responsible for identifying equipment, personnel, and resource requirements and coordinating availability. The Monitoring Division Manager is also responsible for ensuring that monitoring measurements, sample collections, and derived analytical data are scientifically defensible, of acceptable known quality, and in consistent units according to FRMAC requirements. The Monitoring Division is organized into the following five groups.

- A. Aerial Measurements
- B. Field Monitoring and Sampling
- C. Laboratory Analysis
- D. Data Control
- E. Quality Assurance

C9.2 Ongoing Duties

- A. Review the availability of DOE resources and other federal agency resources having response capabilities applicable to the needs of the Monitoring Division.
- B. Participate in applicable FRMAC drills or exercises every three years. Participation could be as a player, planner, evaluator, etc. Obtain a briefing from the participating Monitoring Division Manager after each major exercise or drill.
- C. Participate on the FRMAC Monitoring Working Group.
- D. Obtain minutes and progress reports from all FRMAC working groups.
- E. Assist the FRMAC operations and training working groups in reviewing training schedules to meet monitoring, sampling, and analysis needs.
- F. Ensure that the Monitoring Division is prepared, in depth, to fulfill the division's six responsibilities (see Section 4).
- G. Participate in efforts to update the *FRMAC Monitoring and Analysis Manual*; review the *FRMAC Operations Manual*, *Emergency Phase*, and other applicable documents annually; and provide updated documents as appropriate to the DOE/NV or others, as directed.
- H. Ensure that DOE and EPA mobile laboratories have applicable isotope libraries for the projected types of emergency events. In addition, ensure that each mobile laboratory and DOE national laboratory has developed sample analysis procedures.
- I. Ensure that sufficient sample preparation resources are available for the mobile laboratories.

- J. Obtain training to improve personal knowledge and ability to manage the various facets of the Monitoring Division groups.
- K. Ensure that the Monitoring Division procedures reflect technically sound, scientifically accepted radiation protection practices based on accepted guidelines.
- L. Ensure that monitoring, sampling, and analytical procedures incorporate appropriate QA principles and procedures to ensure that informational products are consistently of known quality.

C9.3 Activation Duties

Upon receiving notice for FRMAC alert and activation and appointment to this position, the Monitoring Division Manager will take the following actions.

- A. Complete applicable verification procedures.
- B. If appropriate, report to the DOE/NV EOC and obtain emergency information.
- C. In consultation with the DOE/NV RSL, identify equipment and individuals to staff the Monitoring Division.
- D. Travel to the FRMAC site with the FRMAC Advance Party or deploy with the Main Party, as directed. (It is expected that the Monitoring Division Manager will be a member of the Advance Party.)
- E. Keep the Operations Manager informed of the status of all activities.

C9.4 Operational Duties

- A. During the Advance Party meeting with the involved LFA and state(s), the Monitoring Division Manager or representative will obtain the following information, as appropriate.
 - 1. Identification of the LFA and state advisors to the Monitoring Division.
 - 2. Identification of counterparts and liaisons.
 - 3. Protective actions that have been or are taking place in the off-site area. (Hard copy including an illustrative map, especially for the evacuated areas, is desirable.)
 - 4. Monitoring and sampling activities that are scheduled for completion by the time FRMAC is operational (off-site and on-site).
 - a. Where are the samples analyzed? For what isotopes? What is expected time of completion?
 - b. Can FRMAC obtain this data? When and how?
 - 5. Identify and obtain adequate maps (both for field teams and the Monitoring Division status map coordinator).
 - 6. Determine preestablished state, local, and facility off-site monitoring locations.
 - 7. Identify off-site land use.
 - a. Commercial food and milk production.
 - b. Family cows, milk goats, and backyard gardens.

8. Identify locations of surface drinking water supplies and open-air water treatment facilities.
 9. Will state, local, and/or facility monitoring personnel join the FRMAC?
 - a. If not, who is the state contact to coordinate off-site monitoring and analytical activity?
 - b. If state, local, and/or facility monitoring personnel join the FRMAC, determine allowable exposure levels and dose commitments. These values, which may be much different from FRMAC values, must be respected. This is also applicable to local individuals who will drive vehicles.
 10. Identify institutions, facilities, or residents located in the evacuated areas who were not evacuated or must return in the near future.
 11. How and when will federal responders, who will be monitoring prior to an operational FRMAC (*i.e.*, RAP teams), be folded into the FRMAC?
 12. How can FRMAC monitors pass through roadblocks into evacuated areas to perform monitoring duties?
 13. Are facility radiation workers or local personnel, who are familiar with the area, available to drive FRMAC vehicles?
- B. Upon arrival at the designated FRMAC location, the Monitoring Division Manager will take the following actions.
1. Lay out the Monitoring Division space according to the *FRMAC Operations Manual, Emergency Phase*.
 2. Obtain area maps from the Support Division.
 3. Determine the available field monitoring team resources and create combined (federal/state) teams, if possible.
 4. Determine the available analytical laboratory capabilities.
 5. If the Monitoring Division Manager was not part of the Advance Party, obtain a copy of the FRMAC Monitoring and Analysis Plan developed by the Advance Party.
 6. If new developments indicate that the priorities in the initial FRMAC Monitoring and Analysis Plan should be modified, immediately meet with the SSA and the Assessment Division Manager to discuss and determine the possible changes. Ensure that Monitoring Division activities reflect the prioritized needs of the LFA and state(s).
 7. Select the necessary resources to implement the prioritized tasks; ensure that the monitoring teams are familiar with FRMAC procedures (monitoring, sampling, reporting, and radiation protection); and perform necessary equipment checks.
 8. Provide the FRMAC field monitoring teams and the Monitoring Division staff with up-to-date information, provide a thorough radiation protection briefing including "turnback" and allowable emergency worker dose limits, and dispatch the field monitoring teams.
- C. Activate the following five Monitoring Division functional elements.
1. Aerial Measurements
 2. Field Monitoring and Sampling
 3. Laboratory Analysis

- 4. Data Control
- 5. Quality Assurance
- D. Provide the prioritized FRMAC Monitoring and Sampling Plan to the division staff and ensure that changes are promptly distributed.
- E. Provide briefings to the division staff at the beginning of the shift; update briefings, as appropriate; and hold a closeout briefing at the end of the shift.
- F. With the SSA and the Assessment Division Manager, continuously evaluate FRMAC requirements as identified by the LFA and state(s) against the resources and adjust priorities accordingly. If conflicts arise, refer to the LFA and state(s) through the FRMAC Director for resolution.
- G. Participate in FRMAC briefings.
- H. Obtain the briefing order from the Operations Manager and present data, operating conditions, etc., as requested.
- I. Ensure that division personnel operate within the applicable emergency radiation worker dose limits and protective guidelines are established by the H&S Division and ensure that exposures are maintained ALARA.
- J. Ensure that field data logs and forms are reviewed and discrepancies or deficiencies are resolved.

C9.5 Closeout Duties

- A. Assist the FRMAC Director in transferring FRMAC management to the EPA.
 - 1. Assist with transfer briefings.
 - 2. Assist in transferring the FRMAC database.
 - 3. Provide requested reports, etc.
 - 4. Assist in closeout functions with DOE/HQ or DOE/NV.
- B. Maintain travel status to assist EPA, as directed.
- C. Ensure that supervisors hold a critique after the emergency phase has ended.
- D. Hold a Monitoring Division management team critique.
- E. Participate in the Director's response critique.
- F. Prepare a lessons-learned report and include successes, issues (observations and problems), solutions, and suggestions.

C10.0 ASSESSMENT DIVISION MANAGER

C10.1 Functional Description

Environmental, radiological data that are gathered or received by the FRMAC flow through the Assessment Division Manager to the FRMAC Director. The Assessment Division Manager reports to the Operations Manager. The Assessment Division Manager is responsible for overseeing the handling, processing, evaluation, assessment, and reporting of data. The Assessment Division is responsible for reviewing and assembling environmental data to obtain an overview status of the radiological situation. The Assessment Division Manager ensures the technical integrity of the data. Six groups comprise the Assessment Division.

- A. Data Management
- B. Analysis
- C. Overview
- D. GIS
- E. Atmospheric Predictions
- F. Meteorology

The Data Management group operates the FRMAC Data Center. This center develops and maintains a comprehensive, traceable, and accountable database. These data are formatted to be easily understood by management and decision makers. The Assessment Division Manager works closely with representatives from the LFA and state(s) detailed to the Assessment Division, SSA, and Monitoring Division Manager.

