

National Human Exposure Assessment Survey (NHEXAS)

Arizona Study

Quality Systems and Implementation Plan for Human Exposure Assessment

The University of Arizona
Tucson, Arizona 85721

Cooperative Agreement CR 821560

Standard Operating Procedure

SOP-UA-F-5.1

Title: Field Collection of Yard Composite Soil Samples

Source: The University of Arizona

U.S. Environmental Protection Agency
Office of Research and Development
Human Exposure & Atmospheric Sciences Division
Human Exposure Research Branch

Notice: The U.S. Environmental Protection Agency (EPA), through its Office of Research and Development (ORD), partially funded and collaborated in the research described here. This protocol is part of the Quality Systems Implementation Plan (QSIP) that was reviewed by the EPA and approved for use in this demonstration/scoping study. Mention of trade names or commercial products does not constitute endorsement or recommendation by EPA for use.

Field Collection of Yard Composite Soil Samples

1.0 PURPOSE AND APPLICABILITY

This SOP establishes a uniform procedure for the collection of yard composite soil samples in the field. This procedure must be followed to insure consistent and reliable collection of outdoor soil samples for NHEXAS Arizona project, AZ Border project (BORDER AZ), and other Health and the Environment projects.

2.0 DEFINITIONS

- 2.1 AZ BORDER = The US border region is defined as 100 km north of the border. In this study, we define the border as 40 km north of the border. The Arizona Border Study or "Border AZ" is an alias for "Total Human Exposure in Arizona: A Comparison of the Border Communities and the State" conducted in Arizona by the University of Arizona / Battelle / Illinois Institute of Technology Consortium.
- 2.2 BUCKET = A plastic container with a buckle top or tight-fitting lid. One bucket is assigned to each household to be sampled. Household identification and stage numbers are listed on the outside of the container. The bucket contains all paperwork and questionnaires to be completed by field staff or household respondents. It serves as the primary vehicle for securing and transporting forms, data and samples to and from the field through the course of the study.
- 2.3 CHAIN OF CUSTODY RECORD = A vital data tracking and quality assurance form which is attached to every sample sheet or sample container (see Fig. 2) The chain of custody record used to track soil samples is a modified version of UA-G.4-1.X. This custody record is stamped on the paper bag in which the Ziploc bag and sample are transferred to and from the field. Chain of custody commences with sample generation by Field Team Members or the Materials Technician.
- 2.4 FIELD KIT = A sampling tool-box containing appropriate collection and storage utensils. For soil sampling the kit contains soil sample containers (Ziploc Freezer Bags), a 30 yard tape measure, indelible ink pens, two stainless steel trowels and additional copies of the Soil Sampling Data Sheet (Fig. 1). The Ziploc Freezer Bags in which the samples are collected are housed within a paper bag.
- 2.5 HOUSEHOLD (HH) = The residence occupied by study respondent(s).
- 2.6 HOUSEHOLD IDENTIFICATION NUMBER (HHID) = A unique number and character combination which is assigned to each respondent household for identification purposes. This number must be recorded on all data (forms, samples, questionnaires and

correspondence) generated by the household.

- 2.7 MATERIALS TECHNICIAN (Materials Tech.) = The employee of the research project who assigns unique soil sample ID numbers to sample collection containers before sample collection in the field.
- 2.8 N/A = Not Applicable.
- 2.9 NHEXAS Arizona = Acronym for National Exposure Assessment Survey, a research project conducted in Arizona by the University of Arizona / Battelle / Illinois Institute of Technology Consortium.
- 2.10 PACKET = This is a large household specific plastic folder or paper envelope which holds the physical questionnaires and field sampling forms collected from a study household.
- 2.11 PAH = Polycyclic Aromatic Hydrocarbons
- 2.12 SAMPLE = The composite soil sample collected according to protocol in the yards of participating households. Samples will be collected, transported and stored in appropriate soil sample containers.
- 2.13 SAMPLE ID (Sample Identification Number) = A numeric code, generated by NHEXAS tracking system, that uniquely identifies every sample.
- 2.14 SOIL SAMPLE CONTAINER = Soil samples will be collected, transported and stored in resealable polyethylene gallon size bags of at least .4mm thickness. The project is currently using Ziploc freezer bags to collect soil for metals and pesticide analysis.
- 2.15 SOIL SAMPLING DATA SHEET = A field data sheet to record specific information regarding yard soil collection, transport, storage and custody (see Fig. 1).
- 2.16 TEAM LEADER = The member of the field team who is primarily responsible for respondent contact, data collection, field form and questionnaire completion, and site QC checks of all data.
- 2.17 TEAM MEMBER = The member of a field team responsible for assisting the Team Leader in the collection of data and completion of quality control checks in the field.
- 2.18 VISIT = A scheduled appointment with participating respondents at their place of residence (HH) for the collection of samples, questionnaires and other data.

3.0 REFERENCES

- 3.1 Lebowitz, M.D. 1993. Study Design (Revision of 31 Dec. 1993). EPA NHEXAS Cooperative Agreement.

4.0 DISCUSSION

- 4.1 This SOP outlines the correct procedure for the collection of soil samples at participating households according to the strategies outlined in the NHEXAS project, AZ Border project (BORDER AZ) and other Health and Environment projects. Soil samples will be obtained from the residential yard (two trowels full from each of four sides). The yard sample and an additional soil foundation sample (see SOP #UA-F-6.X) may be collected, stored and recorded at the same time. Collection will be recorded on the soil sampling data sheet (Fig. 1).
- 4.2 The yard soil sample will be collected at a location which is 10 feet \pm 1 foot perpendicular to the wall of the building and the foundation soil sample site (if the foundation soil is collected). If the foundation soil sample is collected at the same time as the yard soil sample, different stainless steel trowels will be used to collect the foundation and yard soil samples. Both soil samples are composite samples (by type) and are collected on all four sides of a home. The Chain of Custody record is stamped on the paper bag in which the Ziploc Freezer Bag is kept.
- 4.3 The yard sample will be prepped for analysis to determine PAH, metal and / or pesticide content upon return to the Field Office. Analysis may occur at the UofA Laboratory or at Battelle. Proper sample collection, custody and handling procedures must be of primary concern to all field staff. Ziploc bags will be transported to the field at room temperature in the HH bucket. Once the sample is collected, it is stored in a cooler with blue-ice until it returns to the lab where it is stored in a freezer at -20°C.

