2020 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.

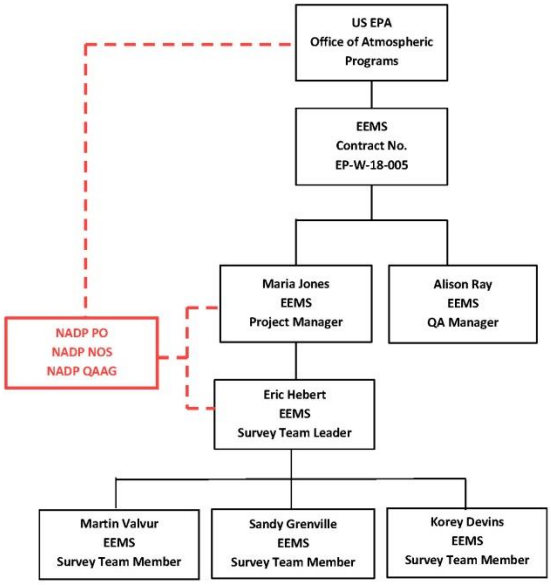
1.0 Introduction / Background

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 site 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 considered separate sites) are usually scheduled for surveys during each contract period. 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 site operator has access to current versions of NADP manuals and documentation currently found on line.
- 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.

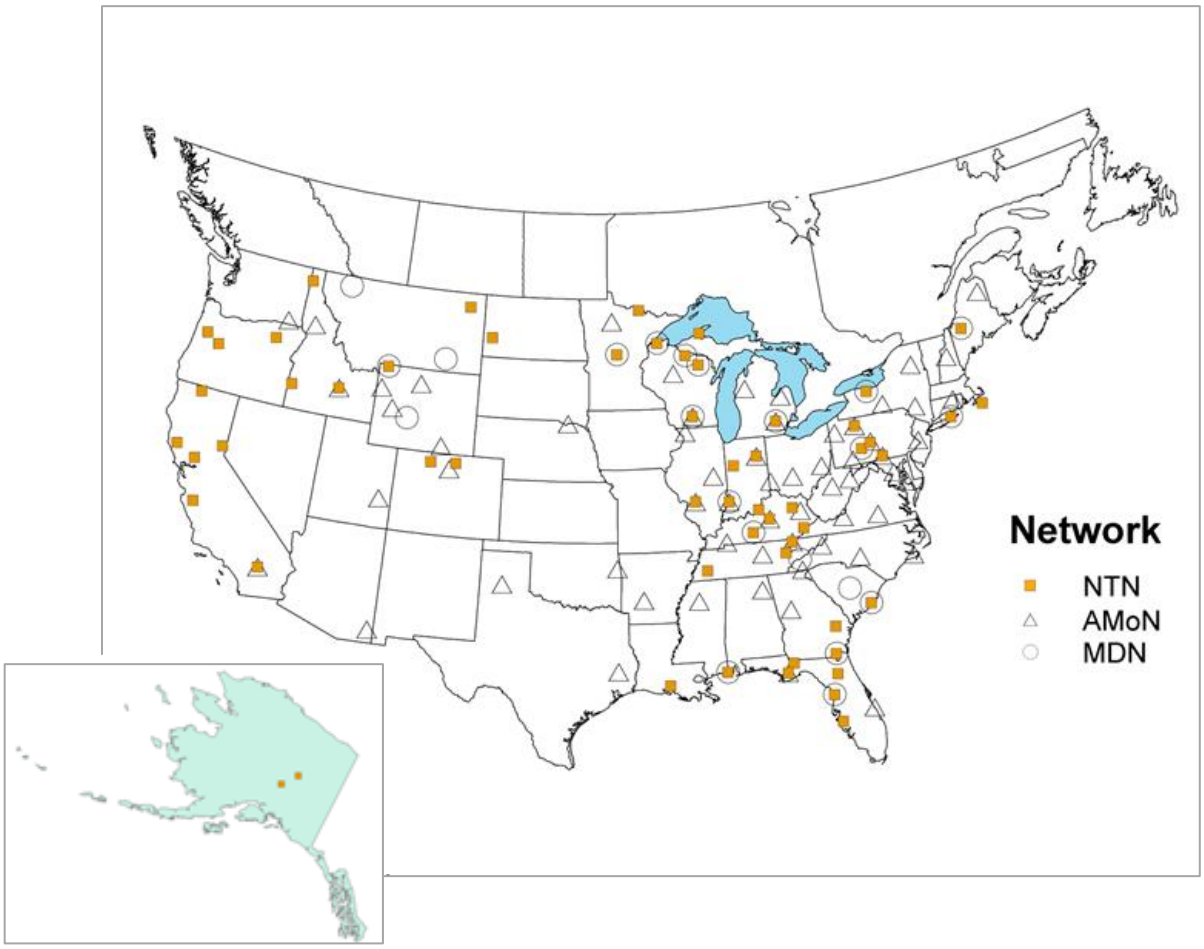
2.0 Status of Sites Surveyed

2.1 Sites Surveyed

This annual report includes site surveys performed from January through December of 2020.

A total of 79 NADP collectors (this number includes co-located sites) were surveyed during the period covered by this report at 62 distinct locations. These include 22 MDN sites and 57 NTN sites. Figure 2-1 is a map of the sites visited during 2020. 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 2020



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 62 precipitation raingages surveyed (co-located sites usually use the same raingage) were electronic raingages, either ETI NOAH IV (38 raingages), or the OTT PLUVIO (20 raingages). Only four Belfort mechanical raingage were surveyed, of which three were found to be operating reasonably well and one required to be replaced.

Of the 79 collectors surveyed, 34 sites operated N-CON collectors. The 45 remaining collectors were AeroChem Metrics (ACM) type, manufactured by either AeroChemetrics or Loda Electronics Company.

Eighteen 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 2020 and the equipment found at the sites is shown in Table 2-1.

Table 2-1. Sites Surveyed from January through December 2020 and Equipment Found

Site ID	Site Name	Network	Survey Date	Collector Type	Raingage Type	Backup Raingage Type
AK01	Poker Creek	NTN	10/8/2020	ACM-Type	ETI	N/A
AK03	Denali National Park-Mt. Mckinley	NTN	10/7/2020	ACM-Type	ETI	Tipping Bucket
CA45	Hopland	NTN	7/23/2020	N-CON	OTT	N/A
CA50	Sagehen Creek	NTN	6/22/2020	N-CON	OTT	Other
CA66	Pinnacles National Park-Bear Valley	NTN	7/21/2020	ACM-Type	ETI	Tipping Bucket
CA67	Joshua Tree National Park-Black Rock	NTN	11/13/2020	ACM-Type	ETI	Tipping Bucket
CA76	Montague	NTN	7/24/2020	N-CON	OTT	N/A
CA88	Davis	NTN	7/20/2020	N-CON	OTT	Tipping Bucket
CO13	Fort Collins	NTN	3/10/2020	N-CON	ETI	N/A

Site ID	Site Name	Network	Survey Date	Collector Type	Raingage Type	Backup Raingage Type
CO93	Buffalo Pass - Dry Lake	NTN	6/30/2020	ACM-Type	OTT	Tipping Bucket
FL03	Austin-Cary Forest	NTN	5/19/2020	ACM-Type	Belfort	N/A
FL05	Chassahowitzka National Wildlife Refuge	MDN/NTN	7/14/2020	ACM-Type	ETI	N/A
FL14	Quincy	NTN	3/3/2020	N-CON	OTT	Stick
FL23	Sumatra	NTN	3/3/2020	ACM-Type	ETI	N/A
FL41	Verna Well Field	NTN	5/26/2020	N-CON	OTT	Stick
GA09	Okefenokee National Wildlife Refuge	MDN/NTN	6/3/2020	ACM-Type	ETI	Stick
GA20	Claxton	NTN	6/9/2020	ACM-Type	ETI	N/A
ID02	Priest River Experimental Forest	NTN	11/24/2020	ACM-Type	ETI	N/A
ID03	Craters of The Moon National Monument & Preserve	NTN	7/6/2020	ACM-Type	ETI	N/A
ID11	Reynolds Creek	NTN	7/9/2020	N-CON	OTT	N/A
IL46	Alhambra	NTN	12/7/2020	ACM-Type	ETI	N/A
IN20	Roush Lake	NTN	11/4/2020	N-CON	OTT	N/A
IN22	Southwest Purdue Agriculture Center	MDN/NTN	12/4/2020	ACM-Type N-CON	OTT	N/A
IN41	Agronomy Center For Research And Extension	NTN	11/3/2020	ACM-Type	PLUVIO	N/A
KY03	Mackville	NTN	8/25/2020	N-CON	ETI	N/A
KY10	Mammoth Cave National Park-Houchin Meadow	MDN/NTN	8/19/2020	ACM-Type	ETI	Tipping Bucket
KY19	Cannons Lane	NTN	8/25/2020	N-CON	OTT	N/A
KY22	Lilley Cornett Woods	NTN	8/21/2020	N-CON	OTT	N/A
KY35	Clark State Fish Hatchery	NTN	8/24/2020	N-CON	OTT	N/A
LA12	Iberia Research Station	NTN	9/2/2020	ACM-Type	ETI	N/A
MA14	Nantucket	NTN	10/22/2020	N-CON	ETI	N/A
ME04	Carrabassett Valley	MDN/NTN	9/26/2020	N-CON ACM-Type	ETI	N/A
MI52	Ann Arbor	MDN/NTN	10/7/2020	ACM-Type	ETI	N/A
MI99	Chassell	NTN	6/26/2020	ACM-Type	Belfort	Other
MN23	Camp Ripley	MDN/NTN	9/27/2020	ACM-Type N-CON	OTT	N/A
MN32	Voyageurs National Park-Sullivan Bay	NTN	9/30/2020	ACM-Type	ETI	N/A
MS12	Grand Bay Nerr	MDN/NTN	9/3/2020	ACM-Type	ETI	N/A

Site ID	Site Name	Network	Survey Date	Collector Type	Raingage Type	Backup Raingage Type
MT05	Glacier National Park-Fire Weather Station	MDN	8/13/2020	ACM-Type	ETI	Tipping Bucket
MT95	Badger Peak	MDN	10/19/2020	N-CON	ETI	N/A
MT96	Poplar River	NTN	10/20/2020	ACM-Type	Belfort	N/A
ND00	Theodore Roosevelt National Park-Painted Canyon	NTN	10/21/2020	ACM-Type	ETI	Tipping Bucket
NY43	Rochester	MDN/NTN	10/30/2020	N-CON	ETI	N/A
NY96	Cedar Beach - Southold	MDN/NTN	10/21/2020	N-CON	ETI	N/A
OR10	H. J. Andrews Experimental Forest	NTN	7/27/2020	ACM-Type	ETI	N/A
OR18	Starkey Experimental Forest	NTN	7/29/2020	N-CON	OTT	N/A
OR97	Hyslop Farm	NTN	7/28/2020	ACM-Type	ETI	N/A
PA00	Arendtsville	NTN	7/28/2020	ACM-Type	ETI	N/A
PA13	Allegheny Portage Railroad National Historic Site	MDN/NTN	7/28/2020	N-CON	OTT	N/A
PA29	Kane Experimental Forest	NTN	7/22/2020	ACM-Type	ETI	N/A
PA42	Leading Ridge	NTN	7/24/2020	N-CON	OTT	Stick
SC05	Cape Romain National Wildlife Refuge	MDN/NTN	6/22/2020	ACM-Type	ETI	N/A
SC19	Congaree Swamp	MDN	6/16/2020	ACM-Type	OTT	Other
TN00	Walker Branch Watershed	NTN	10/15/2020	ACM-Type	ETI	N/A
TN04	Speedwell	NTN	10/12/2020	ACM-Type	ETI	N/A
TN12	Great Smoky Mountains National Park-Clingmans Dome	MDN	10/13/2020	ACM-Type	Belfort	Tipping Bucket
TN14	Hatchie National Wildlife Refuge	NTN	10/22/2020	N-CON	OTT	N/A
WI06	UW Arboretum	MDN/NTN	6/22/2020	N-CON	ETI	N/A
WI08	Brule River	MDN/NTN	6/25/2020	N-CON	ETI	N/A
WI10	Potawatomi	MDN/NTN	10/2/2020	ACM-Type	ETI	N/A
WI36	Trout Lake	MDN/NTN	6/24/2020	N-CON	ETI	N/A
WY08	Yellowstone National Park-Tower Falls	MDN/NTN	8/11/2020	ACM-Type	ETI	Stick
WY26	Roundtop Mountain	MDN	6/1/2020	N-CON	ETI	Tipping Bucket

A total of 62 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 2020

Site ID	Station Name	Date Visited
AL99	Sand Mountain Research & Extension Center	5/31/2020
AR03	Caddo Valley	8/22/2020
AZ98	Chiricahua	9/28/2020
CA67	Joshua Tree National Park-Black Rock	11/12/2020
CO88	Rocky Mountain National Park - Longs Peak	5/20/2020
CT15	Abington	9/28/2020
FL19	Indian River	5/22/2020
FL23	Sumatra	3/3/2020
GA41	Georgia Station	6/1/2020
ID03	Craters of the Moon National Monument	7/6/2020
ID07	Nez Perce	7/8/2020
IL11	Bondville	11/5/2020
IL37	Stockton	11/18/2020
IL46	Alhambra	12/7/2020
IN20	Roush Lake	11/4/2020
IN22	Southwest Purdue Agriculture Center	12/4/2020
KY03	Mackville	8/25/2020
KY29	Crockett	11/8/2020
KY98	Cadiz	12/8/2020
MD06	Blackwater NWR	11/15/2020
MD99	Beltsville	9/22/2020
ME93	Ashland	9/27/2020
MI51	Unionville	10/6/2020
MI52	Ann Arbor	10/7/2020
MI95	Hoxeyville	10/3/2020
MN02	Red Lake	9/29/2020
MS30	Coffeeville	8/23/2020
NC02	Cranberry	11/15/2020
NC06	Beaufort	12/12/2020

Site ID	Station Name	Date Visited
NC25	Coweeta	5/30/2020
NC26	Candor	12/16/2020
NE98	Santee	10/22/2020
NH02	Hubbard Brook	9/25/2020
NJ98	Washington Crossing	7/30/2020
NY20	Huntington Wildlife	7/13/2020
NY67	Ithaca	7/20/2020
NY91	Claryville	10/20/2020
OH09	Oxford	11/2/2020
OH54	Deer Creek State Park	8/29/2020
OH99	Quaker City	11/9/2020
OK99	Stilwell	8/21/2020
PA00	Arendtsville	7/28/2020
PA29	Kane Experimental Forest	7/22/2020
PA56	M. K. Goddard	7/21/2020
PA96	Penn State - Fairbrook Park	7/27/2020
PA97	Laurel Hill	6/17/2020
TN04	Speedwell	10/12/2020
TN07	Edgar Evins	10/16/2020
TX41	Alabama-Coushatta	2/17/2020
TX43	Cañónceta	2/20/2020
UT09	Canyonlands National Park-Island in the Sky	8/27/2020
VA13	Blue Grass Trail	11/10/2020
VA24	Prince Edward	12/6/2020
WA04	Confederated Tribes of the Umatilla Indian Reservation	11/23/2020
WI06	UW Arboretum	6/22/2020
WI35	Perkinstown	6/23/2020
WV05	Cedar Creek State Park	11/13/2020
WV18	Parsons	11/12/2020
WY06	Pinedale	8/8/2020
WY93	Basin - Big Horn	6/2/2020
WY94	Grand Tetons National Park	8/10/2020
WY95	Brooklyn Lake	7/15/2020

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 Site Meeting Criteria

	Surveyed	Meeting all Assessments[1]	Percent Meeting all Assessment
Collectors	79	47	59.9
Number of NTN ACM – type	32	23	71.9
Number of MDN ACM – type	13	10	76.9
Number of NTN N-CON	25	7	28.0
、 Number of MDN N-CON	9	7	77.8
Raingages	62	47	75.8
Belfort Raingages	4	2	50.0
Electronic Raingages	58	45	77.6

[1] Meeting all assessments "as found".

	Surveyed	Meeting all Assessments[1]	Percent Meeting all Assessment
Siting Criteria (only rules considered)	79	15	18.9
NTN Siting Criteria	57	11	19.3
MDN Siting Criteria	22	4	18.2
Siting Criteria (rules and guidelines considered)	79	11	13.9
NTN Siting Criteria	57	8	14.0
MDN Siting Criteria	22	3	13.6

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.

In the past, 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 used when preparing the Annual Reports with the consequence that very few sites meet all the siting criteria. For this 2020 NADP Annual Report, Table 3-1 includes the siting criteria taking into account only rules as well as combining rules with guidelines. Table 3-2 presents the siting criteria assessments indicating whether a given assessment is a rule (R) or a guideline (G).

The siting 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?	78	0	0
Siting Criteria Assessments			
R Is the orifice of the collector +/- .3 m of raingage (elevation)?	79	11	13.9
R 45 degree rule met (raingage)	64	16	25.0
G 30 degree guideline for trees met (raingage)	64	30	46.9
R 30 degree rule for buildings met (raingage)	64	1	1.6
R No objects > 1 m height inside 5 m radius (raingage)	64	20	31.3
G No fences > 1 m height inside 2 m radius (raingage)	64	8	12.5
R No vegetation height > 0.6 m within 5 m radius (raingage)	64	11	17.2
R Collector and sensor oriented properly	79	4	5.1
R 45 degree rule met (collector)	79	14	17.7
G 30 degree guideline for trees met (collector)	79	38	48.1
R 30 degree rule for buildings met (collector)	79	0	0.0
R No objects > 1 m height within 5 m radius (collector)	79	26	32.9
R No vegetation height > 0.6 m within 5 m radius (collector)	79	7	8.9
G No treated lumber inside 5 m radius (collector)	79	19	24.1
G No galvanized metal inside 5 m radius collector (MDN)	22	5	22.7
R No pastures and ag. activity within 20 m radius	79	7	8.9

[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 3-1.

Siting and Performance Checks	Number of Assessments[2]	Found Non-Compliant	Percent (%) Non-Compliant
R No herbicides and fertilizers used within 20 m radius	79	6	7.6
R Roads meet NADP siting criteria	79	6	7.6
R Waterways meet NADP siting criteria	79	0	0.0
R Airports meet NADP siting criteria	79	0	0.0
R Animal operations meet NADP siting criteria (NTN)	57	1	1.8
R Combustion sources meet NADP siting criteria	79	0	0.0
G Parking lots and maintenance areas meet NADP siting criteria	79	7	8.9
G Storage areas (fertilizers, road salt, manure, etc.) meet NADP siting criteria	79	0	0.0
G Metalworking operations meet NADP siting criteria (MDN only)	22	0	0.0
ACM-type Collector Assessments			
Dry side bucket is clean (NTN)	45	6	13.3
Dry side bag installed correctly (MDN)	12	1	8.3
Does lid seal properly	45	0	0.0
Lid liner in good condition	45	3	6.7
Fan in good condition (MDN)	11	2	18.2
Cooling fan thermostat in good condition (MDN)	11	0	0.0
Heater in good condition (MDN)	10	0	0.0
Heater thermostat in good condition (MDN)	10	0	0.0
Has flush wall filter mount been installed (MDN)	12	0	0.0
Filter in good condition (MDN)	12	0	0.0
Max / min thermometer within acceptable limits (MDN)	12	0	0.0
ACM sensor operates properly	45	2	4.4
Motor-box operates within acceptable limits	45	2	4.4
N-CON Collector Assessments			
N-CON fan in good condition (MDN)	34	2	5.9
N-CON cooling fan thermostat in good condition (MDN)	34	2	5.9
N-CON heater in good condition (MDN)	9	1	11.1
N-CON heater thermostat in good condition (MDN)	9	0	0.0
N-CON max / min thermometer in acceptable limits (MDN)	9	0	0.0
N-CON sensor respond to 5 passes of the hand	9	0	0.0
N-CON lid seals properly	9	0	0.0
N-CON lid liner in good condition	34	2	5.9
N-CON arms and motorbox do not require tightening	33	18	54.5

Siting and Performance Checks	Number of Assessments[2]	Found Non-Compliant	Percent (%) Non-Compliant
Belfort Raingage Assessments			
Was the 'as found' turn-over set properly	4	2	50.0
Electronic Raingage Assessments			
Raingage operates properly (electronic gage)	58	2	3.4
Does datalogger receive event signals form all collectors (electronic gage)	57	7	12.3
Does optical sensor respond to "blocking" of light beam (ETI)	37	7	18.9
Does optical sensor respond to mist of water (ETI)	34	6	17.6

Tables B-1 through B-4 in Appendix B present EEMS' 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.

Other assessments shown to have a high number of sites out of compliance are related to vegetation. These assessments are 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.

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

CO13-NTN and WI06 MDN and NTN were surveyed during 2020 for the first time. All other sites surveyed in 2020 had been previously visited by EEMS, in 2016, with the exception of WI10 MDN and NTN last surveyed in 2018, and TN00-NTN which had not been surveyed since 2009. Most

of these sites have been visited four or five 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 3-3. For those sites with more than two surveys, only the last two visits were considered (i.e., survey conducted in 2020 and 2016 for most sites).

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

Siting and Performance Checks	% Non-compliant During 2020	% Non-compliant During Previous Survey
Is sampling media quality maintained?	0%	2.6%
R - Is the orifice of the collector +/- .3 m of raingage (elevation)?	15%	15%
R - 45 degree rule met (raingage)	25%	32%
G - 30 degree guideline for trees met (raingage)	44%	54%
R - 30 degree rule for buildings met (raingage)	2%	2%
R - No objects > 1 m height inside 5 m radius (raingage)	31%	44%
R - No fences > 1 m height inside 2 m radius (raingage)	12%	17%
R - No vegetation height > 0.6 m within 5 m radius (raingage)	15%	29%
R - Collector and sensor oriented properly	5%	7%
R - 45 degree rule met (collector)	19%	21%
G - 30 degree guideline for trees met (collector)	47%	43%
R - 30 degree rule for buildings met (collector)	0%	0%
R - No objects > 1 m height within 5 m radius (collector)	32%	27%
R - No fences > 1 m height inside 5 m radius (collector)	19%	19%
R - No vegetation height > 0.6 m within 5 m radius (collector)	8%	17%
G - No treated lumber inside 5 m radius (collector)	25%	27%
G - No galvanized metal inside 5 m radius collector (MDN)	19%	33%
R - No pastures and ag. activity within 20 m radius	9%	9%
R - No herbicides and fertilizers used within 20 m radius	8%	7%
R - Roads meet NADP siting criteria	8%	9%
R - Waterways meet NADP siting criteria	0%	0%
R - Airports meet NADP siting criteria	0%	0%
R - Animal operations meet NADP siting criteria (NTN)	0%	0%
R - Combustion sources meet NADP siting criteria (MDN only)	0%	0%
G - Parking lots and maintenance areas meet NADP siting criteria	9%	5%

Siting and Performance Checks	% Non-compliant During 2020	% Non-compliant During Previous Survey
G - Storage areas (fertilizers, road salt, manure, etc.) meet NADP siting criteria	0%	0%
G - Metalworking operations meet NADP siting criteria (MDN only)	0%	0%
Dry side bucket is clean (NTN)	13%	26%
Dry side bag installed correctly (MDN)	8%	15%
Does lid seal properly	0%	2%
Lid liner in good condition	5%	2%
Fan in good condition (MDN)	18%	8%
Cooling fan thermostat in good condition (MDN)	0%	0%
Heater in good condition (MDN)	0%	0%
Heater thermostat in good condition (MDN)	0%	10%
Has flush wall filter mount been installed (MDN)	0%	17%
Filter in good condition (MDN)	0%	0%
Max / min thermometer within acceptable limits (MDN)	0%	15%
ACM sensor operates properly	5%	5%
Motor-box operates within acceptable limits	5%	2%
N-CON Collector Assessments		
N-CON fan in good condition (MDN)	13%	13%
N-CON cooling fan thermostat in good condition (MDN)	0%	0%
N-CON heater in good condition (MDN)	0%	0%
N-CON heater thermostat in good condition (MDN)	0%	0%
N-CON max / min thermometer in acceptable limits (MDN)	0%	0%
N-CON sensor responds to 5 passes of the hand	6%	0%
N-CON lid seals properly	6%	10%
N-CON lid liner in good condition	6%	6%
Arms and motorbox do not require tightening	55%	N/A
Belfort Raingage Assessments		
Was the 'as found' turn-over set properly	67%	75%
Electronic Raingage Assessments		
Raingage operates properly (electronic gage)	2%	0%
Does datalogger receive event signals form all collectors (electronic gage)	14%	11%
Does optical sensor respond to "blocking" of light beam (ETI)	22%	6%

Siting and Performance Checks	% Non-compliant During 2020	% Non-compliant During Previous Survey
Does optical sensor respond to mist of water (ETI)	28%	6%

Table 3-3 shows that there may have been an improvement in the lid seal of the N-CON collector, but that is not the case. A new item has been added to the N-CON questionnaire to properly record which N-CON collectors required the arms and motorbox to be tightened. During 2020, 55% of all N-CON collectors required adjustments. In 2016, though the problem with the N-CON collector was being addressed in the field and some recommendations were made, the number of collectors with a loose lid were not being recorded. 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. It was in 2018 that instructions were given to surveyors to indicate a poor lid seal if the collector required arm adjustments.

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. Twenty nine of the 62 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	Condición in 2020	Previous Survey
AK01	NTN	Not Present	Not Present
AK03	NTN	Not Present	Not Present
CA50	NTN	Installed	Installed
CA76	NTN	Installed	Installed
CO13	NTN	Installed	N/A
CO93	NTN	Installed	Installed
ID02	NTN	Installed	Installed
ID03	NTN	Installed	Not Present
ID11	NTN	Installed	Installed
ME04	MDN/NTN	Installed	Installed
MI99	NTN	Not Present	Not Present
MN23	MDN/NTN	Not Present	Not Present
MN32	NTN	Installed	Not Present
MT05	MDN	Installed	Installed
MT95	MDN	Installed	Installed

Site ID	Network	Condition in 2020	Previous Survey
MT96	NTN	Installed	Not Present
ND00	NTN	Installed	Installed
NY43	MDN/NTN	Installed	Installed
OR10	NTN	Installed	Installed
OR18	NTN	Installed	Installed
PA13	MDN/NTN	Installed	Not Present
PA29	NTN	Installed	Installed
PA42	NTN	Installed	Not Present
WI06	MDN/NTN	Installed	Installed
WI08	MDN/NTN	Installed	Installed
WI10	MDN/NTN	Installed	Installed
WI36	MDN/NTN	Installed	Installed
WY08	MDN/NTN	Installed	Installed
WY26	MDN	Installed	Installed

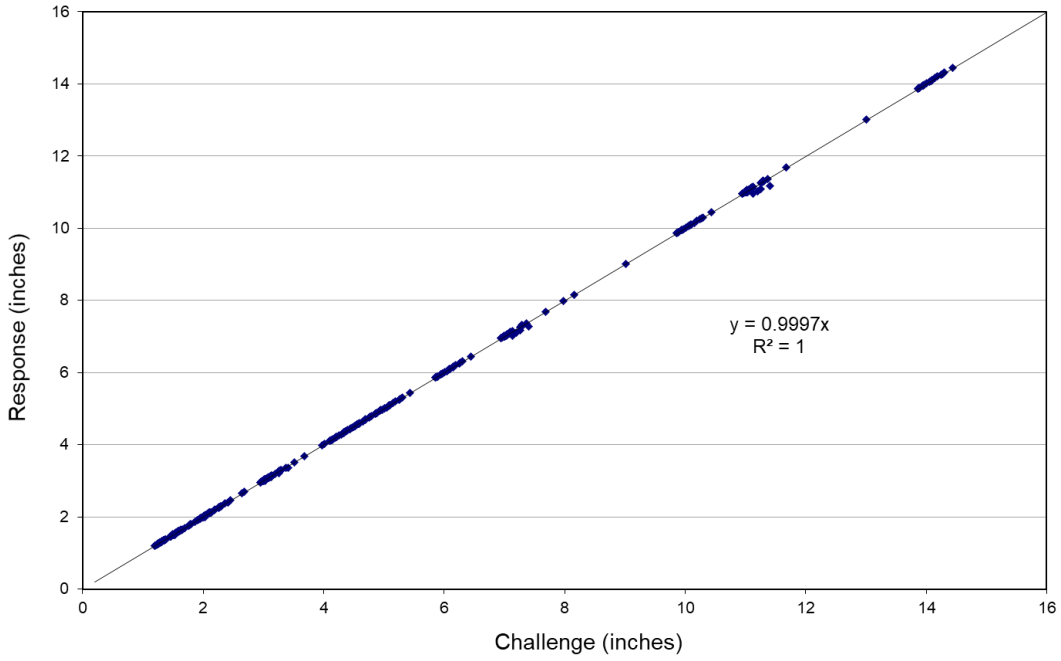
4.0 Field Site Survey Results

This section summarizes the quantifiable survey data relating to raingage accuracy tests and ACM collector sensor heater performance. Sixty-two raingages were surveyed during this reporting period, of which all but four, were electronic raingages. Of the four Belfort mechanical raingage surveyed one could not be adjusted and required a replacement; 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 58 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 – 58 Raingages



4.2 ACM Sensor Heater Tests

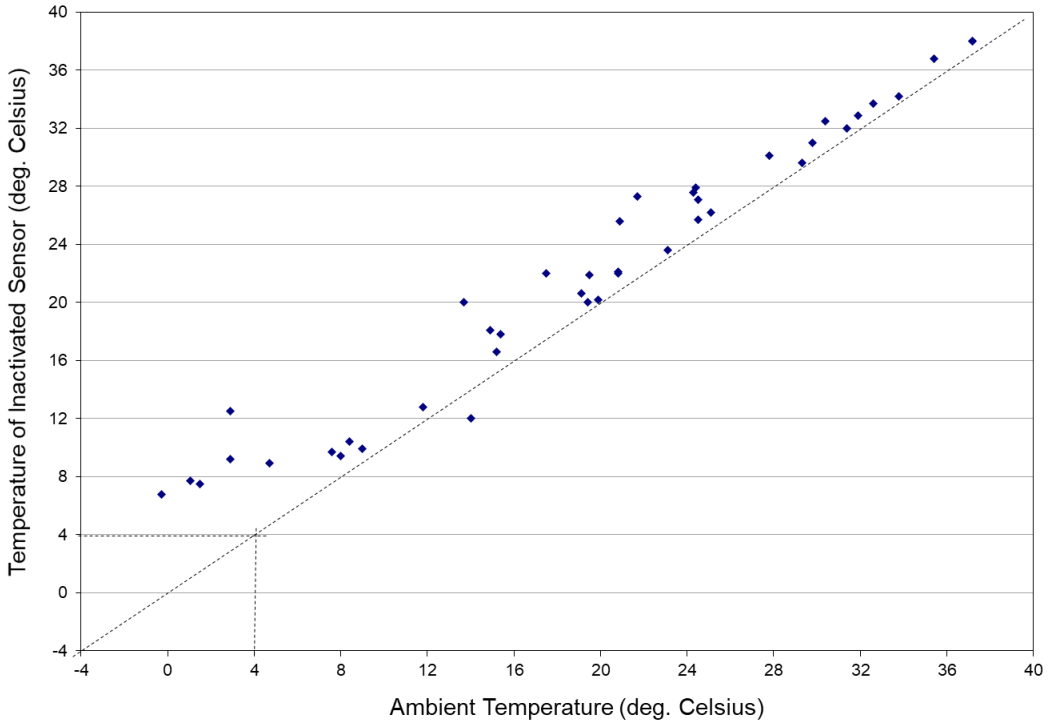
The ACM type collectors used throughout the networks of the NADP utilize a contact grid sensor. Two types of sensors are operated, one with 7 grids, and one with 11 grids which allows for smaller size precipitation to activate the sensor. When precipitation bridges the gap between the grid and

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 except for one showing an ambient temperature greater than the inactivated sensor[3].

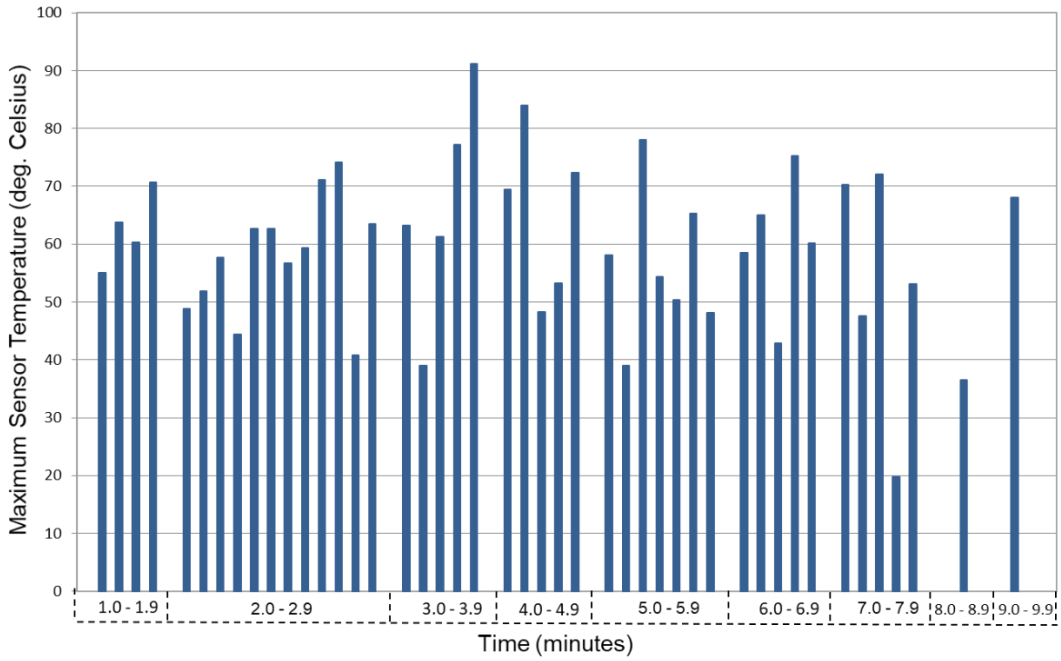
Figure 4-2. Inactivated ACM Sensor Temperature



[3] It is possible that the ambient temperature was recorded at a later time during the site survey

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. Eleven 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.

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



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 º C	1
30.0º to 40.0 º C	3
40.1º to 50.0 º C	7
50.1º to 60.0 º C	11
60.1º to 70.0 º C	12
70.1º to 80.0 º C	9
80.1º to 90.0 º C	1
> 90.1º C	1

Time to Maximum Temperature	Number of Sensors
< 3 min	17
3.0 – 4.0 min	6
4.1 – 5.0 min	6
5.1 – 6.0 min	5
6.1 – 7.0 min	5
7.1 – 8.0 min	5
8.1 – 9.0 min	1
> 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 of the hand 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 2020 were reported to exhibit 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 2020, 34 N-CON collectors were surveyed. Out of the 34 collectors, 19 required the set screws and lid arms bolts to be adjusted and tightened (two MDN and 17 NTN collectors). 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. Once lid arms are found to be loose, the collectors are 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.

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

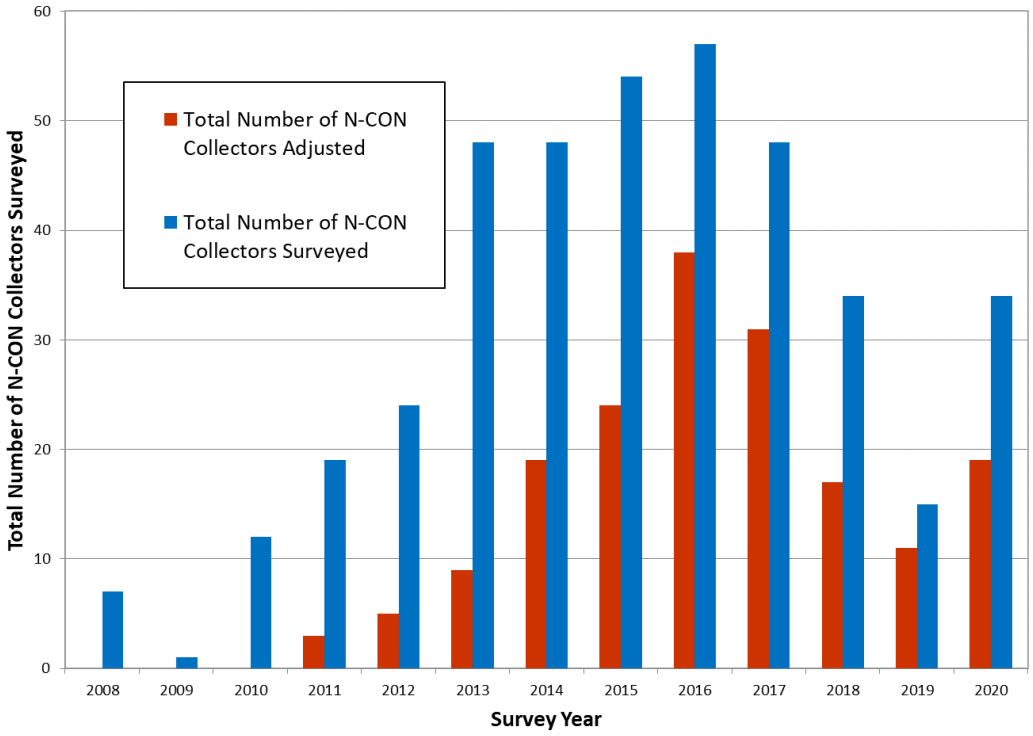
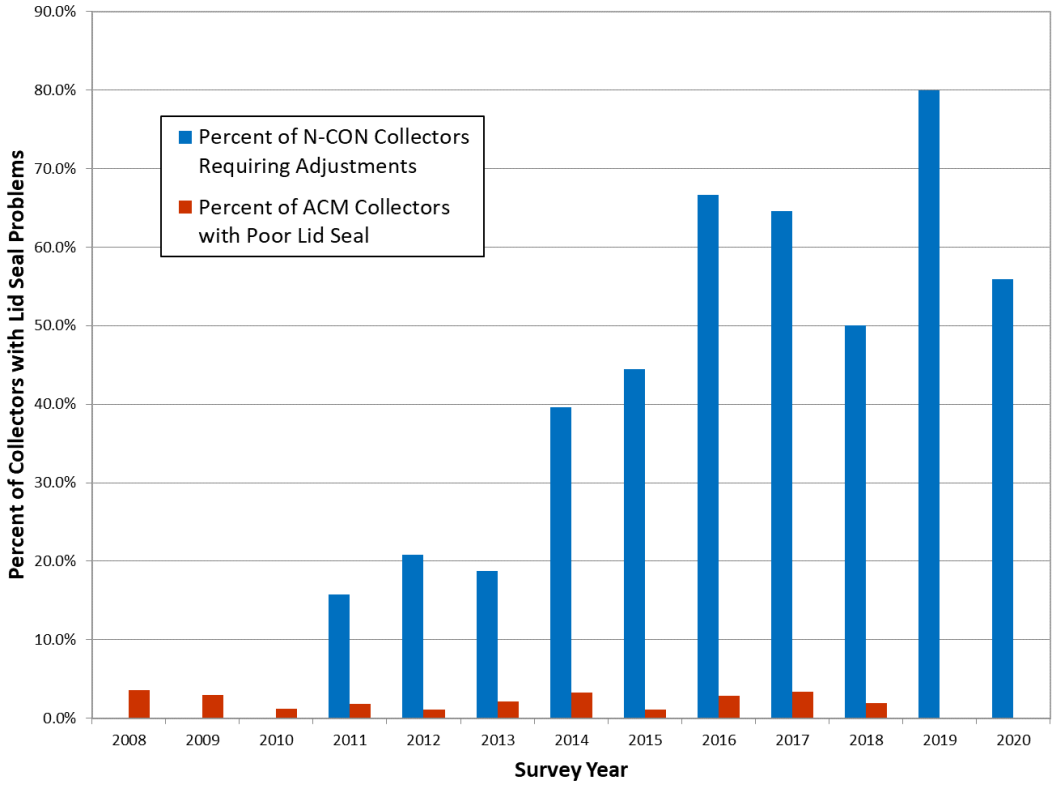


Figure 4-5. Percentage of N-CON and ACM-type Collectors Requiring Lid Adjustments



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. Site WI36 was surveyed in 2016 just after the the upgrade had been installed. This site was surveyed during this reporting year, and the arms required tightning, This is not the only site with the upgrade that has required adjustment of the arms. The upgrade may increase the length of time between adjustments, but it is not a pemanent solution.

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.

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, but since 2019 this has not always been the case and will depend on the type of data transmission the gage uses and/or the preference of the site. Of the 38 ETI NOAH IV gages surveyed, five 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 be 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

Though the goal of the NADP PO is to transition from the PDA to other means of transmission of raingage data, during the 2020 survey year EEMS did not perform any modifications to the raingages encountered that were still using PDA. Of the 58 raingages surveyed, 17 were still utilizing a PDA to download raingage data. It is possible that some site operators are making the transition themselves. The Campbell Scientific Firmware in the raingage data logger was being updated, and the Bluetooth dongle was being replaced. With this modification 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 raingage and download data.

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.

Beginning with 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 four Belfort raingages were surveyed during this reporting period, one of which was found to require a replacement raingage.

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
AK01	Mettler SB32000	0.04%
AK03	Sartorius CPA6202S	**
CA45	Ohaus 1119D	0.03%
CA50	Unknown	-0.13%
CA66	Ohaus 1119D	0.05%
CA67	AEADAM CBK35q 8642	**
CA76	KTRON KS-1WM	0.02%
CA88	Mettler PC16	0.03%
CO13	Mettler/Toledo model PB3002	-0.39%
CO93	Ohaus 1119D	**
FL03	Mettler PT10N	**
FL05	Ohaus 1119D	0.12%

Site Id	Scale Type	Average % Difference
LA12	Ohaus 1119D	**
MA14	DYMO M25-US	-0.03%
ME04	Ohaus	**
MI52	Ohaus 1119D	0.03%
MI99	Ohaus 1119D	**
MN23	Ohaus 1119D	**
MN32	Ohaus 1119D	0.09%
MS12	Denver DA Series	-1.04%
MT96		**
ND00	Ohaus 1119D	0.17%
NY43	AE Adams CBK 16aH	0.07%
NY96	Ohaus 1119D	0.05%

Site Id	Scale Type	Average % Difference
FL14	Ohaus 1119D	0.08%
FL23	Ohaus 1119D	-0.26%
FL41	Ohaus 1119D	0.00%
GA09	Ohaus	-0.05%
GA20	Ohaus 1119D	-0.18%
ID02	Satorius ES 18DCE-IOUR	**
ID03	Ohaus 1119D	0.13%
ID11	Sartorius 110P	0.02%
IL46	Ohaus 1119D	-0.01%
IN20	Ohaus 1119D	0.00%
IN22	Sartorius 3862 M88-1	**
IN41	Ohaus 1119D	0.08%
KY03	Ohaus 1119D	0.04%
KY10	Ohaus 0-20 kg	0.05%
KY19	Sartorius AG	-0.18%
KY22	Ohaus 1119D	0.10%
KY35	Ohaus 1119D	0.04%
OR10	Mettler PE24	**
OR18	Ohaus 1119D	**
OR97	Ohaus 1119D	-0.02%
PA00	OHAUS Triple Beam	0.05%
PA13	Sartorius 1264 MP	**
PA29	Ohaus 1119D	**
PA42	Sartorius 1264MP	**
SC05	Ohaus 1119D	**
TN00	Sartorius 2251	-0.09%
TN04	Ohaus 1119D	0.08%
TN14	Ohaus 1119D	0.04%
WI06		0.03%
WI08	OHAUS Triple Beam	0.25%
WI10		0.01%
WI36	Ohaus 1119D	0.04%
WY08	Ohaus 1119D	0.08%

**Indicates that the scales were not tested due to COVID-19 restrictions.

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 is 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 2020.

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. During 2020, no cooperative site survey was scheduled; Covid-19 made it difficult to complete all the site surveys that were scheduled for 2020. 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 2020).

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 when 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 EPA Project Officer. This 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 PO 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. 2020 Internal QA Results for Duplicate Entry Errors

	Field Entry	Duplicate QA Entry	Total Entries
Total Number of Entries Compared	16,171	16,171	32,342
Initial File Entry Errors	73		
Duplicate QA Entry Errors		56	
Percent Errors	0.45%	0.35%	
Total Entry Errors	129		
Total Percent Errors	0.40%		

The data indicates that of the 32,342 entries that are compared (does not include memo fields), the entry error rate is about 0.40%.

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 guideline 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

StationId	FL05	GA09	KY10	MI52	MN23	MS12	MT05	SC05	SC19	TN12	WI10	WY08
Is sampling media quality maintained?												
Is the orifice of the collector +/- .3 m of raingage (elevation)	X								X			
45 degree rule met (raingage)			X	X			X	X	X			
30 degree rule for buildings met (raingage)		X			X		X	X	X	X		X
30 degree guideline for trees met (raingage)							X					
No objects > 1 m height inside 5 m radius (raingage)	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					
Collector and sensor oriented properly												
45 degree rule met (collector)				X				X	X			
30 degree guideline for trees met (collector)		X		X	X		X	X	X	X		X
30 degree rule for buildings met (collector)												
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
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												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	X											X
Storage areas (fertilizers, road salt, manure, etc.) meet NADP siting criteria												
Metalworking operations meet NADP siting criteria (MDN only)							X					
Dry side bucket is clean	X											
Dry side bag installed correctly							MISSING					
Does lid seal properly												
Lid liner in good condition												
Fan in good condition	X							--	X	--		
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						X			X			
Motorbox operates within acceptable limits												
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)	X				--				--	--		
Does optical sensor respond to mist of water (electronic gage)	X				--				--	--		
Was the 'as found' turn over set properly (Belfort gage)	--	--	--	--	--	--	--	--	--	X	--	--

	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	ME04	MT95	NY43	NY96	PA13	WI06	WI08	WI36	WY26
Is sampling media quality maintained?									
Is the orifice of the collector +/- .3 m of raingage (elevation)	X		X						
45 degree rule met (raingage)		X	X						
30 degree rule for buildings met (raingage)			X		X	X			
30 degree guideline for trees met (raingage)									
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	X			X	X		
No vegetation height > 0.6 m within 5 m radius (raingage)						X			
Does NADP require a raingage wind shield at this site?				X	X				
If raingage wind shield present, is it installed correctly?				--	--				
Collector and sensor oriented properly		X		X					
45 degree rule met (collector)		X	X						
30 degree guideline for trees met (collector)			X		X	X			
30 degree rule for buildings met (collector)									
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)			X				X		
No vegetation height > 0.6 m within 5 m radius (collector)									
No treated lumber inside 5 m radius (collector)			X					X	X
No galvanized metal inside 5 m radius collector (MDN)			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			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)									
N-CON lid seal in good condition									
N-CON lid liner in good condition									
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 a 20-second mist of water	X								
N-CON arms and motorbox do not require tightening	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)			X		--				
Does optical sensor respond to mist of water (electronic gage)			X		--				U to T

	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 (1 of 2)

StationId	AK01	AK03	CA66	CA67	CO93	FL00	FL05	FL23	GA09	GA20	ID02	ID03	IL46	IN41	KY10	LA12	MA14	ME04
Is sampling media quality maintained?																		
Is the orifice of the collector +/- .3 m of raingage (elevation)					X			X										X
45 degree rule met (raingage)				X				X							X			
30 degree rule for buildings met (raingage)		X				X	X	X	X	X								
30 degree guideline for trees met (raingage)																		
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			X		X		X	X			X					X	
Collector and sensor oriented properly																	X	
45 degree rule met (collector)				X				X										
30 degree guideline for trees met (collector)		X				X	X	X	X	X								
30 degree rule for buildings met (collector)																		
No objects > 1 m height within 5 m radius (collector)				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												
No treated lumber inside 5 m radius (collector)	X				X		X	X			X							
No pastures and ag. activity within 20 m radius										X			X			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																		
Animal operations meet NADP site cirteria (NTN and AIRMoN)																X		
Parking lots and maintenance areas meet NADP siting criteria							X											
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						X											--	
ACM sensor operates properly																	--	
Motorbox operates within acceptable limits				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)	U to T				--	--								--				
Does optical sensor respond to mist of water (electronic gage)	U to T				--	--					U to T			--				
Was the 'as found' turn over set properly (Belfort 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 (2 of 2)

StationId	MI52	MI99	MN32	MS12	MT96	ND00	OR10	OR97	PA00	PA29	SC05	TN00	TN04	WI10	WY08
Is sampling media quality maintained?					U to T										
Is the orifice of the collector +/- .3 m of raingage (elevation)			X												
45 degree rule met (raingage)	X		X			X	X								
30 degree guideline for trees met (raingage)		X	X				X				X	X			X
30 degree rule for buildings met (raingage)															
No objects > 1 m height inside 5 m radius (raingage)	X			X		X	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)	X					X	X								
30 degree guideline for trees met (collector)		X	X				X				X	X			X
30 degree rule for buildings met (collector)															
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					X									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									X			X	X		
No herbicides and fertilizers used within 20 m radius									X				X		
Roads meet NADP siting criteria															X
Waterways meet NADP siting criteria															
Airports meet NADP siting criteria															
Animal operations meet NADP site criteria (NTN)															
Parking lots and maintenance areas meet NADP siting criteria															X
Storage areas (fertilizers, road salt, manure, etc.) meet NADP siting criteria															
Dry side bucket is clean			X						X	X					
Does lid seal properly															
Lid liner in good condition													X	X	
ACM sensor operates properly															
Motorbox operates within acceptable limits															
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)		--			--	X		X	X	X			X		
Does optical sensor respond to mist of water (electronic gage)		--			--	X		U to T	X	X			X		
Was the 'as found' turn over set properly (Belfort gage)	--		--	--	X	--	--	--	--	--	--	--	--	--	--

	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 (1 of 2)

StationId	CA45	CA50	CA76	CA88	CO13	FL14	FL41	ID11	IN20	IN22	KY03	KY19	KY22	KY35	MA14	ME04	MN23
Is sampling media quality maintained?																	
Is the orifice of the collector +/- .3 m of raingage (elevation)								X			X					X	
45 degree rule met (raingage)						X					X		X				
30 degree guideline for trees met (raingage)	X	X				X	X				X	X	X	X			X
30 degree rule for buildings met (raingage)																	
No oobjects > 1 m height inside 5 m radius (raingage)														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		
Collector and sensor oriented properly															X		
45 degree rule met (collector)		X				X							X				
30 degree guideline for trees met (collector)	X	X				X	X				X	X	X	X			X
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)	X		X	X													
No vegetation height > 0.6 m within 5 m radius (collector)											X						
No treated lumber inside 5 m radius (collector)		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												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								X				X					
Storage areas (fertilizers, road salt, manure, etc) meet NADP siting criteria																	
N-CON lid seal in good condition																	X
N-CON lid liner in good condition						X											
N-CON sensor responds to a 20-second mist of water							X									X	
N-CON arms and motorbox do not require tightening	X			MISSING	X				X	X	X		X		X	X	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)	--	--	--	--		--	--	--	--	--		--	--	--			--
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 (2 of 2)

StationId	MT95	NY43	NY43	NY96	NY96	OR18	PA13	PA13	PA42	TN14	WI06	WI06	WI08	WI08	WI36	WI36	WY26
Is sampling media quality maintained?																	
Is the orifice of the collector +/- .3 m of raingage (elevation)		X	X														
45 degree rule met (raingage)	X	X	X						X								
30 degree guideline for trees met (raingage)		X	X			X	X	X	X		X	X					
30 degree rule for buildings met (raingage)																	
No objects > 1 m height inside 5 m radius (raingage)	X	X	X								X	X			X	X	
No fences > 1 m height inside 2 m radius (raingage)	X	X	X								X	X	X	X			
No vegetation height > 0.6 m within 5 m radius (raingage)											X	X					
Collector and sensor oriented properly	X			X	X												
45 degree rule met (collector)	X	X	X														
30 degree guideline for trees met (collector)		X	X			X	X	X	X		X	X			X		
30 degree rule for buildings met (collector)																	
No objects > 1 m height within 5 m radius (collector)	X	X	X			X	X	X			X	X	X	X			
No fences > 1 m height inside 5 m radius (collector)		X	X										X	X			
No vegetation height > 0.6 m within 5 m radius (collector)																	
No treated lumber inside 5 m radius (collector)		X	X			X				X					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		X	X							X							
Waterways meet NADP siting criteria																	
Airports meet NADP siting criteria																	
Animal operations meet NADP site criteria (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 lid seal in good condition										X							
N-CON lid liner in good condition															X		
N-CON sensor responds to a 20-second mist of water																	
N-CON arms and motorbox do not require tightening			X		X		X	X	X	X	X		X		X		
Raingage operates properly (electronic gage)																	
Does datalogger receive event signals form all collectors (electronic gage)				X	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			--	--	--	--	--							U to T

	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 5)

StationId	FL05				GA09					IN22			KY10				ME04			
Year	2010	2013	2016	2020	2008	2011	2013	2016	2020	2015	2019	2020	2010	2013	2016	2020	2009	2012	2016	2020
Is the orifice of the collector +/- .3 m of raingage (elevation)	X			X														X	X	X
45 degree rule for met (raingage)					X									X	X	X				
30 degree rule for buildings met (raingage)					X	X	X	X	X											
30 degree guideline for trees met (rain gage)																				
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			X	X	X	X											
45 degree rule met (collector)					X									X	X					
30 degree guideline for trees met (collector)					X	X	X	X	X										X	
30 degree rule for buildings met (collector)																				
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)																				
No treated lumber inside 5 m radius (collector)																				
No galvanized metal inside 5 m radius collector (MDN)																		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		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				X																
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**

Table C-1. NADP – MDN – Siting Criteria and Sample Quality: Comparison Between Surveys of Findings Most Likely to Impact Data Quality (2 of 5)

StationId	MI52		MN23					MS12			MT05					MT95		
Year	2016	2020	2008	2011	2013	2016	2020	2013	2016	2020	2008	2011	2013	2016	2020	2013	2016	2020
Is the orifice of the collector +/- .3 m of raingage (elevation)																		
45 degree rule for met (raingage)	X	X										X	X	X	X	X	X	X
30 degree rule for buildings met (raingage)				X		X	X				X	X	X	X	X			
30 degree guideline for trees met (rain gage)												X	X	X	X			
No objects > 1 m height inside 5 m radius (raingage)	X	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								X		X	X			
45 degree rule met (collector)	X	X														X	X	X
30 degree guideline for trees met (collector)		X		X		X	X				X			X	X			
30 degree rule for buildings met (collector)																		
No objects > 1 m height within 5 m radius (collector)	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		X					X			X	X	X				
No treated lumber inside 5 m radius (collector)					X	X					X							
No galvanized metal inside 5 m radius collector (MDN)	X	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													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)															X			

	Indicates found compliant
X	**Indicates found non-compliant**

Table C-1. NADP – MDN – Siting Criteria and Sample Quality: Comparison Between Surveys of Findings Most Likely to Impact Data Quality (3 of 5)

StationId	NY43				NY96		PA13					SC05					SC19				
Year	2010	2013	2016	2020	2016	2020	2008	2010	2013	2016	2020	2008	2011	2013	2016	2020	2008	2011	2013	2016	2020
Is the orifice of the collector +/- .3 m of raingage (elevation)	X	X	X	X															X	X	X
45 degree rule for met (raingage)	X	X	X	X			X					X				X		X	X	X	X
30 degree rule for buildings met (raingage)	X	X	X	X			X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
30 degree guideline for trees met (rain gage)																					
No objects > 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)	X	X	X	X																	
No vegetation height > 0.6 m within 5 m radius (raingage)			X																		
45 degree rule met (collector)	X	X	X	X			X									X		X	X	X	X
30 degree guideline for trees met (collector)	X	X	X	X			X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
30 degree rule for buildings met (collector)																					
No objects > 1 m height within 5 m radius (collector)	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	X	
No vegetation height > 0.6 m within 5 m radius (collector)			X																		
No treated lumber inside 5 m radius (collector)		X	X	X																	
No galvanized metal inside 5 m radius collector (MDN)		X	X	X													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		X	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**

Table C-1. NADP – MDN – Siting Criteria and Sample Quality: Comparison Between Surveys of Findings Most Likely to Impact Data Quality (4 of 5)

StationId	TN12		WI08					WI10					WI36					WY08			
Year	2016	2020	2008	2011	2013	2016	2020	2009	2012	2015	2018	2020	2008	2010	2013	2016	2020	2009	2013	2016	2020
Is the orifice of the collector +/- .3 m of raingage (elevation)								X													
45 degree rule for met (raingage)																					
30 degree rule for buildings met (raingage)	X	X														X		X	X	X	X
30 degree guideline for trees met (rain gage)																					
No objects > 1 m height inside 5 m radius (raingage)					X											X	X		X	X	X
No fences > 1 m height inside 2 m radius (raingage)				X	X	X	X													X	X
No vegetation height > 0.6 m within 5 m radius (raingage)				X																	
45 degree rule met (collector)																					
30 degree guideline for trees met (collector)	X	X			X											X		X	X	X	X
30 degree rule for buildings met (collector)																					
No objects > 1 m height within 5 m radius (collector)				X	X	X	X											X	X	X	X
No fences > 1 m height inside 5 m radius (collector)				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	X	X
No galvanized metal inside 5 m radius collector (MDN)			X	X	X	X	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																			X	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																			X	X	X
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**

Table C-1. NADP – MDN – Siting Criteria and Sample Quality: Comparison Between Surveys of Findings Most Likely to Impact Data Quality (5 of 5)

StationId	WY26		
Year	**2013**	**2016**	**2020**
Is the orifice of the collector +/- .3 m of raingage (elevation)			
45 degree rule for met (raingage)			
30 degree rule for buildings met (raingage)			
30 degree guideline for trees met (rain gage)			
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)			
45 degree rule met (collector)			
30 degree guideline 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)	X	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)			

	Indicates found compliant
X	**Indicates found non-compliant**

Table C-2. NADP – NTN – Siting Criteria and Sample Quality: Comparison Between Surveys of Findings Most Likely to Impact Data Quality (1 of 12)

StationId	AK01				AK03				CA45				CA50				CA66			
Year	2010	2013	2016	2020	2010	2013	2016	2020	2010	2013	2016	2020	2010	2013	2016	2020	2010	2013	2016	2020
Is the orifice of the collector +/- .3 m of raingage (elevation)																				
45 degree rule met (raingage)					X				X				X	X	X		X	X		
30 degree rule for buildings met (raingage)					X	X	X	X	X	X	X	X	X	X	X	X				
30 degree guideline for trees met (rain gage)																				
No objects > 1 m height inside 5 m radius (raingage)					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	X	X		X						X							
45 degree rule met (collector)													X	X	X	X				
30 degree guideline for trees met (collector)					X	X	X	X	X	X	X	X	X	X	X	X				
30 degree rule for buildings met (collector)																				
No objects > 1 m height within 5 m radius (collector)									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		X							X	X									
No treated lumber inside 5 m radius (collector)			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																				
Airports meet NADP siting criteria																				
Animal operations meet NADP site criteria (NTN)																				
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**

Table C-2. NADP – NTN – Siting Criteria and Sample Quality: Comparison Between Surveys of Findings Most Likely to Impact Data Quality (2 of 12)

StationId	CA67				CA76				CA88				CO93					FL05			
Year	2010	2013	2016	2020	2010	2013	2016	2020	2010	2013	2016	2020	2008	2011	2014	2016	2020	2010	2013	2016	2020
Is the orifice of the collector +/- .3 m of raingage (elevation)													X	X	X	X	X	X		X	
45 degree rule met (raingage)	X	X	X	X																	
30 degree rule for buildings met (raingage)																					X
30 degree guideline for trees met (rain gage)																					
No objects > 1 m height inside 5 m radius (raingage)	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	
45 degree rule met (collector)	X	X	X	X																	
30 degree guideline for trees met (collector)																					X
30 degree rule for buildings met (collector)																					
No objects > 1 m height within 5 m radius (collector)	X	X	X	X						X											X
No fences > 1 m height inside 5 m radius (collector)							X	X			X	X									
No vegetation height > 0.6 m within 5 m radius (collector)	X	X	X	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	X									
No herbicides and fertilizers used within 20 m radius											X	X							X		
Roads meet NADP siting criteria																			X	X	
Waterways meet NADP siting criteria																					
Airports meet NADP siting criteria																					
Animal operations meet NADP site criteria (NTN)																					
Parking lots and maintenance areas meet NADP siting criteria																					X
Storage areas (fertilizers, road salt, manure, etc.) meet NADP siting criteria																					

	Indicates found compliant
X	**Indicates found non-compliant**

Table C-2. NADP – NTN – Siting Criteria and Sample Quality: Comparison Between Surveys of Findings Most Likely to Impact Data Quality (3 of 12)

StationId	FL14				FL23				FL41				GA09					GA20			
Year	2010	2013	2016	2020	2010	2013	2016	2020	2010	2013	2016	2020	2008	2011	2013	2016	2020	2009	2013	2016	2020
Is the orifice of the collector +/- .3 m of raingage (elevation)					X	X	X	X													
45 degree rule met (raingage)	X	X	X	X	X	X	X	X	X				X								
30 degree rule for buildings met (raingage)	X	X	X	X	X			X	X	X	X	X	X	X	X	X	X	X	X	X	X
30 degree guideline for trees met (rain gage)																					
No objects > 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)																		X	X	X	
No vegetation height > 0.6 m within 5 m radius (raingage)					X			X	X					X	X	X	X				
45 degree rule met (collector)		X	X	X	X	X	X	X	X				X								
30 degree guideline for trees met (collector)	X	X	X	X	X			X	X	X	X	X	X	X	X	X	X	X	X	X	X
30 degree rule for buildings met (collector)																					
No objects > 1 m height within 5 m radius (collector)					X	X	X	X		X	X				X			X			
No fences > 1 m height inside 5 m radius (collector)																		X	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													
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			
Waterways meet NADP siting criteria																					
Airports meet NADP siting criteria																					
Animal operations meet NADP site criteria (NTN)																					
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**

Table C-2. NADP – NTN – Siting Criteria and Sample Quality: Comparison Between Surveys of Findings Most Likely to Impact Data Quality (4 of 12)

StationId	ID02					ID03					ID11					IL46				
Year	2008	2011	2013	2016	2020	2008	2011	2013	2016	2020	2008	2011	2013	2016	2020	2009	2012	2014	2016	2020
Is the orifice of the collector +/- .3 m of raingage (elevation)											X	X	X	X	X					
45 degree rule met (raingage)																				
30 degree rule for buildings met (raingage)																				
30 degree guideline for trees met (rain gage)																				
No objects > 1 m height inside 5 m radius (raingage)											X	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	X	X	X									X	
45 degree rule met (collector)																				
30 degree guideline for trees met (collector)																				
30 degree rule for buildings met (collector)																				
No objects > 1 m height within 5 m radius (collector)																		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	
No treated lumber inside 5 m radius (collector)	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													X		X	X	X
Roads meet NADP siting criteria																				
Waterways meet NADP siting criteria																				
Airports meet NADP siting criteria																				
Animal operations meet NADP site criteria (NTN)																				
Parking lots and maintenance areas meet NADP siting criteria												X	X	X	X					
Storage areas (fertilizers, road salt, manure, etc.) meet NADP siting criteria																				

	Indicates found compliant
X	**Indicates found non-compliant**

Table C-2. NADP – NTN – Siting Criteria and Sample Quality: Comparison Between Surveys of Findings Most Likely to Impact Data Quality (5 of 12)

StationId	IN20					IN22					IN41					KY03			
Year	2010	2012	2014	2016	2020	2008	2011	2013	2016	2020	2007	2011	2013	2016	2020	2010	2013	2016	2020
Is the orifice of the collector +/- .3 m of raingage (elevation)																X	X	X	X
45 degree rule met (raingage)																X	X	X	X
30 degree rule for buildings met (raingage)						X										X	X	X	X
30 degree guideline for trees met (rain gage)																			
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)																			
45 degree rule met (collector)																			
30 degree guideline for trees met (collector)						X											X	X	X
30 degree rule for buildings met (collector)																			
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
No treated lumber inside 5 m radius (collector)											X								
No pastures and ag. activity within 20 m radius																			
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 criteria (NTN)																			
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**

Table C-2. NADP – NTN – Siting Criteria and Sample Quality: Comparison Between Surveys of Findings Most Likely to Impact Data Quality (6 of 12)

StationId	KY10				KY19				KY22				KY35				LA12			
Year	2010	2013	2016	2020	2010	2013	2016	2020	2010	2013	2016	2020	2010	2013	2016	2020	2016	2020	2016	2020
Is the orifice of the collector +/- .3 m of raingage (elevation)																				
45 degree rule met (raingage)		X	X	X					X	X	X	X								
30 degree rule for buildings met (raingage)								X	X	X	X	X	X		X	X				
30 degree guideline for trees met (rain gage)																				
No objects > 1 m height inside 5 m radius (raingage)															X	X				
No fences > 1 m height inside 2 m radius (raingage)									X	X	X	X								
No vegetation height > 0.6 m within 5 m radius (raingage)																			X	X
45 degree rule met (collector)			X						X	X	X	X								
30 degree guideline for trees met (collector)								X	X	X	X	X	X		X	X				
30 degree rule for buildings met (collector)																				
No objects > 1 m height within 5 m radius (collector)	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)																				
No treated lumber inside 5 m radius (collector)																				
No pastures and ag. activity within 20 m radius	X																X	X		
No herbicides and fertilizers used within 20 m radius					X	X														
Roads meet NADP siting criteria								X												
Waterways meet NADP siting criteria																				
Airports meet NADP siting criteria																				
Animal operations meet NADP site criteria (NTN)																	X	X		
Parking lots and maintenance areas meet NADP siting criteria								X												
Storage areas (fertilizers, road salt, manure, etc.) meet NADP siting criteria																				

Indicates found compliant

X **Indicates found non-compliant**

Table C-2. NADP – NTN – Siting Criteria and Sample Quality: Comparison Between Surveys of Findings Most Likely to Impact Data Quality (7 of 12)

StationId	ME04				MI52				MI99					MN23				
Year	2009	2012	2016	2020	2010	2013	2016	2020	2008	2010	2013	2016	2020	2008	2011	2013	2016	2020
Is the orifice of the collector +/- .3 m of raingage (elevation)	X	X	X	X														
45 degree rule met (raingage)					X	X	X	X										
30 degree rule for buildings met (raingage)											X	X	X		X		X	X
30 degree guideline for trees met (rain gage)																		
No objects > 1 m height inside 5 m radius (raingage)					X	X	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								X			
45 degree rule met (collector)					X	X	X	X										
30 degree guideline for trees met (collector)											X	X	X				X	X
30 degree rule for buildings met (collector)																		
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	X	X	X										
No vegetation height > 0.6 m within 5 m radius (collector)					X		X	X							X			
No treated lumber inside 5 m radius (collector)																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 criteria (NTN)																		
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**

Table C-2. NADP – NTN – Siting Criteria and Sample Quality: Comparison Between Surveys of Findings Most Likely to Impact Data Quality (8 of 12)

StationId	MN32					MS12			MT96					ND00					NY43		
Year	2008	2011	2013	2016	2020	2013	2016	2020	2008	2012	2015	2018	2020	2008	2011	2013	2016	2020	2013	2016	2020
Is the orifice of the collector +/- .3 m of raingage (elevation)		X	X	X	X														X	X	X
45 degree rule met (raingage)					X									X	X	X	X	X	X	X	X
30 degree rule for buildings met (raingage)		X	X	X	X														X	X	X
30 degree guideline for trees met (rain gage)																					
No objects > 1 m height inside 5 m radius (raingage)						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	X					X	X			X	X	X	X			X	
45 degree rule met (collector)														X	X	X	X	X	X	X	X
30 degree guideline for trees met (collector)	X	X	X	X	X														X	X	X
30 degree rule for buildings met (collector)																					
No objects > 1 m height within 5 m radius (collector)														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	X	X	X		X			X				X	X	X	X			X	
No treated lumber inside 5 m radius (collector)																			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															X	X			X	X	X
Waterways meet NADP siting criteria																					
Airports meet NADP siting criteria																					
Animal operations meet NADP site criteria (NTN)																					
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**

