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DOE METEOROLOGICAL SUPPORT MEETING REPORT

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Silver Spring, Maryland
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UNITED STATES DEPARTMENT OF COMMERCE

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ABBREVIATIONS AND ACRONYMS

AEC	Atomic Energy Commission
AFOS	Automation of Field Observations and Services
ARL	Air Resources Laboratory
ATDD	Atmospheric Turbulence and Diffusion Division
AWIPS	Advanced Weather Interactive Processing System
AWS	Air Weather Service
DIMIS	DOE Interactive Meteorological Information System
DMCC	DOE Meteorological Coordinating Council
DOC	Department of Commerce
DOD	Department of Defense
DOE	Department of Energy
DOT	Department of Transportation
EMSL	Environmental Monitoring System Laboratory
EPA	Environmental Protection Agency
ERL	Environmental Research Laboratory
ETL	Environmental Technology Laboratory
FAA	Federal Aviation Administration
FCMSSR	Federal Committee for Meteorological Services and Supporting Research
FEMA	Federal Emergency Management Agency
FRD	Field Research Division
FRMAC	Federal Radiological Monitoring and Assessment Center
INEL	Idaho National Engineering Laboratory
MAR	Modernization and Restructuring
McIDAS	Man-Computer Interactive Data Access System
MCSP	Meteorological and Climatological Services Project
NASA	National Aeronautics and Space Administration
NN-60	Office of Nonproliferation and National Security, Office of Emergency Management
NOAA	National Oceanic and Atmospheric Administration
NODDS	Navy Oceanographic Data Distribution System
NSF	National Science Foundation
NTSB	National Transportation Safety Board
NWS	National Weather Service
OFCM	Office of the Federal Coordinator for Meteorology
OR	Oak Ridge National Laboratory
PNL	Pacific Northwest Laboratories
RASS	Radio Acoustic Sounding System
RL	Richland Field Office
RFO	Rocky Flats Office
SORD	Special Operations and Research Division
SRMP	Savannah River Meteorological Program
SRS	Savannah River Site
USFS	United States Forest Service
USN	United States Navy

DOE METEOROLOGICAL SUPPORT MEETING REPORT

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ABSTRACT

In late 1994 the Department of Energy (DOE), Nevada Operations Office (NV), convened a DOE meteorological support meeting. The purpose of the meeting was to provide DOE field offices with a better understanding of the meteorological programs within the DOE community, to identify issues of common interest and concern, and to focus on future DOE field meteorological support requirements. Technical subjects were also reviewed at the meeting including the National Weather Service (NWS) modernization program, National Oceanic and Atmospheric Administration (NOAA) remote sensing systems, and the availability of meteorological information display technologies. Focus was placed on duel-use technology and interagency cooperation and coordination in atmospheric science. The historical relationship and noteworthy contributions by NOAA to DOE operations were recognized. One of the most significant accomplishments of the meeting was the formation of the DOE Meteorological Coordinating Council. The mission of the Council is to coordinate meteorological support and atmospheric research to meet DOE objectives. Overall, the meeting was quite successful and productive.

DOE METEOROLOGICAL SUPPORT MEETING REPORT

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INTRODUCTION

In late November 1994, the Department of Energy (DOE), Nevada Operations Office (NV), convened a DOE méteorological support meeting at the DOE facility in Las Vegas, Nevada. The Air Resources Laboratory (ARL), Special Operations and Research Division (SORD), organized and managed this three-day meeting. Attendance was by invitation only. Thirty-one people attended the meeting. The meeting Agenda is in Appendix A. Participants are listed in Appendix B.

The purpose of the meeting was to provide DOE organizations with a better understanding of the meteorological programs within the DOE community, to identify areas of common interest and concern, and to focus on future DOE field office meteorological support requirements. Technical subjects reviewed at the meeting were the impact of the National Weather Service (NWS) modernization program on DOE operations that use NWS products and systems, future DOE emergency response requirements, new NOAA remote sensing technologies, sharing of meteorological data between DOE and NOAA, meteorological monitoring requirements for DOE facilities, emerging data analysis, processing, archiving, and display technologies, and proper characterization of on-site boundary-layer processes. A critical theme of the meeting was to identify the commonality of DOE meteorological support requirements, remote sensing equipment, and future meteorological information display systems. Focus was placed on dual-use technology and interagency cooperation and coordination between NOAA, DOE, and DOD.

The meeting began with overview presentations by managers of meteorological programs at the major DOE field offices. Additional presentations included a report from the Office of the Federal Coordinator for Meteorology, the ARL Headquarters perspective of NOAA support to DOE operations, an update on NOAA remote sensing technologies, and a discussion of the future DOE Consequence Assessment Workshop. Technical reports on new and future meteorological information and display systems were given by representatives from the NWS - National Implementation Staff, the U. S. Navy - Fleet Numerical Meteorology and Oceanography Center, the University of Wisconsin - McIDAS program, and the NOAA/ERL Forecast Systems Laboratory. The meeting concluded with a round-table discussion on future meteorological needs of DOE programs, on ways to promote cost-effective support to DOE operations and meteorological research projects, and on procedures for fostering coordination/cooperation among the meteorological programs at the key DOE field offices.

SUMMARIES OF FIELD OFFICE REPORTS

Richland Site (Dana Hoitink) - is managed by the DOE/Richland Field Office (RL). The facility covers 560 sq mi within the arid Columbia River valley in southeastern Washington.

The Pacific Northwest Laboratory (PNL), Meteorological and Climatological Services Project (MCSP), provides the DOE/RL, and Hanford Site contractors with meteorological and climatological services. These services include emergency response functions, weather forecasting for on-site operations and special projects, meteorological monitoring, and climatological support. The Project and operates 24-hr daily out of the Hanford Meteorological Station (HMS). The Project staff of ten employees responds to Hanford site needs through a program that includes 1) extensive data acquisition through a site-wide meteorological monitoring network; 2) 24-hr/day weather forecasting services, using an Automation of Field Operations and Services system (AFOS) and weather satellite imagery; 3) 24-hr/day surface observation program, 6-hr synoptic observations, and twice daily pilot balloon releases; and 4) climatological data support through monthly and annual summaries, as well as meteorological input to annual environmental reports.

Meteorological support to the Hanford Site has been provided by Battelle Pacific Northwest Laboratories for 50 yr. Not only has operational support been provided but also fundamental research into atmospheric processes has been a key part of PNL's support to DOE-Richland. The research program employees 36 scientists in the Earth and Environmental Center.

The meteorological monitoring program consists of an array of 23, 10-m towers and three, 60-m towers instrumented with temperature and wind direction and speed sensors (see Fig. 1). Data from this network are transmitted via UHF radio into a computer that decodes the data and plots graphics products for immediate display and use by HMS personnel. Larger scale meteorological data are received from NOAA via the NOAA/DOE AFOS network. The primary node for this network is at the ARL/SORD office in Las Vegas, Nevada.

Rocky Flats Site (Bert Crist) - is managed by the DOE/Rocky Flats Office (RFO). This facility is located along the eastern slopes of the Rocky Mountains and approximately 15 mi northwest of downtown Denver, Colorado. The RFO facility is one of the smaller sites, covering only 10 sq. mi.

Meteorological services are provided to the DOE/RF, through EG&G, Rocky Flats, Inc. Seven EG&G technical and scientific personnel provide meteorological and climatological services to support DOE site operations. Weather forecasts are issued twice daily to

