NADP Network Quality Assurance Plan

National Atmospheric Deposition Program

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Abbreviations

AIRMoN	Atmospheric Integrated Research Monitoring Network
AMNet	Atmospheric Mercury Network
AMoN	Ammonia Monitoring Network
ANSI	American National Standards Institute
ASQC	American Society for Quality Control
BAC	Budget Advisory Committee
CAL	Central Analytical Laboratory
CSREES	Cooperative State Research, Education, and Extension Service
DMAS	Data Management and Analysis Subcommittee
DQI	Data Quality Indicator
DQO	Data Quality Objective
EC	Executive Committee
EROS	Ecological Response and Outreach Subcommittee
FOF	Field Observer Form
FORF	Field Observer Report Form
HAL	Mercury (Hg) Analytical Laboratory
ISWS	Illinois State Water Survey
MDN	Mercury Deposition Network
MOF	Mercury Observer Form
NADP	National Atmospheric Deposition Program
NED	Network Equipment Depot
NOS	Network Operations Subcommittee
NRSP	National Research Support Project
NTN	National Trends Network
PDA	Personal Digital Assistant
PO	Program Office
QA	Quality Assurance
QAAG	Quality Assurance Advisory Group
QAP	Quality Assurance Plan
QAPP	Quality Assurance Project Plan
QAR	Quality Assurance Report
QC	Quality Control
QMP	Quality Management Plan
QMS	Quality Management System
QR	Quality Rating
SAES	State Agricultural Experiment Stations
SOP	Standard Operating Procedure
SOW	Statement of Work
USDA	United States Department of Agriculture
U.S. EPA	United States Environmental Protection Agency
USGS	United States Geological Survey

1.0 Introduction

The National Atmospheric Deposition Program (NADP) originated in October 1977. At present, it is comprised of three networks: the Atmospheric Integrated Research Monitoring Network (AIRMoN), the Mercury Deposition Network (MDN), and the National Trends Network (NTN). The NTN is the original precipitation chemistry network of the NADP. Its samples are collected on a weekly basis and are analyzed for acids, nutrients, and base cations. AIRMoN samples are analyzed for the same chemical species as the NTN, but sampling is done daily rather than weekly. AIRMoN joined the NADP in 1992. MDN samples are collected on a weekly basis and are analyzed for mercury species. MDN was established within the NADP in 1996.

This document, the NADP Network Quality Assurance Plan (QAP), forms part of the NADP's Quality Management System (QMS). That system is illustrated in Figure 1. The QMS establishes protocols for data collection, validation, and assessment within the NADP. These protocols are network independent, and apply to AIRMoN, MDN, and NTN equally. The QAP and its protocols will apply to proposed initiatives for additional networks or activities when such initiatives are incorporated into networks within the NADP. This document is intended to meet the requirements of "Part B: Collection and Evaluation of Environmental Data" of the consensus standard ANSI/ASQC E4-2004 (ANSI/ASQC, 2004) and is consistent with the U.S. EPA's *Requirements for Quality Assurance Project Plans* (U.S. EPA, 2001).

