Atmospheric Mercury Network
Data Management Manual

National Atmospheric Deposition Program

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Abbreviations

AIRMoN	Atmospheric Integrated Research Monitoring Network
AMNet	Atmospheric Mercury Network
AMoN	Ammonia Monitoring Network
CAMD	Clean Air Markets Division
CAMNet	Canadian Atmospheric Mercury Network
CASTNET	Clean Air Status and Trends Network
CVAFS	Cold Vapor Atomic Fluorescence Spectroscopy
DFU	Dry Filter Unit
DQO	Data Quality Objective
GEM	Gaseous Elemental Mercury (expressed in ng/m^3)
GOM	Gaseous Oxidized Mercury (expressed in pg/m^3)
Hg	Mercury
MDE	Mercury Deposition Event
MDN	Mercury Deposition Network
MSDS	Material Safety Data Sheet
NADP	National Atmospheric Deposition Program
NED	Network Equipment Depot
NIST	National Institute of Standards and Technology
NTN	National Trends Network
NYSDEC	New York State Department of Environmental Conservation
$PBM_{2.5}$	Particulate-Bound Mercury less than 2.5 μm in diameter (expressed in pg/m^3)
PO	Program Office
QA	Quality Assurance
QAAG	Quality Assurance Advisory Group
QC	Quality Control
RespFctr	Response Factor
RGM	Reactive Gaseous Mercury (expressed in pg/m^3)
SAES	State Agricultural Experiment Stations
SOP	Standard Operating Procedures
TGM	Total Gaseous Mercury (expressed in ng/m^3)
UHP	Ultra-High Purity
U.S. EPA	United States Environmental Protection Agency
USGS	United States Geological Survey

Units and Conversion Factors

°	degrees
°C	degrees Celcius
cm	centimeters
L	liters
lpm	liters per minute
m/sec	meters per second
mbar	millibars (1 mbar = 10^{-3} bar)
mm	millimeters (1 mm = 10^{-3} m)
ng	nanograms (1 ng = 10^{-9} g)
ng/m^3	nanograms per cubic meter
pg	picograms (1 pg = 10^{-12} g)
pg/m^3	picograms per cubic meter
psi	pounds per square inch
µm	micrometer (1 µm = 10^{-6} m)
V	volts
W/m^2	Watts per square meter

Introduction

This document, the *NADP AMNet Data Management Manual*, details the data practices within the Atmospheric Mercury Network (AMNet). It considers what data is captured, how that data is processed and stored, where the data will be made available, and when the data will be available. These processes ensure consistent data operations across the network and over time, and help ensure that the data quality objectives (DQOs) of the network are met.

Network Data

Table 1 lists the types of data products that are collected for use in the network, the frequency with which these products are collected and/or updated, and the individual(s) responsible for the data product. All data products will be maintained indefinitely at the National Atmospheric Deposition Program (NADP) Program Office (PO).

Table 1. AMNet Data Products.

Data Product	Frequency	Responsible Party
Tekran instrument data, raw data	Collect: 5 minute averages Submit to PO: monthly	Site Operator
Meteorological instrument data, raw data (site dependent)	Collect: 15 minute averages Submit to PO: monthly	
Tekran data, processed and quality-assured	Process: 60 minute, or 120 minute averages, based on instrument cycle Post: within 6 months of data submission	NADP Program Office
Meteorological data, processed and quality-assured (site dependent)	Process: 15 minute averages Post: within 6 months of data submission	
Site Report A *Each Visit/Weekly Activities**	Complete: each visit Submit to PO: monthly	Site Operator
Site Report B *Glassware Change-out/Monthly Activities**	Complete: as needed Submit to PO: monthly	
Site Report C *Quarterly Activities**	Complete: as needed Submit to PO: quarterly	
Site Report D *Annual/As-Needed Activities**	Complete: as needed Submit to PO: when completed	
Preliminary Data Reports to site	Monthly	Site Liaison
Site Liaison logs (e.g., phone, Email)	As needed	
Site Information Worksheet (SIW)	Submit to PO: prior to site start-up Update: as needed	Site Operator
Site sketch	Submit to PO: prior to site start-up Update: every 2 years	Site Operator, NADP Program Office
Site photos	Submit to PO: prior to site start-up Update: every 2 years	
Site Performance and Systems Survey reports	Once every 2 years	NADP Program Office

* Site Reports A-D are discussed in separate Standard Operating Procedure documents.

