
National Atmospheric Deposition Program Site Survey Program Annual Report

Prepared for:

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List of Acronyms and Abbreviations

AIRMoN	Atmospheric Integrated Research Monitoring Network
CAL	Central Analytical Laboratory
CASTNET	Clean Air Status and Trends Network
DVM	Digital multi-meters
DQI	Data Quality Indicator
EEMS	Environmental, Engineering & Measurement Services, Inc.
EPA	U.S. Environmental Protection Agency
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
PO	Program Office
QA	Quality Assurance
QAPP	Quality Assurance Project Plan
QC	Quality Control
QR	quality rating
SOP	Standard Operating Procedures

Executive Summary

Under US EPA contract number EPW-07061, Support for Conducting Systems and Performance Surveys of National Atmospheric Monitoring Stations, Environmental, Engineering & Measurement Services, Inc. (EEMS) has initiated an independent evaluation and assessment site survey program for the purpose maintaining the quality assurance of the networks of the National Atmospheric Deposition Program (NADP). The NADP is a cooperative, multi-agency network, which measures precipitation chemistry and estimates atmospheric wet deposition for various pollutant ions and mercury. The three inter-related NADP networks are, the National Trends Network (NTN), the Atmospheric Integrated Research Monitoring Network (AIRMoN), and the Mercury Deposition Network (MDN). EPA has provided long-standing support for the operation of NADP including operational support for four US Forest Service monitoring sites, and recurring funding for the chemical analysis and coordination for 31 other wet deposition sites, in addition to the support for the survey and quality assurance programs of the NADP atmospheric deposition site 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:

- Graphical representation of the site instruments with respect to each other and the site surroundings.
- Evaluation of site operator proficiency and technique.
- Reinforcement of NADP protocols and training.
- Maintenance, evaluation, and quality assurance assessment of site instruments.

Site surveys afford the necessary checks and balances for site operations and serve to validate data provided by the sites in the network.

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 a means to establish 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, reports, and field laboratory procedures.

Ongoing QA programs are an essential part of, and add credence to, any long-term monitoring network. The external evaluations provided by this program verify, and support, the established procedures and criteria of the NADP and its networks, and ensure they are maintained. The site survey program provides a higher level of confidence for NADP reported data.

Quality assurance and quality control (QC) activities for these networks improve overall data quality and ensures 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 activities strengthen the reliability and overall quality of the data the Agency uses for policy decisions and for measures of accountability.

Essentially, NADP site surveys are accomplished by visiting each site, observing the site operator while performing the routine site activities, providing technical and training support, checking the operation of the site instrumentation, performing routine repairs and maintenance, and reporting the results. 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 liaisons, site operators, supervisors, and sponsors. Approximately 90 NADP sites (collocated are not considered separated sites) are scheduled for surveys during each contract period. The schedule is developed based on the elapsed time since the previous site survey (longest time between visits first), and consideration for efficient and cost effective travel.
2. Preparing for field site surveys. During survey preparation, available site data are compiled and reviewed creating the site file. The necessary materials and standards for each site survey are checked and shipped if necessary. The site operators 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 the NADP collector location using a WAAS GPS.

- Qualitatively evaluating the site regarding the current NADP siting criteria.
 - Verifying, or creating the site plan view. The site plan view identifies all equipment and major features within a 30 meter radius.
 - Qualitatively assessing the site surroundings regarding obstructions to wind and precipitation 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, field analytical analysis (AIRMoN), calibrations, cleaning, maintenance, recordkeeping, reporting, and material storage. Reviewing on-site documentation (raingage charts, logs, forms) for legibility, accuracy and completeness. Confirming that the current versions of NADP manuals/documentation are present.
 - Quantitatively assessing the accuracy of the NADP instrumentation responses to QA standards. These include standard weights for raingage tests and mass determinations, and analytical standards for pH and conductivity meter and cell tests (AIRMoN sites only).
 - Recording all data on the hard copy forms provided in the site file. Printing additional forms from the database if required in order to record all data. Comparing the observations to the pre-populated values, 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 leveling and stabilizing the instrument, and correcting the orientation. 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 SOP specific to the network.

5. Transferring observations from survey forms to survey database. Enter the survey information obtained in the steps above into the survey database and review 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 PO Quality Assurance Manager, and the EPA Project Officer. The report is then included in the site file with the appropriate document control number.

7. Providing a Site Performance Survey Report, with the survey data set. The final site survey data set is considered to be the final site survey report. The data set is delivered to the NADP Program Office QA Manager and the EPA Project Officer each month and contains data obtained during site surveys conducted the previous month. The data set for each site consists of:
 - Survey results that have been subjected to duplicate entry and internal QA review.
 - Edited and scanned site plan view (or site sketch).
 - Digital photographs.
 - Scanned raingage chart.
 - Any additional pertinent supporting information.

2.0 Status of Sites Surveyed

2.1 Sites Surveyed

Due to the limited number of sites surveyed in 2007, the first annual report included the site surveys performed between December 2007 and March 31, 2008. This annual report includes site surveys performed between April and December 2008. Subsequent annual reports (i.e. 2009) will include sites surveyed during the calendar year. The annual reports will cover portions of two contract periods which begin and end in June of each year.

A total of 141 NADP sites (this number includes collocated sites) were surveyed during the period covered by this report at 116 distinct locations. These include 40 MDN sites, 97 NTN sites, and four AIRMoN sites. Table 2-1 is a list of the sites surveyed and includes the network, site name, survey date, and equipment found.

2.2 General Status of Sites Surveyed

Overall the sites surveyed during the reporting period were found in good condition and collecting data that meets NADP quality objectives. Most of the sites visited were operating Belfort mechanical raingages as the primary raingage. Due to the age of the gages, most were found to have some operational issues. Most problems were minor and were corrected during the site survey. Since the survey data indicates that a large percentage of gages required attention, it is likely that the mechanical gages have reached, or in some cases exceeded, their useful life-expectancy. Altogether 14 electronic gages were surveyed, and no problems were observed with those gages.

The qualitative evaluation of the site personnel with respect to their ability to follow NADP protocols and operate the site instrumentation, found them all 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 are, or could, impact data quality are discussed in Section 3.0.

2.3 Equipment Encountered During the Site Surveys

The list of sites surveyed from April through December of 2008 and the equipment found at the sites is shown in Table 2.1.

Table 2-1. Sites Surveyed from April through December 2008 and Equipment Found at the Sites

Site ID	Site Name	Network	Survey Date	Collector Type	Raingage Type	Backup Raingage Type
01NS	Kejimkujik National Park	MDN	09/01/08	N-CON	Electronic	Tipping Bucket
08WI	Brule River	MDN	05/19/08	ACM-type	Belfort	
99VT	Underhill	MDN	09/29/08	N-CON	Belfort	Tipping Bucket
99VT	Underhill	NTN	09/29/08	ACM-type	Electronic	Tipping Bucket
AR16	Buffalo National River-Buffalo Point	NTN	04/18/08	ACM-type	Belfort	
AR27	Fayetteville	NTN	04/18/08	ACM-type	Belfort	
AZ03	Grand Canyon National Park-Hopi Point	NTN	07/02/08	ACM-type	Belfort/Electronic	Tipping Bucket
AZ97	Petrified Forest National Park-Rainbow Forest	NTN	04/21/08	ACM-type	Belfort	Tipping Bucket
CAN5	Frelighsburg	NTN	09/26/08	ACM-type	Belfort	Other
CO01	Las Animas Fish Hatchery	NTN	12/11/08	ACM-type	Belfort	
CO10	Gothic	NTN	06/28/08	ACM-type	Belfort	Tipping Bucket
CO91	Wolf Creek Pass	NTN	07/07/08	ACM-type	Belfort	
CO93	Dry Lake	NTN	11/04/08	ACM-type	Belfort	Tipping Bucket
CO96	Molas Pass	NTN	07/01/08	ACM-type	Belfort	
CO97	Buffalo Pass - Summit Lake	MDN/NTN	11/04/08	ACM-type	Belfort	
CO99	Mesa Verde National Park-Chapin Mesa	MDN/NTN	07/08/08	ACM-type	Belfort	
CT15	Abington	NTN	08/22/08	ACM-type	Belfort	Tipping Bucket
ID02	Priest River Experimental Forest	NTN	10/11/08	ACM-type	Belfort	
ID03	Craters of the Moon National Monument	MDN/NTN	10/03/08	ACM-type	Electronic	
ID11	Reynolds Creek	NTN	05/29/08	ACM-type	Belfort	
IN21	Clifty Falls State Park	MDN	04/24/08	ACM-type	Belfort	Stick Gage
IN22	Southwest Purdue Agriculture Center	NTN	04/22/08	ACM-type	Belfort	Tipping Bucket
IN28	Bloomington	MDN	04/24/08	ACM-type	Belfort	Ott
KS07	Farlington Fish Hatchery	NTN	04/17/08	ACM-type	Belfort	Stick Gage

**Table 2-1. Sites Surveyed from April through December 2008 and Equipment Found at the Sites
 (continued)**

Site ID	Site Name	Network	Survey Date	Collector Type	Raingage Type	Backup Raingage Type
KS31	Konza Prairie	NTN	04/14/08	ACM-type	Belfort	Belfort
KS32	Lake Scott State Park	NTN	04/15/08	ACM-type	Belfort	Stick Gage
MD08	Piney Reservoir	MDN/NTN	11/17/08	ACM-type	Electronic	
MD99	Beltsville	MDN/NTN	12/01/08	ACM-type	Electronic	Tipping Bucket
ME00	Caribou	MDN	08/25/08	N-CON	Electronic	
ME00	Caribou	NTN	08/25/08	ACM-type	Electronic	
ME98	Acadia National Park-McFarland Hill	MDN/NTN	08/28/08	ACM-type	Electronic	Belfort/ Tipping Bucket
MI99	Chassell	NTN	05/08/08	ACM-type	Belfort	Other
MN08	Hovland	NTN	06/12/08	ACM-type	Belfort	
MN16	Marcell Experimental Forest	MDN/NTN	06/11/08	ACM-type	Belfort	Stick Gage
MN18	Fernberg	MDN/NTN	06/09/08	ACM-type	Belfort	
MN23	Camp Ripley	MDN/NTN	05/22/08	ACM-type	Belfort	
MN28	Grindstone Lake	NTN	05/22/08	ACM-type	Belfort	
MN32	Voyageurs National Park-Sullivan Bay	NTN	06/10/08	ACM-type	Belfort	
MN99	Wolf Ridge	NTN	06/11/08	ACM-type	Belfort	
MT00	Little Bighorn Battlefield National Monument	NTN	10/09/08	ACM-type	Belfort	
MT05	Glacier National Park-Fire Weather Station	MDN/NTN	10/06/08	ACM-type	Electronic	Tipping Bucket
MT96	Poplar River	NTN	10/08/08	ACM-type	Belfort	
MT97	Lost Trail Pass	NTN	10/02/08	ACM-type	Belfort	
MT98	Havre - Northern Agricultural Research Center	NTN	10/07/08	ACM-type	Belfort	
NC06	Beaufort	NTN	08/28/08	ACM-type	Belfort	Tipping Bucket
NC08	Waccamaw State Park	MDN	09/03/08	ACM-type	Belfort	
NC25	Coweeta	NTN	08/10/08	ACM-type	Belfort	Stick Gage
NC29	Hofmann Forest	NTN	08/27/08	ACM-type	Belfort	
NC34	Piedmont Research Station	NTN	09/05/08	ACM-type	Belfort	Stick Gage

**Table 2-1. Sites Surveyed from April through December 2008 and Equipment Found at the Sites
 (continued)**

Site ID	Site Name	Network	Survey Date	Collector Type	Raingage Type	Backup Raingage Type
NC35	Clinton Crops Research Station	NTN	09/04/08	ACM-type	Belfort	
NC36	Jordan Creek	NTN	09/03/08	ACM-type	Belfort	
NC42	Phelps Lake	MDN	08/27/08	ACM-type	Belfort	
ND00	Theodore Roosevelt National Park-Painted Canyon	NTN	09/10/08	ACM-type	Belfort	Tipping Bucket
ND01	Lostwood National Wildlife Refuge	MDN	09/10/08	ACM-type	Belfort	
ND08	Icelandic State Park	NTN	09/08/08	ACM-type	Belfort	
ND11	Woodworth	NTN	09/09/08	ACM-type	Belfort	
NE15	Mead	MDN	09/18/08	N-CON	Electronic	Belfort
NE15	Mead	NTN	09/18/08	ACM-type	Belfort	NOAH IV
NE99	North Platte Agricultural Experiment Station	NTN	09/17/08	ACM-type	Belfort	
NH02	Hubbard Brook	NTN	09/23/08	ACM-type	Belfort	
NM01	Gila Cliff Dwellings National Monument	NTN	04/04/08	ACM-type	Belfort	
NM07	Bandelier National Monument	NTN	04/03/08	ACM-type	Belfort	Tipping Bucket
NM08	Mayhill	NTN	04/08/08	ACM-type	Belfort	
NM10	Caballo	MDN	04/07/08	ACM-type	Belfort	
NM12	Capulin Volcano National Monument	NTN	12/12/08	ACM-type	Belfort	
NS01	Kejimikujik National Park	MDN	09/01/08	ACM-type	Belfort	Tipping Bucket
NV02	Lesperance Ranch	MDN	06/28/08	ACM-type	Belfort	
NV03	Smith Valley	NTN	06/30/08	ACM-type	Belfort	
NV05	Great Basin National Park-Lehman Caves	NTN	07/01/08	ACM-type	Belfort	
NV99	Gibb's Ranch	MDN	06/26/08	ACM-type	Belfort	
NY01	Alfred	NTN	08/08/08	ACM-type	Belfort	
NY08	Aurora Research Farm	NTN	08/07/08	ACM-type	Belfort	Belfort
NY10	Chautauqua	NTN	05/05/08	ACM-type	Belfort	
NY20	Huntington Wildlife	MDN/NTN	10/02/08	ACM-type	Belfort	Tipping Bucket

**Table 2-1. Sites Surveyed from April through December 2008 and Equipment Found at the Sites
 (continued)**

Site ID	Site Name	Network	Survey Date	Collector Type	Raingage Type	Backup Raingage Type
NY22	Akwesasne Mohawk-Fort Covington	NTN	08/04/08	ACM-type	Belfort	
NY29	Moss Lake	NTN	08/05/08	ACM-type	Belfort	Tipping Bucket
NY52	Bennett Bridge	NTN	08/06/08	ACM-type	Belfort	
NY67	Ithaca	AIRMoN	10/07/08	ACM-type	Stick/Belfort	Belfort
NY68	Biscuit Brook	MDN/NTN	09/04/08	ACM-type	Belfort	
NY98	Whiteface Mountain	NTN	09/30/08	ACM-type	Belfort	Belfort
OH02	Athens Super Site	MDN	06/11/08	ACM-type	Belfort	Tipping Bucket
OH49	Caldwell	NTN	04/28/08	ACM-type	Belfort	
OH71	Wooster	NTN	05/06/08	ACM-type	Belfort	Stick Gage
OK00	Salt Plains National Wildlife Refuge	NTN	04/16/08	ACM-type	Belfort	Stick Gage
OK15	Newkirk	MDN	12/20/08	ACM-type	Electronic	Tipping Bucket
OK17	Kessler Farm Field Laboratory	NTN	04/13/08	ACM-type	Belfort	Tipping Bucket
OK29	Goodwell Research Station	NTN	04/15/08	ACM-type	Belfort	Tipping Bucket
OK99	Stilwell	MDN/NTN	04/17/08	ACM-type	Electronic	
ON07	Egbert	MDN	10/10/08	ACM-type	Belfort	
OR09	Silver Lake Ranger Station	NTN	05/30/08	ACM-type	Belfort	
OR10	H. J. Andrews Experimental Forest	NTN	05/30/08	ACM-type	Belfort	Tipping Bucket
OR18	Starkey Experimental Forest	NTN	05/27/08	ACM-type	Belfort	
OR97	Hyslop Farm	NTN	05/31/08	ACM-type	Belfort	
PA13	Allegheny Portage Railroad National Historic Site	MDN	04/30/08	ACM-type	Belfort	Stick Gage
PA15	Penn State	NTN/AIRMoN	06/01/08	ACM-type	Belfort	Belfort
PA18	Young Woman's Creek	NTN	05/03/08	ACM-type	Belfort	
PA29	Kane Experimental Forest	NTN	05/02/08	ACM-type	Belfort	
PA30	Erie	MDN	05/06/08	ACM-type	Belfort	Stick Gage
PA42	Leading Ridge	NTN	04/30/08	ACM-type	Belfort	Stick Gage
PA90	Hills Creek State Park	MDN	05/01/08	ACM-type	Belfort	Stick Gage

