

# **Atmospheric Integrated Research Monitoring Network Site Operations Manual**



National Atmospheric Deposition Program

For information about the National Atmospheric Deposition Program (NADP) contact:

NADP Program Office  
Illinois State Water Survey  
University of Illinois at Urbana-Champaign  
2204 Griffith Drive  
Champaign, Illinois 61820-7495

URL: <http://nadp.isws.illinois.edu>  
e-mail: [nadp@isws.illinois.edu](mailto:nadp@isws.illinois.edu)  
phone : 217-333-7871

## **Acknowledgements**

This manual was revised with guidance from the Quality Assurance Advisory Group and the Network Operations Subcommittee of the National Atmospheric Deposition Program. Their assistance was invaluable.

The authors wish to thank the following individuals for their efforts:

Rick Artz, National Oceanic and Atmospheric Administration, Air Resources Laboratory  
Tracy Dombek, Illinois State Water Survey  
Eric Hebert, Environmental Engineering & Measurement Services, Inc.  
Maria Jones, Environmental Engineering & Measurement Services, Inc.  
Brian Kerschner, Illinois State Water Survey  
Melissa Puchalski, U.S. Environmental Protection Agency  
Chris Rogers, Amec Foster Wheeler  
Michael Snider, Illinois State Water Survey  
Richard Tanabe, Environment and Climate Change Canada  
Greg Wetherbee, United States Geological Survey

## Document Change History

Version	Description	Effective Date
2.3	Updated Tables 1, 3, 9, and 10. Added new Table 8. Updated Training information. Updated protocol for lid seal replacement. Updated FAQ to include statements about Thies sensor with ACM collector, special studies, and SC115 flash drive. Updated FAQ to clarify procedure for handling frozen precipitation samples.	01/2017
2.2	Major revision from 1994 document.	03/2015

## Abbreviations

AIRMoN	Atmospheric Integrated Research Monitoring Network
AMNet	Atmospheric Mercury Network
AMoN	Ammonia Monitoring Network
CAL	Central Analytical Laboratory
FOF	Field Observer Form
FORF	Field Observer Report Form
HAL	Mercury (Hg) Analytical Laboratory
MDN	Mercury Deposition Network
MOF	Mercury Observer Form
NADP	National Atmospheric Deposition Program
NED	Network Equipment Depot
NOS	Network Operations Subcommittee
NTN	National Trends Network
PDA	Personal Digital Assistant
PO	Program Office
QA	Quality Assurance
QC	Quality Control
SAES	State Agricultural Experiment Stations
SOP	Standard Operating Procedures
U.S. EPA	United States Environmental Protection Agency
USGS	United States Geological Survey

## Introduction

The Atmospheric Integrated Research Monitoring Network (AIRMoN) joined the National Atmospheric Deposition Program (NADP) in 1992. Prior to 1992, many AIRMoN sites were part of the Multi-state Atmospheric Power Production Pollution Study (MAP3S) network. The MAP3S network was operated by the Department of Energy from 1976 through 1991. In 1991 the National Oceanic and Atmospheric Administration Air Resources Laboratory assumed responsibility for the network.

AIRMoN sites collect precipitation samples within 24 hours of the start of a precipitation event. Data from these samples are important in the development and testing of models for atmospheric processes.

Each site in the network is configured with an automated precipitation collector and a raingage. Pseudo-event based samples are collected for analysis. That is, samples are collected each morning following a precipitation event. Site operators follow standard operating procedures to ensure data comparability and representativeness throughout the network. All samples are shipped to the Central Analytical Laboratory (CAL) at the University of Illinois in Champaign, Illinois for analysis. Provided sufficient volume is available, samples are analyzed for free acidity ( $H^+$  as pH), conductance, calcium ( $Ca^{2+}$ ), magnesium ( $Mg^{2+}$ ), sodium ( $Na^+$ ), potassium ( $K^+$ ), sulfate ( $SO_4^{2-}$ ), nitrate ( $NO_3^-$ ), chloride ( $Cl^-$ ), bromide ( $Br^-$ ), ammonium ( $NH_4^+$ ), and ortho-phosphate ( $PO_4^{3-}$ ).

Following review of the data for completeness and accuracy, data are made available on the National Atmospheric Deposition Program (NADP) website. Data are flagged for equipment failure, sample mishandling, and contamination. A map indicating active and inactive AIRMoN sites is available on the NADP website, as is the complete data record for each site in the network. Collection of AIRMoN samples changed from using clean, re-used buckets to bag lined buckets on 1 October 2014.

