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1.0 PURPOSE AND APPLICABILITY

This standard operating procedure (SOP) is a guide to archiving and maintenance of optical visibility monitoring data. The purpose of this SOP is to assure that the following data and information are secure and available:

- Nephelometer data
- Transmissometer data
- Associated meteorological data
- Supporting documentation

These archives are a historical record of both raw and processed data files and provide information that supports the documentation of existing conditions and trends in monitored areas. Duplicate copies of digital data are stored off-site to prevent data loss.

The following technical instructions (TIs) provide detailed information regarding specific archive procedures:

- TI 4600-5000 *Nephelometer Data Archives (IMPROVE Protocol)*
- TI 4600-5010 *Transmissometer Data Archives (IMPROVE Protocol)*

2.0 RESPONSIBILITIES

2.1 PROJECT MANAGER

The project manager shall:

- Ensure that archives are accessible, orderly, complete, and current.
- Ensure that duplicate archives are properly stored off-site.

2.2 DATA ANALYST

The data analyst shall:

- Archive raw nephelometer and transmissometer data on a monthly basis.
- Archive processed nephelometer data on a quarterly basis.
- Archive processed transmissometer data on an annual basis.
- Maintain supporting hard copy documentation.
- Prepare and maintain data archive files and records.

3.0 REQUIRED EQUIPMENT AND MATERIALS

Required equipment and materials include computer equipment and software, digital data, and supporting equipment and materials as discussed in the following subsections.

3.1 COMPUTER EQUIPMENT AND SOFTWARE

Optical visibility monitoring digital data archives are performed on IBM-PC compatible systems. Required computer system components and software include:

- IBM-PC Pentium class computer system with VGA and 80 megabyte hard disk and 64 megabytes of RAM
- Microsoft Windows98, or Windows2000 operating system
- CD-R drive (52x24x52)
- CD-Rs (1x-52x compatible 700mb capacity)
- CD labels
- 3.5" diskettes
- 3.5" diskette labels
- Creator Classic or compatible CD-writing software
- Laserjet printer

3.2 DIGITAL DATA EQUIPMENT AND MATERIALS

ASCII files must be available in a designated network ARS computer network directory. All optical data will be handled as ASCII files. Equipment and materials for maintaining digital data archives include:

- Three-ring binders
- Plastic storage diskette and CD pouches

3.3 SUPPORTING DOCUMENTATION EQUIPMENT AND MATERIALS

Supporting hard copy documentation for optical data is divided into two categories: site-based and instrument-based. All supporting documentation is archived on a continual basis. Equipment and materials for maintaining supporting documentation archives include:

- Manila file folders
- Hanging file folders
- Standard file cabinets

4.0 METHODS

Archiving of raw digital data is performed on a monthly basis. Archiving of all raw and processed digital data is performed after data have been finalized and reported (generally quarterly for nephelometer data and annually for transmissometer data). All files are in ASCII format. Files are stored in their original formats (non-compressed) on CD and/or diskette and at least two copies of each archive CD are created. One CD is stored at ARS, the other(s) are stored off-site. Hard copies of supporting documentation are archived on a continual basis and stored in-office.

Procedures for archiving optical data are discussed in the following two (2) major subsections:

- 4.1 Nephelometer Data Archives
- 4.2 Transmissometer Data Archives

4.1 NEPHELOMETER DATA ARCHIVES

4.1.1 Nephelometer Digital Data Archives

Table 4-1 outlines the nephelometer monthly and quarterly archive process. Raw data files (site-specific daily files collected by telephone modem, Internet (IP address), or downloaded from storage modules) are archived monthly. Level-1 validated files are archived quarterly.

Specific nephelometer archive procedures are detailed in TI 4600-5000, *Nephelometer Data Archives (IMPROVE Protocol)*.