**Table 2-1. Sites Surveyed from April through December 2008 and Equipment Found at the Sites
 (continued)**

Site ID	Site Name	Network	Survey Date	Collector Type	Raingage Type	Backup Raingage Type
SD04	Wind Cave National Park-Elk Mountain	NTN	09/16/08	ACM-type	Belfort	Tipping Bucket
SD18	Eagle Butte	MDN	09/12/08	N-CON	Electronic	
SD99	Huron Well Field	NTN	09/15/08	ACM-type	Belfort	Stick Gage
TX02	Muleshoe National Wildlife Refuge	NTN	04/02/08	ACM-type	Belfort	
UT01	Logan	NTN	11/02/08	ACM-type	Belfort	Stick Gage
UT08	Murphy Ridge	NTN	11/03/08	ACM-type	Belfort	
UT09	Canyonlands National Park-Island in the Sky	NTN	07/03/08	ACM-type	Belfort	Tipping Bucket
UT98	Green River	NTN	07/04/08	ACM-type	Belfort	
UT99	Bryce Canyon National Park-Repeater Hill	NTN	07/03/08	ACM-type	Belfort	
VT01	Bennington	NTN	09/22/08	ACM-type	Belfort	
VT99	Underhill	AIRMoN	09/29/08	ACM-type	Stick Gage	Belfort
VT99	Underhill	MDN/NTN	09/29/08	ACM-type	Belfort	Tipping Bucket
WA24	Palouse Conservation Farm	NTN	05/28/08	ACM-type	Belfort	Belfort
WA98	Columbia River Gorge	NTN	05/27/08	ACM-type	Belfort	
WI08	Brule River	MDN	05/19/08	ACM-type	Belfort	
WI09	Popple River	MDN/NTN	05/06/08	ACM-type	Belfort	
WI25	Suring	NTN	05/06/08	ACM-type	Belfort	
WI32	Middle Village	MDN	05/05/08	ACM-type	Belfort	
WI35	Perkinstown	NTN	05/21/08	ACM-type	Belfort	
WI36	Trout Lake	MDN/NTN	05/08/08	ACM-type	Belfort	
WI37	Spoooner	NTN	05/20/08	ACM-type	Belfort	
WV99	Canaan Valley Institute	AIRMoN	06/03/08	ACM-type	Stick Gage	NOAH IV
WV99	Canaan Valley Institute	MDN	06/03/08	N-CON	Electronic Gage	Stick Gage
WY99	Newcastle	NTN	09/11/08	ACM-type	Belfort	Tipping Bucket

Of the 141 sites surveyed (collectors), only six sites had N-CON collectors, and of all the primary gages, only 14 electronic gages were surveyed. Fifty-two sites visited operate various types of backup gages. The site survey only takes into account the siting criteria of the backup gage, not the performance of the gage itself.

3.0 Specific Problems Encountered and Frequency

Each site survey consists of assessing, and entering into a database, information as it relates to NADP siting criteria, performance and condition of the equipment found (collector and primary gage), status of supplies, site operator’s performance, and other general information relating to the site.

The questionnaire used during the performance survey of a typical NTN and MDN site (i.e., Belfort raingage, ACM-type collector and no backup raingage) contains 221 and 222 required entries, respectively. The typical AIRMoN site consists of an ACM-type collector and a NWS Stick Gage. The AIRMoN questionnaire contains 187 required entries (not including memo fields).

3.1 Findings Likely to Impact Data Quality

The assessments considered by EEMS to impact data quality are categorized by element, as collector, compliance with siting criteria rules, or raingage performance. Of the 141 sites included in this report, 112 sites were in accordance with all collector assessments, 48 sites were in accordance with all raingage assessments, and 17 sites conformed to all siting criteria rules.

Of the 26 siting criteria assessments found to most impact data quality, 9 were found in conformity at all sites. Of the 12 assessments concerning collectors, 3 were found in conformity at all sites.

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 at sites that ***did not*** meet NADP criteria for those rules.

Tables 3-1 through 3-3 present the non-compliant survey data for the different networks and sites.

Table 3-1. Percent of Non-compliant Findings - MDN

Siting and Performance Checks	Number of Assessments	Found Non-Compliant	Percent (%) Non-Compliant
Is sampling media quality maintained?	40	1	2.5
Siting Criteria Assessments			
Is the orifice of the collector +/- .3 m of raingage (elevation)	40	5	12.5
45 degree rule met (raingage)	40	6	15.0
30 degree rule for trees met (raingage)	40	11	27.5

Table 3-1. Percent of Non-compliant Findings - MDN (continued)

Siting and Performance Checks	Number of Assessments	Found Non-Compliant	Percent (%) Non-Compliant
No objects > 1 m height inside 5 m radius (raingage)	40	17	42.5
No fences > 1 m height inside 2 m radius (raingage)	40	5	12.5
No vegetation height > 0.6 m within 5 m radius (raingage)	40	6	15.0
Collector and sensor oriented properly	40	3	7.5
45 degree rule met (collector)	40	6	15.0
30 degree rule for trees met (collector)	40	10	25.0
No objects > 1 m height within 5 m radius (collector)	40	14	35.0
No fences > 1 m height inside 5 m radius (collector)	40	7	17.5
No vegetation height > 0.6 m within 5 m radius (collector)	40	6	15.0
No treated lumber inside 5 m radius (collector)	40	14	35.0
No galvanized metal inside 5 m radius collector	40	11	27.5
No pastures and ag. activity within 20 m radius*	20	0	0.0
No herbicides and fertilizers used within 20 m radius*	22	0	0.0
Waterways meet NADP siting criteria	40	1	2.5
ACM-type Collector Assessments			
Dry side bucket is clean*	31	1	3.2
Does lid seal properly	34	1	2.9
Has flush wall filter mount been installed	34	2	5.9
Filter in good condition	34	2	5.9
Max / min thermometer in acceptable limits	34	4	11.8
ACM sensor operates properly	34	5	14.7
Motorbox operates within acceptable limits	34	2	5.9
N-CON Collector			
Lid liner in good condition**	5	1	20.0
Belfort Gage			
Was the 'as found' turn over set properly***	28	23	82.1

* Surveyors not aware that these criteria apply to MDN sites.

** One of the six sites reported “missing” to this assessment.

*** The assessment with the highest percentage of failures is the Belfort gage turnover setting. In order to better understand the problems noted with the Belfort raingages some additional description of the gage is necessary. The gage is a dual-traverse mechanical weighing precipitation gage designed to measure the amount of precipitation which falls during a seven day period. The precipitation is captured through an eight inch opening and funneled into a bucket. The bucket rests on a mechanical scale that moves an ink pen as weight (precipitation) is added to the bucket. The pen trace is recorded on a paper chart attached to a rotating drum which completes one rotation during a seven day period. The chart is marked both vertically and horizontally so both time and precipitation can be determined from the pen trace.

The bottom of the chart begins at zero precipitation and the top of the chart corresponds to six inches of precipitation. The dual-traverse gage is designed to measure from zero to twelve inches of precipitation. This is accomplished by the fist, or upward traverse of the pen from zero to six inches, and then as additional weight is added to the bucket the pen “turns over” and begins a second or downward traverse from six to twelve inches of precipitation. Proper function of the gage requires that the pen moves within ± 0.10 inches of the distance corresponding to the weight of the precipitation amount and that it turns over at the top of the chart.

Table 3-2. Percent of Non-compliant Findings - NTN

Siting and Performance Checks	Number of Assessments	Found Non-Compliant	Percent (%) Non-Compliant
Is sampling media quality maintained?	97	1	1.0
Siting Criteria Assessments			
Is the orifice of the collector +/- .3 m of raingage (elevation)	97	7	7.2
45 degree rule met (raingage)	97	13	13.4
30 degree rule for trees met (raingage)	97	28	28.9
No objects > 1 m height inside 5 m radius (raingage)	97	33	34.0
No fences > 1 m height inside 2 m radius (raingage)	97	7	7.2
No vegetation height > 0.6 m within 5 m radius (raingage)	97	15	15.5
Collector and sensor oriented properly	97	8	8.2
45 degree rule met (collector)	97	11	11.3
30 degree rule for trees met (collector)	97	26	26.8
No objects > 1 m height within 5 m radius (collector)	97	33	34.0
No fences > 1 m height inside 5 m radius (collector)	97	12	12.4
No vegetation height > 0.6 m within 5 m radius (collector)	97	13	13.4
No treated lumber inside 5 m radius (collector)	97	13	13.4
No pastures and ag. activity within 20 m radius	97	5	5.2
No herbicides and fertilizers used within 20 m radius	97	3	3.1
ACM-type Collector Assessments			
Dry side bucket is clean	97	14	14.4
Does lid seal properly	97	4	4.1
Lid liner in good condition	97	1	1.0
ACM sensor operates properly	97	3	3.1
Motorbox operates within acceptable limits	97	5	5.2
Belfort Raingage Assessments			
Was the 'as found' turn over set properly*	88	59	67.0

* Of the 89 NTN sites using Belfort gages, one reported “Not Applicable” to this assessment.

Table 3-3. Percent of Non-compliant Findings - AIRMoN

Siting and Performance Checks	Number of Assessments	Found Non-Compliant	Percent (%) Non-Compliant
Siting Criteria Assessments			
Is the orifice of the collector +/- .3 m of raingage (elevation)	4	1	25.0
30 degree rule for trees met (raingage)	4	2	50.0
No vegetation height > 0.6 m within 5 m radius (raingage)	4	2	50.0
Collector and sensor oriented properly	4	2	50.0
No treated lumber inside 5 m radius (collector)	4	2	50.0
ACM-type Collector Assessments			
Dry side bucket is clean	4	1	25.0
NWS Stick Gage Assessments			
Does the stick measure within tolerances (.01")	4	2	50.0

Tables 1 through 5 in Appendix B present EEMS’s findings regarding the assessments of siting criteria, raingage and collector condition, and site operator proficiency (assessed as “sampling media quality maintained”) which are considered to be the areas that may most impact data quality. As described in survey task #3, the assessment of site operator proficiency includes the qualitative evaluation of the site personnel regarding the methods and procedures used for sample handling, recordkeeping, reporting, equipment cleaning, maintenance, and material storage. Additionally, on-site documentation (raingage charts, logs, forms) was also assessed for legibility, accuracy and completeness.

The data indicate that most of the non-compliant findings are related to objects within the 5 meter radius of the raingage and/or collector. The other most prevalent issues are the calibration and turn over adjustment of the Belfort gage. The assessments performed on electronic gages resulted in no failures, thus the reason electronic gage assessments are not included in tables 3-2 and 3-3.

Table 3-4 lists the sites surveyed that have seen changes since the last survey (i.e., to the question “No significant changes to local site conditions within 500 meters of the collector since previous survey” the response was “NO”). However, these changes may or may not have contributed to siting criteria compliance. The effects of the changes are captured in the current siting criteria results presented in the previous tables.

Table 3-4. Sites with Changes Since Last Survey

Station ID	Network	Station ID	Network	Station ID	Network
08WI	MDN	NC08	MDN	PA30	MDN
AR16	NTN	NC25	NTN	PA42	NTN
AR27	NTN	NC36	NTN	SD04	NTN
AZ03	NTN	NE15	NTN	SD18	MDN
ID03	NTN	NV05	NTN	SD99	NTN

Table 3-4. Sites with Changes Since Last Survey (continued)

Station ID	Network	Station ID	Network	Station ID	Network
IN21	MDN	NV99	MDN	UT01	NTN
MD08	MDN/NTN	NY08	NTN	WI08	MDN
MD99	MDN	NY10	NTN	WI32	MDN
ME00	MDN/NTN	OK00	NTN	WI35	NTN
ME98	MDN/NTN	OK99	MDN	WV99	AIRMoN
MN18	MDN/NTN	OR18	NTN		
MT96	NTN	PA15	AIRMoN/NTN		

3.2 Findings Related to the Wind Shield at Site Surveyed

Data provided by the NADP PO indicate that raingages located at elevations greater than 1000 meters are required to have a wind shield installed, as well as at sites where more than 20 percent of the annual precipitation is frozen. Table 3-5 presents the assessments of wind shields at the sites surveyed during the period covered by this annual report.

Table 3-5. Status of Surveyed Sites Requiring Raingage Shields

Site ID	Network	Condition	Site ID	Network	Condition	Site ID	Network	Condition
AZ03	NTN	Not Present	ND01	MDN	Not Present	PA18	NTN	Not Present
AZ97	NTN	Not Present	ND08	NTN	Installed	PA29	NTN	Not Present
CAN5	NTN	Improperly Installed	ND11	NTN	Improperly Installed	PA30	MDN	Not Present
CO01	NTN	Installed	NE15	MDN/NTN	Not Present	PA42	NTN	Not Present
CO10	NTN	Not Present	NE99	NTN	Installed	PA90	MDN	Not Present
CO91	NTN	Installed	NH02	NTN	Installed	SD04	NTN	Not Present
CO93	NTN	Installed	NM07	NTN	Not Present	SD18	MDN	Installed
CO96	NTN	Installed	NM08	NTN	Not Present	SD99	NTN	Installed
CT15	NTN	Not Present	NM12	NTN	Not Present	UT01	NTN	Not Present
ID02	NTN	Installed	NS01	MDN	Installed	UT08	NTN	Installed
ID03	MDN/NTN	Installed	01NS	MDN	Not Present	UT09	NTN	Not Present
ID11	NTN	Installed	NV02	MDN	Not Present	UT98	NTN	Not Present
KS32	NTN	Not Present	NV03	NTN	Installed	UT99	NTN	Not Present
MD08	MDN/NTN	Improperly Installed	NV05	NTN	Not Present	VT01	NTN	Not Present
ME00	MDN/NTN	Installed	NV99	MDN	Not Present	VT99	AIRMoN	Not Present
ME00	NTN	Installed	NY01	NTN	Not Present	VT99	MDN/NTN	Not Present
ME98	MDN/NTN	Installed	NY08	NTN	Not Present	99VT	MDN	Not Present
MI99	NTN	Not Present	NY10	NTN	Not Present	99VT	NTN	Installed
MN08	NTN	Not Present	NY20	MDN/NTN	Installed	WA24	NTN	Installed
MN16	MDN/NTN	Not Present	NY22	NTN	Not Present	WI08	MDN	Not Present
MN18	MDN/NTN	Not Present	NY29	NTN	Not Present	08WI	MDN	Not Present
MN23	MDN/NTN	Not Present	NY52	NTN	Not Present	WI09	MDN/NTN	Not Present
MN28	NTN	Not Present	NY67	AIRMoN	Installed	WI25	NTN	Not Present
MN32	NTN	Not Present	NY68	MDN/NTN	Not Present	WI32	MDN	Not Present
MN99	NTN	Not Present	NY98	NTN	Not Present	WI35	NTN	Not Present
MT00	NTN	Not Present	ON07	MDN	Improperly Installed	WI36	MDN/NTN	Not Present
MT05	MDN/NTN	Installed	OR09	NTN	Installed	WI37	NTN	Not Present
MT96	NTN	Not Present	OR18	NTN	Installed	WV99	AIRMoN	Not Present
MT97	NTN	Installed	PA13	MDN	Not Present	WV99	MDN	Not Present
MT98	NTN	Installed	PA15	AIRMoN	Not Present	WY99	NTN	Not Present
ND00	NTN	Not Present	PA15	NTN	Not Present			

4.0 Field Site Survey Results

This section summarizes the quantifiable survey data relating to raingage accuracy tests and sensor heater performance.

4.1 Belfort Raingage Accuracy

Figure 4.1 presents the “as found” Belfort raingage accuracy results for all Belfort raingages encountered during the period covered by this report. At collocated sites the same gage measures precipitation data for more than one network (i.e. MDN and NTN). Data presented here represents precipitation data as a whole, and is not related to any one network of NADP.

Overall program-wide Belfort raingage accuracy was found to be very good with a slope of approximately 99% and a correlation of 0.9778. A relatively few number of sites were not performing well and are easily identifiable in Figure 4-1.

