



3.4 SELECTION OF DECISION UNITS

A Decision Unit is an area where a decision is to be made regarding the extent and magnitude of contaminants with respect to potential environmental hazards posed by existing or anticipated future exposure to the contaminants. Strictly speaking, a decision unit is really a volume rather than area of soil, because the thickness of the decision unit is often a key factor. Average contaminant levels are determined in the selected decision units.

Establishing decision units early in the site investigation design helps develop an effective sampling approach and ensure that adequate data are available to prepare an Environmental Hazard Evaluation (EHE, see Section 13). Note that identification of decision units is an important element of any sampling strategy, including *Multi-increment* or discrete sampling approaches. A discussion of decision unit investigation strategies in the context of EHEs is also included in the HDOH guidance document *Evaluation of Environmental Hazards at Sites with Contaminated Soil and Groundwater* (HDOH, 2008).

The selection of decision units (DUs) is unique to each site and depends in part on the specific type of environmental hazard under investigation (see Step 8 in Section 3.2 and Section 13). Decision units generally fall into two categories: 1) Exposure Areas, and 2) Spill Areas. The appropriate type, size, shape and number of DUs for a given project is necessarily site-specific and must take into consideration the historical, current and future use of the site. Investigation objectives and approaches can vary over time as the project proceeds and alternate DUs may need to be established to assist in response actions or long-term management of sites. For example, DUs established for site characterization purposes may need to be refined for the remedial phase of the project to better isolate high-priority areas and optimize resources available for cleanup.

DUs for different media (e.g. soil vs. groundwater vs. soil gas vs. indoor air) should in most cases be treated separately, even if they are investigated concurrently. DUs for different media could overlap but may have different decisions associated with them.

3.4.1 Decision Units Associated with Exposure Areas

The most appropriate decision unit for relatively immobile contaminants that primarily pose direct-exposure, toxicity-based



hazards (e.g., lead, arsenic, dioxins, polychlorinated biphenyls [PCBs] or polynuclear aromatic hydrocarbons [PAHs], etc.) is the assumed exposure area. “Exposure areas” are areas frequented by residents or workers who may come in contact with contaminants in soil on a regular basis (see Section 13). Examples include residential yards, schoolyards, playgrounds, gardens, open areas on commercial/industrial properties, etc. (refer to Figure 3-8). For exposure area DUs, the primary question is “What is the representative concentration of target contaminants across the exposure area as a whole?” The DUs could be based on current land use (e.g., an open area of a commercial or industrial site) and/or or future use of the area (e.g., assumed hypothetical residential lots).

The size of exposure area DUs for commercial or industrial sites should be based on the location of exposed areas of soil and use of the site by workers. DUs based on exposure areas for residential properties usually encompass the entire yard and/or open, unpaved common areas in high-density developments. For future redevelopment projects that involve single-family homes, the size of a hypothetical residential lot is generally assumed to be 5,000 ft² (see Subsection 3.5). When possible, it is generally best to investigate a site in a manner that allows unrestricted land use (i.e., residential land use, see Section 13).

The concentration of contaminants in small areas or “hot spots” within the DU itself is not important, nor is the exact location of these areas. **The objective of the DU investigation is to estimate an average contaminant concentration for the DU as a whole, not to identify maximum and minimum contaminant concentrations within the DU.** It is essential, however, to determine representative average concentrations of contaminant(s) for the DU; this includes areas of both higher and lower contaminant concentrations across the DU. As discussed in more detail in Section 4, this is best accomplished by the collection of a *Multi-increment* (versus discrete) sample or samples across the DU. In addition, replicate field samples are collected during the sampling effort to determine the precision of the contaminant data collected. The precision of the average contaminant concentration(s) in the DU is considered when evaluating data quality and comparing the results to relevant action levels.