Table C-2. NADP – NTN – Siting Criteria and Sample Quality: Comparison Between Surveys of Findings Most Likely to Impact Data Quality (9 of 12)

StationId	NY96				OR10					OR18					OR97					PA00			
Year	2009	2013	2016	2020	2008	2011	2013	2016	2020	2008	2011	2013	2016	2020	2008	2011	2013	2016	2020	2010	2013	2016	2020
Is the orifice of the collector +/- .3 m of raingage (elevation)										X													
45 degree rule met (raingage)						X	X	X	X											X	X		
30 degree rule for buildings met (raingage)					X	X	X	X	X		X		X	X									
30 degree guideline for trees met (rain gage)																							
No objects > 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
45 degree rule met (collector)					X	X	X	X	X														
30 degree guideline for trees met (collector)					X	X	X	X	X	X	X		X	X									
30 degree rule for buildings met (collector)																							
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																		
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				X					
No pastures and ag. activity within 20 m radius											X	X	X				X			X		X	X
No herbicides and fertilizers used within 20 m radius														X			X			X		X	X
Roads meet NADP siting criteria							X																
Waterways meet NADP siting criteria																							
Airports meet NADP siting criteria																							
Animal operations meet NADP site criteria (NTN)																							
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**

Table C-2. NADP – NTN – Siting Criteria and Sample Quality: Comparison Between Surveys of Findings Most Likely to Impact Data Quality (10 of 12)

StationId	PA13			PA29					PA42					SC05					TN00	
Year	2013	2016	2020	2008	2010	2013	2016	2020	2008	2010	2013	2016	2020	2008	2011	2013	2016	2020	2009	2020
Is the orifice of the collector +/- .3 m of raingage (elevation)																				
45 degree rule met (raingage)										X	X	X	X	X						
30 degree rule for buildings met (raingage)	X	X	X	X					X	X	X	X	X	X	X	X	X	X	X	X
30 degree guideline for trees met (rain gage)																				
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)																				
45 degree rule met (collector)																				
30 degree guideline for trees met (collector)			X	X					X	X	X	X	X	X	X	X	X	X	X	X
30 degree rule for buildings met (collector)																				
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)																				
No vegetation height > 0.6 m within 5 m radius (collector)																				
No treated lumber inside 5 m radius (collector)								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																				
Airports meet NADP siting criteria																				
Animal operations meet NADP site criteria (NTN)																				
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**

Table C-2. NADP – NTN – Siting Criteria and Sample Quality: Comparison Between Surveys of Findings Most Likely to Impact Data Quality (11 of 12)

StationId	TN04				TN14				WI08		WI10					WI36				
Year	2009	2013	2016	2020	2010	2013	2016	2020	2016	2020	2009	2012	2015	2018	2020	2008	2010	2013	2016	2020
Is the orifice of the collector +/- .3 m of raingage (elevation)											X									
45 degree rule met (raingage)		X	X		X															
30 degree rule for buildings met (raingage)					X														X	
30 degree guideline for trees met (rain gage)																				
No objects > 1 m height inside 5 m radius (raingage)						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														
45 degree rule met (collector)		X	X																	
30 degree guideline for trees met (collector)					X	X													X	X
30 degree rule for buildings met (collector)																				
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	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	X															
Roads meet NADP siting criteria							X	X												
Waterways meet NADP siting criteria																				
Airports meet NADP siting criteria																				
Animal operations meet NADP site criteria (NTN)																				
Parking lots and maintenance areas meet NADP siting criteria							X	X												
Storage areas (fertilizers, road salt, manure, etc.) meet NADP siting criteria						X														

Indicates found compliant

X **Indicates found non-compliant**

Table C-2. NADP – NTN – Siting Criteria and Sample Quality: Comparison Between Surveys of Findings Most Likely to Impact Data Quality (12 of 12)

StationId	WY08			
Year	2009	2013	2016	2020
Is the orifice of the collector +/- .3 m of raingage (elevation)				
45 degree rule met (raingage)				
30 degree rule for buildings met (raingage)	X	X	X	X
30 degree guideline for trees met (rain gage)				
No objects > 1 m height inside 5 m radius (raingage)		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)				
45 degree rule met (collector)				
30 degree guideline for trees met (collector)	X	X	X	X
30 degree rule for buildings met (collector)				
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)		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		X	X	X
Waterways meet NADP siting criteria				
Airports meet NADP siting criteria				
Animal operations meet NADP site criteria (NTN)				
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**

Table C-3. NADP – MDN – Raingage and Collector: Comparison Between Surveys of Findings Most Likely to Impact Data Quality (1 of 5)

StationId	FL05				GA09					IN22			KY10				ME04			
Year	2010	2013	2016	2020	2008	2011	2013	2016	2020	2015	2019	2020	2010	2013	2016	2020	2009	2012	2016	2020
Does lid seal properly																	--	--	--	--
Lid liner in good condition																	--	--	--	--
Fan in good condition				X	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		--	--	--	--
Filter in good condition											--			U to T	--		--	--	--	--
Max / min thermometer in acceptable limits		X												X			--	--	--	--
Dry side bag installed correctly																	--	--	--	--
ACM sensor operates properly																	--	--	--	--
Motorbox operates within acceptable limits																	--	--	--	--
N-CON lid seal in good condition	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--			X	
N-CON lid liner in good condition	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--				
N-CON fan in good condition	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--				
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	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--				
N-CON sensor responds to a 5 passes of the hand	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--				X
N-CON arms and motorbox do not require tightening	--	--	--	--	--	--	--	--	--		--	--	--	--	--	--	**	**	**	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								
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 C-3. NADP – MDN – Raingage and Collector: Comparison Between Surveys of Findings Most Likely to Impact Data Quality (2 of 5)

StationId	MI52		MN23					MS12			MT05					MT95		
Year	2016	2020	2008	2011	2013	2016	2020	2013	2016	2020	2008	2011	2013	2016	2020	2013	2016	2020
Does lid seal properly																--	--	--
Lid liner in good condition																--	--	--
Fan in good condition																--	--	--
Cooling fan thermostat in good condition																--	--	--
Heater in good condition				U to T	U to T				--	--						--	--	--
Heater thermostat in good condition					U to T				--	--						--	--	--
Has flush wall filter mount been installed																--	--	--
Filter in good condition	U to T		X											MISSING		--	--	--
Max / min thermometer in acceptable limits	X					X							X			--	--	--
Dry side bag installed correctly	X													X	MISSING	--	--	--
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	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--			
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 a 5 passes of the hand	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--		
N-CON arms and motorbox do not require tightening	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	**	**	
Was the 'as found' turn over set properly (Belfort gage)	--	--	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)			--	--	--	--	--	--	U to T									

	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 (3 of 5

StationId	NY43				NY96		PA13					SC05					SC19				
Year	2010	2013	2016	2020	2016	2020	2008	2010	2013	2016	2020	2008	2011	2013	2016	2020	2008	2011	2013	2016	2020
Does lid seal properly	--	--	--	--	--	--			--	--	--										
Lid liner in good condition	--	--	--	--	--	--			--	--	--							X			
Fan in good condition	--	--	--	--	--	--			--	--	--				X	--					X
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	--	--	--	--	--	--	U to T	--	--	--	--										
Max / min thermometer in acceptable limits	--	--	--	--	--	--			--	--	--					--					
Dry side bag installed correctly	--	--	--	--	--	--			--	--	--										
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 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 a 5 passes of the hand		--					--	--				--	--	--	--	--	--	--	--	--	--
N-CON arms and motorbox do not require tightening	**	**	**		**		--	--	**	**	X	--	--	--	--	--	--	--	--	--	--
Was the 'as found' turn over set properly (Belfort gage)	--	--	--	--	--	--	X		--	--	--	X		--	--	--	X	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)			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-3. NADP – MDN – Raingage and Collector: Comparison Between Surveys of Findings Most Likely to Impact Data Quality (4 of 5)

StationId	TN12		WI08					WI10					WI36					WY08			
Year	2016	2020	2008	2011	2013	2016	2020	2009	2012	2015	2018	2020	2008	2010	2013	2016	2020	2009	2013	2016	2020
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	--	--			--	--	--				X					--	--				
Has flush wall filter mount been installed	--	--			--	--	--									--	--				
Filter in good condition	--	--			--	--	--									--	--	U to T	--	--	
Max / min thermometer in acceptable limits					--	--	--								X	--	--				
Dry side bag installed correctly					--	--	--									--	--				
ACM sensor operates properly					--	--	--									--	--				
Motorbox operates within acceptable limits					--	--	--	X					X			--	--				
N-CON lid seal in good condition	--	--	--	--				--	--	--	--	--	--	--	--			--	--	--	--
N-CON lid liner in good condition	--	--	--	--				--	--	--	--	--	--	--	--			--	--	--	--
N-CON fan in good condition	--	--	--	--				--	--	--	--	--	--	--	--			--	--	--	--
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	--	--	--	--	X			--	--	--	--	--	--	--	--			--	--	--	--
N-CON sensor responds to a 5 passes of the hand	--	--	--	--				--	--	--	--	--	--	--	--			--	--	--	--
N-CON arms and motorbox do not require tightening	--	--	--	--	**	**		--	--	--	--	--	--	--	--	**		--	--	--	--
Was the 'as found' turn over set properly (Belfort gage)	X	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-3. NADP – MDN – Raingage and Collector: Comparison Between Surveys of Findings Most Likely to Impact Data Quality (5 of 5)

StationId	WY26		
Year	2013	2016	2020
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	--	--	--
Dry side bag installed correctly	--	--	--
ACM sensor operates properly	--	--	--
Motorbox operates within acceptable limits	--	--	--
N-CON lid seal in good condition		X	
N-CON lid liner in good condition			
N-CON fan in good condition			
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 a 5 passes of the hand			
N-CON arms and motorbox do not require tightening	**	**	
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)			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 12)

StationId	AK01				AK03				CA45				CA50				CA66			
Year	2010	2013	2016	2020	2010	2013	2016	2020	2010	2013	2016	2020	2010	2013	2016	2020	2010	2013	2016	2020
Dry side bucket is clean										--	--	--		--	--	--			X	
Does lid seal properly										--	--	--		--	--	--				
Lid liner in good condition										--	--	--		--	--	--				
ACM sensor operates properly										--	--	--		--	--	--				
Motorbox operates within acceptable limits	X									--	--	--		--	--	--				
N-CON lid seal in good condition	--	--	--	--	--	--	--	--	--	X			--	X			--	--	--	--
N-CON lid liner in good condition	--	--	--	--	--	--	--	--	--				--				--	--	--	--
N-CON sensor responds to a 5 passes of the hand	--	--	--	--	--	--	--	--	--				--				--	--	--	--
N-CON arms and motorbox do not require tightening	--	--	--	--	--	--	--	--	--	**	**	X	--	**	**		--	--	--	--
Was the 'as found' turn over set properly (Belfort gage)	--	--	--	--	--	--	--	--		--	--	--		--	--	--			--	--
Raingage operates properly (electronic gage)	U to T								--				--				--	--		
Does datalogger receive event signals form all collectors (electronic gage)	U to T								--				--			X	--	--		
Does optical sensor respond to "blocking" of light beam (electronic gage)	U to T	U to T		U to T					--	--	--	--	--	--		--	--	--		
Does optical sensor respond to mist of water (electronic gage)	U to T	U to T		U to T					--	--	--	--	--	--		--	--	--		

Table C-4. NADP – NTN – Raingage and Collector: Comparison Between Surveys of Findings Most Likely to Impact Data Quality (Page 2 of 12)

StationId	CA67				CA76				CA88				CO93				
Year	2010	2013	2016	2020	2010	2013	2016	2020	2010	2013	2016	2020	2008	2011	2014	2016	2020
Dry side bucket is clean						--	--	--		--	--	--				X	
Does lid seal properly						--	--	--		--	--	--					
Lid liner in good condition						--	--	--		--	--	--					
ACM sensor operates properly						--	--	--		--	--	--					
Motorbox operates within acceptable limits				X		--	--	--		--	--	--					
N-CON lid seal in good condition	--	--	--	--	--				--				--	--	--	--	--
N-CON lid liner in good condition	--	--	--	--	--	X			--				--	--	--	--	--
N-CON sensor responds to a 5 passes of the hand	--	--	--	--	--				--				--	--	--	--	--
N-CON arms and motorbox do not require tightening	--	--	--	--	--	**	**		--	**	**	MISSING	--	--	--	--	--
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)				U to T	--				--		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 C-4. NADP – NTN – Raingage and Collector: Comparison Between Surveys of Findings Most Likely to Impact Data Quality (Page 3 of 12)

StationId	FL05				FL14				FL23				FL41				GA09				
Year	2010	2013	2016	2020	2010	2013	2016	2020	2010	2013	2016	2020	2010	2013	2016	2020	2008	2011	2013	2016	2020
Dry side bucket is clean						--	--	--						--	--	--					
Does lid seal properly						--	--	--						--	--	--					
Lid liner in good condition						--	--	--	X					--	--	--					
ACM sensor operates properly						--	--	--						--	--	--					
Motorbox operates within acceptable limits				X		--	--	--						--	--	--					
N-CON lid seal in good condition	--	--	--	--	--				--	--	--	--	--				--	--	--	--	--
N-CON lid liner in good condition	--	--	--	--	--			X	--	--	--	--	--				--	--	--	--	--
N-CON sensor responds to a 5 passes of the hand	--	--	--	--	--				--	--	--	--	--			X	--	--	--	--	--
N-CON arms and motorbox do not require tightening	--	--	--	--	--	**	**		--	--	--	--	--	**	**		--	--	--		--
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)	--				--								--				--				
Does optical sensor respond to "blocking" of light beam (electronic gage)	--				--	--	--	--					--	--	--	--	--				
Does optical sensor respond to mist of water (electronic gage)	--				--	--	--	--					--	--	--	--	--				

Table C-4. NADP – NTN – Raingage and Collector: Comparison Between Surveys of Findings Most Likely to Impact Data Quality (Page 4 of 12)

StationId	GA20				ID02					ID03					ID11				
Year	2009	2013	2016	2020	2008	2011	2013	2016	2020	2008	2011	2013	2016	2020	2008	2011	2013	2016	2020
Dry side bucket is clean												X	X				--	--	--
Does lid seal properly																	--	--	--
Lid liner in good condition																	--	--	--
ACM sensor operates properly															X		--	--	--
Motorbox operates within acceptable limits															X		--	--	--
N-CON lid seal in good condition	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--			
N-CON lid liner in good condition	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--		X	
N-CON sensor responds to a 5 passes of the hand	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--			
N-CON arms and motorbox do not require tightening	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	**	**	
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		--		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 5 of 12)

StationId	IL46					IN20					IN22					IN41				
Year	2009	2012	2014	2016	2020	2010	2012	2014	2016	2020	2008	2011	2013	2016	2020	2007	2011	2013	2016	2020
Dry side bucket is clean								--	--	--	X	X	--	--	--	X	X			X
Does lid seal properly								--	--	--			--	--	--					
Lid liner in good condition								--	--	--			--	--	--					
ACM sensor operates properly								--	--	--			--	--	--					
Motorbox operates within acceptable limits			X					--	--	--			--	--	--					
N-CON lid seal in good condition	--	--	--	--	--	--	--				--	--				--	--	--	--	--
N-CON lid liner in good condition	--	--	--	--	--	--	--				--	--				--	--	--	--	--
N-CON sensor responds to a 5 passes of the hand	--	--	--	--	--	--	--				--	--				--	--	--	--	--
N-CON arms and motorbox do not require tightening	--	--	--	--	--	--	--	**	**	X	--	--	**	**	X	--	--	--	--	--
Was the 'as found' turn over set properly (Belfort gage)	--	--	--	--	--		X	--	--	--	X	--	--	--	--	X	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)						--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Does optical sensor respond to mist of water (electronic gage)						--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Table C-4. NADP – NTN – Raingage and Collector: Comparison Between Surveys of Findings Most Likely to Impact Data Quality (Page 6 of 12)

StationId	KY03				KY10				KY19				KY22				KY35			
Year	2010	2013	2016	2020	2010	2013	2016	2020	2010	2013	2016	2020	2010	2013	2016	2020	2010	2013	2016	2020
Dry side bucket is clean	X	--	--	--					X		--	--	X	--	--	--	X	--	--	--
Does lid seal properly		--	--	--							--	--		--	--	--		--	--	--
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	--				--	--	--	--	--	--			--				--		X	
N-CON sensor responds to a 5 passes of the hand	--				--	--	--	--	--	--			--				--			
N-CON arms and motorbox do not require tightening	--	**	**	X	--	--	--	--	--	--	**		--	**	**	X	--	**	**	
Was the 'as found' turn over set properly (Belfort gage)	--	--	--	--	--	--	--	--	X	--	--	--	X	--	--	--		--	--	--
Raingage operates properly (electronic gage)	U to T								--				--				--			
Does datalogger receive event signals form all collectors (electronic gage)	U to T								--				--				--			X
Does optical sensor respond to "blocking" of light beam (electronic gage)	U to T								--	--	--	--	--	--	--	--	--	--	--	--
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 7 of 12)

