United States Environmental Protection Agency | Office of Solid Waste and Emergency Response | 9355.9-01FS EPA540-F-93-043 September 1993

EPA DATA QUALITY OBJECTIVES PROCESS FOR SUPERFUND Fact Sheet

EPA Order 5360.1, entitled, *Policy and Program Requirements to Implement the Mandatory Quality Assurance Program*, establishes mandatory quality assurance (QA) requirements for Agency environmental data collection activities. The National Oil and Hazardous Substances Pollution Contingency Plan (NCP) mandates specific Superfund QA requirements. Both documents emphasize two requirements: (1) Superfund environmental data must be of known quality; and (2) QA plans based on generic or site-specific procedures are required to obtain the first objective. The Office of Solid Waste and Emergency Response (OSWER) has developed this fact sheet to promote the Data Quality Objective Process for Superfund: Interim Final Guidance. The focus here is the development and implementation of a quality system which requires all Superfund activities to develop and operate management processes and structures for assuring that the data collected are of known quality. The Data Quality Objective process is an effective means by which managers and technical staff may plan and design a more efficient QA plan and a more timely sampling and analysis program that is consistent with the integrated site assessment and accelerated response activities of the Superfund Accelerated Cleanup Model (SACM). Conforming to this guidance will help ensure that site managers generate data of known quality that are sufficient for their intended use.

This fact sheet describes the Interim Final Guidance on the Data Quality Objectives Process for Superfund (September 1993)[1]. This new guidance supersedes previous 1987 Superfund guidance on Data Quality Objectives (DQOs), *Data Quality Objectives for Remedial Response Activities: Development Process*, EPA/540/G-87/003. This fact sheet also introduces the Guidance for Conducting Environmental Data Quality Assessment and the DQO Decision Error Feasibility Trials software.

What are DQOs? DQOs are qualitative and quantitative statements derived from the outputs of each step of the DQO Process that:

(1) Clarify the study objective;
(2) Define the most appropriate type of data to collect;
(3) Determine the most appropriate conditions from which to collect the data; and
(4) Specify acceptable levels of decision errors that will be used as the basis for establishing the quantity and quality of data needed to support the decision.

The DQOs are then used to develop a scientific and resource-effective sampling design.

What is the Data Quality Objective Process?

The DQO Process is a scientific and legally defensible data collection planning process to help users decide what **type, quality, and quantity** of data will be **sufficient** for environmental decision making.

What are the products of the DQO Process?

The products (outputs) of the DQO process are statements that define data quality criteria and sampling design performance specifications. The key data quality criteria state "how good" the data should be and are expressed as acceptable probabilities of decision errors. Other data quality criteria include the spatial and temporal boundaries of the study, and a precise statement of the environmental conditions that will be studied to determine the need for remedial or removal actions. Sampling design performance specification outputs include the sampling design method, the numbers and locations of samples and the sample collection method.

[1] U.S. Environmental Protection Agency. 1993. *Data Quality Objectives Process for Superfund: Interim Final Guidance* EPA/540/G-93/071.

What are the benefits of using the DQO Process to plan Superfund studies?

The DQO Process offers site managers a way to plan field investigations so that the quality of data collected can be evaluated with respect to the data's intended use. This is a timely benefit that responds to recent declarations by the General Accounting Office (GAO) and the Office of the Inspector General (OIG) that EPA monitoring programs are **not** adequately using statistical data collection design procedures, and therefore are unable to evaluate data quality submitted for decision making and cannot state the quality of decisions based on the data. The DQO process is responsive to the GAO and OIG concerns because it provides a method by which site managers can estimate how data quality contributes to the quality of their decisions.