5.0 RESPONSIBILITIES

- 5.1 The Field Coordinator is responsible for:
- (a) 100% QA check of field forms;
 - (b) Accepting custody of soil sample from the Team Leader;
 - (c) Transferal of sample to the Lab Coordinator;
 - (d) Performing 10% QA in-field audit of collection, transportation and storage methods.
- 5.2 The Team Leader is responsible for:
- (a) arranging sampling dates and times with the HH;
 - (b) selecting the sample sites at each HH;
 - (c) custody of the soil samples and supplementary data collected;

- (d) completing the Chain of Custody Record (Fig. 2);
- (e) quality control checks in the field;
- (f) transfer of sample to the Field Coordinator.

5.3 All Team Members are responsible for:

- (a) obtaining the soil samples according to protocol;
- (b) properly storing and labeling the collected sample;
- (c) completing the Soil Sampling Data Sheet (Fig. 1);
- (d) quality control checks in the field.

6.0 MATERIALS AND REAGENTS

6.1 Materials

Sample storage containers (Ziploc Freezer Bags), indelible ink pen, 30 yard measuring tape, two stainless steel trowels, sample storage cooler, blue ice-packs, Soil Sampling Data Sheet, paper bag with Chain of Custody Record stamped on it, kim wipes and deionized water.

6.2 Reagents

Deionized water to rinse and clean the trowel after use.

7.0 PROCEDURE

7.1 Preparation

7.1.1 Field Site Selection Criteria

Indicate on the Field Sheet whether each sample site violates any of the following field site selection criteria.

- (a) Yard soil samples are collected 10 feet \pm 1 foot perpendicular to the wall or foundation of the dwelling occupied by the primary respondent. Permission must be granted to collect the soil - check with the Team Leader to see if the respondents would prefer you **not** to sample in certain areas. If so, avoid sampling those areas.
- (b) Since the Yard Soil sample is to be collected perpendicular to the Foundation Soil sample (when collected), attempt to choose Foundation Soil sample sites (UA-F-6.X) which would also allow you to collect Yard Soil samples. That is, be sure that your Foundation Soil site has a potential Yard soil site perpendicular to, and approximately 10 feet away from, the chosen site whenever possible (Fig. 3.).
- (c) If the residence is an apartment or multiple family dwelling unit, sample the base of

the building as if it were a single family housing unit. Annotate the building type and consequential effects on sample site selection on the field sheet (Fig. 4.).

- (d) If a sample is to be taken by the side of a road or near a driveway, exercise extreme caution, be wary of traffic flows and be conscious of your surroundings.
- (e) If the sample is to be collected in a part of the yard in which vegetation is dense or your view is partially obscured, be aware of environmental hazards such as scorpions, snakes, etc.
- (f) Try to avoid pools of standing water, cat litter boxes etc. Note any unusual characteristics of the sample site in the comments section of the Soil Sampling Data Sheet. Comments might include references to nearby fuel or chemical spills, drainage or rain-run-off patterns, etc.

7.1.2 Reagents - none.

7.1.3 Standards & Blanks

Field standards will be created by the Materials Technician. Thirty gram (+/- 3 gram) samples of an ASTM standard soil matrix will be weighed on filter paper, then placed in Ziploc Freezer Bags (see 1 and 2 below). These bags will be assigned sample-IDs and recorded as standards in the tracking system. Field standards will be taken to and returned from the field under the same conditions as the 'live' or 'real' sample. Duplicate samples (two soil samples from the same household) will also be collected. Standards and duplicates will be analyzed with 'live' or 'real' samples. 10% of all samples collected will be for QC\QA purposes.

1. Locate standard soil matrix. Thoroughly mix / homogenize the matrix with a stainless steel tool before weighing standards.
2. Turn on the scale in the laboratory and follow the calibration guidelines (UA-L-1.X). Place a piece of weighing paper on the scale and tare to 0.0000. Using a stainless steel tool, scrape small amounts of the matrix on to the weighing paper until the scale displays a weight of 30 grams \pm 3 grams. Place soil in a new Ziploc Freezer Bag. Label the sample containers (Ziploc Freezer Bags) with indelible ink; include the sample type, sample ID, date, and collector's ID.
3. Set aside, place the weighing paper on to the scale pan, tare if necessary, and repeat the procedure.

7.1.4 Samples

The Field Kit and Bucket must be stocked with appropriate materials, specifically : sample storage containers, indelible ink pens, two trowels, a 30 yard measuring tape, kim wipes, and deionized water. The particular Soil Sampling Data Sheet and Chain of Custody Record (stamped on the paper bag which houses the Ziploc bag) for the HH to be sampled

should be in the HH bucket. Additional Sampling Data Sheets and Chain of Custody Records are available in the Field Kit.

7.2 Sample Collection

The data/sample flow diagram for composite soil samples is shown in Figure 5. The relative timing of soil sampling to other sample collection by stage is displayed in Figure 6.

7.2.1 Blanks deployed

- (a) A standard matrix or duplicate collection container (7.1.3) will be randomly assigned by the Materials Tech to a Household. It experiences the same storage and shipment conditions as the other soil sample containers, but the standard is returned unexposed and unopened. It is analyzed with the other soil samples.
- (b) The duplicate sample container is used to collect a second trowel full of soil immediately adjacent (within 1 inch) to the location of the 'live' or 'real' sample. The duplicate sample experiences the same storage and shipment conditions as the other soil sample, and is analyzed with the other soil samples.

7.2.2 Samples

The Team Leader coordinates with, and obtains consent from, respondents in each HH.

7.2.3 Residential yard composite soil samples will be collected at the four sides of the house. Site location and any necessary comments will be recorded on the data sheet (Fig. 1).

