PSD QUALITY

AMBIENT AIR QUALITY & METEOROLOGICAL MONITORING

ANNUAL DATA REPORT FORMAT

PLEASE NOTE

- **Annual Data Reports to be submitted in both hard copy and electronically (MS Word or PDF format).**
- **Validated data to be submitted in both hard copy and electronically (MS Excel or ASCII format).**

COVER LETTER/TRANSMITTAL LETTER TO ADEC AIR PERMITS

Cover/Transmittal letter presents data report to Air Permits and certifies that reported data is valid. The cover letter must also identify if the project complies with permit monitoring conditions (as applicable). If monitoring was conducted to comply with a permit condition, please address the cover letter as directed in the permit. If monitoring was conducted in support of a permit application, please address the cover letter to Alan Schuler in the Juneau office (410 Willoughby Ave., Juneau, AK 99801). The cover letter must include: source name; permit number (as applicable), revision and date; address, phone #, email address, name and title and electronic signature of responsible Facility Representative certifying the validity of the data report.

TITLE PAGE

Permitee Name
Facility Name
Air Permit Number, Permit Revision Number and Permit Issue Date (as applicable)
Monitoring Project Name
Project Monitoring Year (i.e., Jan 1, 2004 –Dec 31, 2004, etc.)
Name of Agency/Contractor who prepared Report
Email Address and Phone Number of Agency/Contractor for Report Preparation
Report Issue Date

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EXECUTIVE SUMMARY

Executive summary (maximum 2 pages, not including tables) of monitoring project including any specific activities that affected parameter specific minimum data completeness criteria.

In addition to a written executive summary, the following tables are to be included in this section:

1st and 2nd Max Concentration Table: Summary of quarterly measured air quality parameters per EPA FRM/FEM pollutant method. Identifies 1st and 2nd high maximum concentrations for each criteria pollutant averaging period and respective % of the Alaska Ambient Air Quality Standard (AAAQS). In addition to the quarterly average, an annual average will be presented for each pollutant with an annual average standard. As reference for the Max Concentration Table, the respective AAAQS are included in the table. All data exceeding 80% of the AAAQS is highlighted in bold red font.

Meteorological Data Capture Table: Indicate the number of valid hours per month and the quarterly percent data capture for each meteorological parameter.

QAPP Variation Table: Highlight all items and procedures that are inconsistent with the approved Monitoring and Quality Assurance Project Plan (QAPP). The QAPP Variation Table should consist of the following three columns: 1) the item/procedure, 2) a summary of the variation, and 3) a summary of the reason for making the variation.

1. INTRODUCTION

1.1 **Project Summary:** Provide a succinct 1-2 paragraph summary of the project purpose, scope, location, and planned duration (i.e., who, what, when, where).

1.2 **Measurement Methods Table:** List each parameter, measurement method, manufacturer model #, EPA FRM or FEM designation, sampling frequency, averaging period, measurement range, instrument measurement resolution and manufacturer listed lower detection limit (LDL), (i.e., the "how" of this monitoring project).

1.3 **Variations from QAPP:** Describe all items and procedures that differ from the approved Monitoring and Quality Assurance Project Plan (QAPP).

2.0 STATION PERFORMANCE SUMMARY

2.1 Significant Project Events

2.2 Missing, Invalid and Adjusted Data

2.3 Network Data Completeness

This section addresses monitoring project data completeness for all parameters. Any parameter not meeting valid data completeness criteria is addressed in detail, identifying each problem, extent of affected data and corrective action/s taken to return monitoring project to acceptable levels of data completeness. Data missing due to routine maintenance, calibrations, quality assurance audits and data which do not satisfy program criteria for accuracy and quality assurance are invalid when calculating data recovery.

Data Completeness Table. This table lists quarterly data completeness for all air quality pollutants and meteorological measurements. Measured and calculated (e.g.,

sigma theta (σ_θ) and sigma phi (σ_w) parameters that do not meet the required minimum data completeness are highlighted in bold red font.

Calculations and criteria for determining Data Completeness will be specified in Appendix A, **Data Recovery Percentage**.