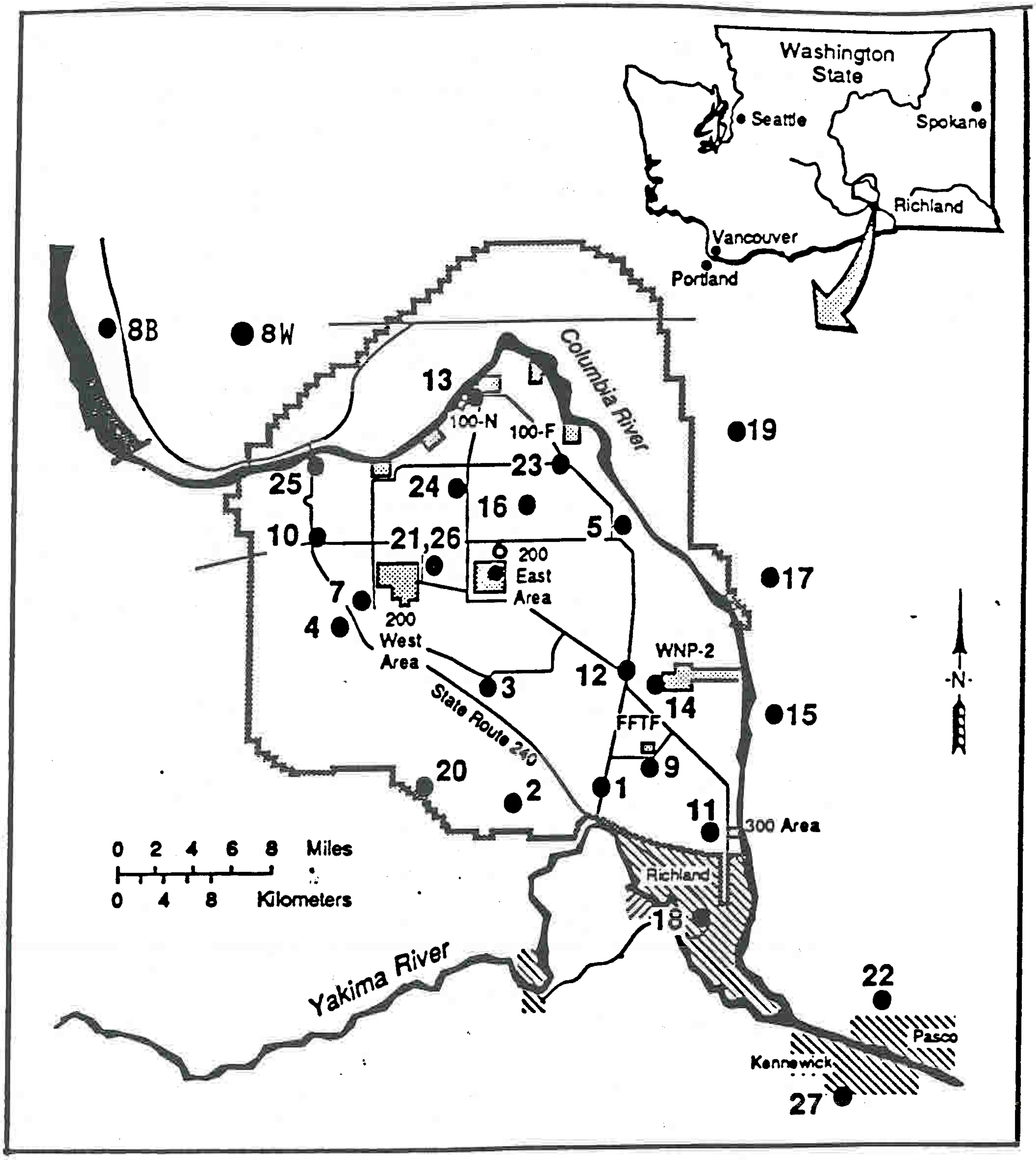

Figure 1. Meteorological monitoring network for the Hanford Site.

support on-site operations and other activities. A constant weather watch is maintained during routine working hours for severe thunderstorms, lightning, winter storms, and strong winds. In addition, EG&G manages and operates a meteorological monitoring program that ties into the local NOAA/ERL network, conducts dose assessments, runs dispersion models, and supports an emergency response preparedness program. The Colorado Department of Public Health has formally approved the Rocky Flats emergency response program. On-site meteorological monitoring is provided by wind and temperature data collected from a 60-m tower. This tower is equipped with standard meteorological sensors located at the surface, 10-m, 25-m, and 60-m levels above the ground. Data are transmitted to the forecast office and to the Emergency operations Center every 15 min. These data are also archived for future use. In early 1995, EG&G plans to have a radar/RASS system operational on-site, and during CY 1995 there are plans to access meteorological data from five, Colorado Department of Public Health and Environment, 10-m towers located near the Plant.

Savannah River Site (Robert Addis) - is managed by the DOE/Savannah River Operations Office. This facility is located in extreme southwestern South Carolina, along the banks of the Savannah River and roughly 30 mi southeast of Augusta, Georgia. The site covers and area of approximately 300 sq mi. The site has been the primary producer of tritium for use in nuclear weapons.

With a staff of 19 personnel, the Westinghouse, Savannah River Meteorological Program (SRMP), provides meteorological support to DOE operations at the Savannah River Site (SRS). Research on atmospheric transport and dispersion is also conducted to provide SRS with the best modeling capability available to support emergency response operations and other programs. The SRMP also provides daily weather forecast services for the SRS. Meteorological data is obtained from a local network (Fig. 2) of eight, 60-m (200-ft) towers with sensors at the 60-m level, of one, 300-m (1000-ft) tower instrumented at eight levels, and one, 60-m tower instrumented at four levels. Additional local upper-air data are collected by three acoustic doppler radars, a Beukers rawinsonde system, and an Airsonde and tethersonde system. Larger scale meteorological data are received from NOAA via the DOE AFOS network. The primary node for this network is at the ARL/SORD office in Las Vegas, Nevada.

Oak Ridge Site (Carmen Nappo) - is managed by the DOE/Oak Ridge Operations Office (OR). This facility is located on nearly 100 sq mi of hilly and heavily vegetated terrain in eastern Tennessee and about 25 mi west of Knoxville.

Since 1948 the ARL, Atmospheric Turbulence and Diffusion Division (ATDD) has been providing meteorological service to DOE/OR. The ATDD has an international reputation as a leader in research related to atmospheric transport and dispersion processes with

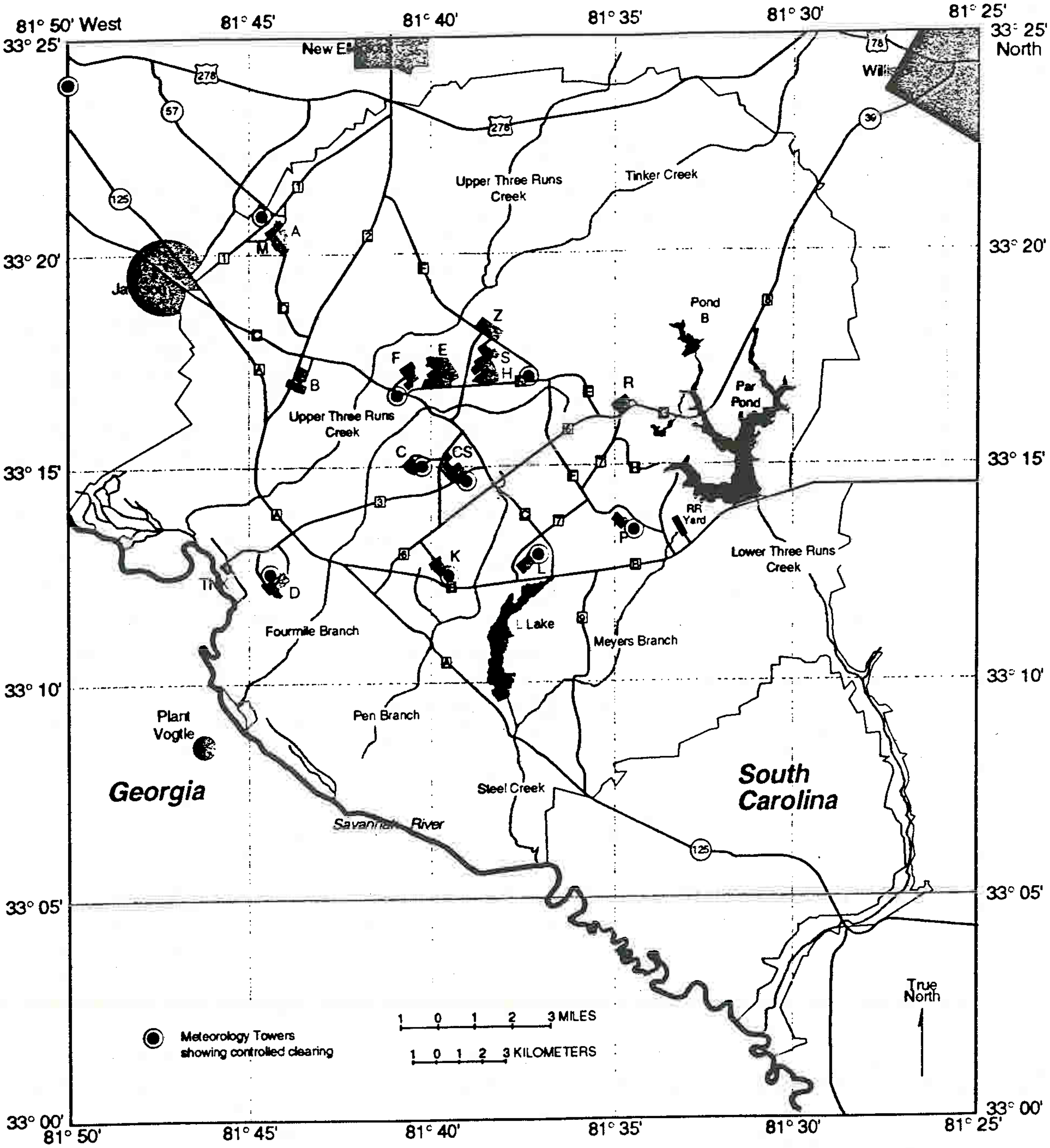

Figure 2. Meteorological monitoring network for the Savannah River site.

emphasis on problems related to air quality in the lower atmosphere. The mission of the ATDD is to improve understanding of boundary-layer processes, and to develop predictive models for atmospheric transport, dispersion, and air-surface exchange of pollutants and of properties that vary in time and space. The ATDD also consults with other NOAA Laboratories, the DOE National Laboratories, EPA, DOD, NASA, USFS, and universities. Moreover, ATDD personnel have developed advanced systems for monitoring atmospheric boundary layer processes. Locally, ATDD personnel provide meteorological consultation and supplemental data to the K-25 and Y-12 facilities. Total staff at ATDD is 29 people.

Idaho Site (David George) - is managed by the DOE/Idaho Operations Office and is generally referred to as the Idaho National Engineering Laboratory. The laboratory is located on 890 sq mi of arid land in southeastern Idaho, approximately 40 mi west of Idaho Falls. The site is at the foot of the Lost River and Lemhi mountain ranges and is characterized as slightly rolling terrain.

