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FLOOR DUST SAMPLING

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1.0 SCOPE AND APPLICATION

The collection of indoor dust samples for multi-purpose comparison requires a systematic and regimented collection and handling protocol. It is the consistent routine practiced at each individual collection location that allows a direct and representative interpretation of data.

This sampling method defines the fundamental techniques necessary to obtain representative and defensible indoor dust samples to support an environmental project or study effort. Recognize that there may be site-specific circumstances that necessitate deviation from the standard protocol described in this sample collection procedure, and in such case, documentation and record-keeping diligence is of utmost importance to justify any alternative practice employed.

2.0 METHOD SUMMARY

Sample collection focuses on maximization of both sample mass and careful documentation of area in which sample mass is collected. The Nilfisk GS-80 high-volume sampler, equipped with a high-efficiency particulate air (HEPA) filter, will be used to collect sample mass from pre-measured areas throughout study homes. Recoverable sample media includes soil and particulate matter having cross-sectional dimensions of approximately 5 micrometers (μm) and larger, typically embedded in carpets or deposited on hard-surface areas.

Sample mass will be collected in a vacuum bag protected and secured with a secondary poly liner. The poly liner allows the vacuum bag to be used, removed, and shipped with minimal exposure to cross-contamination locations. The initial sample is a combination of the dust collected, the vacuum bag, and the liner until the sample can be properly processed in a controlled, laboratory environment. A diagram of the Nilfisk GS-80 vacuum is illustrated in Figure 1.

Primary sample areas will target living areas in which children are most likely to play or spend proportionately longer amounts of time, i.e. in front of the television, in the middle of the family-room floor, and the bedroom floor. In addition, entry ways or areas in front



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of doorways will also be considered primary sample target locations because of the propensity to track dirt and dust inside the home from outside areas.

It is crucial to the success of this sampling effort to make every attempt to properly obtain as much sample mass as may be available in any particular household. Because the target analyte list (TAL) is relatively extensive, sample mass is the overall limiting factor affecting the comparability of data obtained. Consequently, in instances where study homes are relatively small or when extracted dust mass from primary target living areas is not likely to be sufficient to support the TAL, secondary target areas including hallways and/or additional bedrooms may be systematically sampled to increase the total mass of the dust sample acquired.

In addition to the dust sample collected using the Nilfisk High-Volume Surface Sampler, relinquished household vacuum bags will be collected as a precautionary measure. In the event that analytical results pertaining to the collected dust sample indicate discrepancies or inconsistencies, additional dust mass will then be available for supplemental examination. The household vacuum bags will only be collected if they have been used exclusively in the home.

Collected samples will be transported to the Nevada Division of Environmental Protection (NDEP) field office for shipment to the laboratory. If additional TAL analyses are required to be performed at alternate laboratories, sample mass will be divided at the Laboratory and shipped under supplemental chain-of-custody procedures.



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3.0 Equipment/MATERIALS REQUIRED

The following materials will be required to conduct the dust samples. Both disposable and reusable sampling equipment is required.

- 3.1 Nilfisk Model GS-80 High-Volume Surface Sampler (vacuum cleaner)
- 3.2 Nilfisk vacuum bags
- 3.3 Poly liners for vacuum bags
- 3.4 Sealed storage container (zip lock bags)
- 3.5 Razor Blade or knife
- 3.6 One (1) square meter (m²) folding rulers or similar measuring device
- 3.7 Masking tape
- 3.8 Analytical balance (at field office)
- 3.9 Distilled water
- 3.10 Methanol
- 3.11 Kimwipes™ or equivalent laboratory tissue/towel
- 3.12 Plastic bags