2.4 Precision Statistics

2.4.1 Monitoring Network Precision Statistics

This section addresses quarterly as well as individual precision statistics for the criteria pollutant monitoring network. Precision of meteorological measurement systems is not assessed. **All individual precision values/results will be reported regardless if there is a deminimus threshold for calculating individual precision data** (e.g., collocated PM_{10} Hi-Volume samplers, TSP, Lead, $PM_{2.5}$ FRM filter-based samplers, etc.). Quarterly precision will be calculated in accordance with 40CFR Part 58 Appendix B. All precision data and calculations used to calculate precision data as well as to determine precision results will be included in Appendix B.

Monitoring Network Precision Table: Lists quarterly precision results (and respective precision criteria) for each ambient air quality measured parameter. Any exceedance of the precision criteria is highlighted in bold red font and addressed in respect to how precision results affect reported data quality in the executive summary report. Data to be included in quarterly precision tables are: measurement parameter, individual precision measurement, number of precision checks, % difference, average % difference, standard deviation, upper 95% probability limit, lower 95% probability limit, and precision criteria.

2.4.2 Analytical Laboratory Precision Statistics (for Gravimetric Analysis of Particulate Samples)

Analytical laboratory precision for filter-based (gravimetric) PM samplers will be assessed quarterly in four ways and included/reported in Appendix B:

1. **Replicate Sample Measurements**. Measurement precision between successive weights of the same pre-exposed filter and same post-exposed filter quantifies potential laboratory bias introduced into laboratory results. All pre- and post-exposed replicate sample results associated with PM data reported for a monitoring quarter will be presented in table format including pre- and post-exposure filter reweigh goal criteria, filter – filter reweigh difference and quarterly average difference for filter pre- and post- reweighs.
2. **Field Blank Samples** – Measurement precision of a filter that has been handled exactly like sampled filters, except that it has not been sampled, quantifies potential bias associated with filter handling and exposure procedures.

   All field blank sample results associated with PM data reported for a monitoring quarter will be presented in table format, including:
   - Pre- and post-filter weights;
   - Pre—post-filter weight difference;

- Quarterly average difference for all field blank samples; and
- Acceptable field blank goal criteria.

3. **Laboratory Blank Samples** - Measurement precision of a filter equilibrated (minimum 24 hours at 35%≥ relative humidity ≤ 45% and 20°C≥ temperature ≤ 30°C and average temp ≤± 3°C) with a sample batch and weighed at the beginning and end of a sample analysis batch conditioning process quantifies potential problems with filter conditioning procedures during weighing sessions.

   All laboratory blank samples results will be presented in table format, including:
   - Pre- and post- filter blank sample results:
   - Differences,
   - Average quarterly difference; and
   - Acceptable laboratory blank sample goal criteria.
4. **Filter Conditioning Environment** – The filter conditioning environment must be maintained so that samples are equilibrated within acceptable ranges and control tolerances listed above and in the PM method. Pre- and post-sample filter conditioning data will be reported with the respective sample filter data with the PM raw/processed data. Please note: Acceptable Pre- and post-exposure sample conditioning is within 5% RH and 3°C.

Analytical Laboratory Precision Table (for Gravimetric Analysis of Particulate Samples). Lists quarterly precision results (and respective precision criteria) for each type of precision check. Any exceedance of the precision criteria is highlighted in bold red font and addressed in respect to how precision/accuracy results affect reported data quality in the executive summary report. Data to be included in the Analytical Laboratory Quarterly Precision Table will be presented in two parts.

Part one of the table will include:
- Replicate filter Type and blank precision check Type;
- Number of Type of precision checks;
- Average difference;
- Maximum difference; and
- Precision criteria.

Part two of the table will include:
- Type of filter conditioning check (Temperature, Relative Humidity);
- Number of conditioning periods;
- Minimum, maximum and average filter conditioning time for all conditioning periods;
- Extremes measured over all conditioning periods (Maximum, Minimum and Difference); and
- Filter conditioning precision criteria.

Deviations from the above laboratory precision criteria must be specifically identified and justification given why data should be considered valid.