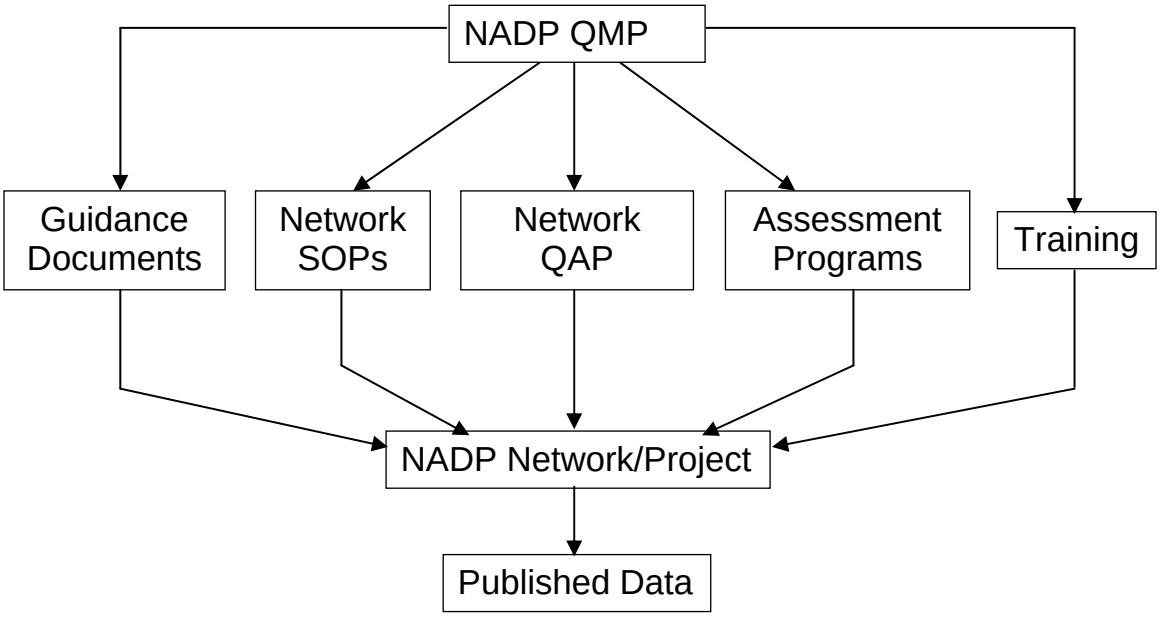

Figure 1. NADP Quality Management System (QMS) structure.

Though the terms Quality Assurance Plan (QAP) and Quality Assurance Project Plan (QAPP) may be used interchangeably, this document will use the term QAP.

The NADP Network QAP should be reviewed annually by the QA Staff at each of the NADP affiliated analytical laboratories, and by the NADP QA Manager. Revisions to this document

should be made as necessary, or at least once every three years. Reissue notices may be used if changes are not required at the end of a three year period. Following approval of any document within the NADP Quality Management System (QMS) by the NADP Executive Committee (EC), the document will be made available through the NADP website. That site may be accessed at http://nadp.isws.illinois.edu/.

2.0 Project Management

The NADP Governance Handbook defines and describes the mission of the NADP, its organization both in terms of funding and operation, and its management. The Governance Handbook provides the basis for NADP operations and its QMS. The organization and management of individual NADP affiliated analytical laboratories is defined and described in the QAP for each affiliated laboratory. The NADP Governance Handbook and the laboratory QAPs are available from the NADP website (http://nadp.isws.illinois.edu).

An objective of each NADP network is the collection of data to evaluate the amount, and the chemistry of an environmental sample. This helps characterize the geographic and temporal trends associated with particular chemical species. Data Quality Objectives (DQOs) are used to define how a network will operate, and how the data needs of its users will be met.

2.1 Data Quality Objectives (DQOs)

DQOs are the qualitative and quantitative statements that specify the required technical characteristics of the data to be collected. The EC establishes DQOs for each NADP network, with input from the NADP Subcommittees. The Statement of Work (SOW) for each laboratory will specify the required DQOs for analytical chemistry data. The Quality Assurance Advisory Group (QAAG) oversees several assessment programs to ensure that the DQOs are met.

DQOs are used to define a network in the following terms:

- The type(s) of data to collect.
- The time(s) at which data are collected.
- The location(s) at which data is collected.
- The duration of the study.
- The mechanism by which data is collected.
- The criteria for determining whether data are acceptable.

2.2 Special Training/Certification

Training is an important component of the NADP QMS. Field operators need sufficient knowledge to operate and maintain their field site. Laboratory analysts and other support staff need sufficient knowledge to perform their duties and meet QA requirements.

Training for the NADP network field operators is accomplished through several mechanisms. This includes the use of training videos, Site Operations Manuals, and an annual training course. It is the responsibility of the Program Coordinator to ensure that site operator training is available, adequate, and current. It is the responsibility of the site supervisor to ensure that the field operator has received adequate training to operate the site in accordance with NADP protocols. A Site Liaison is assigned to each network to provide guidance and assistance to the site operators. Telephone support with the Site Liaison should be available via a toll-free number.

The Laboratory Director is responsible for ensuring that analysts and technicians have sufficient training to perform their duties, and operate the analytical equipment in a safe and proficient manner. Proficiency in the operation of the equipment should be documented before unsupervised operation of the equipment is permitted.

