2019 National Atmospheric Deposition Program Site Survey Program Annual Report

Prepared for:

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Office of Atmospheric Programs

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List of Acronyms and Abbreviations

ACM	Aerochem Metrics
AIRMoN	Atmospheric Integrated Research Monitoring Network
AMNet	Atmospheric Mercury Network
AMoN	Ammonia Monitoring Network
CAL	Central Analytical Laboratory
CASTNET	Clean Air Status and Trends Network
DC	direct current
DVM	Digital multi-meters
EEMS	Environmental, Engineering & Measurement Services, Inc.
EPA	U.S. Environmental Protection Agency
FORF	Field Observation Report Form
FSSD	Field Site Survey Database
HAL	Hg (Mercury) Analytical Laboratory
MDN	Mercury Deposition Network
NADP	National Atmospheric Deposition Program
NIST	National Institute of Standards and Technology
NOS	Network Operations Subcommittee
NTN	National Trends Network
PDA	Personal Digital Assistant
PO	Program Office
QA	Quality Assurance
QAAG	Quality Assurance Advisory Group
QAPP	Quality Assurance Project Plan
QC	Quality Control
QR	quality rating
RTD	Resistive Temperature Detector
SOP	Standard Operating Procedures
USGS	United States Geological Service
WAAS	Wide Area Augmentation System
WSLH	Wisconsin State Laboratory of Hygiene

Executive Summary

Under US EPA contract number EPW-18-005, Support for Conducting Systems and Performance Audits of CASTNET and NADP Monitoring Stations, Environmental, Engineering & Measurement Services, Inc. (EEMS) has executed an annual independent evaluation and assessment site survey program for the purpose of enhancing the quality assurance of the networks of the National Atmospheric Deposition Program (NADP). The NADP is a cooperative, multi-agency organization, which measures precipitation chemistry and estimates atmospheric wet deposition for various pollutant ions and atmospheric concentrations of ammonia and mercury. The NADP networks are: the National Trends Network (NTN), the Mercury Deposition Network (MDN), the Atmospheric Mercury Network (AMNet), and the Ammonia Monitoring Network (AMoN). Surveys of AMoN sites are limited to siting criteria data collection when sites are collocated with an existing NADP wet-deposition network or a CASTNET site as part of this contract. No information is collected for AMNet sites. EPA has provided long-standing support for the operation of NADP monitoring sites, and recurring funding for the chemical analysis and coordination for several wet deposition sites, in addition to the support for the survey and quality assurance programs of the NADP networks.

To understand the impact of emissions reductions on the environment, scientists and policy makers use data collected from long-term national monitoring networks such as the Clean Air Status and Trends Network (CASTNET) and the NADP to quantify changes in pollutant deposition. These networks are complementary in many ways and provide information on a variety of indicators necessary for tracking temporal and spatial trends in regional air quality and atmospheric deposition.

Work performed under this contract includes the survey of sites associated with the NADP. Site surveys include:

- Maintenance, evaluation, and quality assurance assessment of site instruments.
- Evaluation of site operator proficiency and technique.
- Reinforcement of NADP protocols and training.
- Photograph catalog to include all the equipment related to the site along with siting conditions and any findings that should be recorded.

Independent surveys provide accountability for the program and help ensure sites are being operated consistently following the NADP QAPP. The reported survey results are used to validate data provided by the individual sites.

The results of those surveys performed during the reporting period are presented in this report. One of the most notable items to report during this reporting period is the transition of the HAL from

Frontier Eurofins Global Sciences to the Wisconsin State Laboratory of Hygiene (WSLH). Needless to say a transition of this magnitude was a major undertaking. EEMS is happy to report that network operations were not negatively impacted during this transition. EEMS assisted with the transition by answering operator questions, providing reminders to operators about the changes during the surveys.

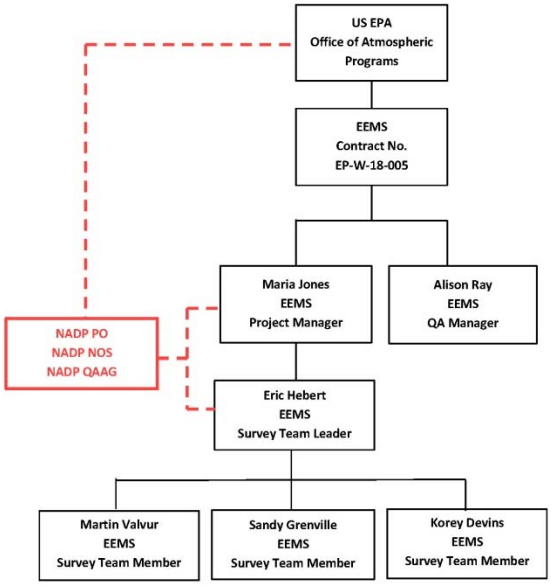
1.0 Introduction / Background

The National Atmospheric Deposition Program (NADP) Site Survey Program is an independent and unbiased Quality Assurance (QA) program of systems and performance surveys to assess and document the conditions and operations of the collective sites of the NADP. The conditions and operations pertain to the siting, sample collection and handling, equipment operation and maintenance, recordkeeping, reporting, and field laboratory procedures.

Ongoing QA programs are an essential part of, and add credence to, any long-term monitoring program. The external evaluations provided by this program verify, and support the established procedures and criteria of the NADP and its networks, and ensures they are maintained. The site survey program affords a higher level of confidence in the data reported by the NADP by verifying that each site operator is following the field SOPs. The survey program complements the QA/QC procedures followed by the PO and the CAL.

Quality assurance and quality control (QC) activities for these networks improve overall data quality and ensure field measurements remain accurate and precise. Stringent QA and QC are essential for obtaining unbiased and representative atmospheric deposition measurements, and for maintaining the integrity of the sample during collection, handling, and analysis. These QA and QC activities strengthen the reliability and overall quality of the data that the agency uses for policy decisions and for measures of accountability. Figure 1-1 shows the current organization chart for the NADP Site Survey Program.

Figure 1-1. Organization Chart of the NADP Site Survey Program



Surveys of the NADP sites are performed under contract EP-W-18-005. Maria Jones fulfills the role of Project Manager which includes contract issues, reports, and database administrator. Alison Ray as the QA Manager is responsible for reviewing all the data gathered in the field. Eric Hebert as the Survey Team Leader is responsible for the scheduling as well as directing the Survey Team Members in the performance of the sites surveys. Martin Valvur, Sandy Grenville and Korey Devins are the field technicians that perform the surveys along with Eric Hebert. Both the Project Manager and Survey Team Leader maintain close contact with the NADP PO, and NOS and participate in QAAG meetings.

NADP site surveys are accomplished by visiting approximately 25% of the total precipitation (or wet deposition) NADP sites each year. The operation of the site instrumentation is checked, maintenance is performed as needed, the site operator is observed while performing the routine site activities, technical and training support are provided, and the results are reported during each survey. More details of the activities are provided in the following key tasks.

1. Scheduling sites to be surveyed. This task is coordinated with the EPA Project Officer, the NADP Program Office, network liaison, site operators, supervisors, and sponsors. Approximately 80 NADP sites (co-located are not considered separate sites) are usually scheduled for surveys during each contract period. However, the number of sites scheduled in 2019 was lower due to budget constraints. The schedule is developed based on the elapsed time since the previous site survey (priority given to longest time since previous survey), inclusion of sites that have not been surveyed, and consideration for efficient and cost-effective travel.

2. Preparing for field site surveys. During survey preparation, available site data are compiled and reviewed. A current year site file is created. The necessary materials and standards for each site survey are checked and shipped if necessary. The operators of the sites scheduled for surveys are contacted to finalize the survey arrangements.

3. Performing site surveys. During each site survey a comprehensive qualitative and quantitative assessment is performed. The site assessment consists of:
   - Verifying site contact information.
   - Verifying the NADP collector location using a WAAS GPS.
   - Qualitatively evaluating the site regarding the current NADP siting criteria that can be found at:
     https://nadp.slh.wisc.edu/siteops/lib/other/NADP-2010_Site_Selection_and_Installation_Manual_V_3.0.pdf
   - Qualitatively assessing the site surroundings regarding obstructions which could impact data collection and quality. Documenting the site surroundings with at least 8 digital photographs taken in the cardinal directions of N, NE, E, SE, S, SW, W, and

NW. The photographs should be taken within 5 -10 meters of the NADP collector with the direction referenced.

- Qualitatively assessing the instruments and equipment with regard to function, maintenance, and condition. Documenting equipment malfunctions and signs of wear on the survey forms and with photographs as necessary.
- Qualitatively evaluating the site personnel regarding the methods and procedures used for sample handling, calibrations, cleaning, maintenance, recordkeeping, reporting, and material storage. Confirming that the current versions of NADP manuals and documentation are accessible.
- Quantitatively assessing the accuracy of the NADP instrumentation responses to QA standards. These include standard weights for raingage tests and mass determinations.
- Recording all data on standardized hard copy forms. Printing additional forms from the database, if required, in order to record all data. Comparing the observations to the pre-populated values from the previous survey, verifying and correcting any discrepancies, and confirming with the site personnel as needed.

4. Performing minor repairs, maintenance, adjustments, and guidance. With the consent of the site personnel and the approval of the appropriate liaison

   - Perform any necessary minor repair, maintenance, adjustment, and calibration to restore proper function in accordance with the Network Operations Subcommittee (NOS) procedures. These tasks can include items such as leveling and stabilizing the instrument, correcting the collector orientation, and correcting event recorder wiring.
   - Record all actions on the appropriate survey form.
   - Provide technical assistance, instruction, and training regarding the maintenance of the site and equipment, sample collection and handling, and site operation procedures, consistent with the NADP Quality Assurance Project Plan (QAPP), and standard operating procedures (SOP) specific to the network.

5. Transferring observations from survey forms to survey database. Entering the survey information obtained in the steps above into the survey database and reviewing for significant differences using the automated verification feature, and entry/exit rules.

6. Conducting an exit interview with the site personnel. This task includes the preparation and delivery of an exit/spot report summarizing any equipment deficiencies or failures, survey results, activities, adjustments, and any aspects that are, or could potentially affect data quality. The report is provided to the site operator, supervisor, NADP QA Manager, and the EPA Project Officer. The report is then archived in perpetuity in the site file on the EEMS server.

7. Providing a quarterly data set (final site survey report) in the form of tables. This final data set includes all the information gathered during the site surveys conducted in the previous three months. The data for each site consists of:

    - Survey results that have been subjected to duplicate entry and internal QA review.
    - Digital photographs.
    - Scanned raingage chart (if applicable).
    - Any additional pertinent supporting information.

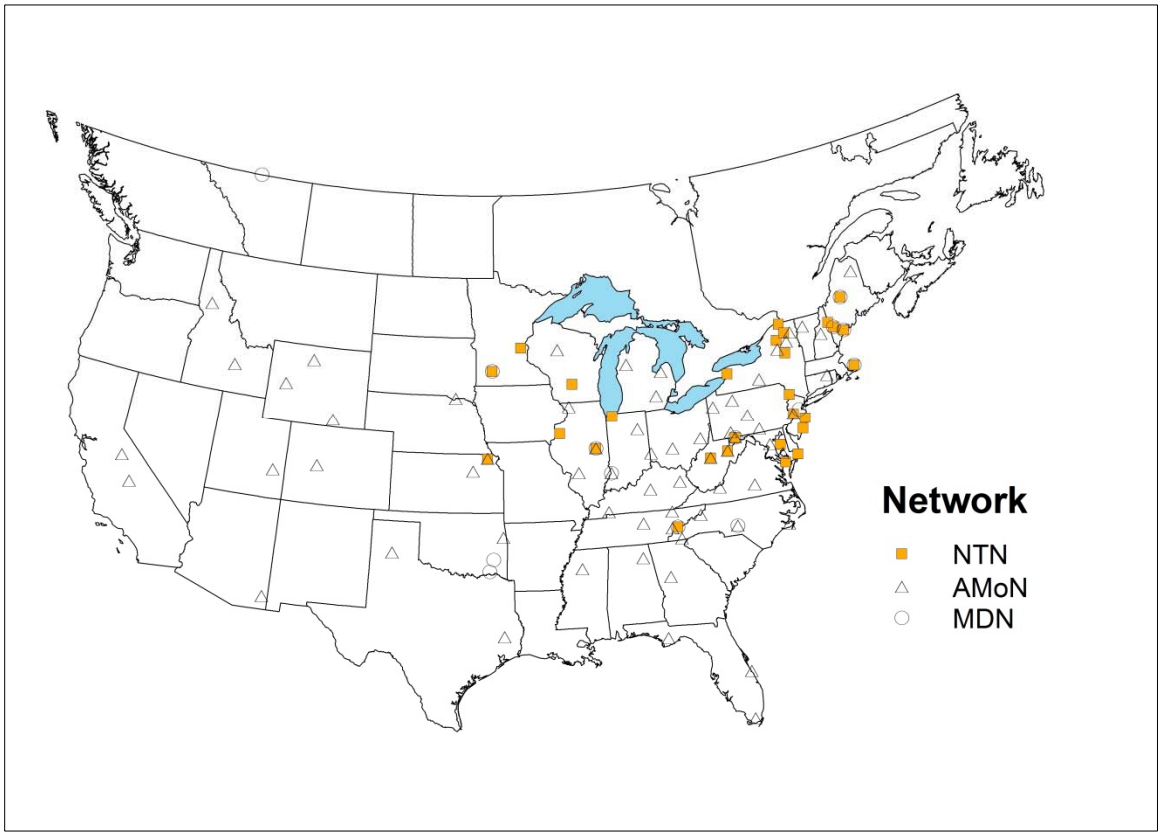
2.0 Status of Sites Surveyed

2.1 Sites Surveyed

This annual report includes site surveys performed from January through December of 2019.

A total of 42 NADP collectors (this number includes co-located sites) were surveyed during the period covered by this report at 34 distinct locations. These include 14 MDN sites and 28 NTN sites. Figure 2-1 is a map of the sites visited during 2019. AMoN sites are also included in the map, however only adherence to the siting criteria is checked for these samplers. Table 2-1 is a list of the sites surveyed and includes the network, site name, survey date, and equipment.

Figure 2-1. Site Survey Locations in 2019



2.2 General Status of Sites Surveyed and Equipment Encountered

Overall the sites surveyed during this reporting period were found in good condition and collecting data that meet NADP quality objectives. Most of the 34 precipitation raingages surveyed (co-located sites usually use the same raingage) were electronic raingages, either ETI NOAH IV (26

raingages), or the OTT PLUVIO (7 raingages). Only one Belfort mechanical raingage was surveyed, and was found to be operating reasonably well.

Of the 42 collectors (sites) surveyed, 15 sites operated N-CON collectors. The 27 remaining collectors were AeroChem Metrics (ACM) type, manufactured by either AeroChemetrics or Loda Electronics Company.

Ten locations visited operate backup raingages of various types. Only assessments related to siting criteria of the backup raingages are evaluated during surveys, not the gage accuracy.

The qualitative evaluation of the site personnel with respect to their ability to follow NADP protocols and operate the site instrumentation, found the overwhelming majority of site operators to be capable, knowledgeable, and committed to maintaining quality throughout the sample and data collection process. They demonstrated both enthusiasm and conscientiousness concerning the operation of their sites by their willingness to receive instruction from the survey team regarding improvements to their sample handling technique and equipment maintenance.

Specific survey findings that impact, or could impact data quality, are discussed in Section 3.0. The list of sites surveyed during 2019 and the equipment found at the sites is shown in Table 2-1.

Table 2-1. Sites Surveyed from January through December 2019 and Equipment Found

Site ID	Site Name	Network	Survey Date	Collector Type	Raingage Type	Backup Raingage Type
AB14	Genesee	MDN	8/20/2019	N-CON	ETI	Tipping Bucket
IL11	Bondville	NTN	11/8/2019	ACM	OTT	OTT
IL11	Bondville	MDN	11/8/2019	N-CON	OTT	OTT
IL78	Monmouth	NTN	11/4/2019	N-CON	OTT	OTT
IN22	Southwest Purdue Agriculture Center	MDN	11/7/2019	ACM	OTT	N/A
IN34	Indiana Dunes National Lakeshore	NTN	11/6/2019	ACM	OTT	Stick
KS97	Kickapoo Tribe	NTN	10/23/2019	ACM	ETI	N/A
MA01	North Atlantic Coastal Lab	MDN/NTN	8/27/2019	ACM	ETI	N/A
MD08	Piney Reservoir	MDN/NTN	7/23/2019	ACM	ETI	N/A
MD13	Um Wye Center	NTN	11/19/2019	ACM	ETI	BELFORT
MD15	Smith Island	NTN	9/4/2019	ACM	BELFORT	N/A
MD18	Assateague Island National Seashore-Woodcock	NTN	9/5/2019	ACM	ETI	N/A

Site ID	Site Name	Network	Survey Date	Collector Type	Raingage Type	Backup Raingage Type
ME02	Bridgton	MDN/NTN	8/20/2019	ACM	ETI	N/A
ME08	Gilead	NTN	8/21/2019	N-CON	OTT	N/A
ME09	Greenville Station	MDN/NTN	9/23/2019	ACM	ETI	N/A
ME96	Casco Bay-Wolfe's Neck Farm	MDN/NTN	9/24/2019	ACM	ETI	N/A
MN01	Cedar Creek	NTN	5/21/2019	N-CON	ETI	N/A
MN27	Lamberton	MDN/NTN	5/20/2019	ACM	ETI	N/A
NC26	Candor	MDN	6/17/2019	N-CON	ETI	N/A
NJ00	Edwin B. Forsythe National Wildlife Refuge	NTN	9/9/2019	ACM	ETI	N/A
NJ30	New Brunswick	MDN	6/19/2019	ACM	OTT	N/A
NJ39	Cattus Island	NTN	9/10/2019	ACM	ETI	N/A
NJ99	Washington Crossing	NTN	9/10/2019	ACM	ETI	N/A
NY22	Akwesasne Mohawk-Fort Covington	NTN	8/14/2019	ACM	ETI	N/A
NY28	Piseco Lake	NTN	10/8/2019	N-CON	ETI	N/A
NY59	Wanakena	NTN	8/6/2019	N-CON	ETI	N/A
NY92	Amherst	NTN	10/15/2019	N-CON	ETI	N/A
NY93	Paul Smith's	NTN	8/13/2019	N-CON	ETI	N/A
OK05	Hugo	MDN	4/15/2019	N-CON	ETI	TIPPING BUCKET
OK97	Tuskahoma	MDN	4/15/2019	N-CON	ETI	N/A
PA72	Milford	NTN	7/17/2019	N-CON	OTT	N/A
TN11	Great Smoky Mountains National Park-Elkmont	MDN/NTN	10/8/2019	ACM	ETI	BELFORT
WI31	Devil's Lake	NTN	5/17/2019	N-CON	ETI	N/A
WV05	Cedar Creek State Park	NTN	11/13/2019	ACM	ETI	N/A
WV18	Parsons	NTN	9/25/2019	ACM	ETI	STICK

A total of 65 AMoN sites were included in the site surveys, and they are listed in Table 2-2. The sampler mounting height is measured and photographs (directional and overview) are taken of the sampler during the AMoN site survey.