Figure 4-1. As Found Belfort Accuracy Results All Sites

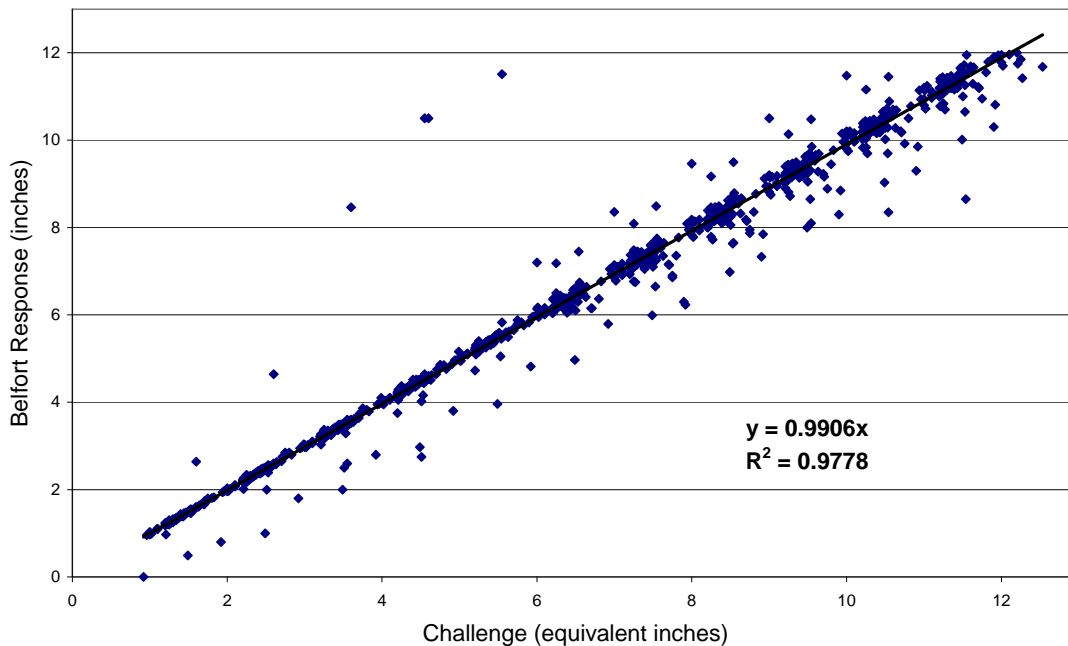
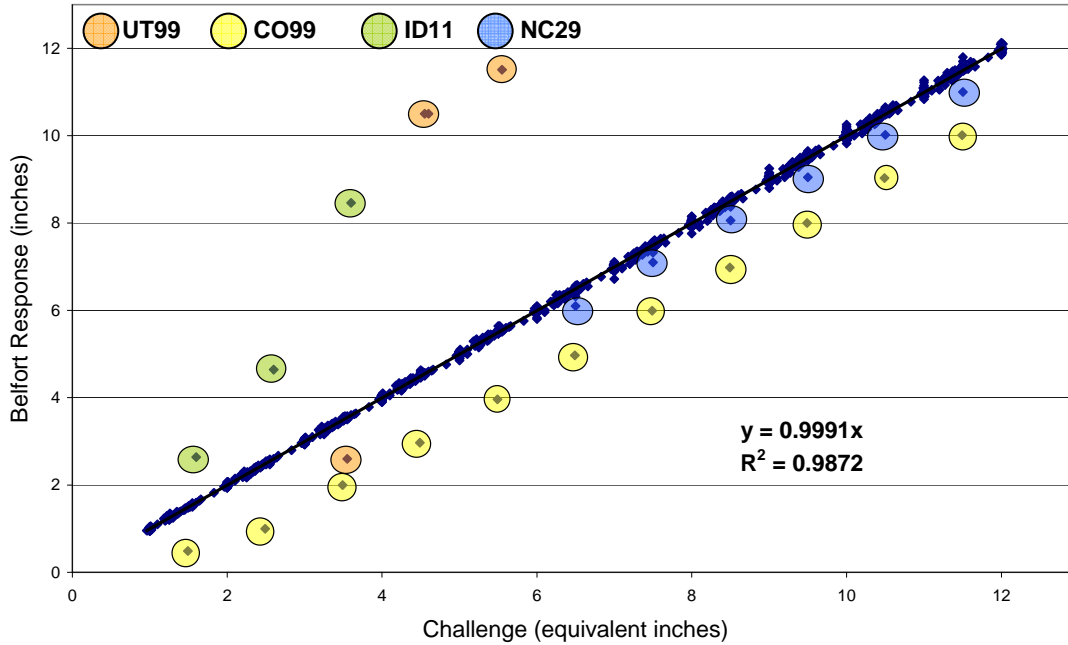


Figure 4-2 presents the “as left” Belfort raingage accuracy results for all gages encountered following any adjustments or improvements to the operation. Adjustments include leveling, cleaning, adjusting linkage, and calibration. Overall program-wide accuracy was improved as the results indicate with a slope of approximately 99.9% and a correlation of 0.9891, however there were still some gages that could not be adjusted to within the tolerance of 0.10 inch throughout the entire range of 0-12 inches. The data denoted with colored circles in Figure 4-2 represent sites NC29, UT99, ID11, and CO99. Other site results are much closer to the tolerance of 0.10

and cannot be distinguished from the line. Replacements were requested for all gages that were not adjusted to within tolerance, or improved to within acceptable operating condition, except for site NC29 which was scheduled to be replaced with an electronic gage within one month from the site survey.

Figure 4-2. As Left Belfort Accuracy Results All Sites



4.2 Belfort Calibration Results

Only data from Belfort gages that were adjusted during the survey are presented in this subsection. Gages that were already within tolerance or could not be adjusted to within tolerance are not included. Figure 4-3 presents the “unadjusted” calibration results and Figure 4-4 presents the results after adjustments and calibration. There is a noticeable decrease in accuracy observed in points above six inches in Figure 4-3. This is mostly attributed to improper gage turnover which was discussed in Section 3.0 and will be addressed again in Section 6.0 of this report.

Figure 4-3. As Found Belfort Accuracy Prior to Adjustment

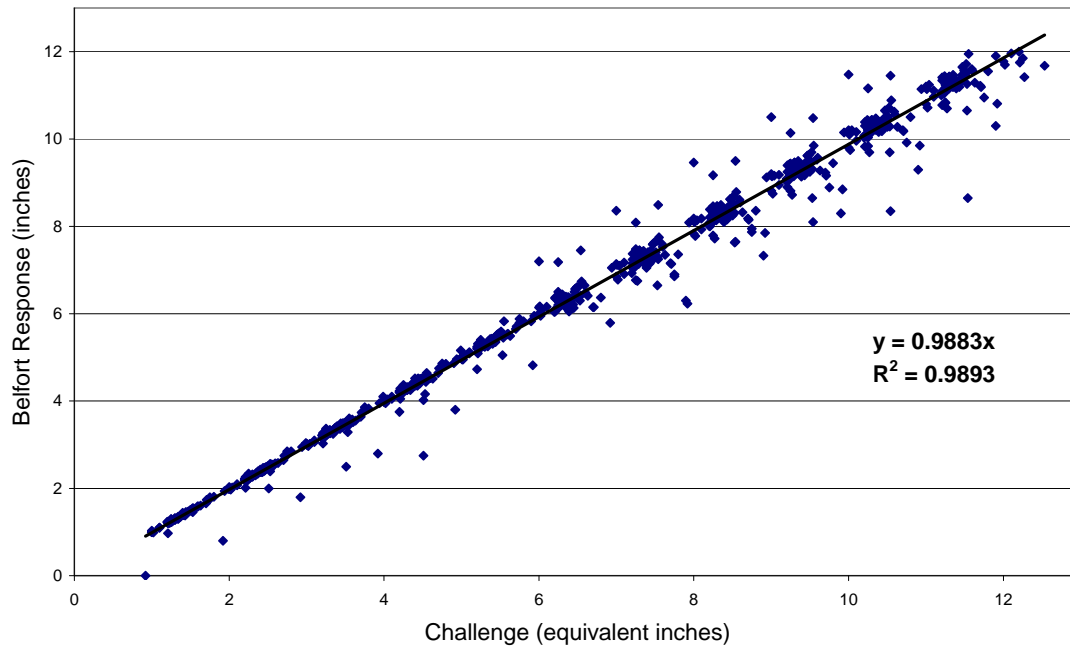
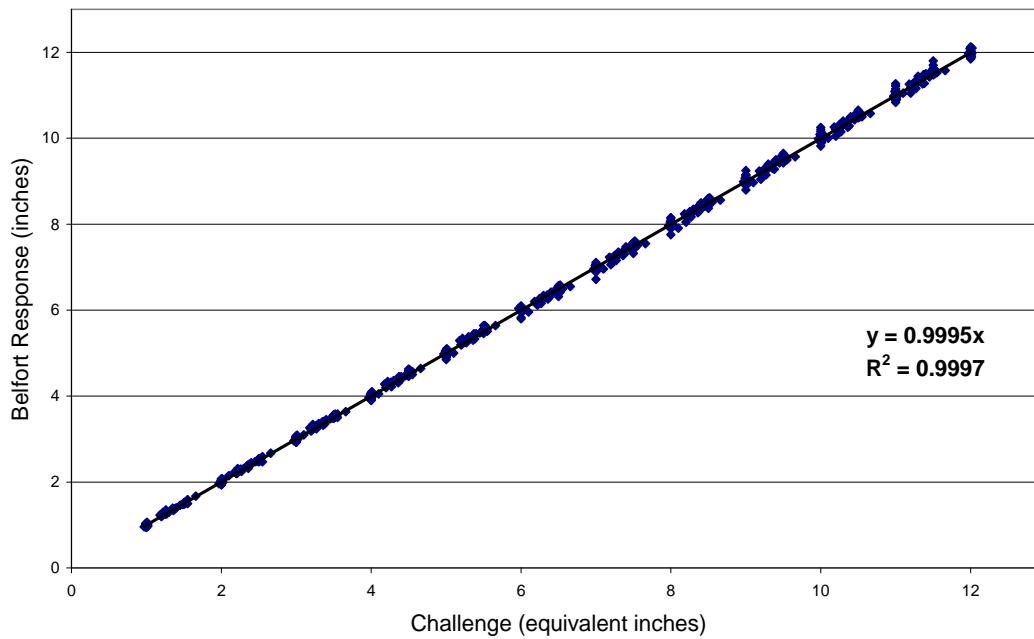


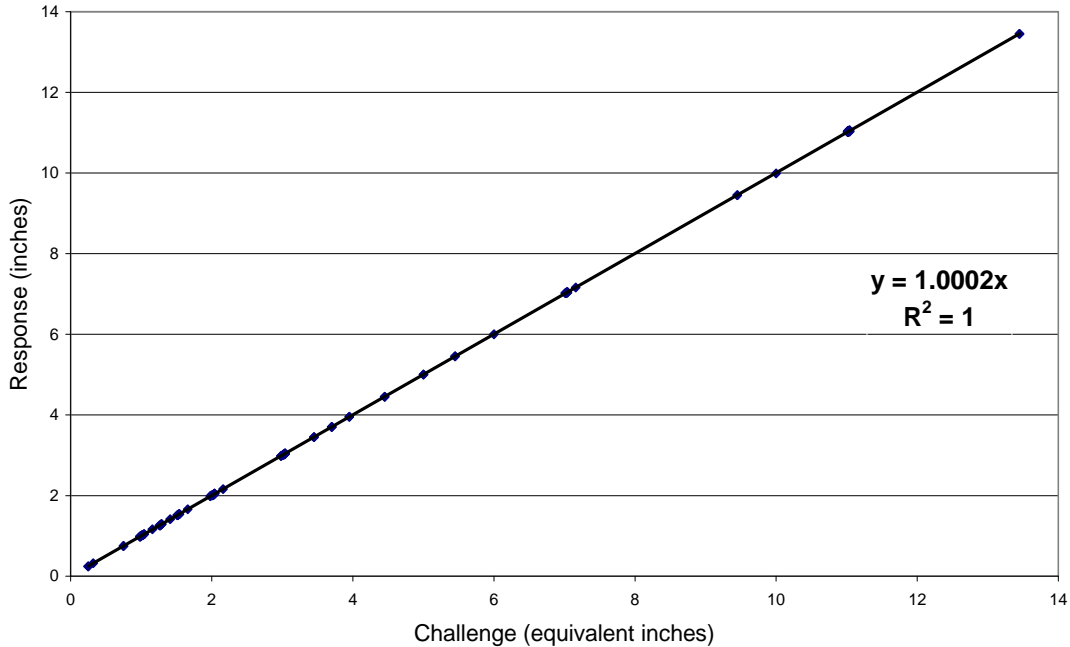
Figure 4-4. As Left Belfort Accuracy Adjusted Gages Only



4.3 Electronic Gage Accuracy

The results of the accuracy tests for the electronic raingages surveyed during the period covered by this report are presented in Figure 4-5. As clearly indicated the gages are very accurate for the entire span. No problems were encountered and no adjustments were required for the electronic gages.

Figure 4-5. As Found Electronic Gage Accuracy



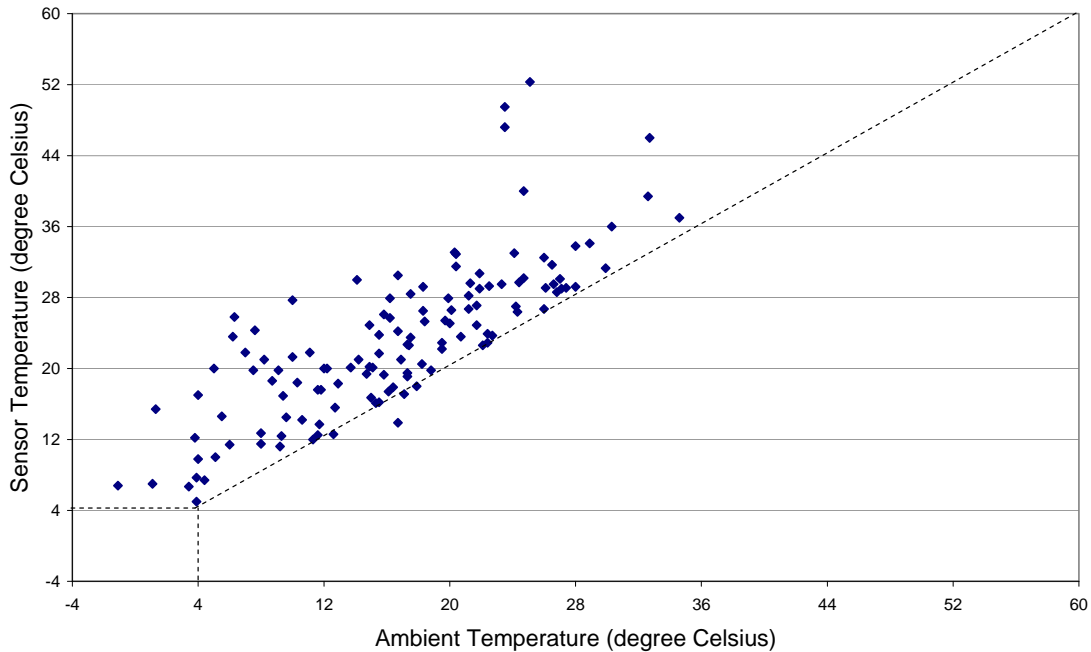
4.4 Sensor Heater Tests

The ACM type collectors used throughout the networks of the NADP utilize a contact grid 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 4°C during dry conditions. This provides enough heat to melt frozen precipitation and bridge the gap quickly when a snow or ice event occurs. 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 and to maximize the precipitation catch. 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 4-6.

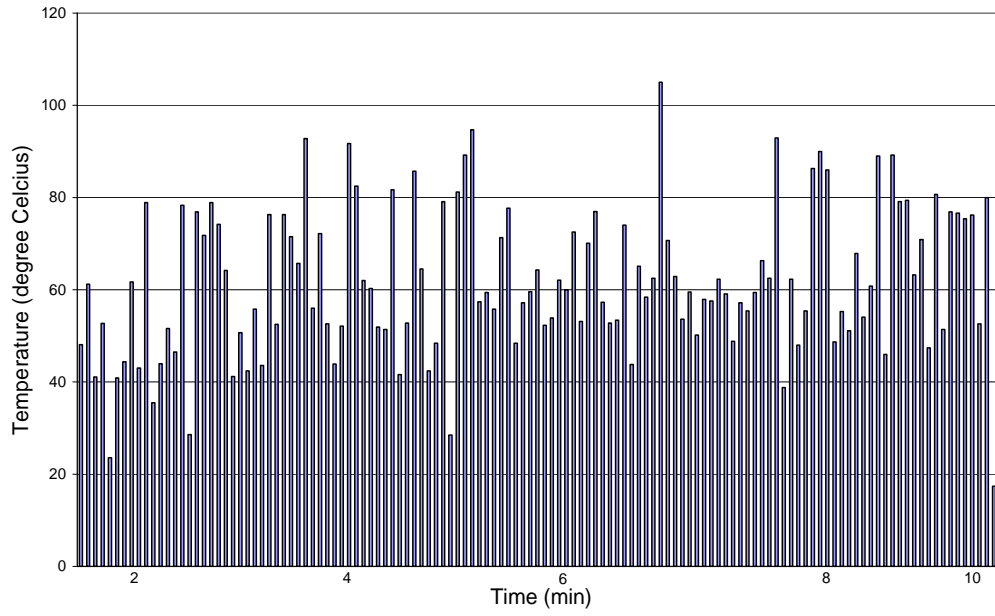
Figure 4-6. Inactivated Sensor Temperature



It appears that the sensors are maintaining a temperature above 4° when the ambient temperature is lower than 4°C, however the data indicate that the sensor heaters may still be activated when the ambient temperature is above 4°C.

