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EPA

Project Summary

Technical Guidance Document Construction Quality Assurance for Hazardous Waste Land Disposal Facilities

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The U.S. Environmental Protection Agency's (EPA's) construction quality assurance (CQA) program for hazardous waste land disposal facilities is a two-part program established to ensure that a completed hazardous waste land disposal facility has been constructed to meet or exceed all design criteria, plans, and specifications. The first part of this program will present regulations that specify the use of construction quality assurance at hazardous waste land disposal facilities and is being developed by the Office of Solid Waste and Emergency Response. The second part of this program, addressed by this Technical Guidance Document (TGD), presents the elements of a site-specific CQA plan. This TGD covers CQA for hazardous waste landfills, surface impoundments, and waste piles. The major components of these facilities that are addressed include foundations, dikes, low-permeability soil liners, flexible membrane liners, leachate collection systems, and final cover systems.

The CQA plan is a site-specific document that should be submitted during the permitting process to satisfy EPA's CQA program. At a minimum, the CQA plan should include five elements, which are briefly summarized below:

- ***Responsibility and Authority*—The responsibility and authority of organizations and key personnel (by title) involved in permitting, designing, and constructing the hazardous waste land disposal facility should be described in the CQA plan.**
- ***CQA Personnel Qualifications*—The qualifications of the CQA officer and supporting CQA inspection personnel should be presented in the CQA plan in terms of the training and experience necessary to fulfill their identified responsibilities.**
- ***Inspection Activities*—The observations and tests that will be used to ensure that the construction or installation meets or exceeds all design criteria, plans, and specifications for each hazardous waste land disposal facility component should be described in the CQA plan.**
- ***Sampling Strategies*—The sampling activities, sample size, methods for determining sample locations, frequency of sampling, acceptance and rejection criteria, and methods for ensuring that corrective measures are implemented as addressed in the design criteria, plans, and specifications should be presented in the CQA plan.**
- ***Documentation*—Reporting requirements for CQA activities should be described in detail in the CQA plan. This should include such items as daily summary reports, inspection data sheets, problem identification and corrective measures reports, block evaluation reports, acceptance reports, and final documentation. Provisions for the**

final storage of all records also should be presented in the CQA plan.

The TGD describes these elements in detail and presents guidance on those activities pertaining to each of the elements that are necessary to ensure that a completed facility has been constructed to meet or exceed all design criteria, plans, and specifications. It is intended for the use of organizations involved in permitting, designing, and constructing hazardous waste land disposal facilities, including treatment, storage, and disposal facilities.

This Project Summary was developed by EPA's Hazardous Waste Engineering Research Laboratory, Cincinnati, OH, to announce key findings of the research project that is fully documented in a separate report of the same title (see Project Report and ordering information at back).

Responsibility and Authority

Identifying and describing the responsibility and authority of organizations concerned with CQA should be the first element of a CQA plan. The principal organizations involved in permitting, designing, and constructing a hazardous waste land disposal facility include the permitting agency, facility owner/operator, design engineer(s), CQA personnel, and construction contractor(s). Except for the permitting agency, the principal organizations will not necessarily be completely independent of each other: the facility owner/operator also may be the construction contractor; the CQA personnel may be employees of the facility owner/operator, of the design engineer, or of an independent firm. Regardless of the relationships among the organizations, it is essential that the areas of responsibility and lines of authority for each organization be clearly delineated as the first element of the CQA plan. This will help establish the necessary lines of communication that will facilitate an effective decision making process during implementation of the site-specific CQA plan. It is also essential that the organization performing CQA operates independently of and is not responsible to the organizations involved in constructing the facility.

Personnel Qualifications

The second element of the CQA plan should identify the required qualifications of the CQA officer and the CQA inspection personnel and describe their expected duties.

CQA Officer

The CQA officer is that individual assigned singular responsibility for all aspects of the CQA plan implementation. The CQA officer is responsible to the facility owner/operator but should function independently of the owner/operator, design engineer, and construction contractor. The location of the CQA officer within the overall organizational structure of the project, including the facility owner/operator, design engineer, construction contractor, and permitting agencies, should be clearly described within the CQA plan.

The CQA officer should possess adequate formal academic training in engineering, engineering geology, or closely associated disciplines and sufficient practical, technical, and managerial experience to successfully oversee and implement construction quality assurance activities for hazardous waste land disposal facilities. Many of the responsibilities of a CQA officer may also require that he or she be a registered Professional Engineer or the equivalent. Because the CQA officer may have to interrelate with all levels of personnel involved in the project, good communication skills are essential. The CQA officer should be expected to ensure that communication of all CQA-related matters is conveyed to and acted upon by the affected organizations.