StationId	LA12		MA14		ME04				MI52				MI99					MN23				
Year	2016	2020	2016	2020	2009	2012	2016	2020	2010	2013	2016	2020	2008	2010	2013	2016	2020	2008	2011	2013	2016	2020
Dry side bucket is clean	X		--	--					X	X									X	--	--	--
Does lid seal properly			--	--																--	--	--
Lid liner in good condition			--	--																--	--	--
ACM sensor operates properly			--	--																--	--	--
Motorbox operates within acceptable limits			--	--									X							--	--	--
N-CON lid seal in good condition	--	--			--	--	--	--	--	--	--	--	--	--	--	--	--	--	--			X
N-CON lid liner in good condition	--	--			--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	X		
N-CON sensor responds to a 5 passes of the hand	--	--			--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--		
N-CON arms and motorbox do not require tightening	--	--	**	X	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	**	X
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)													--	--	--	--	--	--	--			
Does optical sensor respond to "blocking" of light beam (electronic gage)							X						--	--	--	--	--	--	--	--	--	--
Does optical sensor respond to mist of water (electronic gage)							X						--	--	--	--	--	--	--	--	--	--

Table C-4. NADP – NTN – Raingage and Collector: Comparison Between Surveys of Findings Most Likely to Impact Data Quality (Page 8 of 12)

StationId	MN32					MS12			MT96					ND00					NY43		
Year	2008	2011	2013	2016	2020	2013	2016	2020	2008	2012	2015	2018	2020	2008	2011	2013	2016	2020	2013	2016	2020
Dry side bucket is clean			U to T		X												X		--	--	--
Does lid seal properly																			--	--	--
Lid liner in good condition																			--	--	--
ACM sensor operates properly							X			X									--	--	--
Motorbox operates within acceptable limits							X												--	--	--
N-CON lid seal in good condition	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--			
N-CON lid liner in good condition	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--			
N-CON sensor responds to a 5 passes of the hand	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--		
N-CON arms and motorbox do not require tightening	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	**	X
Was the 'as found' turn over set properly (Belfort gage)	X	--	--	--	--	--	--	--	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)	--					--			--	--	--	--	--	--	X			X		X	X
Does optical sensor respond to mist of water (electronic gage)	--					--	U to T		--	--	--	--	--	--	X			X		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 9 of 12)

StationId	NY96				OR10					OR18					OR97				
Year	2009	2013	2016	2020	2008	2011	2013	2016	2020	2008	2011	2013	2016	2020	2008	2011	2013	2016	2020
Dry side bucket is clean			--	--				X				--	--	--					
Does lid seal properly			--	--								--	--	--					
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 a 5 passes of the hand	--	--			--	--	--	--	--	--	--				--	--	--	--	--
N-CON arms and motorbox do not require tightening	--	--	**	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	
Does optical sensor respond to "blocking" of light beam (electronic gage)					--	--	--			--	--	--	--	--	--			U to T	X
Does optical sensor respond to mist of water (electronic gage)	MISSING				--	--	--			--	--	--	--	--	--			U to T	U to T

Table C-4. NADP – NTN – Raingage and Collector: Comparison Between Surveys of Findings Most Likely to Impact Data Quality (Page 10 of 12)

StationId	PA00				PA13			PA29					PA42					SC05				
Year	2010	2013	2016	2020	2013	2016	2020	2008	2010	2013	2016	2020	2008	2010	2013	2016	2020	2008	2011	2013	2016	2020
Dry side bucket is clean				X	--	--	--					X		X	--	--	--					
Does lid seal properly			X		--	--	--								--	--	--					
Lid liner in good condition					--	--	--								--	--	--					
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 a 5 passes of the hand	--	--	--	--				--	--	--	--	--	--	--				--	--	--	--	--
N-CON arms and motorbox do not require tightening	--	--	--	--	**	**	X	--	--	--	--	--	--	--	**	**	X	--	--	--	--	--
Was the 'as found' turn over set properly (Belfort gage)	--	--	--	--	--	--	--	X	--	--	--	--	X	X	--	--	--	X	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)				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 11 of 12)

StationId	TN00		TN04				TN14				WI08		WI10				
Year	2009	2020	2009	2013	2016	2020	2010	2013	2016	2020	2016	2020	2009	2012	2015	2018	2020
Dry side bucket is clean	X		X	X					--	--	--	--					
Does lid seal properly									--	--	--	--					
Lid liner in good condition						X			--	--	--	--				X	X
ACM sensor operates properly	X			X					--	--	--	--					
Motorbox operates within acceptable limits									--	--	--	--					
N-CON lid seal in good condition	--	--	--	--	--	--	--	--		X			--	--	--	--	--
N-CON lid liner in good condition	--	--	--	--	--	--	--	--					--	--	--	--	--
N-CON sensor responds to a 5 passes of the hand	--	--	--	--	--	--	--	--					--	--	--	--	--
N-CON arms and motorbox do not require tightening	--	--	--	--	--	--	--	--	**	X	**	X	--	--	--	--	--
Was the 'as found' turn over set properly (Belfort gage)	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)	--					X	--	--	--	--							
Does optical sensor respond to mist of water (electronic gage)	--					X	--	--	--	--							

Table C-4. NADP – NTN – Raingage and Collector: Comparison Between Surveys of Findings Most Likely to Impact Data Quality (Page 12 of 12)

StationId	WI36					WY08			
Year	2008	2010	2013	2016	2020	2009	2013	2016	2020
Dry side bucket is clean				--	--			X	
Does lid seal properly				--	--				
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	--	--	--	--
N-CON sensor responds to a 5 passes of the hand	--	--	--			--	--	--	--
N-CON arms and motorbox do not require tightening	--	--	--	**	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)	--	--							
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
AK01	NTN	University of Alaska Fairbanks USFS - Pacific Northwest Research Station	U.S. Forest Service
AK03	NTN	Denali National Park	NPS-Air Resources Division
CA45	NTN	U.S. Geological Survey - University of California-State Agricultural Experiment Station	U.S. Geological Survey
CA50	NTN	U.S. Geological Survey	U.S. Geological Survey
CA66	NTN	Pinnacles National Monument	NPS-Air Resources Division
CA67	NTN	Joshua Tree National Park	NPS-Air Resources Division
CA76	NTN	County of Siskiyou-Air Pollution Control District	U.S. Geological Survey
CA88	NTN	U.S. Geological Survey -University of California - Davis	U.S. Geological Survey
CO13	NTN		U.S. Geological Survey
CO93	NTN	Routt National Forest	U.S. Forest Service
FL03	NTN	University of Florida-State Agricultural Experiment Station	U.S. Environmental Protection Agency - Clean Air Markets
FL05	MDN	Chassahowitzka National Wildlife Refuge - USFWS-Air Quality Branch	USFWS-Air Quality Branch
FL05	NTN	Chassahowitzka National Wildlife Refuge - USFWS-Air Quality Branch	USFWS-Air Quality Branch
FL14	NTN	U.S. Geological Survey	U.S. Geological Survey
FL23	NTN	U.S. Environmental Protection Agency - Clean Air Markets	U.S. Environmental Protection Agency - Clean Air Markets
FL41	NTN	U.S. Geological Survey	U.S. Geological Survey

Site ID	Network	Operating Agency	Sponsoring Agency
GA09	MDN	Okefenokee National Wildlife Refuge - USFWS-Air Quality Branch	USFWS-Air Quality Branch
GA09	NTN	Okefenokee National Wildlife Refuge - USFWS-Air Quality Branch	USFWS-Air Quality Branch
GA20	NTN	U.S. Environmental Protection Agency - Clean Air Markets	U.S. Environmental Protection Agency - Clean Air Markets
ID02	NTN	Priest River Experimental Forest	U.S. Forest Service
ID03	NTN	Craters of the Moon National Monument	NPS-Air Resources Division
ID11	NTN	U.S. Department of Agriculture - Agricultural Research Service	U.S. Geological Survey
IL46	NTN	U.S. Environmental Protection Agency - Clean Air Markets	U.S. Environmental Protection Agency - Clean Air Markets
IN20	NTN	U.S. Geological Survey	U.S. Geological Survey
IN22	MDN	Purdue University	Lake Michigan Air Directors Consortium
IN22	NTN	Purdue University-State Agricultural Experiment Station-Southwestern Purdue Agriculture Center	U.S. Geological Survey
IN41	NTN	Purdue University-State Agricultural Experiment Station	Purdue University-State Agricultural Experiment Station
KY03	NTN	U.S. Environmental Protection Agency - University of Kentucky	U.S. Geological Survey
KY10	MDN	Mammoth Cave National Park	NPS-Air Resources Division
KY10	NTN	Mammoth Cave National Park	NPS-Air Resources Division
KY19	NTN	Louisville and Jefferson County Metropolitan Sewer District - U.S. Geological Survey	U.S. Geological Survey
KY22	NTN	Eastern Kentucky University	U.S. Geological Survey

Site ID	Network	Operating Agency	Sponsoring Agency
KY35	NTN	U.S. Geological Survey	U.S. Geological Survey
LA12	NTN	Louisiana Department of Environmental Quality - Louisiana State University-State Agricultural Experiment Station-Iberia	U.S. Geological Survey
MA14	NTN	Nantucket Land Council, Inc	Nantucket Land Council, Inc
ME04	MDN	Penobscot Indian Nation	Maine Department of Environmental Protection
ME04	NTN	Penobscot Indian Nation	Maine Department of Environmental Protection
MI52	MDN		Lake Michigan Air Directors Consortium
MI52	NTN	U.S. Environmental Protection Agency - Clean Air Markets	U.S. Environmental Protection Agency - Clean Air Markets
MI99	NTN	Michigan Tech University	U.S. Forest Service
MN23	MDN	Minnesota Pollution Control Agency	Minnesota Pollution Control Agency
MN23	NTN	U.S. Geological Survey	U.S. Geological Survey
MN32	NTN	Voyageurs National Park	NPS-Air Resources Division
MS12	MDN	Mississippi Department of Environmental Quality	National Oceanic and Atmospheric Administration - Air Resources Laboratory
MS12	NTN	Mississippi Department of Environmental Quality	National Oceanic and Atmospheric Administration - Air Resources Laboratory
MT05	MDN	Glacier National Park	NPS-Air Resources Division
MT95	MDN	Northern Cheyenne Tribe	Northern Cheyenne Tribe
MT96	NTN	Fort Peck Assiniboine & Sioux Tribes	Fort Peck Assiniboine & Sioux Tribes

Site ID	Network	Operating Agency	Sponsoring Agency
ND00	NTN	Theodore Roosevelt National Park	NPS-Air Resources Division
NY43	MDN	New York State Department of Environmental Conservation	New York State Energy Research & Development Authority
NY43	NTN	New York State Department of Environmental Conservation	New York State Energy Research & Development Authority
NY96	MDN	County of Suffolk-Department of Health Services	New York State Energy Research & Development Authority
NY96	NTN	County of Suffolk-Department of Health Services	County of Suffolk-Department of Health Services-Peconic Estuary Program - U.S. Environmental Protection Agency
OR10	NTN	H.J. Andrews Experimental Forest	U.S. Forest Service
OR18	NTN	Forestry & Range Sciences Laboratory	U.S. Geological Survey
OR97	NTN	U.S. Environmental Protection Agency - Clean Air Markets	U.S. Environmental Protection Agency - Clean Air Markets
PA00	NTN	U.S. Environmental Protection Agency - Clean Air Markets	U.S. Environmental Protection Agency - Clean Air Markets
PA13	MDN	U.S. Geological Survey	NPS-Air Resources Division
PA13	NTN	Allegheny Portage Railroad National Historic Site - U.S. Geological Survey	NPS-Air Resources Division - Pennsylvania Department of Environmental Protection - Pennsylvania State University
PA29	NTN	Northeastern Research Station	U.S. Forest Service
PA42	NTN	Pennsylvania State University	Pennsylvania State University-State Agricultural Experiment Station-
SC05	MDN	Cape Romaine National Wildlife Refuge	USFWS-Air Quality Branch
SC05	NTN	Cape Romaine National Wildlife Refuge - USFWS-Air Quality Branch	USFWS-Air Quality Branch
SC19	MDN	South Carolina Division of Air Quality	South Carolina Department of Health and Environmental Control

Site ID	Network	Operating Agency	Sponsoring Agency
TN00	NTN	National Oceanic and Atmospheric Administration - Air Resources Laboratory	National Oceanic and Atmospheric Administration - Air Resources Laboratory
TN04	NTN	U.S. Environmental Protection Agency - Clean Air Markets	U.S. Environmental Protection Agency - Clean Air Markets
TN12	MDN	NPS-Air Resources Division	NPS-Air Resources Division
TN14	NTN	U.S. Fish and Wildlife Service	U.S. Geological Survey
WI06	MDN	Wisconsin State Laboratory of Hygiene	Wisconsin State Laboratory of Hygiene
WI06	NTN	Wisconsin State Laboratory of Hygiene	Wisconsin State Laboratory of Hygiene
WI08	MDN	Wisconsin Department of Natural Resources	Wisconsin Department of Natural Resources
WI08	NTN	Wisconsin Department of Natural Resources	Wisconsin Department of Natural Resources
WI10	MDN	Forest County Potawatomi Community	Forest County Potawatomi Community - U.S. Environmental Protection Agency
WI10	NTN	Forest County Potawatomi Community	Forest County Potawatomi Community
WI36	MDN	Wisconsin Department of Natural Resources	Wisconsin Department of Natural Resources
WI36	NTN	Wisconsin Department of Natural Resources	Wisconsin Department of Natural Resources
WY08	MDN	Yellowstone National Park	Wyoming Department of Environmental Quality
WY08	NTN	Yellowstone National Park	NPS-Air Resources Division
WY26	MDN	Shoshone National Forest	Wyoming Department of Environmental Quality

APPENDIX E

Transfer Standard Instrument Certifications

Date

2/14/2020 - - Calibration and certification of fluke Thermocouples

TMI Cert data -- 1/29/2020

	STD	EEMS RTD	diff	corrected
cert # =	A3483055	01229		
	-25.00	-25.05	0.050	-25.03
	0.00	0.01	-0.010	0.03
	100.00	100.02	-0.020	100.01
	150.00	150.01	-0.010	149.99
			0.000	0.02
			0.000	0.02

01229

2020 correction: slope= 1.00025954

intercept= -0.0170992

1.0000000

Eric Hebert 2/14/2020

At EEMS	Date 2/14/2020	fluke =	01311	offset -1.4	01312	offset -0.8	01310	offset -0.1
RTD 01229		thermo =	EEMS van3 01236		EEMS van 2 01237		EEMS van 1 01238	
raw	corrected		raw	corrected	raw	corrected	raw	corrected
-0.01	0.01		0.0	0.44	0.0	0.08	0.0	0.34
92.27	92.26		92.4	92.58	92.6	92.40	92.7	92.46
73.59	73.59		73.3	73.53	73.7	73.55	73.7	73.58
65.52	65.52		65.3	65.56	65.6	65.48	65.6	65.53
50.94	50.94		50.4	50.70	50.9	50.82	50.8	50.82
40.69	40.70		40.2	40.53	40.7	40.65	40.5	40.59
29.35	29.36		28.8	29.16	29.4	29.39	29.0	29.16
20.90	20.91		20.4	20.79	20.9	20.92	20.6	20.81
		Thermocouple offset =	-1.4		-0.8		-0.1	
POST CALIBRATION CHECK								
25.23	25.24		25.4	25.77	25.3	25.30	25.3	25.48
		slope =	**1.002857**		**1.003086**		**1.006229**	
		intercept =	**-0.44457**		**-0.080234**		**-0.33941**	
		correlation =	**1.0000**		**1.0000**		**1.0000**	

