QUALITY CONTROL/QUALITY ASSURANCE PLAN

DELINEATION AND VERIFICATION FOR
FRANK ROAD CLASS III-IV DEMOLITION
LANDFILL
SHELBY COUNTY, TENNESSEE

HBA Project Number
97-09167

Prepared For:

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FOR CONSTRUCTION OF LINER AND FINAL COVER
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PERSONNEL AND THEIR RESPONSIBILITIES

Introduction

1. The purpose of this plan is to establish standards that must be followed by the Quality Assurance (QA) Consultant(s) in order to insure that the construction of the clay liner and cover meets the specifications given in the design. The QA Consultant(s) shall use sound engineering judgement when determining what additional procedures may be required in order to further assure the construction quality.

2. The Quality Assurance Plan shall be performed by a consultant(s) that is independent of all other Construction Contractors involved in construction on the site, including the Earthwork Contractor(s). The plan will be performed in addition to any Construction Quality Control Program implemented by other contractors.

3. Detailed in this plan are the minimum qualifications of the QA Personnel, minimum standards for soil selection, minimum testing programs, minimum construction standards, and the minimum documentation required to assure that the requirements of the plans and specifications are met. The Tennessee Division of Solid Waste Management has prepared a construction quality assurance (CQA) guidance document. A copy is presented in Appendix G. This guidance document presents the minimum standards for construction of both liner and final cover which will be applied at this site.

4. Throughout this document, the word "clay" is used to mean material of low-permeability. This may include soil classification as clay or mixtures of soil with additives required to meet the specifications.

QUALITY ASSURANCE MANAGER

5. The Quality Assurance Manager shall be a professional engineer certified in the State of Tennessee and experienced in Geotechnical Engineering and Earthwork Construction.

6. He shall have a working knowledge of the plans and specifications for the job.

7. He shall have the responsibility to inform the Landfill Operator and the Contractor of any construction that does not meet the design specifications. All parties must agree on the actions needed to bring the construction to the specifications.

8. He shall inspect the site at an appropriate frequency and review all test data and QA Monitor logs on a daily basis in order to maintain control over the QA Program.

9. He shall respond promptly to items needing attention or approval in order to expedite the work.

10. He shall be responsible for the approval or disapproval of the landfill construction work. Approval shall be based on conformance to the design specifications, conformance to the QA Plan, and sound engineering judgement.

QUALITY ASSURANCE MONITOR.

11. The Quality Assurance Monitor shall be chosen by the QA Manager.

12. The monitor shall be familiar with the tests, processes, and material involved in the construction phase he is monitoring. The monitor shall be experienced in performing nuclear gauge density tests, nuclear gauge moisture content tests, visual-manual soil classification, field permeability tests, hand penetrometer tests and field vane shear tests.

13. He shall visit the site as required during construction and monitor all appropriate construction operations. He shall oversee all sampling and field testing mandated in these plans and dictated by the QA Manager.

14. He shall fill out a log and submit it to the QA Manager.

15. He shall report any nonconformances to the specifications immediately to the QA Manager.

16. If appropriate, the Quality Assurance Manager may assume the duties of the Quality Assurance Monitor.

PREPARATION AND SOIL SELECTION.

Survey Monuments.

17. Monuments that establish horizontal and vertical control shall be founded by a Professional Engineer or Surveyor licensed in the State of Tennessee. These monuments shall be of sufficient number and location in order to facilitate surveying during the construction of the cover. These monuments shall also be located and protected so they will not be destroyed during construction activities. Each monument will be labeled on-site and located on a reproducible site plan. The QA Manager shall approve the monument locations.

Material from On-Site and Off-Site Borrow Areas.

18. If an off-site or separate on-site borrow area is proposed, an appropriate number of core samples shall be taken to determine the depth and consistency of the clay layer and the volumetric extent of different material types within the area. Clay types will be distinguished by visual-manual classification procedures (ASTM D 2488-84) and any other procedures that are appropriate.

19. An appropriate number of Shelby tubes or bulk samples as determined by the QA Manager shall be taken in order to determine the properties of the clays. Standard Proctor Tests (ASTM D 698-78), grain size analysis (ASTM D 422-63), Atterberg Limits (ASTM D 4318-84), and permeability tests on recompacted samples will be performed on each type of clay at varying densities. Based on the results of the tests, the QA Manager shall determine what types of clay at what densities will meet the specifications for the clay cover, upon removal and recompaction. Moisture-Density Tests (ASTM D-698) shall be

performed at a minimum frequency of one test per 5, 000 cubic yards of material placed and one test for each type of clay employed.