- (a) Before starting (or immediately after) sampling, label the sample containers (Ziploc Freezer Bags) with indelible ink; include the sample type, HHID, sample ID, date, and collector's ID.
- (b) Clean the stainless steel trowel by rinsing with deionized water and drying with kim wipes.
- (c) Walk around the house and determine the sampling sites. Collect soil to all (up to eight) possible sampling locations. If there are less than four possible sampling locations, make sure to take enough soil at each site so the total sampling mass will approximate the mass that would have been collected by sampling at four locations.
- (d) On each side of the house, divide (by eye) the length of the wall (as if it was straight) into three approximately equal units.
- (e) Collect a soil sample at the 1/3 and 2/3 point, 10 feet \pm 1 foot from the foundation of the dwelling / structure. (Fig. 3 a,b and Fig. 4 a,b).
- (f) Pace-out a distance of ten feet (plus or minus 1 foot) perpendicular to the wall.
- (g) Record the sites on the sampling data sheet (Fig. 1).

7.2.4 Yard soil samples are collected as a composite sample. The total of eight yard samples (2 front, 2 rear, 2 at each side) are collected and held in the same sampling container. At each of the eight sites:

- (a) Carefully clear the area of the sampling site of large gravel/debris/leaves etc.
- (b) Collect 1 trowel-load of soil up to a Max. of 1 inch depth.
- (c) Open the sample container and place the sample within.
- (d) Re-seal container.
- (e) Move to next sampling site.
- (f) Use the same trowel for all eight yard soil samples. Do not use the same trowel in collecting the foundation soil that you used when collecting the yard soil samples without rinsing it thoroughly with deionized water and drying it with kim wipes first.
- (g) It is recommended that you use one cleaned stainless steel trowel for the yard soil and a second trowel for the foundation soil.

7.2.5 If the yard soil and foundation soil are collected at the same time, the following sampling sequence is recommended:

- (a) Collect foundation soil at site 1 with trowel A.
- (b) Move 10 feet perpendicular to site 1 (± 1 foot: visual estimation).
- (c) Collect yard soil at site 1 with trowel B.
- (d) Move to next foundation soil sampling location, and repeat a-c in 7.2.5.

7.2.6 When the eighth and final yard sample has been collected:

- (a) Clean hands.
- (b) Complete the appropriate sections of the Soil Sampling Data Sheet (Fig. 1).
- (c) Notify Team Leader that soil sampling is complete.
- (d) Store the sample in the cooler on blue ice.

7.2.7 When the Field Team returns from the field:

- (a) The collector relinquishes the samples to the Team Leader.
- (b) The Team Leader transfers custody to the Field Coordinator/freezer.
- (c) The Field Coordinator or Materials Tech. transfers custody to Lab Supervisor for sieving, analysis and shipment to cooperating laboratories for analysis (as applicable).

7.3 Calculations

Calculations are limited to estimating the length of the side of a home and pacing out 10 feet ± 1 foot from the wall of each building sampled. When collecting duplicate samples, the technician will also need to collect duplicate samples at an approximate maximum distance of one inch from each the 'live' or 'real' collection sites. The tape measure is available for verification if needed; however, visual estimation of distance and depth is acceptable.

7.4 Quality Control

- 7.4.1 (a) 10 percent of all samples will be used for QA/QC purposes.
- (b) In the HH sampling site the Team Leader supervises all work and completion of forms. Team Members work collectively and check each other's work for accuracy, precision and compliance with SOP procedure and policy.
- (c) The "comments" section on the data sheet must be completed, if necessary. Examples of situations which might violate sample quality include: soil under gravel, cement on the sampling area, sample taken after rain, strong wind while sampling, or grass included with sample, etc.
- (d) The Field Coordinator supervises 1 out of 10 sampling procedures to insure that proper collection methods are used.

7.4.2 Tolerance Limits

Estimation of the length of a dwelling and its subdivision into three equal segments may be accomplished by eye. In cases where unusual circumstances influence sampling, notify the Team Leader of the situation and document the decision \ discussion on the Soil Sampling Data Sheet (Fig. 1). Distance from the wall of the building is to be approximately 10 feet +/- one foot. Distances may be estimated by the field team. Insure that the trowel does not penetrate the soil to a depth greater than one inch +/- 1/2 inch. Depth may be approximated by the field team.

7.4.3 Detection Limits

Collect a sample wherever possible. If the sample site has no soil overlay (such as on a tile, brick or cement surface) collect the dust/dirt if possible and document the nature of the ground covering as appropriate. Document possible sources of metal/pesticide contamination where visually detected.

7.4.4 Corrective Actions

Apparent mis-labeling problems detected in the field may be corrected by the Team Members when appropriate and in accordance with SOP #UA-C-2.X.

8.0 RECORDS

8.1 Soil Sampling Data Sheet

- 8.1.1 This data sheet (Fig.1) will serve as the primary record of both yard soil and foundation soil samples collected in the field. The soil sample collector is responsible for the thorough completion of this form.

- 8.1.2 The completed original Soil Sampling Data Sheet will be securely archived with the HH packet upon completion of post field QA checks to be accomplished by the Team Leader and Field QA Coordinator.

8.2 Chain of Custody Record

- 8.2.1 This Record (Fig.2) will serve as the primary record of sample custody after collection in the field. The Team Leader and the collector are responsible for the thorough completion of this form.
- 8.2.2 The completed original Chain of Custody Record will remain with the soil sample at all times. The Chain of Custody Form UA-G4-1.X is stamped on the paper bag in which the Ziploc bag containing the sample is placed (Fig. 2).

8.3 Sample

- 8.3.1 The sample container (Ziploc bag) will also have HHID, date, sample type, sample ID and collector's initials recorded upon it with indelible ink.
- 8.3.2 The original Chain of Custody Record will remain with the sample regardless of where it is shipped or stored.