Data and Site Report Submission

Tekran instrument raw data files and the completed Site Reports should be uploaded to the NADP PO via the following URL: http://nadp.isws.illinois.edu/upload/amn. As indicated in Table 1, instrument data should be submitted monthly. Completed Site Reports should be submitted according to the report schedule. Questions and/or problems relating to the submission of these files should be directed to the AMNet Site Liaison (608-335-4232, amnet@isws.illinois.edu).

Measurement of Mercury Species

The Tekran 2537 system measures mercury concentration using cold vapor atomic fluorescence spectroscopy (CVAFS). Mercury sampling and measurement occurs for 2 out of every 3 hours of operation. During the first 2 hours of operation, the Tekran 2537 measures the concentration of gaseous elemental mercury (GEM). These measurements are made directly and are presented as 5-minute averages. Each average results from the operation (i.e., collection and analysis) of one of two cartridges that operate in alternating fashion. As alternating cartridges are used for the measurements, cartridge bias is evaluated as part of data validation.

Throughout the entire 2 hour sampling period, two other mercury species are concentrated for analysis at the end of the period. These species include gaseous oxidized mercury (GOM), and particulate-bound mercury of mean diameter less than or equal to 2.5 μm ($PBM_{2.5}$). The concentration of these species in ambient air is low, hence the need to concentrate them during the first two hours of instrument operation. Analysis for GOM and $PBM_{2.5}$ requires an hour to complete, and occurs during the third hour of instrument operation. No sampling occurs during this third hour of instrument operation, and GEM is not measured. The resulting concentrations for GOM and $PBM_{2.5}$ correspond to the first two hours of instrument operation, when sampling occurred.

Concentrations for GOM and $PBM_{2.5}$ are calculated using the equations listed below. The Cycle IDs used in the equations represent the cycles of operation of the Tekran 2537 instrumentation as identified in Table 2. Table 2 also includes the associated Event Flags and the cartridge used for the measurement, assuming normal start-up of the instrumentation. Event Flags appear in the untitled column to the right of the *Stat* column in the Tekran 2537 output, and are numeric values from 1 to 4. Figure 1 illustrates sample data from the Tekran 2537 and identifies the corresponding Event Flags and cycles of operation. Table 3 identifies the column names that are used with the Tekran 2537 output data. It should be noted that the cycles apply to the third hour of operation of the instrumentation, and do not include sampling or measurement of GEM.

$PBM_{2.5}$ (pg/m^3): Cycle(E) + Cycle(F) + Cycle(G) - 3*Cycle(C)

GOM (pg/m^3): Cycle(H) + Cycle(I) + Cycle(J) - 3*Cycle(C)

The majority of $PBM_{2.5}$ and GOM that were captured during the 2 hour sampling period is expected to be released (and measured) during cycles E and H, respectively. Values for cycles F, G, I, and J are expected to be much smaller by comparison, and in many cases will be 0 pg/m^3. Cycle(C) is also expected to have a value of 0 pg/m^3. It measures the concentration of mercury in the final system flush prior to measurement of $PBM_{2.5}$ and GOM. As indicated in Table 2, Cycle(E) and Cycle(H) are measured using different cartridges. Again, evaluation of cartridge bias is necessary as part of data validation.

Table 2. Tekran 2537 Cycles of Operation for Measurement of GOM and $PBM_{2.5}$.

Cycle ID	Cycle Description	Event Flags	Cartridge*
A	Flush	1	A
B	Flush	1	B
C	Flush	1	A
D	Pyrolyzer heating	2	B
E	$PBM_{2.5}$ heating	3	A
F	$PBM_{2.5}$ heating	3	B
G	$PBM_{2.5}$ heating	3	A
H	GOM heating	4	B
I	GOM heating	4	A
J	GOM heating	4	B
K	Cooling	1	A
L	Cooling	1	B

* Assumes normal startup of the Tekran instrumentation with Cartridge A.