2.4.**3 Analytical Laboratory Precision Statistics for Lead Analysis of Particulate Samples** will be assessed/reported in four ways and included in Appendix B of the report:

1. **Replicate Lead Samples --** Measurement precision between replicate analyses of the same sample filter strip quantifies potential laboratory bias introduced into laboratory results. All replicate sample results associated with PM data reported for the monitoring quarter will be presented in table format including replicate analysis goal criteria, Lead replicate – Lead filter difference and quarterly average difference for Lead replicate – Lead filter analysis.
2. **Duplicate Lead Samples --** Measurement precision between duplicate filter strips from the same sample filter quantifies potential laboratory bias introduced into the preparation and analysis of duplicate samples. All Duplicate Lead sample results associated with PM data reported for the monitoring quarter will be presented in table format including: duplicate Lead Sample analysis acceptance criteria, Duplicate Lead filter strip – Lead filter strip difference and quarterly average difference for Duplicate Lead filter strip – Lead filter strip analysis.
3. **Field Blank Lead Samples** – Measurement precision of a Lead Field Sample Filter that has been handled exactly like sampled filters, except that it has not been sampled, quantifies potential bias associated with filter handling and exposure procedures. All Lead Field Blank sample results associated with PM data reported for the monitoring quarter will be presented in table format, including laboratory's practical quantification limit (pql) limit for the Lead method, individual Lead Field Blank results, quarterly average Lead Field Blank results, and Lead Field Blank acceptance criteria.
4. **Laboratory Blank Lead Samples --** Measurement precision of a Lead Filter Blank sample that has not been taken to the field quantifies potential laboratoy bias introduced into the preparation of reagents used and laboratory handling of sample filters. All Lead Laboratory Blank samples results associated with PM data reported for the monitoring quarter will be presented in table format, including laboratory's practical quantification limit (pql) limit for the Lead method, individual Laboratory Blank Lead Sample results, quarterly average Laboratory Blank Lead Sample results, and Laboratory Blank Lead sample acceptance criteria

Analytical Laboratory Precision Table (for Lead Analysis of Particulate Samples). Lists quarterly precision results (and respective precision criteria) for each type of precision check. Any exceedance of the precision criteria is highlighted in bold red font and addressed in respect to how precision/accuracy results affect reported data quality in the executive summary report.

Data to be included in the Analytical Laboratory Quarterly Precision Table for Lead Analysis of Particulate Samples will include for each type of Lead precision check the following:

- Number of Type of precision check;

- Average difference;
- Maximum difference; and
- Precision criteria.

Deviations from the above laboratory precision criteria must be specifically identified and justification given why data should be considered valid.

2.5 Accuracy Statistics

Accuracy Statistics will be provided for both Instrument Calibration/Quality Control Checks as well as Independent Quarterly Quality Assurance Audits. Complete calibration data, Quality Control Check data and Independent Audits will be included in section C of the Report.

2.5.1 Instrument Calibration Statistics

This section summarizes quarterly statistics for all quality control (QC) checks performed on individual ambient air monitors as well as for all specific method monitors within a monitoring network.

A written summary description of quarterly calibrations of ambient air monitors and biannual calibrations of meteorological systems meteorological monitoring systems will be included in this section. Written description will note date of calibration, any problems with the respective calibrations and corrective actions taken. Complete documentation of each parameter calibration will be included in Appendix C.1. Complete documentation of each parameter quality control (QC) check performed will be included in Appendix C.2 of the respective quarterly data report. ***Calibration/QC check reports will include documentation showing traceability of all standards used in calibrating equipment. Traceability documents must show standards/equipment used are traceable over range of measurements made and are in-certification for the time of use.*** Calibration/QC check data must also identify all calculations used to calculate reported data.

Quarterly statistics of all quality control checks for each respective ambient monitoring parameter will be reported.

Quality Control Check/Accuracy Table: Lists quarterly Quality Control (QC) check results (and respective QC criteria) for each measurement parameter. Any exceedance of a QC check criteria will be highlighted in bold red font and addressed in respect to how QC check results affect reported data quality in the executive summary report.

Data to be included in the QC Check/Accuracy Table are:

- Measurement parameter;
- QC check standard value;
- Measured response;
- Number of QC checks;

- % difference;
- Average % difference;
- Standard deviation; and
- QC check criteria.

2.5.2 Independent Quality Assurance Audits

This section summarizes quarterly accuracy statistics for individual criteria pollutant monitors as well as monitoring networks consisting of more than one specific site parameter (e.g. networks containing two or more CO site monitors, etc.). Each quarter every individual criteria pollutant monitor within a monitoring network will be audited. All individual accuracy (performance audit values) will be reported as well as used in calculating quarterly accuracy statistics for the monitoring network. Quarterly accuracy will be calculated in accordance with 40CFR Part 58 Appendix B.

