

Technical Note

Guidance for Photochemical Assessment Monitoring Stations (PAMS) Required Network Implementation Plans and Enhanced Monitoring Plans (EMPs)

This guidance and the following two attachments represent templates for consideration for implementation plans for the (1) Required Monitoring Network PAMS site (at certain NCore sites) and (2) for the EMPs required for moderate or higher nonattainment areas (NA) and states within the Ozone Transport Region (OTR). These templates should help in the development of implementation plans that should be included in the annual monitoring network plan as required by 40 CFR 58.10.

For higher population NCore sites (i.e., those in Core Based Statistical Areas (CBSAs) greater than 1,000,000), the Required Monitoring Network Implementation Plan must include the final site location, the types of instruments to be installed, and frequency of measurements that will be made. The Required Monitoring Network Implementation Plans should state the methods and procedures that will be followed as stipulated in the final PAMS rule, national PAMS Quality Assurance Program Plans (QAPP), and the PAMS Technical Assistance Document (TAD). The expected auto gas chromatograph (GC) monitoring systems will require a level of expertise which may not be currently available to monitoring agencies. Early planning is crucial to meeting deployment and measurement deadlines.

The final ozone national ambient air quality standards (NAAQS) rule has waiver provisions which allow monitoring organizations which have low concentrations of ozone (as defined in the rule) to request a waiver from implementing PAMS at an otherwise required NCore site entirelyⁱ, or to make PAMS measurements at alternative locations such as existing PAMS sites or existing National Air Toxics Trends Station (NATTS) sitesⁱⁱ. In addition, while it is expected that auto GCs will be used for VOC measurements in order to report hourly measurements, there is an opportunity to seek a waiver and instead collect three 8-hour canister samples, once every three daysⁱⁱⁱ. In addition, a monitoring organization may request that it utilize data from a nearby meteorological station rather than establish its own^{iv}. Monitoring organizations must request a waiver from any deviation described above. The waivers will be in the form of a one or two page technical memo that describes the need and rationale for the waiver, and any other requisite supporting information including alternative locations (such as existing PAMS sites), and/or proposed alternative measurement procedures (see end notes to this memo in this regard). The waiver will be submitted to the EPA Regional Administrator for review and approval. Waivers may be submitted with the required Annual Monitoring Network Implementation Plan or as a standalone document, if agreed to by the local EPA Regional Office.

- Monitoring organizations should submit the draft Implementation Plan for required PAMS locations and any waivers to EPA Regional Offices by May 1, 2017, along with their draft Annual Monitoring Network Plan (AMNP). This will ensure that a 30 day public notice is provided, and EPA may provide comments during that time. Final Implementation Plans should be submitted by July 1, 2017, along with the AMNP.

NOTE: The regulation requires that the draft Implementation Plans be submitted by July 1, 2018; however, in order to be operational by June 1, 2019, it is recommended that the organizations submit their Implementation Plans by May 1, 2017.

- As with all AMNPs, the EPA Regions will have 120 days to review the waivers and the proposed PAMS Implementation Plans, and provide a formal response to the state's plan (and waiver if proposed), no later than October 31, 2017 (Based on the submission of the final AMNP by July 1, 2017).

All O₃ moderate (and worse) NA areas and states in the OTR must develop and implement EMPs. These EMPs must include the final site location, the types of instruments to be installed, and the frequency of measurements that will be made at the site. They should also identify the rationale for proposed measurements, and in the case of EMP sites within the OTR, must take into account interstate and interregional transport of ozone and ozone precursors.

- Monitoring organizations should submit the draft EMPs for areas in the OTR and moderate NAsto EPA Regional Offices by May 1, 2018, along with their draft AMNP. This will ensure that a 30 day public notice is provided, and the EPA can provide comments during that time. Final EMPs should be submitted by July 1, 2018, along with the AMNP.

NOTE: The regulation requires these EMPs be submitted by October 1, 2019 (or two years following the effective date of a designation to a classification of Moderate or above O₃ NA whichever is later). We recognize that some areas may not know if they are moderate nonattainment areas until after that date, and the dates described here may need to be pushed back by exactly one year to accommodate that possibility. However, for areas in the OTR, to ensure (possible) continuity of existing measurements, and for a variety of other logistical and programmatic considerations, we recommend this earlier submittal date of July 1, 2018.