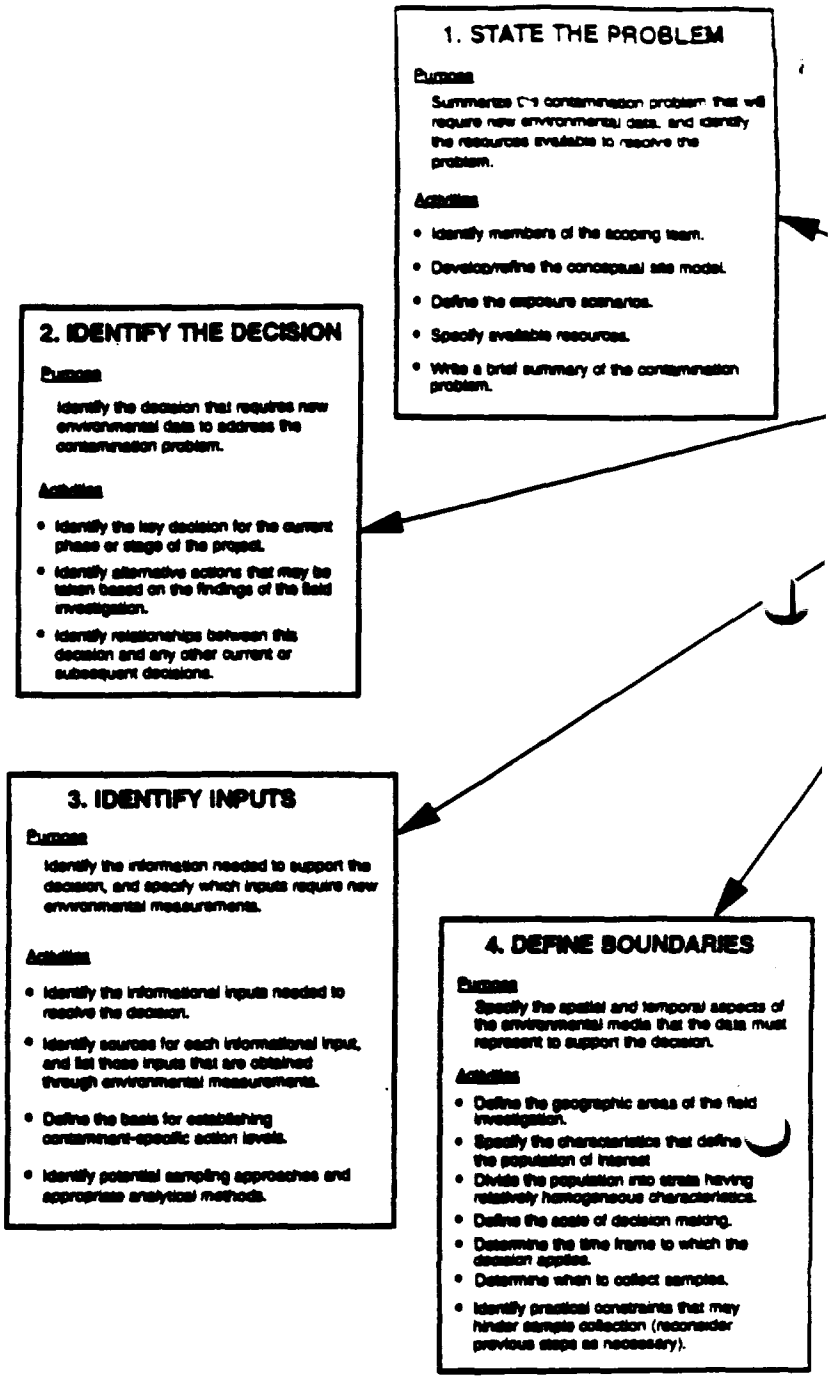
Specifically, the DQO process:

- helps site managers decide **how many samples and analyses are required** to support defensible decision making;
- helps site managers **define where and when samples are to be collected**;
- helps site managers develop a **statistical sampling design** that allows the uncertainty in data to be quantified;
- helps field personnel **identify resource-efficient sample collection methods**;
- helps laboratory analysts **identify resource-efficient analytical methods**;
- can drastically **reduce overall project costs**;
- provides the QA community with a **scientific basis** for defining the **right type and number of quality control and assessment samples and associated analytical precision and recovery requirements**;
- provides a structure for **clarifying multiple study objectives** into specific decisions;
- encourages the **participation and communication** of data users and relevant technical experts in planning, implementation and assessment.