Date	Time	Typ	C	Stat	AdTim	Vol	Bl	BlDev	MaxV	Area	**pg/m3**	
10-07-02	07:10:01	CONT	B	OKF	1 300	5.00	0.130	.061	0.131	3658	0.401	: A
10-07-02	07:15:01	CONT	A	NPF	1 300	4.99	0.130	.068	.000	0	.000	: B
10-07-02	07:20:01	CONT	B	NPF	1 300	4.99	0.130	.069	.000	0	.000	: C
10-07-02	07:25:01	CONT	A	OKF	2 300	4.99	0.129	.066	0.132	8497	0.899	: D
10-07-02	07:30:01	CONT	B	OKF	3 300	4.99	0.129	.078	0.159	111421	12.217	: E
10-07-02	07:35:01	CONT	A	NPF	3 300	4.99	0.129	.047	.000	0	.000	: F
10-07-02	07:40:01	CONT	B	NPF	3 300	4.99	0.130	.095	.000	0	.000	: G
10-07-02	07:45:01	CONT	A	OKF	4 300	5.00	0.130	.067	0.160	105635	11.177	: H
10-07-02	07:50:01	CONT	B	NPF	4 300	4.99	0.130	.056	.000	0	.000	: I
10-07-02	07:55:01	CONT	A	NPF	4 300	4.99	0.130	.070	.000	0	.000	: J
10-07-02	08:00:01	CONT	B	NPF	1 300	4.99	0.131	.078	.000	0	.000	: K
10-07-02	08:05:01	CONT	A	NPF	1 300	4.99	0.131	.057	.000	0	.000	: L

Figure 1. Sample output from the Tekran 2537 with Cycle IDs (far right column).

Table 3. Column Headers Used With Tekran 237 Output Data.

Column Header	Meaning	Units	Value
Date	start date of the measurement		MM:DD:YY
Time	start time of the measurement		HH:MM:SS (24-hr clock)
Typ	mode of operation		CLN, CONT, SPAN, ZERO
C	channel		A or B
Stat*	instrument status		M#, M#F, NP, NPF, OK, OKF, OL, OLF
AdTim	Sampling time	seconds	
Vol	sample volume	liters	
Bl	baseline voltage	volts	
BlDev	standard deviation of the baseline voltage	volts	
MaxV	peak voltage	volts	
Area	Area under the curve recorded by CVAFS analysis		
pg/m3	measured concentration	pg/m^3	

* "#"identifies the number of peaks (1-9),
"F" means a scaling factor has been applied to the measured concentration,
"M" means multiple peaks detected,
"NP" means no peak detected,
"OK" means a single peak was detected and that everything is ok,
"OL" means overload i.e., the peak height is out of range.

Data Validation

As indicated in Figure 2, validation of the Tekran instrument raw data is a three-step process. This process includes:

1. automated quality assurance (QA) checks,
2. manual inspection by the AMNet Site Liaison, and
3. approval by the Site Operator and/or Site Supervisor at each site