C10.2 Ongoing Duties

- A. Review the qualifications of potential division staff members.
- B. Participate as a member of the FRMAC Assessment Working Group and other working groups, as appropriate.
- C. Obtain meeting minutes and progress reports from the working groups.
- D. Participate in applicable FRMAC drills or exercises every three years. Participation could be as a player, planner, evaluator, etc. Obtain a briefing from the participating Assessment Division Manager after each major exercise or drill.
- E. Assist the FRMAC operations and training working groups in reviewing the training schedule and determine that the Assessment Division training needs can be met by the scheduled training.
- F. Ensure that the Assessment Division organization is prepared, in depth, to provide for the six divisional responsibilities.
- G. Participate in efforts to update Assessment Division plans and manuals, review documents annually, and provide updated documents, as appropriate, to the DOE/NV and others, as directed.
- H. Obtain training to improve personal knowledge and ability to manage and plan the various facets of the Assessment Division.
- I. Be familiar with and periodically review the FRMAC tracking system.

C10.3 Activation Duties

Upon receiving notice for FRMAC alert and activation and appointment to this position, the Assessment Division Manager will take the following actions.

- A. Complete applicable verification procedures.
- B. If directed, report to the DOE/NV EOC and obtain information about the radiological emergency.
- C. Notify or appoint, as appropriate, the Assessment Division Deputy Manager, and the six group supervisors. Group supervisors and staff may come from organizations located throughout the United States.
 1. For Nevada organizations, determine the estimated time of arrival at the DOE/NV EOC or other DOE/NV assembly points.
 2. For other locations, determine the estimated time of arrival at the designated FRMAC location.
- D. Alert members of the Assessment Division necessary to provide dual shifts for the expected staffing levels associated with the specific scenario.
 1. Provide travel instructions, as needed.
 2. Provide emergency site telephone numbers, if possible.
- E. Ensure that arrangements for deploying Assessment Division personnel and equipment are updated and implemented.
- F. Travel to the emergency site with the Advance Party. (It is suggested, if possible, that the Assessment Division Manager and the Data Management group leader [Data Center Supervisor] be in the Advance Party.)

C10.4 Operational Duties

Upon arrival at the FRMAC facility, the Assessment Division Manager will take the following actions.

Note: The information-gathering process might be accomplished before the FRMAC is set up.

- A. Interview the RAP Team Leader and others, as appropriate, and integrate the RAP team response, including applicable ground-based radiological data into the FRMAC database as soon as possible. Review data and resolve differences.
- B. Obtain AMS survey results as soon as they are available.
- C. Combine the above and other pertinent data into an overview and present to the FRMAC Director and staff.
- D. Coordinate the Assessment Division overview with the SSA, if available.
- E. In preparation for the arrival of the Main Party, lay out the FRMAC Assessment Division space according to the *FRMAC Operations Manual, Emergency Phase*.
- F. Discuss and understand differences in measurements and interpretations of radiological data.
- G. Participate with the Monitoring Division Manager in developing the initial FRMAC Monitoring and Sampling Plan.

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- H. Determine the assessment priorities for setting up and activating the division's functions as listed below (refer to Section 4.0 and the *FRMAC Assessment Manual* for more detail).
 - 1. Data Management (the Data Center)
 - 2. Analysis
 - 3. Overview
 - 4. GIS
 - 5. Atmospheric Predictions
 - 6. Meteorology
 - I. Provide information to the Director and management team, as directed or requested, and distribute information, as directed, to the LFA and state(s) or others.
 - J. Coordinate, establish, or modify, as applicable, the priorities for producing Assessment Division reports with the LFA and/or state representatives detailed to the division and meet with the Operations Manager and the FRMAC Deputy Director to obtain concurrence with the senior LFA and state representatives.
 - K. Ensure that radiological data taken by the state(s) and/or other organizations outside of the FRMAC are received and integrated with FRMAC data.
 - L. Work closely with the Monitoring Division Manager and the SSA to make sure that measurements meet assessment needs.
 - M. Jointly with the H&S Division Manager, establish the FRMAC emergency radiation worker dose limits and protective guidelines. Provide information to project dose, dose rate, and appropriate indicators of exposure.
 - 1. If there is a radiological release in progress, the dose could be from immersion, inhalation, and deposition.
 - 2. If the release is over, the dose could be from deposition or possibly resuspension.
 - N. Ensure that all steps have been taken to ensure the quality of technical data.
 - O. Resolve differences in data results, data reviews, or data-transmission procedures.
 - P. Ensure that a comprehensive and traceable set of radiological data is being assembled.
 - Q. Participate in FRMAC briefings.
 - 1. Obtain the briefing order from the Operations Manager.
 - 2. Coordinate the update of status-board information with the FRMAC tracker.
 - 3. Provide briefings, as appropriate, on the status of data evaluation and assessment and on the overview of the radiological situation.
 - 4. Ensure that the basis of the data is understood.

C10.5 Closeout Duties

- A. Assist the FRMAC Director in transferring the FRMAC management to the EPA.
 - 1. Assist with transfer briefings.
 - 2. Assist in transferring the FRMAC database.

3. Provide requested reports, etc.
 4. Assist with closeout functions with DOE/HQ and DOE/NV.
 5. Ensure that all aspects of the technical data and associated information have been met or plans have been activated to meet the long-term requirements for the archived FRMAC database.
- B. Remain in travel status to assist EPA, as directed.
 - C. Hold a critique with the Assessment Division staff.
 - D. Participate in the Director's response critique.
 - E. Prepare a lessons-learned report and include successes, issues (observations and problems), suggestions, and recommendations.

C11.0 HEALTH AND SAFETY DIVISION MANAGER

C11.1 Functional Description

The H&S Division Manager is responsible for all health and safety issues concerning FRMAC personnel. This includes radiation and contamination control and the radiological protection of federal and contractor participants. This manager reports to the Operations Manager. The H&S Manager will coordinate and direct health and safety efforts in conjunction with the other FRMAC managers and will ensure that personnel radiation exposures are maintained at levels within the appropriate emergency radiation worker dose limits (established by the H&S Division) and ALARA. The safety coordinator (within this division) will work with the FRMAC managers to ensure that operations (both inside the FRMAC facility and outside in field operations) are conducted in a safe manner. The H&S Division Manager's staff is arranged into three groups.

- A. Health Physics
- B. Safety/Industrial Hygiene
- C. Medical

C11.2 Ongoing Duties

- A. Ensure that the staff is trained in operating the various monitoring equipment used for contamination control, personnel dosimetry, radiation protection, industrial hygiene, and safety-testing functions are available in DOE/NV, contractor, or federal agency organizations.
- B. Review DOE and other federal agency response capabilities that could assist with the emergency health and safety responsibilities.
- C. Encourage the H&S Division staff to attend FRMAC training courses or determine other means to provide potential health and safety personnel having familiarity with FRMAC procedures.
- D. Participate in applicable FRMAC drills or exercises every three years. Participation could be as a player, planner, evaluator, or controller. Obtain a briefing from the participating H&S Division Manager after each exercise.
- E. Participate in the FRMAC H&S Working Group.
- F. Obtain meeting minutes and progress reports from all working groups.
- G. Annually, review training schedules to meet health and safety needs.
- H. Ensure that the H&S organization is prepared, in depth, to fulfill the responsibilities of the three H&S Division groups.
 - I. Participate in efforts to update the *FRMAC Health and Safety Manual*; review the *FRMAC Operations Manual*, *Emergency Phase*, and other applicable documents annually; and provide updated documents, as appropriate, to DOE/NV or others, as directed.
- J. Obtain training to improve personal knowledge and the ability to manage the various facets of the H&S Division groups.
- K. Ensure that the procedures of the H&S Division groups reflect technically sound, scientifically accepted radiation protection practices based on accepted guidelines.

- L. Ensure that all industrial hygiene or safety monitoring and sampling procedures and plans incorporate appropriate QA principles and procedures to ensure that all inspection reports are of consistent and known quality.

C11.3 Activation Duties

Upon receiving notice for FRMAC alert and activation and appointment to this position, the H&S Division Manager will take the following actions.