Figure 1. Soil Sampling Data Sheet. (page 1 of 2)

SOIL SAMPLING									
Form Type: <div style="border: 1px solid black; padding: 2px; display: inline-block;">104</div> <small>FORM UA-F-5.0-1.0</small>	Study: <input type="radio"/> 1. NHEXAS <input type="radio"/> 2. Border <input type="radio"/> 3. _____ <input type="radio"/> 4. _____ <input type="radio"/> 5. _____	Stage # <div style="border: 1px solid black; width: 20px; height: 20px; display: inline-block;"></div> Collapsed? Y <input type="radio"/> N <input type="radio"/> 8 <input type="radio"/>	Team Leader: _____ <small>Init.</small> Collected by: _____ <small>Init.</small>	Tech ID <div style="border: 1px solid black; width: 20px; height: 20px; display: inline-block;"></div> Tech ID <div style="border: 1px solid black; width: 20px; height: 20px; display: inline-block;"></div>	HHID <div style="border: 1px solid black; width: 40px; height: 20px; display: inline-block;"></div> Sample Date <div style="display: flex; justify-content: space-between;"> <div><div style="border: 1px solid black; width: 20px; height: 20px; display: inline-block;"></div> / <div style="border: 1px solid black; width: 20px; height: 20px; display: inline-block;"></div> / <div style="border: 1px solid black; width: 20px; height: 20px; display: inline-block;"></div></div> <div> <small>MO DAY YR</small> </div> </div>	F.S. <div style="border: 1px solid black; width: 20px; height: 20px; display: inline-block;"></div> QC: <input checked="" type="checkbox"/> <div style="border: 1px solid black; width: 20px; height: 20px; display: inline-block;"></div>	Visit <div style="border: 1px solid black; width: 20px; height: 20px; display: inline-block;"></div>		
1. Collection Start Time: <div style="border: 1px solid black; width: 40px; height: 20px; display: inline-block;"></div> : <div style="border: 1px solid black; width: 40px; height: 20px; display: inline-block;"></div>		2. Collection Stop Time: <div style="border: 1px solid black; width: 40px; height: 20px; display: inline-block;"></div> : <div style="border: 1px solid black; width: 40px; height: 20px; display: inline-block;"></div>		QC: <input checked="" type="checkbox"/> <div style="border: 1px solid black; width: 20px; height: 20px; display: inline-block;"></div>					
Site #	Foundation Soil	qc: <input checked="" type="checkbox"/>	Comments	Yard Soil	qc: <input checked="" type="checkbox"/>	Comments			
1	<input type="radio"/> Y <input type="radio"/> N <input type="radio"/> N/A	<div style="border: 1px solid black; width: 20px; height: 20px; display: inline-block;"></div>	<div style="border: 1px solid black; width: 40px; height: 20px; display: inline-block;"></div>	<input type="radio"/> Y <input type="radio"/> N <input type="radio"/> N/A	<div style="border: 1px solid black; width: 20px; height: 20px; display: inline-block;"></div>	<div style="border: 1px solid black; width: 40px; height: 20px; display: inline-block;"></div>			
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4	<input type="radio"/> Y <input type="radio"/> N <input type="radio"/> N/A	<div style="border: 1px solid black; width: 20px; height: 20px; display: inline-block;"></div>	<div style="border: 1px solid black; width: 40px; height: 20px; display: inline-block;"></div>	<input type="radio"/> Y <input type="radio"/> N <input type="radio"/> N/A	<div style="border: 1px solid black; width: 20px; height: 20px; display: inline-block;"></div>	<div style="border: 1px solid black; width: 40px; height: 20px; display: inline-block;"></div>			
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10	<input type="radio"/> Y <input type="radio"/> N <input type="radio"/> N/A	<div style="border: 1px solid black; width: 20px; height: 20px; display: inline-block;"></div>	<div style="border: 1px solid black; width: 40px; height: 20px; display: inline-block;"></div>	<input type="radio"/> Y <input type="radio"/> N <input type="radio"/> N/A	<div style="border: 1px solid black; width: 20px; height: 20px; display: inline-block;"></div>	<div style="border: 1px solid black; width: 40px; height: 20px; display: inline-block;"></div>			
3. Foundation Soil Sample ID: <div style="border: 1px solid black; width: 40px; height: 20px; display: inline-block;"></div> 53 <div style="border: 1px solid black; width: 20px; height: 20px; display: inline-block;"></div> <div style="border: 1px solid black; width: 20px; height: 20px; display: inline-block;"></div> <div style="border: 1px solid black; width: 20px; height: 20px; display: inline-block;"></div> <div style="border: 1px solid black; width: 20px; height: 20px; display: inline-block;"></div> <div style="border: 1px solid black; width: 20px; height: 20px; display: inline-block;"></div>				Comments: <div style="border: 1px solid black; height: 40px; width: 100%;"></div>					
4. Yard Soil Sample ID: <div style="border: 1px solid black; width: 40px; height: 20px; display: inline-block;"></div> 51 <div style="border: 1px solid black; width: 20px; height: 20px; display: inline-block;"></div> <div style="border: 1px solid black; width: 20px; height: 20px; display: inline-block;"></div> <div style="border: 1px solid black; width: 20px; height: 20px; display: inline-block;"></div> <div style="border: 1px solid black; width: 20px; height: 20px; display: inline-block;"></div> <div style="border: 1px solid black; width: 20px; height: 20px; display: inline-block;"></div>									
QC <input checked="" type="checkbox"/> By: _____ Tech ID <div style="border: 1px solid black; width: 20px; height: 20px; display: inline-block;"></div>									

Data Use Only:	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F	G	H	I	J
	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

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Figure 1. Soil Sampling Data Sheet. (page 2 of 2)


PAGE 2
Soil Sampling

5. Thin Film Loc.: ☐ 1. curb ☐ 2. drive ☐ 3. mailbox ☐ 4. outer window sill ☐ N/A (def.)

6. Thin Film ID#: 59

QC: ☒ []

Provide a rough birds-eye view of the residence and yards. Indicate sample sites by site #.


N

QC: ☒ []

Office Use Only

Form Status:	<input type="radio"/> 1. Cmp	Tech. ID	MO	DAY	YR	Tech. ID	MO	DAY	YR
	<input type="radio"/> 2. N Cmp	QC: _____							
	<input type="radio"/> 3. P Cmp	Init.				DE: _____			
	<input type="radio"/> 4. Re-col					Init.			
<input type="radio"/> 5. Ref	QA: _____					DP Batch:		QXV:	F S O I 1
<input type="radio"/> 7. Dest	Init.								
<input type="radio"/> 8. N/A									
<input type="radio"/> 9. Misc									

Chain of custody initiated (sig.): _____
Consigned to packet on: [] ____/____/____ Box UA G4-2.0

Comments: _____

Figure 2. Chain of Custody Record for Soil Samples.