Figure 4-7 presents the maximum temperature reached by each sensor when activated, and the time required for each sensor to reach that temperature. There seems to be considerable variability between sensors for maximum temperature, but nearly all sensors are generally around 60°C prior to 10 minutes of activation.

Figure 4-7. Activated Sensor Temperature and Elapsed Time



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 a measure of the site survey program's effectiveness as a QA tool, EEMS intends to plot the number of problem sites per year, and those sites with significant improvements from previous visits. As surveys are completed and the survey database is populated, tracking of site conditions and improvements will be captured and reported on the three-year site survey rotation schedule.

5.1 Documentation

Although most sites surveyed have been operating for a very long time, and most site operators are experienced and knowledgeable of the procedures and duties they are required to perform, some of the documentation of those procedures is outdated. It is important to modify and update site operation reference documentation and distribute that documentation to the operators, supervisors, and data users.

The NADP website is a valuable tool for providing both data and documentation for data users, but it is sometimes not utilized by site operation personnel. Changes to procedures that are distributed via direct mailing to operators, and are intended to append or replace pages in the current documentation are not always retained on-site. Some site operators suggested a revised QAPP be distributed, and subsequent revisions and updates be supplied and tracked electronically.

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 Belfort Raingage

As indicated in the 2007 report, analysis of the survey data obtained from the sites surveyed during this reporting period also suggests that an additional raingage operation and maintenance procedure may benefit data quality. The most common problems observed with the Belfort raingages include improper turnover adjustment and dirty linkage. Dirty linkage causes sticky or poor pen response to changes in weight.

Measured precipitation would be affected by incorrect pen turnover when large amounts of precipitation occurred during the sample period, or when the gage is winterized which raises the pen baseline and allows precipitation to accumulate for multiple weeks. Both cases are more likely to cause the pen to turnover and begin the downward transverse. In most cases where the

gage turnover was an issue, a minor adjustment corrected the second transverse (six to twelve inch) response.

Two solutions that are easily implemented and could help to eliminate inaccuracies in precipitation measurement due to turnover problems are:

- Reduce the amount of antifreeze used during the winter and have the site operator empty the bucket and replace the antifreeze more frequently during the winter to avoid reaching the second transverse.
- Have the site operator check and adjust the turnover on a regular schedule.

The first suggestion may not be practical at all site locations due to both the amount of precipitation that falls during one week and the logistics involved with winterization of the gage.

The second solution requires removing the gage cover and making an adjustment to a linkage. There is always a potential for undesired results when adjustments are made to the mechanical linkage of the gage, therefore training should be provided and proper care should be exercised if implementing this approach. It has been our experience however, that the turnover adjustment is relatively straightforward and easily accomplished. Most site operators would be able to perform this adjustment with proper instruction received during the annual training classes provided by the Central Analytical Laboratory (CAL) and the Mercury Analytical Laboratory (HAL) and/or on site training provided during the site surveys.

It is further suggested that if the second approach (check and adjust the turnover) is to be performed, it should be done during good weather just prior to winterizing the gage.

The second problem affecting the gages surveyed was the accumulation of dirt on the internal moving linkages. In most cases cleaning the linkages restored proper function of the gage. Therefore it is suggested that the site operators be instructed to clean the gages regularly at least once per year. The best time to clean the gage would vary from site to site based on the local weather patterns. For example, gages in the southwest should be cleaned following the spring windstorms when they are likely to receive the most wind-blown dust. This would also ensure that they are clean and working properly prior to the season most likely for precipitation to occur.

It would also be advisable to clean the gage when performing the turnover adjustment, and check the turnover when cleaning the gage, since both procedures require removing the gage cover.

5.2.2 ACM Type Collector

Problems with the following items were observed at large number of sites or were frequently noted during the surveys:

Chimney caulking for MDN collectors

In a number of cases water appears to seep between the funnel and chimney. This is especially prevalent during events with high winds. This has the potential to cause confusion regarding the source of the liquid in the over-flow container and possibly the Quality Rating (QR) code of the sample. Figure 5-1 shows a typical funnel/chimney position during sample collection. Perhaps a different chimney cap material that would produce a better seal between the funnel and the chimney itself could be investigated to help solve this problem.

Figure 5-1. MDN Funnel to Chimney Seal



Motorbox inspection doors

It was noticed that approximately 13 of the 34 MDN ACM type collectors surveyed were missing the motorbox inspection door making it impossible in some cases to check fuses and voltage at the motorbox. It would be beneficial to install motorbox inspection doors where needed.

MDN dry side bucket protocol

For the most part dry side buckets at MDN sites were found to be in good condition given that a new bag is installed every week. However, there were some exceptions and some site operators were unsure of the procedure to get a replacement dry side bucket. It would be constructive to clarify the procedure for dry side bucket replacement and cleaning.

Sensor temperature

A large percentage of site operators are not testing the sensor heater before activating the motorbox (see Section 4.0). If this is an important requirement, a notification should be sent to site operators requesting them to perform this test and giving them clear instructions on how to

perform it. It has been EEMS' experience that this evaluation is difficult to do accurately without using the proper test equipment. It may be more desirable to have the site operators only report the observations of frozen precipitation on the sensor during the winter season which is when this function of the sensor is most important. The operators are routinely checking the sensor heaters after sensor activation.

Collector arms during cold season

There are instances site operators report malfunction of motorbox due to the arms freezing in one position. It would be beneficial to inform the site operators that new GORTEX® boots are being tested at the CAL and are available to help prevent ice buildup.

Lid liner replacement protocol

Some site operators are unsure of when the lid liner should be replaced. The liner replacement frequency may have been modified throughout the history of NADP operation. Some sites have local bird populations that appear to have conflicts with lid liners. It would be helpful to remind site operators of the minimum required replacement schedule and procedures, and reinforce the requirement for the liner to be replaced whenever needed.

6.0 Field Laboratory Survey Results

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. AIRMoN sites still require pH and conductivity measurements; this section will focus on weighing, decanting the NTN samples; and the weighing, decanting, pH and conductivity measurements of AIRMoN samples.

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 collocated with CASTNET sites, since there is usually space available for the lab equipment.

Sample weighing

Some site scales used for sample weighing require attention. 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 5% or more was used as the accuracy tolerance.

Table 6-1. Average Percent Difference for Site Scales

Site Id	Network	Average % Difference	Site Id	Network	Average % Difference	Site Id	Network	Average % Difference
99VT	NTN	-0.11%	MT05	NTN	0.08%	OK00	NTN	0.03%
AR16	NTN	0.04%	MT96	NTN	-0.36%	OK17	NTN	0.26%
AR27	NTN	0.00%	MT97	NTN	-0.05%	OK29	NTN	0.06%
AZ03	NTN	-0.03%	MT98	NTN	-0.11%	OK99	NTN	-0.21%
AZ97	NTN	-0.65%	NC06	NTN	0.05%	OR09	NTN	0.39%
CAN5	NTN	-0.01%	NC25	NTN	0.00%	OR10	NTN	0.01%
CO01	NTN	0.50%	NC29	NTN	-0.09%	OR18	NTN	-0.05%
CO10	NTN	0.07%	NC34	NTN	0.07%	OR97	NTN	-0.01%
CO91	NTN	0.02%	NC35	NTN	0.01%	PA15	AIRMoN	0.00%
CO93	NTN	0.06%	NC36	NTN	0.02%	PA15	NTN	0.00%
CO96	NTN	-0.31%	ND00	NTN	-0.08%	PA18	NTN	0.00%
CO97	NTN	0.06%	ND08	NTN	0.09%	PA29	NTN	0.14%
CO99	NTN	0.02%	ND11	NTN	-0.15%	PA42	NTN	0.00%

Table 6-1. Average Percent Difference for Site Scales (continued)

Site Id	Network	Average % Difference	Site Id	Network	Average % Difference	Site Id	Network	Average % Difference
CT15	NTN	0.02%	NE15	NTN	-0.06%	SD04	NTN	-0.08%
ID02	NTN	-0.15%	NE99	NTN	0.00%	SD99	NTN	0.03%
ID03	NTN	0.03%	NH02	NTN	-0.01%	TX02	NTN	-0.03%
ID11	NTN	-0.01%	NM01	NTN	-0.02%	UT01	NTN	0.00%
IN22	NTN	0.00%	NM07	NTN	-0.02%	UT08	NTN	-0.03%
KS07	NTN	0.01%	NM08	NTN	0.00%	UT09	NTN	0.01%
KS31	NTN	0.07%	NM12	NTN	0.42%	UT98	NTN	0.10%
KS32	NTN	0.08%	NV03	NTN	0.10%	UT99	NTN	0.15%
MD08	NTN	0.00%	NV05	NTN	0.11%	VT01	NTN	0.75%
MD99	NTN	0.25%	NY01	NTN	0.20%	VT99	AIRMoN	-0.11%
ME00	NTN	-0.02%	NY08	NTN	0.01%	VT99	NTN	-0.11%
ME98	NTN	0.04%	NY10	NTN	-0.07%	WA24	NTN	0.00%
MI99	NTN	0.19%	NY20	NTN	0.05%	WA98	NTN	-0.08%
MN08	NTN	0.06%	NY22	NTN	0.03%	WI09	NTN	-0.06%
MN16	NTN	-0.01%	NY29	NTN	0.10%	WI25	NTN	0.04%
MN18	NTN	0.03%	NY52	NTN	0.04%	WI35	NTN	0.05%
MN23	NTN	0.02%	NY67	AIRMoN	0.27%	WI36	NTN	0.09%
MN28	NTN	-0.13%	NY68	NTN	-0.01%	WI37	NTN	0.07%
MN32	NTN	0.08%	NY98	NTN	-0.08%	WV99	AIRMoN	0.01%
MN99	NTN	-0.07%	OH49	NTN	-0.05%	WY99	NTN	0.12%
MT00	NTN	0.07%	OH71	NTN	-0.05%			

pH and Conductivity Measurements

This subsection presents the results of the field chemistry evaluations performed at the four AIRMoN sites.

In order to evaluate the pH and conductivity measurements performed in the field by the site operators, a sample of simulated rain was obtained from the CAL. Prior to each AIRMoN site survey the AIRMoN Site Liaison provided the survey team with in-house prepared simulated rain sample 08FR10. The CAL determined that the pH of this sample was 5.16 ± 0.1 pH units and 3.8 ± 0.3 uS/cm. The pH comparisons are presented in Table 6-2 and the conductivity comparisons are shown in Table 6-3.

The results are good with only one site (VT99) outside the tolerance for pH and conductivity measurements. All of the site operators demonstrated good technique while performing chemistry measurements. Probe and meter calibrations were performed prior to making the field measurements and sample temperature stabilization was maintained as best as possible. One site, PA15, utilized a constant temperature controlled bath while performing the measurements. This

site had the lowest errors for both the pH and conductivity measurements of the simulated sample.

Table 6-2. Difference in pH Readings between Target and Measured Values

Site Id	Network	pH Target Value	Response	Difference
NY67	AIRMoN	5.16	5.22	-0.06
PA15	AIRMoN	5.16	5.13	0.03
VT99	AIRMoN	5.16	5.02	0.14
WV99	AIRMoN	5.16	5.12	0.04

Table 6-3. Difference in Conductivity Readings between Target and Measured Values

Site Id	Network	Conductivity Target Value	Response	Difference
NY67	AIRMoN	3.8	3.65	0.15
PA15	AIRMoN	3.8	3.9	-0.10
VT99	AIRMoN	3.8	4.2	-0.40
WV99	AIRMoN	3.8	3.968	-0.17

7.0 Data Quality Information

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

7.1 Quality Assurance Project Plan

Improvement to procedures for collecting survey data, recording data in the survey database and reporting survey results are an ongoing process. As improvements are identified, suggested changes are submitted for approval by the EPA Project Officer, and the NADP QA manager. Once the suggested changes are approved the Site Survey QAPP and associated SOPs can be updated. The expected date for the completion of the QAPP revision 1 is December 2009. This revision will include updated data entry screens and site data reporting, filing, and archiving procedures.

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.

In February 2009 (not during the period covered by this report), EEMS' QA Manager attended one site survey to observe the performance of two of the three survey teams. An internal QA audit report of the survey was distributed to the appropriate interested parties by the QA Manager following the visit. This will become an annual internal QA occurrence. Reports of results from this activity will be included in this section of future annual reports. The next internal QA audit is tentatively scheduled for late summer 2009.

Beginning with the first site survey performed in calendar year 2009 (FL32), the EEMS QA Manager is providing site operators with a form for them to evaluate the performance of the field technician completing the site survey. These forms are provided with a self addressed stamped envelope in order to make it easier for the site operator to respond. The QA Manager will be using the information gathered to provide reports to management and suggestions for improvements of techniques and procedures for the field technicians. A summary of the results will be provided to the EPA Project Officer and NADP QA Manager,

7.3 Duplicate Data Entry

A routine procedure utilized as part of the 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 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.

Once data have been approved by the QA Manager, appropriate tables are generated and sent to the Program Office and the EPA Project Officer. It is EEMS' goal to forward this information on a monthly basis, however there are times when data verification may take longer than expected.

7.4 Identifiable Areas 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 are somewhat 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. As cases are discovered during review of the survey reports, additional clarification is requested from the PO clarify to the intent of the question. This information is then shared with the survey team members to eliminate confusion and maintain consistency. Subsequent versions of the questionnaire and database will be provided with clarifications.

Prior to the 2008 fall NADP meeting, EEMS prepared a list of items from the site survey questionnaire that can cause confusion or be misinterpreted during surveys. This list was

discussed with the NADP PO QA Manager and the EPA Project Officer. Some of these items required further definition and refinement; others were candidates for removal from the questionnaire. Changes were approved by the NADP QA Manager, and are under review by the EPA Project Officer. EEMS will finalize these changes after receiving approval or rejection from the EPA Project Officer. The proposed changes can be found in Appendix C of this report.

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.

Site file review

The internal review and audit process performed by the EEMS QA Manager (as described in previous sections) has identified some problems with the files received from the site survey teams. The problems were generally a result of poor recordkeeping on the part of the survey team. Issues included illegible or incomplete field form entries, incomplete equipment forms, site sketches not notated, inconsistent file naming, and delays in providing survey information. The issues were addressed by providing a corrective action memo to the survey team members. Subsequent survey files and reports have improved considerably. Files and reports will continue to be reviewed and monitored to improve consistency and quality.

Subsequent annual reports will include an internal QA summary of the observed site file problems and corrective actions implemented. Additional analysis will be performed to quantify the errors associated with the survey process, and present statistics related to typographical errors and those attributed to mistakes during the surveys.

Internal survey audits

The first internal audit of a site survey was conducted at FL32 in February 2009. Although it was not performed during the period covered by this report, we feel it is important to discuss one finding from that audit.

Through cooperation amongst the survey technicians and the EEMS QA Manager, a problem with one team's technique was discovered. Measurement of the dry and wet side bucket holder heights was performed with a tape measure marked in tenths of feet rather than inches. As a result an error was made by the team using that equipment. All measurements made by that survey team were recorded inaccurately, but are correctable. The bucket holder heights were reported as 9.4 inches when the actual height is 0.94 feet, or 11.28 inches. The effected data will

be revisited and values will be corrected in the transfer tables of the database delivered to the EPA and the Program Office.

EEMS suggests that all measurements recorded in the survey database be reported using the metric system. This change would involve the measurement of bucket holder heights and the temperature of the MDN sample enclosure chambers.

7.5 Survey Equipment Certification

The instruments used by the survey team are maintained and certified by the EEMS QA Manager. Most undergo annual certification by various sources. Digital multi-meters (DVM) are certified National Institute of Standards and Technology (NIST) traceable by the manufacturer. The DVMs are used to measure temperature with a thermocouple input which is certified with a NIST traceable thermometer.

