Tissue Extraction

References: National Status and Trends Program for Marine Environmental Quality - *Sampling and Analytical Methods of the National Status and Trends Program Mussel Watch Project*: 1993-1996 Update; NOAA Technical Memorandum NOS ORCA 130. NOAA/NOS/ORCA, Silver Springs, MD. pp 175-177.

Northwest Fisheries Science Center Organic Analytical Procedures in: *Sampling and Analytical Methods of the National Status and Trends Program*: National Benthic Surveillance and Mussel Watch Programs 1984-1992; NOAA Technical Memorandum NOS ORCA 71. NOAA/NOS/ORCA, Silver Springs, MD. pp IV.35-IV.97.

1. Scope and Application

Matrices: This method is applicable to the extraction of non-volatile and semivolatile organic compounds (polynuclear aromatic hydrocarbons, saturated hydrocarbons, polychlorinated biphenyls and pesticides) in tissue samples.

Definitions: Refer to Alpha Analytical Quality Manual.

Tissuemizer extraction is the process of isolating organic compounds of interest from the tissue sample matrix. Tissue samples must first be prepared following the applicable sections of the Alpha Analytical SOP *Tissue Preparation and Homogenization* (OP-003). The amount of tissue required for extraction will depend on the type of tissue samples being evaluated and the project specific data quality objectives (DQOs). Sample cleanup is highly recommended, since many organic compounds cannot be analyzed directly without removal of some interferences from the sample matrix. See Section 4.2 for a listing of applicable Alpha Analytical sample cleanup SOPs.

This procedure uses the *Omni International* – GLH 20mm x 195mm, stainless steel tissuemizer for extraction. Groups of organic compounds such as semivolatiles, pesticides, polychlorinated biphenyls (PCBs), and petroleum hydrocarbons are separated on the basis of their common solubility in dichloromethane (methylene chloride) and then analyzed in accordance with the appropriate Alpha Analytical SOP:

- Analysis of Parent and Alkylated Polynuclear Aromatic Hydrocarbons, Selected Heterocyclic Compounds, Steranes and Triterpanes by GC / MS - SIM (O-008);
- Total Petroleum and Saturated Hydrocarbons by GC/FID (O-003);
- Determination of PCB Homologs, Individual Congeners and Pesticides by GC/MS-SIM (O-015);
- Method 8081A-Organochlorine Pesticides by GC/ECD (O-011).

The data report packages present the documentation of any method modification related to the samples tested. Depending upon the nature of the modification and the extent of intended use, the laboratory may be required to demonstrate that the modifications will produce equivalent results for the matrix. Approval of all method modifications is by one or more of the following laboratory personnel before performing the modification: Area Supervisor, Department Supervisor, Laboratory Director, or Quality Assurance Officer.

This method is restricted to use by or under the supervision of analysts experienced in the operation of the equipment and in the interpretation of the data. Each analyst must demonstrate the ability to

generate acceptable results with this method by performing an initial demonstration of capability, analyzing a proficiency test sample and completing the record of training.

After initial demonstration, ongoing demonstration is based on acceptable laboratory performance of at least a quarterly laboratory control sample or acceptable performance from an annual proficiency test sample. A major modification to this procedure requires demonstration of performance. The identification of major method modification requiring performance demonstration is directed by the Quality Assurance Officer and/or Laboratory Director on a case-by-case basis.

2. Summary of Method

A 5-15 gram aliquot of tissue sample is weighed then dried by mixing with sodium sulfate.

This mixture is then solvent extracted three times using 3x100mL portions of dichloromethane and the tissuemizer probe.

The three serial extractions are each individually centrifuged, decanted and combined to one sample extract.

Finally, the extract is concentrated and as necessary, cleanup procedures are performed prior to analysis in accordance with the appropriate Alpha Analytical SOP. See Section 4.2 for the list of cleanup SOPs and Section 1 for analytical SOPs.

2.1 Method Modifications from Reference

None.

3. Reporting Limits

Refer to Analytical SOPs for Reporting Limit information.

4. Interferences

4.1 Solvents, reagents and glassware may introduce interferences. These must be demonstrated to be free of interferences by the analysis of a method blank. See the Alpha Analytical SOP *Reagent, Solvent and Standard Control* (G-008) and *Laboratory Glassware Cleaning* (G-002), for additional details.

