QUALITY ASSURANCE PROJECT PLAN (QAPjP) and QA Report for Pacific 2001

Prepared by: Robert McLaren
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1. **Principal Investigator**
   Robert McLaren (Associate Prof)
   Center for Atmospheric Chemistry
   York University
   4700 Keele St,
   Toronto, Ontario M3J 1P3

2. **Team Members**
   John Liggio (graduate student)
   Daniel Aubin (research assistant)
   Heng Yao (post doctoral fellow)
   Maria Giannokakis (undergraduate assistant)

3. **Measurement Program**
   Hivol measurements of selected particle phase organic carbonyl and carboxylic acid species, especially aromatic HC and monoterpene oxidation products (ie- dicarbonyls, benzaldehyde, tolualdehydes, nopinone, pinonaldehyde; + pinic & pinonic acids + selected C2-C9 dicarboxylic acids.

4. **Measurement Species and Units**
   HiVol
   Mass concentration - ng m^{-3}

5. **Representative Size Range (if PM)**
   HiVol: <2.5 m

6. **Measurement Platform (surface, airborne)**
   ~ 2 m above ground, except at Sumas where we anticipate 5m above concrete deck.

7. **Measurement Sites (surface only)**
   Slocan, Langley, Sumas Mountain, Cassiar tunnel

8. **Measurement Objective(s)**
9. **Measurement Details**
   9.1. Field Measurements
   9.1.1. Measurement Principle
   Filter collection using a Hi-volume sampler
   9.1.2. Instrumentation (Manufacturer/Model)
   Hivol sampler: General Metal Works Model 2000H

   9.1.3. Flow System
   Hivol system: The flow of the hivol is nominally 40 cfm and changes (somewhat) as the filter loading increases. The motor outlet is connected to a 20 feet hose that exhausts downwind of the sampler. For some York

measurements, PM 2.5um cutoff will be provided with a concentional PM10 impactor head converted with a Tisch Environmental PM2.5 conversion kit (TE-6001-2.5)

9.1.4. Inlet Height Above Ground (if surface)
Hivol: 2 m above ground level on top of platform.

9.1.5. Nominal Flow Rate
1.13 m3/min (40 ft3/min)

9.1.6. Flow Measurement/Control
Flow rate is recorded on a Dickson Model 3-B-L Circular chart recorder , Chart no 106.

9.1.7. Flow Temperature and Pressure

9.1.8. Sampling Times/Period/Frequency
2 -12 hour samples per day

9.1.9. Sampling Methods
The SOP will be very similar to those written up by Pierrette Blanchard for quartz fiber filters. Briefly, teflon coated filters will be pre-cleaned by DCM extraction followed by heating under flowing He to 350 C. Samples will be stored in custom designed metal storage containers for the study. After sampling, samples will be stored individually in tin foil with numerical codes identifying the filters, again placed in the predesigned boxes and frozen in central freezers

9.1.10. Filter Type/Coating Type/Reagent Type
Pallflex (part # 7224) EmfabTeflon-coated glass fibre filters (8 x 10 in).

9.1.11. Planned Changes to Instruments or Methods During Study

9.2. Laboratory Measurements (If Applicable)

9.2.1. Laboratory Name and Address
Robert McLaren's laboratory, Dept of Chemistry, York University.

9.2.2. Analytical Method(s)

Hivol Teflon coated filters	Carbonyls	HPLC
	Acids	GC/MS

9.2.3. Sample Extraction or Work-up

HiVol filters	Carbonyls	- acidified DNPH assisted extraction
	Acids – DCM solvent extraction	

9.2.4. Analytical Detection Limits

Carbonyls -10 pg /m3
Acids -

10. Quality Assurance/Quality Control

10.1. Field Quality Assurance/Quality Control

10.1.1. Traceability

Flow rate measurements and adjustments will be made on a weekly basis or as needed.