- As with all AMNPs, the EPA Regions will have 120 days to review the proposed EMPs, and provide a formal response to the state's plan, no later than October 31, 2018. (Based on the submission of the final AMNP by July 1, 2018).

While not a comprehensive list, EMP may include: additional O₃ sites; additional NO_x or NO_y sites; additional VOC/carbonyl measurements (different time periods, different locations and different precursors); or enhanced upper air measurements. EPA encourages that all EMPs be developed in consideration of and in coordination with other nearby PAMS/ EMPs. In the OTR, EPA intends that this coordination should occur and include all states in the OTR. For the states in the OTR, EPA encourages a comprehensive EMP with well-defined objectives.

References

ⁱ Appendix D of 40 CFR Part 58, 5(f) allows an otherwise required NCore site from implementing PAMS if the ozone design value is less than 85% of the NAAQS, and the area is not considered important regarding upwind or downwind nonattainment areas. States/ locals which have such an area should consult with the local EPA Regional Office. Such an area would need to submit a request to the EPA Regional Administrator and include a discussion of design values in the area, and all areas nearby- including a discussion of the closest ozone nonattainment area(s), and its relationship (or lack thereof) to air quality in the area seeking a waiver. That request should be part of the AMNP described above, and EPA would approve (or disapprove) the request when it acts on the AMNP. Any alternative method of seeking such a waiver should be agreed with the appropriate EPA Regional Office.

ⁱⁱ Appendix D of 40 CFR Part 58, 5(c) allows for the collection for required PAMS measurements at an alternative location. For areas considering such a request, it must be demonstrated that the alternate location will provide representative and useful data for regional or national tracking of trends in ozone precursors. For example, it may be a nearby location that has measured PAMS compounds in the past, and could be beneficial from a trends perspective. Any request should meet the specific requirements of the rule, be included in the AMNP, and to be acceptable, be approved by the EPA Regional Administrator.

ⁱⁱⁱ Appendix D of 40 CFR Part 58, 5(d) provides that the EPA Regional Administrator may grant a waiver from continuous VOC measurements to allow for speciated VOC measurement as three- 8 hour averages on every third day during the ozone season. EPA will consider waivers where precursor concentrations are low, or for other logistical or programmatic constraints. In considering approval of a waiver, the EPA Regional Administrator will consider the ability to compare and utilize other nearby PAMS (and EMP) locations to ensure the data collected can be used in a useful manner. Any request should meet the specific requirements of the rule, be included in the AMNP, and to be acceptable, be approved by the EPA Regional Administrator.

^{iv} Appendix D of 40 CFR Part 58, 5(e) provides that the EPA Regional Administrator may grant a waiver allowing representative meteorological data from nearby monitoring stations to be used to meet the meteorological measurements required. To be acceptable, a request must provide for the location of the alternative measurements, a detailed description of the appropriateness and representativeness of the location relative to PAMS location, assurance that the data will always be available, and ensure that the data meet appropriate EPA quality assurance requirement for those measurements. Any request should meet the specific requirements of the rule, be included in the AMNP, and to be acceptable, be approved by the EPA Regional Administrator.

PAMS Monitoring Implementation Network Plan

Example Monitoring Organizations Required to Operate at NCore Sites

(Insert monitoring organization) formerly operated two Photochemical Assessment Monitoring Stations (PAMS) sites in the air monitoring network in 2015, at the *(Insert Location)* and *(Insert Location)* sites. However, the recently revised monitoring rule (80 FR 65292; October 26, 2015) requires PAMS measurements June 1 through August 31 at NCore sites that are located in Core-Based Statistical Areas (CBSAs) with populations of 1,000,000 or more.

Network Decision

- The NCore site located at *(Insert Location)* will serve as the location of the required PAMS site and will measure the following parameters described below. An Inventory of equipment used at the site(s) is provided in attachment 2

- We request a waiver from implementing PAMS at an otherwise required NCore site entirely, or to make PAMS measurements at alternative locations such as existing PAMS sites or existing NATTS sites. Rationale for this waiver is provided in Waiver attachment

Auto GC Decision

Volatile organic compounds (VOCs) – A complete list of the targeted compounds are found in Table 1.

- We will measure hourly speciated VOC measurements with an auto-gas chromatograph (GC) using *(insert manufacturer)*.