External assessment programs should document the expertise and/or training requirements of individuals participating in those programs.

It is the responsibility of the Program Coordinator to ensure that personnel at the Program Office have sufficient knowledge to perform their duties and meet requirements of the QMS. Annual performance reviews should be used to document proficiency and encourage continued professional development.

Safety concerns are network and site specific. It is the responsibility of the site operator and the site supervisor to determine regulatory requirements, and establish appropriate safety protocols for their site. The Laboratory Director is responsible for safety protocols in the NADP affiliated laboratories.

2.3 Documentation and Records

Documents comprising the NADP QMS, a description of their content and availability, and the schedule for updating each document are listed in Table 1. These documents provide detailed information regarding specific aspects of the NADP QMS. The current, approved versions of many of these documents are available from the NADP website. Version information and page numbering is included as part of the header and footer sections in each document to avoid ambiguity.

For the purposes of the NADP QMS, Network Operations Manuals and Training videos are considered Standard Operating Procedures (SOPs). As discussed in the NADP Quality Management Plan (QMP), the use of SOPs ensures that all participants will be able to perform activities consistently over time.

Table 1. NADP QMS Documents.

Document Title	Content/Objective	Update Frequency	Availability
NADP Governance Handbook	Organization and management of the NADP.	Yearly review, update at least every 3 years	NADP website
NADP QMP	Umbrella document for NADP QMS.		
NADP Network QAP	Protocols for site selection, site operation, and data management for NADP networks. Protocols for meeting NADP DQOs.		
NADP Site Selection and Installation Manual	Criteria for site selection. Criteria for site installation. Requirements for site re-location.		
NADP Site Information Worksheet	Information required for: - new sites - major re-location of sites		
Guidelines for NADP Laboratory Reviews	Suggested topics and questions for a review of an NADP affiliated laboratory.		
Guide for New NADP Initiatives	Steps and requirements for establishing - a new network within the NADP. - new analytes and sample intervals within the NADP - new database and report procedures for new analytes, sample interval or network		
QAP for analytical laboratories	Laboratory analysis and QA protocols. Data verification and validation protocols.	contract period	
QAP for external QA programs	Protocols for external QA programs		NADP website, External entity reports and/or websites
SOPs for external QA programs	Procedures for external QA programs		
SOWs	Requirements and DQOs for work to be completed by NADP affiliated laboratories		Internal document

All equations used to generate NADP data products should be documented in SOPs. The purpose, limitations, and assumptions made with these equations should be stated clearly. The use of constant values (e.g., temperature, ideal gas law constant) in generating NADP data products should be documented and supported. These documents should be available on the NADP website.

All scripts, equations, and internally developed software should be tested prior to their use. Acceptance criteria for each equation, script, and software product should be defined prior to testing. Test results should be documented and maintained for the life of the associated data product. When changes are made to a particular script, equation, and/or software, retesting is required. Once testing is complete, test results should be documented. Test results should be traceable to a particular version of the equation, script, or software.

Changes to NADP data products should be identified clearly and described. Descriptions of changes should include:

- date of the change,
- reason for the change (e.g., change to NADP protocol), and
- affected products (e.g., annual data summary, monthly and annual precipitation totals).

Information associated with the collection of a sample in the field should be recorded in duplicate, at a minimum. This is accomplished through the use of network field forms. The duplicate copy should be maintained at the site. Original documentation should be submitted to the appropriate analytical lab and/or the NADP Program Office, as appropriate. The format of these records is specified by the network, and is documented in the Network Operations Manual. The use of electronic field forms is encouraged. Hardcopy field forms and raingage charts should be maintained at the NADP Program Office for a minimum of 5 years. If digitized, and archived, hardcopy field forms and raingage charts at the Program Office may be purged one year from the date of collection.

Lab notebooks, analyst notebooks, site liaison notebooks, instrument log books, and/or standard solution log books should be maintained and be available for review. The Lab Manager should review these records on a monthly basis. Record review is indicated by initialing and dating the records. Electronic journals and notebooks are acceptable, and should be maintained on a network drive to allow common access and to ensure backup of the file(s). File permissions should be such as to prevent inadvertent changes by non-authorized personnel.