Meteorological biannual accuracy results are reported per individual measurement parameter in accordance with USEPA "Meteorological Monitoring Guidance for Regulatory Modeling Applications EPA-454/R-99-005 Chapter 5 System Performance (Recommended System Accuracies, Resolutions and Response Characteristics for Meteorological Sensors)."

Performance Audit Accuracy Table: Lists quarterly performance accuracy (audit) results (and respective audit criteria) for each measurement parameter. Any exceedance of accuracy criteria will be highlighted in bold red font and addressed in respect to how accuracy results affect reported data quality in the executive summary report.

Data to be included in the Accuracy Table are:

- Measurement parameter;
- Project monitoring quarter
- Audit standard value;
- Analyzer/instrument measured response;
- Number of network audit measurements for a specific parameter;
- Network parameter % difference;
- Average network parameter % difference;
- Network parameter standard deviation;
- Network parameter upper 95% probability limit;
- Network parameter lower 95% probability limit; and
- Audit criteria for each parameter.

Only individual QA statistics will be reported for individual parameter networks.

Note: Quarterly accuracy performance audits for Lead on Particulate monitoring will be reported for both Lead sampler flow rate audits as well as Lead (laboratory) filter strip audits.

The complete audit report will be included in the respective quarterly report's Appendix C.3. Audit reports will follow the required ADEC, Ambient Air Monitoring and Meteorological Audit Report Format.

In addition, a technical systems audit (TSA) will be conducted of every monitoring project, normally within 30 days of start-up of the monitoring program. The technical system audit is an on-site (field, lab, etc.) qualitative assessment of the complete monitoring program to generate and report reliable data as specified in the approved Quality Assurance Project Plan (QAPP). A summary of the TSA findings will be included in this section. The complete TSA (including all completed questionnaire forms, responses, findings, recommendations, etc will be included in appendix C.3.

3.0 MONITORING DATA NETWORK SUMMARY

This chapter will provide a quarterly/annual summary and analysis of air quality and meteorology data collection for the monitoring project. Summaries of all continuous hourly/daily validated gaseous, particulate and meteorological data for each month will be included in Appendix D.

Summaries of all manual particulate sampling data, laboratory analytical data and final reported results will be included in Appendix E.

3.1 Air Quality Data Summary

Project specific ambient air monitored as part of the National Ambient Air Quality Standards (NAAQS) and Alaska Ambient Air Quality Standards (AAAQS) program will be presented in this section in table format with a written pollutant specific summary for each site specific air quality parameter measured.

Each pollutant specific summary will address AAAQS applicable average concentrations and how it compares to the AAAQS. Every measured exceedance of the AAAQS will also be specifically identified. Pollutant specific data will be analyzed, characterized and interpreted with respect to project goals and objectives. It is incumbent upon the data user to provide the appropriate statistical and graphical representation/interpretation of data.

Project Specific Quarterly/Annual AAAQS Ambient Air Monitoring Table. This table lists quarterly ambient air monitoring data for each measured parameter.

The data to be included in the table are:

1) site ID; measurement parameter;
2) AAAQS applicable standard and respective averaging period;
3) Average measured value;
4) 1st high value;
5) 2nd high value; and
6) if any exceedances of the AAAQS, the number of exceedances (highlighted in bold red font) of the AAAQS for the respective site/parameter/averaging period.

3.2 Meteorological Data Summary

Project specific meteorological data will be presented in this section in table format with a specific written summary for each meteorological parameter measured.

Information to be included/for some of the meteorological parameters follows (**Note:** similar format to be used for reporting other meteorological data):

Wind Speed (WS) and Direction (WD) Climatology: This section provides a written characterization of the Annual WS and WD climatology for the site and surrounding region.

Annual Wind Rose: This figure will present/summarize hourly average WS and WD and % of quarterly WS/WD frequency,

Annual Wind Rose Analysis Table: This table lists quarterly wind rose data as a percent of all valid quarterly hours. WD (subdivided into 45^{o} increments) will be tabulated against: WS (subdivided into WS representative site increments in m/s), Total (for each specific direction), and Average WS.

Figure showing wind rose superimposed over site map and/or topographic map. Include in map source location/s and monitoring location/s.