4.1.2 Nephelometer Supporting Documentation Archives

Supporting hard copy documentation is archived on a continual basis. Nephelometer monitoring support documentation includes the following:

- Site specifications
- Site servicing trip reports
- Monitoring timelines
- Data analyst/site operator correspondence
- Site operator log sheets
- Instrument calibration and audit reports
- Instrument maintenance logs
- Weekly and quarterly data plots
- Quarterly summary history forms
- Quarterly uncertainty printouts

Table 4-1

Archiving Procedures for Nephelometer and
Associated Digital Data and Supporting Information

Nephelometer Data Archives			
Timing	File Types Archived	Media	Disposition
Monthly Archive of Nephelometer Digital Data			
By the 10 th of the month following the month of record	<ul style="list-style-type: none"> Raw data files (site-specific daily files collected by telephone modem, Internet (IP address), or downloaded from storage modules) 	CD-R	<ul style="list-style-type: none"> One copy at ARS
Quarterly Archive of Nephelometer Digital Data			
After data have been finalized and reported (within 90 days after the end of a quarter)	<ul style="list-style-type: none"> Processed Level-1 data files (xxxxx_N11 files) 	CD-R	<ul style="list-style-type: none"> One copy at ARS One copy off-site One copy to CIRA
Archive of Supporting Hard Copy Documentation			
Continuously	<ul style="list-style-type: none"> Site specifications Site servicing trip reports Monitoring timelines Data analyst/site operator correspondence Site operator log sheets Instrument calibration and audit reports Instrument maintenance logs Weekly plots Quarterly plots Quarterly summary history forms Quarterly uncertainty printouts 	Hard copies	<ul style="list-style-type: none"> On file at ARS or ARS storage

4.2 TRANSMISSOMETER DATA ARCHIVES

4.2.1 Transmissometer Digital Data Archives

Table 4-2 outlines the transmissometer monthly and quarterly archive process. Raw data files (daily Wallops files) are archived monthly. Level-1 validated files (weather-removed) are archived annually.

Specific transmissometer archive procedures are detailed in TI 4600-5010, *Transmissometer Data Archives (IMPROVE Protocol)*.

Table 4-2

Archiving Procedures for Transmissometer and
Associated Digital Data and Supporting Information

Transmissometer Data Archives			
Timing	File Types Archived	Media	Disposition
Monthly Archive of Nephelometer Digital Data			
By the 10 th of the month following the month of record	<ul style="list-style-type: none"> Raw data files (site-specific daily Wallops files) 	3.5" diskette	<ul style="list-style-type: none"> One copy at ARS
Bi-monthly	<ul style="list-style-type: none"> Raw data files (site-specific daily Wallops files) 	CD-R	<ul style="list-style-type: none"> One copy at ARS
Annual Archive of Nephelometer Digital Data			
After data have been finalized and reported	<ul style="list-style-type: none"> Processed Level-1 data files (xxxxx_T1W files) 	CD-R	<ul style="list-style-type: none"> One copy at ARS One copy off-site One copy to CIRA
Archive of Supporting Hard Copy Documentation			
Continuously	<ul style="list-style-type: none"> Site specifications Monitoring timelines Data analyst/site operator correspondence Site operator log sheets Instrument calibration and audit reports Instrument maintenance logs Bi-monthly plots Quarterly plots Quarterly summary history forms 	Hard copies	<ul style="list-style-type: none"> On file at ARS or ARS storage

4.2.2 Transmissometer Supporting Documentation Archives

Supporting hard copy documentation is archived on a continual basis. Transmissometer monitoring support documentation includes the following:

- Site specifications
- Monitoring timelines
- Data coordinator/site operator correspondence
- Site operator log sheets
- Instrument calibration and audit reports
- Instrument maintenance logs
- Bi-monthly and quarterly plots
- Quarterly summary history forms



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QUALITY ASSURANCE/QUALITY CONTROL DOCUMENTATION SERIES	
TITLE	TRANSMISSOMETER DATA ARCHIVES (IMPROVE PROTOCOL)
TYPE	TECHNICAL INSTRUCTION
NUMBER	4600-5010
DATE	JANUARY 1994

AUTHORIZATIONS		
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REVISION HISTORY			
REVISION NO.	CHANGE DESCRIPTION	DATE	AUTHORIZATIONS
1.0	Monthly archive and tape naming procedures	March 1995	
1.1	Minor text and formatting changes	December 1996	
2.0	Changed archive media / delete data archivist.	May 2005	

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1.0 PURPOSE AND APPLICABILITY

This technical instruction (TI) is a guide to archiving transmissometer-based optical visibility monitoring data. The purpose of this TI is to assure that data and supporting information are secure and available. This TI is referenced from Standard Operating Procedure (SOP) 4600, *Optical Monitoring Data Archives*.

2.0 RESPONSIBILITIES

2.1 PROJECT MANAGER

The project manager shall:

- Ensure that archives are accessible, orderly, complete, and current.
- Ensure that duplicate archives are properly stored off-site.