[illegible]

Comments

Figure 3a. Sampling Sites.

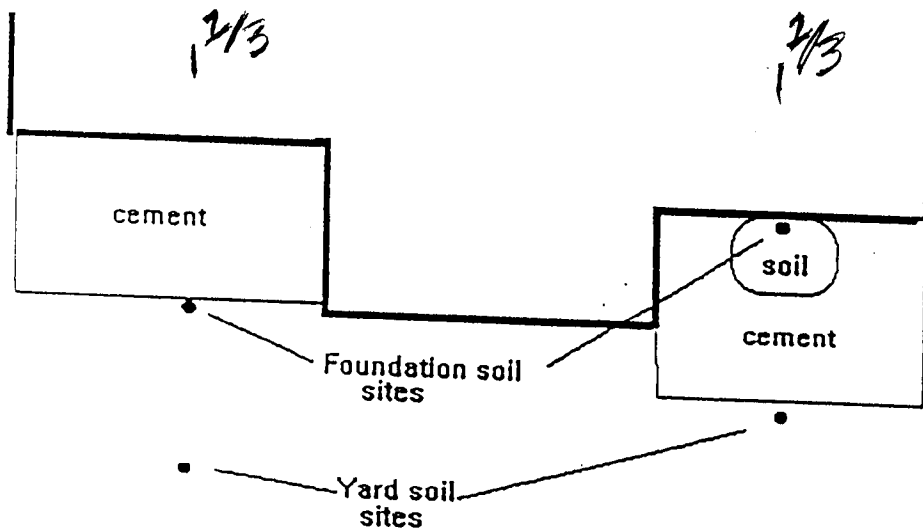


Figure 3b. Sampling Sites

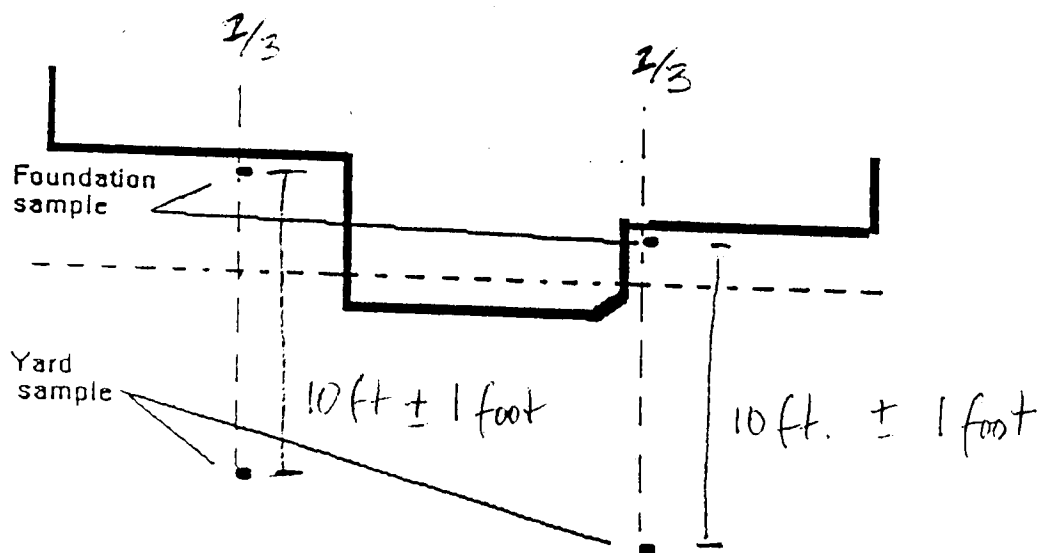


Figure 4a. Example of sampling sites for a single family dwelling.

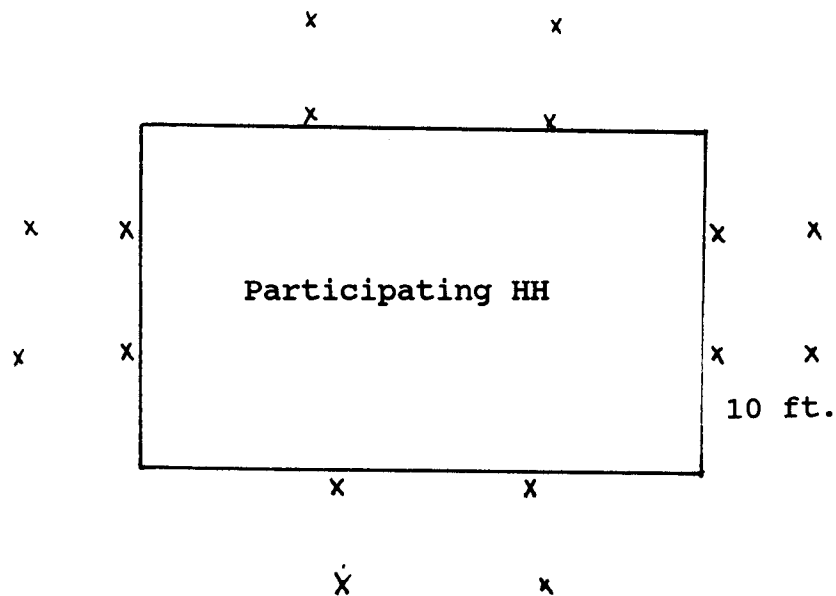


Figure 4b. Example of sampling sites for a multi-family dwelling or apartment.

