

AIR MANAGEMENT PROGRAM • AIR QUALITY MONITORING

Considerations When Designing an Ambient Air Monitoring Study

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Step 1: Questions and Goals

Determine the goals of the study and what questions the project is designed to answer. These will provide the framework of the study during development and execution. Include information such as:

- what pollutant(s) the study is focusing on
- why the study is being conducted
- who the user wants to reach
- the length of time the study will take place

Step 2: Environmental Description and Location

Create a detailed description of the study's location and terrain. Add maps, plots or charts to visually show the location and any other pertinent information.

Step 3: Sampling Program Details

For the purpose of the study, determine what criteria the data collection should meet.

- Parameters
 - What parameters will be measured during the study period (PM2.5, SO2, Ozone, Toxics, etc.)?
- Spatial scale (see 40 CFR Part 58 Appendix E)
 - How many data collection sites will be included?
 - What is the scale of locations being sited?
 - Are there specific areas of impact that are intended to be examined (schools, elder care facilities, hospitals, etc.)?
 - Have meteorology data or modeling evaluations been considered to determine areas of predicted highest concentration for the parameters of interest?
- Duration of the study
 - Are there changes over time or seasonality of measurements that should be accounted for?
 - Is there a before/after condition being evaluated?
- Granularity of measurements
 - What National Ambient Air Quality Standards are the data intended to be compared to?
 - What time intervals of data should be collected (sub-hourly, hourly, daily, etc.) or calculated to allow for appropriate comparison?

Step 4: Monitoring Site Description

Determine what equipment and methods will be used to collect data.

- Does the equipment and method(s) fit the purposes of the study?
 - Estimate the cost, maintenance and any additional needs for the equipment over the study period
 - Look at sensor comparisons and performance studies with regulatory sensors to determine the best one for the study. The Air Quality Performance and Evaluation Center is a good resource: <http://www.aqmd.gov/aq-spec/evaluations/laboratory>

- Will the equipment and methods meet the logistical constraints of the study?
 - Are there power requirements (electrical circuits, battery, generator, solar, etc.)?
 - Are there climatological restraints (precipitation, temperature, solar radiation, etc.)?
 - Are there security needs (fencing, locked enclosures, etc.)?
- Are there siting limitations?
 - Do samples need to be collected at a certain height?
 - Are there obstructions that need to be avoided?
 - Are the sites free of interfering sources (burn piles, parking lots, building exhausts, etc.)?

Step 5: Data Acquisitions / Reporting / Analysis

Determine how the data will be collected.

- Samples collected for laboratory analysis:
 - What laboratories will be involved in analysis?
 - What are the hold times between sampling and collection, collection and analysis?
 - Are there temperature requirements for sample storage?
 - Do the laboratory analytical methods meet the criteria needs for the study?
- Onsite/internal data records:
 - What type of data logging will be used?
 - Internal (on-board) storage, SD Card, Website (Cloud)
 - How is the data retrieved and backed up?
 - SD Card download, USB download, Website
 - How often must the data be collected to prevent data loss (overwriting memory buffer)?

Step 6: Data Quality

Review the quality of the data collected.

- Data Completeness
 - How frequently does a valid data point need to be collected to be representative of the conditions being studied?
- Ensure data quality objectives are met.
 - Are the questions of the study qualitative or quantitative?
 - What detection limits will be useful for determining whether a parameter is present or absent?
 - How accurate does the data need to be?
 - *Does a correction factor need to be applied to the data?*
 - How well does the method need to compare to a regulatory method?
 - How precise does the data need to be?
 - How well do different sensors of the same method need to compare with each other?
- Include all needed ancillary data.
 - Will the study utilize independent data sets such as meteorological data?
 - Will metadata need to be collected regarding operations or events (production schedules, precipitation events, traffic counts, etc.)?
- Include the quality control measures that will support the defensibility of the data.
 - Calibration checks – verify the accuracy of the sensor/monitor by challenging with a known standard, ideally a known concentration of the target pollutant and perhaps with a zero air source where the pollutant does not exist
 - Collocation with a higher standard – Compare measurements of the sensor/monitor with a higher quality standard to relate accuracy to the higher standard

- Collocation with an identical method – compare measurement of a sensor/monitor to determine how repeatable the measurement is
- Audits – checks of the instrument/procedures by an oversight agency or expert

Resources

For more information and assistance for air sensor studies, visit:

- EPA's [Enhanced Air Sensor Guidebook](#)
- NACAA's [air sensor summary](#) page for general assistance
- South Coast - [Air Quality Sensor Performance Evaluation Center](#) for specific collocation studies