BL2 Weight / Balance Calibration Log

Date	Balance SN#	Weight SN#	Cal Type	Std. (g)	Act. (g)	Calibrator	Notes
2/14/2020	8028481064	26677	Bal Init	0.00	0.00	SEG	Initial Balance Check
2/14/2020	8028481064	26677	Bal Init	1500.00	1499.43	SEG	Initial Balance Check
2/14/2020	8028481064	26677	Bal Init	1000.00	999.63	SEG	Initial Balance Check
2/14/2020	8028481064	26677	Bal Init	500.00	499.79	SEG	Initial Balance Check
2/14/2020	8028481064	26677	Bal Init	200.00	199.89	SEG	Initial Balance Check
2/14/2020	8028481064	26677	Bal Init	100.00	99.94	SEG	Initial Balance Check
2/14/2020	8028481064	26677	Bal Init	50.00	49.98	SEG	Initial Balance Check
2/14/2020	8028481064	26677	Bal Init	0.00	0.00	SEG	Initial Balance Check
2/14/2020	8028481064	BL2-0	Audit		999.3	SEG	ETI/Belfort Set #2 - VAN2
2/14/2020	8028481064	BL2-1	Audit		822.6	SEG	ETI/Belfort Set #2 - VAN2
2/14/2020	8028481064	BL2-2	Audit		820.0	SEG	ETI/Belfort Set #2 - VAN2
2/14/2020	8028481064	BL2-3	Audit		823.9	SEG	ETI/Belfort Set #2 - VAN2
2/14/2020	8028481064	BL2-4	Audit		824.5	SEG	ETI/Belfort Set #2 - VAN2
2/14/2020	8028481064	BL2-5	Audit		822.9	SEG	ETI/Belfort Set #2 - VAN2
2/14/2020	8028481064	BL2-6	Audit		823.6	SEG	ETI/Belfort Set #2 - VAN2
2/14/2020	8028481064	BL2-7	Audit		822.9	SEG	ETI/Belfort Set #2 - VAN2
2/14/2020	8028481064	BL2-8	Audit		822.9	SEG	ETI/Belfort Set #2 - VAN2
2/14/2020	8028481064	BL2-9	Audit		823.1	SEG	ETI/Belfort Set #2 - VAN2
2/14/2020	8028481064	BL2-10	Audit		823.3	SEG	ETI/Belfort Set #2 - VAN2
2/14/2020	8028481064	BL2-11	Audit		823.0	SEG	ETI/Belfort Set #2 - VAN2
2/14/2020	8028481064	BL2-12	Audit		823.6	SEG	ETI/Belfort Set #2 - VAN2
2/14/2020	8028481064	BL2-a	Audit			SEG	ETI/Belfort Set #2 - VAN2
2/14/2020	8028481064	BL2-b	Audit		205.60	SEG	ETI/Belfort Set #2 - VAN2
2/14/2020	8028481064	BL2-c	Audit		206.10	SEG	ETI/Belfort Set #2 - VAN2
2/14/2020	8028481064	BL2-d	Audit		206.28	SEG	ETI/Belfort Set #2 - VAN2
2/14/2020	8028481064	26677	Bal Post	0.00	0.00	SEG	Post Balance Check
2/14/2020	8028481064	26677	Bal Post	1500.00	1499.41	SEG	Post Balance Check
2/14/2020	8028481064	26677	Bal Post	1000.00	999.63	SEG	Post Balance Check
2/14/2020	8028481064	26677	Bal Post	500.00	499.78	SEG	Post Balance Check
2/14/2020	8028481064	26677	Bal Post	200.00	199.92	SEG	Post Balance Check
2/14/2020	8028481064	26677	Bal Post	100.00	99.96	SEG	Post Balance Check
2/14/2020	8028481064	26677	Bal Post	50.00	49.98	SEG	Post Balance Check
2/14/2020	8028481064	26677	Bal Post	0.00	0.00	SEG	Post Balance Check

Calibrator Signature: Sandy Grenville Date: 2/14/2020

Reviewer Signature: _____ Date: _____

P2OTT2 Weight / Balance Calibration Log

Date	Balance SN#	Weight SN#	Cal Type	Std. (g)	Act. (g)	Calibrator	Notes
2/14/2020	8028481064	26677	Bal Init	0.00	0.00	SEG	Initial Balance Check
2/14/2020	8028481064	26677	Bal Init	1500.00	1499.41	SEG	Initial Balance Check
2/14/2020	8028481064	26677	Bal Init	1000.00	999.63	SEG	Initial Balance Check
2/14/2020	8028481064	26677	Bal Init	500.00	499.78	SEG	Initial Balance Check
2/14/2020	8028481064	26677	Bal Init	200.00	199.92	SEG	Initial Balance Check
2/14/2020	8028481064	26677	Bal Init	100.00	99.96	SEG	Initial Balance Check
2/14/2020	8028481064	26677	Bal Init	50.00	49.98	SEG	Initial Balance Check
2/14/2020	8028481064	26677	Bal Init	0.00	0.00	SEG	Initial Balance Check
2/14/2020	8028481064	P2OTT2-1	Audit		1016.4	SEG	Ott P2 Set #2 - VAN 2
2/14/2020	8028481064	P2OTT2-2	Audit		1016.8	SEG	Ott P2 Set #2 - VAN 2
2/14/2020	8028481064	P2OTT2-3	Audit		1016.9	SEG	Ott P2 Set #2 - VAN 2
2/14/2020	8028481064	P2OTT2-4	Audit		1016.7	SEG	Ott P2 Set #2 - VAN 2
2/14/2020	8028481064	P2OTT2-5	Audit		1017.0	SEG	Ott P2 Set #2 - VAN 2
2/14/2020	8028481064	P2OTT2-6	Audit		1017.6	SEG	Ott P2 Set #2 - VAN 2
2/14/2020	8028481064	P2OTT2-7	Audit		1016.9	SEG	Ott P2 Set #2 - VAN 2
2/14/2020	8028481064	P2OTT2-8	Audit		1015.5	SEG	Ott P2 Set #2 - VAN 2
2/14/2020	8028481064	P2OTT2-9	Audit		1016.2	SEG	Ott P2 Set #2 - VAN 2
2/14/2020	8028481064	P2OTT2-a	Audit		254.16	SEG	Ott P2 Set #2 - VAN 2
2/14/2020	8028481064	P2OTT2-b	Audit		254.14	SEG	Ott P2 Set #2 - VAN 2
2/14/2020	8028481064	P2OTT2-c	Audit		254.37	SEG	Ott P2 Set #2 - VAN 2
2/14/2020	8028481064	P2OTT2-d	Audit		254.30	SEG	Ott P2 Set #2 - VAN 2
2/14/2020	8028481064	26677	Bal Post	0.00	0.00	SEG	Post Balance Check
2/14/2020	8028481064	26677	Bal Post	1500.00	1499.40	SEG	Post Balance Check
2/14/2020	8028481064	26677	Bal Post	1000.00	999.62	SEG	Post Balance Check
2/14/2020	8028481064	26677	Bal Post	500.00	499.80	SEG	Post Balance Check
2/14/2020	8028481064	26677	Bal Post	200.00	199.90	SEG	Post Balance Check
2/14/2020	8028481064	26677	Bal Post	100.00	99.94	SEG	Post Balance Check
2/14/2020	8028481064	26677	Bal Post	50.00	49.97	SEG	Post Balance Check
2/14/2020	8028481064	26677	Bal Post	0.00	0.00	SEG	Post Balance Check

Calibrator Signature: Sandy Grenville Date: 2/14/2020

Reviewer Signature: _____ Date: _____

BL1 And BL3 Weight / Balance Calibration Log

Date	Balance SN#	Weight SN#	Cal Type	Std. (g)	Act. (g)	Calibrator	Notes
2/28/2020	8028481064	26677	Bal Init	0.00	0.00	SEG	Initial Balance Check
2/28/2020	8028481064	26677	Bal Init	1500.00	1499.68	SEG	Initial Balance Check
2/28/2020	8028481064	26677	Bal Init	1000.00	999.76	SEG	Initial Balance Check
2/28/2020	8028481064	26677	Bal Init	500.00	499.85	SEG	Initial Balance Check
2/28/2020	8028481064	26677	Bal Init	200.00	199.92	SEG	Initial Balance Check
2/28/2020	8028481064	26677	Bal Init	100.00	99.96	SEG	Initial Balance Check
2/28/2020	8028481064	26677	Bal Init	50.00	49.98	SEG	Initial Balance Check
2/28/2020	8028481064	26677	Bal Init	0.00	0.00	SEG	Initial Balance Check
2/28/2020	8028481064	BL3-0	Audit		1000.4	SEG	ETI/Belfort Set #3 - VAN 3
2/28/2020	8028481064	BL3-1	Audit		824.0	SEG	ETI/Belfort Set #3 - VAN 3
2/28/2020	8028481064	BL3-2	Audit		823.2	SEG	ETI/Belfort Set #3 - VAN 3
2/28/2020	8028481064	BL3-3	Audit		825.0	SEG	ETI/Belfort Set #3 - VAN 3
2/28/2020	8028481064	BL3-4	Audit		823.6	SEG	ETI/Belfort Set #3 - VAN 3
2/28/2020	8028481064	BL3-5	Audit		823.6	SEG	ETI/Belfort Set #3 - VAN 3
2/28/2020	8028481064	BL3-6	Audit		822.9	SEG	ETI/Belfort Set #3 - VAN 3
2/28/2020	8028481064	BL3-7	Audit		823.5	SEG	ETI/Belfort Set #3 - VAN 3
2/28/2020	8028481064	BL3-8	Audit		824.6	SEG	ETI/Belfort Set #3 - VAN 3
2/28/2020	8028481064	BL3-9	Audit		824.0	SEG	ETI/Belfort Set #3 - VAN 3
2/28/2020	8028481064	BL3-10	Audit		820.7	SEG	ETI/Belfort Set #3 - VAN 3
2/28/2020	8028481064	BL3-11	Audit		823.8	SEG	ETI/Belfort Set #3 - VAN 3
2/28/2020	8028481064	BL3-12	Audit		823.0	SEG	ETI/Belfort Set #3 - VAN 3
2/28/2020	8028481064	BL1-a	Audit		207.35	SEG	ETI/Belfort Set #3 - VAN 3
2/28/2020	8028481064	BL1-b	Audit		207.11	SEG	ETI/Belfort Set #3 - VAN 3
2/28/2020	8028481064	BL1-c	Audit		206.95	SEG	ETI/Belfort Set #3 - VAN 3
2/28/2020	8028481064	BL1-d	Audit		207.41	SEG	ETI/Belfort Set #3 - VAN 3
2/28/2020	8028481064	26677	Bal Post	0.00	0.00	SEG	Post Balance Check
2/28/2020	8028481064	26677	Bal Post	1500.00	1499.66	SEG	Post Balance Check
2/28/2020	8028481064	26677	Bal Post	1000.00	999.76	SEG	Post Balance Check
2/28/2020	8028481064	26677	Bal Post	500.00	499.86	SEG	Post Balance Check
2/28/2020	8028481064	26677	Bal Post	200.00	199.93	SEG	Post Balance Check
2/28/2020	8028481064	26677	Bal Post	100.00	99.96	SEG	Post Balance Check
2/28/2020	8028481064	26677	Bal Post	50.00	49.98	SEG	Post Balance Check
2/28/2020	8028481064	26677	Bal Post	0.00	0.00	SEG	Post Balance Check

Calibrator Signature: Sandy Grenville Date: 2/28/2020

Reviewer Signature: _____ Date: _____

BL4 Weight / Balance Calibration Log

Date	Balance SN#	Weight SN#	Cal Type	Std. (g)	Act. (g)	Calibrator	Notes
2/28/2020	8028481064	26677	Bal Init	0.00	0.00	SEG	Initial Balance Check
2/28/2020	8028481064	26677	Bal Init	1500.00	1499.66	SEG	Initial Balance Check
2/28/2020	8028481064	26677	Bal Init	1000.00	999.76	SEG	Initial Balance Check
2/28/2020	8028481064	26677	Bal Init	500.00	499.86	SEG	Initial Balance Check
2/28/2020	8028481064	26677	Bal Init	200.00	199.93	SEG	Initial Balance Check
2/28/2020	8028481064	26677	Bal Init	100.00	99.96	SEG	Initial Balance Check
2/28/2020	8028481064	26677	Bal Init	50.00	49.98	SEG	Initial Balance Check
2/28/2020	8028481064	26677	Bal Init	0.00	0.00	SEG	Initial Balance Check
2/28/2020	8028481064	BL4-0	Audit		1034.0	SEG	ETI/Belfort Set #4 - VAN1
2/28/2020	8028481064	BL4-1	Audit		824.7	SEG	ETI/Belfort Set #4 - VAN1
2/28/2020	8028481064	BL4-2	Audit		823.4	SEG	ETI/Belfort Set #4 - VAN1
2/28/2020	8028481064	BL4-3	Audit		824.4	SEG	ETI/Belfort Set #4 - VAN1
2/28/2020	8028481064	BL4-4	Audit		824.4	SEG	ETI/Belfort Set #4 - VAN1
2/28/2020	8028481064	BL4-5	Audit		822.9	SEG	ETI/Belfort Set #4 - VAN1
2/28/2020	8028481064	BL4-6	Audit		824.6	SEG	ETI/Belfort Set #4 - VAN1
2/28/2020	8028481064	BL4-7	Audit		823.8	SEG	ETI/Belfort Set #4 - VAN1
2/28/2020	8028481064	BL4-8	Audit		824.1	SEG	ETI/Belfort Set #4 - VAN1
2/28/2020	8028481064	BL4-9	Audit		824.8	SEG	ETI/Belfort Set #4 - VAN1
2/28/2020	8028481064	BL4-10	Audit		823.4	SEG	ETI/Belfort Set #4 - VAN1
2/28/2020	8028481064	BL4-11	Audit		823.8	SEG	ETI/Belfort Set #4 - VAN1
2/28/2020	8028481064	BL4-12	Audit		823.8	SEG	ETI/Belfort Set #4 - VAN1
2/28/2020	8028481064	BL4-a	Audit		207.36	SEG	ETI/Belfort Set #4 - VAN1
2/28/2020	8028481064	BL4-b	Audit		207.35	SEG	ETI/Belfort Set #4 - VAN1
2/28/2020	8028481064	BL4-c	Audit		207.50	SEG	ETI/Belfort Set #4 - VAN1
2/28/2020	8028481064	BL4-d	Audit		207.59	SEG	ETI/Belfort Set #4 - VAN1
2/28/2020	8028481064	26677	Bal Post	0.00	0.00	SEG	Post Balance Check
2/28/2020	8028481064	26677	Bal Post	1500.00	1499.64	SEG	Post Balance Check
2/28/2020	8028481064	26677	Bal Post	1000.00	999.75	SEG	Post Balance Check
2/28/2020	8028481064	26677	Bal Post	500.00	499.84	SEG	Post Balance Check
2/28/2020	8028481064	26677	Bal Post	200.00	199.91	SEG	Post Balance Check
2/28/2020	8028481064	26677	Bal Post	100.00	99.96	SEG	Post Balance Check
2/28/2020	8028481064	26677	Bal Post	50.00	49.98	SEG	Post Balance Check
2/28/2020	8028481064	26677	Bal Post	0.00	0.00	SEG	Post Balance Check

Calibrator Signature: Sandy Grenville Date: 2/28/2020

Reviewer Signature: _____ Date: _____

P2OTT1 Weight / Balance Calibration Log

Date	Balance SN#	Weight SN#	Cal Type	Std. (g)	Act. (g)	Calibrator	Notes
2/28/2020	8028481064	26677	Bal Init	0.00	0.00	SEG	Initial Balance Check
2/28/2020	8028481064	26677	Bal Init	1500.00	1499.66	SEG	Initial Balance Check
2/28/2020	8028481064	26677	Bal Init	1000.00	999.75	SEG	Initial Balance Check
2/28/2020	8028481064	26677	Bal Init	500.00	499.86	SEG	Initial Balance Check
2/28/2020	8028481064	26677	Bal Init	200.00	199.93	SEG	Initial Balance Check
2/28/2020	8028481064	26677	Bal Init	100.00	99.96	SEG	Initial Balance Check
2/28/2020	8028481064	26677	Bal Init	50.00	49.98	SEG	Initial Balance Check
2/28/2020	8028481064	26677	Bal Init	0.00	0.00	SEG	Initial Balance Check
2/28/2020	8028481064	P2OTT1-1	Audit		1017.5	SEG	Ott P2 Set #1 - VAN 3
2/28/2020	8028481064	P2OTT1-2	Audit		1017.8	SEG	Ott P2 Set #1 - VAN 3
2/28/2020	8028481064	P2OTT1-3	Audit		1017.1	SEG	Ott P2 Set #1 - VAN 3
2/28/2020	8028481064	P2OTT1-4	Audit		1017.9	SEG	Ott P2 Set #1 - VAN 3
2/28/2020	8028481064	P2OTT1-5	Audit		1016.5	SEG	Ott P2 Set #1 - VAN 3
2/28/2020	8028481064	P2OTT1-6	Audit		1016.7	SEG	Ott P2 Set #1 - VAN 3
2/28/2020	8028481064	P2OTT1-7	Audit		1017.4	SEG	Ott P2 Set #1 - VAN 3
2/28/2020	8028481064	P2OTT1-8	Audit		1016.3	SEG	Ott P2 Set #1 - VAN 3
2/28/2020	8028481064	P2OTT1-9	Audit		1017.6	SEG	Ott P2 Set #1 - VAN 3
2/28/2020	8028481064	P2OTT1-a	Audit		255.26	SEG	Ott P2 Set #1 - VAN 3
2/28/2020	8028481064	P2OTT1-b	Audit		255.10	SEG	Ott P2 Set #1 - VAN 3
2/28/2020	8028481064	P2OTT1-c	Audit		255.16	SEG	Ott P2 Set #1 - VAN 3
2/28/2020	8028481064	P2OTT1-d	Audit		255.45	SEG	Ott P2 Set #1 - VAN 3
2/28/2020	8028481064	26677	Bal Post	0.00	0.00	SEG	Post Balance Check
2/28/2020	8028481064	26677	Bal Post	1500.00	1499.63	SEG	Post Balance Check
2/28/2020	8028481064	26677	Bal Post	1000.00	999.75	SEG	Post Balance Check
2/28/2020	8028481064	26677	Bal Post	500.00	499.85	SEG	Post Balance Check
2/28/2020	8028481064	26677	Bal Post	200.00	199.92	SEG	Post Balance Check
2/28/2020	8028481064	26677	Bal Post	100.00	99.95	SEG	Post Balance Check
2/28/2020	8028481064	26677	Bal Post	50.00	49.96	SEG	Post Balance Check
2/28/2020	8028481064	26677	Bal Post	0.00	0.00	SEG	Post Balance Check