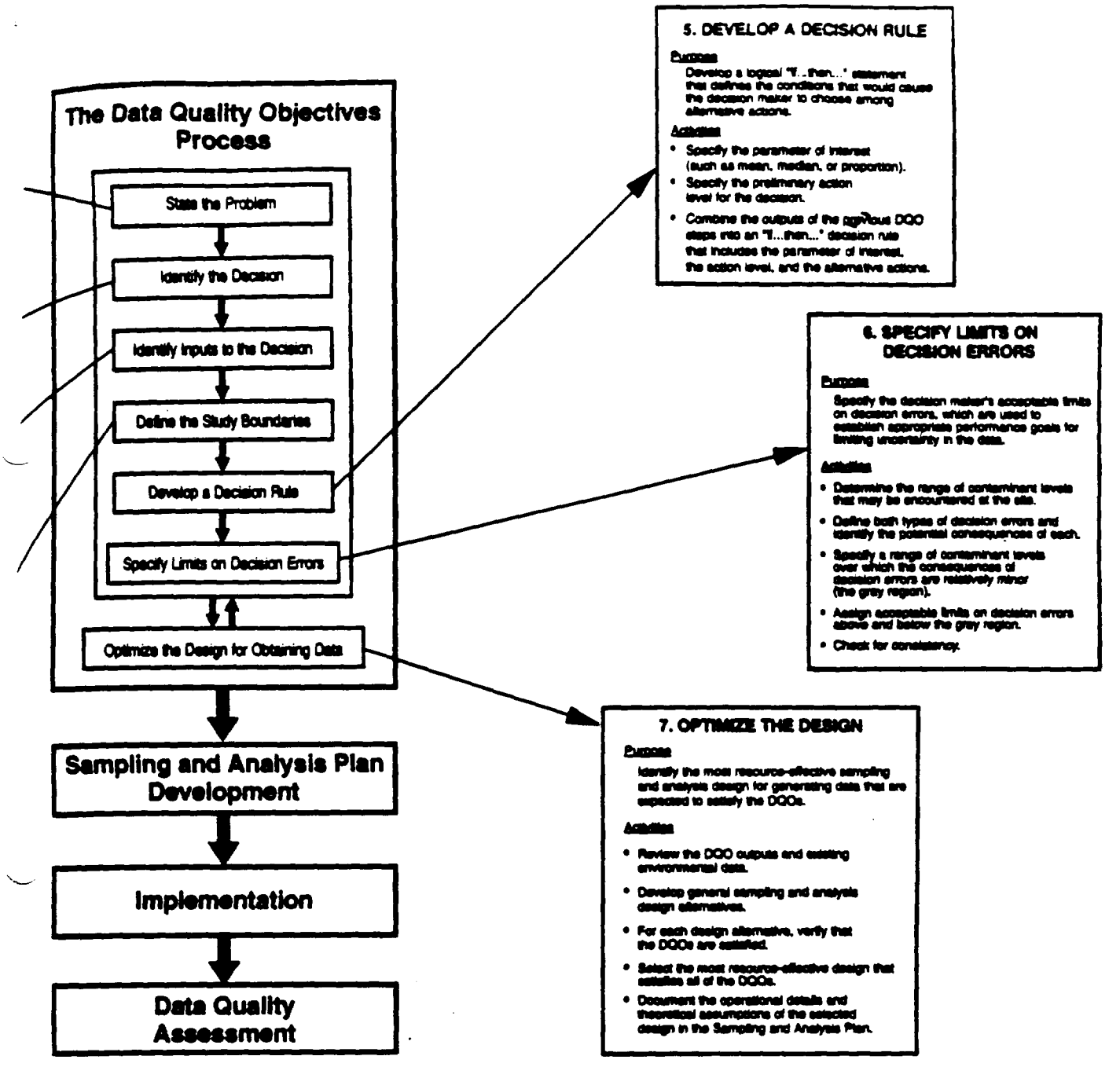
What role does statistics play in the DQO Process?

The statistical procedures used in the DQO Process provide:

- a scientific basis for making inferences about areas of a site based on information contained in environmental samples;



- a basis for defining data quality criteria and assessing the achieved data quality for supporting integrated site assessment decisions;
- a foundation for defining meaningful quality control procedures that are based on the intended use of the data;
- quantitative criteria for knowing when site managers can stop sampling (i.e., when the site has been adequately characterized); and
- a solid foundation for planning subsequent data collection activities.