- A. Complete applicable verification procedures.
- B. Report to the DOE/NV EOC or respond, as directed.
- C. Appoint and notify the H&S Division Deputy Manager and the three H&S Division group supervisors and determine their estimated time of arrival at the DOE/NV EOC or other designated location.
- D. Alert members of the H&S organization necessary to provide 24-hour operations for the expected staffing levels associated with the specific incident scenario.
 - 1. Provide travel instructions, as needed.
 - 2. Provide FRMAC site telephone numbers, if possible.
- E. Ensure that arrangements for deploying personnel and equipment are updated and implemented.
- F. Travel to the designated FRMAC site with the Advance Party or deploy with the Main Party, as directed.

C11.4 Operational Duties

Upon arrival at the FRMAC facility, the H&S Division Manager will take the following actions.

- A. Lay out the H&S Division space according to the *FRMAC Operations Manual, Emergency Phase*, as applicable.
- B. Determine available resources to meet immediate needs. Ensure that H&S Division personnel are familiar with FRMAC procedures and detail staff to accomplish the immediate tasks.
- C. Ensure that the FRMAC "hot line" is established according to procedures.
- D. Provide H&S Division staff with a briefing of expected conditions, types of contamination, contamination control needs, etc. Provide a briefing to H&S Division staff at the beginning of their shift and during the shift if conditions change and conduct a closeout briefing at the end of the shift.
- E. Activate and manage the three H&S Division functional groups.
 - 1. **Health Physics.** This group manages the following health physics concerns for the FRMAC:
 - a. Radiation protection
 - b. Personnel dosimetry
 - c. Contamination control

- d. Radioactive material shipping or receiving
- e. Radioactive waste
- 2. **Safety/Industrial Hygiene.** The H&S industrial hygienist will ensure that FRMAC participants are protected from hazards related to chemical exposures, environmental factors, and use of flammable and cryogenic materials and will provide guidance on fire protection, confined space entry, and electrical safety.
- 3. **Medical.** This group will provide medical services as follows:
 - a. On-site emergency medical care and/or any medical followup for FRMAC personnel.
 - b. The Oak Ridge REAC/TS program will provide medical support to the FRMAC.
- F. Contact the Assessment Division Manager and jointly determine, if possible, the field personnel dosimeter reading that will equate to the established emergency radiation worker dose limit.
 - 1. If a radiological release is in progress, the dose could be from immersion, inhalation, and deposition.
 - 2. If the release is over, the dose could be from deposition or possibly resuspension.
- G. Contact the Monitoring Division Manager and jointly ensure that the Monitoring Division field supervisors are familiar with the radiation protection guidance.
 - 1. Dose-reporting frequency
 - 2. Dose-reporting levels
 - 3. Turnback exposure-rate levels
- H. In conjunction with the Assessment Division Manager, evaluate the radioactivity expected to be in the prioritized field monitoring and sampling areas; implement the use of protective clothing or equipment, as necessary; and ensure that potassium iodide is available in field team "kits," as needed.
 - I. Provide information to the Director and management team, as directed or requested.
- J. Review facility logs and forms at the end of the shift and resolve discrepancies or deficiencies.
- K. Ensure that personnel receive adequate rest to function at full capacity in a safe manner.
- L. Ensure that health physics coverage is provided for all FRMAC teams such as photo, communications, etc., who might enter a restricted or contaminated area and, if a radioactive or hazardous substance release is continuing or imminent, advise the Director in conjunction with the SSA on the adequacy of the FRMAC facility.
- M. Review all FRMAC personnel dosimeter records to ensure that emergency radiation worker dose limits are maintained within the applicable radiation dose criteria and ALARA. Ensure that complete personnel dosimetry records are furnished to the Assessment Division Data Center.
- N. In coordination with the Monitoring Division Manager and the SSA, evaluate and recommend to the Director, on a case-by-case basis, personnel who may potentially exceed the emergency radiation worker dose limit. (Emergency radiation workers can be authorized to receive up to 25 rems for operations related to protecting the public and unlimited doses on a voluntary basis for lifesaving.)
- O. If there are "over exposures," ensure that the Director is informed, review the incident, and determine the cause. If procedures were at fault, obtain concurrence from the SSA and the Director and revise and distribute the new procedure.

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- P. Maintain cognizance of potential contamination and establish evaluation programs to determine if FRMAC dosimetry is necessary for associated, off-facility, analytical laboratories.
 - Q. Participate in FRMAC briefings.
 - 1. Obtain the briefing order from the Operations Manager.
 - 2. Present health and safety status reports, as requested.

C11.5 Closeout Duties

- A. Assist the FRMAC Director in transferring FRMAC management to the EPA.
 - 1. Assist with transfer briefings.
 - 2. Provide requested reports, etc.
 - 3. Assist with closeout functions with DOE/HQ or DOE/NV.
 - 4. Provide necessary followup with shipments of radioactive materials and/or waste.
 - 5. Ensure that the person receiving radioactive material transfers is authorized to receive this material.
- B. Remain in travel status to assist EPA, as directed.
- C. Ensure that each group leader holds a critique after the emergency phase has ended.
- D. Coordinate an H&S Division staff critique.
- E. Participate in the Director's response critique.
- F. Prepare a lessons-learned report and include successes, issues (observations and problems), solutions, and suggestions.

APPENDIX D**FRMAC MONITORING, SAMPLING, AND ANALYSIS ACTIVITIES
INITIAL PRIORITIES AND STRATEGIES**

This appendix discusses and lists generic guidelines for developing the initial FRMAC Monitoring and Sampling Plan to support the LFA and state needs. The actual plan will be tailored to the actual emergency.

D1.0 Advance Party Meeting

During the Advance Party meeting with the involved state(s) and the LFA, an initial FRMAC Monitoring and Sampling Plan will be initiated. To create this plan and for the FRMAC Monitoring Division to become operational, the Monitoring Division representative will make the following determinations.

- A. Identify LFA and state advisors to the Monitoring Division.
 - B. Identify counterparts and liaisons.
 - C. Identify the protective actions that have been taken or are taking place in the off-site area (the Monitoring Division requires a hard copy, including an illustrative map, especially for the evacuated and sheltered areas).
 - D. Identify the monitoring and sampling activities that will be completed by the time FRMAC is operational (off-site and on-site).
 1. What analyses are the samples undergoing?
 2. What is the expected time when results will be available?
 3. Can FRMAC obtain copies of the monitoring and analytical data—when and how?
 - E. Identify and obtain adequate maps (both for field teams and the Monitoring Division status coordinator).
 - F. Identify the location of preestablished state, local, and facility off-site monitoring sites.
 - G. Identify local populated areas and critical facilities such as hospitals, nursing homes, and prisons.
 - H. Identify locations of surface drinking water supplies and open-air water treatment facilities.
 - I. Determine if state, local, and/or facility monitoring personnel will join the FRMAC.
 1. If they will not join the FRMAC, determine who is the state contact for coordinating off-site monitoring and analytical activity.
 2. If state, local, and/or facility monitoring personnel join the FRMAC, determine allowable exposure levels and dose commitments. These values, which may be much different from FRMAC values, must be respected. This is also applicable to local individuals provided to drive monitoring vehicles.
 3. Ideally, a FRMAC monitoring team will be composed of three members: two federal participants and one state or local participant.
 - J. Identify institutions, facilities, and residences located in the evacuated areas that were not evacuated or where people must reenter in the near future.
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- K. Determine how and when federal responders, who will be monitoring prior to an operational FRMAC (*i.e.*, RAP teams), will be folded into the FRMAC.
- L. Determine how FRMAC monitors can pass through roadblocks into evacuated areas in order to perform monitoring duties.
- M. Identify local and/or facility personnel, familiar with the area, who are available to drive FRMAC monitoring vehicles.

D2.0 Priorities

The initial FRMAC Monitoring and Sampling Plan will reflect LFA and state(s) requirements and should include the following general priorities.