Meteorological support is provided to the DOE, Idaho National Engineering Laboratory (INEL) by 13 personnel in the ARL, Field Research Division (FRD). This NOAA office has been in operation for 45 yr. The mission of FRD is to support emergency exercises and INEL operations with meteorological data, weather predictions, dispersion calculations, and consultations. To accomplish this mission, the FRD operates and manages a large meteorological monitoring network to characterize the meteorology and climatology of the Idaho National Engineering site. All meteorological data are quality controlled and archived for future use. Additional use of this data base is made in operational weather forecasts tailored to meet DOE/INEL and contractor requirements and to prepare climatological summaries that are distributed to users.

The FRD/INEL meteorological monitoring network consists of 30 wind towers (see Fig. 3) that provide wind and temperature data to FRD meteorologists. The overall Meteorological Monitoring Program design is dictated by the need to produce representative data for the INEL area to meet specific operational and potential emergency response situations. Most towers are 15-m tall; however four towers range from 45 to 75 m in height. All towers are instrumented at multiple levels. Eleven have relative humidity, precipitation, and solar radiation sensors. Continuous wind and temperature profiles are obtained from a 915 MHz wind-profiling radar and Radio Acoustic Sounding System (RASS). Wind profiles generally extend to approximately 1500 m (5000 ft) above ground and temperature profiles to near 450 m (1500 ft).

Nevada Site (Allen Barr) - is managed by the Nevada Operations Office. The Nevada Test Site (NTS) is the nations underground nuclear weapons testing facility and occupies 1350 sq mi of south central Nevada. The NTS is located approximately 75 mi northwest of Las Vegas. The topography of the NTS is complex with a system

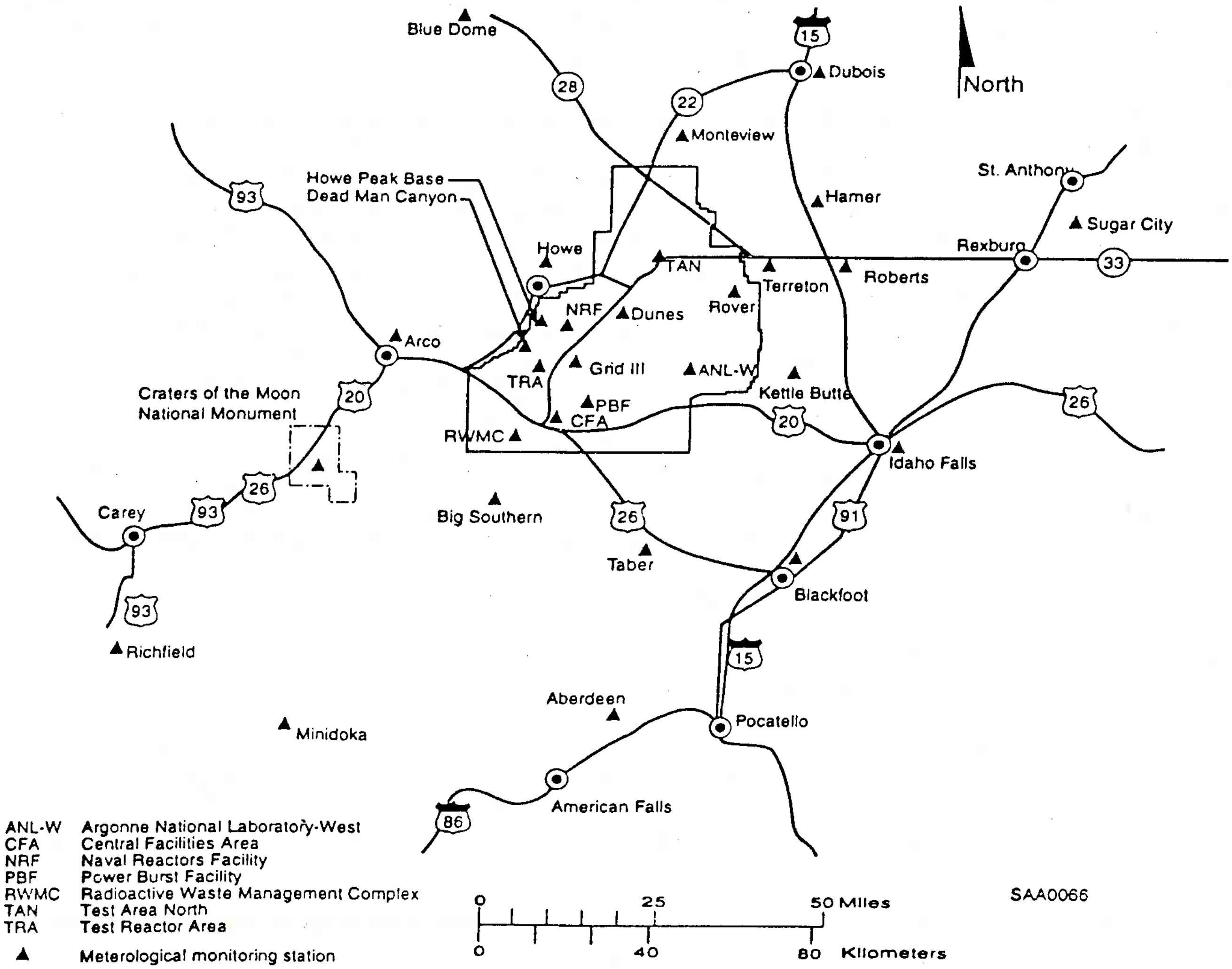

Figure 3. Meteorological monitoring network for the Idaho National Engineering Laboratory site.

of dry lake beds, canyons, and mountains. Elevations range from nearly 850 m (2750 ft) above mean sea level (MSL) to 2300 m (7600 ft) MSL. The climate is dry with cool winters and hot summers.

The ARL, Special Operations and Research Division (SORD), provides full meteorological support to all DOE/NV operations on and off the NTS. The SORD staff of 27 personnel is responsible for conducting a broad atmospheric science program in support of nuclear and non-nuclear projects authorized by DOE/NV.

In addition, both basic and applied research are carried out on problems of mutual interest to DOE and to NOAA. Emphasis is on the maintenance of meteorological support to national defense projects and to the stewardship of nuclear weapons. These capabilities focus on those facets of meteorology having a direct bearing on the transport, dispersion, deposition (fallout), and resuspension of radioactive and/or toxic materials. Furthermore, the mission of SORD involves technical support to the emergency preparedness and emergency response activities of DOE/NV, maintenance of a comprehensive meteorological monitoring program for the Nevada Test Site (NTS), and provision of meteorological and climatological services required in support of DOE/NV and contractor programs at the NTS and elsewhere, as necessary. Personnel at SORD also consult with senior scientists and engineers at the DOE National Laboratories, NASA, private contractors, EPA/EMSL, USGS, USFS, and other NOAA laboratories.

Components of the U. S. Department of Commerce and NOAA have had a presence on the NTS for over 40 yr; but under acronyms other than SORD in the past. During this time SORD personnel have built a solid technical reputation in meteorological operations in the nuclear weapons testing arena. SORD is recognized for expertise in the transport, dispersion, and deposition of radioactive materials and for developing a rapid emergency response capability for the unlikely occurrence of an accident resulting from the release of radioactive material into the atmosphere.

The SORD meteorological monitoring network consists of 31, 10-m towers and two, 30-m towers (see Fig. 4). Wind speed and direction are measured at the 10-m level on all the towers and temperature and relative humidity are sampled at the 2-m level. Data from these towers are transmitted via microwave radio to a central processor that checks the data, creates data files, and archives the data every 15 min. The data files are accessed by micro-computers to create graphics products for operational use and for immediate display at 15-min intervals.

Large-scale meteorological data and numerical weather forecast products from NOAA/NWS are received via AFOS. SORD is the DOE node for distribution of NOAA/NWS AFOS products, serving the Savannah River site, the Hanford Meteorological Station, the DOE Richland Office, and both the Desert Rock Meteorological Observatory and