2.2 DATA ANALYST

The data analyst shall:

- Archive raw transmissometer and associated meteorological data on a monthly and bi-monthly basis.
- Archive processed transmissometer data on an annual basis.
- Maintain supporting hard copy documentation.
- Prepare and maintain data archive files and records.

3.0 REQUIRED EQUIPMENT AND MATERIALS

Required equipment and materials include computer equipment and software, digital data, and supporting equipment and materials as discussed in the following subsections.

3.1 COMPUTER EQUIPMENT AND SOFTWARE

Optical visibility monitoring digital data archives are performed on IBM-PC compatible systems. Required computer system components and software include:

- IBM-PC Pentium class computer system with VGA and 80 megabyte hard disk and 64 megabytes of RAM
- Microsoft Windows98, or Windows2000 operating system
- 3.5" diskettes

- 3.5” diskette labels
- CD-R drive (52x24x52)
- CD-Rs (1x-52x compatible 700mb capacity)
- CD labels
- Creator Classic or compatible CD-writing software
- Laserjet printer

3.2 DIGITAL DATA EQUIPMENT AND MATERIALS

ASCII files of transmissometer data (raw, Level-A, Level-0, and Level-1) must be available in a designated ARS computer network directory. All transmissometer data will be handled as ASCII files. Equipment and materials for maintaining digital data archives include:

- Three-ring binders
- Plastic storage diskette and CD pouches

3.3 SUPPORTING DOCUMENTATION EQUIPMENT AND MATERIALS

Supporting hard copy documentation for transmissometer data is divided into two categories: site-based and instrument-based. All supporting documentation is archived on a continual basis. Equipment and materials for maintaining supporting documentation archives include:

- Manila file folders
- Hanging file folders
- Standard file cabinets

4.0 METHODS

Table 4-1 outlines archiving procedures for transmissometer and associated digital data and supporting information. Details of each archive procedure are described in the following four (4) major subsections:

- 4.1 Monthly and Bi-Monthly Archive of Transmissometer Digital Data
- 4.2 Annual Archive of Transmissometer Digital Data
- 4.3 Disposition of Digital Data
- 4.4 Disposition of Supporting Documentation

Table 4-1

Archiving Procedures for Transmissometer and
Associated Digital Data and Supporting Information

Transmissometer Data Archives			
Timing	File Types Archived	Media	Disposition
Monthly Archive of Nephelometer Digital Data			
By the 10 th of the month following the month of record	<ul style="list-style-type: none"> Raw data files (site-specific daily Wallops files) 	3.5" diskette	<ul style="list-style-type: none"> One copy at ARS
Bi-monthly	<ul style="list-style-type: none"> Raw data files (site-specific daily Wallops files) 	CD-R	<ul style="list-style-type: none"> One copy at ARS
Annual Archive of Nephelometer Digital Data			
After data have been finalized and reported	<ul style="list-style-type: none"> Processed Level-1 data files (xxxxx_T1W files) 	CD-R	<ul style="list-style-type: none"> One copy at ARS One copy off-site One copy to CIRA
Archive of Supporting Hard Copy Documentation			
Continuously	<ul style="list-style-type: none"> Site specifications Monitoring timelines Data analyst/site operator correspondence Site operator log sheets Instrument calibration and audit reports Instrument maintenance logs Bi-monthly plots Quarterly plots Quarterly summary history forms 	Hard copies	<ul style="list-style-type: none"> On file at ARS or ARS storage

4.1 MONTHLY AND BI-MONTHLY ARCHIVE OF TRANSMISSOMETER DIGITAL DATA

Raw data files (files downloaded daily from Wallops Island) are archived on a monthly basis and also on a bi-monthly basis (every two months). By the 10th of the month following the month of record (after the bi-monthly plots are completed), the raw data files are archived on 3.5" diskettes. Every two months, the same files are archived to CD-R.

The raw data files (Wallops daily files) are located on the ARS computer network on the O:/trans/Wallops directory. The naming convention for the raw data files is GALyyjjj.dat, where yy is the year and jjj is the Julian date.

Monthly archiving of raw data files is a two-part process performed by the data analyst as described below:

COPY FILES TO ARCHIVE DIRECTORY The files are *copied* from the O:/trans/Wallops directory to the O:/trans/Wallops/archive directory.

ARCHIVE FILES

The files are then archived to 3.5" diskette and labeled. The 3.5" diskette holds 1.44 megabytes, or approximately 65 raw daily data files of average size. One diskette is created and labeled containing the archive.