- A. Support for the LFA and the state(s).
- B. If a large, unmonitored release is ongoing or is projected, determine if inhalation may be a major source of risk (*i.e.*, are radioiodines present).
- C. Monitor where people are located near the edge of the evacuated areas.
- D. After deposition, determine isotopic ratios.
- E. Identify areas that have not been evacuated but where early health effects are possible (greater than 100 rem in four days; *i.e.*, 1 rem/h).
- F. Identify areas that have not been evacuated but where the EPA Early Phase Protective Action Guide (PAG) may be exceeded (greater than 1 rem in four days; *i.e.*, approximately 10 mrem/h).
- G. Provide a measure of the validity for the dispersion models in use.
- H. Establish air sampling stations to measure resuspension and future plume releases.
- I. Monitor institutions, facilities, or residences located in the evacuated areas that were not evacuated or where people must reenter in the near future.
- J. Look for hot spots and characterize the off-site area.
- K. Monitor and document areas for possible return of residents.
- L. Sample surface drinking water supplies and open-air water treatment facilities.

D3.0 Strategies

To accomplish the priorities, the following strategies should be considered.

- A. Monitoring Aircraft
 - 1. If aircraft are on-scene prior to plume release (helicopters plus fixed-wing aircraft), the following actions will be performed.
 - a. Maintain the fixed-wing aircraft in a readiness mode at a nearby airport.
 - b. To detect an unmonitored release, periodically fly a helicopter at a safe distance in a fixed, repeatable pattern above the reactor site.
 - c. If a significant plume release is detected, replace the helicopter with the fixed-wing aircraft. The fixed-wing aircraft will be used as follows:

- 1) Track the plume.
 - 2) Determine plume height, size, and direction.
 - 3) Attempt to identify the major isotopes including the radioiodines.
 - 4) Transect and sample the plume for source-term determination, if necessary.
2. By tracking the plume with aircraft, invaluable information is obtained for positioning monitoring personnel downwind and for identifying areas for possible initiation of protective actions.

B. Plume Release

1. If possible prior to plume release, place gamma monitors, air samplers, and TLDs (all three at the same location) at representative locations between the fence line and populated areas. Emphasis should be given to the prevailing wind direction if wind exists.
2. Place gamma monitors, air samplers, and TLDs at representative populated areas.
3. Based on information received from the monitoring aircraft and the meteorological conditions, deploy monitoring teams to travel roads in the vicinity of the incident site looking for the plume.
4. Each team should be equipped with plume sampling and radioiodine analysis capability. Teams should traverse assigned areas until contact is made with the plume. The teams should proceed as follows:
 - a. Notify the FRMAC when the plume is detected.
 - b. Proceed through the plume until maximum radiation is detected (always being aware of radiation turnback levels).
 - c. Stop, exit the vehicle, and make beta/gamma open and closed window measurements at waist height and at ground level.
 - d. If the waist-height, open beta window measurement ($\beta+\gamma$) is significantly greater than the waist-height, closed beta window measurement (γ), the monitor is probably in the plume and should collect a five-minute, high-volume air sample using a filter medium and a silver zeolite or similarly treated charcoal cartridge.
 - e. Proceed through the plume noting when the plume is exited.
 - f. In a background area, analyze the charcoal cartridge for the presence of radioiodines.
 - g. Report the radioiodine results to the FRMAC.

C. Deposition Measurements by Aircraft

Upon arriving at the location of a radiological emergency where deposition has occurred, the radiological monitoring aircraft will be flown in (a) a serpentine pattern traversing the predominant plume footprint and (b) a circle with a radius of ten miles around the emergency site. The mission for this initial flight is to determine the following:

1. Direction and approximate exposure rates along the deposition center line
2. Outline of the contamination footprint
3. Major isotopes

Following the initial flight, detailed radioactive deposition mapping is performed. The flight plan is dependent on radiological conditions, weather, terrain, and priorities. Depending on the magnitude of the release, size of the deposition footprint, and monitoring requirements, the aircraft's

altitude and the distance between the parallel flight lines will vary. Normally, the helicopter is flown at an approximate altitude of 150 feet and a speed of 70 knots. Parallel flight lines are separated by approximately 250 feet. Flying at an altitude of 150 feet provides a monitoring window on the ground of about 300 feet in width. In this manner, the helicopter can map the ground deposition at a rate of approximately four square miles per hour.

The following products are available from aerial mapping:

- Isodose and exposure contours calculated to one meter above the ground
- Soil deposition determinations of specific radionuclides
- Total activity inventories of radionuclides of interest
- Gamma-ray energy spectra

The monitoring aircraft provides a very rapid and exhaustive method for radiologically mapping an area, and it should be used to complement the monitoring performed by field teams. In concert with the principle of ALARA, the aircraft should be utilized instead of ground field teams for monitoring in the more highly contaminated areas. Also, the aircraft can be used to monitor where road access is limited. Sufficient overlap between the monitoring aircraft and the field monitoring activities is required to estimate the comparability of the radiological data.

D. Monitoring Where People Reside

Based on the aerial monitoring and meteorological data, initiate monitoring in the downwind direction from the plume footprint. Monitor where people are residing in the nonevacuated areas. Continue monitoring for 360 degrees. Attempt to monitor along the edge of the inhabited zones closest to the evacuated areas. Place representative, continuous particulate, and reactive gas air samplers and TLDs in these close-in inhabited areas to measure resuspension, integrated exposure, and possible future plume releases. The actual placement of the samplers should be determined by the number of samplers available, population distribution, and local wind rose. The following types of facilities usually have electrical power available and are "good" places to locate air samplers:

- Fire and police stations
- County and state road maintenance facilities
- Schools and public park facilities
- City, county, and state municipal buildings
- Hospitals

If none of these facilities are available, attempt to locate the samplers at service stations, convenience stores, or residences. As a last resort, use the portable generators to supply the electrical power for the samplers.

E. Deposition

Identify isotopic mix and verify deposition models by taking appropriate radiation measurements using roadways and the monitoring aircraft to traverse the predicted footprint. The chosen roadways and flight paths should intersect a representative number of predicted radiation contours. Depending on the radiological release, if applicable, *in situ* gamma spectrometry systems are the preferred field-team instrument to be used with an exposure-rate meter. Also as a rule-of-thumb, soil and vegetation samples should be collected at every order-of-magnitude change in measured radiation levels.

F. Monitoring Institutions, Facilities, and Residences Located in the Evacuated Areas That Were Not Evacuated or Where People Must Reenter in the Near Future

The monitoring of these areas must be coordinated with state and/or local officials. When approaching nonevacuated residences, monitoring teams should be accompanied by local uniformed police or firemen. It is necessary to monitor the exteriors of the structures as well as the interiors. Interior monitoring will include the acquisition of swipes from representative surfaces. Environmental TLDs should be placed inside and outside of each occupied structure. Representative individuals at each location should be assigned to wear a TLD. If available, gamma-rate recorders should be placed inside the structures. The appropriateness of locating particulate and reactive gas air samplers at these stay-in locations should be determined. A brochure describing basic facts about radioactivity and exposure reduction techniques for inhabited structures should be distributed.

G. Characterization

For monitoring and sampling activities, the Monitoring Division will use the NRC sector divisions of the off-site area (sixteen 22.5-degree sectors). If the FRMAC response is to other than an NRC-related incident, the Monitoring Division can create 22.5-degree sector/distance maps oriented around the incident site by using GIS capabilities. To characterize the area and to identify hot spots, at least one monitoring team should be assigned to each sector. If practical, monitoring activities should be initiated at a distance well beyond the deposition footprint and moved in toward the incident center. As the monitoring progresses, a serpentine pattern will be followed throughout the sector as closely as safe vehicle travel allows. The sites where representative radiation measurements are taken should include all preestablished state, local, and facility monitoring locations. Soil and vegetation samples should be collected at each order-of-magnitude change in the radiation field measurements or as directed. At representative locations, including within the evacuated areas, a continuous air sampler and an environmental TLD should be positioned. Together, they will provide a measure of resuspension and integrated radiation exposure at that location. These will complement those placed near the evacuated and inhabited areas.

H. Drinking Water

In coordination with state and/or local officials, drinking water samples should be collected from surface supplies and open-air water treatment facilities located in the affected areas.

I. Farms, Dairies, and Food Processing Plants

The monitoring and sampling of farms, dairies, and food processing plants will, in all likelihood, be conducted at the request of state or local officials. If no priorities or requests are received, the FRMAC should consider the following:

- Farms and dairies within the deposition footprint will receive last priority for Monitoring Division resources (contamination is ensured because of their location, and therefore, their products are not immediately marketable).
- Farms outside of the deposition footprint will be monitored in order of the perishability of crops.
- Milk, food, and animal feed processing facilities outside of the evacuated area will be monitored and sampled in order of their "importance."