Table 2-2. AMoN Sites Visited in 2019

Site ID	Station Name	Date Last Visited
AL99	Sand Mountain Research & Extension Center	4/27/2019
AZ98	Chiricahua	4/11/2019
CA44	Yosemite NP - Turtleback Dome	5/13/2019
CA83	Sequoia NP - Ash Mountain	5/14/2019
CO10	Gothic	8/6/2019
CT15	Abington	9/25/2019
FL11	Everglades National Park – Research Center	3/19/2019
FL19	Indian River	3/19/2019
FL23	Sumatra	3/27/2019
GA41	Georgia Station	3/26/2019
ID03	Craters of the Moon National Monument	7/9/2019
ID07	Nez Perce	7/8/2019
IL11	Bondville	11/8/2019
IL37	Stockton	11/5/2019
IL46	Alhambra	12/16/2019
IN20	Roush Lake	5/8/2019
IN22	Southwest Purdue Agriculture Center	11/7/2019
KS31	Konza Prairie	10/22/2019
KS97	Kickapoo Tribe	9/24/2015
KY03	Mackville	11/5/2019
KY29	Crockett	11/11/2019
KY98	Cadiz	12/17/2019
MD06	Blackwater NWR	11/19/2019
MD08	Piney Reservoir	7/23/2019
MD99	Beltsville	11/18/2019
ME93	Ashland	9/19/2019
MI51	Unionville	8/22/2019
MI52	Ann Arbor	8/22/2019
MI95	Hoxeyville	8/23/2019
MS30	Coffeeville	4/16/2019
NC02	Cranberry	10/06/2019
NC06	Beaufort	12/17/2019
NC25	Coweeta	6/13/2019

Site ID	Station Name	Date Last Visited
NC26	Candor	6/17/2019
NE98	Santee	10/25/2019
NH02	Hubbard Brook	8/19/2019
NJ98	Washington Crossing	6/17/2019
NY20	Huntington Wildlife	7/5/2019
NY67	Ithaca	7/15/2019
NY94	Claryville	7/10/2019
NY98	Whiteface Mountain	7/2/2019
OH09	Oxford	10/25/2019
OH54	Deer Creek State Park	10/24/2019
OH99	Quaker City	11/10/2019
OK99	Stilwell	4/15/2019
PA00	Arendtsville	7/24/2019
PA29	Kane Experimental Forest	7/24/2019
PA56	M. K. Goddard	7/25/2019
PA96	Penn State - Fairbrook Park	7/25/2019
PA97	Laurel Hill	9/26/2019
TN01	Great Smoky Mountains NP - Look Rock	10/07/2019
TN04	Speedwell	11/6/2019
TN07	Edgar Evins	4/28/2019
TX41	Alabama-Coushatta	2/25/2019
TX43	Canonceta	3/1/2019
UT09	Canyonlands National Park-Island In The Sky	8/13/2019
VA13	Horton's Station	9/24/2019
VA24	Prince Edward	7/26/2019
VT99	Underhill	7/9/2019
WI35	Perkinstown	8/27/2019
WV05	Cedar Creek St. Park	11/13/2019
WV18	Parsons	9/25/2019
WY06	Pinedale	6/30/2019
WY93	Basin - Big Horn	8/19/2019
WY95	Brooklyn Lake	7/16/2019

3.0 Specific Problems Encountered and Frequency

Each site survey consists of evaluating the existing conditions relating to NADP siting criteria, performance and condition of the equipment (collector and primary raingage), status of supplies, site operator's performance, and other general information relating to the site. Once the evaluations are completed and recorded on a standardized questionnaire, the information is entered into a relational database by the field surveyor and summary reports are created. The number of checks performed during a survey will vary depending on the network and the type of equipment present at the site.

3.1 Findings Likely to Impact Data Quality

The evaluations considered by EEMS to have the most impact on data quality can be categorized by four elements and are listed in terms of relative importance as:

- Sample handling
- Collector operation
- Compliance with siting criteria rules and guidelines, and
- Raingage performance.

Table 3-1 presents the number of collectors, raingages and sites that meet the assessment criteria, chosen from these categories that are deemed likely to impact data quality.

Table 3-1. Collector, Raingage and Siting Meeting Criteria

	Surveyed	Meeting all Assessments[1]	Percent Meeting all Assessment
Collectors	42	30	71%
Number of NTN ACM – type	18	13	72%
Number of MDN ACM – type	9	9	100%
Number of NTN N-CON	10	6	60%
、 Number of MDN N-CON	5	2	40%
Raingages	34	21	62%
Belfort Raingages	1	1	100%
Electronic Raingages	33	20	61%
Siting Criteria	42	10	24%

[1] Meeting all assessments "as found".

	Surveyed	Meeting all Assessments[1]	Percent Meeting all Assessment
NTN Sites Meeting All Siting Criteria	28	8	29%
MDN Sites Meeting All Siting Criteria	14	2	14%

All site operators were found to maintain sample media quality, however gloves were not consistently used by all operators. The proper protocol regarding glove use was stressed during the survey visits.

EEMS has used both rules and guidelines as requirements for sites to comply with, and has made no distinctions between them given that both rules and guidelines are part of the site survey questionnaire. This approach was also used when preparing the Annual Reports with the consequence that very few sites meet all the siting criteria. For this 2019 NADP Annual Report, only the siting criteria rules are taken into account when estimating the percent of non-compliant findings shown in Table 3-2.

The sitting criteria has evolved in the past years, and some criteria that were considered rules at one time, are no longer included in the latest approved siting criteria requirements. However, these criteria remain part of the site survey questionnaire since it is EEMS' understanding that accurately completing the site survey questionnaire is the method to obtain a good description of the condition of a site. Making this information available in a searchable database allows users to extract desired data, and answer potential questions. However, modifications to the site survey questionnaire could be implemented to generate a more precise description of a site, allowing certain information to be less generic and more quantitative as well as qualitative when possible. For instance, EEMS believes that it is important when describing a site that the amount of vegetation surrounding the equipment be reported as accurately as possible. YES/NO answers to these types of questions are not helpful; the presence of one small tree near the equipment receives the same weight as would a cluster of large trees. EEMS is open to including any data in the site survey questionnaire that will make the site representation more precise.

Appendix A contains the complete list of current survey assessments that EEMS considers could directly impact data quality. The remainder of this section and the following tables focus on the survey data that describes only the assessments that did ***not*** meet NADP criteria during this reporting period.

Table 3-2 presents the non-compliant survey data for the different sites. EEMS cannot report with any level of confidence that siting or operation for the entire NADP has improved or declined during the period of site survey performance. However, summarizing this information allows any elevated number of observed assessment failures to be quickly and easily identified. Items with a

non-compliant percentage greater than 20% are identified in Table 3-2 and discussed in more detail in other sections of this report.

Table 3-2. Percent of Non-compliant Findings

Siting and Performance Checks	Number of Assessments[2]	Found Non-Compliant	Percent (%) Non-Compliant
Sample Handling			
Is sampling media quality maintained?	42	0	0
Siting Criteria Assessments			
Is the orifice of the collector +/- .3 m of raingage (elevation)?	42	3	7.1
No vegetation height > 0.6 m within 5 m radius (raingage)	42	10	23.8
Collector and sensor oriented properly	42	5	11.9
45 degree rule met (collector)	42	5	11.9
30 degree rule for buildings met (collector)	42	0	0.0
No objects > 1 m height within 5 m radius (collector)	42	19	45.2
No vegetation height > 0.6 m within 5 m radius (collector)	42	10	23.8
No pastures and ag. activity within 20 m radius	42	3	7.1
No herbicides and fertilizers used within 20 m radius	42	3	7.1
Roads meet NADP siting criteria	42	1	2.4
Waterways meet NADP siting criteria	42	1	2.4
Airports meet NADP siting criteria	42	1	2.4
Animal operations meet NADP siting criteria (NTN)	28	0	0.0
Metalworking operations meet NADP siting criteria (MDN only)	14	0	0.0
Dry side bucket is clean (NTN)	18	4	22.2
Dry side bag installed correctly (MDN)	9	0	0.0
Does lid seal properly	27	0	0.0
Lid liner in good condition	27	0	0.0
Fan in good condition (MDN)	9	0	0.0
Cooling fan thermostat in good condition (MDN)	9	0	0.0

[2] The number of assessments varies depending on the number of observations made. The breakdown of the number of assessments for each check is presented in Table 3-2. For example: 14 MDN sites were surveyed, so the siting criteria assessment specific to MDN sites is 14. Of the 14 MDN sites, 9 operate an ACM-type collector and 5 operate an N-CON collector.

Siting and Performance Checks	**Number of Assessments[2]**	**Found Non-Compliant**	**Percent (%) Non-Compliant**
Heater in good condition (MDN)	9	0	0.0
Heater thermostat in good condition (MDN)	9	0	0.0
Has flush wall filter mount been installed (MDN)	9	1	11.1
Filter in good condition (MDN)	8	0	0.0
Max / min thermometer within acceptable limits (MDN)	9	0	0.0
ACM sensor operates properly	27	2	7.4
Motor-box operates within acceptable limits	27	0	0.0
N-CON fan in good condition (MDN)	5	2	40.0
N-CON cooling fan thermostat in good condition (MDN)	5	0	0.0
N-CON heater in good condition (MDN)	5	1	20.0
N-CON heater thermostat in good condition (MDN)	5	0	0.0
N-CON max / min thermometer in acceptable limits (MDN)	5	1	20.0
N-CON sensor respond to a 5 passes	15	1	6.7
N-CON lid seals properly	15	5	33.3
N-CON lid liner in good condition	15	2	13.3
Was the 'as found' turn-over set properly	1	0	0.0
Raingage operates properly (electronic gage)	33	1	3.0
Does datalogger receive event signals form all collectors (electronic gage)	33	9	27.3
Does optical sensor respond to "blocking" of light beam (ETI)	26	4	15.4
Does optical sensor respond to mist of water (ETI)	26	4	15.4

Tables B-1 through B-4 in Appendix B present EEMS's findings regarding the assessments of siting criteria, raingage and collector condition, and site operator proficiency (assessed as sampling media quality maintained) which are considered to be the areas that may most impact data quality. As described in survey Task #3, the assessment of site operator proficiency includes the qualitative evaluation of the site personnel regarding the methods and procedures used for sample handling, recordkeeping, reporting, equipment cleaning, maintenance, and material storage.

The data indicate that most of the non-compliant findings are related to objects being closer to the collector than the siting criteria allows.

Two assessments shown to have a high number of sites out of compliance are related to vegetation. This assessment is expected to vary depending on the season in which the survey was conducted. Early and late in the year the vegetation will be shorter, in the middle of the growing season it will be taller. Therefore this assessment is not very useful for trend evaluation. It is also worthwhile to consider some work presented in the Open-File Report 2011-1170 by the USGS titled ***Four Studies on Effects of Environmental Factors on the Quality of National Atmospheric Deposition Program Measurements*** where it is shown that taller vegetation near the collector and raingage may increase collection efficiency.

OK05-MDN and OK97-MDN were sites visited for the first time during 2019. All other sites surveyed have experienced no changes since the last visit (i.e., to the question "No significant changes to local site conditions within 500 meters of the collector since previous survey" the response was "YES").

3.2 Survey Results for Sites with Multiple Survey Visits

Two sites, OK05-MDN and OK97-MDN, were surveyed by EEMS in 2019 for the first time. All other sites surveyed in 2019 had been previously visited by EEMS, in 2015, with the exception of MA01 MDN and NTN last surveyed in 2016. Most of these sites have been visited at least four times by EEMS. Tables presenting the survey assessments for successive visits can be found in Appendix C. Comparisons of the percent non-compliant results for successive surveys are presented in Table 3-4. For those sites with more than two surveys, only the last two visits were considered (i.e., survey conducted in 2019 and 2015, but not the survey conducted in 2012).

Table 3-3. Percent of Non-compliant Items for Sites Surveyed more than Once

Siting and Performance Checks	% Non-compliant During 2019	% Non- compliant During Previous Survey
Is sampling media quality maintained?	0%	0%
Is the orifice of the collector +/- .3 m of raingage (elevation)	8%	3%
No vegetation height > 0.6 m within 5 m radius (raingage)	25%	18%
Collector and sensor oriented properly	8%	10%
45 degree rule met (collector)	10%	13%
No objects > 1 m height within 5 m radius (collector)	45%	35%
No vegetation height > 0.6 m within 5 m radius (collector)	25%	20%
No pastures and ag. activity within 20 m radius	8%	8%
No herbicides and fertilizers used within 20 m radius	8%	15%
Roads meet NADP siting criteria	3%	3%

Siting and Performance Checks	% Non-compliant During 2019	% Non- compliant During Previous Survey
Airports meet NADP siting criteria	3%	0%
Dry side bucket is clean	15%	14%
Does lid seal properly	0%	3%
Lid liner in good condition	0%	0%
Fan in good condition	0%	9%
Heater in good condition	0%	0%
Has flush wall filter mount been installed	11%	9%
Filter in good condition	0%	0%
Max / min thermometer in acceptable limits	0%	0%
ACM sensor operates properly	7%	3%
Motorbox operates within acceptable limits	0%	3%
N-CON lid seals properly	38%	0%
N-CON lid liner in good condition	15%	0%
N-CON cooling fan thermostat in good condition	0%	0%
N-CON max / min thermometer in acceptable limits	33%	0%
Was the 'as found' turn over set properly (Belfort gage)	0%	0%
Raingage operates properly (electronic gage)	3%	0%
Does datalogger receive event signals form all collectors (electronic gage)	19%	7%
Does optical sensor respond to "blocking" of light beam (electronic gage)	17%	4%
Does optical sensor respond to mist of water (electronic gage)	17%	4%

Table 3-3 shows a remarkable increase in the percentage of N-CON collectors failing the lid seal question compared to the previous survey. This is a consequence of having changed the criteria for the answer to the question. In previous years surveyors assumed that if the lid was resting on the bucket or chimney of the collector this meant a good seal. No consideration was made to whether it was possible the lid could move under windy conditions and have a poor seal. For the past couple of years, if the motorbox arms require adjustment, then the surveyors consider the lid is not sealing properly. The percentage of N-CON collectors requiring tightening of the set screws has increased. A specific question pertaining to the motorbox arms has been added to the survey questionnaire to address this issue. Also noticeable is the increase of failures with the optical sensor of the ETI raingage. These raingages have been showing wear and corrosion around the connections for the sensors.

Comparing data from one survey to another indicates that the number of compliant parameters increases at some sites, and decreases at other sites. Therefore, it is difficult to determine whether

there has been an overall improvement to the network operation. A better gauge of network operation might be tracking the increase or decrease in sample quality codes as assigned by the laboratories responsible for evaluating and analyzing the samples. It can be assumed that as all site survey findings are addressed (siting criteria, equipment maintenance, operator procedures, etc.) there will be a quantifiable effect e.g., on sample quality.

Furthermore, not all of these performance checks have the same impact on the quality of the sample. Allowing vegetation to grow may impact sample quality less than not maintaining a clean dry-side bucket. Since most of the items found out of compliance are related to siting criteria, significant improvements in data quality may not be realized, but changes in the surrounding area including industrial or agricultural sources, obstructions, or vegetation may impact overall trend in the data.

3.3 Findings Related to the Wind Shield at Sites Surveyed

Data provided by the NADP PO indicate that raingages located at elevations greater than 1000 meters are encouraged to have a wind shield installed, as well as at sites where more than 20 percent of the annual precipitation is frozen. Table 3-4 presents the assessments of wind shields at the sites surveyed during the period covered by this annual report, and whether a shield was present at the time of the previous survey. Eighteen of the 34 raingages surveyed during the reporting period covered by this report were identified as potentially required to have a wind shield.

Table 3-4. Status of Surveyed Sites Requiring Raingage Shields

Site ID	Network	Condition in 2019	Previous Survey
AB14	MDN	Installed	Installed
IN34	NTN	Installed	Installed
KS97	NTN	Installed	Installed
MA01	MDN/NTN	Installed	N/A
MD08	MDN/NTN	Installed	Installed
ME02	MDN/NTN	Installed	Installed
ME08	NTN	Installed	Installed
ME09	MDN/NTN	Installed	Installed
ME96	MDN/NTN	Installed	Installed

Site ID	Network	Condition in 2019	Previous Survey
MN01	NTN	Installed	Installed
MN27	MDN/NTN	Not Present	Installed
NY22	NTN	Installed	Installed
NY28	NTN	Installed	Installed
NY59	NTN	Installed	Installed
NY92	NTN	Installed	Installed
NY93	NTN	Installed	Installed
WI31	NTN	Installed	Installed
WV18	NTN	Installed	Installed

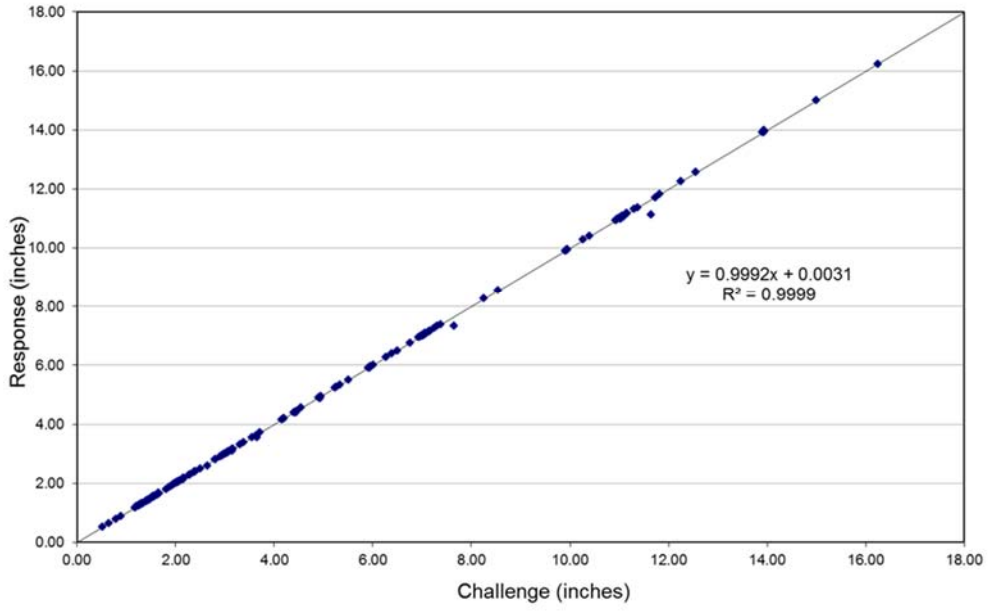
4.0 Field Site Survey Results

This section summarizes the quantifiable survey data relating to raingage accuracy tests and ACM collector sensor heater performance. Thirty-four raingages were surveyed during this reporting period, of which all but one, were electronic raingages. One Belfort mechanical raingage was surveyed; this report does not include a sub-section dedicated to the performance of Belfort mechanical raingages.

4.1 Electronic Raingage Accuracy

The results of the accuracy tests for the 33 electronic raingages challenged during the period covered by this report are presented in Figure 4-1. As demonstrated by the graph the raingages report the weight of the standards added very accurately for the entire span. No problems with the electronic raingages were encountered regarding the accuracy. Other issues encountered are discussed in Section 5.0.