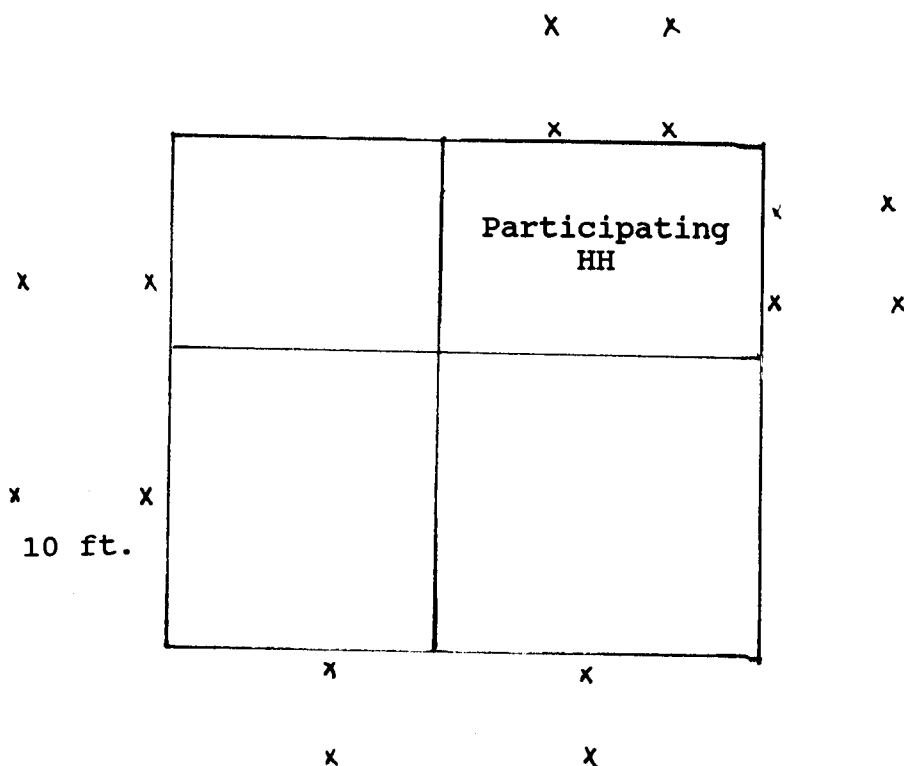


Figure 5. Data/Sample Flow Diagram for Yard and Foundation Composite Soil Samples

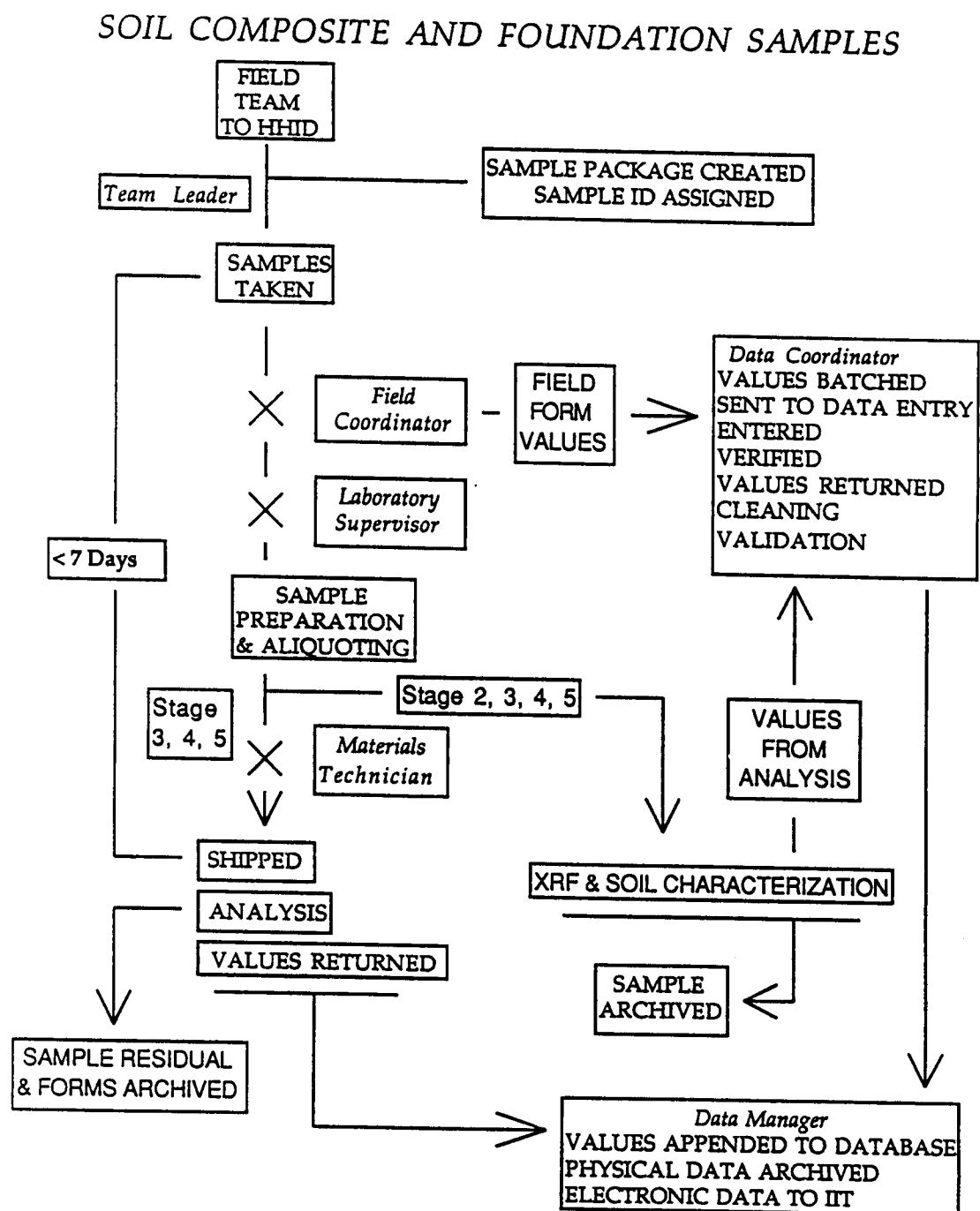


Figure 6. Relative Timing of Soil Sample Collection by Stage (page 1 of 3)