4.0 SAMPLE PROCEDURES

- 4.1 Review field data sheets, and documentation materials to confirm adequate and appropriate field supplies, sample locations, and preliminary measurement requirements.
- 4.2 Upon arrival at the sampling location, document field conditions per the field log forms and record all requested general information. Don appropriate field sampling apparel including tyvek™ pants, tyvek™ over-shirt, and booties. Make sure to don booties at the threshold to the residence prior to entering. Take extra surgical gloves in the house for subsequent use.
- 4.3 Survey primary and secondary target sample areas and sketch the area to be sampled. At a minimum, primary target areas should include the main area in the living room and/or family room, the area immediately in front of the television (if possible), the



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main area in the child's or children's bedroom(s), and the entry way or area in front of the primary entrance to the home. Secondary areas may include hallways or additional bedrooms, (not bathrooms) as necessary or appropriate, depending on the mass of sample that is expected to be available at the residence. Record additional information required on the field log forms, as appropriate.

- 4.4 Use the folding ruler or template to define 1-square meter (m²) areas to be vacuumed. Masking tape can be used, if needed, to mark off the perimeter of the 1-square meter areas designated for sample collection. Do not touch the designated sample areas with ungloved hands. Using masking tape with surgical gloves is not practical; therefore, extreme caution must be observed while taping to protect the unaltered integrity of the sample area. If square meter areas are immediately adjacent, the entire area may be taped in a single unit as long as the exact area is measured and logged. Allow narrow walking paths between the targeted sample areas for maneuverability. Make every attempt to remain outside the delineated areas while preparing the sample areas and conducting the sampling. Do **not** allow the Nilfisk vacuum canister to roll into the segregated sample areas. If used, put the used masking tape in a zip-loc™ bag when finished taping delineated sample areas.
- 4.5 Record the area designed for sampling in each room, as well as the total area designated for sampling within the entire residence.
- 4.6 Assemble the Nilfisk GS-80 by :
 - (Done at office before leaving by staff)
 - 4.6.1 Unlatching the 2, lower, side canister wing nuts configured in the front and back of the unit (below the Nilfisk logo and above the hose connection).
 - 4.6.2 Cut a 3-inch cross in one side of the poly liner approximately ½-way between the top and bottom of the liner.
 - 4.6.3 Slip the cut aperture over the vacuum intake port and fit the body of the liner into the canister so that the edges of the liner fold out over the lip of the canister bottom. The top of the liner bag will be seen from the outside of the canister and will be secured when the top of the canister is reattached.



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- 4.6.4 Set the vacuum bag on top of the poly liner (note the bag indicates which side should face up) and expand the bag manually to allow unimpeded flow through the bag.
 - 4.6.5 Secure the opening of the vacuum bag to the aperture where the hose fits onto the canister.
 - 4.6.6 Once the poly liner and the bag are secured, reseal the top of the canister over the housing compartment, engage the wing nuts, and fold the wings for a secure fit. Make sure not to pinch or tear the edges of the exposed poly liner. Tape down wing nuts with packing tape to prevent opening.
(Done in the field)
 - 4.6.7 Insert the hose into the intake port, matching the notches in the male connection to the notches in the female port, press and turn to engage and lock the connection. The hose should be snug, without lateral give, and the rubber gasket should be square to the base of the intake port.
 - 4.6.8 Slip the appropriate vacuum head for the sample surface onto the loose end of the vacuum hose. This connection is a tapered-slip connection, therefore, use conservative pressure to secure the vacuum head to the hose. Should the vacuum head dislodge, slightly twist the hose into the vacuum head while applying pressure to create additional friction.
 - 4.6.9 Adjust vacuum head to extend brush down on hard surfaces or up for use on carpet surfaces.
- 4.7 Working from sample area at nearest side of each room toward the farthest, begin sample collection at one corner of a delineated sample area. Move the vacuum head slowly and deliberately in strips the width of the vacuum head along a lateral axis of the square area. **Pass the vacuum head back and forth four times over each lateral strip, for a total of eight strokes**, and on the last pass, angle the vacuum head to the right or left (depending on the initial corner selected) to begin the next strip, which will be the width of the vacuum head, immediately adjacent to the completed strip. Again, pass the vacuum head back and forth for four complete cycles over the second lateral strip and then angle the vacuum head to begin the third adjacent strip. Continue this process until the entire designated unit has been vacuumed with four “double” passes of the vacuum head.