Records associated with internal and external QA programs should be maintained indefinitely. These data should accompany the data that are submitted to the Program Office, and should be identified clearly. This includes duplicates, and field QA sample measurements. As appropriate, a report documenting results of the external QA Program should be made available to the Program Office. This report should be generated on an annual basis.

Each NADP affiliated laboratory must submit a Quality Assurance Report (QAR) to the NADP program office on an annual basis. The QAR should document the results of QA/QC activities during the year, significant equipment changes, significant protocol changes, and Method Detection Limits (MDLs) as determined for the year. The QAAG will arrange for the draft QAR to be reviewed by 3 external reviewers, one of whom may be the QA Manager. The final QAR will be announced by QAAG at the next meeting of the NADP Subcommittees. Once accepted, the final QAR will be made available on the NADP website.

Changes to network protocol as approved during NADP Committee meetings should be documented as part of the meeting minutes. Minutes from the NADP subcommittee meetings should be available on the NADP website within 6 months of the meeting. This allows meeting minutes to be approved before they are posted to the NADP website.

3.0 Data Generation and Acquisition

Table 2 lists data products and documentation associated with the operation of an NADP network. Included in the Table are the frequency with which these products are generated, and the personnel responsible for the product.

3.1 Siting Criteria

The *NADP Site Selection and Installation Manual* should be consulted when selecting the location for an NADP monitoring station. Sites will be classified based on the population density within 15km of the site. Exceptions to siting criteria require approval of the QA Manager, the NADP Network Operation Subcommittee (NOS) Chair, and the NOS Vice Chair. All sites should endeavour to meet NADP siting criteria on a continual basis. Compliance with siting criteria will be documented as part of the Site Systems and Performance Survey program.

3.2 Sample Collection and Analysis

Sample collection should follow protocols detailed in the Network Operations Manual. Deviations from these protocols may impact sample quality and should be avoided. Changes to approved protocols require approval of NOS. NOS meets twice a year, once in the Spring, and then again in the Fall.

Sample processing and analysis should follow protocols detailed in the Analytical Laboratory's QAP and SOPs. Deviations from these protocols could impact sample quality and should be avoided. Changes to approved protocols require approval of NOS. Analytical laboratories affiliated with the NADP must have a QAP. That document should consider the following items:

- Testing, inspection, and maintenance of instruments and equipment
- Calibration and calibration frequency of instruments and equipment

- Inspection and acceptance of instruments and equipment
- Inspection and acceptance of consumables
- Quality Control (QC) activities for each analytical method
- Traceability of records to a particular instrument, analyst, and/or technician

3.3 Data Management

Each NADP network must have a documented control mechanism for detecting and correcting errors in the data. To prevent data loss and accidental changes to data, electronic records must be stored on secure electronic media following accepted data management practices. Metadata should accompany data files. Metadata should include the data format, data fields with associated units, and other information that may inform the data user about the nature of the data, their quality, or their use. Data should be stored permanently, and should be backed up on a regular basis. Data edits must be documented and tracked (e.g., date of change, time of change, personnel making the change). Provisional and raw data will not be made available for general distribution.

4.0 Assessment and Oversight

The goals of the NADP quality assessment programs are to verify that QAPs and SOPs are followed, and that DQOs are being met. Table 3 lists the quality assessment programs used by the NADP and its affiliated laboratories, including program frequency, personnel who oversee the programs, required documentation, and corrective actions that are required when a problem is found

External assessment programs are conducted by the U.S. EPA and the USGS, and are an integral part of the NADP QMS. The U.S. EPA funds the Site Systems and Performance Survey program. The Precipitation Chemistry Quality Assurance Project at the USGS operates several programs including: Field-Audit, System-Blank, Blind-Audit, Co-location Sampler, and Interlaboratory –Comparison programs. These programs help evaluate both field and laboratory operations. Details regarding each of these programs may be found in the corresponding QAP or SOP. The USGS programs are documented in two USGS Open-File reports (USGS, 2005; USGS, 2007). These documents may be accessed from the USGS Precipitation Chemistry Quality Assurance Project website (http://bqs.usgs.gov/precip/). Documentation associated with the U.S. EPA program may be accessed from the NADP website.

Table 2. NADP Data Products and Documentation.