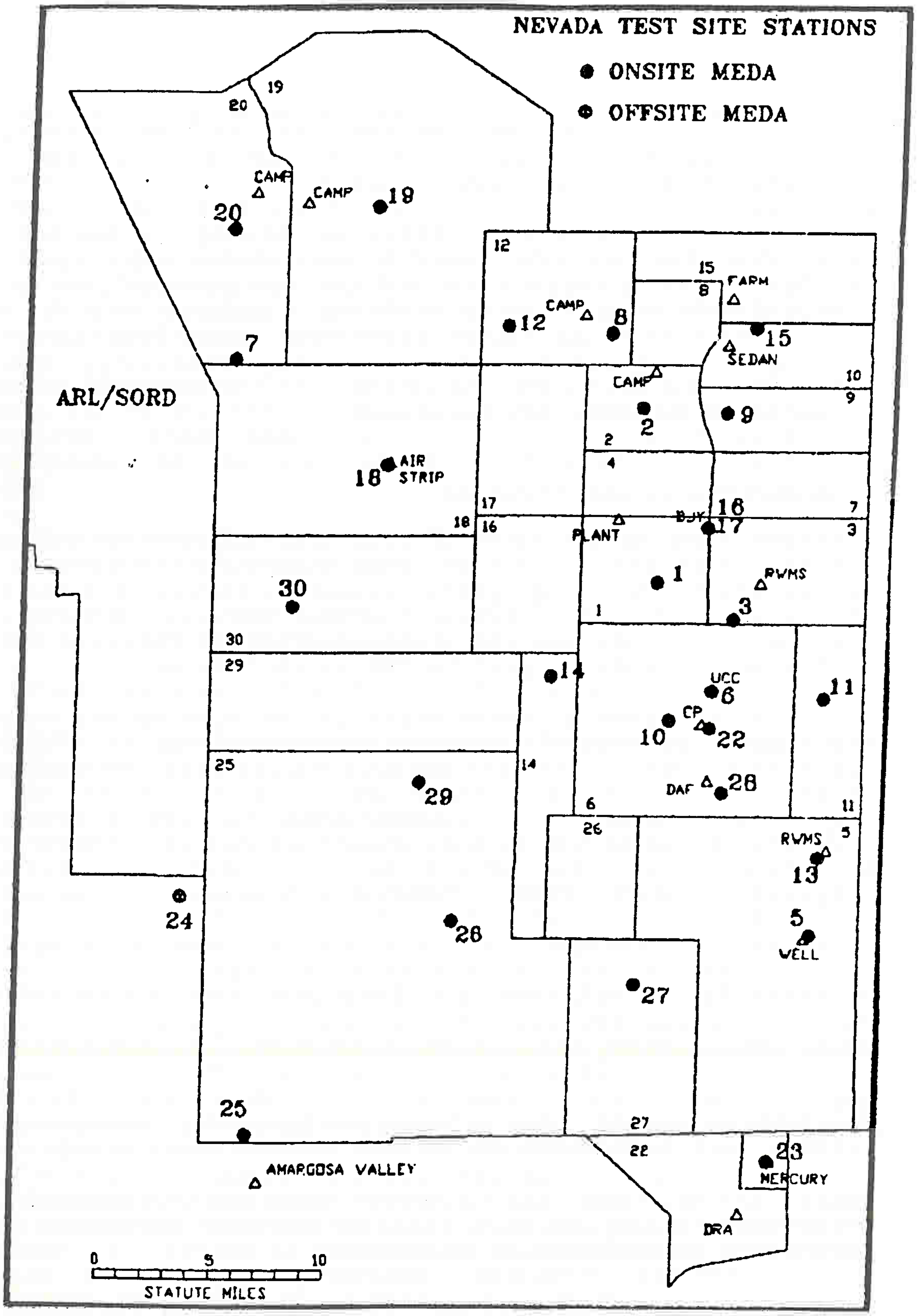

Figure 4. Meteorological monitoring network for the Nevada Test Site.

CP-1 on the NTS. Other weather products supplied to DOE contractors, the National Laboratories, the NWS, and Nellis AFB include real-time cloud-to-ground lightning flash graphical products and local forecast products.

SORD also provides meteorological monitoring and weather forecast services to NEST and FRMAC activities. Monitoring support includes surface and upper-air data collection and analysis. Weather forecast service entails maintaining a constant weather watch for conditions that might impact NEST/FRMAC operations and personnel, issuing site-specific, mesoscale wind, stability, and weather forecasts, and providing consultation to the On-Scene Commander and to National Laboratories personnel.

NOAA SUPPORT TO DOE PROGRAMS

NOAA provides scientific and technical support to DOE through a variety of programs. DOE has supported NOAA atmospheric research activities for nearly 50 years, primarily through the Air Resources Laboratory and the National Weather Service; however, other components of NOAA and its predecessors have received DOE support in the past. NOAA support to DOE is as follows:

Office of the Federal Coordinator for Meteorological Services and Supporting Research (OFCM) (James Harrison) - The Office of the Federal Coordinator for Meteorological Services and Supporting Research, more briefly known as the Office of the Federal Coordinator (OFCM), is an interdepartmental office established as a result of the Office of Management and Budget (OMB) Circular-62. The mission of the office is to promote coordination and cooperation among Federal agencies involved in meteorological activities so that the most and best weather information and user services are provided for the funds made available by Congress. Federal agencies active in this effort are the NWS, the Federal Aviation Agency (FAA) of the Department of Transportation (DOT), the Air Weather Service (AWS) of the U. S. Air Force (USAF), the Naval Oceanography Command (NOC) of the U. S. Navy (USN) and the U.S. Army in the Department of Defense (DOD), the Departments of Agriculture, Energy, Interior, and State, the Environmental Protection Agency (EPA), Federal Emergency Management Agency (FEMA), National Aeronautics and Space Administration (NASA), National Science Foundation (NSF), National Transportation Safety Board (NTSB), and the Nuclear Regulatory Commission (NRC). Altogether, there are more than 16,000 U.S. Government personnel engaged in meteorological operations.

Funding for the OFCM is provided by the DOC, DOD, and DOT. The Office carries out its tasks through a small staff working with agency personnel who serve on councils, committees, working groups, task groups, and ad hoc groups. It supports all of the Federal agencies that are engaged in meteorological activities or have a need for meteorological services. The OFCM provides the coordinating infrastructure, prepares operational plans, conducts studies, and responds to special inquiries and investigations. DOE is represented on many of OFCM's groups, including the highest level Federal Committee for Meteorological Services and Supporting Research (FCMSSR). Interest from DOE is in atmospheric modeling, weather forecasting, remote sensing technologies, and air pollution monitoring and forecasting. During the meeting it was suggested that the DOE atmospheric science programs coordinate work accomplishments and needs with the OFCM.

Air Resources Laboratory (William Pendergrass) - ARL has had a long and productive relationship with DOE since the laboratory was formed in 1965. Other than the Headquarters Division in Silver Spring, Maryland, ARL is composed of the following four research divisions:

> Atmospheric Sciences and Modeling Division - Research Triangle Park, North Carolina,
>
> Atmospheric Turbulence and Diffusion Division - Oak Ridge, Tennessee,
>
> Field Research Division - Idaho Falls, Idaho
>
> Special Operations and Research Division - Las Vegas, Nevada.

Three of these Divisions derive significant funding from DOE. The Special Operations and Research Division (Las Vegas) is supported almost entirely by DOE - Defense Programs, the Atmospheric Turbulence and Diffusion Division (Oak Ridge) receives approximately 25% funding from DOE as does the Field Research Division (Idaho Falls).

The ARL carries out research and field operations on atmospheric processes that relate to air quality and climate. Focus is on the transport, dispersion, deposition, and transformation of trace gases, aerosols, and radioactive materials and their exchange between the atmosphere and biological and physical surfaces. Time frames of interest range from minutes and hours to that of geological epochs and spatial scales of kilometers to global. Research in all of these areas involves physical and numerical studies, leading to the development of air quality simulation models and emergency response models. In addition, the Laboratory provides technical advice to elements of NOAA and other Government agencies on environmental problems, emergency assistance, and climate change.

ERL - Environmental Technologies Laboratory (Donald Beran) - An update of ETL remote sensing technologies was provided. Recent advances in optical lidars, wind profilers, scanning radars, passive sensing instruments, and other support equipment were described. ETL optical lidars have been and are being developed to measure wind flow and planetary boundary layer turbulence parameters. In particular, the mobile 1-J CO_2 Doppler Lidar developed at ETL is unique and the compact, dual wavelength CO_2 Doppler lidar has been recently used to study marine boundary layer cloud microphysics and to measure water vapor profiles. A one millimeter wave scintillometer and several infrared scintillometers have been developed and are being used to measure boundary-layer heat fluxes. Other lidar systems have been and are being developed to measure airborne ozone and aerosols.

Radar Wind Profilers have been developed to detect atmospheric inhomogeneities that are caused by variations in temperature and humidity. By measuring the Doppler shift in frequency of the backscattered energy along beams pointed in several directions, wind speed and direction can be calculated as a function of height. Moreover, if an acoustic wave is launched vertically near the profiler and its wavelength matches that of the radar, the radar can measure the propagation speed of the acoustic wave, which relates directly to virtual air temperature. Thereby, with the addition of a Radio Acoustic Sounding System (RASS) to the profiler, vertical profiles of temperature can also be measured. Since this technology is mature, these systems can operate unattended for months. Most profilers operate at 404 or 915 MHz; however ETL is developing a unit that operates at 50 MHz and another at 449 MHz. The 449 MHz frequency is likely to be used by the new National Profiler Network.

The ETL Radar and Meteorology Division has developed three high performance scanning Doppler radars which have been used exclusively over the past decade for research of the atmosphere and the ocean surface. Both X- and K-band radars are used for atmospheric and oceanic research.

Passive microwave radiometers are used extensively by ETL researchers. These systems are capable of simultaneously measuring liquid water in clouds and precipitable water vapor in the atmosphere. An exciting new concept is based on the fact that atmospheric moisture causes a delay in the time of arrival of GPS signals. ETL engineers are developing a process for backing out this delay and relating it to the water vapor content of the atmosphere. It is thought that this new concept may lead to an inexpensive method for measuring integrated water vapor.

Consequence Assessment Workshop (Carl Mazzola) - The status of this significant Workshop was reported. The Workshop is being offered to all cognizant DOE, M&O Contractors, and to DOE contractor organizations by the DOE Office of Nonproliferation and National Security, Office of Emergency Management (NN-60). The first Workshop is targeted for the last full week in January 1995, in a location to be determined. Future Workshops will be given on a two-monthly basis at DOE facilities generating the highest level of interest.