- We request a waiver to allow three 8-hour samples every third day as an alternative to daily hourly speciated VOC measurements at locations *(insert locations)*. Rationale for this waiver is provided in Waiver Attachment

Meteorology Measurements Decision – Note: EPA is suggesting the use of ceilometers for determining mixing height, however other types of meteorological equipment that provide for an indication of mixing height can be proposed

- Will measure wind direction, wind speed, temperature, humidity, atmospheric pressure, precipitation, solar radiation, ultraviolet radiation, and mixing height. We have elected to use the following instrumentation to measure the parameters described above: *(insert equipment models and manufacturer)* .

- We request a waiver to allow meteorological measurements to be obtained from other nearby sites. Rationale for this waiver is provided in Waiver attachment

Other Required Measurements

- **Carbonyls** - Carbonyl sampling at a frequency of three 8-hour samples on a one-in-three day basis (~90 samples per PAMS sampling season) using (*insert sampler and analytical manufacturer*). A complete list of the target carbonyl compounds may be found in Table 1. The TO-11A test method, as used in the National Air Toxics Trends (NATTS) program¹ will be used.
- **Nitrogen Oxides** – Will monitor for NO and NO_y (total oxides of nitrogen) in addition to true NO₂. The true NO₂ is required to be measured with a direct reading NO₂ analyzer, cavity attenuated phase shift (CAPS) spectroscopy or photolytic-converter NO_x analyzer. We have elected to use (*insert type and manufacturer*) for the true NO₂ measurement. NO and NO_y will be measured using a (*insert manufacturer*).

Table 1 PAMS Target Compound List

Priority Compounds				Optional Compounds			
1	1,2,3-trimethylbenzene ^a	19	n-hexane ^b	1	1,3,5-trimethylbenzene	19	m-diethylbenzene
2	1,2,4-trimethylbenzene ^a	20	n-pentane	2	1-pentene	20	methylcyclohexane
3	1-butene	21	o-ethyltoluene ^a	3	2,2-dimethylbutane	21	methylcyclopentane
4	2,2,4-trimethylpentane ^b	22	o-xylene ^{a,b}	4	2,3,4-trimethylpentane	22	n-decane
5	acetaldehyde ^{b,c}	23	p-ethyltoluene ^a	5	2,3-dimethylbutane	23	n-heptane
6	acetone ^{c,d}	24	Propane	6	2,3-dimethylpentane	24	n-nonane
7	benzene ^{a,b}	25	propylene	7	2,4-dimethylpentane	25	n-octane
8	c-2-butene	26	styrene ^{a,b}	8	2-methylheptane	26	n-propylbenzene ^a
9	ethane ^d	27	toluene ^{a,b}	9	2-methylhexane	27	n-undecane
10	ethylbenzene ^{a,b}	28	t-2-butene	10	2-methylpentane	28	p-diethylbenzene
11	Ethylene			11	3-methylheptane	29	t-2-pentene
12	formaldehyde ^{b,c}			12	3-methylhexane	30	α/β-pinene
13	Isobutane			13	3-methylpentane	31	1,3 butadiene ^b
14	Isopentane			14	Acetylene	32	benzaldehyde ^c
15	Isoprene			15	c-2-pentene	33	carbon tetrachloride ^b
16	m&p-xylenes ^{a,b}			16	cyclohexane	34	Ethanol
17	m-ethyltoluene ^a			17	cyclopentane	35	Tetrachloroethylene ^b
18	n-butane			18	isopropylbenzene ^b		

Source: Revisions to the Photochemical Assessment Monitoring Stations Compound Target List. U.S. EPA, November 20, 2013

^a Important SOAP (Secondary Organic Aerosols Precursor) Compounds

^b HAP (Hazardous Air Pollutant) Compounds

^c Carbonyl compounds

^d Non-reactive compounds, not considered to be VOC for regulatory purposes

¹ See NATTS Technical Assistance Document for TO-11A method.