Location	Responsible Personnel	Data Product	Frequency	Reference
Affiliated lab	analyst	sample chemistry	network dependent	Analytical laboratory QAP and SOPs
		internal validation samples (e.g., blanks, blinds, control samples, duplicates, ion balance, reagent checks, spikes, splits, surrogates)	protocol dependent	
		external field and inter-laboratory comparison QC samples)		External QA Program SOP
		specifications for consumables (e.g., chemicals, DI water, sample bottles, calibration gases)	annual review, updates as necessary	Analytical laboratory SOP
	QA staff	QA Report	annually	Network QAP, Analytical laboratory QAP
		SOPs	annual review, updates as necessary	Analytical laboratory QAP
		equipment calibration documentation/certification	annual re-calibration/re-certification	
		specifications for consumables	annual review, updates as necessary	
	Network Site Liaison	Site Operations Manual	annual review, updates as necessary	Network QAP, Analytical Laboratory QAP
		Training Materials		
		Training Course		
		specifications for field consumables		Network Operations Manual
	Data Manager	control mechanism for errors	annual review, updates as necessary	Network QAP, Analytical Laboratory QAP
		specifications for consumables (e.g., storage media)		
		specifications for hardware and software		
		data standards		

Table 2. NADP Data Products and Documentation - continued.

Location	Responsible Personnel	Data Product	Frequency	Reference
Field Site	Site Supervisor	Site Information Worksheet (SIW)	prior to startup, prior to site re-location	NADP Site Selection and Installation Manual
		photos		
		site sketch		
	Site Operator	field sample	network dependent, see Site Operations Manual	Network Operation Manual
		field form		
		field QA sample	annual for participating sites	External QA Program SOP
	external field survey team	site exit report	each site once every 3-4 years	External Systems and Performance Survey QAP
		photos	with site survey	
		site sketch		
		equipment calibration documentation/certification	annual re-calibration/re-certification	
Program Office	Project Site Liaison	data summary reports to site personnel	annually	Network QAP
		Network summary report		
	Database Manager	NADP website	Content updated as needed	
	QA Manager	NADP QMP	annual review, updates at least once every 3 years, approval by NADP Subcommittees and EC	QMP
		NADP Network QAP		
		NADP Governance Handbook		
		affiliated laboratory review report		
		QMS review report		
		NADP Site Selection and Installation Manual		
		NADP Site Information Worksheet		
		Guide for New NADP Initiatives		

Table 3. NADP Assessment Programs.

Type	Frequency	Personnel	Documentation	Response and Corrective Action	Conflict Resolution
Proficiency	as part of training	New personnel, or personnel new to a piece of equipment or new to a protocol	Annual performance reviews Training records	Continued supervision until proficiency criteria are met	Laboratory Director Program Coordinator
Acceptance, Laboratory Equipment	with purchase of new equipment	Analyst and QA staff	Laboratory QARs (major changes only)	Not approved for network use until acceptance criteria are met	Laboratory Director QA Manager Program Coordinator
Acceptance, Reusables	as needed, items that are cleaned (e.g., bottles, buckets, sample train)	Analyst and QA staff	Laboratory QARs NOS meeting minutes QAAG reports	Discontinue use until acceptance criteria are met	Laboratory Director QA Manager Program Coordinator
Acceptance, Consumables	with new consumables (e.g., bags, buckets, filters, reagents)	Analyst and QA staff	Laboratory QARs NOS meeting minutes QAAG reports	Discontinue use until acceptance criteria are met	Laboratory Director QA Manager Program Coordinator
Site Systems and Performance Survey	every 3 years	Survey personnel under contract with U.S. EPA	1) compliance with siting criteria 2) compliance with field operations manual and SOPs 3) verification of equipment operation Written reports to QA Manager and U.S. EPA Program Officer.	Site Operator and Site Supervisor in coordination with Site Liaison and QA Manager. Document corrective actions that can be made, and when those corrective actions are made.	QA Manager U.S. EPA Program Officer
Data Quality	as needed (determined by QAAG, Executive Committee, Program Coordinator, or DMAS)	QA Manager in coordination with individuals appointed by QAAG or DMAS	1) documentation of data validation and verification processes in QAPs and SOPs. 2) compliance with QAPs and SOPs. 3) data of sufficient quality to meet DQOs and SOW requirements Report format determined by Review requester.	QA Manager proposes corrective actions. DMAS Chair approves corrective actions.	DMAS Chair NADP EC Chair
Interlaboratory-Comparison	monthly to participating laboratories	USGS Precipitation Chemistry Quality Assurance Project	Results posted to an access controlled website, and published in USGS reports.	USGS identifies/proposes corrective actions.	Program Coordinator NADP EC Chair
Field QA Samples	annual at participating field sites	USGS Precipitation Chemistry Quality Assurance Project			QA Manager Program Coordinator NOS Chair