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- 4.8 Visually inspect the sampled area to assess sample collection efficiency. If visible dust and dirt remain or if dust or dirt can be dislodged by agitating carpet fibers with finger tips, then document the observations and rationale used for continuing the sample collection protocol and repeat step 5.9 and 5.10. If not, prepare to sample the remaining delineated sample areas.
- 4.9 Move to the next delineated area designated for sample collection and repeat steps 4.7, 4.9, and 4.10 until all of the delineated sample areas have been carefully sampled. Turn off the vacuum when sampling is complete.
- 4.10 After all of the delineated sample areas have been vacuumed according to steps 4.9 and 4.10:
 - 4.10.1 Hold the vacuum head in the air away from any objects or surfaces and turn on the vacuum;
 - 4.10.2 Tap the nozzle against your hand to dislodge any residual dust remaining in the nozzle or the hose for collection in the canister;
 - 4.10.3 Turn off the vacuum cleaner and allow it to sit undisturbed for at least 30 seconds;
 - 4.10.4 Unsnap the 2, lower wing-nuts and remove the upper body of the canister from the collection chamber;
 - 4.10.5 Carefully pull the poly liner away from the outside of the canister and surround the inner vacuum bag;
 - 4.10.6 Carefully pull the vacuum bag away from the intake port and fold the aperture to secure the dust contents to the degree possible without the use of adhesives. Close the poly liner around the vacuum bag using caution to secure the package;
 - 4.10.7 Transfer the poly liner/vacuum bag package into a zip lock plastic bag;
 - 4.10.8 Label the exterior of the plastic bag with the designated sample number as described in **Section 3.0** of the Sampling Plan; and
 - 4.10.9 **By office staff:** Log the sample numbers on the proper Chain-of-Custody form(s). Complete the field sample form and store the secured sample in a moderately chilled cooler during transportation and shipment to the designated laboratory. Custody seal the cooler prior to shipment.



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- 4.13 Unplug and prepare the Nilfisk GS-80 for demobilization. Collect all auxiliary equipment and gear and remove them from the residence.
- 4.14 Request from residence, if available, contents of their homes vacuum bag for back-up samples.

5.0 CONTINGENCY SAMPLE MEASURES

- 5.1 If there is no carpet measure and tape, if needed, hard-floor areas using the same protocol as that described for carpeting but with the head brushes down. It will be imperative to maximize sample area and avoid touching delineated sample areas with anything except the vacuum head. Delineated sampling units in a configuration that affords access and maneuverability and follow the standard operating procedures.
- 5.2 Determine if the household vacuum has been used exclusively in the home and if so, politely request the study participant to relinquish the household vacuum bag. If the study participant consents, collect the vacuum bag while wearing gloves to avoid contaminating the sample, and secure the vacuum bag in a plastic bag. Double bagging may be necessary. Label the household vacuum bag sample in accordance with the procedures defined in **Section 3.0** of the Sampling Plan.
- 5.3 Maximizing sample mass is critical to the success and comparability of this environmental sampling event. Consequently, if subject residence conditions are atypical and cannot be accommodated by standard operating procedure, alternative sampling procedures may be implemented as long as conditions and rationale used to justify such deviations are documented and recorded in detail on field sample forms. There is no reasonable way to anticipate every possible conditional anomaly, therefore, field teams must use sound judgment and good, defensible scientific practice if implementing sampling procedures alternative to those described.