Copies of the draft version of the "Atmospheric Dispersion Modeling Resource" book was brought for distribution to attendees. When published in January 1995, this document will contain 23 different attributes of 91 dispersion models used by the DOE, DOD, DOC, EPA, USFS, and NRC. Publication of this resource book is sponsored by the Subcommittee on Consequence Assessment and Protective Actions of NN-60 and, therefore, will be available to all participants of the Consequence Assessment Workshop.

METEOROLOGICAL INFORMATION AND DISPLAY SYSTEMS

A future vital need for meteorological support to DOE operations will be a modern, interactive meteorological information and display system. Presently, several DOE sites use the NWS AFOS system. The NOAA node for the DOE part of this network is the ARL/SORD office in Las Vegas, Nevada. SORD serves as the meteorological communications hub for the Savannah River Site, the Hanford Meteorological Station, CP-1 at the NTS, and the Desert Rock Meteorological Observatory on the NTS. SORD provides 24-hr support, technical consultation, spare parts, and software upgrades to these customers. Presently the DOE AFOS network is quite reliable and operates satisfactorily; however, this system is aging, represents 1970's technology, and requires occasional upgrades to disk drives, internal processors, and communications systems. There are several modern meteorological information and display systems appearing on the market or being developed that offer more computational speed, mass storage, and interactive processing and display capabilities beyond those of AFOS. In fact, the NWS plans to decommission AFOS by the end of the century. Consequently, invitations were extended to several organizations having or developing the meteorological display systems of the future.

The National Weather Service Modernization Program (John Sokich) - A thorough overview of the NWS Modernization and Restructuring Program (MAR) was provided. During the MAR transition, the NWS must assure that there will be no degradation of services. Primary objectives of the MAR are to improve the quality and reliability of NWS products and services and to improve the lead time and specificity of warnings of short-lived, life-threatening weather events. Focus was placed on GOES-8, ASOS, NEXRAD (88-D), and AWIPS. The capabilities of GOES-8 were reviewed, an update on the status of GOES-7 was provided, and an outlook for GOES-9 was provided.

ASOS is being deployed. A total of 850 machines will serve NWS facilities and 750 additional machines will be built for other users. ASOS is a solid remote sensor; however, it does not detect freezing rain, thunderstorms, snow depth, dust, and ceilings above 3600 m (12,000 ft). These concerns are being addressed and no stand-alone ASOS will be comissioned until at least 1996. There were questions raised regarding systematic changes in local climatology due to the installation of ASOS. With regard to this issue, it was pointed out that the temperature (and dew-point) sensors are giving readings that are slightly warmer that those from instrument shelters. The NWS is reviewing this concern.

The 88-D radar deployment was reviewed and capabilities described. All present were familiar with this system. The NWS expects the 88D's to be fully deployed by early 1996. The issue of access to NOAA radar data by other NOAA offices was addressed. Federal agencies needing access to real-time radar data should have access to it through the NEXRAD Information Dissemination System (NIDS). The NWS has an agreement with all NIDS vendors to have a special subscriber status established for approximately 100 ports, or about two ports per state. The intent is to allow access to the radar data for emergency management entities at no cost for the data. However, anyone can apply for special subscriber status. DOE field offices would appear to fall under the emergency management concept.

The AWIPS system and sub-system design reviews have been completed. AWIPS will have an advanced interactive graphics capability and will be backed by NWS training, spare parts service, and communications support. However, for non-NOAA offices who may want AWIPS, such as DOE, the costs maybe prohibitive. This important issue will need to be assessed and balanced against the advantages of using AWIPS.

U. S. NAVY NODDS PROGRAM (John Garthner) - The Navy Oceanographic Data Distribution System (NODDS) is a state-of-the-art methodology that makes environmental information and DMSP satellite imagery available to Department of Defense (DOD) users worldwide. Due to the success of NODDS, the system now has many non-Navy customers, one of which is ARL/SORD. Data processing and display take place on local microcomputers.

Access to NODDS is via a telephone line (up to 9600 baud) to the Fleet Numerical Meteorology and Oceanography Center in Monterey, California. NODDS software is MS/DOS-based, requires at least a 80286 CPU, an EGA color monitor (VGA for satellite imagery), hard disk drive, mouse, and a modem to download data. Telephone access is through commercial, SprintNET, or INMARSAT. To achieve optimum speed a 80386 CPU (or better) with numeric coprocessor is recommended. Moreover, there are two versions of NODDS, the Navy version and the NOAA version. The NOAA version has different access telephone numbers and has archived numerical model output data available.

NODDS has a robust data processing and display capability for meteorological and oceanographic data. Animation of numerical model output is available at one-hour intervals, three-dimensional analyses can be displayed, basic station data are clearly plotted, four-panel displays can be created, and the software offers color shading or fill graphics.

THE UNIVERSITY OF WISCONSIN McIDAS PROGRAM (J.T. Young and Denise Laitch) - the Space Science and Engineering Center (SSEC) of the University of Wisconsin developed the Man-computer Interactive Data Access System (McIDAS) 20 years ago. The system has evolved through three distinct generations and is now entering a fourth generation. McIDAS was designed to be a continually evolving system with a "bottom up" management system. The present mainframe supports a multitude of tasks. These tasks include ingesting the following:

a. real-time imagery from GOES, Meteosat-nominal, Meteosat-ADC, NOAA-11, NOAA-12, and a subset of the GMS data via a communications link with Australia,

b. Kavouras Inc. and Weather Services Inc. radar data,

c. GOES data from the archive to satisfy user requests,

d. conventional data from NWS IDS, PPS, and DDS circuits and decoding these data, and

e. NMC (now the National Center for Environmental Prediction) model grids.

It was reported that in addition to McIDAS-OS2, McIDAS is now available on UNIX platforms. This version of McIDAS, McIDAS-X, is supported on IBM RS/6000, Silicon Graphics, and Sun Microsystems workstations. Both OS2 and X work together to provide a broad spectrum of functionality. The next effort, presently underway, is the development of an IBM RS/6000 based system (McIDAS-XDB) capable of ingesting real-time satellite imagery and other data.

SORD was given the opportunity to evaluate the OS2 version. It was found that McIDAS was a very powerful meteorological data display system with solid interactive graphics capability. However, the user interface is command-line oriented and has limited ability to interface easily with the user. In addition, all image and graphics processing is accomplished at the University of Wisconsin; thereby requiring the commitment of long-distance telephone resources. McIDAS has many satisified users and is an excellent system, especially for research activities. McIDAS operations are not staffed on a 24-hour per day basis and does not seek to become an emergency response system.

THE ERL FORECAST SYSTEMS LABORATORY WFO-ADVANCED (Carl Bullock) - The WFO-Advanced project was started in September 1994 by the ERL-Forecast Systems Laboratory. WFO-Advanced is an AWIPS type system that is closely tied to the AWIPS program and operations perspective. Advantage has been taken of the experience gained through the DARE program. The system will be designed to ingest data from a variety of sources, including satellites, 88-D radars, vertical profilers, and local meteorological networks. The workstation will be easy to use, have a fast response, will anticipate and guide forecaster action, have a multi-windows environment, and be capable of displaying data in three-dimensions from different perspectives. Software will include a Local Analysis and Prediction System (LAPS) with multivariate, 3-D analysis of data. Present horizontal resolution of LAPS is 10 km and the vertical resolution is 50 mb. Graphics output will be through an AWIPS Forecast Preparation System (AFPS) which will ingest NWP data and then produce forecast analyses in graphical form that can be adjusted and manipulated by the forecaster. Full demonstration of WFO-Advanced is projected to be in late CY 1995 with an operational system in Denver by the Spring 1996. Full implementation is expected by the end of CY 1996.

A DOE Interactive Meteorological Information System (Darryl Randerson) - Near the end of this decade, the NWS plans to complete its modernization program which will include the replacement of AFOS with AWIPS. Presently, three of the major DOE field offices (RL, SRS, NV) depend on the NWS AFOS system for national meteorological information, graphics products, and data. SORD is the AFOS hub for the distribution of AFOS products to these DOE sites. Other DOE field offices (RFO and INEL) would like to have access to the DOE meteorological network, but spare AFOS systems are no longer available. As the replacement for AFOS, AWIPS, is phased in, AFOS will be phased out. Although no date has been set, at this time, for the decommissioning of AFOS, it may occur in the 1999 to 2001 time frame. DOE and other AFOS users will need to consider either replacing AFOS with the new AWIPS system, identifying other systems, or developing their own systems. None of these choices are economically pleasing. However, we must consider that participation in the NWS AWIPS procurement should make spare parts, training, and depot services available to all customers.

Systems such as McIDAS or NODDS are robust meteorological information distribution systems that have some operational limitations. The McIDAS has a large learning curve, is not especially user friendly, and service is not provided 24-hr per day. However, McIDAS is a powerful research tool with excellent analysis and overlay capability. By contrast, NODDS is set-up in a windows environment, is designed for operational support, uses new visualization techniques, allows electronic downloading of software when appropriate, and is easier to use operationally than McIDAS. Forecast products from NODDS are those generated by the

Fleet Numerical Oceanography Center in Monterey, California. NODDS service is provided 24-hr per day; however the availability of training is limited and there is no depot service for hardware. For additional NODDS information see the related discussion on NODDS above.