Stability Frequencies (if used by model): This section summarizes Stability Class distributions derived annually and compares it to regional/local climatology. The written summary identifies the method for calculating the Stability Class and includes the approved method in the annual report's appendices.

Stability Class Frequency Distribution Graph. This graph presents stability class versus frequency of occurrence for respective Stability Class distribution method used as well as lists the numerical percentage of occurrence.

Temperature Climatology: This section provides a written summary for hourly average near-surface ambient temperatures during the project's monitoring year and compares it to actual measured and/or expected regional/local climatology.

Temperature Climatology Table. This table presents the following temperature information per year, month and monitoring quarter:

- Daily mean max (^{o}C);
- Daily mean minimum (^{o}C);
- Mean monthly (^{o}C);
- Extreme-record highest (^{o}C, year and day); and
- Extreme-record lowest (^{o}C, year and day).

Temperature Climatology Graph. This line/scatter plot graph presents recorded temperature (^{o}C) per hour for the month/year.

APPENDIX A: DATA PROCESSING SPECIFICATIONS AND STATISTICAL FORMULAE

A.1 Data Recovery Percentage

This section lists calculations and criteria used to determine % Data Recovery. ***All missing data due to routine maintenance, calibrations, quality control checks, quality assurance audits and data which do not satisfy program criteria for accuracy and quality assurance will be included in the data recovery calculation/s.***

Data completeness for continuous ambient air quality monitoring methods will be calculated assuming:

- a minimum of 75% valid hourly average data to calculate 1-hour, 3-hour, 8-hour, and 24-hour; and
- a minimum of 80% valid hourly averages to calculate quarterly and annual average data completeness.

Data completeness for meteorological monitoring methods will be calculated assuming:

- a minimum of 75% valid hourly average data to calculate 1-hour average;
- a minimum of 90% valid hourly average to calculate quarterly average data completeness; and
- a minimum of 90% quarterly data completeness for 4 consecutive monitoring quarters (before any data substitution).

Quarterly Data completeness (DC_I) for each continuous parameter will be determined by:

$$DC_i = h_v/h_i \text{ x } 100$$

Where: h_i = number of hours of valid data
h_i = total possible number of hours for the monitoring period

Data completeness for 24-hour integrated PM_{10} and $PM_{2.5}$ monitoring data will be calculated assuming:

- On occasion, the final particulate filter weight can be less than the initial filter weight, resulting in a negative mass concentration. Unless laboratory QA/QC checks (i.e., zero, standard weight QC checks, lab blanks, field blanks, travel blanks or variations in pre- and post-filter conditioning) indicate a problem with the gravimetric analysis, negative mass concentrations can occur due to inherent errors in the combined analysis of low ambient particulate concentrations. In cases where net filter weight is less, than zero, and QA/QC checks are within acceptable limits, the ambient particulate concentration will be considered valid

and reported as 0 µg/standard cubic meters of air (sm^3) for PM_{10} and 0 µg/cubic meters of air (m^3) for $PM_{2.5}$;

- a total valid 24-hour integrated collection time of 23hours ≥ valid sample collection time ≤ 24hours; and
- a minimum of 80% valid 24-hour samples per quarter.

Quarterly Data completeness (DC_I) for 24-hour integrated PM_{10} and $PM_{2.5}$ monitoring data will be determined by:

$$DC_i = h_v/h_i \text{ x } 100$$

Where: h_i = number of days of valid data
h_i = total possible number of sampling days for the monitoring period.

A.2 Data Bias Correction Using Calibration Information

This section specifies how valid data will be corrected for zero/span drift. Data will be corrected for both instrument zero and span drift when the analyzer exceeds the method specific zero/span quality control check criteria yet is within data validation criteria. Data exceeding the method specific data validation criteria will not be corrected and invalidated. Data will be corrected using periodic Level 1 zero and span calibration data and/or multipoint calibration data using the Linear Interpolation method for data reduction as discussed in Section 12.8 of EPA Quality Assurance Handbook for Air Pollution Measurement Systems Volume II. Part I (USEPA 1998).

A.3 Estimation of Pasquill—Gifford Stability Categories

This section will specify the method/s that will be used to estimate stability categories following procedures identified in , "Section 9 Upper-Air Monitoring" of Meteorological Monitoring Guidance for Regulatory Modeling Applications (EPA-454/R-99-005). This section will also include tables listing all assignment criteria for the stability categories for each stability method used.