The weights used to challenge the weighing raingages and site scales are certified on a NIST traceable electronic scale.

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 D.

APPENDIX A

Assessments Determined to Impact Data Quality

Assessments Determined to Impact Data Quality

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

Field Entry	NTN	MDN	AIRMON
Heater in good condition	N/A	✓	N/A
Heater thermostat in good condition	N/A	✓	N/A
Has flush wall filter mount been installed	N/A	✓	N/A
Filter in good condition	N/A	✓	N/A
Max / min thermometer in acceptable limits	N/A	✓	N/A
ACM sensor operates properly	✓	✓	✓
Motorbox operates within acceptable limits	✓	✓	✓
N-CON fan in good condition	N/A	✓	N/A
N-CON cooling fan thermostat in good condition	N/A	✓	N/A
N-CON heater in good condition	N/A	✓	N/A
N-CON heater thermostat in good condition	N/A	✓	N/A
N-CON max / min thermometer in acceptable limits	N/A	✓	N/A
N-CON sensor responds to a 20-second mist of water	✓	✓	✓
N-CON lid seal in good condition	✓	✓	✓
N-CON lid liner in good condition	✓	✓	✓
Was the 'as found' turn over set properly (Belfort gage)	✓	✓	✓
Raingage operates properly (electronic gage)	✓	✓	✓
Does datalogger receive event signals form all collectors (electronic gage)	✓	✓	✓
Does optical sensor respond to "blocking" of light beam (electronic gage)	✓	✓	✓
Does optical sensor respond to mist of water (electronic gage)	✓	✓	✓
Does the stick measure within tolerances (.01") (NWS stick gage)	✓	✓	✓

N/A= Not applicable

APPENDIX B

Findings Most Likely to Impact Data Quality

Table 1 - Findings Most Likely to Impact Data Quality - NTN Sites with Belfort Gages (page 1 of 8)

	AR16	AR27	AZ03	AZ97	CAN5	CO01	CO10	CO91	CO93	CO96	CO97	CO99
Is sampling media quality maintained?												
Is the orifice of the collector +/- .3 m of raingage (elevation)								X	X			
30 degree rule for buildings 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)												
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 rule for buildings met (collector)												
30 degree rule for trees met (collector)	X					X		X		X		
No objects > 1 m height within 5 m radius (collector)		X	X				X	X			X	
No fences > 1 m height inside 5 m radius (collector)												
No vegetation height > 0.6 m within 5 m radius (collector)			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 siting criteria												
Parking lots and maintenance areas meet NADP siting criteria												
Storage areas (fertilizers, road salt, manure, etc) meet NADP siting criteria												
Dry side bucket is clean		X										
Does lid seal properly				X	X							
Lid liner in good condition												
ACM sensor operates properly												
Motorbox operates within acceptable limits				X								
Was the 'as found' turn over set properly					X				X	X		X

X

Indicates found non-compliant

Table 1 - Findings Most Likely to Impact Data Quality - NTN Sites with Belfort Gages (page 2 of 8)

	CT15	ID02	ID11	IN22	KS07	KS31	KS32	MI99	MN08	MN16	MN18	MN23
Is sampling media quality maintained?												
Is the orifice of the collector +/- .3 m of raingage (elevation)			X			X						
30 degree rule for buildings met (raingage)												
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)												
Collector and sensor oriented properly	X								X		X	
45 degree rule met (collector)												
30 degree rule for buildings met (collector)												
30 degree rule for trees met (collector)				X					X			
No objects > 1 m height within 5 m radius (collector)	X					X				X	X	
No fences > 1 m height inside 5 m radius (collector)												
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											
Roads meet NADP siting criteria												
Waterways meet NADP siting criteria												
Airports meet NADP siting criteria												
Animal operations meet NADP siting criteria												
Parking lots and maintenance areas meet NADP siting criteria												
Storage areas (fertilizers, road salt, manure, etc) meet NADP siting criteria												
Dry side bucket is clean				X								
Does lid seal properly												
Lid liner in good condition												
ACM sensor operates properly			X									
Motorbox operates within acceptable limits	X		X					X				
Was the 'as found' turn over set properly	X	X	X	X	X	X		X	X	X	X	X

X

Indicates found non-compliant

Table 1 - Findings Most Likely to Impact Data Quality - NTN Sites with Belfort Gages (page 3 of 8)

	MN28	MN32	MN99	MT00	MT96	MT97	MT98	NC06	NC25	NC29	NC34	NC35
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)						X		X	X			
No fences > 1 m height inside 2 m radius (raingage)												
No vegetation height > 0.6 m within 5 m radius (raingage)		X										
Collector and sensor oriented properly	X											
45 degree rule met (collector)											X	
30 degree rule for buildings met (collector)												
30 degree rule for trees met (collector)		X				X					X	
No objects > 1 m height within 5 m radius (collector)			X			X		X	X			
No fences > 1 m height inside 5 m radius (collector)									X			
No vegetation height > 0.6 m within 5 m radius (collector)		X										
No treated lumber inside 5 m radius (collector)						X			X			
No pastures and ag. activity within 20 m radius												
No herbicides and fertilizers used within 20 m radius												
Roads meet NADP siting criteria												
Waterways meet NADP siting criteria												
Airports meet NADP siting criteria												
Animal operations meet NADP siting criteria												
Parking lots and maintenance areas meet NADP siting criteria												
Storage areas (fertilizers, road salt, manure, etc) meet NADP siting criteria												
Dry side bucket is clean							X	X			X	
Does lid seal properly												
Lid liner in good condition							X					
ACM sensor operates properly												
Motorbox operates within acceptable limits												
Was the 'as found' turn over set properly	X	X	X		X	X			X	X		X

X

Indicates found non-compliant

Table 1 - Findings Most Likely to Impact Data Quality - NTN Sites with Belfort Gages (page 4 of 8)

	NC36	ND00	ND08	ND11	NE15	NE99	NH02	NM01	NM07	NM08	NM12	NV03
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)		X								X		X
No fences > 1 m height inside 2 m radius (raingage)										X		
No vegetation height > 0.6 m within 5 m radius (raingage)		X		X								
Collector and sensor oriented properly												
45 degree rule met (collector)		X										
30 degree rule for buildings met (collector)												
30 degree rule for trees met (collector)							X			X		
No objects > 1 m height within 5 m radius (collector)		X								X		
No fences > 1 m height inside 5 m radius (collector)										X		
No vegetation height > 0.6 m within 5 m radius (collector)		X		X								
No treated lumber inside 5 m radius (collector)							X					
No pastures and ag. activity within 20 m radius				X								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 siting criteria												
Parking lots and maintenance areas meet NADP siting criteria												
Storage areas (fertilizers, road salt, manure, etc) meet NADP siting criteria												
Dry side bucket is clean										X		
Does lid seal properly												X
Lid liner in good condition												
ACM sensor operates properly												
Motorbox operates within acceptable limits				X								
Was the 'as found' turn over set properly	X			X		X		X		X	X	

X

Indicates found non-compliant

Table 1 - Findings Most Likely to Impact Data Quality - NTN Sites with Belfort Gages (page 5 of 8)

	NV05	NY01	NY08	NY10	NY20	NY22	NY29	NY52	NY68	NY98	OH49	OH71
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)			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
Collector and sensor oriented properly							X					
45 degree rule met (collector)										X		
30 degree rule for buildings met (collector)												
30 degree rule for trees met (collector)				X				X		X	X	
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	
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				
No pastures and ag. activity within 20 m radius			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 siting criteria												
Parking lots and maintenance areas meet NADP siting criteria												
Storage areas (fertilizers, road salt, manure, etc) meet NADP siting criteria												
Dry side bucket is clean			X	X		X						
Does lid seal properly												
Lid liner in good condition												
ACM sensor operates properly												
Motorbox operates within acceptable limits												
Was the 'as found' turn over set properly	X	X	X	X	X	X		X		X	X	X

X

Indicates found non-compliant

Table 1 - Findings Most Likely to Impact Data Quality - NTN Sites with Belfort Gages (page 6 of 8)

	OK00	OK17	OK29	OR09	OR10	OR18	OR97	PA15	PA18	PA29	PA42	SD04
Is sampling media quality maintained?												
Is the orifice of the collector +/- .3 m of raingage (elevation)						X						
30 degree rule for buildings met (raingage)												
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
Collector and sensor oriented properly												
45 degree rule met (collector)					X							
30 degree rule for buildings met (collector)												
30 degree rule for trees met (collector)		X			X	X			X	X	X	
No objects > 1 m height within 5 m radius (collector)					X	X				X		
No fences > 1 m height inside 5 m radius (collector)					X							
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												
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												
Parking lots and maintenance areas meet NADP siting criteria												
Storage areas (fertilizers, road salt, manure, etc) meet NADP siting criteria												
Dry side bucket is clean								X				
Does lid seal properly												X
Lid liner in good condition												
ACM sensor operates properly			X									
Motorbox operates within acceptable limits												
Was the 'as found' turn over set properly		X	X	X			X		X	X	X	

X

Indicates found non-compliant

Table 1 - Findings Most Likely to Impact Data Quality - NTN Sites with Belfort Gages (page 7 of 8)

	SD99	TX02	UT01	UT08	UT09	UT98	UT99	VT01	VT99	WA24	WA98	WI09
Is sampling media quality maintained?											X	
Is the orifice of the collector +/- .3 m of raingage (elevation)							X				X	
30 degree rule for buildings met (raingage)												
No objects > 1 m height inside 5 m radius (raingage)					X			X		X		
No fences > 1 m height inside 2 m radius (raingage)								X				
No vegetation height > 0.6 m within 5 m radius (raingage)					X							
Collector and sensor oriented properly											X	
45 degree rule met (collector)					X							
30 degree rule for buildings met (collector)												
30 degree rule for trees met (collector)							X	X				
No objects > 1 m height within 5 m radius (collector)					X	X		X				
No fences > 1 m height inside 5 m radius (collector)						X		X				
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												
Roads meet NADP siting criteria												
Waterways meet NADP siting criteria												
Airports meet NADP siting criteria												
Animal operations meet NADP siting criteria												
Parking lots and maintenance areas meet NADP siting criteria												
Storage areas (fertilizers, road salt, manure, etc) meet NADP siting criteria												
Dry side bucket is clean		X									X	
Does lid seal properly												
Lid liner in good condition												
ACM sensor operates properly												
Motorbox operates within acceptable limits												
Was the 'as found' turn over set properly	X	X		X	X		X	X	X	X	X	

X Indicates found non-compliant

Table 1 - Findings Most Likely to Impact Data Quality - NTN Sites with Belfort Gages (page 8 of 8)

	WI25	WI35	WI36	WI37	WY99
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)		X			
No fences > 1 m height inside 2 m radius (raingage)					
No vegetation height > 0.6 m within 5 m radius (raingage)					
Collector and sensor oriented properly					
45 degree rule met (collector)		X		X	
30 degree rule for buildings met (collector)					
30 degree rule for trees met (collector)				X	
No objects > 1 m height within 5 m radius (collector)		X			
No fences > 1 m height inside 5 m radius (collector)					
No vegetation height > 0.6 m within 5 m radius (collector)					
No treated lumber inside 5 m radius (collector)					
No pastures and ag. activity within 20 m radius					
No herbicides and fertilizers used within 20 m radius					
Roads meet NADP siting criteria					
Waterways meet NADP siting criteria					
Airports meet NADP siting criteria					
Animal operations meet NADP siting criteria					
Parking lots and maintenance areas meet NADP siting criteria					
Storage areas (fertilizers, road salt, manure, etc) meet NADP siting criteria					
Dry side bucket is clean					
Does lid seal properly					
Lid liner in good condition					
ACM sensor operates properly			X		
Motorbox operates within acceptable limits					
Was the 'as found' turn over set properly	X	X		X	X

X Indicates found non-compliant

Table 2 - Findings Most Likely to Impact Data Quality - NTN Sites with Electronic Gages

	99VT	AZ03	ID03	MD08	MD99	ME00	ME98	MT05
Is sampling media quality maintained?								
Is the orifice of the collector +/- .3 m of raingage (elevation)								
45 degree rule met (raingage)								X
30 degree rule for buildings 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)								
No vegetation height > 0.6 m within 5 m radius (raingage)		X	X	X			X	
Collector and sensor oriented properly								
45 degree rule met (collector)							X	
30 degree rule for buildings met (collector)								
30 degree rule for trees met (collector)	X							X
No objects > 1 m height within 5 m radius (collector)		X		X	X	X		X
No fences > 1 m height inside 5 m radius (collector)								X
No vegetation height > 0.6 m within 5 m radius (collector)		X		X	X		X	
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								
Waterways meet NADP siting criteria								
Airports meet NADP siting criteria								
Animal operations meet NADP siting criteria								
Parking lots and maintenance areas meet NADP siting criteria								
Storage areas (fertilizers, road salt, manure, etc) meet NADP siting								
Dry side bucket is clean					X	X		
Does lid seal properly								
Lid liner in good condition								
ACM sensor operates properly								
Motorbox operates within acceptable limits								
Raingage operates properly								
Does datalogger receive event signals form all collectors								
Does optical sensor respond to "blocking" of light beam								
Does optical sensor respond to mist of water								

X

Indicates found non-compliant

Table 3 - Findings Most Likely to Impact Data Quality - MDN Sites with Electronic Gages

	01NS	ID03	MD08	MD99	ME00	ME98	MT05	NE15	OK15	OK99	SD18	WV99
Is sampling media quality maintained?												
Is the orifice of the collector +/- .3 m of raingage (elevation)					X							
30 degree rule for buildings met (raingage)												
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	X	
No vegetation height > 0.6 m within 5 m radius (raingage)		X	X			X						
Collector and sensor oriented properly												X
45 degree rule met (collector)						X						
30 degree rule for buildings met (collector)												
30 degree rule for trees met (collector)					X		X					
No objects > 1 m height within 5 m radius (collector)				X	X					X	X	
No fences > 1 m height inside 5 m radius (collector)							X			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 galvanized metal inside 5 m radius collector (MDN)	X				X							
No pastures and ag. activity within 20 m radius										missing		missing
No herbicides and fertilizers used within 20 m radius										missing		missing
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												missing
Metalworking operations meet NADP siting criteria (MDN only)												
Dry side bucket is clean	N/A				N/A			N/A	N/A		N/A	N/A
Does lid seal properly (ACM or N-CON)												
Lid liner in good condition (ACM or N-CON)	X											
Fan in good condition (ACM or N-CON)												
Cooling fan thermostat in good condition (ACM or N-CON)												
Heater in good condition (ACM or N-CON)												
Heater thermostat in good condition (ACM or N-CON)												
Max / min thermometer in acceptable limits (ACM or N-CON)												
Has flush wall filter mount been installed (ACM)	N/A				N/A			N/A			N/A	N/A
Filter in good condition (ACM)	N/A				N/A			N/A			N/A	N/A
Sensor operates properly (ACM)	N/A				N/A			N/A			N/A	N/A
Motorbox operates within acceptable limits (ACM)	N/A				N/A			N/A			N/A	N/A
Does sensor respond to a 20-second mist of water (N-CON)		N/A	N/A	N/A		N/A	N/A		N/A	N/A		
Raingage operates properly												
Does datalogger receive event signals form all collectors												
Does optical sensor respond to "blocking" of light beam												
Does optical sensor respond to mist of water												

X

Indicates found non-compliant

missing

Surveyor assumed item not applicable to MDN

Table 4 - Findings Most Likely to Impact Data Quality - MDN Sites with Electronic Gages (page 1 of 3)

	08WI	99VT	CO97	CO99	IN21	IN28	MN16	MN18	MN23	NC08
Is sampling media quality maintained?										
Is the orifice of the collector +/- .3 m of raingage (elevation)								X		
30 degree rule for buildings 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
No vegetation height > 0.6 m within 5 m radius (raingage)										
Collector and sensor oriented properly		X								
45 degree rule met (collector)										X
30 degree rule for buildings met (collector)										
30 degree rule for trees met (collector)		X			X		X			X
No objects > 1 m height within 5 m radius (collector)			X					X		X
No fences > 1 m height inside 5 m radius (collector)										X
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			X					X
No pastures and ag. activity within 20 m radius	missing			missing	missing	missing	missing	missing	missing	
No herbicides and fertilizers used within 20 m radius	missing			missing			missing	missing	missing	
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	missing			missing			missing	missing	missing	
Metalworking operations meet NADP siting criteria (MDN only)										
Dry side bucket is clean		N/A								
Does lid seal properly (ACM or N-CON)	X									
Lid liner in good condition (ACM or N-CON)										
Fan in good condition (ACM or N-CON)										
Cooling fan thermostat in good condition (ACM or N-CON)										
Heater in good condition (ACM or N-CON)										
Heater thermostat in good condition (ACM or N-CON)										
Has flush wall filter mount been installed (ACM)		N/A								
Filter in good condition (ACM)		N/A							X	
Max / min thermometer in acceptable limits (ACM or N-CON)										
Sensor operates properly (ACM)	X	N/A			X					
Motorbox operates within acceptable limits (ACM)		N/A								
Was the 'as found' turn over set properly	X	X		X	X	X	X	X	X	X