4.2 Interferences can be removed by sample cleanup. The cleanup methods performed by Alpha Analytical include the following: *Alumina Column Cleanup of Organic Extracts* (OP-009), *Sulfur Cleanup with Copper* (OP-007), *Gel-Permeation Chromatography* (OP-006), *Silica Cleanup and Fractionation* (NF02-001) and *Sulfuric Acid Cleanup* (OP-010). Only appropriate cleanup techniques must be performed based on the suspected interference and the compounds of interest. For example, sulfuric acid cleanup is not applicable to samples requiring pesticide analysis because this rigorous cleanup will destroy the majority of pesticides.

4.3 Soapy residue may result in basic conditions on glassware and may cause degradation of the pesticides Aldrin and Heptachlor, and some organophosphorous pesticides. All glassware must be rinsed thoroughly with deionized water and solvent to remove soapy residue. See the Alpha Analytical SOP (G-002) *Laboratory Glassware Cleaning,* for additional details.

4.4 Phthalate esters can be a major source of contamination if any material containing plasticizers (phthalates) comes in contact with the sample during the extraction process. Use of plastic or any material containing plasticizers (phthalates) should be avoided during extraction or analysis.

5. Health and Safety

The toxicity or carcinogenicity of each reagent and standard used in this method is not fully established; however, each chemical compound should be treated as a potential health hazard. From this viewpoint, exposure to these chemicals must be reduced to the lowest possible level by whatever means available. A reference file of material safety data sheets is available to all personnel involved in the chemical analysis. Additional references to laboratory safety are available in the Chemical Hygiene Plan.

All personnel handling environmental samples known to contain or to have been in contact with municipal waste must follow safety practices for handling known disease causative agents.

6. Sample Collection, Preservation, Shipping and Handling

6.1 Sample Collection

Tissue samples: As guidance, a minimum of 50 grams of sample must be collected for organic analyses in a glass jar with a Teflon or PTFE-lined screw cap. The amount of sample needed, will depend upon the project DQOs, such as reporting limits and the need for MS/MSD and/or duplicate analyses. Extra sample must be collected, if possible, to allow the laboratory adequate sample volume in case re-preparation and re-analysis is needed. Large whole individual fish, fillets, or vegetation may be wrapped in plastic and/or aluminum foil depending upon the requested analyses. Large crustaceans, reptiles or amphibians may be individually packed in well-labeled Styrofoam coolers.

6.2 Sample Preservation

It is recommended that samples are preserved by freezing them with dry ice at ≤ -20°C

If samples are not shipped frozen, they will be stored in freezers at Alpha Analytical upon arrival, and until processing. The samples must remain frozen and maintained at ≤ -20°C ± 10°C until processing. After processing, individual sample homogenates must also be stored at ≤ -20°C ±10°C until extraction/digestion and analysis.

6.3 Sample Shipping

It is preferable to ship tissue samples frozen.

6.4 Sample Handling

Sample processing and extraction/digestion hold times are suspended by freezing the sample. Hold time monitoring is resumed when samples are removed from freezers for processing and then returned to freezers pending extraction/digestion. Movement of samples into and out of freezers is tracked through Internal Chain of Custody logbooks. The recommended extraction hold time is 14 days from sample collection to extraction. Analysis hold time is set at 40 days from extraction date to analysis date.

7. Equipment and Supplies

7.1 OMNI International GLH-01 Grinder: 500-28,000 RPM, 115V, 700W, 6 speeds, with stainless steel probes (for samples without metals analysis) or titanium probes (for samples with metals analysis).

7.2 Clear, tall glass jars: 250 mL, with Teflon lined caps (Proclean-GTJ250, pre-cleaned).

7.3 Spatulas: Stainless steel, rinsed with DCM.

7.4 Concentration apparatus

7.4.1 Kuderna-Danish (K-D) concentrator tubes: 10mL, ground glass.

7.4.2 Kuderna-Danish (K-D) Evaporation flasks: 500mL that attach to concentrator tubes with clips.

7.4.3 Snyder columns: 3-ball macro.

7.4.4 Teflon boiling chips.

7.4.5 Water bath.

7.4.6 N-EVAP: by Organomations, Nitrogen blow-down for micro-concentration.

7.5 Top-loading analytical balance: Capable of accurately weighing to the nearest 0.01gram.

7.6 Vials: 2mL, 4mL and 10mL for transfer of concentrated extract.

7.7 Syringes: 1mL - 10mL.

7.8 Filter funnels.

7.9 Centrifuge: Beckman Model TJ-6

Note: All maintenance records including routine upkeep and outside service visits are maintained in the instrument maintenance logbooks for the OMNI International GLH grinder motor and probes, Organomations N-EVAP and Beckman Centrifuge.

8. Reagents and Standards

Use reagent grade chemicals for all reagents. Deionized (DI) water is ASTM Type II laboratory reagent grade water.

8.1 Methylene Chloride: ACS approved, Pesticide grade, see Alpha Analytical SOP *Reagent, Solvent and Standard Control* (G-008) for additional details regarding solvent purity.

8.2 Acetone: ACS approved, Pesticide grade, see Alpha Analytical SOP *Reagent, Solvent and Standard Control* (G-008) for additional details regarding solvent purity.

8.3 Hexane: ACS approved, Pesticide grade, see Alpha Analytical SOP *Reagent, Solvent and Standard Control* (G-008) for additional details regarding solvent purity.

8.4 Sodium Sulfate: Granular, anhydrous. Purified by heating to 400°C for 4 hours.

8.5 Glass wool: Purified by heating to 400°C for 4 hours.

8.6 Spiking solutions: Including the following solutions (see the appropriate Alpha Analytical SOPs cited in Section 1 for details on the correct spike concentrations and spike volumes):

8.6.1 Surrogate spiking solution

8.6.2 Laboratory Control Sample (LCS) solution

8.6.3 Matrix Spiking (MS) solution.

9. Quality Control

The laboratory must maintain records to document the quality of data that is generated. Ongoing data quality checks are compared with established performance criteria to determine if the results of analyses meet the performance characteristics of the method.

9.1 Blank(s)

Note: If laboratory Equipment Blanks are required per project DQO, see the Alpha Analytical SOP *Tissue Preparation and Homogenization* (OP-003) for details.

A method blank must be prepared in sodium sulfate once per every 20 samples or per extraction batch, whichever is more frequent. If samples will be extracted for a variety of determinative analyses (*i.e.,* PAH, Pesticide and PCBs within the same extraction batch) a method blank for *each* analysis must be prepared and carried through the same extraction procedures as the samples.

Organic compounds of interest must not be detectable in the method blank at a concentration greater than the reporting limit.

Corrective Action: Extraction of the method blank and all associated samples must be performed until the blank is in control. Samples cannot be analyzed until an acceptable method blank analysis is obtained. Exceptions may be made with approval of the Department Manager, Laboratory Director, Project Manager and/or Operations Manager, if the samples associated with the out of control method blank are non-detect for the compound of interest, or if sample concentrations are greater than 5x the blank levels. In such cases, the sample results are accepted without corrective action for the high method blank and the client is notified in a project narrative associated with the sample results.

9.2 Laboratory Control Sample / Laboratory Control Sample Duplicate (LCS/LSCD)

Laboratory control samples (LCS/LCSD) must be prepared once per every 20 samples or per extraction batch, whichever is more frequent, in sodium sulfate and spiked with a solution prepared from a second source or lot number, other than the source used to verify the accuracy of the standard curve for the determinative analytical method. The LCS/LCSD contains all target compounds of interest, and is extracted along with the samples as verification of the accuracy of the entire extraction procedure. If samples will be extracted for a variety of determinative analyses (*i.e.,* PAH, Pesticide and PCBs within the same extraction batch) a LCS for *each* analysis must be prepared and carried through the same procedures as the samples.

The acceptable recovery QC limits are documented in Section 12.

Corrective Action: Analysis according to the appropriate Alpha Analytical SOP must be repeated once to see if an analytical error has occurred. If the LCS and/or the LCSD recoveries are still out of control limits, re-extract and re-analyze the LCS and all associated samples. Samples cannot be reported until an acceptable LCS is obtained. Exceptions may be made with approval of the Department Manager, Laboratory Director and/or Operations Manager, if the samples associated with the out of control LCS are also associated with a matrix spike or matrix spike duplicate pair that is in control. This is an acceptable measure of accuracy of the extraction and analytical procedures. An explanation of this out of control LCS and/or LCSD

recovery must be included in the project narrative to the client and the sample data reported with the acceptable MS (and MSD) results as batch QC.

9.3 Initial Calibration Verification (ICV)

Not applicable to this method.

9.4 Continuing Calibration Verification (CCV)

Not applicable to this method.