D4.0 Sampling Frequency

A. Air Sampling

Particulate and reactive gas samples and whole air samples for analyzing noble gas are exchanged daily. If samplers are in operation when a plume release occurs, the samples will be changed out following plume passage in most situations.

B. TLDs

The lower levels of detection for personnel and area TLDs are approximately 10 mrem and 10 mR, respectively. The TLDs should be deployed for a sufficient length of time so that meaningful data that meets FRMAC objectives are produced.

C. Milk Sampling

Following a single release containing radioiodine, the radioiodine will begin to appear in the milk of exposed cows and goats in three to four hours. The radioiodine concentration will attain a maximum level in approximately three days. For these reasons, milk sampling should begin the day after the plume passes. If milk from a particular dairy is to be characterized, sampling should begin with the first milking after the plume passes and continue daily. When the milk is collected, samples of the feed and water for these animals should also be collected.

Note: From the same exposure, goat's milk will have radioiodine concentrations four times greater than cow's milk.

D. Water Sampling

Community supplies of surface drinking water and open-air water treatment facilities located within the deposition footprint should be sampled following passage of the plume and resampled daily. Daily sampling should continue until useability of the water is determined (*i.e.*, does it meet drinking water standards or is it a non-flowing body of water sufficiently contaminated that it cannot be used as a drinking water supply for some period of time).

Community supplies of surface drinking water located outside of the deposition footprint but in the proximity should be sampled daily for a minimum of three days or until acceptable levels are achieved. Sediment samples will be collected from surface drinking water supplies located within the deposition footprint and resampled as required.

E. Collecting Samples

Care should be exercised in collecting environmental samples. The radioanalytical laboratories can be easily inundated. A sufficient number of samples must be collected to characterize the environment and to satisfy monitoring requirements, but the collection of samples should be performed prudently.

APPENDIX E

CONTENT OF THE ENVIRONMENTAL RADIOLOGICAL DATA ARCHIVE

The following outline lists the types of environmental radiological data that would be required or desired to be retained in the long-term archival database of FRMAC. In developing the list, primary considerations were given for (a) information for reconstructing the radiological situation at any time during the emergency phase and (b) a solid scientific basis for defending each data point used in the analysis and evaluation. A detailed description of each type of information begins on page 143.

Note: H represents information collected from Home Lab/Agency.
F represents information collected at the FRMAC.

E1.0 Field Survey Instruments

E1.1 Instrument Calibration Procedures (H)

E1.2 Current Calibration Records for Each Survey Instrument Used (H)

E1.2.1 Instrument Information

E1.2.2 Source and Calibration Information

E1.2.3 Personnel Information

E1.3 Instrument Calibration Checks in the Field (F)

E1.4 Conversion Factors Generated to Normalize Readings from Different Instruments in the Field to Appropriate Reporting Units (F)

E1.5 Field Measurement Procedures (F)

E1.6 Field Measurement Results (F)

E2.0 Air Samples

E2.1 Air Samples (In-Field Measurements)

E2.1.1 Air Filter Specifications (H)

E2.1.2 Air Sampler Calibration Records (H)

E2.1.3 Air Impactor Calibration Records (H)

E2.1.4 Air-Sampling Procedures (F)

E2.1.5 Detector Calibration Procedures/Records for Filter-Counting Instruments in the Field (F)

E2.1.6 Air Sampler Results (In-Field Measurements) (F)

E2.1.6.1 Collection Parameters

E2.1.6.2 Filter Counting

E2.2 Air Samples (Fixed or Mobile Labs)

E2.2.1 Calibration Procedures/Records for Laboratory Measurement Devices (H)

E2.2.2 Laboratory Sample Results (H, F)

E3.0 Chain of Custody for Samples

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- E4.0 Milk Samples and Other Dairy Products
 - E4.1 Collection, Handling, and Analysis Procedures (F)
 - E4.2 Sample Collection Records
 - E4.3 Sample Handling and Control (F)
 - E4.4 Sample Laboratory Results (H, F)
 - E5.0 Soil, Vegetation, and Water Samples
 - E5.1 Sampling Procedures (F)
 - E5.2 Sampling Records (F)
 - E5.3 In-Field Measurement Records
 - E5.3.1 Detector Calibration Procedures/Records (H)
 - E5.3.2 Field Measurement Results (F)
 - E5.4 Laboratory Analysis Records
 - E5.4.1 Calibration Procedures/Records (H)
 - E5.4.2 Laboratory Sample Results (H, F)
 - E5.4.3 Sample Preparation Procedures (H)
 - E5.4.4 Quality Control Results (Blind Samples, Split/Duplicate Samples, Internal Laboratory Quality Control Samples, etc.) (H)
 - E6.0 Aerial Monitoring Data
 - E7.0 Special Measurements and Records
 - E7.1 *In Situ* Deposition Measurements and Records (H, F)
 - E7.2 Ranger/FIDLER/VIOLINIST Measurements and Records (H, F)
 - E7.3 TLD Measurements and Records (H, F)
 - E7.4 Other Measurements and Records (As Appropriate) (H, F)
 - E8.0 Personnel Qualifications
 - E8.1 Monitors (H)
 - E8.2 Sample Collectors (H)
 - E8.3 Laboratory Technicians (H)
 - E8.4 Assessors (H)
 - E9.0 Other Records
 - E9.1 Codes, References, and Regulations (H, F)
 - E9.2 Computer Codes Plus Documentation of Revision Control (H, F)
 - E9.3 FRMAC Training/Orientation Program (As Applicable) (F)
 - E9.4 GPS Records (H, F)
 - E9.5 Other (H, F)
 - E10.0 Data Validation Procedures (As Appropriate)
-

E1.0 FIELD SURVEY INSTRUMENTS

E1.1 Instrument Calibration Procedures

Copies of the procedures used by the participating organizations for each field survey instrument brought to the field should be provided to the FRMAC staff within the first or second week of FRMAC operation. These procedures are necessary to establish operating practices associated with the specific activity, if needed for future reference. If full calibrations are performed at the FRMAC, the procedures will be documented.

E1.2 Current Calibration Records for Each Survey Instrument

Copies of calibration records generated by the participating organizations for each instrument calibrated in the field should be provided to the FRMAC staff within the first or second week of FRMAC operation. If full calibrations are performed at the FRMAC, the calibration records will be documented. The FRMAC will expect a certificate of calibration for each instrument to include, as a minimum, the following information.

E1.2.1 Instrument Information

- Instrument type and serial number (probe model if applicable)
- Time and date calibration was made
- Location/facility performing calibration
- Geometry used for calibration
- Background values, measured or calculated
- Results of calibrations, instrument reading, units (as-found and as-left), etc.
- Calculation of conversion (correction) factors, etc.
- Environmental conditions during calibration (temperature, pressure), as applicable
- Other specific information related to the type of instrument, as applicable
- Minimum-detectable activity for instrument
- Uncertainty estimate for instrument

E1.2.2 Source and Calibration Information

- Source(s) used and true value at time of calibration
- Source calibration information, National Institute of Science and Technology (NIST) traceable, etc.

E1.2.3 Personnel Information

- Person and organization responsible for performing calibration and their qualifications
- Calibration procedures followed

E1.3 Instrument Calibration Checks in the Field

All field survey instruments brought to the FRMAC will be periodically checked in the field for calibration. This will be a check, not a recalibration. The instrument check form will contain the following information:

- Instrument type and serial number
- Person/organization performing check
- Source type (nuclide and activity)
- Geometry
- Time/date/location
- Check results
- Tolerances
- Acceptability (yes or no)
- Signature of checker
- Date of last calibration
- Nonconformance reports (generated when recalibration attempts indicate that instrument has failed to hold calibration or remains outside of calibration)

E1.4 Conversion Factors Generated to Normalize Readings from Different Instruments in the Field to Appropriate Reporting Units

During a FRMAC response, it is highly likely that many different types of field monitoring instruments will be used. A conversion table will be generated at the FRMAC to normalize the readings as an aid in plotting the data. The conversion factors will consider instrument efficiency, minimum detection levels, and dominant isotopes measured in relation to the calibration source.

E1.5 Field Measurement Procedures

These procedures are documented in the *FRMAC Monitoring and Analysis Manual*. The procedures include, as a minimum, the following information:

- Height of measurement
- Procedures for instrument setup, if required
- Location determination (surface type, plowed field, paved road, etc.)
- Length of time of measurement, if appropriate
- Instrument reading method (scale, dial, digital, etc.)
- Background determinations
- Method of recording and reporting results (raw instrument readings by radio, calculated net results on data form, etc.)