X

Indicates found non-compliant

missing

Surveyor assumed item not applicable to MDN

Table 4 - Findings Most Likely to Impact Data Quality - MDN Sites with Electronic Gages (page 2 of 3)

	NC42	ND01	NM10	NS01	NV02	NV99	NY20	NY68	OH02	ON07
Is sampling media quality maintained?										
Is the orifice of the collector +/- .3 m of raingage (elevation)			X		X					
30 degree rule for buildings 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				
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 rule for buildings met (collector)										
30 degree rule for trees met (collector)								X		
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				
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 galvanized metal inside 5 m radius collector (MDN)	X			X						X
No pastures and ag. activity within 20 m radius	missing		missing		missing	missing			missing	
No herbicides and fertilizers used within 20 m radius	missing		missing		missing	missing			missing	
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					missing	missing			missing	
Metalworking operations meet NADP siting criteria (MDN only)										
Dry side bucket is clean								X		
Does lid seal properly (ACM or N-CON)										
Lid liner in good condition (ACM or N-CON)										
Fan in good condition (ACM or N-CON)										
Cooling fan thermostat in good condition (ACM or N-CON)										
Heater in good condition (ACM or N-CON)										
Heater thermostat in good condition (ACM or N-CON)										
Has flush wall filter mount been installed (ACM)										X
Filter in good condition (ACM)										
Max / min thermometer in acceptable limits (ACM or N-CON)						X		X		
Sensor operates properly (ACM)				X						
Motorbox operates within acceptable limits (ACM)										
Was the 'as found' turn over set properly	X	X	X	X	X	X	X		X	X

X

Indicates found non-compliant

missing

Surveyor assumed item not applicable to MDN

Table 4 - Findings Most Likely to Impact Data Quality - MDN Sites with Electronic Gages (page 3 of 3)

	PA13	PA30	PA90	VT99	WI08	WI09	WI32	WI36
Is sampling media quality maintained?		X						
Is the orifice of the collector +/- .3 m of raingage (elevation)		X						
30 degree rule for buildings 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)								
No vegetation height > 0.6 m within 5 m radius (raingage)		X						
Collector and sensor oriented properly					X			
45 degree rule met (collector)	X							
30 degree rule for buildings met (collector)								
30 degree rule for trees met (collector)	X	X	X					
No objects > 1 m height within 5 m radius (collector)		X						
No fences > 1 m height inside 5 m radius (collector)							X	
No vegetation height > 0.6 m within 5 m radius (collector)								
No treated lumber inside 5 m radius (collector)				X				
No galvanized metal inside 5 m radius collector (MDN)					X		X	
No pastures and ag. activity within 20 m radius	missing	missing			missing	missing	missing	missing
No herbicides and fertilizers used within 20 m radius	missing	missing			missing	missing	missing	missing
Roads meet NADP siting criteria								
Waterways meet NADP siting criteria		X						
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					missing	missing	missing	missing
Metalworking operations meet NADP siting criteria (MDN only)								
Dry side bucket is clean						N/A	N/A	
Does lid seal properly (ACM or N-CON)								
Lid liner in good condition (ACM or N-CON)								
Fan in good condition (ACM or N-CON)								
Cooling fan thermostat in good condition (ACM or N-CON)								
Heater in good condition (ACM or N-CON)								
Heater thermostat in good condition (ACM or N-CON)								
Has flush wall filter mount been installed (ACM)						X		
Filter in good condition (ACM)			X					
Max / min thermometer in acceptable limits (ACM or N-CON)		X		X				
Sensor operates properly (ACM)	X						X	
Motorbox operates within acceptable limits (ACM)				X				X
Was the 'as found' turn over set properly	X		X	X	X		X	

X

Indicates found non-compliant

missing

Surveyor assumed item not applicable to MDN

Table 5 - Findings Most Likely to Impact Data Quality - AIRMoN Sites

	NY67	PA15	VT99	WV99
Is sampling media quality maintained?				
Are samples stored and shipped properly				
Is the orifice of the collector +/- .3 m of raingage (elevation)			X	
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)	X		X	
Collector and sensor oriented properly	X			X
45 degree rule met (collector)				
30 degree rule for buildings met (collector)				
30 degree rule for trees 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	
No pastures and ag. activity within 20 m radius (NTN/AIRMoN)				
No herbicides and fertilizers used within 20 m radius (NTN AIRMoN)				
Roads meet NADP siting criteria				
Waterways meet NADP siting criteria				
Airports meet NADP siting criteria				
Animal operations meet NADP siting criteria (NTN and AIRMoN)				
Parking lots and maintenance areas meet NADP siting criteria				
Storage areas (fertilizers, road salt, manure, etc) meet NADP siting criteria				
Dry side bucket is clean				X
Does lid seal properly				
Lid liner in good condition				
ACM sensor operates properly				
Motorbox operates within acceptable limits				
Does the stick measure within tolerances (.01")		X		X

X Indicates found non-compliant

APPENDIX C

Suggested Modifications to the Site Survey Questionnaire

Table of Questions Requiring Revision and Action Taken

Question as it Currently Exists in Questionnaire	Issues with the questions	Decision Made, Possible Solution or Clarification
Site Information		
Non-NADP precipitation chemistry	Clarify - only if <u>not</u> removed from NTN sample?	Delete question (same as question in Field Lab Form)
Date of rescheduled survey	Would like to remove question. Rescheduled survey would have a survey date, canceled survey will not be submitted	Delete question (new survey date will be survey date)
Operator is competent	We recommend removing both of these questions and creating one that asks "recommend operator attend NADP training class".	Replace both of these questions with new question "Site operator not recommended or interested in attending training course"
No CAL/HAL follow-up needed with operator on technique	If assessment indicates that the operator would benefit from additional training, question will be asked positively: Example: "Has site operator attended training? Would site operator like to attend training?"	
Does operator check sensor heater before and after collector opening?	We recommend changing to <u>after activating</u> . Site operator does not say... Cannot tell by touch if heated by sun, or even warm. Could be applied for winter.	No change - stress the need for testing. Sensor should not be heating at temps above 40.
→	We want to add Site Supervisor to EEMS db →	Add new field to database: Site Supervisor contact name
→	We want to add Site Supervisor information to EEMS db →	Add new fields to database: Site Supervisor phone number, email address

Table of Questions Requiring Revision and Action Taken (*continued*)

Question as it Currently Exists in Questionnaire	Issues with the questions	Decision Made, Possible Solution or Clarification
Siting Criteria		
No significant changes to local site conditions within 500 meters of the collector since previous survey	Is equipment relocation or replacement considered a significant change? How far does it have to move before it is significant?	Only means new buildings, clear cutting, new agriculture activity, items not on site sketch
Site Type	Suggest that we delete from EEMS db. We would need to research to answer accurately. Currently based on census information	Data would remain pre-populated. Change the available response to "agree" "not certain" "undesigned"
Raingage mounting	Minimum height for "stand-on" platform? (NY67, NY98)	No minimum height - if you can stand on it, it is a platform
Raingage ground cover, 30 m radius	Do platforms count as natural?	Consider features <u>not</u> identified in site sketch. Site should represent surroundings (no over mowing)
No objects > 1 m height inside 5 m radius (raingage)	Criteria says from the base of collector... ?	Greater than 1 meter height starting from bottom of gage.
No fences > 1 m height inside 2 m radius (raingage)	Criteria says from the base of collector... ?	Greater than 1 meter height starting from bottom of gage.
No vegetation height > 0.6 m within 5 m radius (raingage)	Criteria says from the base of collector... ?	Greater than 1 meter height starting from bottom of gage.
Collector mounting	Minimum height for "stand-on" platform? (NY67, NY98)	No minimum height - if you can stand on it, it is a platform

Table of Questions Requiring Revision and Action Taken (*continued*)

Question as it Currently Exists in Questionnaire	Issues with the questions	Decision Made, Possible Solution or Clarification
Collector ground cover, 30 m radius	Do platforms count as natural?	Consider features <u>not</u> identified in site sketch. Site should represent surroundings (no over mowing)
No objects > 1 m height within 5 m radius (collector)	Criteria says from the base of collector... ?	Greater than 1 meter height starting from bottom of collector legs.
No fences > 1 m height inside 5 m radius (collector)	Criteria says from the base of collector... ?	Greater than 1 meter height starting from bottom of collector legs.
No vegetation height > 0.6 m within 5 m radius (collector)	Criteria says from the base of collector... ?	Greater than 1 meter height starting from bottom of collector legs.
No treated lumber inside 5 m radius (collector)	Is old treated wood allowed? Do posts under decks count?	Include any, without regard to age. Elaborate in comments section
No galvanized metal inside 5 m radius collector (MDN)	How much?	Include comments as to type and how much. Elaborate in comments section.
ACM Collector		
Were the correct fuses found	We have found collectors labeled with 1 amp and 1/2 amp. We will make sure the fuse matches the collector. Where not labeled, we will assume 1/2 amp?	Mark checking with Tim to determine fuse preference - we will label motorboxes if miss-labeled
Order replacement ACM battery	Who provides batteries? Collectors and gages?	Response intended for site supervisors, no change
Dry side bucket is clean	Clarify - just the rim?	Still assess condition and replacement procedures for both NTN and MDN

Table of Questions Requiring Revision and Action Taken (*continued*)

Question as it Currently Exists in Questionnaire	Issues with the questions	Decision Made, Possible Solution or Clarification
Overflow bucket in good condition	We would like to discuss the purpose of the question and overflow bucket and causes of leaks. Also inlet heater	Provided input to Bob and Gerard regarding source of leaks
Max / min thermometer in acceptable limits	What is acceptable limit... 5 degrees?	Five degrees C is acceptable
Dry side bag installed correctly	About things in the bucket to hold the bag down	Okay to add things to hold bag down - Adding following question
→	Add new question? →	“Is quantity of liquid in dry side bag assessed and reported?”
Hight of both dry and wet bucket holders	Currently in inches	Request change to cm
Correct sensor grid type	We recommend changing question to number of grids present... Some sites use more sensitive grid to improve collection.	Changing the response field to number of grids with acceptable answers, 7 and 11
Does sensor respond to a drop of water	Would like to clarify question to "one drop of water"	Change question to “one” instead of “a”. A "no" response would also mean sensor <u>does not</u> operate properly.
Temperature of sensor inactivated (deg. C)	Still need clarification about sensor "warming"	Sensor is not supposed to warm when inactive and above 40 C
Maximum temperature = <10 minutes (deg. C)	Not having trouble with measurements, but we suggest not insulating the sensor during test to make it more "real-world"	Do not insulate the sensor during test

Table of Questions Requiring Revision and Action Taken (*continued*)

Question as it Currently Exists in Questionnaire	Issues with the questions	Decision Made, Possible Solution or Clarification
Motorbox operates within acceptable limits	Is there another quantitative test other than 2 weights?	2 weights is the only test
N-CON Collector		
Were the correct fuses found?	N-CON manual has fuse listed as 10 and 7	Discussed with Jack - 10 amp is preferred - he will make sure they are labeled - we will also label in field
Max / min thermometer in acceptable limits	What is acceptable limit... 5 degrees?	Five degrees C is acceptable
Temperature of enclosure	Currently reported in degrees F	Request change to C
Belfort		
Order replacement pen nibs	Can they use felt pens?	Add felt tip pens to supply list (well pens are \$60 each! - suggest operator try cleaning before ordering)
Field Lab		
Does site conduct field chemistry	Question similar to # 12 on Site Information. Removed from NTN sample?	Only "yes" if removed from NTN sample - new procedure - pour 75 ml into NTN bottle and seal - use bucket for other
Measured conductivity of audit sample	Is there a criterion?	Discussed with Jane - not as tight as lab tolerance - send remaining audit sample back to Jane

Table of Questions Requiring Revision and Action Taken (*continued*)

Question as it Currently Exists in Questionnaire	Issues with the questions	Decision Made, Possible Solution or Clarification
Measured pH of audit sample	Is there a criterion?	Discussed with Jane - not as tight as lab tolerance - send remaining audit sample back to Jane
Temperature of blank bottles in refrigerator	Is there a criterion? Degrees C or F	Modify question: Temperature of blank bottles and samples in refrigerator (C) Should be 4 degrees C
Supplies		
Sample mailers on hand Black Box w/blue tape	No one uses black box mailers... Is this question needed?	Remove question
Temperature blank bottles on hand	Are blanks sent with each sample mailing and should they have a supply of "blank bottles"	Remove question - same as #18 above
Order gloves	Clarify - specific from each lab?	MDN (gloves from HAL) must be used for MDN procedures - CAL gloves should be used for NTN and AIRMoN
Stick Gage		
1.21 Inch Calibration Check - PASSED	We would like to calculate challenge depths based on the actual diameters these could be different for each gage and entered like Belfort calibration or balance calibration	New question - adding 500 ml to tube and calculating challenge depth - reporting standard and response: 500 ml test challenge

Table of Questions Requiring Revision and Action Taken (*continued*)

Question as it Currently Exists in Questionnaire	Issues with the questions	Decision Made, Possible Solution or Clarification
2.43 Inch Calibration Check - PASSED		New question - adding 1000 ml to tube and calculating challenge depth - reporting standard and response: 1000 ml test challenge
→	Would like to add question regarding diameter of funnel →	New question : Diameter of funnel
→	Would like to add question regarding diameter tube →	New question: Diameter of tube
Backup Gage		
No objects > 1 m height inside 5 m radius (backup raingage)	Same as siting criteria questions	Greater than 1 meter height starting from bottom of gage.
No fences > 1 m height inside 2 m radius (backup raingage)	Same as siting criteria questions	Greater than 1 meter height starting from bottom of gage.
No vegetation height > 0.6 m within 5 m radius (backup raingage)	Same as siting criteria questions	Greater than 1 meter height starting from bottom of gage.