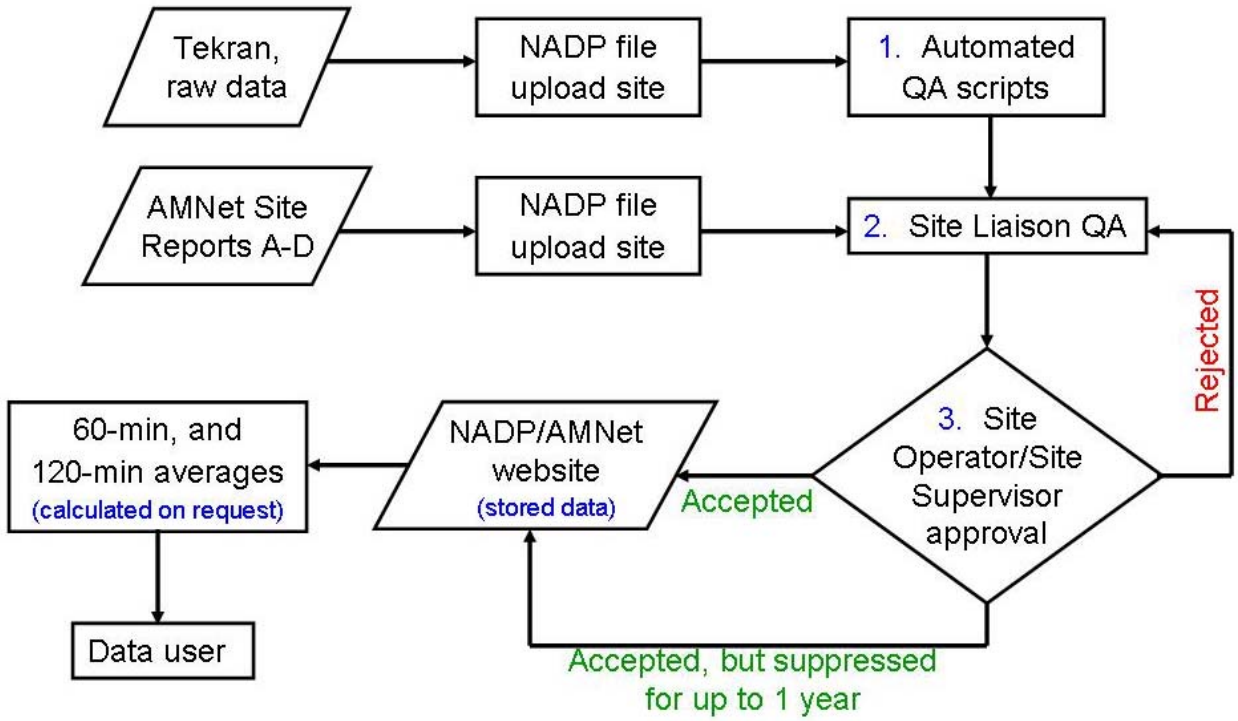

Figure 2. AMNet Quality Assurance and Data Flow Process.

Upon receipt at the NADP PO, the raw data files from the Tekran 2537 are imported into the AMNet SQL Server database. As part of the data import, quality assurance screening criteria are applied to the data. Validation flags are assigned to each data record based on the criteria listed in Tables 4 and 5. Table 4 lists the data flags used to qualify data from the Tekran instrumentation. Table 5 lists the data flags used to qualify data from the meteorological instrumentation.

Table 4. AMNet Data Flags Assigned by Quality Assurance Screening Criteria.

Data Flag*	Description	Mercury Species
null	Data meets criteria used in the automated scripts	All
A1	$\lvert(\text{Air cartridge bias}_i - \text{Air cartridge bais}_{i+1})/\text{Air cartridge bias}_i\rvert > 0.10$ for 24 consecutive hours	GEM
A2	$\lvert(\text{Air cartridge bias}_i - \text{Air cartridge bais}_{i+1})/\text{Air cartridge bias}_i\rvert > 0.15$ for 24 consecutive hours	GEM
B0	Baseline voltage < 0.01V	All
B1	Baseline voltage < 0.05V, or Baseline voltage > 0.25V	All
B2	$\lvert\text{Baseline voltage}_i - \text{Baseline voltage}_{i+1}\rvert > 0.01$V	All
B3	Baseline deviation > 0.10V for 5 consecutive readings	All
B5	Baseline deviation > 0.20V	All
C0	$\lvert(\text{Calibration}_i - \text{Calibration}_{i+1})/\text{Calibration}_i\rvert > 0.10$	All
C1	$\lvert(\text{Calibration cartridge bias}_i - \text{Calibration cartridge bais}_{i+1})/\text{Calibration cartridge bias}_i\rvert > 0.10$	All
C2	$\lvert(\text{Calibration cartridge bias}_i - \text{Calibration cartridge bais}_{i+1})\rvert/\text{Calibration cartridge bias}_i > 0.20$	All
C5	$\lvert(\text{Calibration}_i - \text{Calibration}_{i+1})/\text{Calibration}_i\rvert > 0.05$	All
E0	First GEM from each cartridge	GEM
E1	GEM < 1.00 ng/m^3 for same cartridge	GEM
E5	$\lvert(\text{GEM}_i - \text{GEM}_{i+1})/\text{GEM}_i\rvert > 0.50$ for same cartridge	GEM
F1	72 hours < Time between calibrations < 144 hours	All
F2	Time between calibrations > 144 hours	All
G0	GOM = 0 pg/m^3 for more than 24 hours	GOM
G1	Cycle(H) < 0.70 x GOM, or Cycle(I) > 0.20 x GOM, or Cycle(J) > 0.10 x GOM	GOM
G2	GOM < 0 pg/m^3	GOM
L1	GEM cycles < 24 before desorption	GOM $PBM_{2.5}$
L2	GEM cycles <> $\text{GEM cycles}_{\text{historical}}$	GOM $PBM_{2.5}$
M2	Status = M2 (multiple peaks)	All
M3	Status > M2 (multiple peaks)	All
NP	Status = NP (no peak)	GEM
OL	Status = OL (overload)	All

* Data Flags in Red indicate invalid data.

