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THE DQO PROCESS

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The DQO process is a planning tool for assuring that the scientific method is applied systematically to an environmental problem. The purpose for using the process is to facilitate more efficient and cost-effective design of field investigations that support improved decision making with reduced decision errors. Thus, in addition to savings in investigation costs, substantial cost savings are also realized by the reduction in decision errors that is typically achieved. When applied to questions concerning the need to remediate hazardous waste sites, for example, substantial savings result by reducing the frequency with which sites are *falsely* determined to require cleanup as well as by reducing and focusing cleanup that is required.

The seven steps of the DQO process are:

1. Define the problem;

2. Identify the Decision(s);

3. Define the Inputs to the Decision(s);

4. Specify the Decision Boundaries;

5. Specify the Decision Rule;

6. Establish Relevant Data Quality Objectives; and

7. Optimize the Design.

The process is not intended as an add-on to existing procedures but simply as a tool that fosters a new way to think about the problem being addressed. By working through the seven steps, one is primarily forced to alter the manner with which one conceptualizes a problem and the order with which one addresses its components. For example, one must specify the precise set of risk-management decisions that need to be determined to resolve site-related concerns *at the beginning of the project* rather

then later, after data have been collected. By knowing the exact decisions that need to be resolved *during planning*, it is much easier to identify both the precise types of data (defined in Step 3) and the precise quality of data (defined in Step 6) that are needed to support the required decision making. Thus, collection of superfluous data is eliminated and, by properly focusing on the issues, the quality of the data that are collected can be improved substantially with little or no increase in investigation effort or cost. Finally, by carefully matching the quality and characteristics of the data that are collected to the *specific* manner in which the evaluation is to be performed to support the required decisions (which must be specified in Step 5), decision errors can be reduced substantially.

Importantly, formal consideration of data quality during data evaluation to support risk-management decisions can lead also to a reduction in decision errors, even when the DQO process is not applied during planning. At a minimum, considering data quality informs decision makers about the probability that their decisions contain an error and, therefore, indicate the confidence that can be placed in such decisions. Otherwise, the problems are insidious; if one does not evaluate data quality, one will never know whether a decision error has been committed.