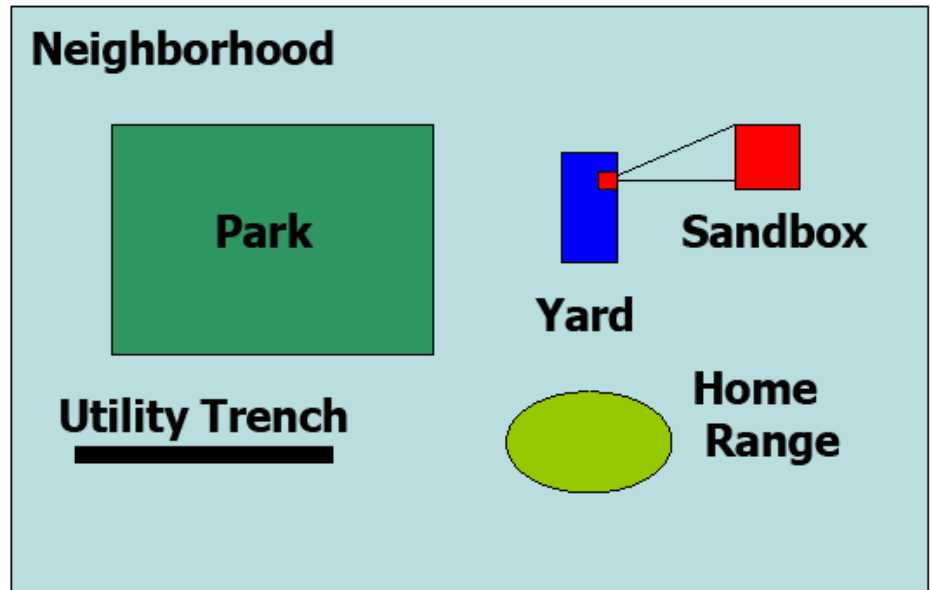
Examples of DUs based on exposure areas are included in Subsection 3.5. Decision units based on exposure areas can also



be established for ecological risk assessments. Additional guidance on decision units for ecological risk assessments will be included in the TGM in the future.

Figure 3-8. Model/example of Exposure Area Decision Units

Model/example of Exposure Area Decision Units - Areas where residents or workers may be exposed to contaminants in soil on a regular basis. For ecological receptors this area is called the *home range*. The size & shape of exposure area decision units depends on the targeted receptor and the desired scale of the evaluation.

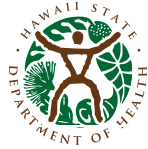


3.4.2 Decision Units Associated with Spill Areas

For use in this guidance, a “spill area” is defined as a discernable area of elevated contamination in soil that can be mapped with respect to surrounding areas. Examples include areas with obviously contaminated and stained soils, unpaved areas used to store or mix hazardous chemicals, known waste disposal areas, areas immediately adjacent to transformer pads or other types of equipment that may have contained hazardous chemicals, releases from pipelines, etc.

The isolation and evaluation of individual spill areas is generally necessary to evaluate environmental hazards associated with soil leaching, vapor intrusion and gross contamination hazards (see Step 8 in Subsection 3.2 and Section 13). This applies to most releases of petroleum, solvents and highly mobile pesticides like atrazine and ametryn. In these cases, the appropriate question is “What is the representative concentration of the contaminant(s) within the spill area itself?”

If the target contaminant at the site poses one or more of these potential concerns, then the spill area itself should be established as a separate decision unit. For example, a spill area associated



with a petroleum release around an aboveground storage tank should be identified as a separate DU and appropriately investigated. This is because petroleum contamination can pose multiple environmental hazards, including leaching of contamination to subsurface groundwater resources, intrusion of vapors into overlying buildings and nuisance or even explosion hazards associated with grossly contaminated soil. It is inappropriate to incorporate data outside of the spill area in the evaluation of these types of hazards.

It may also become important to consider individual spill areas within an exposure area DU if the target contaminant poses potential direct exposure hazards, and the site is being evaluated for remediation options (once initial site characterization sampling has established a contaminant concentration within the DU is above relevant action levels). For example, isolating and remediating large spill areas at a site heavily contaminated with arsenic can help optimize remedial actions to reduce average exposure concentrations (see Section 4.2.9 and 4.3.3).

Isolation and remediation of spill areas within an exposure area DU may also be necessary to prevent localized but heavily contaminated soil from being spread out across a larger area during future construction activities. For example, PCB-contaminated soil in the immediate vicinity of a transformer pad may not in itself pose direct exposure hazards to workers or even future residents given the assumed exposure area. However, under a future redevelopment scenario, the soil could be excavated and spread out over a much larger area. This could result in a dramatic increase in the average concentration of a contaminant across the DU(s). Decision units for these types of spill areas as well as other examples are described in Subsection 3.5.

3.4.3 Evaluation of Decision Unit Data

The evaluation of data collected from DUs is discussed in Section 13 of this guidance as well as the accompanying guidance *Evaluation of Environmental Hazards at Sites with Contaminated Soil and Groundwater* (HDOH, 2008). When using a decision unit strategy, the entire area of a decision unit is acted upon as a single entity based on the average contaminant data collected from that decision unit. If the decision outcome is “contaminated,” then the entire area of the DU is treated as being contaminated. If the data indicate that remediation is required, this applies to the entire



decision unit. If the outcome is “not contaminated,” then the entire area of the DU is treated as being not contaminated. As discussed above, this makes the selection of decision units very important to ensure that appropriate exposure areas and/or spill areas are identified, and areas of obvious heavy contamination are segregated into separate DUs to reduce the volume of soil that is identified as “contaminated” and requires treatment.