Figure 4-1. Electronic Raingage Accuracy – 33 Raingages



4.2 ACM Sensor Heater Tests

The ACM type collectors used throughout the networks of the NADP utilize a contact grid sensor. Two types of sensors are operated, one with 7 grids, and one with 11 grids which allows for smaller size precipitation to activate the sensor. When precipitation bridges the gap between the grid and the sensor plate the sensor is "activated" and the collector opens. In order to optimize that operation

the sensor is heated at a low level when the ambient temperature is below approximately 4˚C during dry conditions. This provides sufficient heat to melt frozen precipitation and bridge the gap quickly when a snow or ice event occurs. The manufacturer states that when the ambient temperature is above 4˚C and the conditions are dry, the sensor is not heated.

When the sensor is activated the sensor is heated at a high level to evaporate the precipitation from the grid surface quickly when the event ends. The intent is to minimize the time the collector is open with no precipitation occurring. The nominal temperature range of an activated sensor is approximately 60˚C within 10 minutes of activation.

The inactive sensor temperature tests are conducted using a thermocouple with the sensor shaded immediately after measuring the ambient temperature with the same device. The thin thermocouple is placed directly on the sensor plate between the sensor grids without making contact with the grid. The test results are presented in Figure 4-2. The results indicate that all sensor heaters were functioning properly.

Figure 4-2. Inactivated ACM Sensor Temperature

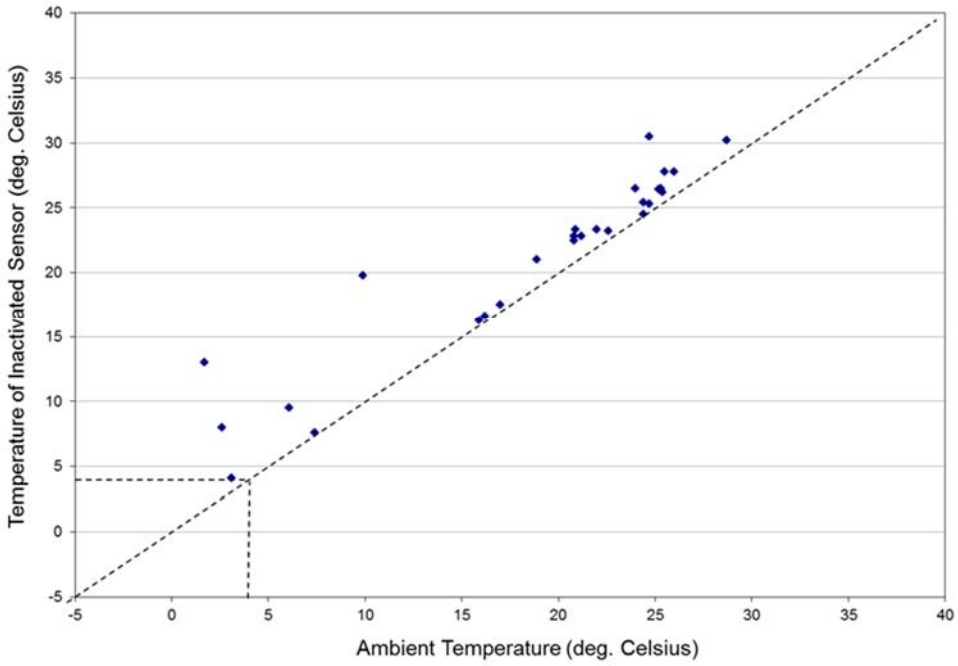
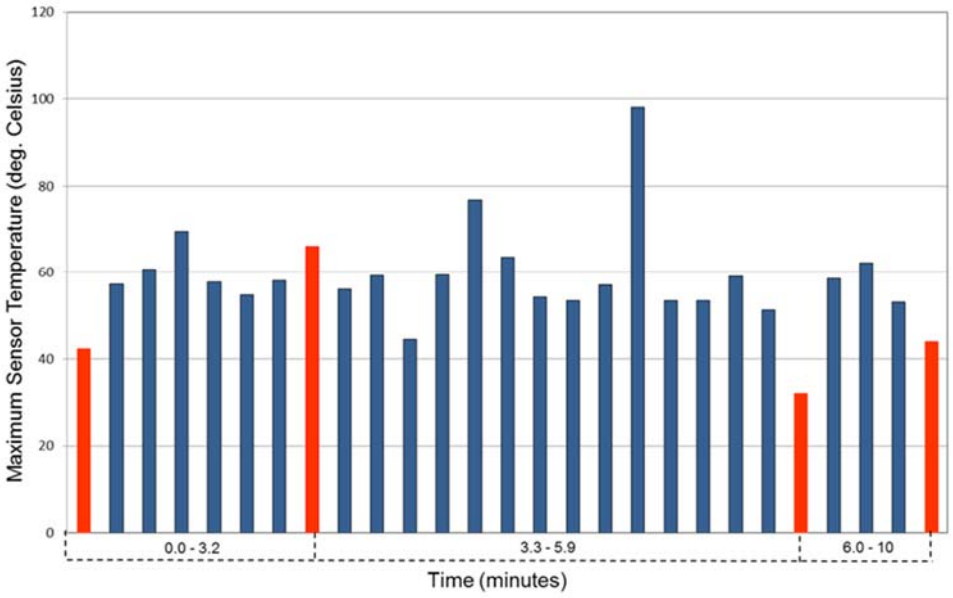


Figure 4-3 presents the maximum temperature reached by each sensor when activated, and the time required for each sensor to reach that temperature. There is some variability between sensors for maximum temperature, but most sensors are between 50˚C and 70˚C within 10 minutes of activation. Four sensors did not reach 50˚C, but most were reported to be functioning properly. The fact that the 50˚C mark was not reached may be due to windy and cool conditions at the sites. One sensor nearly reached 100 ˚C which would have flagged the sensor for replacement.

Figure 4-3. Activated ACM Sensor Temperature Increase and Elapsed Time



* Red lines in the graph indicate the 10 minutes divided into thirds to make it stand out that most of the sensors reach the maximum temperature between 3.4 and 6.6 minutes.

Further evaluation of the data presented in Figure 4-3 is provided in Table 4-1, which includes the number of sensors that reached the maximum temperature within each 10 degree range above 30 degrees.

Table 4-1. ACM Activated Sensors for Each Temperature Range and Time Elapsed

Temperature Range	Number of Sensors
< 30.0 ºC	0
30.0º to 40.0 ºC	1
40.1º to 50.0 ºC	3
50.1º to 60.0 ºC	16
60.1º to 70.0 ºC	5
70.1º to 80.0 ºC	1
80.1º to 90.0 ºC	0
> 90.1º C	1

Time to Maximum Temperature	Number of Sensors
< 3 min	7
3.0 – 4.0 min	8
4.1 – 5.0 min	5
5.1 – 6.0 min	4
6.1 – 7.0 min	0
7.1 – 8.0 min	2
8.1 – 9.0 min	0
> 9.1 min	1

Sensor test data indicate that the ACM heated grid sensors in the network are functioning as expected throughout the network. Based on the evaluations performed on the sensors during the site surveys, (checks on the temperature of the plate and one water drop sensitivity test), it cannot

be determined whether or not there is any difference in the performance of the 7-grid and the 11-grid sensor.

4.3 Thies Sensor Tests

The N-CON collectors in the networks use an open-path sensor manufactured by Thies to detect precipitation and activate the collector. Thies sensors are evaluated by counting the number of passes through the open-path required to activate the collector. The NADP has prescribed that the sensor sensitivity be set to 5 passes through the sensor. Other sensor evaluations include inspection of the sensor housing to ensure there are no cracks that would allow moisture to enter the sensor. None of the sensors inspected during 2019 exhibited any cracks.

4.4 N-CON Motor/Lid-Arm Set Screws

EEMS is continuing to tighten all set screws and lid arm bolts and apply Loctite. During this process the lids are adjusted to seal properly and the site operator is instructed as to how to evaluate the collector to maintain proper adjustment. During 2019, 15 N-CON collectors were surveyed. Out of the 15 collectors, 11 required the set screws and lid arms bolts to be adjusted[3] and tightened. Given that N-CON collectors are now being surveyed once every four years, emphasis should be placed on ensuring site operators are aware of this problem, and that they have proper written instructions and tools to perform the necessary adjustments.

When collectors are found in this condition, they present a potential impact to data quality. When lid arms are found to be loose, the collectors are normally flagged as having a "poor lid seal". Proper lid seal is a direct indicator of data quality and therefore loose lid arms are an indicator of compromised data quality. Data collected since the introduction of N-CON single bucket collectors to the NTN network beginning around 2011 indicate that a very large percentage of collectors had a poor lid seal. Figure 4-5 is a comparison of ACM-type collector lid seal compared to the percentage of N-CON collectors that required lid arm adjustments. It is clear that poor lid seal condition increased with the introduction of N-CON collectors to the network.

It can also be seen in Figure 4-4 that the number of collectors that need adjustment correlates with the total number of collectors observed. Some of the collectors visited have been adjusted and tightened during repeat visits, meaning that the initial repair with Loctite did not last between survey visits. This indicates the design flaw in the lid arms is likely to continue to be a problem with the collector going forward.

[3] The four collectors not requiring adjustment were MDN collectors.

Figure 4-4. N-CON Collectors Surveyed and Adjusted per Survey Year

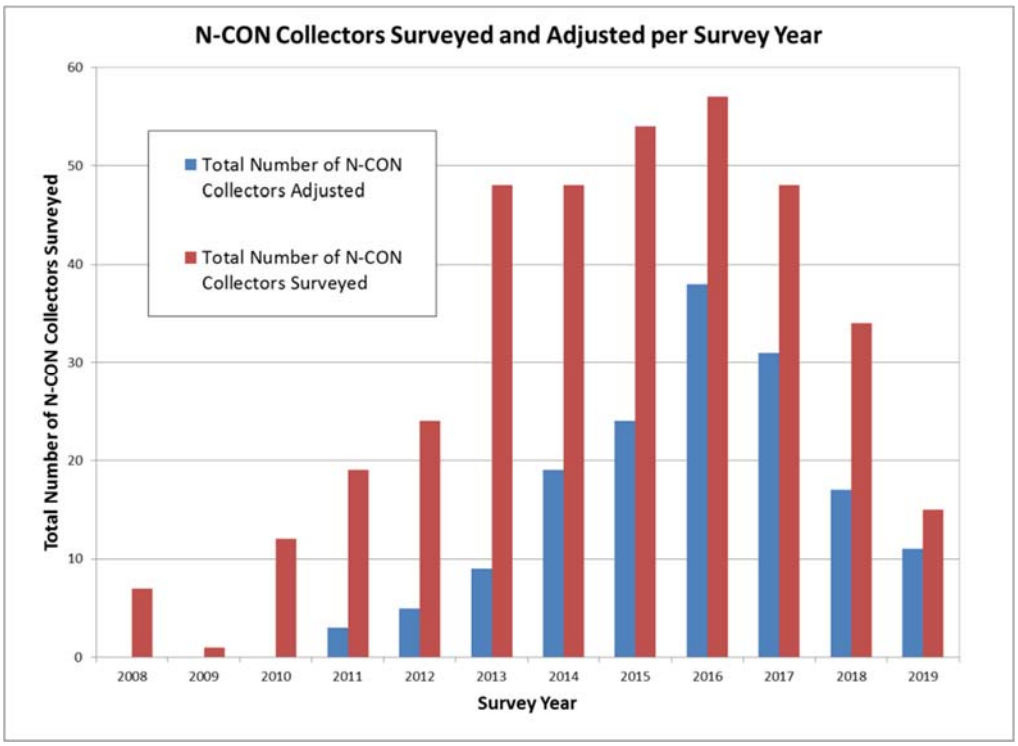
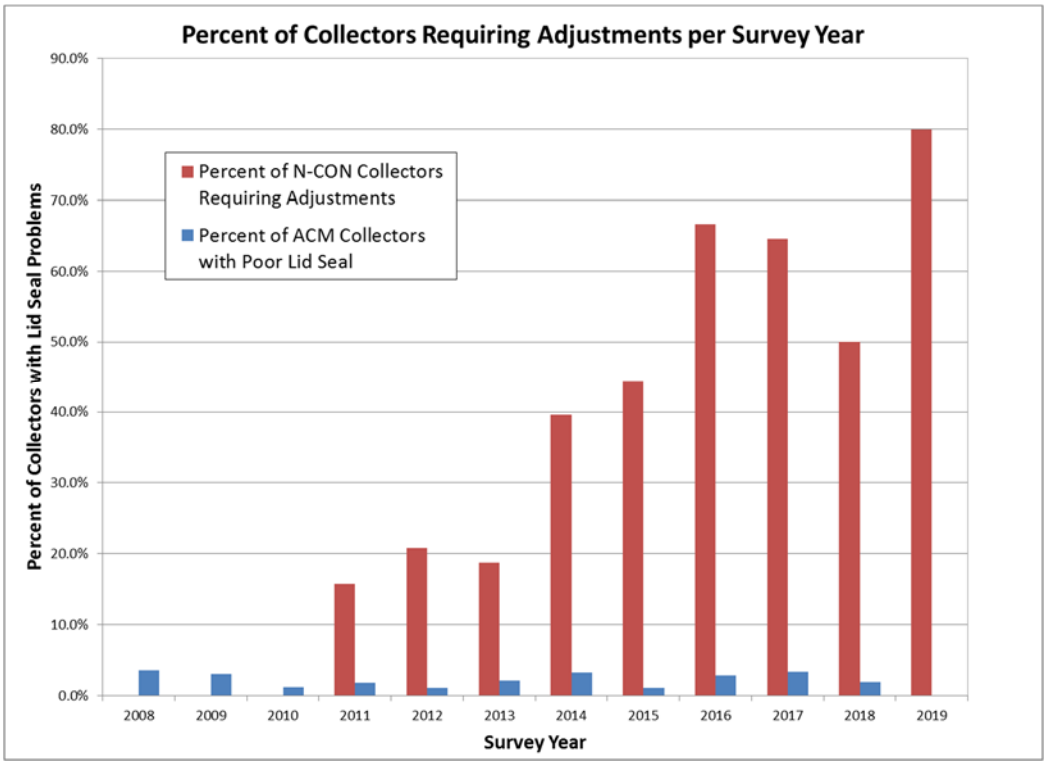


Figure 4-5. Percentage of N-CON and ACM-type Collectors Requiring Lid Adjustments



There is a recommended upgrade to the NTN N-CON collector that was installed at site WI36 a few years ago. The upgrade is a plastic spacer that is placed on the collector motor (inside the collector housing) and holds the motor more securely against the lid of the collector housing. The intention is to limit the movement of the motor when the collector is opening/closing which should in turn help to keep the sets screws from loosening. The PO may want to follow up with the site operator at this site to determine whether this is a possible solution. Site WI36 was surveyed in 2016.

5.0 Recommendations to the NADP Program Office

The following subsections provide recommendations that, in the opinion of EEMS, would help to improve the operation of the sites and quality of data collected by the NADP.

As was the case in previous years, most of the assessments that were found to be non-compliant are related to siting criteria.

It is suggested that the list of assessments that are critical to the operation of the sites and data quality continue to be refined. In addition, research that has been conducted by the USGS and others that relate siting criteria to sample quality should be used to determine if assessments can be removed or added to the site surveys. For example it has been shown in a USGS Open-File Report "Four Studies on Effects of Environmental Factors on the Quality of National Atmospheric Deposition Program Measurements" by Gregory Wetherbee et al, that taller vegetation near the collector may actually improve collection efficiency and therefore could be considered to be positive and not a negative influence.

Although qualitative information is important, further refinement of the assessments should include more quantitative information that might be more useful and valuable. For example, the ground cover assessment could be refined to include the presence of any buildings within 30 meters and the square footage of ground covered by un-natural materials if those items are deemed to be significant to sample quality. By improving the information gathered during surveys more meaningful interpretation of deposition data can be performed.

Once this is accomplished and a smaller list of items that are significant to site operation and data quality is identified, more detailed tracking of site conditions and improvements may lead to trends in data as to specific improvements at individual sites.

Further discussions by the Quality Assurance Advisory Group (QAAG) have addressed some of these issues. It is expected that future reports will address those decisions and refinements.

5.1 Documentation

Training for all networks is an essential function for maintaining NADP data quality. With the transition from the HAL to the WSLH HAL the site operator training program is also in a transition period. EEMS will continue to be informed of the changes and ensure site operators are made aware of available resources.

It is important to continue to modify and update site operation reference documentation and distribute that documentation to the operators, supervisors, and data users. EEMS is aware that this

process has been ongoing at the NADP PO and updated manuals and procedures are made available on the NADP website as they are completed and approved. A link to the manuals and training information (support tab) has been added to the home page of the NADP website: https://nadp.slh.wisc.edu/. This process should continue and will continue to improve the field training for new site operators. This is an improvement over the distribution of hardcopy documents that have been produced in the past.

Further improvements could be realized through interactive web-based forms. This could not only reduce some costs, but may engage the site operators and increase interest and participation in data and site evaluation.

5.2 Equipment and Procedures

The following subsections pertain to problems observed with equipment and suggestions for improvement to equipment and procedures used to collect NADP data.

5.2.1 ACM Type Collector

Problems with the following items were frequently noted with the ACM type collectors during the surveys:

Sensor Temperature

Improvement was observed regarding site operators testing the sensor heater before activating the motor-box (see Section 4.0). EEMS continues to review the proper operation of the sensors with the site operators, and stresses the importance of testing the sensors each week.

Sensor Response Tests

In addition to comparison of raingage catch tests, comparisons of the various collector sensors operating in the network should be more thoroughly evaluated. Ideally any approved sensor should respond identically in terms of response to all types of precipitation events. Currently this is not the case. Testing is currently underway to attempt to both qualify and quantify the operation of all types of approved sensors (optical and mechanical).

Probably the most significant improvement that could be made to the network as a whole would be to replace the various types of precipitation sensors with a single uniform sensor for all types of collectors. It is suggested that, if possible a single sensor, or combination of different types of sensors acting as one, be approved for use that can both trigger sample collection and indicate precipitation to be recorded by the electronic raingages.

5.2.2 MDN Collectors

As reported previously, it was observed that there is some lack of consistency regarding sealing of the unused MDN sample train chimney. The collectors were originally approved and provided with a plastic funnel and hose to allow precipitation to pass through the chimney and out the bottom of the collector. Some of the older collectors have been in the field long enough that the funnel or hose, or both have deteriorated causing leaks into the collector housing. Most site operators have corrected the leaks using various materials to seal the opening of the chimney.

It is suggested that second chimney funnel and drain hose be added to the requested supplies section of the field data form so operators can request approved materials for the repair of their collectors.

5.2.3 N-CON MDN Heaters

N-CON collectors for both MDN and NTN have been a welcome addition to the accepted list of approved NADP collectors. However, occasionally accepted equipment operation can be improved by additional modifications. The original N-CON collectors approved, purchased, and in operation for the MDN network fall into that category.