The option to build a DOE interactive meteorological information system (DIMIS) from off-the-shelf hardware and software is possible but froth with potential pitfalls. This DIMIS would not only be used to support vital research and weather analysis and forecasting activities, but also be critical to on-site emergency response requirements. The system would provide direct access to synoptic environmental information, ingesting data streams from federal, military, university, and local sources. Once ingested these data would be processed rapidly into graphical form for color display on workstations and onto wide-screen displays for viewing and use by operation and management teams. The system would need to be computationally powerful, have animation, have overlay/underlay and zoom capability, and display gridded data and analyses in three dimensions from variable view-points. In addition, it must provide users with the speed and flexibility needed to analyze and forecast mesoscale meteorological conditions. Table I contains a listing of generic-type specifications for the envisioned DOE system. The shortcomings of this approach are obvious; training will have to be in-house, spare parts may only be available after a few years, and depot type services may also only last a few years. On the positive side, if the system is designed to be upgradeable, new advances in PC technology can be easily installed so that the system capabilities are not frozen.

The other NOAA meteorological information system that DOE needs to track closely is WFO-Advanced. This developmental system was discussed in the previous section.

There are several other systems available through the private sector. Examples of these are the General Services Corporation METPRO workstation, the Lockheed MeteoStar LEADS system, and the Unisys Corperations SkyVision system. All are powerful modular systems that ingest, process, analyze, and display meteorological data from local and national data bases. Most are based on an open systems architecture, UNIX, Motif, and the X-Windows System. These systems must also be reviewed for potential future use by DOE meteorological programs and as a possible replacement for the DOE meteorological network linking the appropriate field offices into a functional unit.

TABLE I. Envisioned Specifications for a DOE Interactive Meteorological Information System.

PRIMARY METEOROLOGICAL WORKSTATION

- High-end Workstation
- Pointer Device and enhanced keyboard
- Ethernet interface link to local node
- Large Internal disk
- Large capacity MB RAM
- 19" or larger RGB color monitors (2) capable of 1280 x 1024 pixel resolution
- 24-bit color
- Windows 95
- X-Windows software supporting OSF/MOTIF
- Include proper security lockouts

REMOTE WORKSTATION

- High-end Workstation
- Pointer Device and enhanced keyboard
- 32 MB RAM
- Super VGA graphics adaptor
- 16" RGB color monitor
- Ethernet compatible
- Windows 95
- X-Windows software supporting OSF/MOTIF
- Include proper security lockouts

RECOMMENDATIONS

- Use Commercial Off-Shelf Technology
- Be Upgradeable
- Redundancy
- Use Open-Systems Standards
- Be Able to Read/Write Data in a Manner Compatible with AWIPS
- Use Client/Server Concept: Client Defines Area of Interest and Then Chooses Products to View

ROUND-TABLE DISCUSSION

Following the formal briefings, a round-table discussion was held to review meeting accomplishments and to identify and to assess future meteorological needs for DOE operations. Recognition was focused on the fact that DOE has supported and, thereby, contributed significantly to the development and advancement of atmospheric science over the past 50 years. Historically, meteorological operations and research at DOE field offices such as those at Richland, Oak Ridge, Savannah River, Idaho Falls, Rocky Flats, and at the Nevada Test Site has been funded by the former Atomic Energy Commission, the Environmental Research and Development Administration, and by the present DOE. This relationship began with the development, fabrication, and testing of atomic weapons and the national security and safety issues associated with them. It has always been DOE policy to conduct operations in a safe and competent manner and in compliance with applicable Federal, State, and local environmental protection and personnel safety laws and regulations.

Environmental protection legislation specifies requirements for meteorological services. These requirements help to identify the type assets needed to achieve the capability to provide the necessary services. The assembled participants reviewed the regulatory requirements for meteorological services. Regulatory requirements for meteorological and climatological support to DOE facilities are clearly defined in DOE Orders, public laws, Federal and State standards and regulations, and Nuclear Regulatory Commission Guidelines. Some of these laws, regulations, and guidelines are as follow:

DOE Order 5400.1, General Environmental Protection Program, in particular, Chapter IV, Paragraph 6. This Order, issued in November 1988, establishes environmental protection program requirements for DOE operations. Moreover, the Order contains requirements and provides guidance on environmental monitoring programs for DOE operations. Under Chapter IV, Paragraph 6, the requirement for a meteorological monitoring program is identified. Data collected are expected to be representative of the DOE facility and are to be used to characterize atmospheric transport and dispersion conditions in the vicinity of DOE facilities. The Order specifies that *a meteorological information/monitoring program shall be developed as a specific element of all environmental monitoring plans* and also notes the need for the development of site climatology.

DOE Order 5440.1E, establishes DOE policy for implementation of the National Environmental Policy Act of 1969. Also see DOE Order 5400.5, Radiation Protection of the Public and the Environment, which establishes standards and requirements for operation of DOE facilities with respect to protection of the public and the environment against undue risk from radiation. This Order states that *dose evaluation models that are codified, approved, or accepted by regulatory or other authorities shall be used where appropriate, such as the AIRDOS/RADRISK codes for determining compliance with 40 CFR Part 61, Subpart H.* These models require properly analyzed climatological data as the driver for dose calculations.

DOE Order 5500.3A, Emergency Planning and Preparedness for Operational Emergencies, establishes requirements for planning and preparedness for operational emergencies involving the DOE or requiring DOE assistance. This Order establishes the requirement for site-specific environmental modeling.

DOE/EH-173T, Environmental Regulatory Guide for Radiological Effluent Monitoring and Environmental Surveillance, Jan. 1991, is a DOE regulatory guide that establishes elements of a radiological effluent monitoring and environmental surveillance program that is acceptable to DOE and supports DOE Order 5400.1 and 5400.5. Chapter 4, "Meteorological Monitoring", provides guidelines on environmental protection activities and the assessment of impacts from planned or accidental releases of radioactive material into the atmosphere over DOE facilities. The regulatory guide states that *each DOE site (facility) should establish a meteorological monitoring program that is appropriate to the activities at the site, the topographical characteristics of the site, and the distance to critical receptors.* Moreover, the guide notes that the type of meteorological data is not explicitly stated in laws or regulations; *however, there is implicit recognition in regulations and directives of the type of information required.* There is a clear need to characterize atmospheric transport and dispersion (and deposition) on DOE sites as these parameters are a critical part of the dose assessment process. The guide also states that *in general, DOE sites will be required to have on-site measurements of wind direction, wind speed, and atmospheric stability available to evaluate atmospheric dispersion in the vicinity of facilities and to perform the required dose calculations specified in 40 CFR Part 61.* A meteorological interpretation of the above means that vertical temperature profiles are needed to specify atmospheric stability and that a single observation site is unacceptable for large sites with complex terrain, highly variable vegetative canopies, or on coastal sittings. Finally, the guide notes that *the accuracies of monitoring measurements should be consistent with the specifications set forth in either ANSI/ANS-2.5-1984,.....or guidance provided by the EPA if EPA guidance recommends more stringent specifications.*

Title 42, U.S.C. 7101, et seq., The Department of Energy Organization Act, which establishes the statutory responsibility to ensure incorporation of national environmental protection goals in the formulation of enegy programs, and advance the goal of restoring, protecting, and enhancing environmental quality, and assuring public health and safety.

Title 42, U.S.C. 4321 and **7401**, The National Environmental Policy Act of 1969, as amended, and The Clean Air Act, as amended in 1990.

40 C.F.R. Part 58.20, addresses the need to collect background data from existing State and Local Air Monitoring Stations (SLAMS)

40 C.F.R. Part 61, the National Emission Standards for Hazardous Air Pollutants (NESHAPS) which requires that collective doses to the public within 80 km of the site are evaluated and documented, at least, annually. (DOE 5400.6)

U.S. Nuclear Regulatory Commission, Regulatory Guide, 4.18. 6/23, Standard Format and Content of Environmental Reports for Near-Surface Disposal of Radioactive Waste, Paragraph 3.3.1.

American Nuclear Society, American National Standard, Standard for Determining Meteorological Information at Nuclear Power Plants, ANSI/ANS-2.5-1984.

The accidental release of radioactive or toxic material into the atmosphere can have potentially serious health and environmental consequences. Meteorological processes play a key role in determining the fate of effluents released into the atmosphere. For example, the processing, fabricating, and underground testing of nuclear weapons all have the potential for industrial accident scenarios. In addition to these activities, the use of nuclear material in the generation of electric power[1] and the storage of nuclear waste from power generation, weapons complexes, and medical and commercial processes are all potential sources of nuclear material that could be accidentally released into the atmosphere. Consequently, a central theme within the DOE community has been to protect public health, safety, and the environment on and around DOE facilities. Therefore, the AEC and DOE have required and supported on-site meteorological monitoring, directed the development of emergency response capabilities at DOE facilities, funded research on the modeling of the transport, dispersion, deposition, and resuspension of radioactive and toxic materials, and advocated on-site weather forecasting services tailored specifically for the special operational and emergency management

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[1] Electricity generated by the combustion of coal is also a source of radioactive effluents; namely, uranium and thorium.

Table II. Staffing levels of the principal DOE Field Offices that support significant meteorological programs.