9.5 Matrix Spike / Matrix Spike Duplicate (MS / MSD)

Matrix spike / matrix spike duplicate (MS/MSD) samples must be performed once per 20 samples (5% frequency). If samples will be extracted for a variety of determinative analyses (*i.e.,* PAH, Pesticide and PCBs within the same extraction batch) a MS/MSD pair for *each* analysis must be prepared and carried through the same procedures as the samples. If less than 20 samples are prepared in a one-week time frame, a MS/MSD pair will be extracted at the beginning of each week.

The acceptable recovery and %RPD QC limits are documented in the applicable Alpha Analytical SOPs noted in Section 1. Calculate the %RPD as described in Section 9.6.

Corrective Action: Analysis according to the appropriate Alpha Analytical SOP must be repeated once to see if an analytical error has occurred. If the % recovery and/or %RPD still exceeds the control limits and the LCS/LCSD is compliant; include a project narrative with the results to client noting that there may be potential matrix effects on the accuracy or precision of the reported results as evidenced by MS/MSD recoveries and/or %RPD outside of QC limits.

9.6 Laboratory Duplicate

Duplicate analyses (matrix or sample duplicate) must be performed once per 20 samples (5% frequency). *For Organic analyses, the matrix duplicate is usually in the form of the matrix spike duplicate, see Section 9.5.*

Acceptable relative percent differences (RPD) of duplicates are documented in the applicable Alpha Analytical SOPs noted in Section 1. Acceptance criterion is not applicable to sample concentrations less than 5 times the reporting limit. Calculate the RPD as follows:

$$RPD = \frac{R1 - R2}{\frac{[R1 + R2]}{2}} \times 100$$

Where:
R1 = sample Replicate #1
R2 = sample Replicate #2

Corrective Action: Analysis according to the appropriate Alpha Analytical SOP must be repeated once to see if an analytical error has occurred. If the % RPD still exceeds the control limits; include a project narrative with the results to client noting that there may be potential matrix effects on the precision of the reported organic results as evidenced by the matrix duplicate % RPD exceedance

9.7 Method-specific Quality Control Samples

9.7.1 Surrogate Spike

Surrogate spikes must be added to QC and field samples to evaluate the extraction method performance.

The acceptable surrogate recovery limits are documented in Section 12.

Corrective Action: Analysis according to the appropriate Alpha Analytical SOP must be repeated once to see if an analytical error has occurred. If the % recovery still exceeds the control limits the sample must be re-extracted and re-analyzed to confirm the sample matrix. If *obvious* matrix interferences are noted, consultation with the Department Manager, Laboratory Director and/or Operations Manager may be in order to confirm the need for sample re-extraction. If no re-extraction occurs, the surrogate results and reasons for the no re-extract decision must be discussed in the project narrative to the client.

9.7.2 Standard Reference Materials

Standard reference materials (SRM) are available from the National Institute of Standards and Technology (NIST) and are extracted and analyzed with samples on a project specific basis. These are not used as controls, but to evaluate potential matrix effects in associated samples for the target compounds being evaluated.

Acceptance criteria for SRM analysis will vary from project to project depending upon client data quality objectives (DQOs). Generally, ± 35% difference (%D) based on the true certified values of the target compounds of interest, or 65% - 135% recovery, serve as advisory acceptance criteria.

Corrective Action: Analysis according to the appropriate Alpha Analytical SOP must be repeated once to see if an analytical error has occurred. If the % recovery and/or %D still exceeds the control limits, and the LCS/LCSD and MS/MSD pair are compliant, include a project narrative with the results to client noting that there may be potential matrix effects on the accuracy or precision of the reported results as evidenced by SRM % recoveries and/or %D values outside of QC limits. These cases are normally isolated to the SRM, if all other controls are within limits.

9.8 Method Sequence

- Weigh homogenized sample (5-15g, depending on sample observations and DQO's)
- Dry with sodium sulfate
- Spike samples with appropriate surrogates
- Add methylene chloride to cover sample
- Begin extraction - serially extract 3X following Procedure in Section 10.
- Sample concentration
- Sample cleanup - as needed or instructed
- Final volume

10. Procedure

10.1 Equipment Set-up

Samples are prioritized by the Department Manager or Preparation Team Leader for extraction based on client due date, or other scheduling factors. Samples must be homogenized according to the Alpha Analytical SOP *Tissue Preparation and Homogenization* (OP-003), prior to extraction. If both Organic and Inorganic compounds will be determined, coordination of the sample extraction (Organic) and digestion (Inorganic) is ***strongly recommended***. This eliminates the need for the sample homogenates to be removed from frozen storage repeatedly. *All Project notes, DQO's and/or other documents must be checked prior to weighing samples for extraction*. *See the Department Manager or Project Manager for additional guidance as needed.*

10.2 Initial Calibration

Not applicable to this method.