PAMS Monitoring Implementation Network Plan

Example

Monitoring Organizations Not Required To Operate At NCore Sites

(Insert monitoring organization) formerly operated (*x#*) Photochemical Assessment Monitoring Stations (PAMS) sites in its air monitoring network in 2015, at the *(Insert Location)* and *(Insert Location)* sites. The recent revised ozone NAAQS rule¹ requires PAMS measurements at NCore sites that are located in Core-Based Statistical Areas (CBSAs) with populations of 1,000,000 or more. Since *(Insert monitoring organization)* NCore sites are located in CBSAs with populations less than one million, this requirement does not apply *(insert monitoring organization)*. (In some cases, a State may have an NCore site that requires PAMS measurements, but additional “Enhanced Monitoring” sites are necessary to adequately characterize the problem.) States with moderate or above ozone non-attainment areas and states within the Ozone Transport Region (OTR) are required to develop and implement Enhanced Monitoring Plans (EMPs). These EMPs are intended to provide monitoring organizations with the flexibility to implement additional monitoring to suit the needs of their area such as, additional ozone, ozone precursor and/or meteorological monitoring activities. (For an area in the OTR- include the following: In developing this plan, we have coordinated with all other States (and DC) in the OTR and EPA Regions 1, 2, and 3. As a contiguous area of interregional transport, we have agreed to the spatial distribution of these monitoring locations, as well as the type and frequency of the air quality (and other measurements) to include.)

(Insert monitoring organization) has determined the EMP measurement options will include (but are not limited to) additional ozone air measurement at *(insert location)*, upper air measurements *(insert location)*, measurements of total VOC or enhanced/reduced amount of VOCs/carbonyl species *(identify)*, additional nitrogen dioxide monitoring *(insert location)*, and additional meteorology/boundary layer measurements. This required EMP reflects local needs within the context of interstate, interregional transport of ozone and ozone precursors.

¹80 FR 65292; October 26, 2015

Attachment 1 Waiver Requests and Rationale

Waiver from implementing PAMS at an otherwise required NCore site (waiver could be either in its entirety, or to be at a different location)

Rationale for this waiver

Auto GC Waiver Request

We request a waiver to allow three 8-hour samples every third day as an alternative to daily hourly speciated VOC measurements at locations (insert locations).

Rationale for this waiver

Meteorological Waiver Request

We request a waiver to allow meteorological measurements to be obtained from other nearby sites.

Rationale for Waiver

Attachment 2 Equipment Inventory

(Example)

Region	2	
State	New York	
AQS ID	36-081-0124	
CBSA	New York-Newark-Jersey City, NY-NJ-PA	
Parameter	Category	Detail
Site	Is the AQS site ID listed above the expected PAMS Core site location?	No
	What is the status of the decision for the expected PAMS Core site location (not started, draft, or final)?	Not Started
	Is there an alternate PAMS Core site location selected?	Yes
	Identify type of alternative site (existing PAMS, NATTS, etc)	Existing PAMs
	Alternate site AQS ID (if known)	36-005-0133
Mixing Height	Is there an existing functional ceilometer or other similar instrument available for use?	No but State Installing Network
	current location (at future PAMS Core site, at other site, not applicable)	
	instrument type (ceilometer, radar profiler, etc)	
	manufacturer	
	model	
	date purchased	
Auto GC	Is there an existing Auto GC available for use?	Yes
	current location (at future PAMS Core site, at other site, not applicable)	At Site
	manufacturer	Agilent/Marques
	model	7890A/Unity Air Server 2
	date purchased	04/2016//07/2015
	Does it have a service contract?	GC under warranty/Working on AC for Marques now
True NO2	Is there an existing true NO2 instrument available for use?	No
	current location (at future PAMS Core site, at other site, not applicable)	
	instrument type (photolytic conversion, cavity ringdown, CAPS, etc)	
	manufacturer	
	model	
	date purchased	
Carbonyls Sampling	Is there an existing sequential carbonyls sampling unit or similar instrument available for use?	Yes
	current location (at future PAMS Core site, at other site, not applicable)	In storage at Rensselaer, Site has two channel unit now.
	manufacturer	Atek
	model	8000
	date purchased	2012
	comments	
Carbonyls Analysis	Does the site currently have a support laboratory for carbonyls or plans to use a support laboratory?	Yes, in house
	laboratory name	NYSDEC Air Resources Laboratory
	comments	
Barometric Pressure	instrument type (aneroid barometer, etc)	Yes - Electronic
	manufacturer	Vaisala
	model	WT520
	date purchased	
UV Radiation	instrument type (UV radiometer, etc)	No
	manufacturer	
	model	
	date purchased	
Solar Radiation	instrument type (pyranometer, etc)	No
	manufacturer	
	model	
	date purchased	
Precipitation	instrument type (tipping bucket, weighing, etc)	Electronic Gauge - Weighing
	manufacturer	ETI Instrument Systems
	model	NOAH IV
	date purchased	2011
	comments	Data in NADP Database