Calibrator Signature: Sandy Grenville Date: 2/28/2020

Reviewer Signature: _____ Date: _____

P2OTT3 Weight / Balance Calibration Log

Date	Balance SN#	Weight SN#	Cal Type	Std. (g)	Act. (g)	Calibrator	Notes
2/28/2020	8028481064	26677	Bal Init	0.00	0.00	SEG	Initial Balance Check
2/28/2020	8028481064	26677	Bal Init	1500.00	1499.64	SEG	Initial Balance Check
2/28/2020	8028481064	26677	Bal Init	1000.00	999.75	SEG	Initial Balance Check
2/28/2020	8028481064	26677	Bal Init	500.00	499.84	SEG	Initial Balance Check
2/28/2020	8028481064	26677	Bal Init	200.00	199.91	SEG	Initial Balance Check
2/28/2020	8028481064	26677	Bal Init	100.00	99.96	SEG	Initial Balance Check
2/28/2020	8028481064	26677	Bal Init	50.00	49.98	SEG	Initial Balance Check
2/28/2020	8028481064	26677	Bal Init	0.00	0.00	SEG	Initial Balance Check
2/28/2020	8028481064	P2OTT3-1	Audit		193.83	SEG	Ott P2 Set #3- VAN 1
2/28/2020	8028481064	P2OTT3-2	Audit		193.79	SEG	Ott P2 Set #3- VAN 1
2/28/2020	8028481064	P2OTT3-3	Audit		193.80	SEG	Ott P2 Set #3- VAN 1
2/28/2020	8028481064	P2OTT3-4	Audit		193.77	SEG	Ott P2 Set #3- VAN 1
2/28/2020	8028481064	P2OTT3-5	Audit		193.81	SEG	Ott P2 Set #3- VAN 1
2/28/2020	8028481064	P2OTT3-6	Audit		193.05	SEG	Ott P2 Set #3- VAN 1
2/28/2020	8028481064	P2OTT3-7	Audit		193.82	SEG	Ott P2 Set #3- VAN 1
2/28/2020	8028481064	P2OTT3-8	Audit		193.63	SEG	Ott P2 Set #3- VAN 1
2/28/2020	8028481064	P2OTT3-9	Audit		193.12	SEG	Ott P2 Set #3- VAN 1
2/28/2020	8028481064	P2OTT3-10	Audit		193.76	SEG	Ott P2 Set #3- VAN 1
2/28/2020	8028481064	P2OTT3-a	Audit		254.73	SEG	Ott P2 Set #3- VAN 1
2/28/2020	8028481064	P2OTT3-b	Audit		255.16	SEG	Ott P2 Set #3- VAN 1
2/28/2020	8028481064	P2OTT3-c	Audit		255.51	SEG	Ott P2 Set #3- VAN 1
2/28/2020	8028481064	P2OTT3-d	Audit		255.37	SEG	Ott P2 Set #3- VAN 1
2/28/2020	8028481064	26677	Bal Post	0.00	0.00	SEG	Post Balance Check
2/28/2020	8028481064	26677	Bal Post	1500.00	1499.66	SEG	Post Balance Check
2/28/2020	8028481064	26677	Bal Post	1000.00	999.75	SEG	Post Balance Check
2/28/2020	8028481064	26677	Bal Post	500.00	499.86	SEG	Post Balance Check
2/28/2020	8028481064	26677	Bal Post	200.00	199.93	SEG	Post Balance Check
2/28/2020	8028481064	26677	Bal Post	100.00	99.96	SEG	Post Balance Check
2/28/2020	8028481064	26677	Bal Post	50.00	49.98	SEG	Post Balance Check
2/28/2020	8028481064	26677	Bal Post	0.00	0.00	SEG	Post Balance Check

Calibrator Signature: Sandy Grenville Date: 2/28/2020

Reviewer Signature: _____ Date: _____

EEMS # 01265

Van 2

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: 70° Humidity: 39%
Customer Name	EE&MS	Item Name	USHIKATA
Manufacturer		Model	S-25
Serial Number	190037	Calibration Date	3-2-20
Calibration Frequency		Job Card Number	S-26703
Customer Reference Number		Date of Certification	3-2-20

Measurement Standards

Theodolite Wild T-3 S/N 18801 Calibration 01/17/2020 Due 01/17/2021 NIST Number ~~738/229328-83~~ 738/223398

Optical Wedge K&E 71-7020 S/N 5167 Calibration; 01/16/2019 Due 01/16/2024, NIST Number 731/244084-89 731/221617

Initial Report

Vanes	
Pivot in line with Circle/Sights	☐ Pass ☐ Fail
Needle	
Pivot Sharpness	☐ Pass ☐ Fail
Straightness (+/-15 Minutes)	☐ Pass ☐ Fail
Balance	☐ Pass ☐ Fail
Lifter Function	☐ Pass ☐ Fail
Azimuth Ring	
Control Knob Function	☐ Pass ☐ Fail
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

Direction (Degree)	Tolerance (Minute)	Compass Needle Error (Minute)
0	+/- 30	
45	+/- 30	
90	+/- 30	
135	+/- 30	
180	+/- 30	
225	+/- 30	
270	+/- 30	
315	+/- 30	

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	
Pivot in line with Circle/Sights	☑ Pass ☐ Fail
Needle	
Pivot Sharpness	☑ Pass ☐ Fail
Straightness (+/-15 Minutes)	☑ Pass ☐ Fail
Balance	☑ Pass ☐ Fail
Lifter Function	☑ Pass ☐ Fail
Azimuth Ring	
Control Knob Function	☑ Pass ☐ Fail
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

Direction (Degree)	Tolerance (Minute)	Compass Needle Error (Minute)
0	+/- 30	<30
45	+/- 30	<30
90	+/- 30	<30
135	+/- 30	<30
180	+/- 30	<30
225	+/- 30	<30
270	+/- 30	<30
315	+/- 30	<30

Certification

Joseph Paolozzi	John Noga, Quality Assurance
Repair Technician	John Noga

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

EEMS # 01272

Van 3

Calibration Data Record			Temperature: 70° Humidity: 39%
Customer Name	EE & 45	Item Name	OSHIKATA
Manufacturer		Model	S-25
Serial Number	199578	Calibration Date	3-2-20
Calibration Frequency		Job Card Number	S-26702
Customer Reference Number		Date of Certification	3-2-20

Measurement Standards

Theodolite Wild T-3 S/N 18801 Calibration 01/17/2020 Due 01/17/2021 NIST Number ~~738/229329-83 738/223398~~

Optical Wedge K&E 71-7020 S/N 5167 Calibration; 01/16/2019 Due 01/16/2024, NIST Number 731/244084-89 731/221617

Initial Report

Vanes	
Pivot in line with Circle/Sights	☐ Pass ☐ Fail
Needle	
Pivot Sharpness	☐ Pass ☐ Fail
Straightness (+/-15 Minutes)	☐ Pass ☐ Fail
Balance	☐ Pass ☐ Fail
Lifter Function	☐ Pass ☐ Fail
Azimuth Ring	
Control Knob Function	☐ Pass ☐ Fail
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

Direction (Degree)	Tolerance (Minute)	Compass Needle Error (Minute)
0	+/- 30	
45	+/- 30	
90	+/- 30	
135	+/- 30	
180	+/- 30	
225	+/- 30	
270	+/- 30	
315	+/- 30	

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	
Pivot in line with Circle/Sights	☑ Pass ☐ Fail
Needle	
Pivot Sharpness	☑ Pass ☐ Fail
Straightness (+/-15 Minutes)	☑ Pass ☐ Fail
Balance	☑ Pass ☐ Fail
Lifter Function	☑ Pass ☐ Fail
Azimuth Ring	
Control Knob Function	☑ Pass ☐ Fail
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

Direction (Degree)	Tolerance (Minute)	Compass Needle Error (Minute)
0	+/- 30	<30
45	+/- 30	<30
90	+/- 30	<30
135	+/- 30	<30
180	+/- 30	<30
225	+/- 30	<30
270	+/- 30	<30
315	+/- 30	<30

Certification

Joseph Paologo	
Repair Technician	John Noga, Quality Assurance

Doc templates 2/wk-40-1360 survey compass calibration record

Certificate Number
A3488979
Issue Date: 02/04/20

Certificate of Calibration

Customer: ENVIRONMENTAL ENGINEERING & MEASUREMENT SERVICES
4577 E NW 6TH STREET
GAINESVILLE, FL 36209
352-262-0802

P.O. Number: EEMS

ID Number: 01310

Van-1

Description: DIGITAL MULTIMETER
Manufacturer: FLUKE
Model Number: 187
Serial Number: 86590148
Technician: KENNETH PEER
On-Site Calibration: ☐
Comments:

Calibration Date: 02/04/2020
Calibration Due: 02/04/2021
Procedure: METCAL FLUKE 187 Rev: 6/15/2015
Temperature: 73 °F
Humidity: 40 % RH
As Found Condition: IN TOLERANCE
Calibration Results: IN TOLERANCE

Limiting Attribute:

This instrument has been calibrated using standards traceable to the SI units through the National Institute of Standards and Technology (NIST) or other National Metrological Institute (NMI). The method of calibration is direct comparison to a known standard, derived from natural physical constants, ratio measurements or compared to consensus standards.

Reported uncertainties are expressed as expanded uncertainty values at an approximately 95% confidence level using a coverage factor of k=2. Statements of compliance are based on test results falling within specified limits with no reduction by the uncertainty of the measurement.

TMI's Quality System is accredited to ISO/IEC 17025:2017 and ANSI/NCSL Z540-1-1994. ISO/IEC 17025:2017 is written in a language relevant to laboratory operations, meeting the principles of ISO 9001 and aligned with its pertinent requirements. This calibration complies with all the requirements of ANSI/NCSL Z540-1-1994 and TMI's Quality Manual, QM-1.

Results contained in this document relate only to the item calibrated. Calibration due dates appearing on the certificate or label are determined by the client for administrative purposes and do not imply continued conformance to specifications.

Measurements not currently on TMI's Scope of Accreditation are identified with an asterisk.

WALLY GYNN, BRANCH MANAGER

Scott Chamberlain, QUALITY MANAGER

Calibration Standards

Asset Number	Manufacturer	Model Number	Date Calibrated	Cal Due
7040208	FLUKE	5520A	5/2/2019	5/2/2020

TMI Technical Maintenance, Inc.
12530 TELECOM DRIVE, TEMPLE TERRACE, FL 33637
Phone: 813-978-3054 Fax 813-978-3758
www.tmicalibration.com

ANSI/NCSL Z540-1-1994

Certificate Number
A3479886
Issue Date: 01/28/20

Certificate of Calibration

Van-3

Customer: ENVIRONMENTAL ENGINEERING & MEASUREMENT SERVICES
4577 E NW 6TH STREET
GAINESVILLE, FL 36209
352-262-0802

P.O. Number:

ID Number: EEMS 01311

Description:	DIGITAL MULTIMETER
Manufacturer:	FLUKE
Model Number:	287
Serial Number:	95740135
Technician:	KENNETH PEER
On-Site Calibration:	☐
Comments:	

Calibration Date:	01/28/2020
Calibration Due:	01/28/2021
Procedure:	METCAL FLUKE 287 Rev: 6/15/2015
Temperature:	73 °F
Humidity:	39 % RH
As Found Condition:	**IN TOLERANCE**
Calibration Results:	**IN TOLERANCE**

Limiting Attribute:

This instrument has been calibrated using standards traceable to the SI units through the National Institute of Standards and Technology (NIST) or other National Metrological Institute (NMI). The method of calibration is direct comparison to a known standard, derived from natural physical constants, ratio measurements or compared to consensus standards.

Reported uncertainties are expressed as expanded uncertainty values at an approximately 95% confidence level using a coverage factor of k=2. Statements of compliance are based on test results falling within specified limits with no reduction by the uncertainty of the measurement.

TMI's Quality System is accredited to ISO/IEC 17025:2017 and ANSI/NCSL Z540-1-1994. ISO/IEC 17025:2017 is written in a language relevant to laboratory operations, meeting the principles of ISO 9001 and aligned with its pertinent requirements. This calibration complies with all the requirements of ANSI/NCSL Z540-1-1994 and TMI's Quality Manual, QM-1.

Results contained in this document relate only to the item calibrated. Calibration due dates appearing on the certificate or label are determined by the client for administrative purposes and do not imply continued conformance to specifications.

Measurements not currently on TMI's Scope of Accreditation are identified with an asterisk.

WALLY GYNN, BRANCH MANAGER

Scott Chamberlain, QUALITY MANAGER

Calibration Standards

Asset Number	Manufacturer	Model Number	Date Calibrated	Cal Due
7040208	FLUKE	5520A	5/2/2019	5/2/2020

TMI Technical Maintenance, Inc.
12530 TELECOM DRIVE, TEMPLE TERRACE, FL 33637
Phone: 813-978-3054 Fax 813-978-3758
www.tmicalibration.com

ANSI/NCSL Z540-1-1994

Certificate Number
A3479890
Issue Date: 01/28/20

Certificate of Calibration

Van - 2

Customer: ENVIRONMENTAL ENGINEERING & MEASUREMENT SERVICES
4577 E NW 6TH STREET
GAINESVILLE, FL 36209
352-262-0802

P.O. Number:

ID Number: EEMS 01312

Description: DIGITAL MULTIMETER
Manufacturer: FLUKE
Model Number: 287
Serial Number: 95740243
Technician: KENNETH PEER
On-Site Calibration: ☐
Comments:

Calibration Date: 01/28/2020
Calibration Due: 01/28/2021
Procedure: METCAL FLUKE 287
Rev: 6/15/2015
Temperature: 73 °F
Humidity: 39 % RH
As Found Condition: IN TOLERANCE
Calibration Results: IN TOLERANCE

Limiting Attribute:

This instrument has been calibrated using standards traceable to the SI units through the National Institute of Standards and Technology (NIST) or other National Metrological Institute (NMI). The method of calibration is direct comparison to a known standard, derived from natural physical constants, ratio measurements or compared to consensus standards.

Reported uncertainties are expressed as expanded uncertainty values at an approximately 95% confidence level using a coverage factor of k=2. Statements of compliance are based on test results falling within specified limits with no reduction by the uncertainty of the measurement.

TMI's Quality System is accredited to ISO/IEC 17025:2017 and ANSI/NCSL Z540-1-1994. ISO/IEC 17025:2017 is written in a language relevant to laboratory operations, meeting the principles of ISO 9001 and aligned with its pertinent requirements. This calibration complies with all the requirements of ANSI/NCSL Z540-1-1994 and TMI's Quality Manual, QM-1.

Results contained in this document relate only to the item calibrated. Calibration due dates appearing on the certificate or label are determined by the client for administrative purposes and do not imply continued conformance to specifications.

Measurements not currently on TMI's Scope of Accreditation are identified with an asterisk.

WALLY GYNN, BRANCH MANAGER

Scott Chamberlain, QUALITY MANAGER

Calibration Standards

Asset Number	Manufacturer	Model Number	Date Calibrated	Cal Due
7040208	FLUKE	5520A	5/2/2019	5/2/2020

TMI Technical Maintenance, Inc.
12530 TELECOM DRIVE, TEMPLE TERRACE, FL 33637
Phone: 813-978-3054 Fax 813-978-3758
www.tmicalibration.com

ANSI/NCSL Z540-1-1994

Van 1

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: 70° Humidity: 34%
Customer Name	FE&MS	Item Name	USHIKATA
Manufacturer		Model	S-25
Serial Number	191832	Calibration Date	3-2-20
Calibration Frequency		Job Card Number	S-26704
Customer Reference Number		Date of Certification	3-2-20

Measurement Standards

Theodolite Wild T-3 S/N 18801 Calibration 01/17/2020 Due 01/17/2021 NIST Number 738/229329-83 738/223398

Optical Wedge K&E 71-7020 S/N 5167 Calibration: 01/16/2019 Due 01/16/2024, NIST Number 731/244084-89 731/221617

Initial Report

Vanes	
Pivot in line with Circle/Sights	☐ Pass ☐ Fail
Needle	
Pivot Sharpness	☐ Pass ☐ Fail
Straightness (+/-15 Minutes)	☐ Pass ☐ Fail
Balance	☐ Pass ☐ Fail
Lifter Function	☐ Pass ☐ Fail
Azimuth Ring	
Control Knob Function	☐ Pass ☐ Fail
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

Direction (Degree)	Tolerance (Minute)	Compass Needle Error (Minute)
0	+/- 30	
45	+/- 30	
90	+/- 30	
135	+/- 30	
180	+/- 30	
225	+/- 30	
270	+/- 30	
315	+/- 30	

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	
Pivot in line with Circle/Sights	☑ Pass ☐ Fail
Needle	
Pivot Sharpness	☑ Pass ☐ Fail
Straightness (+/-15 Minutes)	☑ Pass ☐ Fail
Balance	☑ Pass ☐ Fail
Lifter Function	☑ Pass ☐ Fail
Azimuth Ring	
Control Knob Function	☑ Pass ☐ Fail
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

Direction (Degree)	Tolerance (Minute)	Compass Needle Error (Minute)
0	+/- 30	30
45	+/- 30	30
90	+/- 30	30
135	+/- 30	30
180	+/- 30	30
225	+/- 30	30
270	+/- 30	30
315	+/- 30	30

Certification

Repair Technician	John Noga, Quality Assurance