Quality Assurance/Quality Control (QA/QC) activities ensure integrity throughout the network. The U.S. Environmental Protection Agency (EPA) administers an external QA program as further check of the network and its operation.

## Site Selection and Site Re-location

Sites in the NADP networks are selected to quantify wet deposition in major physiographic, agricultural, aquatic, and forested areas within states, regions, and ecoregions. Sites are located away from urban areas and point sources of pollution, e.g., coal-fired power plants. Siting criteria are presented in detail in the *NADP Site Selection and Installation Manual*. That document is available on the NADP website (<http://nadp.isws.illinois.edu>).

Site re-location should be discussed with the Site Liaison to ensure that the new location meets NADP siting criteria. Additional information regarding site re-location is available in the *NADP Site Selection and Installation Manual*.

## Approved Equipment

Table 1 lists the equipment that has been approved by the NADP for use in AIRMoN. Periodically, equipment is tested and evaluated for inclusion in the network. The NADP website should be consulted for the most current list of approved equipment. Questions regarding the list of approved equipment may be directed to the Site Liaison for the network. Contact information for each of the active manufacturers, and for the Site Liaison is included in the Contact List section of this document.

**Table 1.** NADP Approved Equipment for use in the AIRMoN.

Equipment	Manufacturer	Model Number
precipitation collector	Aerochem Metrics, Inc.	301
precipitation collector	Loda Electronics Company	2001
precipitation collector	N-CON Systems	Atmospheric Deposition Sampler
raingage (primary)	ETI Instrument Systems, Inc.	NOAH IV
	OTT Hydromet	OTT NADP Pluvio/Remote Monitoring Module
	OTT Hydromet	OTT Pluvio <sup>2</sup> /Remote Monitoring Module
	OTT Hydromet	OTT Pluvio <sup>2</sup> - L/Remote Monitoring Module
	Belfort Instrument	5-400
	NovaLynx	260-2510
raingage (backup)	Belfort Instrument	B5-780*
wind screen	NovaLynx	260-952 (Alter-Type), or equivalent

\* equipment to be retired by 31 December 2011 in the NADP networks

## Site Operation

Four entities have direct responsibility for the operation of a monitoring site: the Site Sponsor, the Funding Agency, the Site Operator, and the Site Supervisor. The individuals in these roles are responsible for the operation of the site in accordance with standard AIRMoN procedures and criteria.

The Site Sponsor may provide in-kind services for the operation of the monitoring site. This may include: site location, site facilities, and/or a site operator. The Funding Agency provides funds for the operation of a site. This may include: equipment, personnel, chemistry, utilities, shipping, and other expenses related to operation of the site. In some cases the Site Sponsor and the Funding Agency are the same.

Tables 2 and 3 indicate the responsibilities of the Site Supervisor and the Site Operator, respectively, and the frequency of those activities.

It is recommended that each site identify a Backup Operator. The Backup Operator performs Site Operator duties when the Primary Operator is not available.

Excluding travel to and from the site, daily activities associated with operation of the site may take approximately 90 minutes to complete.

In order to maintain uniformity throughout the network, the wet deposition sample should be processed each morning at 9:00 following a precipitation event. Inclement weather and the availability of personnel may prohibit the sample from being processed on this schedule. Every effort should be made to maintain this schedule.

**Table 2.** Responsibilities of the Site Supervisor.

<b>Activity</b>	<b>Frequency</b>
Ensure conformance with AIRMoN procedures	As needed
Ensure conformance with AIRMoN siting criteria	As needed
Review site data	Monthly
Review data reports and summaries	Annually
Arrange for resources to correct problems	As needed

**Table 3.** Responsibilities of the Site Operator.

<b>Activity</b>	<b>Frequency</b>
Inspect site and equipment	Daily*
Verify sensor operation	Daily*
Collect and process sample	Daily*
Collect and process raingage data	Daily*
Complete FOF	Daily*
Maintain/stir anti-freeze solution in backup raingage	Daily*, when winterized
Clean and empty dry side bucket, if present	Daily*
Clean collector surfaces	Daily*
Clean and inspect collector lid seal	Daily*
Ship sample(s) and FOF(s) to the CAL	Weekly**
Process Field Blank QA sample	Monthly
Verify equipment is secure and level	Monthly
Replace dry side bucket, if present	Annually, or as needed
Troubleshoot equipment	As needed
Repair and maintain equipment	As needed
Replace/upgrade equipment	As needed
Winterize/Summerize equipment	Annually (location dependent)
Participate in External Site Performance and Systems Survey	Once every 3-4 years

\* Every morning following a precipitation event.