OFFICE	METEROL	SYSTEMS PROGMR & ENGNR	SCNTFIC & TECHNCL	MATHTCN	ADMIN	CHMSTS
RL/MCSP	7	1	2			
SRS/SRMP	6	6	2	2	3	
OR/ATDD	15	3	6		5	
INEL/FRD	5	1	2	1	2	2
NTS/SORD	9	3	12		3	
RF/EG&G	3	3	1			1

requirements at each DOE facility. Much of the research and all operational support has been provided by the atmospheric research programs at the six field offices directly involved in national defense programs. The number of personnel involved in implementing research results to meteorological operations at these key DOE facilities are listed in Table II.

To complicate the safety issues described above, there are also natural sources of radioactive materials and radiant energy that originate from within the earth and from the cosmos. Separating the impacts of natural and anthropogenic sources of radioactive material can be challenging, especially when attempting to study potential health effects and biological consequences.

The physiography of the DOE field sites ranges from deserts to forests and from relatively flat terrain to mountainous. These site characteristics make meteorological analyses and forecasts challenging. A major limitation on our understanding of the transport and dispersion processes in the atmosphere has been the uncertainty over how to quantify, in a representative way, the rates of exchange of effluents at the earth-atmosphere interface. These exchange processes are driven by atmospheric turbulence, are small and difficult to measure, but are very significant when integrated over larger scales. The atmosphere in contact with the ground is almost always turbulent, and trace gases are rapidly transferred (dispersed) to or from the surface by irregular eddies produced by wind shear and buoyancy forces.

Due in part to research supported by DOE and NOAA, the problems related to the study of boundary-layer processes are becoming tractable; however, much work remains to complete our knowledge base. The challenge to future DOE and NOAA research goals and operational proficiency is to anticipate potential air quality issues and environmental concerns. Some of these may be as follow:

- the release to the atmosphere of radioactive materials from the decommissioning and clean-up of DOE facilities.

- the potential resuspension of radioactive material in the soil at DOE sites and the consequent deposition of this material off-site or within the general public.

- the influence of anthropogenic effluents and especially particulate matter on atmospheric opacity.

- the need to develop the capability to simulate the total environmental system in a manner that is explainable and understandable, sufficiently accurate, and adequately complete to permit coupling with independent models of economics, societal behavior, etc.

- the need to improve environmental predictions; in particular those related to short-range weather forecasts that will drive local-scale emergency response models used to support crisis management situations.

- the potential environmental problems related to the stewardship of nuclear weapons and the decommissioning of nuclear weapons.

- the need to support the procurement of modern equipment to benefit DOE meteorological operations and research and strive to join and participate in atmospheric science projects with other agencies.

Solutions to these environmental and air quality issues will be provided by continuous on-site monitoring, analysis, and proper processing of meteorological information and intellegent use of atmospheric science.

Meteorological monitoring programs at the primary DOE field sites are similar. Table III contains a listing of the type equipment available at each site and Table IV identifies the manufacturers. The Hanford, Savannah River, Idaho, and Nevada sites all have large instrumented tower networks that measure wind speed and direction, temperature, and other parameters. Rocky Flats has one tower located on-site and four other towers around the parimeter of the site. Some sites have standard upper-air measuring equipment while others employ remote sensing technologies. All five sites transfer these network data into central processors that decode the data, run quality checks, create graphics products and data files, and archive the data for later retrieval and use. A unanimous view at the meeting was that meteorological managers at the field offices

Table III. Meteorological Data Collection Systems at the Key DOE Field Sites. Number of Units.

	RL	SRS	NTS	INEL	RF
Tall Towers (>30m)	1	9	1		
Other Towers	26		35	31	
Profilers				1	*
w/RASS				1	1
Acoustic Sounders	4	3			1
Radiosondes			2		
Airsondes		1	1		
Pibals	1		11		
Beukers		1			
Tethersondes		1			

*Access to NOAA/ERL Profilers in the Boulder area.

Table IV. Primary Manufacturers of Meteorological Equipment Used at DOE Sites.

	Wind Sensors	Temperature	Relative Humidity	Pressure	Solar Radiation
RL	Clmtrncs[1]	YSI	Clmatrnc	Setra	Eppley
SRS	Met One	Met One	Met One	Rosemont	Eppley
NTS	Teledyne	Clmtrnics	Omega	AIR	n/a
INEL	Met One	Campbell	Campbell	Setra	Li-Cor
RF	Campbell	Clmtrncs	Clmtrncs	Clmtrncs	Clmtrncs

[1] Clmtrncs = Climatronics

should coordinate needs for field monitoring equipment and review opportunities to share equipment where appropriate to meet DOE mission requirements. Coordination was suggested to seek opportunities to unify meteorological procurements to save money. Sharing equipment assets would also contribute to a more cost effective approach to supporting special field operations.

Extreme meteorological events have been observed and measured on all the large DOE sites. Table V clearly illustrates these extreme events and brings into focus the need to monitor, predict, and study these natural, hazardous phenomena so that proper actions can be taken in the future to mitigate their menacing effects. Flood hazards are a real concern at all DOE facilities with flash flood events being of special concern in the desert environments of the western United States. DOE meteorological programs should play a key role in issuing flood hazard warnings for their DOE facility or range and provide input to local flood preparedness planning. Other natural meteorological phenomena that can be hazardous to personnel and facilities are strong winds, extreme temperatures, heavy snow, hail, and tornadoes. All these phenomena, except for tornadoes, have occurred at all the key DOE field sites.

Access to National Weather Service (NWS) products and gridded data was viewed as desirable. The gridded data could be used locally to drive mesoscale models, to generate local forecast products, and to produce graphics products for use by decision makers and managers. In addition, AFOS-type graphics products can be used to develop customized weather forecasts for special DOE operations.

There was concern about the NWS implementation of AWIPS in the future in terms of procurement costs, availability of spare parts, and training of personnel. Presently, it appears that the AWIPS system may be too costly for DOE and therefore DOE should consider other options. Furthermore, it was not clear as to when AFOS would be decommissioned, but the general view was that it was likely to remain operational for approximately five more years or to the end of this century. Consequently, a prudent fiscal position is for DOE to continue with AFOS support and look for other hardware and software systems that meet operational requirements. In the interim, DOE should establish the specifications for an interactive meteorological information system that will meet future mission support requirements.

A consensus recommendation was that a team of meteorologists and DOE representatives be formed to address these issues in a serious and productive way. Based on deliberations by the attendees, it was recommended that a council be formed and that the council be named the <u>DOE Meteorological Coordinating Council</u>. This Council was formed. The Council mission, objectives, methods, and members are listed in Appendix C.

Table V. Extreme Meteorological Events That Have Occurred at Key DOE Field Sites.

Event	RL	SRS	NTS[1]	INEL	RF
Max Hourly Rain (in)	0.59	3.00	1.50	0.54	n/a
Max 24-hr Rain (in)	1.91	7.50	3.52	1.64	3.40
Max Snowfall (in)	10.2	14.0	10.0	8.6	40.0
Max Snow Depth (in)	15.6	14.0	18.0	22.0	35.0
Max Wind Gust (mph)	80	80	67	78	105
Coldest Temp (°F)	-23	-3	-14	-47	-25
Max Temp (°F)	113	107	113	101	102
Avg Ann Precip (in)	6.26	48.4	7.56	8.71	16.0
Tornado Occrnc	yes	yes	yes	no	no
Hail Occrnc	yes	yes	yes	yes	yes

[1] In dry lake beds only. Precipitation amounts and wind speeds are greater over higher terrain.

SUMMARY

Drawing together managers and key DOE operational meteorological programs and their DOE program managers, as well as research personnel, was very enlightening and beneficial to all. The meeting confirmed the fact that meteorological operations at the large DOE field offices have much in common. In large part the commonality of services stems from federal laws, DOE Orders, and public policy requiring meteorological monitoring and forecast services to protect public safety and health, and the environment. Moreover, due to the vast size of the sites, the complexity of the terrain at some, and the wide variety of surface layer characteristics, meteorological conditions can vary dramatically from place to place on these sites. Consequently, safety concerns relating to protecting personnel from heavy precipitation (flash flooding), severe thunderstorms, lightning, strong winds, extremes in temperature, restrictions in visibility, etc, requires on-site monitoring of meteorological conditions. In addition, meteorological data, and proper interpretation of these data, are vital to managers who are required to make wise decisions for emergency evacuations and prudent recommendations on protective actions to be taken in emergency response situations involving toxic or hazardous substances released into the atmosphere. Furthermore, on-site meteorological data are routinely needed for background information that may pertain to on-site aircraft or vehicle accidents, industrial accidents, or damage to facilities. Overall, the importance of meteorological services to DOE, and the need to continue and improve these services, was recognized by all in attendance.

The historical contributions by NOAA to DOE operations was recognized. NOAA has played a key role in providing meteorological support to DOE and its predecessors. The original basis for Department of Commerce, and eventually NOAA, involvement in Atomic Energy Commission and DOE meteorological operations is the development of atomic weapons and national security issues. NOAA support has been direct, through interagency agreements, and indirect, through consultations, access to NWS data bases and forecast products, and equipment resources procured by private contractors. The vitality of NOAA support is, and has been, NOAA scientific and technical personnel, many of who have dedicated their federal careers to DOE programs. Two components of NOAA have been the principle contributors of vital meteorological services to DOE; namely, ARL and NWS. ARL has provided vital scientific expertise and technical advise and the NWS has provided critical meteorological data and forecast services.