Table 3. NADP Quality Assessment Programs - continued.

Type	Frequency	Personnel	Documentation	Response and Corrective Action	Conflict Resolution
Collocated equipment	as needed (determined by QAAG, Executive Committee, Program Coordinator, or DMAS)	USGS Precipitation Chemistry Quality Assurance Project, QA Manager in coordination with individuals appointed by QAAG or NOS	Report to NOS. Results posted to an access controlled website, and published in USGS reports.	USGS and/or QA Manager identifies/proposes corrective actions.	QA Manager Program Coordinator NOS Chair
Laboratory	On-site, every 3 years, follow-up within one year	Up to 6 reviewers including: Technical systems reviewer(s), Data quality and management reviewer(s), and Team leader PO QA Manager as an observer	Written report 1) documentation and implementation of QAP and SOPs 2) compliance with QAP and SOPs 3) appropriateness and effectiveness of activities with regard to the SOW 4) data of sufficient quality to meet DQOs and SOW requirements Report presented to QA Manager, NADP EC Chair, Program Coordinator, and Lab Director	Lab Director formulates response and timetable for corrective actions. NOS and DMAS approve the response. Final review report and approved response sent to Review Team, Program Coordinator, and Executive Committee.	QA Manager Program Coordinator NADP EC Chair
Quality Management System (QMS)	External review every 3 years on-site, or via remote communication	3 member team appointed by NADP EC Chair	Written report to QAAG, Executive Committtee, subcommittee Chairs documenting: 1) compliance with QMP 2) implementation of QMP procedures 3) compliance of data with DQOs 4) documentation and implementation of the QMS	QA Manager formulates response and timetable for corrective actions.	Program Coordinator NADP EC Chair
Program	4th year of 5 year funding, or as necessary	3 peer scientists, one may be a CSREES representative	Written report on multi-state activities: 1) quality, technical feasibility, and validity of activity 2) relevance to stated goal 3) likelihood of achieving goal 4) responsiveness to stakeholder needs 5) extent of multidisciplinary, multi-state collaboration	NADP EC Chair selects individuals to formulate a response and timetable for corrective actions.	NADP EC Chair Administrative advisors CSREES National Program Leader

The NADP QMS is not a static system. As opportunities are found to enhance a network's ability to meet the DQOs, QA activities must adapt as well. This may necessitate the adoption of a new assessment program, or changes to an existing assessment program. Assessment programs may be ongoing (e.g., system blanks), periodic (e.g., laboratory reviews), or one time occurrences (e.g., testing of candidate equipment for use in a network). Results of these programs should be available to NADP Subcommittee members. Documentation may include annual QARs, or presentation at NADP Subcommittee meetings, provided program results are appropriately discussed in the meeting minutes.

5.0 Data Validation and Usability

Data integrity can be compromised during data entry, electronic capture from automated instruments, or when transferred between different computers or different databases. Procedures for ensuring the accuracy and reliability of data products within each NADP network are a priority and should be documented. Data verification methods may include double entry, manual checking of a fixed percent of data, and computer-automated checking of the entire data record. Data products should be evaluated for bias, precision, completeness, and representativeness with regard to the DQOs.

5.1 Data Review, Verification, and Validation

Two pass verification, also called double data entry, may be used to ensure accuracy in transcribing information to an electronic database. Whenever possible, the process of transferring data between systems should be automated, and should include checksum functions.

As part of the data review process, data should be compared against historic records for the site, and against adjacent records. Adjacent records include both spatial (i.e., adjacent sites) and temporal (i.e., immediately before and after) records. Suspect values should be identified and investigated for possible causes. Resolution of any problems found should be documented.