\*\* 10 calendar day maximum from sample off date

This document does not address safety issues that may result from the operation and maintenance of a monitoring site. It is the responsibility of the site operator and the site supervisor to determine regulatory requirements, and establish appropriate safety protocols.

## Daily Activities

As indicated in Table 3, some activities associated with the operation of an AIRMoN site must be performed on a daily basis. Completion of the daily tasks on a regular schedule is essential. Detailed instructions for many of the daily activities are included in separate Standard Operating Procedure (SOP) documents. On-line video instruction materials detailing these same activities are in production.

When the wet-side bucket contains frozen precipitation, the sample may be weighed, but it should be allowed to melt completely before decanting the sample into the NADP sample bottle. “Clean” snow/ice will melt slower than snow/ice which contains higher concentrations of chemicals. The sample should be allowed to melt in the sealed bucket (i.e., bucket lid in place and secure), at room temperature or inside a refrigerator. Placing the wet-side bucket on a radiator to melt the sample quicker may cause some chemicals in the sample to volatilize, and may melt the bucket.

Samples should be stored in a refrigerator (temperature  $\leq 40^{\circ}\text{F}/4^{\circ}\text{C}$ ) until ready to ship to the CAL for analysis. Typically, samples are shipped once every 7 days and are shipped early in the week. This ensures that the samples arrive at the laboratory in a timely manner. Bottle caps should be taped using the white tape provided by the CAL.

## Weekly Activities

Ship AIRMoN samples and completed FOFs to the CAL for analysis. Samples should be shipped using insulated shipping boxes with ice packs (both provided). Boxes should be shipped either Monday or Tuesday of each week to ensure timely arrival at the CAL. Shipping delays will impact sample chemistry. The time between sample date off and the shipping date should not exceed 10 days.

The wet-side (sample) bucket and sample bag should be replaced at least once every 170 hours (7 days and 2 hours). This helps ensure the integrity of the next sample that is collected.

## Monthly Activities

Field Blank QA samples should be processed once a month. Samples may be processed any time during the month provided 1) no precipitation has occurred since the last sample bucket was deployed, and 2) all collector openings during that time can be explained and result in less than 1 hour of total exposure of the sample bucket. Additional details are available in the *AIRMoN Field Blank Sample SOP*.

## Field Observer Form

When processing the weekly precipitation sample an AIRMoN Field Observer Form (FOF) must be completed. Figure 1 illustrates that form. The Site Operator, i.e., the person processing the sample, should complete Blocks 1-11 on the form. Incomplete forms require additional resources to process, and require a phone call to the Site Operator to gather the missing information. It is recommended that the Site Operator verify that the form is complete and that the information is legible before sending the FOF, and the sample, to the CAL.

**ATMOSPHERIC INTEGRATED RESEARCH MONITORING NETWORK**  
**FIELD OBSERVER FORM – BAG SAMPLE**

Send Completed Form with Each Sample to:  
Central Analytical Laboratory  
Dock B, 2204 Griffith Drive  
Champaign, IL 61820

Problems? Call the CAL at  
1-800-952-7353  
e-mail: airmon@isws.illinois.edu  
or fax: 217-333-0249

► **Complete these fields before sample deployment.**

1. SITE Place barcode sticker here or write in Site ID.  
**PO01**

2. OBSERVER  
Print name **N.S. Liaison** Initials **N S L**

3. SHIPMENT DATE  
MO DAY YR  
**1 2 0 7 1 5**

4. SAMPLE PERIOD  
ON MO DAY YR 0001-2400 YES NO  
**1 2 0 2 1 5 0 9 1 5 X**  
OFF **1 2 0 3 1 5 0 9 1 5 X**  
Was any precipitation occurring 15 minutes before or after the time the bucket was changed? Check YES or NO for the time on and time off.