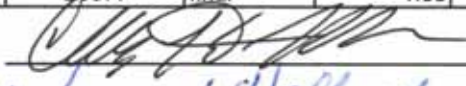
APPENDIX D

Transfer Standard Instrument Certifications

Weight / Balance Calibration Log

Date	Balance SN#	Weight SN#	Cal Type	Std. (g)	Act. (g)	Calibrator	Notes
10/30/2008	8028481064	26677	Int.	1000.00	1000.09	CKH	Scale Cal
10/30/2008	8028481064	26677	Int.	100.00	99.99	CKH	Scale Cal
10/30/2008	8028481064	26677	Int.	50.00	50.00	CKH	Scale Cal
10/30/2008	8028481064	26677	Int.	20.00	20.00	CKH	Scale Cal
10/30/2008	8028481064	26677	Int.	10.00	10.00	CKH	Scale Cal
10/30/2008	8028481064	26677	Int.	5.00	5.00	CKH	Scale Cal
10/30/2008	8028481064	26677	Int.	2.00	2.00	CKH	Scale Cal
10/30/2008	8028481064	26677	Int.	1.00	1.00	CKH	Scale Cal
10/30/2008	8028481064	2008-1	weight	205.00	205.11	CKH	1/4" rain weights
10/30/2008	8028481064	2008-2	weight	205.00	205.08	CKH	1/4" rain weights
10/30/2008	8028481064	2008-3	weight	205.00	205.11	CKH	1/4" rain weights
10/30/2008	8028481064	2008-4	weight	205.00	205.02	CKH	1/4" rain weights
10/30/2008	8028481064	2008-5	weight	205.00	205.08	CKH	1/4" rain weights
10/30/2008	8028481064	2008-6	weight	205.00	205.07	CKH	1/4" rain weights
10/30/2008	8028481064	2008-7	weight	205.00	205.10	CKH	1/4" rain weights
10/30/2008	8028481064	2008-8	weight	205.00	204.96	CKH	1/4" rain weights
10/30/2008	8028481064	0-#2	weight	1000.25	1000.25	CKH	bucket equivalent
10/30/2008	8028481064	1-12	weight	824.78	824.77	CKH	Belfort weights #1
10/30/2008	8028481064	1-11	weight	824.72	824.72	CKH	Belfort weights #1
10/30/2008	8028481064	1-10	weight	822.87	822.87	CKH	Belfort weights #1
10/30/2008	8028481064	1-9	weight	824.40	824.41	CKH	Belfort weights #1
10/30/2008	8028481064	1-8	weight	823.72	823.71	CKH	Belfort weights #1
10/30/2008	8028481064	1-7	weight	824.49	824.49	CKH	Belfort weights #1
10/30/2008	8028481064	1-6	weight	824.89	824.86	CKH	Belfort weights #1
10/30/2008	8028481064	1-5	weight	823.34	823.34	CKH	Belfort weights #1
10/30/2008	8028481064	1-4	weight	823.07	823.06	CKH	Belfort weights #1
10/30/2008	8028481064	1-3	weight	823.75	823.74	CKH	Belfort weights #1
10/30/2008	8028481064	1-2	weight	824.64	824.62	CKH	Belfort weights #1
10/30/2008	8028481064	1-1	weight	824.20	824.17	CKH	Belfort weights #1
10/30/2008	8028481064				206.08	CKH	Scott's 1/4" rain weights
10/30/2008	8028481064				206.27	CKH	Scott's 1/4" rain weights
10/30/2008	8028481064				206.44	CKH	Scott's 1/4" rain weights
10/30/2008	8028481064				206.30	CKH	Scott's 1/4" rain weights
10/30/2008	8028481064						
10/30/2008	8028481064	26677	final	1000.00	1000.08	CKH	scale check
10/30/2008	8028481064	26677	final	5000.00	500.02	CKH	scale check
10/30/2008	8028481064	26677	final	200.00	200.00	CKH	scale check
10/30/2008	8028481064	26677	final	100.00	100.00	CKH	scale check
10/30/2008	8028481064	26677	final	50.00	50.00	CKH	scale check
10/30/2008	8028481064	26677	final	20.00	20.00	CKH	scale check
10/30/2008	8028481064	26677	final	10.00	10.00	CKH	scale check
10/30/2008	8028481064	26677	final	5.00	5.00	CKH	scale check
10/30/2008	8028481064	26677	final	2.00	2.00	CKH	scale check
10/30/2008	8028481064	26677	final	1.00	1.00	CKH	scale check

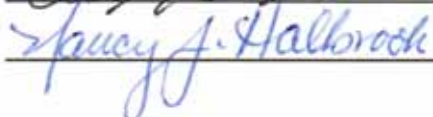
Calibrator Signature: _____



Date: _____

10/30/08

Reviewer Signature: _____



Date: _____

10/30/2008

Range Finder Audit

Tape Distance meters

Keson 100ft

EEMS# 01060

10.00
11.00
12.00
13.00
14.00
15.00
16.00
17.00
18.00
19.00
20.00
21.00
22.00
23.00
24.00
25.00
26.00
27.00
28.00
29.00
30.00

Range Finder Display meters

Nikon ProStaff Laser 440 EEMS# 01043

Repeat 4 times- middle of unit line up

10.5
11.5
12.0
13.0
14.0
15.0
16.0
17.0
18.0
19.0
20.0
21.0
22.0
23.0
24.0
25.0
26.0
27.0
28.0
29.0
30.0

Notes: Target was a painted steel 8"x 8" plate. It was 55 deg F and sunny

Audited By: _____

[Signature]

Date: _____

1/31/09

Reviewed By: _____

[Signature]

Date: _____

1/31/2009

Weight / Balance Calibration Log

Sandy's Set


Date	Balance SN#	Weight SN#	Cal Type	Std. (g)	Wgt. As Marked (g)	Act. (g)	Calibrator	Notes
1/24/2009	8028481064	N/A	Initial	0.00		0.00	CKH	Initial Calibration of Balance
1/24/2009	8028481064	26677	Initial	1000.00		999.98	CKH	Initial Calibration of Balance
1/24/2009	8028481064	26677	Initial	500.00		499.97	CKH	Initial Calibration of Balance
1/24/2009	8028481064	26677	Initial	200.00		199.97	CKH	Initial Calibration of Balance
1/24/2009	8028481064	26677	Initial	100.00		99.98	CKH	Initial Calibration of Balance
1/24/2009	8028481064	26677	Initial	50.00		49.97	CKH	Initial Calibration of Balance
1/24/2009	8028481064	26677	Initial	20.00		19.98	CKH	Initial Calibration of Balance
1/24/2009	8028481064	26677	Initial	10.00		9.98	CKH	Initial Calibration of Balance
1/24/2009	8028481064	26677	Initial	5.00		4.98	CKH	Initial Calibration of Balance
1/24/2009	8028481064	26677	Initial	2.00		1.98	CKH	Initial Calibration of Balance
1/24/2009	8028481064	26677	Initial	1.00		1.00	CKH	Initial Calibration of Balance
1/24/2009	8028481064	N/A	Initial	0.00		0.00	CKH	Initial Calibration of Balance
1/24/2009	8028481064	1-0		N/A	1034.55	1034.37		Bucket Equiv. Weight Set #1
1/24/2009	8028481064	2-1		N/A	824.24	824.18		Belfort Field Set #2
1/24/2009	8028481064	2-2		N/A	823.47	823.40		
1/24/2009	8028481064	2-3		N/A	825.30	825.18		
1/24/2009	8028481064	2-4		N/A	823.82	823.75		
1/24/2009	8028481064	2-5		N/A	823.87	823.80		
1/24/2009	8028481064	2-6		N/A	824.62	824.50		
1/24/2009	8028481064	N/A	Mid-Check	0.00				Mid-Check
1/24/2009	8028481064	26677		200.00				
1/24/2009	8028481064	26677		500.00				
1/24/2009	8028481064	26677		1000.00		1000.00		
1/24/2009	8028481064	N/A		0.00		0.00		
1/24/2009	8028481064	2-7			825.05	824.94		Belfort Field Set #2
1/24/2009	8028481064	2-8			824.90	824.80		
1/24/2009	8028481064	2-9			824.31	824.22		
1/24/2009	8028481064	2-10			823.85	823.80		
1/24/2009	8028481064	2-11			824.00	823.94		
1/24/2009	8028481064	2-12			823.49	823.43		
1/24/2009	8028481064	N/A	Final	0.00		0.00		Post Cal
1/24/2009	8028481064	26677		1.00		1.01		
1/24/2009	8028481064	26677		2.00		2.00		
1/24/2009	8028481064	26677		5.00		5.00		
1/24/2009	8028481064	26677		10.00		10.00		
1/24/2009	8028481064	26677		20.00		20.00		
1/24/2009	8028481064	26677		50.00		50.00		
1/24/2009	8028481064	26677		100.00		99.99		
1/24/2009	8028481064	26677		200.00		199.99		
1/24/2009	8028481064	26677		500.00		499.99		
1/24/2009	8028481064	26677		1000.00		1000.00		

Calibrator Signature: _____

Date: _____

Reviewer Signature: _____

Date: _____


1/24/09
1/25/2009

Weight / Balance Calibration Log

Eric's Set

Date	Balance SN#	Weight SN#	Cal Type	Std. (g)	Wgt. As Marked (g)	Act. (g)	Calibrator	Notes
1/25/2009	8028481064	N/A	Initial	0.00		0.00	CKH	Initial Calibration of Balance
1/25/2009	8028481064	26677	Initial	1000.00		1000.02	CKH	Initial Calibration of Balance
1/25/2009	8028481064	26677	Initial	500.00		499.99	CKH	Initial Calibration of Balance
1/25/2009	8028481064	26677	Initial	200.00		199.99	CKH	Initial Calibration of Balance
1/25/2009	8028481064	26677	Initial	100.00		100.00	CKH	Initial Calibration of Balance
1/25/2009	8028481064	26677	Initial	50.00		50.00	CKH	Initial Calibration of Balance
1/25/2009	8028481064	26677	Initial	20.00		20.00	CKH	Initial Calibration of Balance
1/25/2009	8028481064	26677	Initial	10.00		10.00	CKH	Initial Calibration of Balance
1/25/2009	8028481064	26677	Initial	5.00		5.00	CKH	Initial Calibration of Balance
1/25/2009	8028481064	26677	Initial	2.00		2.00	CKH	Initial Calibration of Balance
1/25/2009	8028481064	26677	Initial	1.00		1.00	CKH	Initial Calibration of Balance
1/25/2009	8028481064	N/A	Initial	0.00		0.00	CKH	Initial Calibration of Balance
1/25/2009	8028481064							
1/25/2009	8028481064	3-1		N/A	823.33	823.24		Belfort Field Set #3
1/25/2009	8028481064	3-2		N/A	823.18	823.08		
1/25/2009	8028481064	3-3		N/A	824.63	824.54		
1/25/2009	8028481064	3-4		N/A	824.50	824.29		
1/25/2009	8028481064	3-5		N/A	824.81	824.62		
1/25/2009	8028481064	3-6		N/A	822.93	822.82		
1/25/2009	8028481064	N/A	Mid-Check	0.00	0.00	0.00		Mid-Check
1/25/2009	8028481064	26677		200.00	200.00			
1/25/2009	8028481064	26677		500.00	500.00			
1/25/2009	8028481064	26677		1000.00	1000.03	1000.02		
1/25/2009	8028481064	N/A		0.00	0.00			
1/25/2009	8028481064	3-7			823.78	823.74		Belfort Field Set #3
1/25/2009	8028481064	3-8			823.43	823.32		
1/25/2009	8028481064	3-9			822.99	822.96		
1/25/2009	8028481064	3-10			823.50	823.46		
1/25/2009	8028481064	3-11			823.78	823.76		
1/25/2009	8028481064	3-12			823.76	823.73		
1/25/2009	8028481064	N/A		0.00		0.00		Mid-Check
1/25/2009	8028481064	26677		200.00		199.99		
1/25/2009	8028481064	26677		210.10		209.98		
1/25/2009		E1-1			208.00	207.70		Field Set #E1
1/25/2009		E1-2			207.00	206.57		
1/25/2009		E1-3			204.50	204.62		
1/25/2009		E1-4			204.00	204.29		
1/25/2009	8028481064	N/A	Final	0.00		0.00		Post Calibration
1/25/2009	8028481064	26677		1.00		1.00		
1/25/2009	8028481064	26677		2.00		2.00		
1/25/2009	8028481064	26677		5.00		5.01		
1/25/2009	8028481064	26677		10.00		10.00		
1/25/2009	8028481064	26677		20.00		20.00		
1/25/2009	8028481064	26677		50.00		49.99		
1/25/2009	8028481064	26677		100.00		100.01		
1/25/2009	8028481064	26677		200.00		199.99		
1/25/2009	8028481064	26677		500.00		500.00		
1/25/2009	8028481064	26677		1000.00		1000.04		

Calibrator Signature: _____

C. Hallbrook

Date: _____

1/25/09

Reviewer Signature: _____

Spacy J. Hallbrook

Date: _____

1/25/2009

Range Finder Audit

Tape Distance meters

Keson 100ft

EEMS# 01060

10.00
11.00
12.00
13.00
14.00
15.00
16.00
17.00
18.00
19.00
20.00
21.00
22.00
23.00
24.00
25.00
26.00
27.00
28.00
29.00
30.00

Range Finder Display meters

Nikon ProStaff Laser 440 EEMS# 01041

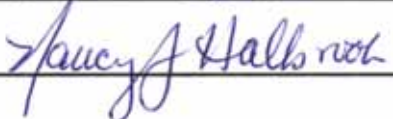
Repeat 4 times- middle of unit line up

10.0
11.0
12.0
13.0
14.0
15.0
16.0
17.0
18.0
19.0
20.0
21.0
22.0
23.0
24.0
25.0
26.0
27.0
28.0
29.0
30.0

Notes: Target was a painted steel 8"x 8" plate. It was 55 deg F and sunny

Audited By: 

Date: 1/31/09

Reviewed By: 

Date: 1/31/2009

Range Finder Audit

Tape Distance meters

Keson 100ft
EEMS# 01060

0.50
1.00
1.50
2.00
2.50
3.00
3.50
4.00
4.50
5.00
5.50
6.00
6.50
7.00
7.50
8.00
8.50
9.00
9.50
10.00
10.50
11.00
11.50
12.00
12.50
13.00
13.50
14.00
14.50
15.00

Range Finder Display meters

Stanley Fat Max Laser Measurer TLM100 EEMS# 01044

Repeat 4 times- rear of unit line up

0.505
1.007
1.506
2.008
2.505
3.009
3.507
4.006
4.508
5.007
5.506
6.005
6.505
7.003
7.504
8.001
8.503
9.004
9.505
10.002
10.501
11.003
11.505
12.006
12.504
13.000
13.500
14.002
14.502
15.001

Notes: Target was a painted concrete wall. It was 55 deg F and sunny

Audited By: 

Date: 1/31/09

Reviewed By: 

Date: 1/31/2009

Range Finder Audit

Tape Distance meters

Keson 100ft

Range Finder Display meters

Nikon ProStaff Laser 440 EEMS# 01040

Repeat 4 times- middle of unit line up

10.00	10.5
11.00	11.0
12.00	12.0
13.00	13.0
14.00	14.0
15.00	15.0
16.00	16.0
17.00	17.0
18.00	18.0
19.00	19.0
20.00	20.0
21.00	21.0
22.00	22.0
23.00	23.0
24.00	24.0
25.00	25.0
26.00	26.0
27.00	27.0
28.00	28.0
29.00	29.0
30.00	30.0

Notes: Target was a painted steel 8"x 8" plate. It was 50 deg F and sun setting

Audited By: 

Date: 2/3/09

Reviewed By: 

Date: 2/3/09

Fluke Thermocouple Calibration

Fluke 287 EEMS# 01311

Thermocouple EEMS# 01236

Eutechnics 4600 Transfer Standard EEMS# 01230, Probe EEMS# 01231- Calibration Date: 01/19/2009

Post Calibration "AS Found"

Offset= +000.0

Transfer Standard deg C

<u>Raw</u>	<u>Corr.</u>
66.80	66.80
35.15	35.15
18.92	18.93
1.01	1.01

Fluke 287 deg C

66.4

34.6

18.5

1.3

Pre Calibration "As Left"

Offset= -000.2

Transfer Standard deg C

<u>Raw</u>	<u>Corr.</u>
56.40	56.41
30.62	30.61
17.60	17.61
0.31	0.31

Fluke 287 deg C

56.4

30.5

17.6

0.4

Calibrated By: _____



Date: _____

2/1/09

Reviewed By: _____



Date: _____

2/1/09

Fluke Thermocouple Calibration

Fluke 287 EEMS# 01312

Thermocouple EEMS# 01237

Eutechnics 4600 Transfer Standard EEMS# 01230, Probe EEMS# 01231- Calibration Date: 01/19/2009

Post Calibration "AS Found"

Offset= +000.0

Transfer Standard deg C

Fluke 287 deg C

Raw Corr.

66.50 66.50

65.4

35.00 35.00

34.1

18.95 18.96

18.3

1.02 1.02

0.9

Pre Calibration "As Left"

Offset= +000.2

Transfer Standard deg C

Fluke 287 deg C

Raw Corr.

57.50 57.51

57.5

30.62 30.61

30.6

17.61 17.62

17.6

0.28 0.28

0.3

Calibrated By: 

Date: 2-1-09

Reviewed By: 

Date: 2/1/09

Certificate of Calibration

Certificate Number
A513853Customer: EE & MS
1950 NW 39TH PLACE
GAINESVILLE, FL 32605
352-317-2463

P.O. Number: CALL FOR C/C

ID Number: 01H0060

Description:	PROBE	Calibration Date:	1/19/2009
Manufacturer:	UNKNOWN	Calibration Due:	1/19/2010
Model Number:	SP034-39	Procedure:	TMI-M-THERMOMETER
Serial Number:	01H0060	Rev:	
Technician:	TOM CROTHERS	Temperature:	72 °F
		Humidity:	38 % RH
		As Found Condition:	IN-TOLERANCE
		Calibration Results:	PASS

Comments:

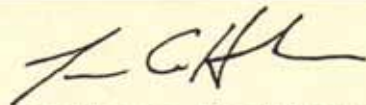
This instrument has been calibrated using standards traceable to the National Institute of Standards and Technology, derived from natural physical constants, ratio measurements or compared to consensus standards. Unless otherwise noted, the method of calibration is direct comparison to a known standard.