10.3 Equipment Operation and Sample Processing

10.3.1 Extraction

10.3.1.1 Weigh a 5-15g aliquot of a well-homogenized sample (sample weight will depend on project DQOs and amount of sample homogenate available) into a pre-cleaned clear 250mL straight wide mouth glass extraction jar (Section 7.2). **Note:** A separate 2-5g aliquot can also be removed at this time and placed on an aluminum tin for dry weight determination (SOP: W-001 *Percent Solids Determination*).

10.3.1.2 Add sodium sulfate incrementally to the sample in a 2:1 mass ratio. For example, if a 15g-sample aliquot is weighed, then 30g of sodium sulfate must be added to the sample. More sodium sulfate may be needed if the sample is not "free-flowing".

10.3.1.3 Generally, add 100 uL of surrogate spiking solution to each sample. The amount of surrogate spike will depend upon the final detection limits, final sample volume and the determinative analytical method. The LCS spiking solution shall be added to the LCS and LCSD samples at this time. Matrix spiking solution shall be added to the matrix spike and matrix spike duplicate samples associated with the extraction batch. The amount of LCS and Matrix Spike solution added will depend upon the same factors as the amount of surrogate spike, usually 100 uL. **Note:** The Organic Department Manager or Preparation Team Leader must be consulted if there are any questions regarding the appropriate amount of spiking solutions. *All sample spiking must be "spike witnessed".*

10.3.1.4 Add the sample extraction solvent (100 mL DCM) to each sample. Use enough solvent to cover the sample during extraction.

10.3.1.5 After rinsing the tip of the probe with methylene chloride into a solvent waste container, place the tip of the grinder probe into the sample mixture. Be sure that the tip of the grinder probe is positioned approximately ½ inch above the bottom of the glass jar to ensure the jar does not break.

10.3.1.6 Tissuemize the sample for 3 minutes on speed setting 1 located on the top of the unit. Make sure the sample is swirling with no sample loss from spray, and no separation between solvent and matrix. The grinder probe tip must be rinsed into

the jar between each independent sample extraction.

10.3.1.7 When four samples are extracted, weigh jars containing sample to ensure the centrifuge will be balanced when loaded. Put sample jars into the centrifuge for 3 minutes at about 1500 rpm. Samples will separate from solvent making the decanting easier.

10.3.1.8 Pour solvent from centrifuged samples into a pre-labeled, rinsed Erlenmeyer flasks.

10.3.1.9 Repeat the extraction steps (starting at 10.3.1.6) twice more with fresh portions of DCM.

10.3.1.10 After all three extractions are complete and transferred through the filter funnel, rinse the funnel three times with methylene chloride from the laboratory squirt bottles to ensure a complete transfer of the entire extract.

10.3.1.11 The extract is now ready for concentration.

10.3.2 Kuderna-Danish (K-D) Concentration

10.3.2.1 Transfer the extract solvent by decanting into a funnel fitted with baked and solvent rinsed glass wool and sodium sulfate, for extract drying. The extract is collected in a solvent rinsed 500-mL K-D flask with the 10-mL concentrator tube attached to the bottom or two 250 mL pre-cleaned clear jars (this is dependant on the analyst's schedule of tasks that day).

10.3.2.2 Place the K-D flask on the water bath with 1-2 boiling chips in the bottom of the tube and the macro Snyder column on top. The bath temperature should be 75 ± 5°C. Macro-concentrate the sample to less than 10mL. This will take approximately 40 minutes. At the proper rate of distillation, the balls of the column will chatter, but the column should not flood with condensed solvent.

10.3.2.3 If the extract appears extremely viscous and reduces in volume very slowly, a final volume of greater than 10mL may be used to ensure that there is no loss of any compounds of interest. See the Organic Department Manager or Laboratory Director for additional guidance on troublesome matrices.