E1.6 Field Measurement Results

Results of measurements from field instruments will form a major database of FRMAC information. Environmental radiological data records generated through these field instruments will include, as a minimum, the following information, as applicable:

- Date and time of measurement
- Location¹
- Instrument type
- Team/monitor names
- Surface type and conditions
- Height above ground or surface
- Instrument identification (model number, serial number, etc.)
- Agency/organization
- Beta window open/closed, if applicable
- Length of measurement time, if appropriate
- Meter reading
- Results and units ($\mu\text{R}/\text{h}$, $\mu\text{Ci}/\text{m}^2$, etc.)
- Scale setting
- Conversion or calibration correction value
- Background value (measured or assumed)
- Weather conditions
- Temperature
- Comments (peak reading and/or average reading, cloud passage, instrument condition, and other data, as applicable)
- Spectral response application
- Susceptibility to noble gas infiltration
- Smears taken and counted, if applicable
- Other samples and types collected, if applicable
- Cross reference

E2.0 AIR SAMPLES

E2.1 Air Samples (In-Field Measurements)

E2.1.1 Air Filter Specifications

Copies of specifications for filters brought to the FRMAC should be provided to the FRMAC staff within the first or second week of FRMAC operation. The specifications should include, as a minimum, the following information:

- Filter type and manufacturer
- Particle-size filtration information
- Manufacturer's specifications and references
- Calibration information, if applicable

E2.1.2 Air Sampler Calibration Records

Copies of air sampler calibration records generated by the participating organizations should be provided to the FRMAC staff within the first or second week of FRMAC operation. The calibration records should include, as a minimum, the following information:

¹ Location description must include longitude and latitude. Other information is also required such as street names, intersections, and descriptive details; for example, 20 feet southwest of bank building, etc.

- Air sampler type and manufacturer
- Air sampler serial number
- Date and time of calibration
- Location/facility where air samplers are calibrated
- Organization and person responsible for performing calibrations and their qualifications
- Calibration procedures
- Flow rates determined with specific filter
- Environmental conditions during calibration

E2.1.3 Air Impactor Calibration Records

Copies of air impactor calibration records generated by the participating organizations should be provided to the FRMAC staff within the first or second week of FRMAC operation. The calibration records should include, as a minimum, the following information:

- Impactor type and manufacturer
- Impactor serial number
- Date and time of calibration
- Location/facility calibrating impactors
- Organization and person responsible for performing calibrations and their qualifications
- Calibration procedures
- Results of calibration
- Environmental conditions during calibration

E2.1.4 Air Sampling Procedures

Air sampling procedures for FRMAC operations are documented in the *FRMAC Monitoring and Analysis Manual*. These procedures, as applicable to the incident response, will become a part of the FRMAC records archive.

E2.1.5 Detector Calibration Procedures/Records for Filter-Counting Instruments in the Field

Copies of detector calibration procedures/records generated by the participating organizations, applicable to counting filters in the field, should be provided to the FRMAC staff within the first or second week of FRMAC operation.

E2.1.6 Air Sampler Results (In-Field Measurements)

E2.1.6.1 COLLECTION PARAMETERS

- Date
- Sampling start time
- Sampling end time
- Total sampling time

- Location²
- Air filter type
- Sample identification number
- Agency/organization
- Team/monitor installing and starting sampler
- Team/monitor collecting and reading filter
- Air sampler type
- Air sampler identification number
- Flow rate (corrected) at start of sampling
- Flow rate (corrected) at end of sampling
- Air volume of sample

E2.1.6.2 FILTER COUNTING

- Detector type
- Detector identification number
- Efficiency (filter paper), flat
- Efficiency (filter paper), folded
- Efficiency (annular kinetic impactor)
- Measurement method (folded or flat)
- Background-counting time (minutes)
- Background counts (counts per minute)
- Sample-counting time (minutes)
- Sample counts (counts per minute)
- Sample concentration (value, units)

E2.2 Air Samples (Fixed or Mobile Labs)

E2.2.1 Calibration Procedures/Records for Laboratory Measurement Devices

Copies of laboratory calibration procedures/records generated by the participating organizations, applicable to counting filters, should be provided to the FRMAC staff within the first or second week of FRMAC operation.

E2.2.2 Laboratory Sample Results

- Detector type
- Detector identification number
- Efficiency (filter paper), flat
- Efficiency (filter paper), folded

² Location description must include longitude and latitude. Other information is also required such as street names, intersections, and descriptive details; for example, 20 feet southwest of bank building, etc.

- Efficiency (annular kinetic impactor)
- Measurement method (folded or flat)
- Background-counting time (minutes)
- Background counts (counts per minute)
- Sample-counting time (minutes)
- Sample counts (counts per minute)
- Sample concentration (value, units)

E3.0 CHAIN OF CUSTODY FOR SAMPLES

Chain-of-custody procedures and forms for all types of samples are documented in the *FRMAC Monitoring and Analysis Manual*. The chain-of-custody forms will become archived FRMAC records and will include, as a minimum, the following information:

- Date and time of each transfer
- Person receiving sample for each transfer
- Date and time sample sent to laboratory
- Name and location of laboratory
- Delivery information
- Split sample and "round robin" intercomparison information, if applicable

E4.0 MILK SAMPLES AND OTHER DAIRY PRODUCTS

E4.1 Collection, Handling, and Analysis Procedures

Collection, handling, and analysis procedures for all types of samples are documented in the *FRMAC Monitoring and Analysis Manual*. These procedures will become a part of the FRMAC records archive.

E4.2 Sample Collection Records

(Prioritize the form to list most important item first.)

- Size of sample collected
- Sample identification
- Collection date and time (local)
- Location (exact coordinates plus descriptive information; e.g., barn or milking parlor, farmhouse, etc.)
- Organization and name of collector
- Training/certification of collector
- Collection procedures
- Type of collection (raw, processed, grocery; when and where produced; etc.)
- Dairy information (production rates, family or commercial operation [name], sold to whom, etc.)
- Forage information (past week, day; distribution; percentage of outside areas; feeding history since disposition; etc.)

- Surface measurement, if applicable (as a reference)
- Other comments (weather, grazing, water source [surface/ground], etc.)

E4.3 Sample Handling and Control

(See Section E3.0, Chain of Custody for Samples)

E4.4 Sample Laboratory Results

- Date and time of receipt (local time)
- Organization and person receiving and producing sample
- Lab identification for sample
- Calibration procedures and records (quality assurance reports, certification information, etc., to show traceability to standards)
- Sample storage conditions
- Sample preparation procedures (reference)
- Analytical procedures (reference)
- Wet, dry, and ash weight, if applicable
- Name of preparer(s)
- Volume received
- Type of analysis
- Date and time of analysis
- Instrumentation used in analysis
- Sample size
- Counting time
- Corrections identified
- Name of person performing analysis
- Results (include date of activity)
- Uncertainties (errors), units, etc.
- Procedure number (reference)

E5.0 SOIL, VEGETATION, AND WATER SAMPLES

Collection, handling, and analysis procedures for all types of samples are documented in the *FRMAC Monitoring and Analysis Manual*. These procedures will become a part of the FRMAC records archive.

E5.1 Sampling Procedures

Copies of the procedures used by the participating organizations (if other than FRMAC procedures) should be provided to the FRMAC staff within the first or second week of FRMAC operation. These procedures are necessary to establish operating practices associated with the specific activity, if needed for future reference. FRMAC-specific sampling procedures should be followed when possible.

E5.2 Sampling Records

- Date
- Sampling start/end time, if applicable
- Total sampling time
- Location³
- Sample identification number
- Agency/organization
- Team/monitor collecting sample
- Environmental conditions during collection
- Identification of procedure that was used

E5.3 In-Field Measurement Records

E5.3.1 Detector Calibration Procedures/Records

Copies of the procedures used by the participating organizations for this calibration activity for each field survey instrument brought to the field should be provided to the FRMAC staff within the first or second week of FRMAC operation. These procedures are necessary to establish operating practices associated with the specific activity, if needed for future reference. If full calibrations are performed at the FRMAC, the procedures used will be documented.