5. SITE OPERATIONS  
Check YES or NO for all samples. If NO for Item 1 or 2, describe in Block 11 and call CAL.  
 1. The sensor heater and motor box operated properly and the event recorder indicates the collector lid opened and closed promptly for each precipitation event.  
 2. Raingage operated properly during sampling period.  
 3. Collector opened and closed at least once during sampling period.  
W = winterized S = summerized 4. Stick Gauge Condition  5. E-gage Condition

7. SAMPLE WEIGHT  
Pre-deployment: **1 9 7 1 . 7** Bag + Bucket + Prep Lid  
CAL Prep Lid: **1 6 9 . 1**  
Post-deployment: **2 1 2 2 . 0** Bag + Bucket + Sample + Field Lid  
**1 6 8 . 0** CAL Field Lid  
**1 8 0 2 . 6** Bag + Bucket  
**1 5 1 . 4** Sample Weight (grams)  
Sample Weight (grams) X 0.00058 inches/gram = **0 0 . 0 9** ← Do these values agree within ± 10%? → **0 0 . 0 9**  
Sample Depth (inches) YES  NO  (If NO, reweigh) NWS gage depth (inches)

6. SAMPLE CONDITION Check YES or NO for all samples. If YES, explain and quantify in Block 11.  
 1. Bird droppings  3. Soot/ash/dirt particles  
 2. Cloudy or discolored  4. Insects/animal matter  
 5. Leaves/twigs/pollen/plant matter  
 6. Handling contamination  
 7. Other

8. PRECIPITATION RECORD  
Type **T R R W S S W L Z L Z R A S P S G I C I P B S E F K H D B D B N + -**  
E-gage depth (inches) **0 0 . 0 9**  
Do these values agree within ± 10%? → **0 0 . 0 9**  
Sample Depth (inches) YES  NO  (If NO, reweigh) NWS gage depth (inches)

9. SAMPLE CHEMISTRY  
Only for Sample Weight greater than 50 grams  
MO DAY YR **1 2 0 3 1 5**  
Standard from bottle **7 5 . 0** + Standard Measured **7 4 . 8** = Correction Factor **1 . 0 0 3**  
Distilled Water (µS/cm) **1 . 8** x Correction Factor **1 . 0 0 3** = Check Sample Measured **2 2 . 0** = Check Sample Corrected **2 2 . 1**  
Precipitation Sample Measured **1 5 . 3** = Precipitation Sample Corrected **1 5 . 3**  
pH **4 . 4 9** \*Is check sample within range? (if not, call CAL) \*Check Sample pH **4 . 5 6**

10. SUPPLIES Circle if needed, until received.  
 Bag Sampling  Field Chemistry  Shipping   
 Sample Bags  Vials  Field Forms   
 Bucket Lids  Kim Wipes  Packing Tape   
 Wire Ties  White Tape  Used Supply   
 Gloves S M L  Return Pack   
 Other: \_\_\_\_\_  
(Specify supply needed)

11. REMARKS – Comment on bag condition (leaks, holes, etc.) after decanting.  
**Pile of treated lumber railroad ties 60m S of collector removed.  
Tree 30m SE of collector trimmed.**

CAL USE ONLY  
Temp (°C)   Type   
Leak  SP  SL

White Copy - Analytical Lab      Yellow Copy - Site Operator      Rev. 9-14

Figure 1. Example of a Completed AIRMoN Field Observer Form.

Page 10 of 21

The precipitation type as indicated in Block 8 of the Field Observer Form (FOF) is based on the National Weather Service weather codes. Table 4 identifies the codes.

**Table 4.** National Weather Service Weather Codes.

Code	Description
A	Hail
BD	Blowing Dust
BN	Blowing Sand
BS	Blowing Snow
D	Dust
E	Sleet
F	Fog
H	Haze
IC	Ice Crystals
IP	Ice Pellets
K	Smoke
L	Drizzle
R	Rain
RW	Rain Showers
S	Snow
SG	Snow Grains
SP	Snow Pellets
SW	Snow Showers
T	Thunder
ZL	Freezing Drizzle
ZR	Freezing Rain
+	Heavy Amounts
-	Light Amounts

### Non-standard Operation

An undefined sample results when the wet-side bucket is exposed during dry weather for an extended period of time without precipitation. This may occur when the sensor fails to heat, or when the collector motorbox malfunctions or fails. Such conditions should be noted in Block 11 of the FOF.

<p>11. REMARKS</p> <p><i>Sensor failed. Collector found open when arrived at site to collect sample. No precipitation within the past hour.</i></p> <div style="text-align: right;">  </div>
---

Rev. 11-12

**Figure 2.** FOF Block 11 indicating non-standard sampling.

## Field Chemistry

Conductivity and pH are measured as part of field chemistry. Sample should be decanted from the bucket to the NADP sample bottle first. Decanting to the pH/conductivity vials from the sample bottle is easier than decanting from the bucket. The sample, sample bucket, bag, and lid should always be weighed (section 7, **Sample Weight**, of the FOF) before sample is decanted.