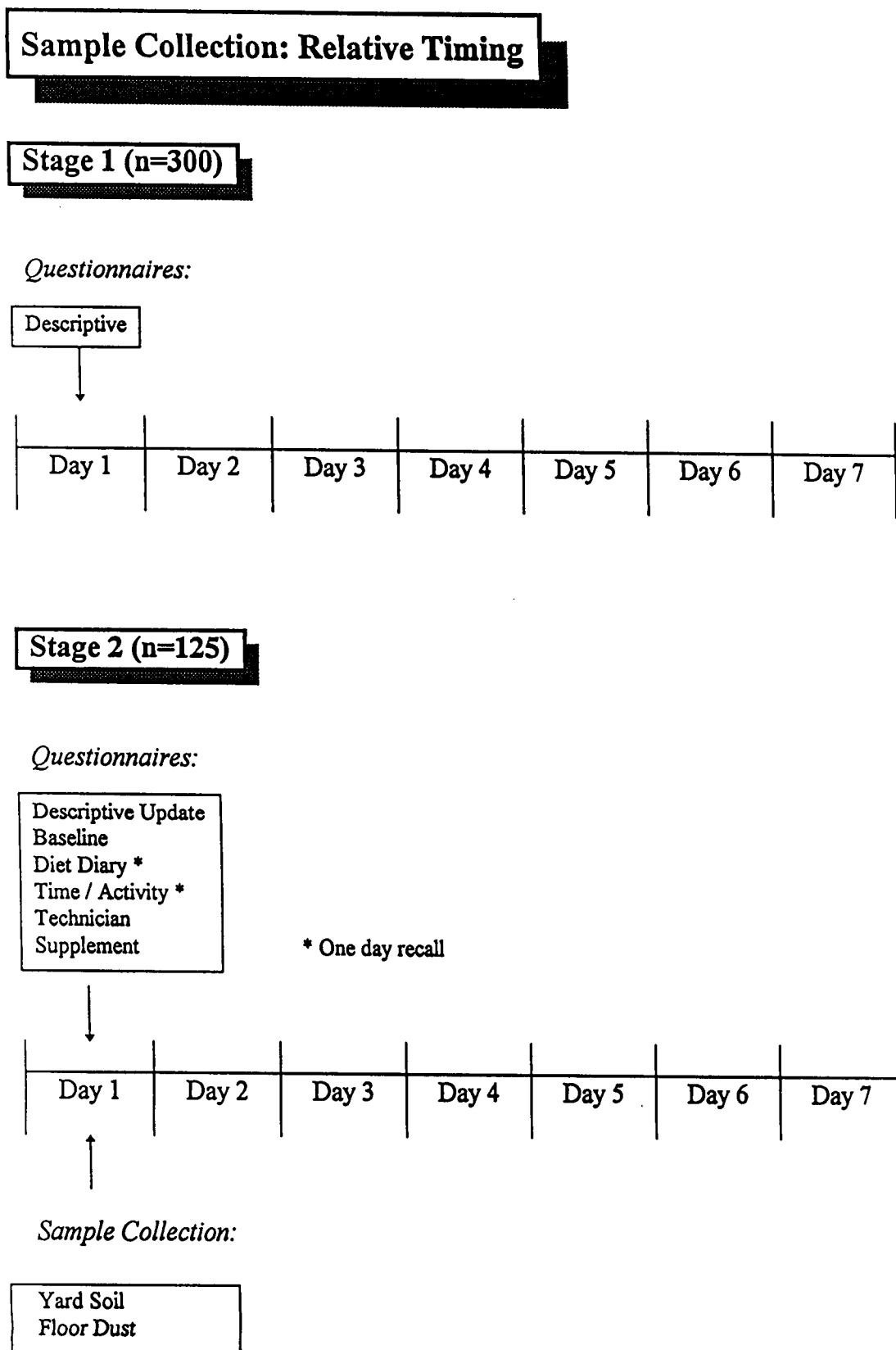
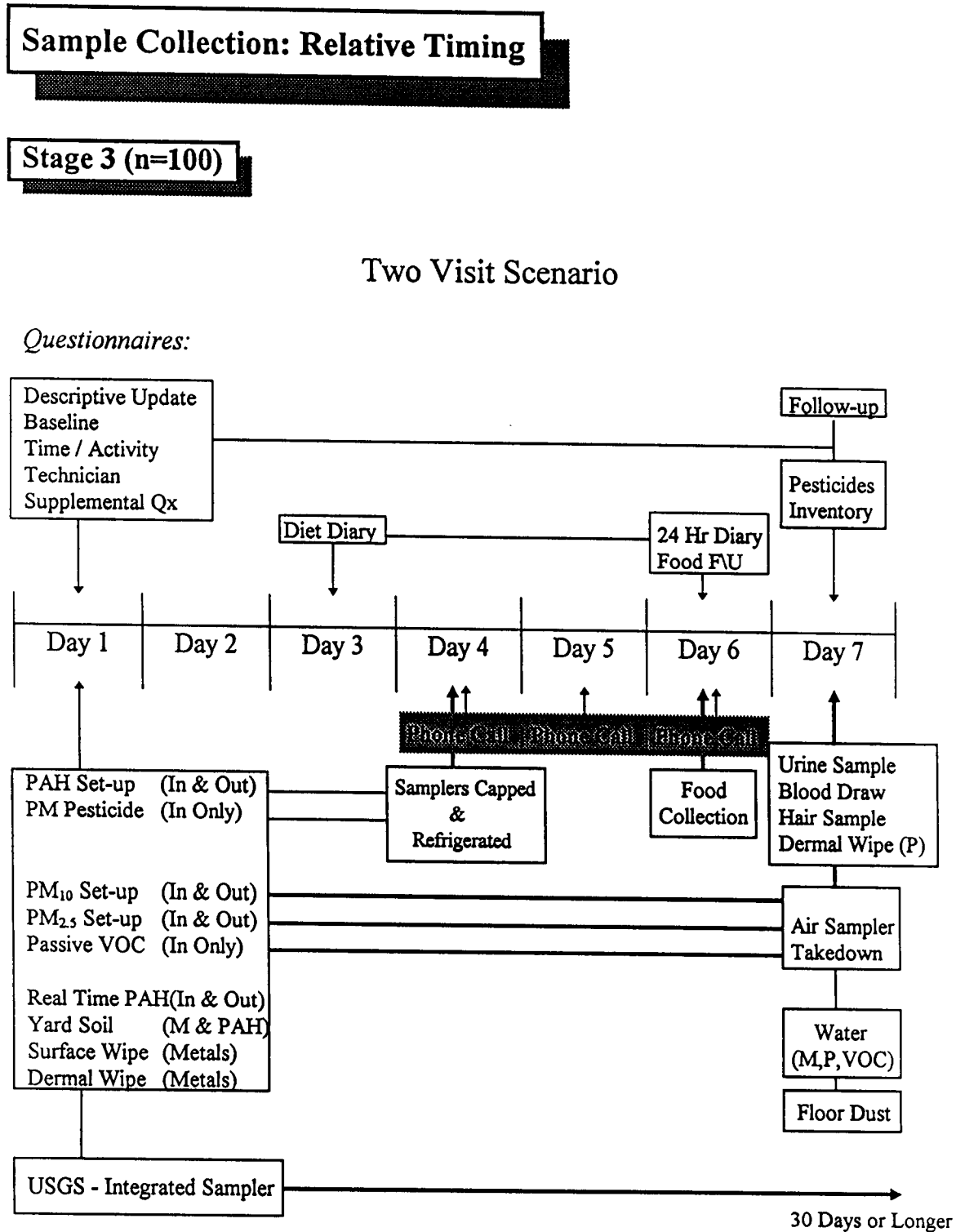