How does the DQO Process fit into integrated site assessment?

The DQO process provides a logical framework for planning multiple field investigations, thereby improving cross-program response planning and allowing optimal cross-program data useability, which are important goals of integrated site assessment under the Superfund Accelerated Cleanup Model (SACM). By emphasizing the need to place limits on the probability of taking incorrect actions, the DQO Process complements the integrated site assessment objective of evaluating the need for action. The DQO Process places a worthwhile investment in planning, which results in timely and efficient cleanups.

How does the DQO Process address early and time-critical sampling activities?

The DQO Process should be used to plan all significant Superfund field investigations, regardless of the sampling objectives. Application of the DQO Process to early and time-critical sampling activities, such as time-critical removals and early remedial actions, allows On-Scene Coordinators, Site Assessment Managers, and Remedial Project Managers to generate data of known quality that are sufficient for their intended use. For these early and time-critical decisions, a less rigorous approach to DQO development is consistent with Superfund policy on accelerated response activities.

How can site managers acquire statistical support for field investigation planning and Data Quality Assessment?

Site managers can access statistical support through Regional and Headquarters quality assurance staff, the alternative remedial contracting strategy (ARCS) contracts and other Superfund contracts.

EPA has also developed the following software and guidance to provide additional support.

PC Software for DQO Decision Error Feasibility Trials

In order to provide real-time evaluation of the impact of DQOs on field investigation resources, EPA has developed an interactive PC-based software package "DQO Decision Error Feasibility Trials" to help site managers develop feasible and affordable DQOs. Site managers can use this statistical tool to quickly vary their DQOs, such as limits on decision errors, then see how these changes affect the number of samples and resources required. The program incorporates several different statistical design options that can be refined in collaboration with a statistical design team.

Data Quality Assessment

EPA has developed a Data Quality Assessment (DQA) guidance document (*Guidance on Conducting Environmental Data Quality Assessment*, EPA QA/G-9) that explains how a site manager can evaluate whether the data satisfy the pre-specified DQOs. In general, DQA consists of the following five steps:

(1) Define the statistical hypothesis;
(2) Determine acceptable decision error rates;
(3) Identify the statistical test and assumptions;
(4) Assess the validity of the statistical test; and
(5) Perform the statistical test and assess the adequacy of the design.

What is the link between quality control and DQO development?

DQOs define complete data collection design performance specifications. DQOs are the driving component of quality assurance project plans (QAPPs), which are required as part of the Sampling and Analysis Plan for each data collection operation. A quality control (QC) program is a required element of the QAPP and is defined based on DQOs. QC programs provide real-time measurements and monitoring of data collection operations to facilitate corrective action and support subsequent data validation and assessments. QC programs can also be used to evaluate whether expected decision error rates have been met.

Where can more information about the Superfund DQO guidance, the DQO process, and QA training be found?

For more information on Superfund DQO guidance contact Duane Geuder, QA Manager for the Office of Emergency and Remedial Response (OERR), at 703-603-8891. EPA provides quarterly DQO and DQA training and quality assurance workshops at the EPA Institute (202-260-3297). The training courses are a series of presentations and exercises that engage the audience in actual DQO development and DQA activities.

Points to Remember

- The DQO Process is a scientific and legally defensible data collection planning approach.
- The DQO Process is a framework for organizing existing QA planning procedures.
- The DQO Process helps produce data of appropriate quality for making defensible decisions.
- The DQO Process helps identify the most effective use of field investigation resources.
- The DQO Process helps develop a statistical sampling design which allows site managers to quantify uncertainty in data and control the probabilities of decision errors.
- The DQO Process provides a basis for defining QA/QC programs and associated analytical precision and recovery requirements.
- The DQO Process leads to identification of efficient sampling and analytical methodologies.
- The DQO Process can drastically reduce overall project costs.

Copies of this Fact Sheet and related Superfund DQO documents can be obtained from:

National Technical Information Service (NTIS)
5285 Port Royal Road
Springfield, VA 22161
703-487-4650

Interim Final Guidance	PB94-963203
Workbook	PB94-963204
Fact Sheet	PB94-963205