E5.3.2 Field Measurement Results

Results of measurements from field instruments as a part of FRMAC operations will form a major database of FRMAC information. Environmental radiological data records generated through these field instruments will include, as a minimum, the following information, as applicable:

- Date and time of measurement
- Location⁴
- Instrument type
- Team/monitor names
- Surface type and conditions
- Height above ground or surface
- Instrument identification (model number, serial number, etc.)
- Agency/organization
- Beta window open/closed (if applicable)
- Length of measurement time
- Meter reading
- Results and units ($\mu\text{R/h}$, $\mu\text{Ci/m}^2$, etc.)
- Scale setting
- Conversion or calibration correction value

^{3,4} Location description must include longitude and latitude. Other information is also required such as street names, intersections, and descriptive details; for example, 20 feet southwest of bank building, etc.

-
- Background value (measured or assumed)
 - Weather conditions
 - Temperature
 - Comments (peak reading and/or average reading, cloud passage, instrument condition, and other data, as applicable)
 - Spectral response application
 - Susceptibility to noble gas infiltration
 - Other samples and types collected, if applicable
 - Cross reference

E5.4 Laboratory Analysis Records

E5.4.1 Calibration Procedures/Records

Copies of the procedures used by the participating organizations should be provided to the FRMAC staff within the first or second week of FRMAC operation. These procedures are necessary to establish operating practices associated with the specific activity, if needed for future reference.

E5.4.2 Laboratory Sample Results

- Date and time of receipt (local time)
- Organization and person receiving and producing sample
- Lab identification for sample
- Calibration procedures and records (quality assurance reports, certification information, etc., to show traceability to standards)
- Sample storage conditions
- Sample preparation procedures (reference)
- Analytical procedures (reference)
- Wet, dry, and ash weight, if applicable
- Name of preparer(s)
- Volume received
- Type of analysis
- Date and time of analysis
- Instrumentation used in analysis
- Sample size
- Counting time
- Corrections identified
- Name of person performing analysis
- Results (include date of activity)
- Uncertainties (errors), units, etc.
- Procedure number (reference)

E5.4.3 Sample Preparation Procedures

Copies of the procedures used by the participating organizations (if FRMAC procedures are not used) should be provided to the FRMAC staff within the first or second week of FRMAC operation. These pro-

cedures are necessary to establish operating practices associated with the specific activity, if needed for future reference.

E5.4.4 Quality Control Results (Blind Samples, Split/Duplicate Samples, Internal Laboratory Quality Control Samples, etc.)

- Known activity of blind samples
- Measured activity of blind samples
- Evaluation of blind sample results, impact on other analyses
- Split/duplicate sample results
- Evaluation of results, impact on other analyses, and acceptability of internal laboratory quality control samples
- Evaluation of results on other analyses

E6.0 AERIAL MONITORING DATA

This activity is usually performed by the AMS organization, which maintains the documentation associated with the following:

- Calibration procedures for instruments
- Calibration records
- Calibration source documentation
- Monitoring procedures
- Monitoring results

If these activities are performed by other organizations associated with the FRMAC, they should provide similar documentation supporting the results of their aerial monitoring program within the first or second week of FRMAC operation.

E7.0 SPECIAL MEASUREMENTS AND RECORDS

E7.1 *In Situ* Deposition Measurements and Records

- Date and time of measurement
- Location⁴
- Instrument type
- Team/monitor names
- Surface type and conditions
- Height above ground or surface
- Instrument identification (model number, serial number, etc.)
- Agency/organization
- Beta window open/closed (if applicable)

⁴ Location description must include longitude and latitude. Other information is also required such as street names, intersections, and descriptive details; for example, 20 feet southwest of bank building, etc.

- Length of measurement time
- Meter reading
- Results and units ($\mu\text{R}/\text{h}$, $\mu\text{Ci}/\text{m}^2$, etc.)
- Scale setting
- Conversion or calibration correction value
- Background value (measured or assumed)
- Weather conditions
- Temperature
- Comments (peak reading and/or average reading, cloud passage, instrument condition, and other data, as applicable)
- Spectral response application
- Susceptibility to noble gas infiltration
- Other samples and type collected, if applicable
- Cross reference

E7.2 Ranger/FIDLER/VIOLINIST Measurements and Records

- Date and time of measurement
- Location⁵
- Instrument type
- Team/monitor names
- Surface type and conditions
- Height above ground or surface
- Instrument identification (model number, serial number, etc.)
- Agency/organization
- Length of measurement time
- Meter reading
- Results and units ($\mu\text{R}/\text{h}$, $\mu\text{Ci}/\text{m}^2$, etc.)
- Scale setting
- Conversion or calibration correction value
- Background value (measured or assumed)
- Weather conditions
- Temperature
- Comments (peak reading and/or average reading, cloud passage, instrument condition, and other data, as applicable)
- Spectral response application
- Susceptibility to noble gas infiltration
- Smears taken and counted, if applicable
- Other samples and types collected, if applicable
- Cross reference

⁵ Location description must include longitude and latitude. Other information is also required such as street names, intersections, and descriptive details; for example, 20 feet southwest of bank building, etc.

E7.3 TLD Measurements and Records

- Date and time of measurement
- Location⁶
- TLD type and holder (shielding values for each element)
- Team/monitor names
- Surface type and conditions
- Height above ground or surface
- TLD identification (model number, serial number, etc.)
- Agency/organization
- Length of measurement time
- Results and units ($\mu\text{R/h}$, $\mu\text{Ci/m}^2$, etc.)
- Conversion or calibration correction value
- Background value (measured or assumed)
- Weather conditions
- Temperature
- Comments (glow curve characteristics)
- Spectral response application
- Cross reference

E7.4 Other Measurements and Records (As Appropriate)

- Date and time of measurement
- Location⁷
- Instrument type
- Team/monitor names
- Surface type and conditions
- Height above ground or surface
- Instrument identification (model number, serial number, etc.)
- Agency/organization
- Beta window open/closed (if applicable)
- Length of measurement time
- Meter reading
- Results and units ($\mu\text{R/h}$, $\mu\text{Ci/m}^2$, etc.)
- Scale setting
- Conversion or calibration correction value
- Background value (measured or assumed)
- Weather conditions
- Temperature
- Comments (peak reading and/or average reading, cloud passage, instrument condition, and other data, as applicable)

^{7,8}Location description must include longitude and latitude. Other information is also required such as street names, intersections, and descriptive details; for example, 20 feet southwest of bank building, etc.

- Spectral response application
- Susceptibility to noble gas infiltration
- Smears taken and counted, if applicable
- Other samples and types collected, if applicable
- Cross reference

E8.0 PERSONNEL QUALIFICATIONS

E8.1 Monitors

- Resumes
- Organizational qualification records

E8.2 Sample Collectors

- Resumes
- Organizational qualification records

E8.3 Laboratory Technicians

- Resumes
- Organizational qualification records

E8.4 Assessors

- Resumes
- Organizational qualification records

E9.0 OTHER RECORDS

E9.1 Codes, References, and Regulations

A bibliography of references, codes, and regulations used by members of the FRMAC should be provided within the first or second week of involvement in the FRMAC. People who work for different organizations tend to become familiar with and refer to a "favorite" set of reference materials for situations that might arise in support of the FRMAC operation. A listing of these references would be important in supporting results and evaluations reached in the FRMAC.

E9.2 Computer Codes Plus Documentation of Revision Control

A description of computer codes used in support of FRMAC operations shall be provided within the first or second week of involvement in the FRMAC. Commercial software programs for word processing, spreadsheets, and graphics need only be referenced by name and version.

E9.3 FRMAC Training/Orientation Program (As Applicable)

Sample copies of lesson plans, worksheets, examinations, problem sets, etc., as well as records of trainee performance should be retained and available to the FRMAC.

E9.4 GPS Records

- Instrument (model number, manufacturer)
- Reference point (satellite, local transmitter)

E9.5 Other (As Appropriate)**E10.0 DATA VALIDATION PROCEDURES (As Appropriate)**

APPENDIX F

KEY REFERENCE DOCUMENTS

F1.0 Primary Federal Plan

"Federal Radiological Emergency Response Plan (FRERP)," *Federal Register*, 48:90, (8 May 1996).

F2.0 Supporting Federal Statutes, Orders, Regulations, and Plans

The Atomic Energy Act of 1954, as amended, Public Law 83-703.