Figure 6. Relative Timing of Soil Sample Collection by Stage (page 2 of 3)



* Active VOC is collected in a subset of 25 homes only

Figure 6. Relative Timing of Soil Sample Collection by Stage (page 3 of 3)

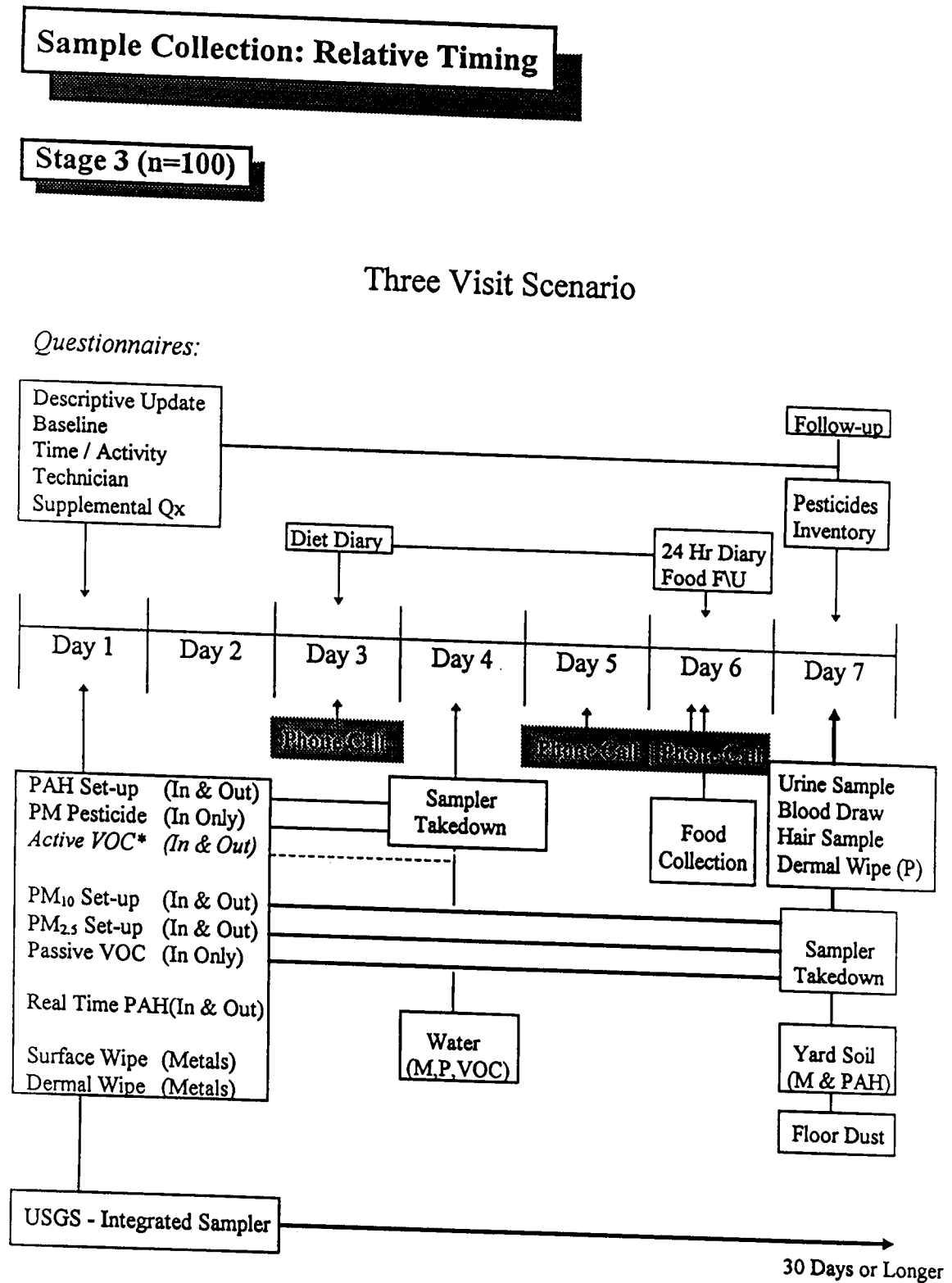


Figure 7. Summary and Troubleshooting Guide for Soil Sample Collection by Stage.

- (1) Collect two soil samples from each side of the home up to a maximum of 8 samples.
- (2) Site selection is based upon the location of the foundation soil collection locations. Collect samples at least 10 feet from wall of home perpendicular to the wall and foundation soil collection site.
- (3) Preliminary reports from the UofA Lab Supervisor suggest that 8 full trowels of soil yields nearly twice as much sample (of the appropriate size fraction) needed for metals and pesticide analysis. Thus, the field crew should always try to collect 8 full trowels of soil, however, if only 4 full trowels can be collected due to some site or situational constraints, the sample may still be valid.