10.3.2.4 Remove the sample from the bath and allow it to drain and cool for approximately 10 minutes.

10.3.2.5 Move the cooled sample, still in the 10-mL concentrator tube, to the N-EVAP unit for micro-concentration, and bring the extract to the final volume required before cleanup. The extract must be concentrated under a *gentle* steady stream of nitrogen. A final volume of 5-10 mL should be used to ensure that there is no loss of any compounds of interest. **Note**: Micro-concentration may not be needed depending upon the determinative analytical method. Client specifications may be different than this SOP. Always see the Organic Department Manager or Laboratory Director for additional guidance when needed.

10.3.2.6 Transfer the sample extract from the concentrator tube to a vial of the appropriate final volume size. The sample may now undergo any necessary cleanup or lipid determination (*Percent Lipids Determination SOP OP-015)* that

may be required prior to analysis. See Section 4.2 for Alpha Analytical sample cleanup SOP references. If the sample does not require cleanup, it may be directly transferred at the correct final volume, with copies of the sample preparation extraction paperwork, including the preparation checklist, and the client folder, to the analytical instrument room for analysis.

10.4 Continuing Calibration

Not applicable to this method.

10.5 Preventive Maintenance

None.

11. Data Evaluation, Calculations and Reporting

Procedures for data and record management for organic extraction must adhere to the Quality Systems Manual, other subordinate documents covering record keeping, and the Alpha Analytical *Document Control* SOP/08-01. All records must be stored in such a manner as to be safe and accessible for at least 10 years.

The extraction bench sheets and other relevant laboratory notebooks must follow the specifications in the Alpha Analytical *Laboratory Notebook Usage Work Instructions,* WI-108-01, and all record keeping and document control practices.

See the appropriate analytical SOPs for details on sample analysis, data evaluation, calculations and data reporting.

12. Contingencies for Handling Out-of-Control Data or Unacceptable Data

All results for the organic compounds of interests are reportable without qualification if extraction and analytical holding times are met, preservation (including cooler temperatures) are met, all QC criteria defined in the table below are met, and matrix interference is not suspected during extraction or analysis of the samples. If any of the below QC parameters are not met, all associated samples must be evaluated for re-extraction and/or re-analysis.

QC Parameter	Acceptance Criteria
Method Blank	< reporting limit
Laboratory Control Sample / Duplicate	See the applicable Alpha Analytical SOP for acceptance criteria
Surrogate Recoveries	See the applicable Alpha Analytical SOP for acceptance criteria
Matrix Duplicate	See the applicable Alpha Analytical SOP for acceptance criteria
Matrix Spike	See the applicable Alpha Analytical SOP for acceptance criteria
Matrix Spike Duplicate	See the applicable Alpha Analytical SOP for acceptance criteria
Standard Reference Material	See the applicable Alpha Analytical SOP for acceptance criteria

If non-compliant organic compound results are to be reported, the Organic Department Manager and/or the Laboratory Director, and/or the QA Manager must approve the reporting of these results. The laboratory Project Manager shall be notified, and may chose to relay the non-compliance to the client, for approval, or other corrective action, such as re-sampling and re-analysis. The analyst or Department Manager performing the secondary review initiates the project narrative, and the narrative must clearly document the non-compliance and provide a reason for acceptance of these results.

13. Method Performance

13.1 Method Detection Limit Study (MDL) / Limit of Detection Study (LOD) / Limit of Quantitation (LOQ)

The laboratory follows the procedure to determine the MDL, LOD, and/or LOQ as outlined in Alpha SOP/08-05. These studies performed by the laboratory are maintained on file for review.

13.2 Demonstration of Capability Studies

Refer to Alpha SOP/08-12 for further information regarding IDC/DOC Generation.

13.2.1 Initial (IDC)

The analyst must make an initial, one-time, demonstration of the ability to generate acceptable accuracy and precision with this method, prior to the processing of any samples.

13.2.2 Continuing (DOC)

The analyst must make a continuing, annual, demonstration of the ability to generate acceptable accuracy and precision with this method.

14. Pollution Prevention and Waste Management

Refer to Alpha's Chemical Hygiene Plan and Waste Management and Disposal SOP for further pollution prevention and waste management information.

15. Referenced Documents

Chemical Hygiene Plan

SOP/08-05 MDL/LOD/LOQ Generation

SOP/08-12 IDC/DOC Generation

Waste Management and Disposal SOP G-006

Laboratory Glassware Cleaning SOP G-002

Reagent, Solvent and Standard Control SOP G-008

16. Attachments

None.