After operation of the heated N-CON collector for MDN began it was determined that improved operation could be achieved by modifying the passive heater to include a fan to actively circulate the air inside the collector and chimney. Photos of collectors taken during surveys indicate collectors have been modified to include the circulating fan.

5.2.4 N-CON NTN Bucket Collector

Generally the N-CON collectors function well and are easy to operate and are an improvement to the network. The problems documented during the previous reporting period are well known and are being addressed. They include:

- Motor/lid-arm adapters that become loose and need adjustment either after shipping or operation of the collector.
- High power consumption and not well suited for direct current (DC) operation.

All the collectors surveyed had been modified to accept “tall” and “short” buckets.

5.2.5 Electronic Raingage

The introduction of the electronic raingages into the network is a great improvement. All site operators that are operating electronic raingages reported that they are happy with the improvement. However, it has been observed that ETI NOAH IV raingages have excessive corrosion around the connections for the sensors and batteries. As part of continuing improvements being implemented in the field, all connectors are being cleaned and dielectric grease is being applied.

As part of the survey for the electronic gages, the time is adjusted to GMT or local time depending on the site. In the past, all electronic gages were set to GMT if they were found to be set to local time. In 2019 this was not always the case and depended on the type of data transmission a gage uses and/or the preference of the site. It is anticipated that in 2020 the logger times will again be standardized to GMT unless there are special site requirements to keep the time set to something other than GMT. Of the 26 ETI NOAH IV gages surveyed, four had problems with the optical sensor. As discussed during the 2018 NADP Fall Meeting in Albany, NY, the possibility of being able to replace the optical sensor in the field should be considered. If this is not feasible, the possibility of testing the optical sensors by themselves could also be useful, since there may instances in which the sensors are working properly, but the electronic circuit board is defective. This was also addressed during the 2018 fall meeting.

PDA, Thumb Drives and Other Methods of Data Download

EEMS is aware that software development and testing requires time. Also the introduction of new electronic devices sometimes renders the older devices obsolete including PDAs. The areas of software development and documentation has been observed during the surveys that took place during this year, continued to improve, and effort should stay focused as continued changes occur going forward.

At sites where PDA devices are used, EEMS is assisting in transitioning the sites to being able to use an Android device to interface with the gage. The Campbell Scientific Firmware in the gage data logger is being updated and the Bluetooth dongle is being replaced. The PDA can still be used but an Android phone loaded with the Campbell Scientific LoggerLink App can also be used by the site operator to interface with the gage and download data. During this reporting period the PO has made significant strides to replace the PDA with paired dongles and android devices. This has benefitted the network and has been welcomed by both the site operators and EEMS.

Recent interface and download methods have utilized devices similar to USB thumb drives that connect directly to the logger serial port and data are transferred to the device automatically. The thumb drive is then transported to an internet connected computer where the data files are uploaded to the CAL. Within minutes of this step, data are automatically posted, and are available on the CAL website for site operators to view.

This process works very well. The only disadvantage noted is the lack of the ability to observe any of the raingage or collector parameters while at the site. Site operators are not able to troubleshoot the equipment and determine if adjustments or repairs are needed to correct any operational problems.

During the 2019 surveys, EEMS has implemented the collection and reporting of the information that is deemed relevant to better inform the NADP PO of the different data acquisition methods that are being used at each site.

5.2.1 Belfort Raingage

Only one Belfort raingage was surveyed during this reporting period which was found to be operating well and measuring rainfall accurately.

6.0 Results of Field Laboratory and Procedure Assessments

The field site survey results have been presented and discussed in other sections of this report. Current field laboratory procedures are limited to sample weighing and decanting at NTN sites. This section will focus on weighing and decanting the NTN samples, and sample handling at MDN sites.

All site operators were observed to be proficient with sample weighing and decanting procedures. During the surveys, training procedures were reinforced regarding not mixing the sample prior to decanting. One suggestion that may be of value would be to move the field lab as close to the sample site as possible to help eliminate sample loss or mixing while transporting the sample to the lab. This is most practical at sites co-located with CASTNET sites, since there is usually space available for the lab equipment.

6.1 Sample Weighing

Although very accurate and easy to use, electronic scales require routine and regular maintenance. This is usually provided by a service contractor that visits the lab and certifies the scale. Scales that are determined to be functioning poorly during the site surveys should be identified as action items and require some follow-up from the CAL. This could include replacing the scale with a surplus instrument. Table 6-1 presents results for the scales surveyed when challenged with four standard Belfort weights (from approximately 830g to 3400g). An average error of 0.5% or more was used as the accuracy tolerance.

Table 6-1. Average Percent Difference for Site Scales

Site Id	Scale Type	Average % Difference
IL11	Denver Instruments S-8001	0.00%
IL78	OHAUS Triple Beam	-0.01%
IN34	OHAUS Triple Beam	-0.07%
KS97	ADAM Model CBK8A	-0.06%
MA01	OHAUS Triple Beam	-0.01%
MD08	Unknown	0.03%
MD13	Mettler PC 4000	-0.11%
MD15	Ohaus IP15KS	0.06%
MD18	OHAUS Triple Beam	-0.05%
ME02	Ohaus 1119D	0.03%
ME08	Ohaus 1119D	-0.07%

Site Id	Scale Type	Average % Difference
MN27	Sartorius Combics 2.	0.00%
NJ00	Acculab VA1600	0.06%
NJ39	OHAUS Triple Beam	-0.03%
NJ99	OHAUS Triple Beam.	-0.03%
NY22	OHAUS - Precision STD	-0.05%
NY28	Adam Equipment CBK 16aH	-0.06%
NY59	Unknown	-0.09%
NY92	Unknown	-0.08%
NY93	AE Adam CBK 16aH	0.01%
PA72	OHAUS Triple-beam	-0.06%
TN11	Ohaus 1119D	-0.04%

Site Id	Scale Type	Average % Difference
ME09	Ohaus 1900	0.62%
ME96	Ohaus Voyager	-0.01%
MN01	AND EK-12KA	0.03%

Site Id	Scale Type	Average % Difference
WI31	OHAUS Triple Beam	0.04%
WV05	Ohaus 1119D	0.01%
WV18	Mettler PM30 scale.	-0.02%

6.2 MDN Sample Handling

Although all site operators observed while exchanging MDN sample trains were careful to maintain sample quality and avoid contamination, some did not use gloves, or change gloves as often during the procedure as recommended by the HAL. Other observations of the procedures include:

- Not capping or securing the sample prior to removing the used sample train
- Not prioritizing the sample and sample bottle contamination above the used sample train cleanliness
- Not maintaining the new sample bottle lid on the bottle until placement in the sampler

The SOP procedures were emphasized during the surveys. It is suggested that the SOP procedures, especially those observed to have been lax in the field, also be stressed during the MDN sample change-out webinars or any new training programs implemented by the WSLH Hg laboratory.

7.0 Data Quality Information

Several procedures are in place to help ensure survey data quality. Foremost, a comprehensive QAPP was developed prior to collecting survey data. Field survey team training was provided to ensure consistency of methods. Duplicate entry of survey data is implemented to help detect and correct typographic errors. Ongoing review of results for accuracy and consistency is provided by the EEMS' QA Manager, who is not involved with the field data collection.

7.1 Quality Assurance Project Plan

Improvement to procedures for collecting survey data, recording data in the survey database and reporting survey results are an ongoing process. As improvements are identified, suggested changes are submitted for approval by the EPA Project Officer, and the NADP QA Manager. Once the suggested changes are approved the Site Survey QAPP and associated SOPs can be updated. The project QAPP was revised in December 2019.

7.2 Field Team Training and Internal QA Audits

Initial survey team training took place while performing two surveys in Indiana in December 2007. Survey team members routinely share experiences through regular communication which helps to clarify questions that may arise the first time a problem is encountered. This is an ongoing process that will continue, thereby expanding the knowledge base of the team and maintaining consistency of methods.

Whenever possible, all survey teams meet and cooperatively complete a site survey. In the past this was accomplished at site IL11 since that site operates all NADP networks and allows the greatest exchange of information and methods among the team members. In 2019 the most recently hired field technician rotated training visits with each of the more senior staff to share experience and techniques. If the schedule and budget permits cooperative site surveys will be performed in the future.

EEMS' QA manager also observes the survey team members during a routine site survey, and provides a report to the project management. This was last performed in 2017.

Site operator questionnaires are provided to each site operator following a site survey. The information gathered is used to improve the site survey program. It is anticipated that refinement of the questionnaires, with input from the NADP PO and laboratories will take place in the near future with the goal of further improvements to the survey program.

Training Class Attendance and Webinar Participation

In order to keep up with changes to the NADP procedures and protocols EEMS survey team members have attended past site operator training classes provided by the Mercury Analytical Laboratory (HAL), Central Analytical Laboratory (CAL), and Program Office and participate in past webinars (no webinars were offered in 2019).

EEMS understands that implementation of a training program is in flux since the PO and laboratories have transitioned to the WSLH. EEMS has always participated with the training programs as a means to stay current with procedures and changes to site equipment. It also allowed EEMS to provide the NADP PO with feedback and suggestions to improve the site operator training classes. EEMS intends to continue this practice in the future if the training program is reinstituted. EEMS intends to participate in the training webinars, when scheduling permits, to accomplish the same goals. EEMS personnel also attend NADP/NOS and participate in QAAG to stay current on any changes and provide feedback on any proposed changes having QA impacts at sites

7.3 Duplicate Data Entry

A routine procedure utilized as part of the EEMS QA program for survey data, is duplicate data entry. Field personnel enter survey data results into the Field Site Survey Database (FSSD) after completing the survey. An initial spot report is generated using this raw data. After completing approximately three surveys, the database is sent electronically to the EEMS office. The original hardcopy field forms are sent to the EEMS office via FedEx.

Upon receipt of the field forms, a second set of data tables are populated independently using the original hardcopy forms. The QA Manager then compares the two sets of tables. Discrepancies are identified and investigated to determine the intended entry. In some cases this requires contacting the field personnel to verify or confirm a result. If necessary, after the QA process and acceptance by the QA Manager, a revised spot report is generated from the set of tables populated at the office. This preserves the original set of tables populated in the field, and provides review, tracking, and edit documentation for the survey results and reports. The photos taken during the site survey are scrutinized during the QA process to ensure that the data recorded is in agreement with the photos.

Once data have been approved by the QA Manager, appropriate tables are generated and sent to the NADP QA Manager and to the EPA Project Officer. This is procedure is performed each quarter.

7.4 Identifiable Areas of Improvement to the Survey Program

As with all programs, continuous efforts are underway within the survey program to provide improvements to techniques and procedures in an attempt to deliver useful and meaningful information to the EPA and NADP. Those efforts have been described in the previous sections. As a direct result, the improvements summarized in the following subsections are being implemented.

7.4.1 Site Survey Questionnaire

Despite considerable effort on the part of both EEMS and the NADP PO, some of the questions contained in the Site Survey Questionnaire remain ambiguous. This has led to some survey field personnel interpreting some questions one way, while another team member might interpret the same question differently. Additionally, some survey questions are redundant or impossible to answer accurately during the field site survey. In the past, as cases were discovered during review of the survey reports, additional clarification was requested from the NADP QA Manager regarding the intent of the question. This information was then shared with the survey team members to eliminate confusion and maintain consistency. The current version of the questionnaire has been recently modified with the addition of a number of fields as requested by the NADP PO.

Refinement and improvement to the information collected during a site survey will continue. It is expected that feedback regarding the survey data will be provided on an annual basis from the NADP PO and other data users so that EEMS can continue to collect data that are meaningful and useful to the NADP.

7.4.2 Internal QA

This section summarizes the results of EEMS' internal QA processes.

Results of Duplicate Data Entry Process and Site File Review

When a discrepancy is identified by the EEMS QA Manager during review of the duplicate data entry, a code is assigned to the record to indicate if the error was the result of a typo by field personnel or QA personnel. If an error in the original entry is identified and not the result of a typo the record is also coded. The results of the QA coding are presented in Table 7-1. Discrepancies due to formatting issues are corrected, but are not considered errors.

Table 7-1. 2019 Internal QA Results for Duplicate Entry Errors

	Field Entry	Duplicate QA Entry	Total Entries
Total Number of Entries Compared	8,270	8,270	16,540
Initial File Entry Errors	23		
Duplicate QA Entry Errors		52	
Percent Errors	0.28%	0.63%	
Total Entry Errors	0.45%		
Total Percent Errors	0.67%		

The data indicates that of the 27,488 entries that are compared (does not include memo fields), the entry error rate is about 0.67%.

7.5 Survey Equipment Certification

The instruments used by the survey team are maintained and certified by the EEMS Survey Team Leader. Most undergo annual certification by various sources. Digital multi-meters (DVM) are certified National Institute of Standards and Technology (NIST) traceable by a third party. The DVMs are used to measure temperature with a thermocouple input which is certified with a NIST traceable Resistive Temperature Detector (RTD).

The weights used to challenge the weighing raingages and site scales are certified annually on a NIST traceable electronic scale at the EEMS facility in Gainesville, FL.

The compass used to determine the azimuth of objects near the collector is certified as NIST traceable annually by a third party.

All certification documentation is provided in Appendix E.

APPENDIX A

Assessments Determined to Impact Data Quality

Assessments Determined to Impact Data Quality

Field Entry	NTN	MDN
Is sampling media quality maintained?	✓	✓
Is the orifice of the collector +/- .3 m of raingage (elevation)	✓	✓
30 degree rule for buildings met (raingage)	✓	✓
No objects > 1 m height inside 5 m radius (raingage)	✓	✓
No fences > 1 m height inside 2 m radius (raingage)	✓	✓
No vegetation height > 0.6 m within 5 m radius (raingage)	✓	✓
Does NADP require a raingage wind shield at this site	✓	✓
If raingage wind shield present, is it installed correctly	✓	✓
Collector and sensor oriented properly	✓	✓
45 degree rule met (collector)	✓	✓
30 degree rule for trees met (collector)	✓	✓
30 degree rule for buildings met (collector)	✓	✓
No objects > 1 m height within 5 m radius (collector)	✓	✓
No fences > 1 m height inside 5 m radius (collector)	✓	✓
No vegetation height > 0.6 m within 5 m radius (collector)	✓	✓
No treated lumber inside 5 m radius (collector)	✓	✓
No galvanized metal inside 5 m radius collector (MDN)	N/A	✓
No pastures and ag. activity within 20 m radius	✓	✓
No herbicides and fertilizers used within 20 m radius	✓	✓
Roads meet NADP siting criteria	✓	✓
Waterways meet NADP siting criteria	✓	✓
Airports meet NADP siting criteria	✓	✓
Animal operations meet NADP siting criteria (NTN)	✓	N/A
Combustion sources meet NADP siting criteria (MDN only)	N/A	✓
Parking lots and maintenance areas meet NADP siting criteria	✓	✓
Storage areas (fertilizers, road salt, manure, etc) meet NADP siting criteria	✓	✓
Metalworking operations meet NADP siting criteria (MDN only)	N/A	✓
Dry side bucket is clean	✓	✓
Does lid seal properly	✓	✓
Lid liner in good condition	✓	✓
Fan in good condition	N/A	✓

Field Entry	NTN	MDN
Cooling fan thermostat in good condition	N/A	✓
Heater in good condition	N/A	✓
Heater thermostat in good condition	N/A	✓
Has flush wall filter mount been installed	N/A	✓
Filter in good condition	N/A	✓
Max / min thermometer in acceptable limits	N/A	✓
ACM sensor operates properly	✓	✓
Motorbox operates within acceptable limits	✓	✓
N-CON fan in good condition	N/A	✓
N-CON cooling fan thermostat in good condition	N/A	✓
N-CON heater in good condition	N/A	✓
N-CON heater thermostat in good condition	N/A	✓
N-CON max / min thermometer in acceptable limits	N/A	✓
N-CON sensor responds to five passes of the hand	N/A	✓
N-CON lid seal in good condition	N/A	✓
N-CON lid liner in good condition	N/A	✓
Was the 'as found' turn over set properly (Belfort gage)	✓	✓
Raingage operates properly (electronic gage)	✓	✓
Does datalogger receive event signals form all collectors (electronic gage)	✓	✓
Does optical sensor respond to "blocking" of light beam (electronic gage)	✓	✓
Does optical sensor respond to mist of water (electronic gage)	✓	✓

N/A = Not applicable

APPENDIX B

Findings Most Likely to Impact Data Quality

Table B-1. Findings Most Likely to Impact Data Quality – MDN Sites with ACM-type Collectors (page 1 of 2)

StationId	IN22	MA01	MD08	ME02	ME09
Is sampling media quality maintained?					
Is the orifice of the collector +/- .3 m of raingage (elevation)					
No objects > 1 m height inside 5 m radius (raingage)		X	X		X
No fences > 1 m height inside 2 m radius (raingage)					
No vegetation height > 0.6 m within 5 m radius (raingage)			X	X	
Collector and sensor oriented properly					
45 degree rule met (collector)					
30 degree rule for trees met (collector)		X	X		X
No objects > 1 m height within 5 m radius (collector)					
No fences > 1 m height inside 5 m radius (collector)					
No vegetation height > 0.6 m within 5 m radius (collector)			X	X	X
No treated lumber inside 5 m radius (collector)		X			X
No galvanized metal inside 5 m radius collector (MDN)					
No pastures and ag. activity within 20 m radius					
No herbicides and fertilizers used within 20 m radius					
Roads meet NADP siting criteria					
Waterways meet NADP siting criteria					
Airports meet NADP siting criteria					
Combustion sources meet NADP siting criteria (MDN only)					
Parking lots and maintenance areas meet NADP siting criteria					
Storage areas (fertilizers, road salt, manure, etc) meet NADP siting criteria					
Metalworking operations meet NADP siting criteria (MDN only)					
Dry side bucket is clean					
Does lid seal properly					
Lid liner in good condition					
Fan in good condition					
Cooling fan thermostat in good condition					
Heater in good condition					
Heater thermostat in good condition					
Has flush wall filter mount been installed	X				
Filter in good condition	--				
Max / min thermometer in acceptable limits					
ACM sensor operates properly					
Motorbox operates within acceptable limits					
Raingage operates properly (electronic gage)					
Does datalogger receive event signals form all collectors (electronic gage)	X			X	X
Does optical sensor respond to "blocking" of light beam (electronic gage)	--	X		X	
Does optical sensor respond to mist of water (electronic gage)	--	X		X	

	Indicates found compliant
X	**Indicates found non-compliant**
--	**Indicates "Not Applicable"**
U to T	**Indicates "Unable to Test"**

Table B-1. Findings Most Likely to Impact Data Quality – MDN Sites with ACM-type Collectors (page 2 of 2)

StationId	ME96	MN27	NJ30	TN11
Is sampling media quality maintained?				
Is the orifice of the collector +/- .3 m of raingage (elevation)		X		
No objects > 1 m height inside 5 m radius (raingage)	X			
No fences > 1 m height inside 2 m radius (raingage)				
No vegetation height > 0.6 m within 5 m radius (raingage)	X			
Collector and sensor oriented properly				
45 degree rule met (collector)				X
30 degree rule for trees met (collector)			X	X
No objects > 1 m height within 5 m radius (collector)	X			
No fences > 1 m height inside 5 m radius (collector)				
No vegetation height > 0.6 m within 5 m radius (collector)	X			
No treated lumber inside 5 m radius (collector)	X		X	
No galvanized metal inside 5 m radius collector (MDN)			X	
No pastures and ag. activity within 20 m radius	X			
No herbicides and fertilizers used within 20 m radius		X		
Roads meet NADP siting criteria			X	
Waterways meet NADP siting criteria				
Airports meet NADP siting criteria				
Combustion sources meet NADP siting criteria (MDN only)				
Parking lots and maintenance areas meet NADP siting criteria				
Storage areas (fertilizers, road salt, manure, etc) meet NADP siting criteria				
Metalworking operations meet NADP siting criteria (MDN only)				
Dry side bucket is clean				
Does lid seal properly				
Lid liner in good condition				
Fan in good condition				
Cooling fan thermostat in good condition				
Heater in good condition				
Heater thermostat in good condition				
Has flush wall filter mount been installed				
Filter in good condition				
Max / min thermometer in acceptable limits				
ACM sensor operates properly				
Motorbox operates within acceptable limits				
Raingage operates properly (electronic gage)				
Does datalogger receive event signals form all collectors (electronic gage)	X		X	
Does optical sensor respond to "blocking" of light beam (electronic gage)			--	
Does optical sensor respond to mist of water (electronic gage)			--	

	Indicates found compliant
X	**Indicates found non-compliant**
--	**Indicates "Not Applicable"**
U to T	**Indicates "Unable to Test"**

Table B-2. Findings Most Likely to Impact Data Quality – MDN Sites with N-CON Collectors

StationId	AB14	IL11	NC26	OK05	OK97
Is sampling media quality maintained?					
Is the orifice of the collector +/- .3 m of raingage (elevation)					
No objects > 1 m height inside 5 m radius (raingage)		X	X		X
No fences > 1 m height inside 2 m radius (raingage)					X
No vegetation height > 0.6 m within 5 m radius (raingage)		X			
Collector and sensor oriented properly	X			X	X
45 degree rule met (collector)				X	
30 degree rule for trees met (collector)					X
No objects > 1 m height within 5 m radius (collector)		X	X		X
No fences > 1 m height inside 5 m radius (collector)				X	X
No vegetation height > 0.6 m within 5 m radius (collector)					
No treated lumber inside 5 m radius (collector)		U to T			
No galvanized metal inside 5 m radius collector (MDN)	X			X	X
No pastures and ag. activity within 20 m radius					
No herbicides and fertilizers used within 20 m radius					
Roads meet NADP siting criteria					
Waterways meet NADP siting criteria					
Airports meet NADP siting criteria					
Combustion sources meet NADP siting criteria (MDN only)					
Parking lots and maintenance areas meet NADP siting criteria					
Storage areas (fertilizers, road salt, manure, etc) meet NADP siting criteria					
Metalworking operations meet NADP siting criteria (MDN only)					
N-CON fan in good condition	X		X		
N-CON cooling fan thermostat in good condition					
N-CON heater in good condition	X				
N-CON heater thermostat in good condition					
N-CON max / min thermometer in acceptable limits		X			
N-CON sensor responds to 5 passes of the hand	X				
N-CON lid seal in good condition	X		X		
N-CON lid liner in good condition					
Was the 'as found' turn over set properly (Belfort gage)	--	--	--	--	--
Raingage operates properly (electronic gage)					
Does datalogger receive event signals form all collectors (electronic gage)	X			X	X
Does optical sensor respond to "blocking" of light beam (electronic gage)		--			
Does optical sensor respond to mist of water (electronic gage)		--			

	Indicates found compliant
X	**Indicates found non-compliant**
--	**Indicates "Not Applicable"**
U to T	**Indicates "Unable to Test"**

Table B-3. Findings Most Likely to Impact Data Quality – NTN Sites with ACM-type Collectors (page 1 of 4)

StationId	IL11	IN34	KS97	MA01	MD08
Is sampling media quality maintained?					
Is the orifice of the collector +/- .3 m of raingage (elevation)					
No objects > 1 m height inside 5 m radius (raingage)	X			X	X
No fences > 1 m height inside 2 m radius (raingage)					
No vegetation height > 0.6 m within 5 m radius (raingage)	X				X
Collector and sensor oriented properly					
45 degree rule met (collector)					
30 degree rule for trees met (collector)			X	X	X
No objects > 1 m height within 5 m radius (collector)	X				X
No fences > 1 m height inside 5 m radius (collector)					
No vegetation height > 0.6 m within 5 m radius (collector)					X
No treated lumber inside 5 m radius (collector)	U to T	X	X	X	
No pastures and ag. activity within 20 m radius					
No herbicides and fertilizers used within 20 m radius			X		
Roads meet NADP siting criteria					
Waterways meet NADP siting criteria					
Airports meet NADP siting criteria					
Animal operations meet NADP site cirteria (NTN and AIRMoN)					
Parking lots and maintenance areas meet NADP siting criteria					
Storage areas (fertilizers, road salt, manure, etc) meet NADP siting criteria					
Dry side bucket is clean					
Does lid seal properly					
Lid liner in good condition					
ACM sensor operates properly					
Motorbox operates within acceptable limits					
Was the 'as found' turn over set properly (Belfort gage)	--	--	--	--	--
Raingage operates properly (electronic gage)					
Does datalogger receive event signals form all collectors (electronic gage)					
Does optical sensor respond to "blocking" of light beam (electronic gage)	--	--	X	X	
Does optical sensor respond to mist of water (electronic gage)	--	--	X	X	

	Indicates found compliant
X	**Indicates found non-compliant**
--	**Indicates "Not Applicable"**
U to T	**Indicates "Unable to Test"**

Table B-3. Findings Most Likely to Impact Data Quality – NTN Sites with ACM-type Collectors (page 2 of 4)

StationId	MD13	MD15	MD18	ME02	ME09
Is sampling media quality maintained?					
Is the orifice of the collector +/- .3 m of raingage (elevation)			X		
No objects > 1 m height inside 5 m radius (raingage)	X	X	X		X
No fences > 1 m height inside 2 m radius (raingage)	X				
No vegetation height > 0.6 m within 5 m radius (raingage)		X		X	
Collector and sensor oriented properly					
45 degree rule met (collector)					
30 degree rule for trees met (collector)			X		X
No objects > 1 m height within 5 m radius (collector)	X	X	X		X
No fences > 1 m height inside 5 m radius (collector)	X				
No vegetation height > 0.6 m within 5 m radius (collector)		X		X	X
No treated lumber inside 5 m radius (collector)	X	X	X		X
No pastures and ag. activity within 20 m radius					
No herbicides and fertilizers used within 20 m radius					
Roads meet NADP siting criteria					
Waterways meet NADP siting criteria					
Airports meet NADP siting criteria					
Animal operations meet NADP site cirteria (NTN and AIRMoN)					
Parking lots and maintenance areas meet NADP siting criteria					
Storage areas (fertilizers, road salt, manure, etc) meet NADP siting criteria					
Dry side bucket is clean				X	
Does lid seal properly					
Lid liner in good condition					
ACM sensor operates properly					
Motorbox operates within acceptable limits					
Was the 'as found' turn over set properly (Belfort gage)	--		--	--	--
Raingage operates properly (electronic gage)		--			
Does datalogger receive event signals form all collectors (electronic gage)		--		X	X
Does optical sensor respond to "blocking" of light beam (electronic gage)		--	X	X	
Does optical sensor respond to mist of water (electronic gage)		--	X	X	

	Indicates found compliant
X	**Indicates found non-compliant**
--	**Indicates "Not Applicable"**
U to T	**Indicates "Unable to Test"**

Table B-3. Findings Most Likely to Impact Data Quality – NTN Sites with ACM-type Collectors (page 3 of 4)

StationId	ME96	NJ00	NJ39	NJ99
Is sampling media quality maintained?				
Is the orifice of the collector +/- .3 m of raingage (elevation)				
No objects > 1 m height inside 5 m radius (raingage)	X		X	X
No fences > 1 m height inside 2 m radius (raingage)				X
No vegetation height > 0.6 m within 5 m radius (raingage)	X	X		
Collector and sensor oriented properly				
45 degree rule met (collector)				X
30 degree rule for trees met (collector)				X
No objects > 1 m height within 5 m radius (collector)	X		X	X
No fences > 1 m height inside 5 m radius (collector)	X			X
No vegetation height > 0.6 m within 5 m radius (collector)	X	X		
No treated lumber inside 5 m radius (collector)	X		X	
No pastures and ag. activity within 20 m radius	X			
No herbicides and fertilizers used within 20 m radius				
Roads meet NADP siting criteria				
Waterways meet NADP siting criteria			X	
Airports meet NADP siting criteria				
Animal operations meet NADP site cirteria (NTN and AIRMoN)				
Parking lots and maintenance areas meet NADP siting criteria			X	X
Storage areas (fertilizers, road salt, manure, etc) meet NADP siting criteria				
Dry side bucket is clean		X		
Does lid seal properly				
Lid liner in good condition				
ACM sensor operates properly	X	X		
Motorbox operates within acceptable limits				
Was the 'as found' turn over set properly (Belfort gage)	--	--	--	--
Raingage operates properly (electronic gage)				X
Does datalogger receive event signals form all collectors (electronic gage)	X		X	
Does optical sensor respond to "blocking" of light beam (electronic gage)				
Does optical sensor respond to mist of water (electronic gage)				

	Indicates found compliant
X	**Indicates found non-compliant**
--	**Indicates "Not Applicable"**
U to T	**Indicates "Unable to Test"**

Table B-3. Findings Most Likely to Impact Data Quality – NTN Sites with ACM-type Collectors (page 4 of 4)

StationId	NY22	TN11	WV05	WV18
Is sampling media quality maintained?				
Is the orifice of the collector +/- .3 m of raingage (elevation)				
No objects > 1 m height inside 5 m radius (raingage)			X	
No fences > 1 m height inside 2 m radius (raingage)				
No vegetation height > 0.6 m within 5 m radius (raingage)				
Collector and sensor oriented properly				
45 degree rule met (collector)		X		
30 degree rule for trees met (collector)		X	X	
No objects > 1 m height within 5 m radius (collector)				
No fences > 1 m height inside 5 m radius (collector)				
No vegetation height > 0.6 m within 5 m radius (collector)				
No treated lumber inside 5 m radius (collector)				
No pastures and ag. activity within 20 m radius				
No herbicides and fertilizers used within 20 m radius				
Roads meet NADP siting criteria				
Waterways meet NADP siting criteria				
Airports meet NADP siting criteria				
Animal operations meet NADP site cirteria (NTN and AIRMoN)				
Parking lots and maintenance areas meet NADP siting criteria				
Storage areas (fertilizers, road salt, manure, etc) meet NADP siting criteria				
Dry side bucket is clean	X		X	
Does lid seal properly				
Lid liner in good condition				
ACM sensor operates properly				
Motorbox operates within acceptable limits				
Was the 'as found' turn over set properly (Belfort gage)	--	--	--	--
Raingage operates properly (electronic gage)				
Does datalogger receive event signals form all collectors (electronic gage)				
Does optical sensor respond to "blocking" of light beam (electronic gage)				
Does optical sensor respond to mist of water (electronic gage)				

	Indicates found compliant
X	**Indicates found non-compliant**
--	**Indicates "Not Applicable"**
U to T	**Indicates "Unable to Test"**

Table B-4. Findings Most Likely to Impact Data Quality – NTN Sites with N-CON Collectors (page 1 of 2)

StationId	IL78	ME08	MN01	MN27	NY28
Is sampling media quality maintained?					
Is the orifice of the collector +/- .3 m of raingage (elevation)				X	
No objects > 1 m height inside 5 m radius (raingage)			X		X
No fences > 1 m height inside 2 m radius (raingage)					X
No vegetation height > 0.6 m within 5 m radius (raingage)					
Collector and sensor oriented properly				X	X
45 degree rule met (collector)					
30 degree rule for trees met (collector)		X			
No objects > 1 m height within 5 m radius (collector)				X	X
No fences > 1 m height inside 5 m radius (collector)					X
No vegetation height > 0.6 m within 5 m radius (collector)					
No treated lumber inside 5 m radius (collector)		X	X		
No pastures and ag. activity within 20 m radius	X				
No herbicides and fertilizers used within 20 m radius				X	
Roads meet NADP siting criteria					
Waterways meet NADP siting criteria					
Airports meet NADP siting criteria					X
Animal operations meet NADP site cirteria (NTN and AIRMoN)					
Parking lots and maintenance areas meet NADP siting criteria					X
Storage areas (fertilizers, road salt, manure, etc) meet NADP siting criteria					
N-CON sensor responds to 5 passes of the hand					
N-CON lid seal in good condition			X	X	
N-CON lid liner in good condition				X	
Raingage operates properly (electronic gage)					
Does datalogger receive event signals form all collectors (electronic gage)					
Does optical sensor respond to "blocking" of light beam (electronic gage)	--	--			
Does optical sensor respond to mist of water (electronic gage)	--	--			

	Indicates found compliant
X	**Indicates found non-compliant**
--	**Indicates "Not Applicable"**
U to T	**Indicates "Unable to Test"**

Table B-4. Findings Most Likely to Impact Data Quality – NTN Sites with N-CON Collectors (page 2 of 2)

StationId	NY59	NY92	NY93	PA72	WI31
Is sampling media quality maintained?					
Is the orifice of the collector +/- .3 m of raingage (elevation)					
No objects > 1 m height inside 5 m radius (raingage)	X	X	X	X	
No fences > 1 m height inside 2 m radius (raingage)		X			
No vegetation height > 0.6 m within 5 m radius (raingage)					
Collector and sensor oriented properly					
45 degree rule met (collector)				X	
30 degree rule for trees met (collector)	X			X	X
No objects > 1 m height within 5 m radius (collector)	X	X	X	X	
No fences > 1 m height inside 5 m radius (collector)		X			
No vegetation height > 0.6 m within 5 m radius (collector)					
No treated lumber inside 5 m radius (collector)	X		X		
No pastures and ag. activity within 20 m radius					
No herbicides and fertilizers used within 20 m radius					
Roads meet NADP siting criteria					
Waterways meet NADP siting criteria					
Airports meet NADP siting criteria					
Animal operations meet NADP site cirteria (NTN and AIRMoN)					
Parking lots and maintenance areas meet NADP siting criteria		X			
Storage areas (fertilizers, road salt, manure, etc) meet NADP siting criteria					
N-CON sensor responds to 5 passes of the hand					
N-CON lid seal in good condition					X
N-CON lid liner in good condition				X	
Raingage operates properly (electronic gage)					
Does datalogger receive event signals form all collectors (electronic gage)					
Does optical sensor respond to "blocking" of light beam (electronic gage)				--	
Does optical sensor respond to mist of water (electronic gage)				--	

	Indicates found compliant
X	**Indicates found non-compliant**
--	**Indicates "Not Applicable"**
U to T	**Indicates "Unable to Test"**

APPENDIX C

Comparison between Surveys of Findings Most Likely to Impact Data Quality

Table C-1. NADP – MDN – Siting Criteria and Sample Quality: Comparison Between Surveys of Findings Most Likely to Impact Data Quality (1 of 2)

StationId	AB14				IL11				IN22		MA01				MD08				ME02				ME09			
Year	2009	2012	2015	2019	2009	2012	2015	2019	2015	2019	2009	2013	2016	2019	2008	2013	2015	2019	2009	2012	2015	2019	2009	2012	2015	2019
Is sampling media quality maintained?												X														
Is the orifice of the collector +/- .3 m of raingage (elevation)																										
No oobjects > 1 m height inside 5 m radius (raingage)						X	X	X			X	X	X	X		X	X	X					X	X	X	X
No fences > 1 m height inside 2 m radius (raingage)																										
No vegetation height > 0.6 m within 5 m radius (raingage)					X	X	X	X			X				X	X	X	X		X		X				
Collector and sensor oriented properly				X																						
45 degree rule met (collector)											X															
30 degree rule for trees met (collector)											X			X				X					X	X	X	X
No objects > 1 m height within 5 m radius (collector)					X	X	X	X																		
No fences > 1 m height inside 5 m radius (collector)																										
No vegetation height > 0.6 m within 5 m radius (collector)					X	X	X								X	X	X	X		X		X	X			X
No treated lumber inside 5 m radius (collector)							X	U to T						X							X				X	X
No galvanized metal inside 5 m radius collector (MDN)		X	X	X																						
No pastures and ag. activity within 20 m radius			X																--							
No herbicides and fertilizers used within 20 m radius			X																							
Roads meet NADP siting criteria																										
Waterways meet NADP siting criteria																										
Airports meet NADP siting criteria																										
Combustion sources meet NADP siting criteria (MDN only)																										
Parking lots and maintenance areas meet NADP siting criteria																										
Storage areas (fertilizers, road salt, manure, etc) meet NADP siting criteria																										
Metalworking operations meet NADP siting criteria (MDN only)																										

	Indicates found compliant
X	**Indicates found non-compliant**
--	**Indicates "Not Applicable"**
U to T	**Indicates "Unable to Test"**

Table C-1. NADP – MDN – Siting Criteria and Sample Quality: Comparison Between Surveys of Findings Most Likely to Impact Data Quality (2 of 2)

StationId	ME96				MN27				NC26			NJ30				TN11			
Year	2009	2012	2015	2019	2009	2012	2015	2019	2008	2015	2019	2009	2012	2015	2019	2009	2012	2015	2019
Is sampling media quality maintained?																			
Is the orifice of the collector +/- .3 m of raingage (elevation)								X											
No oobjects > 1 m height inside 5 m radius (raingage)				X					X	X	X			X					
No fences > 1 m height inside 2 m radius (raingage)																			
No vegetation height > 0.6 m within 5 m radius (raingage)				X															
Collector and sensor oriented properly										X									
45 degree rule met (collector)																X	X	X	X
30 degree rule for trees met (collector)															X	X	X	X	X
No objects > 1 m height within 5 m radius (collector)				X						X	X								
No fences > 1 m height inside 5 m radius (collector)												X	X	X					
No vegetation height > 0.6 m within 5 m radius (collector)				X															
No treated lumber inside 5 m radius (collector)			X	X									X	X	X				
No galvanized metal inside 5 m radius collector (MDN)													X	X	X				
No pastures and ag. activity within 20 m radius	X	X	X	X					--										
No herbicides and fertilizers used within 20 m radius							X	X	--										
Roads meet NADP siting criteria														X	X				
Waterways meet NADP siting criteria																			
Airports meet NADP siting criteria																			
Combustion sources meet NADP siting criteria (MDN only)																			
Parking lots and maintenance areas meet NADP siting criteria																			
Storage areas (fertilizers, road salt, manure, etc) meet NADP siting criteria																			
Metalworking operations meet NADP siting criteria (MDN only)																			

	Indicates found compliant
X	**Indicates found non-compliant**
--	**Indicates "Not Applicable"**
U to T	**Indicates "Unable to Test"**

Table C-1. NADP – MDN – Siting Criteria and Sample Quality: Comparison Between Surveys of Findings Most Likely to Impact Data Quality (1 of 4)

StationId	IL11				IL78				IN34				KS97		MA01				MD08				MD13			
Year	2009	2012	2015	2019	2009	2012	2015	2019	2009	2013	2015	2019	2015	2019	2009	2013	2016	2019	2008	2013	2015	2019	2010	2012	2015	2019
Is sampling media quality maintained?																										
Is the orifice of the collector +/- .3 m of raingage (elevation)																							X			
No oobjects > 1 m height inside 5 m radius (raingage)	X	X	X	X											X	X	X	X	X	X	X	X			X	X
No fences > 1 m height inside 2 m radius (raingage)																									X	X
No vegetation height > 0.6 m within 5 m radius (raingage)	X	X	X	X							X				X				X	X	X	X				
Collector and sensor oriented properly																										
45 degree rule met (collector)															X	X										
30 degree rule for trees met (collector)													X	X	X			X				X				
No objects > 1 m height within 5 m radius (collector)			X	X															X	X	X	X	X		X	X
No fences > 1 m height inside 5 m radius (collector)																									X	X
No vegetation height > 0.6 m within 5 m radius (collector)	X		X								X				X				X	X	X	X				
No treated lumber inside 5 m radius (collector)			X	U to T							X	X	X	X				X			X		X		X	X
No pastures and ag. activity within 20 m radius								X																		
No herbicides and fertilizers used within 20 m radius					X								X	X											X	
Roads meet NADP siting criteria																										
Waterways meet NADP siting criteria																										
Airports meet NADP siting criteria																										
Animal operations meet NADP site cirteria (NTN and AIRMoN)																										
Parking lots and maintenance areas meet NADP siting criteria																							X	X	X	
Storage areas (fertilizers, road salt, manure, etc) meet NADP siting criteria																										

	Indicates found compliant
X	**Indicates found non-compliant**
--	**Indicates "Not Applicable"**
U to T	**Indicates "Unable to Test"**

Table C-1. NADP – MDN – Siting Criteria and Sample Quality: Comparison Between Surveys of Findings Most Likely to Impact Data Quality (2 of 4)

StationId	MD15				MD18				ME02				ME08				ME09				ME96				MN01			
Year	2010	2013	2015	2019	2010	2013	2015	2019	2009	2012	2015	2019	2009	2012	2015	2019	2009	2012	2015	2019	2009	2012	2015	2019	2009	2012	2015	2019
Is sampling media quality maintained?																												
Is the orifice of the collector +/- .3 m of raingage (elevation)					X	X	X	X																				
No oobjects > 1 m height inside 5 m radius (raingage)				X	X	X	X	X									X	X		X				X				X
No fences > 1 m height inside 2 m radius (raingage)																												
No vegetation height > 0.6 m within 5 m radius (raingage)			X	X						X		X												X	X			
Collector and sensor oriented properly																										X		
45 degree rule met (collector)																			X									
30 degree rule for trees met (collector)								X							X	X	X	X	X	X					X			
No objects > 1 m height within 5 m radius (collector)				X				X									X	X	X	X				X				
No fences > 1 m height inside 5 m radius (collector)																								X				
No vegetation height > 0.6 m within 5 m radius (collector)		X	X	X						X		X							X	X				X	X			
No treated lumber inside 5 m radius (collector)		X	X	X			X	X			X			X	X	X		X	X	X			X	X			X	X
No pastures and ag. activity within 20 m radius																					X	X	X	X				
No herbicides and fertilizers used within 20 m radius						X	X																					
Roads meet NADP siting criteria																												
Waterways meet NADP siting criteria																												
Airports meet NADP siting criteria																												
Animal operations meet NADP site cirteria (NTN and AIRMoN)																												
Parking lots and maintenance areas meet NADP siting criteria																												
Storage areas (fertilizers, road salt, manure, etc) meet NADP siting criteria																												

	Indicates found compliant
X	**Indicates found non-compliant**
--	**Indicates "Not Applicable"**
U to T	**Indicates "Unable to Test"**

Table C-1. NADP – MDN – Siting Criteria and Sample Quality: Comparison Between Surveys of Findings Most Likely to Impact Data Quality (3 of 4)

StationId	MN27				NJ00				NJ39		NJ99				NY22				NY28		NY59		NY92		NY93	
Year	2009	2012	2015	2019	2009	2012	2015	2019	2015	2019	2009	2012	2015	2019	2008	2011	2015	2019	2015	2019	2015	2019	2015	2019	2015	2019
Is sampling media quality maintained?																										
Is the orifice of the collector +/- .3 m of raingage (elevation)				X	X																					
No oobjects > 1 m height inside 5 m radius (raingage)									X	X	X	X	X	X					X	X	X	X	X	X	X	X
No fences > 1 m height inside 2 m radius (raingage)														X						X				X		
No vegetation height > 0.6 m within 5 m radius (raingage)							X	X																		
Collector and sensor oriented properly				X					X										X	X					X	
45 degree rule met (collector)														X												
30 degree rule for trees met (collector)											X	X	X	X								X				
No objects > 1 m height within 5 m radius (collector)			X	X					X	X	X	X	X	X					X	X	X	X	X	X	X	X
No fences > 1 m height inside 5 m radius (collector)											X	X	X	X						X			X	X		
No vegetation height > 0.6 m within 5 m radius (collector)							X	X																		
No treated lumber inside 5 m radius (collector)			X						X	X											X	X			X	X
No pastures and ag. activity within 20 m radius															X											
No herbicides and fertilizers used within 20 m radius			X	X																						
Roads meet NADP siting criteria																										
Waterways meet NADP siting criteria									X	X																
Airports meet NADP siting criteria																				X						
Animal operations meet NADP site cirteria (NTN and AIRMoN)																										
Parking lots and maintenance areas meet NADP siting criteria									X	X	X	X	X	X						X			X	X		
Storage areas (fertilizers, road salt, manure, etc) meet NADP siting criteria																										

	Indicates found compliant
X	**Indicates found non-compliant**
--	**Indicates "Not Applicable"**
U to T	**Indicates "Unable to Test"**

Table C-1. NADP – MDN – Siting Criteria and Sample Quality: Comparison Between Surveys of Findings Most Likely to Impact Data Quality (4 of 4)

StationId	PA72				TN11				WI31		WV05				WV18			
Year	2009	2012	2015	2019	2009	2012	2015	2019	2015	2019	2009	2013	2015	2019	2009	2013	2015	2019
Is sampling media quality maintained?												U to T						
Is the orifice of the collector +/- .3 m of raingage (elevation)																		
No oobjects > 1 m height inside 5 m radius (raingage)			X	X							X			X	X			
No fences > 1 m height inside 2 m radius (raingage)															X	X		
No vegetation height > 0.6 m within 5 m radius (raingage)																		
Collector and sensor oriented properly																		
45 degree rule met (collector)	X	X	X	X	X	X	X	X				X	X					
30 degree rule for trees met (collector)		X	X	X	X	X	X	X	X	X	X	X	X	X				
No objects > 1 m height within 5 m radius (collector)	X	X	X	X											X			
No fences > 1 m height inside 5 m radius (collector)																		
No vegetation height > 0.6 m within 5 m radius (collector)																		
No treated lumber inside 5 m radius (collector)																		
No pastures and ag. activity within 20 m radius																		
No herbicides and fertilizers used within 20 m radius																		
Roads meet NADP siting criteria											X							
Waterways meet NADP siting criteria																		
Airports meet NADP siting criteria																		
Animal operations meet NADP site cirteria (NTN and AIRMoN)																		
Parking lots and maintenance areas meet NADP siting criteria																		
Storage areas (fertilizers, road salt, manure, etc) meet NADP siting criteria																		

	Indicates found compliant
X	**Indicates found non-compliant**
--	**Indicates "Not Applicable"**
U to T	**Indicates "Unable to Test"**

Table C-3. NADP – MDN – Raingage and Collector: Comparison Between Surveys of Findings Most Likely to Impact Data Quality (1 of 2)

StationId	AB14				IL11				IN22		MA01				MD08				ME02				ME09			
Year	2009	2012	2015	2019	2009	2012	2015	2019	2015	2019	2009	2013	2016	2019	2008	2013	2015	2019	2009	2012	2015	2019	2009	2012	2015	2019
Dry side bucket is clean				--				--			--	X							X							
Does lid seal properly				--				--																		
Lid liner in good condition				--				--																		
Fan in good condition				--				--													X					
Cooling fan thermostat in good condition				--				--																		
Heater in good condition				--				--																		
Heater thermostat in good condition				--				--																		
Has flush wall filter mount been installed				--				--		X						X	X			X						
Filter in good condition				--		--	--	--		--						--	--									
Max / min thermometer in acceptable limits				--				--																		
ACM sensor operates properly				--				--					X													
Motorbox operates within acceptable limits				--	X			--					X													
N-CON lid seal in good condition	--	--	--		--	--	--		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
N-CON lid liner in good condition	--	--	--	X	--	--	--		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
N-CON fan in good condition	--	--	--	X	--	--	--		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
N-CON cooling fan thermostat in good condition	--	--	--		--	--	--		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
N-CON heater in good condition	--	--	--	X	--	--	--		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
N-CON heater thermostat in good condition	--	--	--		--	--	--		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
N-CON max / min thermometer in acceptable limits	--	--	--		--	--	--	X	--	--	--	--	--		--	--	--		--	--	--		--	--	--	
N-CON sensor responds to 5 passes of the hand	--	--	--	X	--	--	--		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Was the 'as found' turn over set properly (Belfort gage)	--	--	--	--	--	--	--	--	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Raingage operates properly (electronic gage)											--															
Does datalogger receive event signals form all collectors (electronic gage)				X						X	--		X									X				X
Does optical sensor respond to "blocking" of light beam (electronic gage)					--	--	--	--	--	--	--		X	X								X				
Does optical sensor respond to mist of water (electronic gage)					--	--	--	--	--	--	--		X	X								X				

	Indicates found compliant
X	**Indicates found non-compliant**
--	**Indicates "Not Applicable"**
U to T	**Indicates "Unable to Test"**

Table C-3. NADP – MDN – Raingage and Collector: Comparison Between Surveys of Findings Most Likely to Impact Data Quality (2 of 2)

StationId	ME96				MN27				NC26			NJ30				TN11			
Year	2009	2012	2015	2019	2009	2012	2015	2019	2008	2015	2019	2009	2012	2015	2019	2009	2012	2015	2019
Dry side bucket is clean	X				--	X	--		X	--	--								
Does lid seal properly	X									--	--								
Lid liner in good condition	X								X	--	--		X						
Fan in good condition										--	--								
Cooling fan thermostat in good condition										--	--								
Heater in good condition										--	--								
Heater thermostat in good condition										--	--								
Has flush wall filter mount been installed		X								--	--								
Filter in good condition			--							--	--								
Max / min thermometer in acceptable limits										--	--		X						
ACM sensor operates properly										--	--								
Motorbox operates within acceptable limits										--	--								
N-CON lid seal in good condition	--	--	--	--	--	--	--	--	--			--	--	--	--	--	--	--	--
N-CON lid liner in good condition	--	--	--	--	--	--	--	--	--		X	--	--	--	--	--	--	--	--
N-CON fan in good condition	--	--	--	--	--	--	--	--	--		X	--	--	--	--	--	--	--	--
N-CON cooling fan thermostat in good condition	--	--	--	--	--	--	--	--	--			--	--	--	--	--	--	--	--
N-CON heater in good condition	--	--	--	--	--	--	--	--	--			--	--	--	--	--	--	--	--
N-CON heater thermostat in good condition	--	--	--	--	--	--	--	--	--			--	--	--	--	--	--	--	--
N-CON max / min thermometer in acceptable limits	--	--	--		--	--	--		--			--	--	--		--	--	--	--
N-CON sensor responds to 5 passes of the hand	--	--	--	--	--	--	--	--	--			--	--	--	--	--	--	--	--
Was the 'as found' turn over set properly (Belfort gage)	--	--	--	--	X	--	--	--	X	--	--	X	--	--	--	--	--	--	--
Raingage operates properly (electronic gage)					--				--			--							
Does datalogger receive event signals form all collectors (electronic gage)				X	--				--			--			X				
Does optical sensor respond to "blocking" of light beam (electronic gage)					--				--			--	--	--	--				
Does optical sensor respond to mist of water (electronic gage)					--				--	U to T		--	--	--	--				

	Indicates found compliant
X	**Indicates found non-compliant**
--	**Indicates "Not Applicable"**
U to T	**Indicates "Unable to Test"**

Table C-4. NADP – NTN – Raingage and Collector: Comparison Between Surveys of Findings Most Likely to Impact Data Quality (Page 1 of 2)

StationId	IL11				IL78				IN34				KS97		MA01				MD08				MD13			
Year	2009	2012	2015	2019	2009	2012	2015	2019	2009	2013	2015	2019	2015	2019	2009	2013	2016	2019	2008	2013	2015	2019	2010	2012	2015	2019
Dry side bucket is clean							--	--								X										
Does lid seal properly	X						--	--																		
Lid liner in good condition							--	--																		
ACM sensor operates properly							--	--																		
Motorbox operates within acceptable limits							--	--																		
N-CON lid seal in good condition	--	--	--	--	--	--			--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
N-CON lid liner in good condition	--	--	--	--	--	--			--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
N-CON sensor responds to 5 passes of the hand	--	--	--	--	--	--			--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Was the 'as found' turn over set properly (Belfort gage)	--	--	--	--	X	--	--	--	--	--	--	--	--	--	X	--	--	--	--	--	--	--	--	--	--	--
Raingage operates properly (electronic gage)					--										--											
Does datalogger receive event signals form all collectors (electronic gage)			X		--										--											
Does optical sensor respond to "blocking" of light beam (electronic gage)	--	--	--	--	--	--	--	--	X	--	--	--		X	--		X	X								
Does optical sensor respond to mist of water (electronic gage)	--	--	--	--	--	--	--	--	X	--	--	--		X	--		X	X								

StationId	MD15				MD18				ME02				ME08				ME09				ME96			
Year	2010	2013	2015	2019	2010	2013	2015	2019	2009	2012	2015	2019	2009	2012	2015	2019	2009	2012	2015	2019	2009	2012	2015	2019
Dry side bucket is clean											X	X		--	--	--					X		X	
Does lid seal properly														--	--	--								
Lid liner in good condition									X					--	--	--								
ACM sensor operates properly					X									--	--	--								X
Motorbox operates within acceptable limits														--	--	--								
N-CON lid seal in good condition	--	--	--	--	--	--	--	--	--	--	--	--	--				--	--	--	--	--	--	--	--
N-CON lid liner in good condition	--	--	--	--	--	--	--	--	--	--	--	--	--				--	--	--	--	--	--	--	--
N-CON sensor responds to 5 passes of the hand	--	--	--	--	--	--	--	--	--	--	--	--	--				--	--	--	--	--	--	--	--
Was the 'as found' turn over set properly (Belfort gage)	X				--	--	--	--	--	--	--	--		--	--	--	--	--	--	--	--	--	--	--
Raingage operates properly (electronic gage)	--	--	--	--									--											
Does datalogger receive event signals form all collectors (electronic gage)	--	--	--	--								X	--							X				X
Does optical sensor respond to "blocking" of light beam (electronic gage)	--	--	--	--		U to T		X				X	--	--		--								
Does optical sensor respond to mist of water (electronic gage)	--	--	--	--				X				X	--	--		--								

	Indicates found compliant
X	**Indicates found non-compliant**
--	**Indicates "Not Applicable"**
U to T	**Indicates "Unable to Test"**

Table C-4. NADP – NTN – Raingage and Collector: Comparison Between Surveys of Findings Most Likely to Impact Data Quality (Page 2 of 2)

StationId	MN01				MN27				NJ00				NJ39		NJ99				NY22				NY28	
Year	2009	2012	2015	2019	2009	2012	2015	2019	2009	2012	2015	2019	2015	2019	2009	2012	2015	2019	2008	2011	2015	2019	2015	2019
Dry side bucket is clean			--	--	X	X	X	--				X	X		X				X			X	--	--
Does lid seal properly			--	--			X	--															--	--
Lid liner in good condition			--	--				--															--	--
ACM sensor operates properly		X	--	--		X		--				X											--	--
Motorbox operates within acceptable limits		X	--	--				--															--	--
N-CON lid seal in good condition	--	--			--	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--	--	--		
N-CON lid liner in good condition	--	--		X	--	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--	--	--		
N-CON sensor responds to 5 passes of the hand	--	--			--	--	--		--	--	--	--	--	--	--	--	--	--	--	--	--	--		
Was the 'as found' turn over set properly (Belfort gage)	X		--	--	X	--	--	--	--	--	--	--	--	--	X	X		--	X	--	--	--	--	--
Raingage operates properly (electronic gage)	--	--			--										--	--	--	X	--					
Does datalogger receive event signals form all collectors (electronic gage)	--	--			--									X	--	--	--		--					
Does optical sensor respond to "blocking" of light beam (electronic gage)	--	--			--										--	--	--		--					
Does optical sensor respond to mist of water (electronic gage)	--	--			--										--	--	--		--					

StationId	NY59		NY92		NY93		PA72				TN11				WI31		WV05				WV18			
Year	2015	2019	2015	2019	2015	2019	2009	2012	2015	2019	2009	2012	2015	2019	2015	2019	2009	2013	2015	2019	2009	2013	2015	2019
Dry side bucket is clean	--	--	--	--	--	--	X	--	--	--	X				--	--	X	X		X				
Does lid seal properly	--	--	--	--	--	--		--	--	--					--	--	X	X						
Lid liner in good condition	--	--	--	--	--	--		--	--	--					--	--								
ACM sensor operates properly	--	--	--	--	--	--		--	--	--					--	--	X							
Motorbox operates within acceptable limits	--	--	--	--	--	--		--	--	--					--	--								
N-CON lid seal in good condition							--			X	--	--	--	--			--	--	--	--	--	--	--	--
N-CON lid liner in good condition							--		X		--	--	--	--		X	--	--	--	--	--	--	--	--
N-CON sensor responds to 5 passes of the hand							--				--	--	--	--			--	--	--	--	--	--	--	--
Was the 'as found' turn over set properly (Belfort gage)	--	--	--	--	--	--	X	--	--	--	--	--	--	--	--	--	X	--	--	--	X	--	--	--
Raingage operates properly (electronic gage)							--										--				--			
Does datalogger receive event signals form all collectors (electronic gage)							--										--	U to T			--			
Does optical sensor respond to "blocking" of light beam (electronic gage)							--	--	--	--							--				--			
Does optical sensor respond to mist of water (electronic gage)							--	--	--	--							--				--			

	Indicates found compliant
X	**Indicates found non-compliant**
--	**Indicates "Not Applicable"**
U to T	**Indicates "Unable to Test"**