Department of Energy Organization Act, U.S. Codes, Congressional and Administrative News, 95th Congress, First Session, 1977.

Federal Response Plan, as amended, Public Law 93-288, April 1992.

Interagency Radiological Assistance Plan, April 1975.

The Radiation Control for Health and Safety Act, Public Law 90-602 (Subpart 3 of Title 42 USC 241).

The Robert T. Stafford Disaster Relief and Emergency Assistance Act, Public Law 93-288, May 22, 1974.

Title 10 CFR 835, "Occupational Radiation Protection," December 14, 1993.

Title 29 CFR 1910, "Occupational Safety and Health Standards," Subpart 1910.120, "Hazardous Waste Operations and Emergency Response."

Title 44 CFR, "Emergency Management and Assistance," October 1, 1992.

Title 44 CFR 351, "Radiological Emergency Planning and Preparedness," October 1, 1992.

F3.0 Executive Orders

Executive Order 10529, April 22, 1954 (state and local civil defense pre-emergency training programs).

Executive Order 10952, July 20, 1961 (assigns civil defense responsibilities to the Secretary of Defense, Office of Emergency Planning, and others).

Executive Order 11051, September 27, 1962 (prescribes responsibilities of the Office of Emergency Planning).

Executive Order 11490, as amended, October 28, 1969 (assigns emergency preparedness functions to federal departments and agencies).

Executive Order 12196, "Occupational Safety and Health Programs for Federal Employers," February 26, 1980.

Executive Order 12241, "National Contingency Plan," September 29, 1980.

Executive Order 12656, "Assignment of Emergency Preparedness Responsibilities," November 18, 1988.

F4.0 DOE Orders

DOE Order 151.1, "Comprehensive Emergency Management System," September 25, 1995.

DOE Order 5400.1, "General Environmental Protection Program," November 9, 1988.

DOE Order 5400.5, "Radiation Protection of the Public and the Environment," February 8, 1990, and Change 1, June 5, 1990, and Change 2, January 7, 1993.

DOE Order 5500.1B, "Emergency Management System," April 30, 1991, and Change 1, February 27, 1992.

DOE Order 5500.3A, "Planning and Preparedness for Operational Emergencies," April 30, 1991, and Change 1, February 27, 1992.

DOE Order 5500.10, "Emergency Readiness Assurance Program," April 30, 1990, and Change 1, February 27, 1992.

DOE Order 5530.1A, "Accident Response Group," September 20, 1991.

DOE Order 5530.2, "Nuclear Emergency Search Team," September 20, 1991.

DOE Order 5530.3, "Radiological Assistance Program," January 14, 1992, and Change 1, April 10, 1992.

DOE Order 5530.4, "Aerial Measuring System," September 20, 1991.

DOE Order 5530.5, "Federal Radiological Monitoring and Assessment Center," July 10, 1992, and Change 1, December 2, 1992.

DOE/NV Order 5500.4A, "Public Affairs Policy and Planning Requirements for Emergencies," June 8, 1992.

F5.0 Other Federal Agency Documents

Assistant to the Secretary of Defense. *Nuclear Weapon Accident Response Procedures (NARP) Manual*. Doc. No. DoD 5100.52-M, September 1990; Defense Nuclear Agency, Alexandria, VA.

Mc Kenna, T. *et al.* *RTM-93 Response Technical Manual*. Doc. No. NUREG/BR-0150, Vol. 1, Rev. 3, November 1993; Nuclear Regulatory Commission, Division of Operational Assessment, Office for Analysis and Evaluation of Operational Data.

Nevada Test Site Radiological Emergency Response Plan for a Prompt Massive Venting Following an Underground Nuclear Test, DOE/NV, Nevada Test Organization Interface Plan. Rev. 2.2, May 1993; Las Vegas, NV.

Nuclear Regulatory Commission Appropriation Authorization, Public Law 96-295, Section 304, June 30, 1980.

F6.0 FRMAC Documents

FRMAC Administrative Handbook. U.S. Department of Energy, Nevada Operations, Las Vegas, NV (unpublished draft).

FRMAC Director's Handbook. U.S. Department of Energy, Nevada Operations, Las Vegas, NV, October 1991 (unpublished draft).

FRMAC Health and Safety Manual. U.S. Department of Energy, Nevada Operations, Las Vegas, NV (unpublished draft).

FRMAC Monitoring and Analysis Manual. Doc. No. DOE/NV/11718-087, U.S. Department of Energy, Nevada Operations, Las Vegas, NV (unpublished draft).

FRMAC Assessment Manual. Doc. No. DOE/NV/11718-061, U.S. Department of Energy, Nevada Operations, Las Vegas, NV (unpublished draft).

Interim Activation Plan, National Response Assets (NEST, FRMAC, RAP, ARG), September 23, 1994; U.S. Department of Energy, Nevada Operations, Las Vegas, NV.

Overview of FRMAC Operations, Doc. No. DOE/NV-358, Rev. 3, February 1996; U.S. Department of Energy, Nevada Operations, Las Vegas, NV.

FRMAC Interface Plan with RAP, ARG, and NEST. August 1, 1996; Bechtel Nevada, Emergency Response & Proliferation Program, Las Vegas, NV.

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APPENDIX G
ACRONYMS

ALARA	As Low As Reasonably Achievable
AMC	Air Mobility Command
AMS	Aerial Measuring System
ARAC	Atmospheric Release Advisory Capability
ARG	Accident Response Group
ARL/SORD	Air Resources Laboratory/Special Operations and Research Division
CFR	Code of Federal Regulations
DFO	Disaster Field Office
DoD	Department of Defense
DOE	Department of Energy
DOE/HQ	DOE Headquarters
DOE/NV	DOE Nevada Operations Office
DOS	Department of State
DOT	Department of Transportation
DP	Defense Programs
EMD	Emergency Management Division
EOC	Emergency Operations Center
EOF	Emergency Operations Facility (near-site—Nuclear Regulation [NUREG]/0696)
EPA	Environmental Protection Agency
ESO	Energy Senior Official
FAA	Federal Aviation Administration
FBI	Federal Bureau of Investigation
FDA	Food and Drug Administration
FEMA	Federal Emergency Management Agency
FFE	Federal Field Exercise
FIDLER	Field Instrument for Detecting Low-Energy Radiation
FRERP	Federal Radiological Emergency Response Plan
FRMAC	Federal Radiological Monitoring and Assessment Center
GIS	Geographic Information System
GPS	Global Positioning System
HHS	Department of Health and Human Services
H&S	Health and Safety
JIC	Joint Information Center
JOC	Joint Operations Center

keV	.....	Thousand Electron Volts
LFA	.....	Lead Federal Agency
LIMS	.....	Laboratory Information Management System
NaI(Tl)	.....	Sodium Iodide Thallium Activated
NASA	.....	National Aeronautics and Space Administration
NDA	.....	National Defense Area
NEST	.....	Nuclear Emergency Search Team
NIST	.....	National Institute of Science and Technology
NOAA	.....	National Oceanic and Atmospheric Administration
NRC	.....	Nuclear Regulatory Commission
NSA	.....	National Security Area
NTS	.....	Nevada Test Site
NWS	.....	National Weather Service
OEMT	.....	Operational Emergency Management Team
ORIA	.....	Office of Radiation and Indoor Air
OSC	.....	On-scene Commander
OSHA	.....	Occupational Safety and Health Association
PAG	.....	Protective Action Guide
PAR	.....	Protective Action Recommendation
PIO	.....	Public Information Officer
QA	.....	Quality Assurance
QC	.....	Quality Control
RADCON	.....	Radiological Control
Ranger	.....	Automatic Ranging Field Monitoring System
RAP	.....	Radiological Assistance Program
RCO	.....	Regional Coordinating Office
RCT	.....	Radiological Control Technician
REAC/TS	.....	Radiation Emergency Assistance Center/Training Site
REDAR	.....	Radiation and Environmental Data Acquisition and Recording
RSL	.....	Remote Sensing Laboratory
SFO	.....	Senior FEMA Official
SSA	.....	Senior Scientific Advisor
TEDE	.....	Total Effective Dose Equivalent
TLD	.....	Thermoluminescent Dosimeter
USDA	.....	U.S. Department of Agriculture
VHF	Very High Frequency
VIOLINIST	A FIDLER with Enhanced Capabilities

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