Table 4 - continued. AMNet Data Flags Assigned by Quality Assurance Screening Criteria.

Data Flag*	Description	Mercury Species
P0	$PBM_{2.5}$ = 0 pg/m^3 for more than 24 hours	$PBM_{2.5}$
P1	Cycle(E) < 0.70 x $PBM_{2.5}$, or Cycle(F) > 0.20 x $PBM_{2.5}$, or Cycle(G) > 0.10 x $PBM_{2.5}$	
P2	$PBM_{2.5}$ < 0 pg/m^3	
R1	RespFctr < 6x10^6 units, or RespFctr > 12x10^6 units	All
R2	RespFctr < 4x10^6 units	
S0	Cycle(C) > 1.67 pg/m^3	GOM $PBM_{2.5}$
S1	Cycle(C) > 10 pg/m^3	
V5	$\lvert(Volume_{measured} - Volume_{expected})/Volume_{expected}\rvert > 0.05$	All
V7	$\lvert(Volume_{measured} - Volume_{expected})/Volume_{expected}\rvert > 0.07$	
Z1	Zero > 1500 Peak Area units	
Z2	Zero > 1%SPAN	

* Data Flags in Red indicate invalid data.

Table 5. Meteorological Data Flags Assigned by Quality Assurance Screening Criteria*.

Data Flag	Description	Parameter
WS1	WS < 0 m/sec	Wind Speed
WS2	WS > 25 m/sec	
WS3	$\|WS_i - WS_{i+1}\| \leq 0.1$ m/sec for 3 consecutive hours	
WS4	$\|WS_i - WS_{i+1}\| \leq$ 0.5 m/sec for 12 consecutive hours	
WD1	WD < 0°	Wind Direction
WD2	WD > 360°	
WD3	$\|WD_i - WD_{i+1}\| \leq 1°$ for 3 consecutive hours	
WD4	$\|WD_i - WD_{i+1}\| \leq 10°$ for 18 consecutive hours	
AT1	$T > T_{high}$ (date and location dependent)	Temperature
AT2	$T < T_{low}$ (date and location dependent)	
AT3	$\|AT_i - AT_{i+1}\| > 5°C$	
AT4	$\|AT_i - AT_{i+1}\| \leq 0.5°C$ for 12 consecutive hours	
DT1	$\Delta T > 0.1°C$ (during the day)	Temperature Difference
DT2	$\Delta T < -0.1°C$ (at night)	
DT3	$\Delta T > 5.0°C$	
DT4	$\Delta T < -3.0°C$	
DPT1	$T_{DP} > T$	Dew Point Temperature
DPT2	$\|T_{DP,i} - T_{DP,i+1}\| > 5°C$	
DPT3	$\|T_{DP,i} - T_{DP,i+1}\| \leq 0.5°C$ for 12 consecutive hours	
DPT4	$T_{DP} = T$ for 12 consecutive hours	
BP1	BP > 1,060 mbar	Pressure
BP2	BP < 940 mbar	
BP3	$\|BP_i - BP_{i+3\ hrs}\| >$ 6mbar	
SR1	SR > 0 W/m^2 (at night)	Solar Radiation
SR2	$SR > SR_{max}$ (date and location dependent)	
PRE1	Σ(Precip) > 25 mm in 1 hour	Precipitation
PRE2	Σ(Precip) > 100 mm in 24 hours	
PRE3	Σ(Precip) < 50 mm in 3 months	

* Based on data screen criteria as suggested by the U.S. EPA (EPA, 2000).

The second step in the processing of AMNet data requires the AMNet Site Liaison to inspect the quality-assured data resulting from step 1. The purpose of this step is to validate the flags that were assigned to the data by the QA script, to incorporate field notes as recorded in the Site Reports, and to identify other periods of anomalous data. Data flags assigned by the Site Liaison are defined in Table 6 and are used for both the Tekran instrument data and the meteorological data.

Table 6. AMNet Data Flags Assigned by Site Liaison and Site Operator.

Data Flag*	Description	Mercury Species
I1	Pre-injection verification	All
I2	Injection source verification	
I3	Matrix spike	
Q1	Soda-lime changed	
Q2	Glassware changed	
Q3	Flow check	
RM	Routine maintenance	
V1	Valid data	
XV	Invalid data	

* Data Flags in Red indicate invalid data.