The Site Liaison should resolve incomplete and/or inaccurate information on field forms in consultation with the site operator. Persistent problems with the completion of these forms should be addressed as part of field operator training. Changes to field records, whether at the analytical laboratory or the Program Office, should be minimized. This approach ensures that network integrity extends throughout the entire network.

Preliminary data may be provided to site operators and site supervisors as an additional verification step. Field forms maintained at the site can be used to verify complete and accurate transcription of field records by the analytical laboratory. This has the added benefit in that it provides feedback to the site relating to the site's operation. Persistent problems with sample collection can be identified and resolved.

Deviations from sample protocol, equipment malfunction (field or laboratory), and sample handling problems should be noted. The type, magnitude, and duration of these problems will

help qualify the data. Criteria for qualifying data are network specific. One suggested approach for qualifying NADP data is the use of data quality rating codes.

Changes to the structure of the database used to store data from a network, or to the database platform require special care. Data integrity must be preserved. Prior to transitioning to the new database, its data must be verified against the old database. Ideally, the entire data record should be compared and any discrepancies resolved.

5.2 Data Quality Rating Codes

Data validation may include the assignment of a quality rating (QR) code to each sample. QR codes provide the data user with a means for deciding which data to use for a particular analysis. Data of the highest quality, that is, samples that had no problems during collection, handling, and analysis are assigned a quality rating code of "A." Data with a few minor problems are assigned a quality rating code of "B." Data of the lowest quality are considered invalid are assigned a quality rating code of "C."

Criteria for each quality rating code are network specific and should be approved by the NADP Network Operations Subcommittee (NOS) and the NADP Data Management and Analysis Subcommittee (DMAS). Items to consider when developing the criteria include: deviations from sampling protocol, the presence of physical contamination, the nature of the physical contamination, handling contamination, sample duration, and equipment operation. QR codes should be assigned by the analytical laboratory as part of the data review, verification, and validation process. The quality rating codes may be reviewed by the Program Office as part of data transmittal and acceptance, but should not be changed without consultation and resolution with the laboratory. Changes to a sample's quality rating code should occur at the analytical laboratory following investigation, and should be documented.

5.3 Data Availability

Publicly available NADP data, data products, and associated reports are maintained in an on-line repository. Access to that site is not restricted. The site may be accessed at http://nadp.isws.illinois.edu. DMAS approves data formats that are available on-line. These formats are compatible with industry standards. Data may be made available in an alternate format or via alternate means by special request.

Preliminary data should not be made available for general use, and should not be posted to a website with external public access. Requests from internal users, including site supervisors and funding agencies, for preliminary data will be honored whenever possible. That data will be provided in a standard format as determined by the analytical laboratory. As the data is preliminary, the format of the data may differ from the format used by the Program Office.

5.4 NADP Website

The Program Office should maintain a website for the NADP that is freely accessible. This site will serve as the repository for the following:

- Data and data products
- QA documents and reports
- Subcommittee meeting minutes
- Public outreach activities
- Network specific announcements and information

Links should be provided to websites maintained by the NADP affiliated laboratories, and the external QA programs. Data queries should be supported to allow the data user to select data based on network, date, and location. A brief citation should accompany each response to a data request. This text should be cited when NADP data is included in a report, journal article, or other publication.

Appendix: Terms

accuracy – systematic or persistent distortion of a measurement process that causes errors in one direction (i.e., the expected sample measurement is different than the sample's true value).

acidic compound – a chemical compound capable of transferring a hydrogen ion in solution.

acidic precipitation – precipitation with **pH** below approximately 5.0.

ANSI/ASQC E4-2004 – "Specifications and Guidelines for Quality Systems for Environmental Data Collection and Environmental Technology Programs."

assessment – the evaluation process to measure the performance or effectiveness of a system and its elements; this all-inclusive term denotes evaluations, audits, or reviews.

atmospheric deposition – removal of particles and gases from the atmosphere via fallout or precipitation.

audit – a systematic and independent examination to determine whether practices comply with documented **QAPs** and **SOPs**, and that these practices are implemented effectively and are suitable to achieve stated objectives.

base cations – chemical compounds capable of accepting a hydrogen ion in solution; here typically defined as the compounds calcium, magnesium, potassium, and sodium.

bias – see **accuracy.**

comparability – a measure of the confidence with which one data set can be compared to another.

completeness – a measure of the amount of valid data obtained from a measurement system compared to the amount that was possible when **SOPs** are followed.

data quality assessment – scientific and statistical evaluations of validated data to determine if they are of the right type, quality, and quantity to support their intended use.