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6.0 Nilfisk system Decontamination GS-80 S

At the end of each sampling event, decontaminate the Nilfisk GS-80 and all auxiliary equipment in a well-ventilated area in accordance with the following procedure:

- 6.1 Assemble one of the sampling trains to be used as the decontamination unit for decontaminating all of the used vacuum heads, hoses, and wands. Insert a clean poly liner and vacuum bag to perform the bulk decontamination procedure.
- 6.2 Put on clean surgical gloves attach a hose and vacuum head assembly to the vacuum canister. **Turn on** the vacuum and use a bottle brush to remove any accumulated dust. Tap your hand on the vacuum head to remove any visible dirt that accumulates on the brush. When the vacuum head is visibly clean, remove the vacuum head and spray with reagent grade methanol. Allow the vacuum head to air dry on a clean surface.
- 6.3 Use the bottle brush again to clean the wand and hose to dislodge residual dirt and dust. Again, tap your hand on the wand intake while cleaning with the bottle brush to increase the vacuum in the hose.
- 6.4 Repeat steps 6.2 and 6.3 for each vacuum head, wand, and hose assembly requiring decontamination.
- 6.5 When all ancillary Nilfisk GS-80 equipment has been decontaminated, remove the dirty dust bag and poly liner and wipe the inside of the collection chamber with distilled water. Wipe the inside of all other collection chambers with distilled water as well. Spray all Nilfisk collection chambers with reagent grade methanol and allow to air dry. If decontaminating equipment between residences, wipe the inside of the collection chambers between uses.
- 6.6 Wipe the One (1) square meter (m²) folding ruler, or equivalent, with distilled water and then spray with methanol. Allow to air dry on a clean surface.
- 6.7 Label decontaminated equipment indicating the date of last decontamination and the initials of the person performing the decontamination procedure.

Never collect a dust sample without being completely sure that the Nilfisk GS-80 and auxiliary equipment have been properly decontaminated prior to use.



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7.0 Quality Assurance/Quality Control

With limited sample mass available for primary TAL analyses, duplicate or replicate sample protocol may **not be viable** or feasible (if the team leader determines a duplicate sample is viable they will use the extra bags supplied by the field office). If Viable, duplicate samples can be taken for 1 in 10 samples.

8.0 SAFETY PRECAUTIONS

Health and Safety procedures as described and defined in the NDEP Health and Safety Plan (HASP) must be observed and implemented prior to dust sample collection. Chemical exposures are not anticipated, and physical or mechanical hazards are only those that would be found in any typical household environment.

9.0 References

- 9.0 Compendium of Emergency Response Team (ERT) Collection of Indoor Dust Samples from Carpeted Surfaces for Chemical Analysis Using a Nilfisk GS-80 Vacuum Cleaner.
- 9.1 Chuang, Jane C., Callahan, Patrick J., Menton, Ronald G., and Gordon, Sydney M, *Monitoring Methods for Polycyclic Aromatic Hydrocarbons and Their Distribution in House Dust and Track-in Soil*, Environmental Science & Technology, Vol. 29, No. 2, 1995.
- 9.2 Lewis, R.G., Fortmann, R.C., Camann, D.E., *Evaluation of Methods for Monitoring the Potential Exposure of Small Children to Pesticides in the Residential Environment*, Arch. Environ. Contam. Toxicology 26, 37-46, 1994.
- 9.4 American Society for Testing and Materials, *Standard Practice for Collection of Floor Dust for Chemical Analysis, Designation: D 5438-00*.
- 9.5 Health and Safety Plan, *Prepared in Support of: CDC/NCEH Cross-sectional Exposure Assessment Study – Churchill County, Nevada*. September 25, 2001.



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FIELD DATA SHEET - Appendix A

Site:		Samplers:	
Date/Time:		Team Leader:	
Sample ID Number:		Nilfisk I.D.:	
Sample Location:	Surface Type	Dimensions of Sample Area (Grid)	Total Area (m ²)

Total Area Sampled = _____

Type of Surfaces: Carpet Style: Plush, Level Loop, Multilevel, Shag, Other
 Floors: Hardwood, Cement, Tile, Vinyl, Other

Sketch/
General Comments:



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Figure 1
Diagram of Nilfisk GS-80