Assessments of air quality impacts at DOE weapons facilities will continue as DOE reconfigures site operations. Potential impacts will be assessed on the basis of compliance with local, state, or National Ambient Air Quality Standards, or the potential "exceedence of prevention of significant deterioration increments" for particulate matter with aerodynamic diameters less than 10 microns. Assessment criteria will include the EPA's primary and secondary air quality standards for criteria pollutants. Air quality monitoring data will be required to determine maximum background concentrations of pollutants for each DOE site. Models will be needed to project site emissions. On-site meteorological monitoring data will be vital to proper assessments of air quality at DOE facilities. Representative meteorological data must include the three-dimensional description of the state of the atmosphere and accurately depict changes in time and space. Modern remote sensing equipment and robust analysis techniques will be required to tackle air quality assessments properly and accurately and to support emergency management programs effectively.

Appendix A. The DOE Meteorological Meeting Agenda.

MEETING ON
DEPARTMENT OF ENERGY
METEOROLOGICAL SUPPORT PROGRAMS

NEVADA OPERATIONS OFFICE
LAS VEGAS, NEVADA

NOVEMBER 30 - DECEMBER 2, 1994

November 30, Wednesday

7:45 am INTRODUCTION AND WELCOME

Introduction: Darryl Randerson, Director, Air Resources Laboratory, Special Operations and Research Division, Las Vegas, Nevada.

Welcome: James K. Magruder, Assistant Manager for Operations, Department of Energy, Nevada Operations Office, Las Vegas, Nevada.

New Challenges in Meteorological Support to DOE Field Operations, Edward Forness, Department of Energy, Nevada Operations Office, Test Operations Division, Las Vegas, Nevada.

8:30 am METEOROLOGICAL SUPPORT TO DOE FIELD OFFICES

Richland Operations Office: Dana Hoitink, Project Manager, Meteorological and Climatological Services, Battelle Pacific Northwest Laboratories, Richland, Washington.

Rocky Flats Field Office: Bert Crist, DOE Rocky Flats Emergency Preparedness Office , Golden, Colorado.

Savannah River Operations Office: Robert P. Addis, Group Manager, Environmental Transport Group, Westinghouse Savannah River Company, Aiken, South Carolina.

10:00 am BREAK

10:30 am	Oak Ridge Operations Office: Carmen Nappo, Chief, Atmospheric Turbulence and Diffusion Branch, Air Resources Laboratory, Atmospheric Turbulence and Diffusion Division, Oak Ridge, Tennessee.
11:00 am	Idaho Falls Operations Office: David George, Research Meteorologist, Air Resources Laboratory, Field Research Division, Idaho Falls, Idaho.
11:30 am	Nevada Operations Office: Allen E. Barr, Chief, Field Support Branch, Air Resources Laboratory, Special Operations and Research Division, Las Vegas, Nevada.
Noon	LUNCH
1:30 pm	Report from the Office of the Federal Coordinator, James B. Harrison, Deputy Federal Coordinator for Meteorology, Office of the Federal Coordinator, Silver Spring, Maryland.
2:00 pm	Overview of Air Resources Laboratory Support to DOE Field Programs, William R. Pendergrass, Research Meteorologist, Air Resources Laboratory, Atmospheric Turbulence and Diffusion Division, Oak Ridge, Tennessee.
2:30 pm	BREAK
2:45 pm	Update on Remote Sensing Technologies, Donald Beran, Environmental Research Laboratories, Environmental Technology Laboratory, Advanced Programs, Boulder, Colorado.
3:15 pm	Consequence Assessment Workshop, Carl Mazzola, Environmental Project Manager, Stone Webster Engineering Corporation, Aiken,South Carolina.
4:30 pm	ADJOURN

December 1, Thursday

METEOROLOGICAL INFORMATION AND DISPLAY SYSTEMS

8:00 am The National Weather Service Modernization Program, John Sokich, National Weather Service, Transition Program Staff, Silver Spring, Maryland.

9:30 am BREAK

10:00 am The U. S. Navy Oceanographic Data Distribution System, John Garthner, Routing Services Division Head, Fleet Numerical Meteorology and Oceanography Center, Monterey, California.

11:30 am LUNCH

1:00 pm The McIDAS Program, J. T. Young, McIDAS Team Leader, and Denise Laitsch, McIDAS Program Manager, University of Wisconsin, Madison, Wisconsin.

2:00 pm WFO Advanced, Carl Bullock, Acting Division Chief, NOAA/ERL, Forecast Systems Laboratory, Boulder, Colorado.

3:00 pm BREAK

3:30 pm Future Needs of a DOE Interactive Meteorological Information System (DIMIS), Darryl Randerson, Director, Air Resources Laboratory, Special Operations and Research Division, Las Vegas, Nevada.

4:30 pm ADJOURN

December 2, Friday

8:30 am Workshop on Future Needs of DOE Meteorological Support Programs, Round-Table Discussion, all attendees.

11:30 am ADJOURN

Appendix B. List of Participants

DOE METEOROLOGICAL SUPPORT MEETING
LAS VEGAS, NEVADA
ATTENDANCE LIST

Adair, John	NOAA/NWS	702-736-6404
Addis, Robert	SRTC	803-725-3325
Beran, Don	NOAA/ERL/ETL	303-497-6765
Bullock, Carl	NOAA/ERL/ETL	702-497-7247
Crist, Bert L.	DOE/RF-ETS	303-966-7793
Cordero, Scott	NOAA/NWS	702-388-8652
Davis, James R.	U.S. Army	410-278-1226
Ellis, Jim	LLNL/ARAC	510-422-1808
Forness, Ed	DOE/NV-TOD	702-295-1141
Frazer, Donel N.	NOAA/ARL-SORD	702-295-1891
Garthner, John P.	U.S. Navy/FNMOC	408-656-4431
George, David	NOAA/ARL-FRD	208-526-9513
Hall, John	DOE/RL	509-372-1677
Harrison, Jim	NOAA/OFCM	301-427-2002
Hoitink, Dana	DOE/RL PNL	509-372-6414
Jensen, Larry	NOAA/NWS	702-388-6735
Kosier, David	NOAA/NWS	702-388-8652
Lastech, Denise	UW-Madison SSEC	608-265-4741
Mazzola, Carl	Stone & Webster (REPR NN-60)	803-643-7619
Mueller, Peter	DOE/NV FRMAC	702-295-1777
Nappo, Carmen J.	NOAA/ARL-ATDD	615-576-1252
Pendergrass, Will	NOAA/ARL-ATDD	615-576-6234
Pitchford, Marc	NOAA/ARL-SORD	702-895-0432
Randerson, Darryl	NOAA/ARL-SORD	702-295-1231
Sanders, James B.	NOAA/ARL-SORD	702-294-2348
Sokich, John	NOAA/NWS	301-713-0172
Start, G. E.	NOAA/ARL-FRD	208-526-2329
Titus, R. W.	RSN (Repr DOE/NV-TOD)	702-295-1141
Ward, Dana C.	DOE/RL	509-372-1261
Whitney, Gail R.	DOE/SR	803-725-1447
Young, J. T.	Univ. of Wisconsin	608-262-6314

Appendix C. The Objectives, Mission, Methods, and Members of the DOE Meteorological Coordinating Council.

DOE METEOROLOGICAL COORDINATING COUNCIL

(DMCC)

MISSION: COORDINATE METEOROLOGICAL SUPPORT AND ATMOSPHERIC RESEARCH TO MEET DEPARTMENT OF ENERGY (DOE) OBJECTIVES

OBJECTIVES:

1. PROMOTE COST EFFECTIVE SUPPORT FOR ALL DOE FACILITIES.
2. FACILITATE THE USE OF COMMON METHODS, PROCEDURES AND STANDARDS.
3. PLAN FOR FUTURE NEEDS, REQUIREMENTS, AND MISSIONS.
4. ADVOCATE AWARENESS OF ATMOSPHERIC SCIENCE APPLICATIONS AND BENEFITS TO DOE.

METHODS:

1. ENCOURAGE INTERCHANGE OF TECHNICAL INFORMATION BETWEEN DOE OFFICES.
2. FOSTER THE DEVELOPMENT OF ATMOSPHERIC MONITORING EQUIPMENT AND SYSTEMS.
3. ACQUIRE AND DISSEMINATE ATMOSPHERIC DATA PRODUCTS TO MEET ENVIRONMENTAL, SAFETY, AND HEALTH NEEDS AND REQUIREMENTS.
4. PROMOTE CONSISTENCY OF MONITORING AND ASSESSMENT PRODUCTS AND SERVICES.
5. INTERFACE WITH APPROPRIATE AGENCIES, ACADEMICS, AND PROFESSIONAL ORGANIZATIONS.
6. MAKE RECOMMENDATIONS ON EQUIPMENT PROCUREMENTS, REPLACEMENTS, AND MODIFICATIONS TO BENEFIT DOE OPERATIONS.
7. PROVIDE CONSULTATION AND TECHNICAL ASSISTANCE TO FOSTER COOPERATION AND RESEARCH AMONG THE DOE METEOROLOGICAL PROGRAMS.

DMCC MEMBERSHIP

Dr. Darryl Randerson, Chairman

Mr. Carl A. Mazzola, Vice-Chairman

Dr. Robert P. Addis, Savanna River

Mr. Dana Hoitink, Richland

Dr. Rayford P. Hosker, Oak Ridge

Mr. Gene Start, Idaho

Mr. Walter Latimer, Rocky Flats

Mr. Edward J. Forness, Nevada

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