Refer to the SOP for the measurement of conductivity and pH for the proper protocol for these measurements. As indicated by Table 5, sample volume will determine whether field chemistry can be performed.

**Table 5.** AIRMoN Sample Processing as a Function of Sample Volume.

Sample Volume	Field Chemistry	Sample Processing
< 50 mL*	No	ship entire sample to the CAL for analysis
50 mL	Yes	use up to 15 mL of sample for field measurement of pH and conductivity, ship remaining sample to the CAL for analysis
50 -250 mL		measure pH and conductivity in the field, ship remaining sample ( $\geq 35$ mL) to the CAL for analysis
> 250 mL		measure pH and conductivity in the field, ship up to 250 mL (volume of sample bottle) of sample to the CAL for analysis

\* Prior to April 2013, samples of volume less than 10 mL were discarded without analysis.

## Other Activities

Some activities associated with the operation of an AIRMoN site are performed less frequently than the daily activities that were discussed earlier in this document. Instructions for completing these activities (e.g., lid seal replacement, sensor replacement, motorbox replacement) are documented in SOPs and are available from the NADP website (<http://nadp.isws.illinois.edu>). It is recommended that the Site Operator verify that the equipment is secure and level on the first Tuesday of each month.

Prior to the onset of winter, those sites which will experience temperatures below freezing should be winterized. Refer to equipment specific SOPs for winterizing the site. Winterization includes adding anti-freeze (e.g., ethylene glycol or propylene glycol) to the precipitation gage. Additional equipment specific activities are noted in Table 6. Samples that include snow (BS, S, SG, SP, and SW), or ice/freezing rain (E, IC, IP, ZL, and ZR) precipitation types will be invalidated if the site has not been winterized.

**Table 6.** Equipment-specific winterization activities.

<b>Equipment</b>	<b>Activity</b>	<b>Frequency</b>
raingage	Empty weighing chamber and add 2 quarts of antifreeze	when site first winterized
	Maintain/stir anti-freeze mixture	daily when winterized
NWS stick gage	Remove and store 2” tube and funnel	when site first winterized
Belfort raingage* (backup)	Remove and store funnel from top cap	when site first winterized
Belfort raingage* clock (electric)	Replace battery	when site first winterized
battery (DC powered sites)	Service battery fluid	when site first winterized
battery (DC powered sites)	Load test	when site first winterized

\* equipment to be retired by 31 December 2011 in the NADP networks

When the anti-freeze mixture becomes dilute, it will lose its effectiveness and the mixture may freeze in the weighing chamber. This may cause the weighing chamber to crack. To prevent this from occurring, the weighing chamber should be emptied and fresh anti-freeze added to it. A transfer pump (available from the NED) should be used to empty the weighing chamber. The raingage should be inspected each visit to ensure this does not become a problem. Anti-freeze is toxic to wildlife and should be disposed of properly. RV/camper anti-freeze (propylene glycol) is more environmentally friendly and may be a better option for use.

When the temperature at a site will remain above 40°F (4°C) consistently, those sites that have been “winterized” should “summerize.” Refer to equipment specific SOPs for summerizing the site. Activities associated with “summerization” are listed in Table 7.

**Table 7.** Equipment-specific summerization activities

<b>Equipment</b>	<b>Activity</b>	<b>Frequency</b>
NWS stick gage	Replace 2” tube and funnel	when site first summerized
raingage	Dispose of anti-freeze mixture according to proper disposal guidelines	when site first summerized
Belfort raingage* (backup)	Replace funnel in top cap	when site first summerized
battery (DC powered sites)	Service battery fluid	when site first summerized
battery (DC powered sites)	Load test	when site first summerized

\* equipment to be retired by 31 December 2011 in the NADP networks

Once a year, typically the first Tuesday in July, the dry-side bucket should be replaced.

## **Training**

In addition to this manual, it is recommended that those responsible for the operation of a site read the document *NADP Site Selection and Installation Manual*. That document describes the

NADP siting criteria and is available from the NADP website. On-line training videos for the AIRMoN are in production. These materials will be available on the NADP website.

## **Troubleshooting**

SOPs are available from the NADP website (<http://nadp.isws.illinois.edu>) to help troubleshoot problems associated with the operation of the wet-deposition monitoring equipment. Documents are available for the two approved collectors, and for the raingages.

## **Site Performance and Systems Survey**

The U.S. EPA sponsors an external, independent survey of sites in the NADP networks. Each site in the AIRMoN is surveyed once every 3-4 years by an independent survey team. The survey team will contact the site approximately one month prior to their visit to schedule the survey.