Archiving the raw data files to compact disc (CD-R) can be done every two months instead of monthly due to the small size (~20 kb) of the daily files. One CD is created and labeled containing the archive.

4.2 ANNUAL ARCHIVE OF TRANSMISSOMETER DIGITAL DATA

The Level-1 processed, or validated data files containing weather-removed data are archived to CD-R annually, following final data processing. This is performed on an annual basis because transmissometers require post-calibration after removal from a site, which is performed annually. The file naming convention for the Level-1 transmissometer data files (weather removed) is:

xxxxx_T1W.yyq

where:

xxxxx = 5-character site code
T = Transmissometer data
1 = Level-1 data
W = Weather-removed data
yy = Two-digit year
q = Calendar quarter (1, 2, 3, or 4)

Calendar quarters are defined as:

1st Quarter (January, February, and March)
2nd Quarter (April, May, and June)
3rd Quarter (July, August, and September)
4th Quarter (October, November, and December)

Annual archiving of processed data files is a three-part process performed by the data analyst as described below:

CREATE README FILE AND PROCESSING NOTES

A Readme file is created, containing all site and file names sorted by monitoring network or project, a transmissometer file code key is obtained (refer to TI 4400-5000, *Transmissometer Data Reduction and Validation (IMPROVE Protocol)*), and site-specific processing notes are created.

GATHER FILES FOR ARCHIVE The Readme file, file code key file, and processing notes are placed where the processed data files (Level-1 files) reside on the ARS computer network (O:/trans/*pppppppp*/*yyyy*, where *pppppppp* is the project (e.g., IMPROVE, USFS, ADEQ, LADCO, etc.) and *yyyy* is the four-digit year).

COPY FILES TO LOCAL DRIVE AND ARCHIVE The data set is *copied* to a local hard drive directory (i.e., C:/trans data/quarterly archive) and archived to CD-R using CD-writing software. The files are then deleted from the local drive. Three CDs are created and labeled. The file copies on O:/drive are maintained there for several years.

Intermediate processing files and constants files are always maintained on the network drives as active files. They are also backed-up every evening via the network system backup.

4.3 DISPOSITION OF DIGITAL DATA

Archive diskettes, CDs, and records are distributed as follows:

- One monthly archive diskette and CD are maintained in the Data Collection Center (DCC) at ARS in a three-ring binder labeled Transmissometer Data CD Archive. The diskette and CD are placed in a plastic protector pouch with a hard copy of the archive file listing.
- Three annual archive CDs are created. One is maintained in the DCC, one is stored off-site, and the third is delivered to the Cooperative Institute for Research in the Atmosphere (CIRA).

4.4 DISPOSITION OF SUPPORTING DOCUMENTATION

Supporting hard copy documentation is archived continually. The documentation is located in the DCC in labeled three-ring binders and in labeled file cabinets.

4.4.1 Site-Based Supporting Hard Copy Documentation

Site-based transmissometer monitoring support documentation includes:

- Site specifications (refer to TI 4070-3010, *Installation and Site Documentation for Optec LPV-2 Transmissometer Systems (IMPROVE Protocol)*)
- Monitoring timelines
Data coordinator/site operator correspondence
(refer to TI 4110-3300, *Troubleshooting and Emergency Maintenance Procedures for Optec LPV-2 Transmissometer Systems (IMPROVE Protocol)*)
- Site operator log sheets (refer to TI 4110-3100, *Routine Operator Maintenance Procedures for Optec LPV-2 Transmissometer Systems (IMPROVE Protocol)*)
- ARS trip reports from yearly site visits (refer to TI 4115-3000, *Annual Site Visit Procedures for Optec LPV Transmissometer Systems (IMPROVE Protocol)*)

- Bi-monthly plots
Quarterly summary plots
Annual summary plots
(refer to TI 4400-5000, *Transmissometer Data Reduction and Validation (IMPROVE Protocol)*)

4.4.2 Instrument-Based Supporting Hard Copy Documentation

Instrument-based transmissometer monitoring support documentation includes:

- Instrument calibration (refer to TI 4200-2100, *Calibration of Optec LPV-2 Transmissometers (IMPROVE Protocol)*)
- Instrument maintenance logs (refer to TI 4110-3400, *Annual Laboratory Maintenance Procedures for LPV-2 Transmissometer Systems (IMPROVE Protocol)*)
- Field audit reports (refer to SOP 4710, *Transmissometer Field Audit Procedures*)