APPENDIX B: PRECISION DATA

Method Precision Calculation(s): This section specifies the approved method (and lists the algorithm) for calculating method precision for the respective ambient air quality parameters measured.

Quarterly Precision Data Table for Gaseous Pollutants. This table lists all quarterly precision data for all gaseous AAAQS network monitors. The table will include the following site and method specific precision data:

1. Site ID;
2. Date of precision check;
3. Type of precision check (automatic or manual);
4. AAAQS gaseous parameter;
5. Pollutant cylinder gas standard flow rate (sccm/min);
6. Dilution gas flow rate (sccm/min);

7. Precision gas concentration (ppm);
8. Analyzer/DAS response (ppm);
9. Percent difference ((Analyzer/DAS response – Precision Standard Value)/Precision Standard Value X 100);
10. # precision checks;
11. Average % difference;
12. Standard deviation;
13. Upper 95% probability limit; and
14. Lower 95% probability limit.

Note: CO precision standards may be generated by direct introduction of a CO cylinder gas instead of by dilution of a high concentration CO cylinder gas. The above table would be adjusted accordingly.

Note: NO_2 precision data needs to include either the respective gas phase titration (GPT) information or combination of NO cylinder gas dilution and gas NO_2 permeation device dilution information.

Note: If NH_3, NO_2 and/or SO_2 precision data is generated by dilution of a permeation device, the appropriate permeation standard value, dilution air flows, etc must be included with the respective pollutant precision data.

Quarterly Precision Data Table for Collocated Particulate Samplers. This table lists all quarterly precision data for collocated particulate samplers. The table will include he following site and method specific precision data:

1) site ID;
2) Date of precision check;
3) Primary sampler 24-hour value ($\mu g/sm^3$ for PM_{10} and $\mu g/m^3$ for $PM_{2.5}$);
4) Collocated sampler 24-hour value ($\mu g/sm^3$ for PM_{10} and $\mu g/m^3$ for $PM_{2.5}$);
5) Percent difference (Collocated--Primary)/Primary Value X 100);
6) # precision checks;
7) Average % difference;
8) Standard deviation;
9) Upper 95% probability limit; and
10) Lower 95% probability limit.

Quarterly Precision Data Table for Continuous Particulate Monitors. This table lists all quarterly precision data for each continuous particulate monitor in the monitoring network. The table will include the following site and method specific precision data:

1) site ID;
2) Date and time of precision check;
3) Monitor reported flow rate (in actual liters/minute);
4) Calibration standard reported flow rate (in actual liters/minute);
5) Percent difference (Monitor Flow – Cal. Standard flow)/Cal. Std. flow X 100);
6) # precision checks;

7) Average % difference;
8) Standard deviation;
9) Upper 95% probability limit; and
10) Lower 95% probability limit.

APPENDIX C: ACCURACY DATA

Method Accuracy Calculation(s): This section specifies the approved method (and lists the algorithm) for calculating instrument specific as well as network parameter accuracy for the respective ambient air and meteorological parameters measured. Accuracy for criteria pollutants is assessed by "**Independent**" quarterly performance audits of each ambient air quality monitor within a network. Accuracy for meteorological monitoring is assessed by "**Independent**" biannual performance audits of each meteorological sensor/site within a monitoring network.

Measurement accuracy is set by calibration of the measurement system and subsequent acceptable routine quality control (QC) check results verify its continued accuracy. Any data to be considered valid must be at a minimum bracketed by method specific valid calibration/QC check standard criteria results.

C.1 Calibration Data

Complete calibration data for each parameter measured will be included in this appendix. This includes all field and laboratory calibration data.

C.2 Quality Control (QC) Data

Complete Quality Control data for each parameter measured will be included in this appendix. This includes all field, shipping and laboratory QC data.

C.3 Assessment Reports

The following Assessment reports will be included in this section:
Performance Audit Reports
Technical Systems Audit (TSA) Report
Corrective Action Reports

APPENDIX D: VALIDATED CONTINUOUS HOURLY/DAILY/MONTHLY DATA SUMMARIES

APPENDIX E: VALIDATED MANUAL PARTICULATE (FIELD AND LABORATORY) DATA