Weather permitting, the survey team will:

- verify the operation and calibration of field equipment
- document site information
- document compliance with siting criteria
- photograph the site
- verify conformance with NADP procedures
- answer operator questions
- assist with minor repairs and maintenance

A report will be sent to the Site Operator and the Site Supervisor following completion of the survey. The report will provide findings from the survey including: a list of supplies to be ordered, items to be repaired, and conditions of the site relative to the approved siting criteria. Contact information for this program is available in the Contact List section of this document.

## **NADP Website**

The NADP website can be accessed at <http://nadp.isws.illinois.edu>. The website contains the complete data archive for each site in the network, documents relating to the operation of the network, documentation from the site surveys, and a range of data products. Site Operators and Site Supervisors are encouraged to use the website.

## **Frequently Asked Questions**

A balance is needed for the field laboratory. Does NADP supply the balance, and if not, what should we purchase?

*Unfortunately, NADP does not supply a balance for the field laboratory. It is the responsibility of the site. Similarly, NADP does not require a particular manufacturer or model of balance. That said, the balance should meet the following minimum specifications:*

**Minimum range:** 0 to 8,000g

**Minimum readability:** 0.5g

*Table 8 lists instruments that meet these requirements.*

**Table 8.** Balances that meet minimum requirements for use at an AIRMoN field laboratory.

<b>Manufacturer*</b>	<b>Model Number</b>	<b>Range</b>	<b>Readability</b>
Denver Instrument	SI-8001	0 to 8,000 g	0.1 g
Adam Equipment	CBK-35a	0 to 16,000 g	0.5 g

\* Use of a trade or manufacturer's name does not constitute an endorsement by the University of Illinois, the Illinois State Water Survey, the National Atmospheric Deposition Program, or project sponsors.

We would like to start a new site in the network. What do we need to do?

*The “NADP Site Selection and Installation Manual” and the “Site Installation Worksheet” are two documents that will help with this process. Both documents are available from the NADP website. Once complete, the “Site Installation Worksheet,” with a sketch and photos of the proposed site, should be submitted to the NADP Program Office for possible acceptance in the network. Contact the Site Liaison for additional information.*

We would like to conduct a special study at our NADP site. The study might use NADP equipment. What should we do?

*Please contact the Site Liaison before proceeding. All special studies at NADP sites require network approval. This is particularly true if NADP equipment (e.g., the dry-side bucket) will be used in the study.*

A new operator will start next month and will assume primary responsibility for the site. What should we do?

*First, we extend our thanks to the current site operator for all of their efforts operating and maintaining the site.*

*Next, contact the Site Liaison. The Site Liaison will need contact information for the new operator. If possible, provide overlap training for the new Site Operator. Provide a copy of this manual (the “Atmospheric Integrated Research Monitoring Network Site Operations Manual”), and the “NADP Site Selection and Installation Manual.” Both documents are available on the NADP website. On-line training videos for the AIRMoN are in production. These materials will be available on the NADP website.*

I need to re-locate my site. What do I need to do?

*The “NADP Site Selection and Installation Manual” includes guidance for site re-location. This document is available on the NADP website. The Site Liaison can provide guidance as well. The “move” date for the site must be documented. The funding agency should be notified at the outset, and should be kept apprised as work progresses.*

My site will be closing. What do I need to do?

*Contact the Site Liaison. The final “Date Off” for samples will need to be documented. The Site Liaison will discuss the fate of equipment and supplies. Site closure must be done in collaboration with the funding agency.*

It is raining (or snowing) and I am scheduled to collect the precipitation sample. Should I change the sample in the rain (snow)?

*It is best to change the sample after the precipitation has stopped. If this is not possible, and if it is safe to collect the sample, then the sample may be collected during the precipitation event. Use caution so as to prevent bodily harm, and possible sample contamination from clothing, an umbrella, etc. Indicate in Block 11 of the FOF that the sample was collected during a precipitation event.*

It is a holiday and no one is available to collect the sample. What should I do?

*When personnel are otherwise unavailable to collect a sample, collect the sample on the next day.*

How do I process a sample that contains snow and/or ice?

*When the wet-side bucket contains snow and/or ice, the sample should be allowed to melt completely before decanting the sample into the NADP sample bottle. “Clean” snow/ice will melt slower than snow/ice which contains higher concentrations of chemicals. The snow and/or ice should be allowed to melt in the sealed bucket (i.e., bucket lid in place and secure), at room temperature or inside a refrigerator. Do not place the wet-side bucket on a radiator to melt the sample quicker. This may cause some chemicals in the sample to volatilize, and may melt the bucket.*

The sample volume is less than 10 mL. Do I need to submit the sample for analysis?