APPENDIX D

List of Site Funding and Sponsoring Agencies

Site ID	Network	Operating Agency	Sponsoring Agency
AB14	MDN	West Central Airshed Society	Jacques Whitford Stantec Axys Limited
IL11	MDN	Univ of Illinois - IL State Water Survey	Lake Michigan Air Directors Consortium/Midwest Regional Climate Center
IL11	NTN	Illinois State Water Survey - Central Analytical Laboratory	U.S. Environmental Protection Agency - Clean Air Markets
IL78	NTN	University of Illinois-State Agricultural Experiment Station-Northwest Research Center	U.S. Geological Survey
IN22	MDN	Purdue University	Lake Michigan Air Directors Consortium
IN34	NTN	Indiana Dunes National Lakeshore	NPS-Air Resources Division
KS97	NTN	Kickapoo Tribe in Kansas	Kickapoo Tribe
MA01	MDN	North Atlantic Coastal Laboratory	National Park Service-Cape Cod National Seashore
MA01	NTN	North Atlantic Coastal Laboratory	NPS-Air Resources Division
MD08	MDN	University of Maryland - Appalachian Laboratory	Maryland Department of Natural Resources/University of Maryland - Appalachian Laboratory
MD08	NTN	University of Maryland - Appalachian Laboratory	Maryland Department of Natural Resources
MD13	NTN	University of Maryland-State Agricultural Experiment Station	University of Maryland-State Agricultural Experiment Station
MD15	NTN	National Oceanic and Atmospheric Administration - Air Resources Laboratory	National Oceanic and Atmospheric Administration - Air Resources Laboratory
MD18	NTN	Assateague Island National Seashore	Maryland Department of Natural Resources
ME02	MDN	Maine Department of Environmental Protection	Maine Department of Environmental Protection/U.S. Environmental Protection Agency
ME02	NTN	Maine Department of Environmental Protection	Maine Department of Environmental Protection/U.S. Environmental Protection Agency

Site ID	Network	Operating Agency	Sponsoring Agency
ME08	NTN	U.S. Geological Survey	U.S. Geological Survey
ME09	MDN	Maine Department of Environmental Protection	Maine Department of Environmental Protection/U.S. Environmental Protection Agency
ME09	NTN	Maine Department of Environmental Protection	Maine Department of Environmental Protection/U.S. Environmental Protection Agency
ME96	NTN	Maine Department of Environmental Protection	Maine Department of Environmental Protection/U.S. Environmental Protection Agency
ME96	MDN	Maine Department of Environmental Protection - Bureau of Air Quality	Maine Department of Environmental Protection/U.S. Environmental Protection Agency
MN01	NTN	University of Minnesota	Minnesota Pollution Control Agency
MN27	MDN	Minnesota Pollution Control Agency	Minnesota Pollution Control Agency
MN27	NTN	University of Minnesota	Minnesota Pollution Control Agency
NC26	MDN	North Carolina Department of Environment and Natural Resources, Division of Air Quality	North Carolina Department of Environment and Natural Resources, Division of Air Quality
NJ00	NTN	Edwin B. Forsythe National Wildlife Refuge/USFWS-Air Quality Branch	USFWS-Air Quality Branch
NJ30	MDN	New Jersey Department of Environmental Protection	New Jersey Department of Environmental Protection
NJ39	NTN	New Jersey Department of Environmental Protection	U.S. Environmental Protection Agency - Clean Air Markets
NJ99	NTN	New Jersey Department of Environmental Protection	U.S. Environmental Protection Agency - Clean Air Markets
NY22	NTN	Akwesasne Mohawk Tribe	U.S. Environmental Protection Agency - Clean Air Markets
NY28	NTN	New York State Department of Environmental Conservation	New York State Energy Research & Development Authority
NY59	NTN	New York State Department of Environmental Conservation	New York State Energy Research & Development Authority

Site ID	Network	Operating Agency	Sponsoring Agency
NY92	NTN	New York State Department of Environmental Conservation	New York State Energy Research & Development Authority
NY93	NTN	Paul Smith's College	New York State Energy Research & Development Authority
OK05	MDN	Choctaw Nation of Oklahoma	U.S. Environmental Protection Agency
OK97	MDN	Choctaw Nation of Oklahoma	U.S. Environmental Protection Agency
PA72	NTN	Pinchot Institute For Conservation	U.S. Forest Service
TN11	MDN	Great Smoky Mountains National Park	NPS-Air Resources Division
TN11	NTN	Great Smoky Mountains National Park	NPS-Air Resources Division
WI31	NTN	Wisconsin Department of Natural Resources	Wisconsin Department of Natural Resources
WV05	NTN	U.S. Environmental Protection Agency - Clean Air Markets	U.S. Environmental Protection Agency - Clean Air Markets
WV18	NTN	Northeastern Forest Experiment Station - Timber and Watershed Laboratory	U.S. Forest Service

APPENDIX E

Transfer Standard Instrument Certifications

EEMS# 01265

Warren-Knight Instrument Company
2045 Bennett Road
Philadelphia, PA 19116
Phone: 215-464-9300; Fax: 215-464-9303
Web: http://www.warrenind.com

Van 2

Calibration Data Record			Temperature: 71° Humidity: 27%
Customer Name	GC-MS	Item Name	USHIKATA
Manufacturer		Model	S-25
Serial Number	190037	Calibration Date	1-23-19
Calibration Frequency		Job Card Number	S-26076
Customer Reference Number		Date of Certification	1-23-19

Measurement Standards

Theodolite Wild T-3 S/N 18801 Calibration 01/16/19 Due 01/16/20 NIST Number 738/229329-83 738/223398

Optical Wedge K&E 71-7020 S/N 5167 Calibration; 01/16/19 Due 01/16/24, NIST Number 731/244084-89 731/221617

Initial Report

Vanes		Direction (Degree)	Tolerance (Minute)	Compass Needle Error (Minute)
Pivot in line with Circle/Sights	☐ Pass ☐ Fail	0	+/- 30	
Needle		45	+/- 30	
Pivot Sharpness	☐ Pass ☐ Fail	90	+/- 30	
Straightness (+/-15 Minutes)	☐ Pass ☐ Fail	135	+/- 30	
Balance	☐ Pass ☐ Fail	180	+/- 30	
Lifter Function	☐ Pass ☐ Fail	225	+/- 30	
Azimuth Ring		270	+/- 30	
Control Knob Function	☐ Pass ☐ Fail	315	+/- 30	
Pinion Gear	☐ Pass ☐ Fail			
Graduation Clarity	☐ Pass ☐ Fail			
Graduation less than 1 minute in any position	☐ Pass ☐ Fail			
Level Bubble				
Bubble in Level	☐ Pass ☐ Fail			
Physical Condition	☐ Pass ☐ Fail			

Pass/Repair/Replace

Pass	N/A	Replace	Repair	
☐	☐	☐	☐	Needle ☐ Sharpen ☐ Magnetize
☐	☐	☐	☐	Cap with Jewel
☐	☐	☐	☐	Pivot ☐ Sharpen
☐	☐	☐	☐	Level ☐ Remount
☐	☐	☐	☐	North Sight
☐	☐	☐	☐	North Sight Block
☐	☐	☐	☐	South Sight
☐	☐	☐	☐	South Sight Block
☐	☐	☐	☐	Vane Spring
☐	☐	☐	☐	Drive
☐	☐	☐	☐	Control Knob Assembly
☐	☐	☐	☐	Cover Glass
☐	☐	☐	☐	Cover Glass Gasket
☐	☐	☐	☐	Clamp Screw
☐	☐	☐	☐	Pinion Gear
☐	☐	☐	☐	Compass Ring

Final Report

Vanes		Direction (Degree)	Tolerance (Minute)	Compass Needle Error (Minute)
Pivot in line with Circle/Sights	☑ Pass ☐ Fail	0	+/- 30	< 30
Needle		45	+/- 30	< 30
Pivot Sharpness	☑ Pass ☐ Fail	90	+/- 30	< 30
Straightness (+/-15 Minutes)	☑ Pass ☐ Fail	135	+/- 30	< 30
Balance	☑ Pass ☐ Fail	180	+/- 30	< 30
Lifter Function	☑ Pass ☐ Fail	225	+/- 30	< 30
Azimuth Ring		270	+/- 30	< 30
Control Knob Function	☑ Pass ☐ Fail	315	+/- 30	< 30
Pinion Gear	☑ Pass ☐ Fail			
Graduation Clarity	☑ Pass ☐ Fail			
Graduation less than 1 minute in any position	☑ Pass ☐ Fail			
Level Bubble				
Bubble in Level	☑ Pass ☐ Fail			
Physical Condition	☑ Pass ☐ Fail			

Certification

Joseph Paologgi	John Noga, Quality Assurance
Repair Technician	John Noga

SEG

Warren-Knight Instrument Company
2045 Bennett Road
Philadelphia, PA 19116
Phone: 215-464-9300; Fax: 215-464-9303
Web: http://www.warrenind.com

Calibration Data Record			Temperature: 71° Humidity: 37%
Customer Name	EG-MS	Item Name	USHIKATA
Manufacturer		Model	S-25
Serial Number	191832	Calibration Date	1-23-19
Calibration Frequency		Job Card Number	S-26074
Customer Reference Number		Date of Certification	1-23-19

Measurement Standards

Theodolite Wild T-3 S/N 18801 Calibration 01/16/19 Due 01/16/20 NIST Number 738/229329-83 738/223398

Optical Wedge K&E 71-7020 S/N 5167 Calibration: 01/16/19 Due 01/16/24, NIST Number 731/244084-89 731/221617

Initial Report

Vanes		Direction (Degree)	Tolerance (Minute)	Compass Needle Error (Minute)
Pivot in line with Circle/Sights	☐ Pass ☐ Fail	0	+/- 30	
Needle		45	+/- 30	
Pivot Sharpness	☐ Pass ☐ Fail	90	+/- 30	
Straightness (+/-15 Minutes)	☐ Pass ☐ Fail	135	+/- 30	
Balance	☐ Pass ☐ Fail	180	+/- 30	
Lifter Function	☐ Pass ☐ Fail	225	+/- 30	
Azimuth Ring		270	+/- 30	
Control Knob Function	☐ Pass ☐ Fail	315	+/- 30	
Pinion Gear	☐ Pass ☐ Fail			
Graduation Clarity	☐ Pass ☐ Fail			
Graduation less than 1 minute in any position	☐ Pass ☐ Fail			
Level Bubble				
Bubble in Level	☐ Pass ☐ Fail			
Physical Condition	☐ Pass ☐ Fail			

Pass/Repair/Replace

Pass	N/A	Replace	Repair	
☐	☐	☐	☐	Needle ☐ Sharpen ☐ Magnetize
☐	☐	☐	☐	Cap with Jewel
☐	☐	☐	☐	Pivot ☐ Sharpen
☐	☐	☐	☐	Level ☐ Remount
☐	☐	☐	☐	North Sight
☐	☐	☐	☐	North Sight Block
☐	☐	☐	☐	South Sight
☐	☐	☐	☐	South Sight Block
☐	☐	☐	☐	Vane Spring
☐	☐	☐	☐	Drive
☐	☐	☐	☐	Control Knob Assembly
☐	☐	☐	☐	Cover Glass
☐	☐	☐	☐	Cover Glass Gasket
☐	☐	☐	☐	Clamp Screw
☐	☐	☐	☐	Pinion Gear
☐	☐	☐	☐	Compass Ring

Final Report

Vanes		Direction (Degree)	Tolerance (Minute)	Compass Needle Error (Minute)
Pivot in line with Circle/Sights	☑ Pass ☐ Fail	0	+/- 30	30
Needle		45	+/- 30	30
Pivot Sharpness	☑ Pass ☐ Fail	90	+/- 30	30
Straightness (+/-15 Minutes)	☑ Pass ☐ Fail	135	+/- 30	30
Balance	☑ Pass ☐ Fail	180	+/- 30	30
Lifter Function	☑ Pass ☐ Fail	225	+/- 30	30
Azimuth Ring		270	+/- 30	30
Control Knob Function	☑ Pass ☐ Fail	315	+/- 30	30
Pinion Gear	☑ Pass ☐ Fail			
Graduation Clarity	☑ Pass ☐ Fail			
Graduation less than 1 minute in any position	☑ Pass ☐ Fail			
Level Bubble				
Bubble in Level	☑ Pass ☐ Fail			
Physical Condition	☑ Pass ☐ Fail			

Certification

Joseph Paologo	
Repair Technician	John Noga, Quality Assurance John Noga

EEMS # 01272

Warren-Knight Instrument Company
2045 Bennett Road
Philadelphia, PA 19116
Phone: 215-464-9300; Fax: 215-464-9303
Web: http://www.warrenind.com

Calibration Data Record			Temperature: 71° Humidity: 37%
Customer Name	EE-MS	Item Name	USHIKATA
Manufacturer		Model	S-25
Serial Number	199578	Calibration Date	1-23-19
Calibration Frequency		Job Card Number	S-76075
Customer Reference Number		Date of Certification	1-23-19

Measurement Standards

Theodolite Wild T-3 S/N 18801 Calibration 01/16/19 Due 01/16/20 NIST Number 738/229329-83 738/223398

Optical Wedge K&E 71-7020 S/N 5167 Calibration; 01/16/19 Due 01/16/24, NIST Number 731/244084-89 731/221617

Initial Report

Vanes		Direction (Degree)	Tolerance (Minute)	Compass Needle Error (Minute)
Pivot in line with Circle/Sights	☐ Pass ☐ Fail	0	+/- 30	
Needle		45	+/- 30	
Pivot Sharpness	☐ Pass ☐ Fail	90	+/- 30	
Straightness (+/-15 Minutes)	☐ Pass ☐ Fail	135	+/- 30	
Balance	☐ Pass ☐ Fail	180	+/- 30	
Lifter Function	☐ Pass ☐ Fail	225	+/- 30	
Azimuth Ring		270	+/- 30	
Control Knob Function	☐ Pass ☐ Fail	315	+/- 30	
Pinion Gear	☐ Pass ☐ Fail			
Graduation Clarity	☐ Pass ☐ Fail			
Graduation less than 1 minute in any position	☐ Pass ☐ Fail			
Level Bubble				
Bubble in Level	☐ Pass ☐ Fail			
Physical Condition	☐ Pass ☐ Fail			

Pass/Repair/Replace

Pass	N/A	Replace	Repair	
☐	☐	☐	☐	Needle ☐ Sharpen ☐ Magnetize
☐	☐	☐	☐	Cap with Jewel
☐	☐	☐	☐	Pivot ☐ Sharpen
☐	☐	☐	☐	Level ☐ Remount
☐	☐	☐	☐	North Sight
☐	☐	☐	☐	North Sight Block
☐	☐	☐	☐	South Sight
☐	☐	☐	☐	South Sight Block
☐	☐	☐	☐	Vane Spring
☐	☐	☐	☐	Drive
☐	☐	☐	☐	Control Knob Assembly
☐	☐	☐	☐	Cover Glass
☐	☐	☐	☐	Cover Glass Gasket
☐	☐	☐	☐	Clamp Screw
☐	☐	☐	☐	Pinion Gear
☐	☐	☐	☐	Compass Ring

Final Report

Vanes		Direction (Degree)	Tolerance (Minute)	Compass Needle Error (Minute)
Pivot in line with Circle/Sights	☑ Pass ☐ Fail	0	+/- 30	< 30
Needle		45	+/- 30	< 30
Pivot Sharpness	☑ Pass ☐ Fail	90	+/- 30	< 30
Straightness (+/-15 Minutes)	☑ Pass ☐ Fail	135	+/- 30	< 30
Balance	☑ Pass ☐ Fail	180	+/- 30	< 30
Lifter Function	☑ Pass ☐ Fail	225	+/- 30	< 30
Azimuth Ring		270	+/- 30	< 30
Control Knob Function	☑ Pass ☐ Fail	315	+/- 30	< 30
Pinion Gear	☑ Pass ☐ Fail			
Graduation Clarity	☑ Pass ☐ Fail			
Graduation less than 1 minute in any position	☑ Pass ☐ Fail			
Level Bubble				
Bubble in Level	☑ Pass ☐ Fail			
Physical Condition	☑ Pass ☐ Fail			

Certification

Joseph Paloyan	John Noga, Quality Assurance John Noga
Repair Technician	

BL1 And BL3 Weight / Balance Calibration Log

Date	Balance SN#	Weight SN#	Cal Type	Std. (g)	Act. (g)	Calibrator	Notes
1/17/2019	8028481064	26677	Bal Init	0.00	0.00	SEG	Initial Balance Check
1/17/2019	8028481064	26677	Bal Init	1500.00	1499.71	SEG	Initial Balance Check
1/17/2019	8028481064	26677	Bal Init	1000.00	999.80	SEG	Initial Balance Check
1/17/2019	8028481064	26677	Bal Init	500.00	499.88	SEG	Initial Balance Check
1/17/2019	8028481064	26677	Bal Init	200.00	199.93	SEG	Initial Balance Check
1/17/2019	8028481064	26677	Bal Init	100.00	99.95	SEG	Initial Balance Check
1/17/2019	8028481064	26677	Bal Init	50.00	49.97	SEG	Initial Balance Check
1/17/2019	8028481064	26677	Bal Init	0.00	0.00	SEG	Initial Balance Check
1/17/2019	8028481064	BL3-0	Audit		1000.6	SEG	ETI/Belfort Set #3 - VAN 3
1/17/2019	8028481064	BL3-1	Audit		824.1	SEG	ETI/Belfort Set #3 - VAN 3
1/17/2019	8028481064	BL3-2	Audit		823.2	SEG	ETI/Belfort Set #3 - VAN 3
1/17/2019	8028481064	BL3-3	Audit		825.1	SEG	ETI/Belfort Set #3 - VAN 3
1/17/2019	8028481064	BL3-4	Audit		823.6	SEG	ETI/Belfort Set #3 - VAN 3
1/17/2019	8028481064	BL3-5	Audit		823.7	SEG	ETI/Belfort Set #3 - VAN 3
1/17/2019	8028481064	BL3-6	Audit		823.0	SEG	ETI/Belfort Set #3 - VAN 3
1/17/2019	8028481064	BL3-7	Audit		823.5	SEG	ETI/Belfort Set #3 - VAN 3
1/17/2019	8028481064	BL3-8	Audit		824.6	SEG	ETI/Belfort Set #3 - VAN 3
1/17/2019	8028481064	BL3-9	Audit		824.0	SEG	ETI/Belfort Set #3 - VAN 3
1/17/2019	8028481064	BL3-10	Audit		820.7	SEG	ETI/Belfort Set #3 - VAN 3
1/17/2019	8028481064	BL3-11	Audit		823.8	SEG	ETI/Belfort Set #3 - VAN 3
1/17/2019	8028481064	BL3-12	Audit		823.0	SEG	ETI/Belfort Set #3 - VAN 3
1/17/2019	8028481064	BL1-a	Audit		207.41	SEG	ETI/Belfort Set #3 - VAN 3
1/17/2019	8028481064	BL1-b	Audit		207.21	SEG	ETI/Belfort Set #3 - VAN 3
1/17/2019	8028481064	BL1-c	Audit		207.06	SEG	ETI/Belfort Set #3 - VAN 3
1/17/2019	8028481064	BL1-d	Audit		207.47	SEG	ETI/Belfort Set #3 - VAN 3
1/17/2019	8028481064	26677	Bal Post	0.00	0.00	SEG	Post Balance Check
1/17/2019	8028481064	26677	Bal Post	1500.00	1499.71	SEG	Post Balance Check
1/17/2019	8028481064	26677	Bal Post	1000.00	999.80	SEG	Post Balance Check
1/17/2019	8028481064	26677	Bal Post	500.00	499.87	SEG	Post Balance Check
1/17/2019	8028481064	26677	Bal Post	200.00	199.93	SEG	Post Balance Check
1/17/2019	8028481064	26677	Bal Post	100.00	99.96	SEG	Post Balance Check
1/17/2019	8028481064	26677	Bal Post	50.00	49.98	SEG	Post Balance Check
1/17/2019	8028481064	26677	Bal Post	0.00	0.00	SEG	Post Balance Check