20. A plot shall be developed that illustrates the extent of each clay type and the proposed depth of clay excavation. The plot and excavation depth shall be developed/approved by the QA Manager.

21. All soil removed shall be separated according to suitability for the clay cover. Soils not suitable for a clay cover shall be kept separate from the acceptable clay. Clays that are suitable for the cover my require separation according to type, as directed by the QA Manager.

22. All clay from an off-site source shall be approved by the QA Manager before being brought to the site. Approval of the clay shall be based on an adequate amount of test data. The minimum standards for the types of tests performed on the soil and the soil properties are given in paragraph 19 of this section.

Construction Sequence.

23. The site shall be kept graded throughout the construction of the cover so that no water "ponds" on the site.

24. Each lift of fill or placement shall be compacted thoroughly, to the degree of compaction required by the specifications.

25. If the compacted layer is not acceptable, the QA Monitor shall perform additional tests, as necessary, to locate the extent of the area that requires recompaction, and report it immediately to the QA Manager and the Landfill Operator. After corrective actions are taken, the QA Monitor shall perform additional tests to ascertain that the area has been reconstructed to design specifications.

Installation of Cover and Construction Supervision.

26. Before placement and compaction of the first lift of the clay cover, the subbase shall be inspected and approved by the QA Manager. All unacceptable material and/or soft areas shall be removed and backfilled with a suitable material.

27. The site shall be kept free of standing water throughout the construction of the clay cover.

28. The QA Monitor shall keep a record of the type of clay compacted and its location.

29. Different clay types shall not be mixed unless approved by the QA Manager. Clays shall be mixed only if they have comparable permeabilities and densities with the same compaction effort or the permeabilities of their mixture have been determined.

30. Each clay lift shall be compacted to a dry density of no less than either the dry density required to attain acceptable clay properties or 90 percent of the maximum dry density, whichever is greater.

31. Each compacted lift must be tested for density and moisture content by nuclear methods (ASTM D 2922-81 D 3017-78). The number and locations of the tests shall be determined and documented by the QA Monitor. The minimum number of tests required shall meet the requirements set forth in the CQA guidance document shown in Appendix G. In addition, compaction efforts should be monitored to locate and test any potential problem areas.

32. If the compacted layer is not acceptable, the QA Monitor shall perform additional tests, if necessary, to locate the extent of the area that needs to be recompacted and report it immediately to the QA Manager and the Landfill Operator. After corrective action has been taken, the QA Monitor shall perform additional tests to ascertain that the area has been reconstructed to meet the design specifications.

33. The finished clay cover shall have no low areas that "pond" water.

34. The QA Manager shall verify that a minimum of 2.5 feet of compacted clay has been installed. This may include surveying, core sampling, and serial photography. All core holes shall be completely plugged with bentonite grout with a minimum coefficient of permeability of 10^{-7}cm/sec. Any disturbance to the surface shall be removed by rolling until smooth and tight.

35. The QA Manager shall approve the completed clay cover in writing. The approval shall be accompanied by a report with "as-built" drawings, and a description of the site and testing duly stamped by a registered, Professional Engineer.

DOCUMENTATION.

Daily Logs.

36. The QA Monitor shall prepare a daily log giving the detailed descriptions of the construction operations.

37. The daily log shall include but not be limited to (a) construction operations and their locations, (b) operations and locations of other Quality Control Monitors, (c) all tests performed and their designation and location, (d) all the locations and designations of samples taken, (e) locations and findings of core sampling, (f) meteorological conditions, and (g) general comments and observations.

38. A copy of the daily logs shall be kept on site and made available to the Landfill Owner, Quality Control Personnel, and the Contractor.

Test Data.

39. All field and laboratory test data shall be accompanied by test/sampling data, with locations and any reasons for the locations, personnel and any comments which may be appropriate.

Approval Documentation.

40. All corrective measures taken to bring unsuitable work into conformance with the design specifications will be documented. This document will describe what is at fault and the exact location and test designation(s) that shows the work to be unsuitable, the corrective measures agreed upon to bring it into conformance with design specifications, the dates that corrective work was accepted, and the test designation that shows the work

to be acceptable. All work shall be documented as to quality and verified by the QA Manager, including his signature of approval on "as built" drawings.

41. This Construction Quality Assurance (CQA) documentation will be organized and indexed to enable easy access and retrieval of original inspection and testing data sheets and reports. During the construction period, originals of the documents will be maintained by the CQA officer and copies will be kept by the Owner. Once the construction quality assurance has been certified by an independent, registered engineer and has been accepted by the Owner, originals of the CQA documentation will be stored by the owner and maintained through the closure and post-closure period of the site.