*All samples, regardless of volume, should be submitted for analysis. The CAL is able to perform some analyses with as little as 2 mL of sample.*

There are leaves, insects, and/or bird droppings in the sample. How should I process the sample?

*Note the presence of these items in Block 6 of the FOF. When decanting the sample into the 250-mL sample bottle, try to decant only the liquid sample. Any remaining sample and the leaves, insects, and/or bird droppings may be disposed of once the sample for analysis has been decanted.*

A portion of the sample spilled in the field when collecting the wet-side bucket from the collector. What should I do?

*Note this in Block 11 of the FOF. As the sample mass has not been determined, this will impact the information in Blocks 7 and 8 of the FOF. It may also impact sample chemistry. Do not return the spilled sample (e.g., snow) to the wet-side bucket. Doing so will invalidate the sample.*

A portion of the sample spilled when decanting the sample into the 250 mL NADP sample bottle. What should I do?

*Wipe up the spilled sample. Spilled sample should never be returned to the wet-side bucket or to the 250-mL sample bottle. Doing so will invalidate that sample.*

The dry-side bucket contains a significant volume of water (or snow). What should I do?

*Indicate this in Block 11 of the FOF. If the precipitation gage indicates precipitation since the last sample, it is likely that the collector malfunctioned. Verify proper operation of the sensor and the collector motorbox. If necessary, call the Site Liaison for assistance troubleshooting the problem. If equipment malfunction or failure is determined, answer NO to question 1 in Block 5 of the FOF. Call the Site Liaison to order replacement parts.*

How frequently should I change the dry-side bucket?

*Annually, or as needed. The first Tuesday in July is suggested as a possible date to change the dry-side bucket. The rim of the dry-side bucket should be cleaned each time a sample is collected. The interior of the dry-side bucket should be cleaned as necessary.*

Where do I get a new dry-side bucket?

*New dry-side buckets can be taken from the supply of used wet-side buckets. When a used wet-side bucket is used as a dry-side bucket "Dry Side Use Only" should be written in large letters on the side of the bucket with permanent ink. Dry-side buckets should never be used for sample collection, and should never be returned to the CAL for cleaning and re-use.*

I just deployed my last new sample bag. May I wash and re-use a sample bag, or use a new trash bag to line the bucket for the next sampling period?

*No. Only new clean bags received from the CAL may be used. The CAL has a strict protocol for acceptance testing new supplies before use.*

Why do I need to use the lid bag as a glove when putting the lid on the wet-side bucket in the field?

*Precipitation samples have very low ion concentrations. A single drop of sweat, or a fingerprint inside the sample bag or the lid will invalidate the sample for sodium, chloride, ammonium, and possibly other ions. The lid bag or disposable gloves should be used when handling the lid and the wet-side bucket.*

How do I verify the operation of the grid-type sensor?

*When the ambient temperature is below 40°F, the grid sensor should heat and be warm to the touch. Place the heel of a hand slightly above the sensor to verify whether the sensor is heating.*

*A drop of water on the sensor grid should trigger the sensor, causing the sensor to heat, and the collector to open. Blow on the sensor grid to dry it. This should cause the collector to close.*

*If any of these conditions is not met, the sensor may need to be replaced. Consult the Site Liaison for guidance.*

Which grid sensor should I use with my AIRMoN Aerochem Metrics collector?

*The AIRMoN requires a 7-grid sensor when a grid-type sensor is used with the collector.*

Can I use an optical sensor with my AIRMoN Aerochem Metrics collector?

*Though a version of the Thies optical sensor can be used with an Aerochem Metrics collector, the default sensor remains the 7-grid sensor.*

How do I verify operation of the optical sensor used with an N-CON collector?

*With the fingers closed (i.e., no space between the fingers), pass your hand up and down through the sensor's U-shaped opening. The collector should open after the 5<sup>th</sup> pass. Up and down count as separate passes.*

Does the precipitation gage at my site need a wind shield?

*Sites that receive more than 20% of their annual precipitation as snow must install an Alter-type shield on their precipitation gage. This should be complete by 31 December 2011. Sites at an altitude of 1,000 meters or more are encouraged to install a wind shield on their precipitation gage.*

How high above the top of the precipitation gage should the Alter-type wind shield be installed?