CQA Inspection Personnel

The CQA inspection personnel should possess adequate formal training and sufficient practical technical and administrative experience to execute and record inspection activities successfully. This should include demonstrated knowledge of specific field practices relating to construction techniques used for hazardous waste land disposal facilities, all codes and regulations concerning material and equipment installation, observation and testing procedures, equipment documentation procedures, and site safety.

Consultants

Authorities in engineering geology, geotechnical engineering, civil engineering, and other technical disciplines may be called in from external organizations in the event of unusual site conditions or inspection results. The CQA plan should present detailed documentation of consultant qualifications when expert technical judgments are obtained and used as a basis for decision in some aspect of construction quality assurance. Expert opinions should not be used as a substitute for objective data collection and interpretation when suitable observations and test procedures are available.

Inspection Activities

The third element of the CQA plan should describe the inspection activities (observations and tests) that will be performed by the CQA personnel during hazardous waste land disposal facility construction. The scope of this discussion should address only the construction and installation of all facility components and the manufacture/fabrication of various components and subcomponents when pertinent. It is assumed that the site has been characterized adequately, including evaluation of the hydrogeologic environment. It is also assumed that a site-specific facility design has been prepared that meets regulatory requirements and is acceptable to the facility owner/operator and that this design has been evaluated to ensure its technical correctness and feasibility.

This element should address the inspection activities that are necessary to ensure that the facility has been constructed to meet or exceed all design criteria, plans, and specifications. The first part of this section of the TGD addresses general preconstruction activities applicable to all facility components. Subsequent subsections address each facility component separately and are further subdivided into sections on preconstruction, construction, and post-construction inspection activities unique to each component. Specific test methods that may be used to inspect the components of a hazardous waste land disposal facility are listed and referenced in Appendix A.

Sampling Strategies

Sampling strategies should be addressed as the fourth element of the CQA plan. For many materials and construction processes, it is necessary to estimate the quality of the overall material or process from the observed or measure quality of the representative sample that is a small fraction of the total material or process. Examples of these situations include assessment of characteristics of a soil liner (e.g., permeability, moisture content, density, particle size distribution) and destruc-

tive testing of FML seams. This section presents information that may be useful in the selection and implementation of an appropriate sampling strategy for evaluating construction quality. It is intended to provide an introduction to the concepts and assumptions behind different sampling strategies. It is not intended to be a complete or comprehensive treatment of the subject.

The current state of knowledge on sampling strategies for hazardous waste land disposal facility CQA is not developed enough to enable EPA to recommend a specific approach for designing a sampling strategy. For instance, the measurement error inherent in test methods is an important piece of information when devising a statistical sampling strategy. However, the measurement error associated with certain important test methods (e.g., laboratory and field permeability) is not known. Until more information is available, the selection of appropriate sampling strategies should be conducted with the guidance of knowledgeable engineers and statisticians.

Documentation

The ultimate value of a CQA plan depends to a large extent on recognition of all of the construction activities that should be inspected and the assignment of responsibilities to CQA inspection personnel for the inspection of each activity. This is accomplished most effectively by documenting CQA activities and should be addressed as the fifth element of the CQA plan. The CQA personnel will be reminded of the items to be inspected, and will note, through descriptive remarks, data sheets, and checklists signed by them, that the inspection activities have been accomplished.

During the construction of a hazardous waste land disposal facility, the CQA officer should be responsible for all facility CQA documents. This includes the CQA officer's copy of the design criteria, plans, and specifications, the CQA plan, and the original of all the data sheets and reports. Duplicate records may be kept at another location to avoid loss of this information if the originals are destroyed.

Once facility construction is complete, the document originals should be stored by the owner/operator in a manner that will allow for easy access while still protecting them from any damage. An additional copy should also be kept at the facility if this is in a different location from the owner/operator's files. A final copy should be kept by the permitting agency in a publicly acknowledged repository. All documentation should be maintained through the operating and postclosure monitoring periods of the facility.

Concluding Remarks

Construction quality assurance for hazardous waste land disposal facilities is one tool that can be very valuable in improving the overall performance of landfills, surface impoundments, and waste piles. Proper site selection, credible designs, knowledgeable contractors, and competent operation of the completed facility, along with adequate CQA, all contribute to a facility with a reduced potential for failure. Through the thorough application of a site-specific CQA plan, the owner/operator can ensure that the completed facility meets or exceeds all design criteria, plans, and specifications.

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The complete report, entitled "Technical Guidance Document: Construction Quality Assurance for Hazardous Waste Land Disposal Facilities," (Order No. PB 87-132 825/AS; Cost: $18.95, subject to change) will be available only from:

National Technical Information Service
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Springfield, VA 22161
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The EPA Project Officer can be contacted at:

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