Upon completion of these activities for a month of data from a site, a Data Report will be generated and sent to the Site Operator and Site Supervisor. The Data Report will include a list of all time periods for which the data was invalidated with associated explanations. The Report should be generated within 4 weeks of receipt of the raw, instrument data and Site Reports for a site.

The third step in the processing of AMNet data requires the Site Operator and/or Site Supervisor to approve the Data Report. The AMNet Site Liaison should be notified of approval of the Data Report within 4 weeks of receipt of the Report. Questions regarding the validation of data should be discussed with the Site Liaison. Data flags assigned by the Site Operator are the same as those used by the Site Liaison and are defined in Table 6. Again, the data flags apply to both the Tekran instrument data and the meteorological data.

Following approval of the Data Report by the Site Operator and/or Site Supervisor, data is released for posting to the NADP website.

Data Posting

All processed, quality-assured, non-sequestered AMNet data will be freely available via the NADP AMNet website. That site may be accessed at http://nadp.isws.illinois.edu/amn. Registration is required to access the data. Registration is also free. Processed data will be posted to the AMNet website within 6 months of submission of the raw, instrument data to the PO.

60-minute and 120-minute averages are calculated automatically from all valid records at the time the database is queried. These values are not stored in the database.

Averaging periods correspond to the operating cycles of the Tekran instruments. These instruments may be configured to start operation on the hour, or at the next 5 minute interval. In the case of the latter configuration, the operating cycle and the associated averages would not align with the hour. This difference in instrument configuration is important with regard to unattended start-up following a power outage. For instance, GEM has an averaging period of

120 minutes. If the instrument loses power and restarts 15 minutes after the hour, then the corresponding average will also start 15 minutes after the hour. $PBM_{2.5}$ and GOM have a sampling period of 60 minutes. Sample collection for $PBM_{2.5}$ and GOM will start at the same time as the first GEM measurement. As such, average concentrations for $PBM_{2.5}$ and GOM will also start 15 minutes after the hour. With instruments configured to start operation at the next 5 minute interval the timestamps contained in both the 60-minute and the 120-minute average archives can vary, depending on when the instrument was started.

To determine an average value for GEM, at least half the total records for the averaging period must be valid. For instance, there are 24 possible records for GEM during the 120-minute cycle. At least 12 of these records must be valid to generate an average. If no average is generated for GEM, then values for GOM and $PBM_{2.5}$ for the same period will be considered invalid.

At the request of the Site Operator and/or Site Supervisor data for the site may be sequestered for up to 12 months. Sequestered data will be made available on the NADP AMNet website within a year of its submission.

Raw, instrument data is not available from the NADP AMNet website. That data is available solely from the Site Operator and/or Site Supervisor for a site, at their discretion.

Appendix A: Terms

accuracy – the closeness of agreement between the result of a measurement and its true value.

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

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

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

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

bias – systematic or persistent distortion of a measurement process that causes errors in one direction.

chemisorption – chemical adsorption. Adsorption at an exposed surface with the adsorbate surface undergoing a chemical change. That is, a new chemical species results at the surface.

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

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

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

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

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

deposition – see **atmospheric deposition**.

environmental data – any measurements or information that describe environmental processes, location, or conditions; ecological or health effects and consequences; or the performance of environmental technology. Environmental data include information collected directly from measurements, produced from models, and compiled from other sources such as databases or the literature.

Gaseous Elemental Mercury (GEM) – gas phase mercury in its ground electronic state with the chemical formula Hg^0. It is a mono-atomic gas.

Gaseous Oxidized Mercury (GOM) – oxidized gas phase compounds of mercury. It is sometimes called reactive gaseous mercury (RGM). GOM is believed to be the more accurate term as the term "reactive" can be misleading and imprecise.

metadata – data and other information about another related data set (e.g., instrument maintenance logs as metadata for direct instrument readings).

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

$PBM_{2.5}$ – mercury that is bound to particles of mean aerosol diameter less than or equal to 2.5 μm. Mercury is bound to the particle by means of physiosorption, chemisorption, or entrainment during aerosol production.

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

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

physioadsorption - physical adsorption. Adsorption at an exposed surface with the adsorbate surface remaining intact. No chemical reaction takes place.

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

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

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

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

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

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

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

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

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

Reactive Gaseous Mercury (RGM) – see **gaseous oxidized mercury**.

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

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

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

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

Appendix B: References

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