*The pivot axis for the leaves of the Alter-type shield should be at the same height as the orifice to the precipitation gage.*

Ice on the collector arms is a problem at my site. We replace several motorboxes on the collector each winter. What can we do?

*Replacement bushings for the collector arms may be requested from the Site Liaison. The replacement bushings are made of Delrin, a synthetic material with a low coefficient of friction.*

*Boots may be installed at the base of the collector arm, where the collector arm meets the collector frame. The boots may help prevent ice from forming at the base of the collector arm. To date, a suitable material for the collector arm boots for use in the AIRMoN has not been identified.*

How often should I submit data from the electronic raingage?

*Data from the electronic raingage should be submitted at least weekly.*

To whom should I submit data from the electronic raingage?

*Data files for the electronic raingage should be uploaded to the following site:*

<http://nadp.isws.illinois.edu/upload/>

*Alternatively, the data files may be emailed to:*

[nadp-precip@isws.illinois.edu](mailto:nadp-precip@isws.illinois.edu)

Is the SC115 flash drive compatible with a MacBook?

*Yes. Ensure "External disks" is selected under Finder Preferences if the SC115 does not appear.*

How do I download data from the electronic raingage?

*Consult the document “Procedures for downloading raingage data.”*

I cannot connect to the electronic raingage with the PDA. What should I do?

*Verify that Bluetooth is turned on for both the PDA and the electronic raingage. If this does not resolve the problem, power cycle the PDA by depressing the power button on the top right side of the PDA.*

My PDA is broken. What should I do?

*Verify that the battery in the PDA is charged. If the problem persists, contact the Site Liaison.*

Can any PDA be used to collect data from the electronic raingage?

*Though most PDAs could be used to communicate with the electronic raingage, software provided by NADP is required.*

## Contact Lists

**Table 9.** NADP contact information.

<b>NADP Personnel</b>		
<b>Contact</b>	<b>Phone Number</b>	<b>email address</b>
AIRMoN Site Liaison	800-952-7353	<a href="mailto:airmon@isws.illinois.edu">airmon@isws.illinois.edu</a>
AMNet Site Liaison	608-335-4232	<a href="mailto:amnet@isws.illinois.edu">amnet@isws.illinois.edu</a>
AMoN Site Liaison	800-952-7353	<a href="mailto:amon@isws.illinois.edu">amon@isws.illinois.edu</a>
MDN Site Liaison	877-622-6960	<a href="mailto:hal@eurofinsus.com">hal@eurofinsus.com</a>
NTN Site Liaison	800-952-7353	<a href="mailto:ntn@isws.illinois.edu">ntn@isws.illinois.edu</a>
Network Equipment Depot, wet-deposition networks	217-244-1913	<a href="mailto:tleon@illinois.edu">tleon@illinois.edu</a>
Network Equipment Depot, AMNet	608-335-4232	<a href="mailto:amnet@isws.illinois.edu">amnet@isws.illinois.edu</a>
Site Performance and Systems Survey Program	217-244-6413	<a href="mailto:rhodes1@illinois.edu">rhodes1@illinois.edu</a>
USGS External Quality Assurance Program	303-236-1837	<a href="mailto:wetherbe@usgs.gov">wetherbe@usgs.gov</a>

**Table 10.** Active manufacturer contact information for NADP AIRMoN approved equipment.

<b>NADP Equipment Manufacturers</b>		
<b>Manufacturer</b>	<b>Phone Number</b>	<b>URL</b>
Belfort Instrument	800-937-2353	<a href="http://www.belfortinstrument.com">http://www.belfortinstrument.com</a>
ETI Instrument Systems, Inc.	970-484-9393	<a href="http://etisensors.com">http://etisensors.com</a>
OTT Hydromet	800-949-3766	<a href="http://www.ott.com/en-us/">http://www.ott.com/en-us/</a>
N-CON Systems Company, Inc.	800-932-6266	<a href="http://www.n-con.com">http://www.n-con.com</a>
NovaLynx Corporation	530-823-7185	<a href="http://novalynx.com">http://novalynx.com</a>

## **Appendix: References**

NADP AIRMoN Operations Manual, 2017-03  
Version 2.5

National Atmospheric Deposition Program (NADP). 2014. *NADP Site Selection and Installation Manual*. Illinois State Water Survey, Champaign, IL

National Atmospheric Deposition Program (NADP). 2016. *NADP Site Information Worksheet*. Illinois State Water Survey, Champaign, IL