Reported uncertainties and "test uncertainty ratios" (TUR's) are expressed as expanded uncertainty values at approximately 95% confidence level using a coverage factor of K-2. A TUR of 4:1 is routinely observed unless otherwise noted on the certificate. 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 complies with the requirements of ISO 9001, ANSI/NCSL Z540-1, ISO 10012 and MIL STD 45662A.

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.

This certificate shall not be reproduced, except in full, without the written permission of Technical Maintenance, Inc.



Jason Hardman, Branch Manager



Jack Shuler, Quality Manager

Calibration Standards

<u>Asset Number</u>	<u>Manufacturer</u>	<u>Model Number</u>	<u>Serial Number</u>	<u>Cal Due</u>
1092	YELLOW SPRINGS INC	8167-25	1092	7/2/2010
A06118	HART SCIENTIFIC	9103-A	A06118	2/21/2009
A88072	FLUKE	1502A	A88072	8/11/2009



Technical Maintenance, Inc.

12530 Telecom Drive, Temple Terrace, FL 33637

(813) 978-3054 Fax: (813) 978-3758

www.tmicalibration.comCertified to ISO 9001:2000
By Underwriters Laboratories, Inc
Certificate # A2734

Certificate of Calibration

Certificate Number
A513852Customer: EE & MS
1950 NW 39TH PLACE
GAINESVILLE, FL 32605
352-317-2463

P.O. Number: CALL FOR C/C

ID Number: 01D102193

Description:	TEMPERATURE INDICATOR	Calibration Date:	1/19/2009
Manufacturer:	EUTECHNICS	Calibration Due:	1/19/2010
Model Number:	4600-1.2.5	Procedure:	TMI-M-TEMPERATURE
Serial Number:	01D102193	Rev:	
Technician:	TOM CROTHERS	Temperature:	72 °F
		Humidity:	38 % RH
		As Found Condition:	IN-TOLERANCE
		Calibration Results:	PASS

Comments:

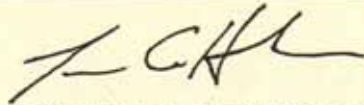
This instrument has been calibrated using standards traceable to the National Institute of Standards and Technology, derived from natural physical constants, ratio measurements or compared to consensus standards. Unless otherwise noted, the method of calibration is direct comparison to a known standard.

Reported uncertainties and "test uncertainty ratios" (TUR's) are expressed as expanded uncertainty values at approximately 95% confidence level using a coverage factor of K-2. A TUR of 4:1 is routinely observed unless otherwise noted on the certificate. 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 complies with the requirements of ISO 9001, ANSI/NC SL Z540-1, ISO 10012 and MIL STD 45662A.

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.

This certificate shall not be reproduced, except in full, without the written permission of Technical Maintenance, Inc.



Jason Hardman, Branch Manager



Jack Shuler, Quality Manager

Calibration Standards

<u>Asset Number</u>	<u>Manufacturer</u>	<u>Model Number</u>	<u>Serial Number</u>	<u>Cal Due</u>
1092	YELLOW SPRINGS INC	8167-25	1092	7/2/2010
A06118	HART SCIENTIFIC	9103-A	A06118	2/21/2009
A88072	FLUKE	1502A	A88072	8/11/2009



Technical Maintenance, Inc.

12530 Telecom Drive, Temple Terrace, FL 33637

(813) 978-3054 Fax: (813) 978-3758

www.tmicalibration.comCertified to ISO 9001:2000
By Underwriters Laboratories, Inc
Certificate # A2734

INSTRUMENT DATA SHEET

Digital Thermometer/Probe

Serial Number: 01H0060 Customer: EE & MS
 Date Tested: 01/19/2009

<u>Parameter Tested</u>	<u>Nominal Value</u>	<u>Tolerance</u>	<u>Lower Limit</u>	<u>Upper Limit</u>	<u>As Found</u>	<u>Pass/Fail</u>	<u>As Left</u>	<u>Correction</u>
Temperature Accuracy								
Deg. C	0.056	+/- .025	0.031	0.081	.054	PASS	AS FOUND	-0.002
	10.019	+/- .025	9.994	10.044	10.029	PASS	AS FOUND	0.010
	19.999	+/- .025	19.974	20.024	20.009	PASS	AS FOUND	0.010
	30.017	+/- .025	29.992	30.042	30.004	PASS	AS FOUND	-0.013
	39.982	+/- .025	39.957	39.971	39.989	PASS	AS FOUND	0.007
	49.946	+/- .025	49.921	49.971	49.952	PASS	AS FOUND	0.006

INSTRUMENT DATA SHEET

Digital Thermometer/Probe

Serial Number: 01D102193 Customer: EE & MS
 Date Tested: 01/19/2009

<u>Parameter Tested</u>	<u>Nominal Value</u>	<u>Tolerance</u>	<u>Lower Limit</u>	<u>Upper Limit</u>	<u>As Found</u>	<u>Pass/Fail</u>	<u>As Left</u>	<u>Correction</u>
Temperature Accuracy								
Deg. C	0.056	+/- .025	0.031	0.081	.054	PASS	AS FOUND	-0.002
	10.019	+/- .025	9.994	10.044	10.029	PASS	AS FOUND	0.010
	19.999	+/- .025	19.974	20.024	20.009	PASS	AS FOUND	0.010
	30.017	+/- .025	29.992	30.042	30.004	PASS	AS FOUND	-0.013
	39.982	+/- .025	39.957	39.971	39.989	PASS	AS FOUND	0.007
	49.946	+/- .025	49.921	49.971	49.952	PASS	AS FOUND	0.006



Warren-Knight Instrument Company

2045 Bennett Road

Philadelphia, PA 19116

Phone: 215-464-9300; Fax: 215-464-9303

Web: <http://www.warrenind.com>

CERTIFICATION OF CALIBRATION AND CONFORMANCE

We hereby certify that the equipment below has been manufactured and/or inspected by standards traceable to NIST. Calibration of the specified instrument has been performed in compliance with ANSI Z540-1 requirements. It is warranted that the equipment has been calibrated to be in full conformance with the drawings and specifications of the instrument. Calibration tests were performed on the material specified below and were in accordance with all applicable quality assurance requirements with data on file at our facility.

Customer Name:	EE & MS
Purchase Order #:	
Instrument:	S25 Compass
Serial Number:	191832
Quantity:	1
Calibration Due:	1/2010

John Noga, Quality Control

January 12, 2009

Measurement Standards:

Theodolite: Wild T-3 S/N 18801/CAL 5/14/97 NIST# 738/229329-83 738/223398

Optical Wedge: K&E 71-7020 S/N 5167/CAL 4/19/01 NIST# 731/244084-89



Warren-Knight Instrument Company

2045 Bennett Road

Philadelphia, PA 19116

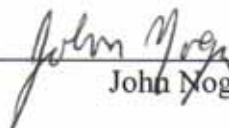
Phone: 215-464-9300; Fax: 215-464-9303

Web: <http://www.warrenind.com>

CERTIFICATION OF CALIBRATION AND CONFORMANCE

We hereby certify that the equipment below has been manufactured and/or inspected by standards traceable to NIST. Calibration of the specified instrument has been performed in compliance with ANSI Z540-1 requirements. It is warranted that the equipment has been calibrated to be in full conformance with the drawings and specifications of the instrument. Calibration tests were performed on the material specified below and were in accordance with all applicable quality assurance requirements with data on file at our facility.

Customer Name:	EE & MS
Purchase Order #:	
Instrument:	S25 Compass
Serial Number:	192034
Quantity:	1
Calibration Due:	1/2010


John Noga, Quality Control

January 12, 2009

Measurement Standards:

Theodolite: Wild T-3 S/N 18801/CAL 5/14/97 NIST# 738/229329-83 738/223398

Optical Wedge: K&E 71-7020 S/N 5167/CAL 4/19/01 NIST# 731/244084-89

Calibration Certificate



NQA ISO 9000:2000 (10100/2)

Description:	TRUE RMS MULTIMETER	Certificate Number:	1567749-86590148:1230648041
Manufacturer:	FLUKE	Date of Calibration:	30 December 2008
Model:	187	Date of Certificate:	30 December 2008
Serial Number:	86590148	Date Due:	30 December 2009
Customer Name:	EEMS	Procedure Name:	FLUKE 187: (1 YEAR) ZCAL VER RS-232 /5520
City, State:	GAINESVILLE, FL	Procedure Revision:	2.0
Customer Item ID:	86590148	Data Type:	FOUND-LEFT
PO Number:	HALBROOK CCS	Temperature:	23.00 °Celsius
RMA Number:	4128507	Relative Humidity:	25% ≤ RH ≤ 60%
Result Summary:	PASS		

The Data type that could be found in this certificate must be interpreted as:

- As-Found - Calibration data collected before the unit is adjusted and/or repaired.
- As-Left - Calibration data collected after the unit is adjusted and/or repaired.
- Found-Left - Calibration data collected without any adjustment and/or repair performed.

This certificate applies only to the item identified and shall not be reproduced other than in full, without the specific written approval by Fluke Corporation. The user is obliged to have the object recalibrated at appropriate intervals.

Comments:

Long Le

Metrology Technician

Traceability Information

For each parameter listed below the calibration was conducted using an unbroken chain of standards to:

DC Voltage

The Voltage Reference standard group, traceable to the Fluke Primary Standards Laboratory, which is traceable to the U.S. representation of the volt, through the internationally accepted value of the Josephson constant $K_J=483597.9$ GHz/V and a 10 Volt Josephson Array Voltage Standard.

Frequency and Period

The GPS-Rubidium Disciplined oscillator frequency standard, traceable to the United States Naval Observatory (USNO), which is traceable to the National Institute of Standards and Technology.

AC Voltage, Resistance, DC Current, AC Current, Capacitance, Inductance, Phase

The Fluke Primary Standards Laboratory, which is traceable to the National Institute of Standards and Technology.

AC Voltage Flatness

The Fluke Primary Standards Laboratory, or Agilent Technologies Standards Laboratory which are traceable to the National Institute of Standards and Technology.

Humidity

The Vaisala Measurement Standards Laboratory Primary Salt calibration bath, with traceability based on the physical phenomena in which the equilibrium relative humidity values associated with certain saturated salt solutions are known.

Rise Time

The Tektronix GmbH Calibration Laboratory which is traceable to the Physikalisch-Technische Bundesanstalt.

Radiation Temperature

The National Institute of Standards and Technology, the Physikalisch-Technische Bundesanstalt, or Hart Scientific.

Contact Temperature

The Fluke Primary Standards Laboratory, Hart Scientific, which are traceable to the National Institute of Standards and Technology.

Gas Flow

The DHI Calibration Laboratory, which is traceable to the National Institute of Standards and Technology.

Pressure

The DHI Calibration Laboratory, which is traceable to the Laboratoire National D'Essais, Physikalisch-Technische Bundesanstalt and National Institute of Standards and Technology, or traceable to the Mensor or Ashcroft Calibration Laboratories, which are traceable to the National Institute of Standards and Technology.

Standards Used

Asset #	Instrument Model	Cal Date	Cal Due
10127	FLUKE 5520A CALIBRATOR	28 August 2008	28 May 2009

End of Report



Calibration Certificate

Description:	TRUE RMS MULTIMETER	Certificate Number:	2740201-95740243:1230647033
Manufacturer:	FLUKE	Date of Calibration:	30 December 2008
Model:	287	Date of Certificate:	30 December 2008
Serial Number:	95740243	Date Due:	30 December 2009
Customer Name:	EEMS	Procedure Name:	FLUKE 287: (1 YEAR) ZCAL VER RS-232 /5520
City, State:	GAINESVILLE, FL	Procedure Revision:	1.3
Customer Item ID:	95740243	Data Type:	FOUND-LEFT
PO Number:	HALBROOK CCS	Temperature:	23.00 °Celsius
RMA Number:	4128507	Relative Humidity:	25% ≤ RH ≤ 60%
Result Summary:	PASS		

The Data type that could be found in this certificate must be interpreted as:

- As-Found - Calibration data collected before the unit is adjusted and/or repaired.
- As-Left - Calibration data collected after the unit is adjusted and/or repaired.
- Found-Left - Calibration data collected without any adjustment and/or repair performed.

This certificate applies only to the item identified and shall not be reproduced other than in full, without the specific written approval by Fluke Corporation. The user is obliged to have the object recalibrated at appropriate intervals.

Comments:

Long Le

Metrology Technician

Traceability Information

For each parameter listed below the calibration was conducted using an unbroken chain of standards to:

DC Voltage

The Voltage Reference standard group, traceable to the Fluke Primary Standards Laboratory, which is traceable to the U.S. representation of the volt, through the internationally accepted value of the Josephson constant $K_j=483597.9$ GHz/V and a 10 Volt Josephson Array Voltage Standard.

Frequency and Period

The GPS-Rubidium Disciplined oscillator frequency standard, traceable to the United States Naval Observatory (USNO), which is traceable to the National Institute of Standards and Technology.

AC Voltage, Resistance, DC Current, AC Current, Capacitance, Inductance, Phase

The Fluke Primary Standards Laboratory, which is traceable to the National Institute of Standards and Technology.

AC Voltage Flatness

The Fluke Primary Standards Laboratory, or Agilent Technologies Standards Laboratory which are traceable to the National Institute of Standards and Technology.

Humidity

The Vaisala Measurement Standards Laboratory Primary Salt calibration bath, with traceability based on the physical phenomena in which the equilibrium relative humidity values associated with certain saturated salt solutions are known.

Rise Time

The Tektronix GmbH Calibration Laboratory which is traceable to the Physikalisch-Technische Bundesanstalt.

Radiation Temperature

The National Institute of Standards and Technology, the Physikalisch-Technische Bundesanstalt, or Hart Scientific.

Contact Temperature

The Fluke Primary Standards Laboratory, Hart Scientific, which are traceable to the National Institute of Standards and Technology.

Gas Flow

The DHI Calibration Laboratory, which is traceable to the National Institute of Standards and Technology.

Pressure

The DHI Calibration Laboratory, which is traceable to the Laboratoire National D'Essais, Physikalisch-Technische Bundesanstalt and National Institute of Standards and Technology, or traceable to the Mensor or Ashcroft Calibration Laboratories, which are traceable to the National Institute of Standards and Technology.

Standards Used

Asset #	Instrument Model	Cal Date	Cal Due
10127	FLUKE 5520A CALIBRATOR	28 August 2008	28 May 2009

End of Report



Calibration Certificate

Description:	TRUE RMS MULTIMETER	Certificate Number:	2740201-95740135:1225441921
Manufacturer:	FLUKE	Date of Calibration:	31 October 2008
Model:	287	Date of Certificate:	31 October 2008
Serial Number:	95740135	Date Due:	31 October 2009
Customer Name:	EEMS	Procedure Name:	FLUKE 287: (1 YEAR) ZCAL VER RS-232 /5520
City, State:	GAINESVILLE, FL	Procedure Revision:	1.3
Customer Item ID:	95740135	Data Type:	FOUND-LEFT
PO Number:	HALBROOK CCS	Temperature:	22.19 °Celsius
RMA Number:	4077877	Relative Humidity:	25% ≤ RH ≤ 60%
Result Summary:	PASS		

The Data type that could be found in this certificate must be interpreted as:

- As Found - Calibration data collected before the unit is adjusted and/or repaired.
- As Left - Calibration data collected after the unit is adjusted and/or repaired.
- As Found/ As Left - Calibration data collected without any adjustment and/or repair performed.

This certificate applies only to the item identified and shall not be reproduced other than in full, without the specific written approval by Fluke Corporation. The user is obliged to have the object recalibrated at appropriate intervals.

Comments:

Long Le
Metrology Technician



Warren-Knight Instrument Company

2045 Bennett Road

Philadelphia, PA 19116


Phone: 215-464-9300; Fax: 215-464-9303

Web: <http://www.warrenind.com>

CERTIFICATION OF CALIBRATION AND CONFORMANCE

We hereby certify that the equipment below has been manufactured and/or inspected by standards traceable to NIST. Calibration of the specified instrument has been performed in compliance with ANSI Z540-1 requirements. It is warranted that the equipment has been calibrated to be in full conformance with the drawings and specifications of the instrument. Calibration tests were performed on the material specified below and were in accordance with all applicable quality assurance requirements with data on file at our facility.

Customer Name:	EE & MS
Purchase Order #:	
Instrument:	S25 COMPASS
Serial Number:	190037
Quantity:	1
Calibration Due:	11/2009


John Noga, Quality Control

November 10, 2008

Measurement Standards:

Theodolite: Wild T-3 S/N 18801/CAL 5/14/97 NIST# 738/229329-83 738/223398

Optical Wedge: K&E 71-7020 S/N 5167/CAL 4/19/01 NIST# 731/244084-89