Calibrator Signature: Sandy Grenville Date: 1/17/2019

Reviewer Signature: _____ Date: _____

BL2 Weight / Balance Calibration Log

Date	Balance SN#	Weight SN#	Cal Type	Std. (g)	Act. (g)	Calibrator	Notes
1/16/2019	8028481064	26677	Bal Init	0.00	0.00	SEG	Initial Balance Check
1/16/2019	8028481064	26677	Bal Init	1500.00	1499.75	SEG	Initial Balance Check
1/16/2019	8028481064	26677	Bal Init	1000.00	999.81	SEG	Initial Balance Check
1/16/2019	8028481064	26677	Bal Init	500.00	499.86	SEG	Initial Balance Check
1/16/2019	8028481064	26677	Bal Init	200.00	199.94	SEG	Initial Balance Check
1/16/2019	8028481064	26677	Bal Init	100.00	99.97	SEG	Initial Balance Check
1/16/2019	8028481064	26677	Bal Init	50.00	49.98	SEG	Initial Balance Check
1/16/2019	8028481064	26677	Bal Init	0.00	0.00	SEG	Initial Balance Check
1/16/2019	8028481064	BL2-0	Audit		999.5	SEG	ETI/Belfort Set #2 - VAN2
1/16/2019	8028481064	BL2-1	Audit		822.8	SEG	ETI/Belfort Set #2 - VAN2
1/16/2019	8028481064	BL2-2	Audit		820.1	SEG	ETI/Belfort Set #2 - VAN2
1/16/2019	8028481064	BL2-3	Audit		824.1	SEG	ETI/Belfort Set #2 - VAN2
1/16/2019	8028481064	BL2-4	Audit		824.7	SEG	ETI/Belfort Set #2 - VAN2
1/16/2019	8028481064	BL2-5	Audit		823.0	SEG	ETI/Belfort Set #2 - VAN2
1/16/2019	8028481064	BL2-6	Audit		823.7	SEG	ETI/Belfort Set #2 - VAN2
1/16/2019	8028481064	BL2-7	Audit		823.1	SEG	ETI/Belfort Set #2 - VAN2
1/16/2019	8028481064	BL2-8	Audit		823.0	SEG	ETI/Belfort Set #2 - VAN2
1/16/2019	8028481064	BL2-9	Audit		823.3	SEG	ETI/Belfort Set #2 - VAN2
1/16/2019	8028481064	BL2-10	Audit		823.4	SEG	ETI/Belfort Set #2 - VAN2
1/16/2019	8028481064	BL2-11	Audit		823.2	SEG	ETI/Belfort Set #2 - VAN2
1/16/2019	8028481064	BL2-12	Audit		823.8	SEG	ETI/Belfort Set #2 - VAN2
1/16/2019	8028481064	BL2-a	Audit			SEG	ETI/Belfort Set #2 - VAN2
1/16/2019	8028481064	BL2-b	Audit		205.70	SEG	ETI/Belfort Set #2 - VAN2
1/16/2019	8028481064	BL2-c	Audit		206.10	SEG	ETI/Belfort Set #2 - VAN2
1/16/2019	8028481064	BL2-d	Audit		206.32	SEG	ETI/Belfort Set #2 - VAN2
1/16/2019	8028481064	26677	Bal Post	0.00	0.00	SEG	Post Balance Check
1/16/2019	8028481064	26677	Bal Post	1500.00	1499.79	SEG	Post Balance Check
1/16/2019	8028481064	26677	Bal Post	1000.00	999.84	SEG	Post Balance Check
1/16/2019	8028481064	26677	Bal Post	500.00	499.90	SEG	Post Balance Check
1/16/2019	8028481064	26677	Bal Post	200.00	199.94	SEG	Post Balance Check
1/16/2019	8028481064	26677	Bal Post	100.00	99.97	SEG	Post Balance Check
1/16/2019	8028481064	26677	Bal Post	50.00	49.97	SEG	Post Balance Check
1/16/2019	8028481064	26677	Bal Post	0.00	0.00	SEG	Post Balance Check

Calibrator Signature: Sandy Grenville Date: 1/16/2019

Reviewer Signature: _____ Date: _____

BL4 Weight / Balance Calibration Log

Date	Balance SN#	Weight SN#	Cal Type	Std. (g)	Act. (g)	Calibrator	Notes
1/17/2019	8028481064	26677	Bal Init	0.00	0.00	SEG	Initial Balance Check
1/17/2019	8028481064	26677	Bal Init	1500.00	1499.52	SEG	Initial Balance Check
1/17/2019	8028481064	26677	Bal Init	1000.00	999.69	SEG	Initial Balance Check
1/17/2019	8028481064	26677	Bal Init	500.00	499.83	SEG	Initial Balance Check
1/17/2019	8028481064	26677	Bal Init	200.00	199.92	SEG	Initial Balance Check
1/17/2019	8028481064	26677	Bal Init	100.00	99.96	SEG	Initial Balance Check
1/17/2019	8028481064	26677	Bal Init	50.00	49.98	SEG	Initial Balance Check
1/17/2019	8028481064	26677	Bal Init	0.00	0.00	SEG	Initial Balance Check
1/17/2019	8028481064	BL4-0	Audit		1034.1	SEG	ETI/Belfort Set #4 - VAN1
1/17/2019	8028481064	BL4-1	Audit		824.7	SEG	ETI/Belfort Set #4 - VAN1
1/17/2019	8028481064	BL4-2	Audit		823.5	SEG	ETI/Belfort Set #4 - VAN1
1/17/2019	8028481064	BL4-3	Audit		824.4	SEG	ETI/Belfort Set #4 - VAN1
1/17/2019	8028481064	BL4-4	Audit		824.5	SEG	ETI/Belfort Set #4 - VAN1
1/17/2019	8028481064	BL4-5	Audit		823.0	SEG	ETI/Belfort Set #4 - VAN1
1/17/2019	8028481064	BL4-6	Audit		824.7	SEG	ETI/Belfort Set #4 - VAN1
1/17/2019	8028481064	BL4-7	Audit		823.8	SEG	ETI/Belfort Set #4 - VAN1
1/17/2019	8028481064	BL4-8	Audit		824.2	SEG	ETI/Belfort Set #4 - VAN1
1/17/2019	8028481064	BL4-9	Audit		824.9	SEG	ETI/Belfort Set #4 - VAN1
1/17/2019	8028481064	BL4-10	Audit		823.5	SEG	ETI/Belfort Set #4 - VAN1
1/17/2019	8028481064	BL4-11	Audit		823.8	SEG	ETI/Belfort Set #4 - VAN1
1/17/2019	8028481064	BL4-12	Audit		823.9	SEG	ETI/Belfort Set #4 - VAN1
1/17/2019	8028481064	BL4-a	Audit		207.38	SEG	ETI/Belfort Set #4 - VAN1
1/17/2019	8028481064	BL4-b	Audit		207.37	SEG	ETI/Belfort Set #4 - VAN1
1/17/2019	8028481064	BL4-c	Audit		207.52	SEG	ETI/Belfort Set #4 - VAN1
1/17/2019	8028481064	BL4-d	Audit		207.59	SEG	ETI/Belfort Set #4 - VAN1
1/17/2019	8028481064	26677	Bal Post	0.00	0.00	SEG	Post Balance Check
1/17/2019	8028481064	26677	Bal Post	1500.00	1499.71	SEG	Post Balance Check
1/17/2019	8028481064	26677	Bal Post	1000.00	999.80	SEG	Post Balance Check
1/17/2019	8028481064	26677	Bal Post	500.00	499.88	SEG	Post Balance Check
1/17/2019	8028481064	26677	Bal Post	200.00	199.96	SEG	Post Balance Check
1/17/2019	8028481064	26677	Bal Post	100.00	99.96	SEG	Post Balance Check
1/17/2019	8028481064	26677	Bal Post	50.00	49.98	SEG	Post Balance Check
1/17/2019	8028481064	26677	Bal Post	0.00	0.00	SEG	Post Balance Check

Calibrator Signature: Sandy Grenville Date: 1/17/2019

Reviewer Signature: _____ Date: _____

P2OTT1 Weight / Balance Calibration Log

Date	Balance SN#	Weight SN#	Cal Type	Std. (g)	Act. (g)	Calibrator	Notes
1/17/2019	8028481064	26677	Bal Init	0.00	0.00	SEG	Initial Balance Check
1/17/2019	8028481064	26677	Bal Init	1500.00	1499.73	SEG	Initial Balance Check
1/17/2019	8028481064	26677	Bal Init	1000.00	999.81	SEG	Initial Balance Check
1/17/2019	8028481064	26677	Bal Init	500.00	499.89	SEG	Initial Balance Check
1/17/2019	8028481064	26677	Bal Init	200.00	199.94	SEG	Initial Balance Check
1/17/2019	8028481064	26677	Bal Init	100.00	99.96	SEG	Initial Balance Check
1/17/2019	8028481064	26677	Bal Init	50.00	49.98	SEG	Initial Balance Check
1/17/2019	8028481064	26677	Bal Init	0.00	0.00	SEG	Initial Balance Check
1/17/2019	8028481064	P2OTT1-1	Audit		1017.6	SEG	Ott P2 Set #1 - VAN 3
1/17/2019	8028481064	P2OTT1-2	Audit		1017.8	SEG	Ott P2 Set #1 - VAN 3
1/17/2019	8028481064	P2OTT1-3	Audit		1017.1	SEG	Ott P2 Set #1 - VAN 3
1/17/2019	8028481064	P2OTT1-4	Audit		1017.9	SEG	Ott P2 Set #1 - VAN 3
1/17/2019	8028481064	P2OTT1-5	Audit		1016.6	SEG	Ott P2 Set #1 - VAN 3
1/17/2019	8028481064	P2OTT1-6	Audit		1016.8	SEG	Ott P2 Set #1 - VAN 3
1/17/2019	8028481064	P2OTT1-7	Audit		1017.5	SEG	Ott P2 Set #1 - VAN 3
1/17/2019	8028481064	P2OTT1-8	Audit		1016.3	SEG	Ott P2 Set #1 - VAN 3
1/17/2019	8028481064	P2OTT1-9	Audit		1017.7	SEG	Ott P2 Set #1 - VAN 3
1/17/2019	8028481064	P2OTT1-a	Audit		255.30	SEG	Ott P2 Set #1 - VAN 3
1/17/2019	8028481064	P2OTT1-b	Audit		255.15	SEG	Ott P2 Set #1 - VAN 3
1/17/2019	8028481064	P2OTT1-c	Audit		255.21	SEG	Ott P2 Set #1 - VAN 3
1/17/2019	8028481064	P2OTT1-d	Audit		255.53	SEG	Ott P2 Set #1 - VAN 3
1/17/2019	8028481064	26677	Bal Post	0.00	0.00	SEG	Post Balance Check
1/17/2019	8028481064	26677	Bal Post	1500.00	1499.71	SEG	Post Balance Check
1/17/2019	8028481064	26677	Bal Post	1000.00	999.80	SEG	Post Balance Check
1/17/2019	8028481064	26677	Bal Post	500.00	499.88	SEG	Post Balance Check
1/17/2019	8028481064	26677	Bal Post	200.00	199.93	SEG	Post Balance Check
1/17/2019	8028481064	26677	Bal Post	100.00	99.95	SEG	Post Balance Check
1/17/2019	8028481064	26677	Bal Post	50.00	49.97	SEG	Post Balance Check
1/17/2019	8028481064	26677	Bal Post	0.00	0.00	SEG	Post Balance Check

Calibrator Signature: Sandy Grenville Date: 1/17/2019

Reviewer Signature: _____ Date: _____

P2OTT2 Weight / Balance Calibration Log

Date	Balance SN#	Weight SN#	Cal Type	Std. (g)	Act. (g)	Calibrator	Notes
1/16/2019	8028481064	26677	Bal Init	0.00	0.00	SEG	Initial Balance Check
1/16/2019	8028481064	26677	Bal Init	1500.00	1499.75	SEG	Initial Balance Check
1/16/2019	8028481064	26677	Bal Init	1000.00	999.81	SEG	Initial Balance Check
1/16/2019	8028481064	26677	Bal Init	500.00	499.86	SEG	Initial Balance Check
1/16/2019	8028481064	26677	Bal Init	200.00	199.94	SEG	Initial Balance Check
1/16/2019	8028481064	26677	Bal Init	100.00	99.97	SEG	Initial Balance Check
1/16/2019	8028481064	26677	Bal Init	50.00	49.98	SEG	Initial Balance Check
1/16/2019	8028481064	26677	Bal Init	0.00	0.00	SEG	Initial Balance Check
1/16/2019	8028481064	P2OTT2-1	Audit		1016.6	SEG	Ott P2 Set #2 - VAN 2
1/16/2019	8028481064	P2OTT2-2	Audit		1017.0	SEG	Ott P2 Set #2 - VAN 2
1/16/2019	8028481064	P2OTT2-3	Audit		1017.2	SEG	Ott P2 Set #2 - VAN 2
1/16/2019	8028481064	P2OTT2-4	Audit		1017.0	SEG	Ott P2 Set #2 - VAN 2
1/16/2019	8028481064	P2OTT2-5	Audit		1017.1	SEG	Ott P2 Set #2 - VAN 2
1/16/2019	8028481064	P2OTT2-6	Audit		1017.9	SEG	Ott P2 Set #2 - VAN 2
1/16/2019	8028481064	P2OTT2-7	Audit		1017.1	SEG	Ott P2 Set #2 - VAN 2
1/16/2019	8028481064	P2OTT2-8	Audit		1015.7	SEG	Ott P2 Set #2 - VAN 2
1/16/2019	8028481064	P2OTT2-9	Audit		1016.4	SEG	Ott P2 Set #2 - VAN 2
1/16/2019	8028481064	P2OTT2-a	Audit		254.23	SEG	Ott P2 Set #2 - VAN 2
1/16/2019	8028481064	P2OTT2-b	Audit		254.18	SEG	Ott P2 Set #2 - VAN 2
1/16/2019	8028481064	P2OTT2-c	Audit		254.42	SEG	Ott P2 Set #2 - VAN 2
1/16/2019	8028481064	P2OTT2-d	Audit		254.39	SEG	Ott P2 Set #2 - VAN 2
1/16/2019	8028481064	26677	Bal Post	0.00	0.00	SEG	Post Balance Check
1/16/2019	8028481064	26677	Bal Post	1500.00	1499.79	SEG	Post Balance Check
1/16/2019	8028481064	26677	Bal Post	1000.00	999.84	SEG	Post Balance Check
1/16/2019	8028481064	26677	Bal Post	500.00	499.90	SEG	Post Balance Check
1/16/2019	8028481064	26677	Bal Post	200.00	199.94	SEG	Post Balance Check
1/16/2019	8028481064	26677	Bal Post	100.00	99.97	SEG	Post Balance Check
1/16/2019	8028481064	26677	Bal Post	50.00	49.97	SEG	Post Balance Check
1/16/2019	8028481064	26677	Bal Post	0.00	0.00	SEG	Post Balance Check

Calibrator Signature: Sandy Grenville Date: 1/16/2019

Reviewer Signature: _____ Date: _____

P2OTT3 Weight / Balance Calibration Log

Date	Balance SN#	Weight SN#	Cal Type	Std. (g)	Act. (g)	Calibrator	Notes
1/17/2019	8028481064	26677	Bal Init	0.00	0.00	SEG	Initial Balance Check
1/17/2019	8028481064	26677	Bal Init	1500.00	1499.71	SEG	Initial Balance Check
1/17/2019	8028481064	26677	Bal Init	1000.00	999.80	SEG	Initial Balance Check
1/17/2019	8028481064	26677	Bal Init	500.00	499.87	SEG	Initial Balance Check
1/17/2019	8028481064	26677	Bal Init	200.00	199.93	SEG	Initial Balance Check
1/17/2019	8028481064	26677	Bal Init	100.00	99.96	SEG	Initial Balance Check
1/17/2019	8028481064	26677	Bal Init	50.00	49.98	SEG	Initial Balance Check
1/17/2019	8028481064	26677	Bal Init	0.00	0.00	SEG	Initial Balance Check
1/17/2019	8028481064	P2OTT3-1	Audit		193.83	SEG	Ott P2 Set #3- VAN 1
1/17/2019	8028481064	P2OTT3-2	Audit		193.79	SEG	Ott P2 Set #3- VAN 1
1/17/2019	8028481064	P2OTT3-3	Audit		193.80	SEG	Ott P2 Set #3- VAN 1
1/17/2019	8028481064	P2OTT3-4	Audit		193.77	SEG	Ott P2 Set #3- VAN 1
1/17/2019	8028481064	P2OTT3-5	Audit		193.77	SEG	Ott P2 Set #3- VAN 1
1/17/2019	8028481064	P2OTT3-6	Audit		193.08	SEG	Ott P2 Set #3- VAN 1
1/17/2019	8028481064	P2OTT3-7	Audit		193.84	SEG	Ott P2 Set #3- VAN 1
1/17/2019	8028481064	P2OTT3-8	Audit		193.63	SEG	Ott P2 Set #3- VAN 1
1/17/2019	8028481064	P2OTT3-9	Audit		193.14	SEG	Ott P2 Set #3- VAN 1
1/17/2019	8028481064	P2OTT3-10	Audit		193.76	SEG	Ott P2 Set #3- VAN 1
1/17/2019	8028481064	P2OTT3-a	Audit		254.73	SEG	Ott P2 Set #3- VAN 1
1/17/2019	8028481064	P2OTT3-b	Audit		255.16	SEG	Ott P2 Set #3- VAN 1
1/17/2019	8028481064	P2OTT3-c	Audit		255.51	SEG	Ott P2 Set #3- VAN 1
1/17/2019	8028481064	P2OTT3-d	Audit		255.37	SEG	Ott P2 Set #3- VAN 1
1/17/2019	8028481064	26677	Bal Post	0.00	0.00	SEG	Post Balance Check
1/17/2019	8028481064	26677	Bal Post	1500.00	1499.71	SEG	Post Balance Check
1/17/2019	8028481064	26677	Bal Post	1000.00	999.80	SEG	Post Balance Check
1/17/2019	8028481064	26677	Bal Post	500.00	499.81	SEG	Post Balance Check
1/17/2019	8028481064	26677	Bal Post	200.00	199.94	SEG	Post Balance Check
1/17/2019	8028481064	26677	Bal Post	100.00	99.96	SEG	Post Balance Check
1/17/2019	8028481064	26677	Bal Post	50.00	49.98	SEG	Post Balance Check
1/17/2019	8028481064	26677	Bal Post	0.00	0.00	SEG	Post Balance Check

Calibrator Signature: Sandy Grenville Date: 1/17/2019

Reviewer Signature: _____ Date: _____