Data Quality Indicator (DQI) – quantitative statistics and qualitative descriptors used to interpret the degree of acceptability or utility of data to the user: principally **bias**/**accuracy**, **precision**, **comparability**, **completeness**, and **representativeness**.

Data Quality Objective (DQO) – qualitative and quantitative statements that specify the technical characteristics of data that are required to support the intended purposes and uses of the data. May include tolerances on the **Data Quality Indicators.**

deposition – see **atmospheric deposition**.

environmental data – any measurements or information that describe environmental processes, location, or conditions; ecological or health effects and consequences; or the performance of environmental technology. Environmental data include information collected directly

from measurements, produced from models, and compiled from other sources such as databases or the literature.

free acidity – free hydrogen ions in solution not bound in other chemical compounds.

metadata – data and other information about another data set.

method detection limit (MDL) – the minimum concentration of a substance that can be measured and reported with 99% confidence that the analyte concentration is greater than zero. It is based on protocols in 40CFR part 136.

nutrient – chemical compounds that enhance the growth of organisms.

peer review – a critical review of a specific scientific and/or technical product to corroborate scientific defensibility, which may include an in-depth assessment of assumptions, calculations, extrapolations, alternative interpretations, methodology, acceptance criteria, and conclusions pertaining to the specific scientific and/or technical products and of the supporting documentation.

performance evaluation – a quantitative test to determine whether a measurement system can obtain results that meet tolerance limits.

pH – a measure of free hydrogen ion in solution on a logarithmic scale.

precipitation – liquid water that falls from the atmosphere, generally snow, rain, and ice, but not fog.

precipitation chemistry – chemical changes occurring in a liquid state in the atmosphere.

precision – a measure of mutual agreement among individual measurements of the same property, usually under prescribed similar conditions, expressed generally in terms of the standard deviation.

Quality Assurance (QA) – an integrated system of management activities involving planning, implementation, documentation, assessment, reporting, and quality improvement to ensure that a process, item, or service is of the necessary type and quality expected by the client; generally implemented after an activity has occurred.

Quality Assurance Plan (QAP) – a formal document describing in comprehensive detail the necessary QA, QC, and other technical activities that must be implemented to ensure that the results of the work performed will satisfy stated performance criteria.

Quality Control (QC) – the overall system of technical activities to measure the attributes and performance of a process, item, or service against defined standards to verify that they meet the stated requirements established by the customer; operational techniques and activities that are used to fulfill requirements for quality; generally implemented while activities are being performed.

quality improvement – a management program to improve the quality of operations using a formal mechanism to encourage worker recommendations, timely management evaluation, and feedback or implementation.

Quality Management Plan (QMP) – a document that describes the quality system in terms of the organizational structure, functional responsibilities of management and staff, lines of authority, and required interfaces for those planning, implementing, and assessing all activities conducted.

Quality Management System (QMS) – the overall management system of the organization that determines and implements the quality policy. Includes strategic planning, allocation of resources, and other systematic activities (e.g., planning, implementation, documentation, and assessment) pertaining to the quality system.

record – a completed document that provides objective evidence of an item or process. Records may include photographs, drawings, magnetic tape, and other data recording media.

representativeness – a measure of the degree to which data accurately and precisely represent the characteristic of a population, parameter variations at a sampling point, a process condition, or an environmental condition.

specifications – a document stating requirements and that refers to or includes drawings or other relevant documents. They should indicate the means and criteria for determining conformance.

Standard Operating Procedure (SOP) – a written document that details the method for an operation, analysis, or action with thoroughly prescribed techniques and steps. The officially approved method for performing certain routine or repetitive tasks.

Statement of Work (SOW) – a written document detailing the procedures and deliverables required to meet contract obligations.

wet deposition – removal of particles and gases from the atmosphere via precipitation.

Appendix B: References

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