10.1.2. Calibration

Flow recorder is calibrated using a Kruz Model 330C Type U.O. Adjustable orifice calibrator.

10.1.3. Zeros and spans

10.1.4. Blanks

~10% of filters will be reserved for highvol loaded blank as per SOP.

10.1.5. Field Quality Control procedures

Disposable gloves will be worn when loading/unloading filters; filters will be loaded/unloaded in a clean room; filters will be inspected for holes when loaded and unloaded in the lab and field;

10.1.6. Precision determination

10.1.7. Comparison with other measurements

10.1.8. Inspections and Audits

10.2. Laboratory Quality Assurance/Quality Control

10.2.1. Traceability

No standard reference materials are available. Traceability will be to samples of pure compounds for both the carbonyls and diacids.

10.2.2. Calibration procedures

Calibrations will be perfomed by spiking known amount of pure materials onto filters and carrying sample through complete analysis.

10.2.3. Blanks

The following blanks will be analyzed during the laboratory analysis for both carbonyls and acids: field blanks, filter blanks, extract blanks.

10.2.4. Other lab QC

extraction recovery will be measured for both carbonyls and acids with independent instrumental calibrations using diluted hydrazone standards (carbonyls) and diluted liquid injections (acids)

10.2.5. Precision determination

Precision to be determined using replicate analyses of 1/8 identical portions of single filters.

10.2.6. Comparison with other methods

some comparibility may be available with other PI's analyzing for diacids.

10.2.7. Audits

11. Data Management and Quality Control

11.1. Raw Data Recording

Flow on high vol to be recorded as per SOP.

11.2. Final Data Reporting

12 hour integrated sample.

11.3. Data Quality Control and Validation

All reported data will be flagged as valid or invalid. Flows will be checked as to wether they are within +/- 10% of nominal flow.

11.4. Validity Flags

VO, V1

11.5. Below Method Detection Limit Values

MDL will be identified using standard analytical definition, 3 sigma of blank/slope. Standard deviation of blank is determined by integrating appropriate sections of chromatogram baseline for blank samples multiple times an for multiple samples. Values below detection limits will be reported as less than the detection limit, e.g., < 0.01ng/m3.

11.6. Derived Parameters

11.7. Explanation of Zero or Negative Data

12. Data Quality Objectives (Pre-Study)

12.1. Accuracy

12.2. Precision

The precision objective is +/- 20% for each individual carbonyl species and acid species. This will be determined using replicate analyses from

the same filter sample using real samples, as well as replicate analyses of spiked blank filters.

12.3. Comparability

12.4. Representativeness

-Depending on conditions, the measurements at this Sumas site can be representative of processed urban air masses with influence from primary and secondary biogenic sources. The measurements can also be representative of direct biogenic emissions as the site is in the heart of a mixed forest on Sumas forest at 300m elevation. Daytime measurements will likely be representive of the boundary layer, while nightime measurements will likely be decoupled from the velley floor due to the elevation of this site (300m asl).
-The Cassiar samples are representative of direct mobile emissions.
-The measurements at the Slocan Park site will be representative of the typical urban/suburban pollution mix that is not significantly processed photochemically.
-The measurements at the Langley site will be representative of either clean marine air (with southwest flows) or processed air pollution (with northwest flows) in which secondary pollutantswill have formed.

12.5. Completeness

Carbonyl completeness objective = 80%, where 100% = 2 valid samples per day.
Acid completeness objective = 80%, where 100% = 2 valid samples per day.

12.6. Other Quality Information

End of Pre-Study QAPjP

Start of Post-Study QA Report

13. Significant Changes to Site, Instruments or Methods During Study

14. Post-study Data Quality Indicators (DQIs)

    14.1.1. Accuracy

    14.1.2. Precision

    14.1.3. Comparability

    14.1.4. Representativeness

    14.1.5. Completeness

    14.2. Blank correction (describe whether done and method used):

    14.3. Other Quality Information

15. References: