LONGHORN ARMY AMMUNITION PLANT

KARNACK, TEXAS

ADMINISTRATIVE RECORD

VOLUME 3 of 4

1992

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Marshall, Texas 75671-1059

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VOLUME 3 of 4

1992

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Volume 2 - Chemical Data Acquisition
Group(s): 1,2, and 3
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LHAAP-11 Suspected TNT Burial Site At Avenues P & Q
LHAAP-12 Active Landfill
LHAAP-13 Suspected TNT Burial Site Between Old & Active Landfills
LHAAP-14 Area 54 Burial Ground
LHAAP-16 Old Landfill
LHAAP-17 Burning Ground No. 2 / Flashing Area
LHAAP-18 & LHAAP-24 Burning Ground / Washout Pond & Evaporation Pond
LHAAP-27 South Test Area
LHAAP-29 Former TNT Production Area
LHAAP-32 Former TNT Disposal Plant
LHAAP-54 or LHAAP-XX Ground Signal Test Area
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LHAAP-14 Area 54 Burial Ground
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LHAAP-32 Former TNT Disposal Plant
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LONGHORN ARMY AMMUNITION PLANT

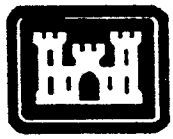
RI/FS

WORK PLAN

VOLUME 2
CHEMICAL DATA ACQUISITION PLAN

PREPARED FOR:
LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS

PREPARED BY:
U.S. ARMY CORPS OF ENGINEERS



JUNE 1992

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LIST OF ACRONYMS

ASTM	American Society of Testing Materials
CDAP	Chemical Data Acquisition Plan
COC	chain of custody form
DQO	data quality objective
EPA	U. S. Environmental Protection Agency
HTW	hazardous and toxic waste
HTW QA&IH	HTW Quality Assurance and Industrial Hygiene Section
QA	quality assurance
QC	quality control
MRD Lab	Corps of Engineers Missouri River Division Laboratory
NIOSH	National Institute of Occupational Safety and Health
OSHA	Occupational Safety and Health Administration
RCRA	Resource Conservation and Recovery Act
RPD	relative percent difference
SSHP	Site Specific Health and Safety Plan
SWD Lab	Corps of Engineers Southwestern Division Laboratory
TAC	Texas Administrative Code

SECTION 1.0
INTRODUCTION

1.1 General. The purpose of this Chemical Data Acquisition Plan (CDAP) is to document the procedures required to ensure that all data obtained from the investigative activities at Longhorn are of acceptable quality. Quality assurance (QA) is the Government activity required to assure desired and verifiable levels of quality in all aspects of an investigation. Quality control (QC) is the functional mechanism to achieve quality data. The QA program, administered by the Government, will ensure that the QC program will result in high quality data. This document will describe the QA/QC procedures for each aspect of the investigations which will meet the data quality objectives of this project. Procedures in this CDAP came from Chemical Quality Data Management for Hazardous Waste Remedial Activities, ER-1110-1-263 (Ref. 3), a Corps of Engineers regulation, with additional guidance from Development of an RFI Work Plan for RCRA Facility Investigations, SW-87-001 (Ref. 8), and Minimum Chemistry Data Reporting Requirements (Ref. 2).

1.2 Site Location and Description.

1.2.1. Site Location. Longhorn AAP occupies 8,493 acres between State Highway 43 at Karnack, Harrison County, Texas, and Caddo Lake, as presented in Figure 1. The nearest major cities are Marshall, Texas, approximately 14 miles southwest, and Shreveport, Louisiana, approximately 40 miles east. Longhorn AAP is located in a region of moist, subhumid to humid, mild climate. The average annual rainfall is 46 inches. Average precipitation is fairly evenly distributed throughout the year; however, December through May could be considered the heavier season. Frequently, summer and fall are drought seasons. The facility is included on the National Priorities List (NPL).

1.2.2 Site Description. Longhorn AAP is a government-owned, contractor-operated industrial installation under the jurisdiction of the U. S. Army Armament, Munitions, and Chemical Command. Longhorn AAP was established in

October 1942 with the primary mission of production of 2,4,6-trinitrotoluene flake with supporting acid production for munitions production. Flake production was halted in 1945 and the primary mission changed to the load, assembly and pack of pyrotechnic and illuminating/signal munitions and solid propellant rocket motors. Industrial operations at Longhorn resulted in the disposal of various hazardous wastes into ditches, streams, and earthen impoundments where contamination has been identified. The Longhorn Division of Morton-Thiokol Corporation is the current operating contractor. Individual sites are described in detail in the work plan.

1.3 Organization. This document discusses the data quality procedures and techniques to be used in the work plan for investigations at Longhorn. The study will be accomplished through the sampling and analysis of soil, sediment, surface water, groundwater, and the installation of monitoring wells. Section 2 discusses project organization; Section 3 discusses the quality assurance objectives for this project; Section 4 discusses the procedures to be used in drilling, well installation, and sampling; and Section 5 discusses sample handling and testing. Sections 6 through 9 discuss sample integrity, data reduction and validation, audits, and corrective action.

SECTION 2.0

PROJECT ORGANIZATION

The U.S. Army Corps of Engineers (COE) will use a multi-disciplinary project team to oversee all project activities. Project management will be performed by Tulsa District. Project activities will be performed by Roy F. Weston, under contract to Fort Worth District and by Ebasco under contract to Tulsa District. This organizational structure is shown in Figure 1. Both contractors will submit a CDAP addendum which will address their organizational structure, subcontractors, laboratories, and any proposed deviations from this document.

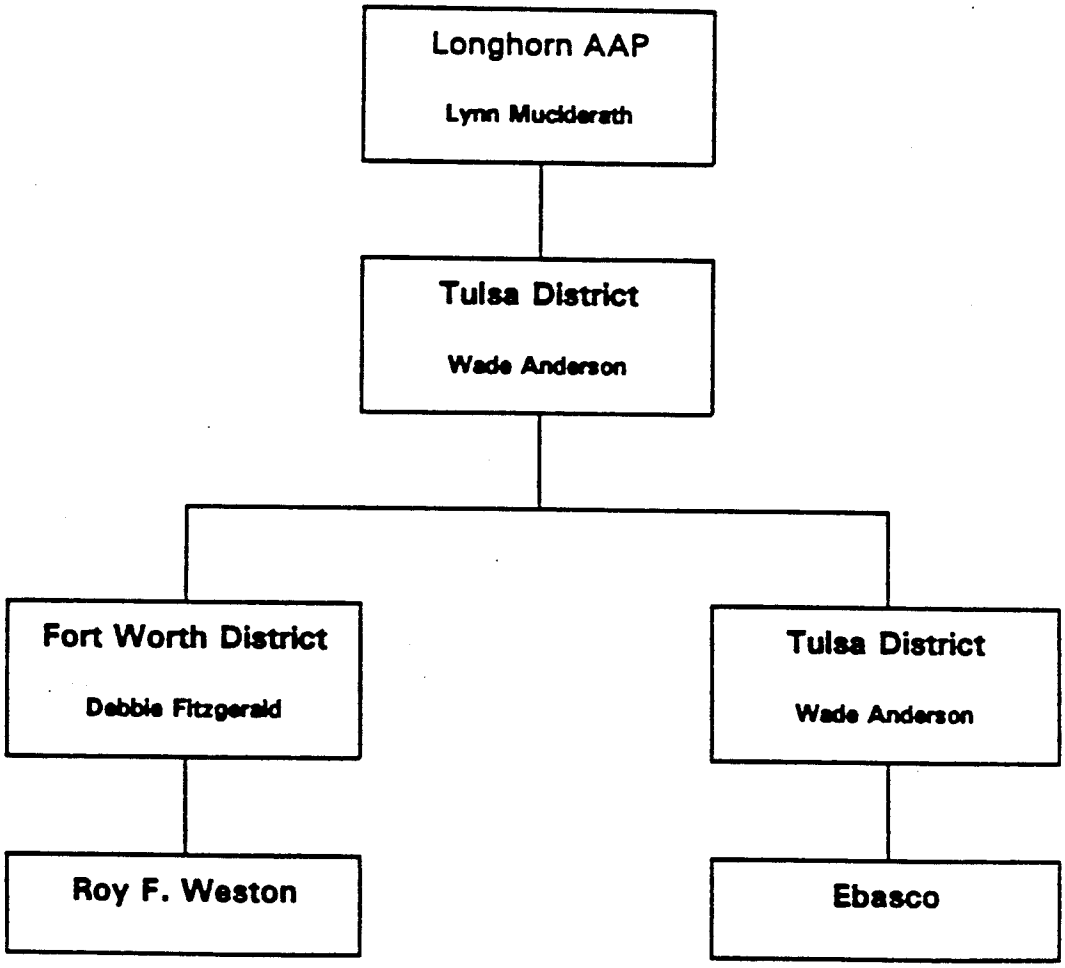


Figure 2.1. Organizational structure of the Longhorn remediation project.

2.1 Field Personnel. Field operations will be conducted by the contractors listed in Section 2.0 or their subcontractors. Later investigative phases will be performed by contractors or the COE.

2.2 Quality Control Personnel. All program personnel are responsible for monitoring and reviewing all procedures used in every stage of the work to ensure that data generated in the course of execution of the work plan is accurate, complete, precise and representative of the site studied. An individual on each field crew will be designated as the Quality Control Officer and will be responsible for the proper execution of field QC, as discussed in Section 4.9.

2.3 Quality Assurance Personnel. Quality assurance will be performed by the Tulsa District, Geotechnical Branch, HTW Quality Assurance and Industrial Hygiene Section (HTW QA&IH). This section reports to the Chief, Geotechnical Branch and will be responsible for performance and system audits of this investigative program, data validation, on-going reviews of QA procedures, and coordination of QA training for project personnel. Data validation reports will be prepared by each contractor. The Tulsa District will add the sections on comparability (based on the QA samples as discussed in section 2.4).

2.4 Laboratory. Analytical testing and quality control testing will be performed by laboratories selected by each contractor. Their labs will be identified in their CDAP addendum. QA testing will be performed by the Corps of Engineers Southwestern Division Laboratory (SWD Lab). Details on SWD Lab organization, responsibilities and key personnel are contained in their QA/QC Plan, which is on file in the Tulsa District office. Samples taken by the contractors will be sent to their laboratories, with the exception of the QA samples, which will be sent to SWD Lab. If sampling should be performed by COE field crews, SWD Lab will receive shipments of samples from the field, which it will pass on to its contract laboratories. Either SWD Lab or a separate contract lab will analyze the QA samples. These laboratories currently include NDRC Laboratories, Richardson, TX; ARDL, Mount Vernon, IL; and Eureka Lab, Sacramento, CA. All analytical laboratories used for this

work will be validated by the Corps of Engineers Missouri River Division Laboratory (MRD Lab). The validation process involves review of their laboratory quality management manual, laboratory performance on audit sample analyses, and an on-site inspection. This validation process is discussed in detail in Appendix C of ER-1110-1-263 (Ref. 3).

SECTION 3.0

DATA QUALITY OBJECTIVES

The data quality objectives (DQOs) of this project have been chosen to meet the goals of site characterization, risk assessment, and remedial design. DQOs are qualitative and quantitative statements which specify the quality of data required to support decisions made during remedial response activities. These DQOs will be used to develop a plan to be used throughout the RI/FS process. Data developed during the study will be used to determine the presence and lateral and vertical extent of contamination in the soil, surface water, and groundwater, as well as the rate of migration. The evaluation of this data will be used to screen remedial alternatives and to begin remediation. These goals can be achieved with analytical support between Level III and Level IV, as described in Ref. 7. Level I will be used for field testing. The minimum internal data reporting requirements (from Ref. 2) which will be required of all analytical laboratories includes the following:

- Sample identification numbers cross-referenced with laboratory ID's and QC sample numbers.
- Problems with arriving samples noted on an appropriate form.
- Each analyte reported as an actual value or less than a specified quantitation limit as listed in tables B.4 to B.8.
- Dilution factors, extraction dates, and analysis dates also reported.
- QC samples to be included as laboratory blanks, surrogate spikes, matrix spikes, laboratory duplicates, field duplicates, and field blanks.

The data developed from the investigations described in this work plan will meet the objectives discussed below with respect to precision, representativeness, accuracy, completeness, and comparability. The majority of this data will be developed in the laboratory from the analysis of field samples and the remainder will be measured in the field.

3.1 Accuracy. Accuracy is the degree to which a measurement agrees with the actual value, i.e., the amount of measurement bias. Accuracy is expressed as a percent recovery of a known concentration of reference material. The

accuracy of an analytical procedure is determined by the addition of a known amount of material (matrix spike) to a field sample matrix or a standard matrix. A standard matrix is made up of distilled water or sterile, clean soil with approximately the same physical properties (porosity, permeability, plasticity, grain size, etc.) as the field sample. The field sample matrix is described as all components of the sample mixture except the analyte (the compound being analyzed). The lab will be required to perform matrix spiking on 10% of field samples, as well as on 5 to 10% of standard matrix samples. Field sample matrix and standard matrix sample spiking show how the sample matrix-analyte chemical interactions affect the analytical results. The matrix behavior of the spiked field sample will be comparable to that of the matrix of the original sample. After analysis for the spike is completed, the accuracy of the procedure is expressed as a percent recovery as shown by the following equation:

$$\text{PERCENT RECOVERY} = \frac{(C_2 - C_1)}{C_0} \times 100\%$$

where C_0 = amount of analyte added to the sample matrix,
C_1 = amount of analyte present in the unspiked sample matrix (equal to zero for the standard matrix),
and C_2 = amount of spiked material recovered in the analysis.

Typically, the amount of a reference analyte spiked into a field sample matrix is specified by the laboratory quality control program, or 3 to 5 times the background concentration of the analyte in the sample matrix. Samples cannot be spiked for all organic compounds which could possibly exist in the field sample matrix, however, a set of surrogate compounds, each of whose physical and chemical properties is similar, is used as surrogate matrix spikes, or surrogates. Acceptable recovery ranges for each class of organic compounds are discussed in the analytical methods for each parameter.

3.2 Precision. Precision is a measure of the degree of reproducibility of an analytical value and is used as a check on the quality of the sampling and analytical procedures. Precision is determined by analyzing replicate samples. The significance of a precision measurement depends on whether the sample is a field replicate, lab replicate, or a matrix spike replicate.

Field replicates are taken at the rate of 10% or one per batch (each daily shipment of samples from a site), whichever is greater. Precision of the analytical method, at each stage, is determined by calculation of a relative percent difference (RPD) between duplicate analytical recoveries of a sample component, relative to the average of those recoveries:

$$RPD = \frac{|C_2 - C_1|}{(C_2 + C_1)/2} \times 100\%$$

where C_1 = analyte concentration in the sample,
C_2 = analyte concentration in the sample replicate,

and $|\ |$ = an absolute value (It is customary to express RPD as a positive number).

These calculations are usually performed on matrix spikes and matrix spike duplicates.

3.3 Completeness. Field completeness will be assessed by comparing the number of samples collected to the number of samples planned. Analytical completeness will be assessed by comparing the total number of samples with valid analytical results to the number of samples collected. The overall project completeness is, therefore, a comparison between the total number of valid samples to the number of samples planned. The results will be calculated following data validation and reduction. Completeness (C) is determined by:

$$C = \frac{P_1}{P_0} \times 100\%$$

where P_0 = total number of samples planned,
and P_1 = number of valid data points.

A value of 90% or higher is the goal. For values less than 90%, problems in the sampling or analytical procedures will be examined and possible solutions explored.

3.4 Representativeness. Representativeness expresses the degree to which sample data accurately and precisely represent actual site conditions. The determination of the representativeness of the data will be performed by

- Comparing actual sampling procedures and chain of custody forms to those described in the work plan,
- Identifying and eliminating nonrepresentative data in site

characterization activities,
- Evaluating holding times and condition of samples on arrival at the laboratory,
- Examining blanks for cross contamination.

Representativeness is a qualitative determination. The representativeness objective of this work plan is to eliminate all non-representative data.

3.5 Comparability. Comparability is a qualitative measure of the confidence with which one data set can be compared to another. These data sets include data generated by different laboratories performed under this work plan, data generated by laboratories in previous investigative phases, data generated by the same laboratory over a period of several years, or data obtained using differing sampling techniques or analytical protocols. The comparability objectives of this work plan are (1) to generate consistent data using standard test methods; and (2) to salvage as much previously generated data as possible. Comparability will be evaluated by comparing the QA sample analyzed by an independent laboratory to its field replicate.

3.6 Sensitivity. Sensitivity is a general term which refers to the calibration sensitivity and the analytical sensitivity of a piece of equipment. The calibration sensitivity is the slope of the calibration curve evaluated in the concentration range of interest. The analytical sensitivity is the ratio of the calibration sensitivity to the standard deviation of the analytical signal at a given analyte concentration. The detection limit, which is based on the sensitivity of the analysis, is the smallest reported concentration in a sample within a specified level of confidence. Quantitation limits represent the sum of all of the uncertainties in the analytical procedure plus a safety factor. The detection limit is a part of the quantitation limit. Quantitation limits are given in tables B.4 to B.8.

3.7 Field measurements. Field measurements will be performed to Level I standards. These will include measurements of pH, conductivity, and temperature on groundwater samples. Precision on field measurements will be assessed by four replicate measurements to determine reproducibility. These consecutive readings should be ± 1° for temperature, ± 0.02 units for pH, and ± 10% for conductivity.

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SECTION 4.0

FIELD OPERATIONS

This section discusses drilling, well installation, sampling, decontamination, waste disposal, other field procedures, and field QA/QC.

4.1 Drilling. An experienced geologist, engineer or technician will serve as an inspector for all drilling activities. The inspector will prepare and describe samples and cuttings, monitor drilling operations, oversee well installation, record groundwater data, and prepare well diagrams and geologic logs. Drilling of most borings will be done by hollow stem auger. This drilling technique utilizes hollow flight augers with a cutting head attached to penetrate the formation. Sampling of these borings will be performed by split spoon, shelby tube, or from the auger flights. Drilling of 3 deep 150-foot borings for geophysical logging will be performed by rock bit or by hollow stem auger, and will be supplemented with a core barrel or denison barrel as needed to obtain samples. Drill pipe, augers, and other equipment used below ground will be steam cleaned as discussed in Section 4.8. It is not anticipated that drilling mud or additives will be needed. Static water levels will be taken from each open borehole after completion of drilling and immediately prior to grouting.

4.1.1 Soil Sampling Equipment. Sampling equipment to be used in conjunction with the drilling techniques discussed above is described in this section. Sampling techniques for sediments are discussed in Section 4.5.2. Samples will be taken at a minimum of one every five feet or every change of lithology, whichever occurs more frequently. Drill action and examination of the materials on the auger flights will be used to determine the location of stratigraphic changes.

4.1.1.1 Split Spoon. A split spoon is a small diameter sampling device which is driven into the soil with a drive hammer. It is frequently used inside hollow stem augers or other types of casing. The sample is representative of the materials encountered, but is not undisturbed. It can

be used for samples for chemical tests or physical tests not requiring an undisturbed sample such as Atterberg limits.

4.1.1.2 Shelby Tube. A Shelby tube is a thin-walled sampler which is pushed into the soil. It takes samples primarily in unconsolidated, cohesive materials. A Shelby tube might be useful in sampling near surface materials or overburden sediments. It also does not produce an undisturbed sample.

4.1.1.3 Auger. Samples for physical tests can be taken off of the auger flights if it is done carefully. Each run with the auger will be limited to two feet. After the auger is removed completely from the boring, cave-in on top of the flights is removed and discarded. The remaining material is examined, and representative samples are taken from the interior of the auger flights, avoiding soil which is in contact with the wall of the boring. This technique works best when the soil is soft and the auger can be "screwed" into the ground rather than drilled into the ground at a high rotation rate. Samples for chemical tests will not be taken from the auger.

4.1.2 Protection of Lower Aquifers. If a perched aquifer is encountered that is potentially contaminated, that water bearing zone will be cased off with the casing thoroughly seated into the lower permeability materials beneath. Drilling will continue through the casing. Surface casings will be installed to a depth of five feet in all cases where the water table is greaer than five feet in depth. Surface casings will also be installed through any obviously contaminated zones. Continuous flight augers, which act as casing, will reduce the potential for contaminated soil into aquifers beneath a contaminated zone.

4.1.3 Geological Logs. The strata encountered during drilling will be described in detail, using the Corps of Engineers geological log form (Eng Form 1836). The log will describe each lithologic unit encountered, groundwater information, sample depths, and drilling methods. The descriptions will include lithology, color, grain size, plasticity, stiffness, cementation, moisture content, sedimentary structures, presence and general orientation of

fractures, and other data determined to be pertinent by the geologist. Boring descriptions will be determined from geological logs or from characterization of cuttings and drill action, where samples are not taken. A geologic log form is shown in Appendix A. It will be used for all soil borings, monitoring wells, and shallow soil samples.

4.1.4 Borehole Abandonment. All borings not converted into monitoring wells will be abandoned by filling with a cement grout. The grout will have the composition as described in Section 4.2 and 31 TAC 287. After the grout has dried, the settlement depression will be filled to the surface with additional grout.

4.2 Monitoring Wells.

4.2.1 Drilling and Installation. Monitoring wells for this project will be drilled by an auger as discussed in Section 4.1. Wells can be installed in borings dedicated for that purpose or in borings drilled for environmental samples, geologic, or water information, as long as the minimum diameter is 8 inches. A typical well schematic is shown in Figure 4.1. If more than one water bearing zone is found, then well clusters will be installed to monitor each zone. In such a case, the upper zone will be cased and/or grouted. Large diameter casing will be installed through the upper water bearing zone to an underlying clay bed, and the annulus will be grouted to the surface.

4.2.1.1 Well Casing. Four-inch nominal diameter, flush-threaded, schedule 40 PVC casing will be installed from the screen to approximately three feet above the surface. Centralizers may be used near the well screen to keep the casing centered in the well bore.

4.2.1.2 Riser and Cap. Surface construction of well pads, covers, etc., will comply with Corps of Engineers requirements as well as requirements of the Technical Enforcement Guidance Document, Ref. 5. Approximately 3 feet of well casing will be left above ground and enclosed in a protective steel casing. The protective casing will extend below the ground surface and will have a locking cover to prevent entry of rainwater and

unauthorized personnel. It will also have a drainhole near the base. A four by four-foot concrete pad, four to six inches thick, will be poured around the protective casing at the ground surface, and will be sloped to promote drainage. A cage or metal posts will be placed in the concrete pad to protect the well.

Figure 4-1. Typical well schematic.

4.2.1.3 **Screen**. Wells will be screened with 4-inch diameter schedule 40 PVC slot screen. The exact depth of the screen will be determined by the inspector within the guidelines established in the work plan. Screen opening size will be 0.01 inches unless formation grain size indicates this is inappropriate. Screens will be a maximum of 20 feet in length. The entire saturated thickness of the aquifer will be screened to a maximum of 20 feet.

4.2.1.4 **Sump**. A two-foot long, 4-inch diameter schedule 40 PVC sump below the screen will be used in all wells to serve as a sediment trap.

4.2.1.5 **Filter Pack**. A sand filter will be placed in the annulus between the well screen and the borehole from the bottom of the hole to approximately two feet above the top of the screen with a tremie pipe. The sand will be either bagged or purchased from a batch plant and will have a 40-60 gradation. The sand will be tested chemically for the same parameters as in the monitoring wells before placement.

4.2.1.6 **Bentonite Seal**. An approximately two-foot thick bentonite seal will be placed above the filter sand in the well annulus. This will be accomplished by using pellets installed via a tremie pipe or by dropping them directly into the annulus. Bentonite pellets will be hydrated with reagent-free water.

4.2.1.7 **Grout**. Grout will be used to fill the annulus between the bentonite seal and the top of the ground, as well as for borehole abandonment. The grout will consist of a pumpable mixture of water, cement, and approximately 5% bentonite. Grout will be pumped or poured through a tremie or into an open hole or pipe. The quantities of grout used will be recorded. Grouting will be accomplished in an appropriate manner for the specific application.

4.2.2 **Development**. After the monitoring well installation has been completed for at least 24 hours, wells will be developed to remove drill fluid and cuttings as well as any fines from the sand filter which might clog up the well screen. Each well will be surged, bailed and/or pumped until the sediments in the water are reduced substantially. At least 5 well volumes

must be removed and temperature, pH, and conductivity must have stabilized over three consecutive readings as discussed in Section 4.5.1.2. Water and cuttings will be disposed of in accordance with Appendix C.

4.2.3 Well Acceptance. It is the responsibility of the drilling agency to drill and install a monitoring well which meets the criteria of Section 4.2. If a well is not constructed of the proper materials by the proper methods or if the well does not perform in such a manner to yield water representative of the aquifer which it monitors, then that well shall not be accepted by the Corps.

4.2.4 Well Schematics and Reports. A well diagram will be prepared for each well which will contain all pertinent information concerning the well, such as diameter, casing materials, depth, locations of the bentonite seal, screen length and opening size, filter pack length and gradation, grout, and the riser pipe height. A geologic log will also be prepared for each well. A typical well schematic is shown in Figure 4.1. A Texas Well Driller's Report, also shown in Appendix A, will be prepared for each well.

4.2.5 Well Abandonment. Wells which have been abandoned because of construction problems or because they are no longer needed will be backfilled in the following manner:

- Well construction materials will be removed.
- The hole will be overdrilled.
- The hole will be grouted with a tremie pipe from the bottom of the boring to the top.

4.3 Location Surveys. All borings, monitoring wells, and sampling points will be physically located by survey. The survey contractor will be required to meet or exceed a Third Order Class 1 survey, with an accuracy of 1 in 10,000. This accuracy equates to approximately 0.01 foot horizontally and vertically. The contractor will use bench marks set from approved established control monumentation in the area. Horizontal control will be in accordance with NAD 1983, and vertical control will be referenced to the NGVD, 1929.

4.4 Water Measurements.

4.4.1 Groundwater.

4.4.1.1 Water Level Measurements. Once the well is completed,

both the water level and bottom of well will be measured to the nearest 0.01 foot. Measurements will be made from a notch or mark at the top of the casing and recorded in the field journal and other appropriate forms. An electric probe will be used to establish equilibrium water levels. Depth to bottom of well will also be measured. The probe will be rinsed in Type II reagent grade water immediately before being lowered into the well and immediately after removing it from the well. If the well is heavily contaminated, additional cleaning of the probe may be required as described in Section 4.8.

4.4.1.2 Slug Tests. Slug tests are performed to determine the hydraulic properties of the aquifer. The purpose of this test is to determine the permeability of the water-bearing strata, taking into account bedding planes, fractures, and other discontinuities. Slug tests can give a more reliable indication of permeability than a laboratory test, which is performed on a very small test specimen. A known volume (slug) of water is removed from a well and the rate of recharge is recorded. Also, a mechanical slug could be added to the well, and the rate that the water level drops would be recorded. Groundwater removed from a slug test will be disposed of in accordance with Appendix C.

4.4.1.3 Pump Tests. A pump test is also used to determine aquifer characteristics. One well is designated as the pump well and additional wells are used for measuring water levels during the test. The test is conducted for a sufficient period of time to establish equilibrium conditions. During the pumping period, water levels are measured in all of the wells with enough frequency to establish a drawdown rate. After pumping has ceased, the wells are again measured to establish a recovery rate. A pump test is more expensive and difficult to administer than slug tests, but yields information pertinent to an area, rather than just a point as is the case with the above. It can also determine a cone of depression and boundary conditions, such as permeability distribution. Groundwater removed from a pump test will be disposed of in accordance with Appendix C.

4.4.2 Pondwater. Elevations of water samples and sediment samples will

be determined by subtracting the depth of the sample from the elevation of the water surface as determined by a survey stake at the water's edge.

4.5 Sampling. The number of samples taken from each medium are given in Table B.9. Each of these media are discussed below.

4.5.1 Groundwater Sampling. Groundwater samples will be collected both from monitoring wells and open bore holes.

4.5.1.1 Sampling from Monitoring Wells.

4.5.1.1.1 Open and Dedicated Wells. Open wells are wells which will not be fitted with dedicated purging and sampling equipment. They will be purged with a portable purging system and sampled with teflon bailers. The portable system typically consists of a submersible or purge pump and a discharge pipe. The purge pump will be operated by a portable generator. The generator will not introduce oils into the well during purging operations. After purging is completed, the equipment will be removed from the well and cleaned thoroughly with distilled water and a nylon brush. The bailers will be taken to the field lab and cleaned as described in Section 4.8. If the well shows evidence of heavy contamination, the purging system will cleaned in the same manner as the bailers. Dedicated wells are wells which have permanently installed sampling and/or purging equipment. Several of the existing wells have dedicated bailers. Newly installed wells are not anticipated to have dedicated equipment at Longhorn.

4.5.1.1.2 Well Evacuation Procedures. Prior to sampling, the stagnant water within the well (five casing volumes) will be removed so that fresh formation water can enter. If after removing five volumes of water, pH , temperature, and conductivity have not stabilized, then additional volumes will be removed. These parameters will be considered to be stabilized if temperature for three consecutive readings is ± 1°, pH is ± 0.5 units, and conductivity is ± 10%. Handling and disposal of purge water is discussed in Appendix C. The well will be sampled as soon as possible after purging, but not before 85% recovery. For slowly recharging wells, sampling will take place as soon as sufficient recharge has occurred to fill sampling containers.

In all cases, sampling will take place within 24 hours of purging. The sampling crew will record the recharge rate, the date, time, and rate of purging, and any unusual conditions noted with this operation. Non-dedicated purging equipment will be thoroughly scrubbed and rinsed with Type II reagent grade water each time it is used. Under heavily contaminated or unknown conditions, additional rinses will be performed, as discussed in Section 4.8.

4.5.1.1.3 Sampling. Wells will be sampled with a teflon bailer, which will be slowly lowered into the well. Each sample container will be filled directly from the bailer. A common container will not be used to fill sample bottles. Sampling equipment and containers will be kept from ground contact, and may be laid on plastic sheets on the ground. Upgradient wells will be sampled before downgradient wells. Samples of groundwater for chemical analysis are taken in the following order:

- Field parameters
- Volatile organics
- Semivolatile organics
- High explosives
- Pesticides and herbicides
- Metals
- Anions

Table B.1 lists container, preservation, and handling requirements for each parameter and Table B.2 lists holding times. Quality assured containers will be used. The sequence of operations for groundwater sampling is as follows:

- Purge slow-recharging wells (if any) at the outset of the sampling day.
- Purge and sample other wells.
- Sample slow rechargers, if possible.
- Preserve the samples.
- Package and ship the samples to the laboratory.

4.5.1.1.4 Immiscible Layers. Immiscible liquid layers are not expected to be encountered; however, procedures for dealing with immiscible layers in groundwater are included in this plan and are listed below.

- The level of the immiscible layer surface and water interface will be determined with an electronic probe. The apparent thickness of the immiscible layer is defined as the difference between the liquid level and the interface level.
- A sample will be collected, using a transparent Teflon bailer. Presence of the immiscible layer will be confirmed visually.

4.5.1.2 Sampling from an Open Bore Hole. All soil borings will be made into the water table and a grab sample of groundwater will be collected prior to plugging the boring. The sample will be collected for the purpose of screening the groundwater to determine the need for groundwater monitoring and to optimize the siting for any required monitoring wells. The groundwater will not be purged prior to sampling and sample collection procedures will be in accordance with the requirements of Section 4.5.1.1.3. The order of sampling shall be as follows:

- Field parameters
- Total organic halogen
- Total organic carbon
- High explosives
- Phenols
- Anions

4.5.2 Surface Water and Sediment Sampling. Water samples will be collected directly into the sampling bottle or by such sampling devices as a Kemmerer sampler or a plexiglass Van Dorn sampler and will be taken several feet below the surface of the ponds. Water samples will also be taken from drainage ditches as described in the work plan. If the ditches are dry, then sampling will be done after a rainfall when the ditches are again flowing. Sediment samples will be taken by a push tube or other suitable device composed of stainless steel or other inert material. After extraction from the tube, the upper five inches of sediment will be composited and placed in glass jars with teflon-lined lids for chemical testing. Samples for volatiles, however, will be discrete with as little disturbance as possible. Sample locations will be accessed by a small boat or by wading.

4.5.3 Soil Sampling. Samples of soil from drill holes will be taken using a split spoon, shelby tube, or auger flights, as discussed in Section 4.1.1.3. Shallow soil samples will be taken with clean, stainless steel shovel, sample push tube, or drill rig sampling equipment. For each shallow soil sample, a composite of the uppermost foot will be taken. Samples taken for volatile analysis, however, will not be composites, but discrete samples with as little disturbance as possible.

4.5.3.1 Physical Testing. Soil samples will be described in the field and classified using the Unified Soil Classification System. They will be tested for Atterberg limits, grain size distribution, and moisture content. Samples will be taken every five feet or change of material and shipped to SWD Lab or to a contract laboratory in plastic or glass jars for testing. All samples will be as representative of the strata as possible. Replicates will be taken as needed for QA/QC purposes by splitting a sample into three portions or taking three grabs from the sampler. The two additional samples will consist of a QC sample to be tested by the same lab and a QA sample to be tested by SWD Lab. Testing for friable asbestos will be performed on sites where there is the potential for contact with asbestos. The laboratory analyst should be certified through NIOSH for asbestos identification. Methods for physical tests are given in Table B.3.

4.5.3.2 Chemical Testing. Samples will be placed in pre-cleaned glass jars with teflon-lined caps. Each sample shall consists of 2 jars of soil. The samples will be taken at a minimum every five feet at discrete depths from borings and as composites for shallow soil samples. The samples will be packed in ice-filled ice chests, and shipped to the laboratory by bus or overnight carrier to SWD Lab. QA/QC samples for soil and rock consist of equipment blanks and replicates as discussed in Section 4.8.

4.6 Geophysics.

4.6.1 Electromagnetic Survey. Electromagnetic surveys measure the electrical conductivity of the subsurface soil, rock, and groundwater. Electrical conductivity is a function of the soil type, porosity, permeability, and the type of fluids which fill the pore spaces. This technique can determine subsurface hydrogeologic conditions, map contaminant plumes when the contaminants alter the conductivity of the groundwater, and locate trench boundaries, buried wastes, and drums.

4.6.2 Downhole Geophysics. Geophysical logging will be performed in the deeper borings at LHAAP, as discussed in the Work Plan. Geophysical logs will be used to yield information on lithology and stratigraphy, and to allow

correlation of boreholes. Specific types of logs which may be employed during the investigations are discussed below.

4.6.2.1 Spontaneous Potential. This log is applicable in water or mud filled open holes. Natural electrical potential resulting from the interaction of borehole fluids, formation matrix, and formation fluids are measured such that the log records vertical variation of this voltage. Typically this log is used for correlation and to define bed thickness.

4.6.2.2 Natural Gamma Ray. This log can be run in dry holes or liquid filled holes, and can be run through PVC or metal casing. A detector in the borehole measures natural radiation in the formations intercepted by the borehole. The natural radiation is a function of the concentration of gamma emitters present (potassium, thorium, uranium). Generally, the concentration of these elements is higher in clays than other lithologies. The log is used for correlation, defining bed thickness, and in lithologic determination.

4.6.2.3 Resistivity Logs. This type of log is applicable in fluid-filled open holes. An electrical current is either applied directly to the borehole environment or induced. A variety of this type of electrical source logs are available commercially, e.g. induction logs, multiple point and spacing resistivity logs, laterlogs, microresistivity logs, and micro-laterlogs. Typical uses include thin bed recognition, correlation, and estimation and/or calculation of water saturation.

4.7 Field Screening.

4.7.1 Headspace Analysis. A headspace analysis tests the air in a sampling jar for volatile organics. A sample will be placed in a glass jar, which will be covered with foil, and warmed for one to two hours. At the end of the warming period, the vapor space in the jar will be tested with Draeger tubes or a photo-ionization detector. This test gives an indication of presence or absence of volatiles. It will be used, along with visual and olfactory observations, to make a field determination of the depth and

relative degree of contamination. Headspace analysis may also be used to make preliminary separations of drilling waste into potentially contaminated and uncontaminated fractions.

4.7.2 Soil Gas Surveys. Air-filled voids in the soil may contain compounds which volatilize from the groundwater below. A soil gas survey is a systematic sampling, analysis, and interpretation of the soil gas and what it represents. Sampling devices are placed in the ground on a grid to obtain samples of soil gas, which is analyzed either on site or in the laboratory. Soil gas surveys can detect contaminant plumes, the parent product, and the degree of weathering.

4.7.3 Air Monitoring for Worker Protection. Air monitoring with a photoionization detector, combustible gas meter, or flame ionization detector, will be used as discussed in the Site Specific Health and Safety Plan (SSHP).

4.8 Decontamination.

4.8.1 Drilling Equipment. Drilling equipment (augers, bits, split spoons, rods, and tools) will be steam cleaned or hot water pressure cleaned prior to use in each boring. A decontamination station will be established for the washing of drilling and sampling equipment at each drillsite. Waste wash water will be collected and disposed of as discussed in Appendix C. Each member of the drilling crew will don a new pair of gloves before beginning each soil boring. The person taking the samples will wear disposable plastic gloves and will change them between each sampling interval. Used gloves will be bagged and disposed of in a manner which meets RCRA guidelines, as discussed in Appendix C.

4.8.2 Well casing. All casing and screens used in monitoring well construction will remain in the factory-sealed containers until use. These materials will be placed on a clean, dry tarp or on blocks during assembly. If contact with the ground does occur, the affected sections will be cleaned with potable water.

4.8.3 Sampling Equipment. Bailers will be cleaned at the end of the work day. Enough clean bailers will be taken to the field each day so that

none needs to be reused in that day's sampling. The sampling equipment will be transported in sealed, clean containers, and care will be taken to avoid contamination. Sampling equipment will be washed with a non-phosphate detergent, tap water, distilled water, and hexane, in that order, allowed to air dry, and sealed back into clean containers. A cleaning seal will accompany each bailer with the following information: equipment identification number, date and time cleaned, and signature of the person who cleaned the equipment. The inclusion of the cleaning seal and numbering of the equipment allows for the tracking of any cleaning or cross contamination problems between samples. Each member of the sampling crew will don a new pair of gloves at each sampling location. The person who actually takes the samples will wear disposable plastic gloves and will change them between each sampling interval for each sampling site.

4.9 Field QA/QC.

4.9.1 Chemical Samples. QA/QC samples for water, sediment, and soil will be used to verify that the sampling and analytical techniques are being performed properly. QC samples are taken in the field and analyzed with the field samples by the same laboratory. QA samples are analyzed by SWD Lab to check the performance of the contract laboratory. QC samples required for soils and water sampling include travel blanks, equipment blanks, and replicates. QA samples also include replicates. QA/QC samples are described below.

4.9.1.1 Travel Blanks. Travel blanks consist of American Society of Testing Materials (ASTM) Type II reagent water sealed into a sample vial in the field laboratory. The blank is not opened again until it is received in the laboratory. One travel blank will be prepared for each shipment of water samples containing volatiles, all of which are shipped in the same ice chest to the lab each day. Travel blanks measure cross contamination during shipment and contamination sources contacted during shipment. They are only analyzed for volatiles.

4.9.1.2 Equipment Blanks. Equipment blanks for water or soil

samples will consist of ASTM Type II water which has been poured over or through non-dedicated sampling equipment such as augers, knives, spoons, or bailers. They will be shipped in the ice chest with the associated samples from the site. Equipment blanks will be prepared and preserved in the same manner as a water sample. Equipment blanks measure the effectiveness of equipment decontamination. Equipment blanks are taken at a rate of 1 for every 20 samples and are analyzed for the same constituents as the associated soil or water samples.

4.9.1.3 Replicate Samples. Replicate samples or splits are extra samples as identical as possible to the original. They may consist of a composite, or as a series of grab samples from the same source. Every tenth sample is taken in triplicate. One of each set of these replicates will be sent to SWD Lab as an audit sample (QA sample) for the contract laboratory, and the other two samples will be sent to the analytical lab as a field sample and a QC sample, each with a unique sample number. In cases where only sufficient sample exists for a duplicate set, every fifth sample is a duplicate. This duplicate alternates as a QC and QA sample.

4.9.2 Samples for Physical Testing. QA/QC on samples for physical testing consists of replicate samples as described in Section 4.9.1.3.

SECTION 5.0

SAMPLE HANDLING AND TESTING

5.1 Sample Numbering System. Sample numbers are assigned by the project manager and are unique to each site. Sample numbers identify the site, well or boring, and type of blank or replicate. Sample numbers are assigned as follows:

LHss-hhhh-xaaa-bb

LHss refers to the site being investigated at Longhorn,
hhhh is the well or boring number,
x describes the sample medium, where

1 = groundwater
2 = soil or rock
3 = sediment
4 = surface water,

aaa is the sample number,
bb is a QA/QC modifier, when needed, where

QA = a QA sample (split for SWD Lab)
QC = a QC sample (split for contract lab)
TB = travel blank
EB = equipment blank.

For example, a QA split from the third soil sample of the second boring from site 32 would look like this: LH32-0002-2003-QA.

5.2 Preparing Samples. When samples are taken in the field, they are preserved according to Table B.1. They are then placed in the ice chest in styrofoam inserts which have cutouts to accommodate the jars. The ice chest is filled with ice and the chain of custody form and field data form are placed inside in a zip-lock plastic bag placed on top of the ice. The ice chest is wrapped with strapping and a seal is placed on the strapping. The samples are then delivered to the bus station or shipper. Samples are shipped on the day they are sampled if possible.

5.3 Receiving Samples. After the ice chests are received at the laboratory, the samples are logged in, the COC is signed, and a cooler receipt form is filled out. This form documents the condition of the samples as received. The samples are checked for breakage or leakage and the temperature of the ice bath is checked. If the temperature exceeds 4°C or if any other problems are

noted, this information is recorded on the COC and the District office is notified of the problem. Samples are repackaged and shipped to contract laboratories using similar procedures as described in Section 5.2.

5.4 Laboratory Procedures. Laboratory analytical procedures come from the following sources: U. S. Environmental Protection Agency (SW 846 and EPA-600, Refs. 6 and 4), and Standard Methods (Ref. 1). Analytical methods from these sources are given in Table B.2. Quantitation limits are given in Tables B.4 through B.8. Quantitation limits, however, are dependent on the concentration of the components in the matrix to be analyzed.

SECTION 6.0

SAMPLE INTEGRITY

The quality of analytical data is suspect if the integrity of the sample cannot be ensured. Integrity includes the procedures and written records which, when taken together, verify that the sample is as represented.

6.1 Security. Security involves procedures which ensure sample integrity. Security is required until final disposal of the sample after laboratory analysis is complete. Aspects of sample security are discussed below.

6.1.1 Security of the Well and Samples in the Field. Each well will have a locking cap and keys will be given out only to those who need them. Samples, once taken, will be in the possession of the sampling crew or locked in the field laboratory. QA and QC samples will be taken, which, when analyzed, will also document the integrity of the sample.

6.1.2 Security of the Sample in the Lab. Samples will be stored in a secure area in the laboratory with limited access to authorized laboratory personnel. Upon receipt of the ice chests, laboratory personnel will check the temperature of the ice bath, the condition of the samples, and the accuracy of the accompanying paperwork.

6.2 Custody. Custody consists of formal records which document integrity. These records are described below.

6.2.1 Chain of Custody Form. The chain of custody form (COC) is a record which describes the sample, the date and method of sampling, and the analyses required. It has spaces for signatures of those receiving and relinquishing the samples. The form is normally signed by the sampler, the individual preparing the samples for shipment, and the receiving individual at the laboratory. The individual preparing the samples for shipment maintains a copy. The original COC is incorporated into the hard copy laboratory report, where it is placed on file. An example of this form is given in Appendix A.

6.2.2 Laboratory Traffic Report. Samples which are sent from SWD Lab to a contract lab are sent with this form. It is a laboratory chain of custody form which gives the sampling date, the analyses to be performed and the date the results are needed. Because various fractions of the sample

might be sent to several contract labs, the original COC cannot be used. The traffic reports are incorporated into the hard copy laboratory reports.

6.2.3 Bill of Lading. A bill of lading (bus bill or airbill) documents receipt of the samples by the carrier. It is not possible for the carrier's representative to sign the COC since it is sealed in the ice chest. Bills of lading are kept on file in the District Office.

6.2.4 Cooler Receipt Form. The cooler receipt form is completed by the laboratory and documents the condition of the samples as received by the lab. This form is available in the hard copy laboratory report.

6.3 Sample Tracking and Identification. Other than the items listed in 6.2, there is additional documentation which demonstrate sample integrity. These are listed as follows:

6.3.1 Field Log Book. The field log book is a bound record, kept by the water sampling crew, in which water sampling information is recorded. It is taken to the wells to record purging and sampling data, water levels, and other items of interest. It is used in the field lab to record preservation and preparation procedures for shipment. It is also used to record equipment calibration and decontamination of sampling equipment. In case of concurrent operations, sampling information will be transferred to the field log book in the field lab. The information for the COC and field data form comes from the field log book.

6.3.2 Field Data Form. The field data form transmits necessary information about the sample to the lab. Field measurements such as pH, conductivity, and water levels as well as problems with the location or the sample are noted on this form. Field data forms are taken for all sampling events. Examples are shown in Appendix A.

6.3.3 Sample Labels. Labels on each jar contain the well or boring number or surface sample location, the sample number, preservation (if any), the analysis to be performed, and the sampler's initials. Examples are provided in Appendix A.

SECTION 7.0

DATA REDUCTION, VALIDATION, AND REPORTING

7.1 Analytical Data.

7.1.1 Field Data. Field data reduction will be performed by the contractor or the COE. Data validation in the field is determined primarily by making several readings (QC checks for reproducibility). Periodic QA oversight is also a part of the validation process. The field data is sent to the lab on the field data form and is returned to the District in the hard copy lab reports.

7.1.2 Laboratory Data. Laboratory data are reduced at the contract lab, which generates a laboratory report containing the analytical data and field and lab QC. Tulsa District performs a QA validation and generates a summary report, which is submitted to the project staff. Laboratory deliverables include the following:

- analytical data, results of field and laboratory blanks, matrix spikes, and matrix spike duplicates, surrogate recoveries, field splits, and COC forms;
- QA validation report;
- ASCII or DBASE format data files.

Calibration and internal standards information, raw data, and all instrumentation graphs and traces will be available from the laboratory, if needed.

7.2 Technical Data. Technical data refers to data of several types, such as groundwater flow calculations, stratigraphic maps generated from geologic and geophysical field data, isopleth profiles of contaminants, and groundwater models. Technical data will be reduced, validated, and reported by the project staff.

SECTION 8.0

AUDITS

Audits, which are QA procedures designed to meet the data quality objectives discussed in Section 4, are of two basic types as discussed below. Table 8.1 gives the audit elements for the Longhorn investigations.

8.1 Systems Audits. A systems audit is a qualitative evaluation of all components of a project to determine if each component is properly performed. Systems audits are generally performed at the outset of investigations and periodically during the life of a project. Systems audits for office and fieldwork will be performed by the Tulsa District, and system audits for laboratory work will be performed by the MRD Lab. These audits consist primarily of site inspections.

8.2 Performance Audits. Performance audits are quantitative evaluations of the components of a project. These consist of audit samples to be checked by MRD as a part of the laboratory validation process, QA replicates taken as a part of the sampling process and analyzed by SWD Lab, and laboratory QA procedures as specified by the analytical method.

TABLE 8.1 AUDIT ELEMENTS FOR Longhorn INVESTIGATIONS

Element	By	Frequency
laboratory site inspection	MRD Lab	at laboratory selection and then every 18 months
field inspections	COE	at least monthly at first less frequently thereafter
technical data inspections	COE	as needed
laboratory check samples	MRD Lab	at laboratory selection and then every 18 months
analysis of field replicates	SWD Lab	every 10 samples
laboratory QA summary report	SWD Lab	one for each lab report

SECTION 9.0

CORRECTIVE ACTION

9.1 Field Activities. Field activities which are improper will be corrected as quickly as possible. The inspector or crew chief will be responsible to see that corrective action is initiated and documented whenever the error has the potential to compromise the quality of the data being generated or whenever there is a possibility that the error might be repeated.

9.2 Field Data. Corrective action for poor field data quality (as determined by replicate measurements or prior expectation) consists of remeasurement until successive readings agree within reasonable limits. Examples of frequently made measurements and limits to which they should agree include:

- pH - Measurements should agree within 0.02 pH unit.
- Conductivity - Measurements should agree within two numbers of the last significant digit.
- Depth and water level measurements - Readings should agree within 0.01 foot.

If remeasurement is not successful, then instrument calibration and operation and the user's technique will be evaluated.

9.3 Laboratory. Laboratory corrective action is described in the analytical method for that analysis.

9.4 Implementing and Reporting. Corrective action should be initiated at the lowest level possible. Corrective action which involves correcting a mistake for little potential of repetition need not be reported as long as the error was not reported. For example, an erroneous water level measurement, such as 40 feet in a 30 foot well, would be corrected by making several additional readings which agreed with each other and looked reasonable. It would not be necessary to report this error. Corrective action involving a potentially repetitive error or one which had been reported should be documented in writing. For example, an erroneous water level measurement due to a low battery in the water level indicator, should be documented because previous suspect water levels may need to be flagged and/or checked. The corrective action report would state the nature of the problem and the potential ramifications as well as what actions have been taken. In this case, it would be to replace the battery and check the last several days of readings of the

indicator. This report will be sent to the project manager.

SECTION 10

REFERENCES

1. American Public Health Association, 1989, "Standard Methods for the Examination of Water and Wastewater", 17th Ed., APHA, Washington, DC.

2. U. S. Army Corps of Engineers, August, 1989, "Minimum Chemistry Data Reporting Requirements for DERP and Superfund HTW Projects", CEMRD-ED-GC Memorandum.

3. U. S. Army Corps of Engineers, January, 1990, "Chemical Data Quality Management for Hazardous Waste Remedial Activities", ER-1110-1-263.

4. U. S. Environmental Protection Agency, March, 1983, "Methods for Chemical Analysis of Water and Wastes", EPA-600/4-79-020.

5. U. S. Environmental Protection Agency, September, 1986, "RCRA Ground Water Monitoring Technical Enforcement Guidance Document.

6. U. S. Environmental Protection Agency, November, 1986, "Test Methods for Evaluating Solid Waste", SW 846, 3rd Ed.

7. U. S. Environmental Protection Agency, May, 1987, "Data Quality Objectives for Remedial Response Activities: Development Process", EPA 540/G-87/003.

8. U. S. Environmental Protection Agency, 1987, "Development of an RFI Work Plan and General Considerations for RCRA Facility Investigations", SW-87-001.

9. U. S. Department of Health and Human Services, 1985, "NIOSH/OSHA Pocket Guide to Chemical Hazards".

005159
0000594

APPENDIX A

FORMS USED IN FIELD SAMPLING ACTIVITIES

MIPR#	SWD LAB#	Chest#	Temp.

005160

GROUNDWATER MONITORING WELL CHAIN OF CUSTODY

U.S. Army Corps of Engineers
Tulsa District, Tulsa, Okla.

Location: Longhorn AAP Date:_____ Time:_____

Site: _____ Well #: _____

Proj. Engineer: _____ Ext#: _____

CONTAINERS

Glass	Plastic	Vial	Chest#	C/Seal#
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____

VOA	Chest#
_____	_____

Int:

PARAMETERS SAMPLED

	pH, Conductivity & Temperature	EPA Method	(0)
	Semi-Volatiles	8270	(2)
	Explosives	8330	(2)
	Herbicides/Pesticides & PCB's (2,4-D & 2,4,5-TP)	8150/8080	(2)
	Nitrate	353.1	(1)
	Total Metals (Ag, As, Ba, Cd, Cr, Hg, Ni, Pb, Sb, Se & Tl)	6010/7041 7060/7470 7740/7841	[1]
	Volatile Organics	8240	{3}

* Containers: () = Amber Glass [] = Plastic {} = Vials

CUSTODY RECORD

Relinquished by	Received by	Date	Time
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

LHAAP/GW/FM1/27JAN92

MIPR#	SWD LAB# [1]	Chest#	Temp.

CHAIN OF CUSTODY
for
VOLATILE ORGANICS

U.S. Army Corps of Engineers
Tulsa District, Tulsa, Okla.

Location: Longhorn AAP	Site:

TRAVEL BLANK DATA

Sample#:_____ Date:_____ Time:_____

Water Source:_____

Analysis Requested: **Volatile Organics**

Date Mfg:_____ Bottle#:_____ C/Seal#:_____

pH:_____ Meter#:_____ Condt:_____ Meter#:_____

Signature of Sampler: _____

SAMPLES CONTAINED IN THIS SHIPMENT

Sample ID Code Number	VOA	Alt#	X-Chest#	SWD Lab #
LHAAP - - 100 - TB				[1]
- - -				
- - -				
- - -				
- - -				
- - -				
Total Samples Shipped				

CUSTODY RECORD

Relinquished by:	Date	Time
Chest#: / C/Seal#: / Bus Bill#:		
Received by:	Date	Time

LHAAP/FM2/15JAN92

MIRP #	SWD LAB #				Chest #	C/Seal	Temp.
						[Y] [N]	
						[Y] [N]	

SOIL SAMPLE
CHAIN OF CUSTODY

U.S. Army Corps of Engineers
Tulsa District, Tulsa, Okla.

Project: Longhorn AAP Proj/Engr: _____ Ext: _____

Site: _____ Boring # _____

Sample depths: _____ to _____ FDF# _____

Start: _____ (Date) / _____ (Time) to _____ (Date) / _____ (Time)

CONTAINERS

Jars	Sample No.(s)				Total #	Chest #	C/Seal #
(2)							
each							

PARAMETERS SAMPLED

	Semi-Volatiles	8270
	Explosives	8330
	Nitrate	353.1
	Herbicides, Pesticides & PCB's (2,4-D & 2,4,5-TP)	8150/8080
	Total Metals (Ag, As, Ba, Cd, Cr, Hg, Ni, Pb, Sb, Se & Tl)	6010/7041 7060/7470 7740/7841
	Volatile Organics	8240

* Containers: () = Wide Mouth Glass Jars w/Teflon liner.

CUSTODY RECORD

Relinquished by	Received by	Date	Time
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

LHAAP/SS/FM1/27JAN92

MIPR#	SWD LAB#	Chest#	Temp.

SURFACE WATER SAMPLE CHAIN OF CUSTODY

U.S. Army Corps of Engineers
Tulsa District, Tulsa, Okla.

Location: Longhorn AAP Date:_____ Time:_____

Site: _____ Location #: _____

Proj. Engineer: _____ Ext#: _____

CONTAINERS

Glass	Plastic	Vial	Chest#	C/Seal#

VOA	Chest#
Int:	

PARAMETERS SAMPLED

	pH, Conductivity & Temperature	EPA Method	(0)
	Semi-Volatiles	8270	(2)
	Explosives	8330	(2)
	Herbicides/Pesticides & PCB's (2,4-D & 2,4,5-TP)	8150/8080	(2)
	Nitrate	353.1	(1)
	Total Metals (Ag, As, Ba, Cd, Cr, Hg, Ni, Pb, Sb, Se & Tl)	6010/7041 7060/7470 7740/7841	[1]
	Volatile Organics	8240	{3}

* Containers: () = Amber Glass [] = Plastic {} = Vials

CUSTODY RECORD

Relinquished by	Received by	Date	Time

LHAAP/SW/FM1/27JAN92

MIPR#	SWD LAB#	Chest#	Temp.

RINSATE WATER SAMPLE CHAIN OF CUSTODY

U.S. Army Corps of Engineers
Tulsa District, Tulsa, Okla.

Location: Longhorn AAP Date:_____ Time:_____

Site: _____ Blank #: _____

Proj. Engineer: _____ Ext#: _____

CONTAINERS

Glass	Plastic	Vial	Chest#	C/Seal#
____	_____	____	_____	_____
____	_____	____	_____	_____

VOA	Chest#
____	_____

Int:

PARAMETERS SAMPLED

	pH, Conductivity & Temperature	EPA Method	(0)
	Semi-Volatiles	8270	(2)
	Explosives	8330	(2)
	Herbicides/Pesticides & PCB's (2,4-D & 2,4,5-TP)	8150/8080	(2)
	Nitrate	353.1	(1)
	Total Metals (Ag, As, Ba, Cd, Cr, Hg, Ni, Pb, Sb, Se & Tl)	6010/7041 7060/7470 7740/7841	[1]
	Volatile Organics	8240	{3}

* Containers: () = Amber Glass [] = Plastic {} = Vials

CUSTODY RECORD

Relinquished by	Received by	Date	Time
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

LHAAP/RB/FM1/27JAN92

WATER SAMPLES FIELD DATA FORM

PROJECT: _____ DATE: __/__/__

SITE: _____ TYPE OF SAMPLE: WATER

WELL NO: _____ LOCATION: _____

CSG DIAMETER: _____ CSG TYPE: _____

RISER ELEVATION: _____

DEPTH TO WATER FROM TOP OF CASING: _____ TIME: __:__

RATE OF RECHARGE: _____

DEPTH TO WATER AT TIME OF SAMPLING: _____ TIME: __:__

WATER TABLE: _____ MEASURING DEVICE: _____

PH: _____ _____ TIME: __:__ TYPE: _____

PH: _____ _____

CONDUCTIVITY, umhos/cm TIME: __:__ TYPE: _____

_____ _____ TEMPERATURE: _____

_____ _____ TURBIDITY: _____

CHEST# _____ C/SEAL# _____ BUS BILL# _____

CHEST# _____ C/SEAL# _____ BUS BILL# _____

NOTES CONCERNING CONDITION OF WELL, ODOR, COLOR, AND PROBLEMS

_____

_____

_____

_____

_____

_____

_____

SAMPLE COLLECTOR: _____

SOIL SAMPLE
FIELD DATA FORM
No:_____

Project: **Longhorn AAP** Proj/Engr: _____ Ext: _____

Site: _____ Boring #:_____

Sample depths:_____ to _____ Total Samples:_____

Start: _____ (Date) /_____ (Time) to _____ (Date) / _____ (Time)

Top of Hole Elev: _____ Water Table: _____

Depth	Description	Jar No.
to		A & B
to		A & B
to		A & B
to		A & B
to		A & B
to		A & B
to		A & B
to		A & B
Page of	Total samples on this form	

Chest #	No/Jars	C/Seal #	Bus bill #

Remarks:

LHAAP/SS/FM2/17JAN92

Sample Collector: _____

LONGHORN AAP
RINSATE WATER SAMPLES
PARAMETER SHEET
FY - 92

CONTAINERS		PARAMETERS	EPA METHOD	PRESERVATIVES
NO.	SIZE		NO./SHIP	
GLASS			(7)	
1	w/m jar	pH, Conductivity, & Temp. (4 sets)	*****	dispose
2	1 liter	Semi-Volatiles	8270	Brim full & 4°C
2	1 liter	Explosives	8330	Brim full & 4°C
2	1 liter	Herbicides, Pesticides & PCB's (2,4-D & 2,4,5-TP)	8150/8080	4°C
1	1 liter	Nitrate	353.1	4°C
PLASTIC			[1]	
1	1 liter	Total Metals (Ag. As. Ba. Cd. Cr. Hg. Ni. Pb. Sb. Se & Tl)	6010/7041/7060 7470/7740/7841	pH<2 w/HNO_3
VIALS			{3}	
3	40 ml vials	Volatile Organics	8240	4 drops HCl, n/a, n/b & 4°C

LH/RB/PAR/27JAN92

One rinsate sample should be taken for every (20) soil samples. The rinsate must be taken on the actual piece of equipment used to obtain the soil sample, (split spoon, auger, knife, etc.) and should have the same I.D. as the corresponding boring/depth number taken with that equipment.

0000573

005168

Hole No.

DRILLING LOG	Division	INSTALLATION	Sheet of Sheets
1. PROJECT		10. SIZE AND TYPE OF BIT	
2. LOCATION (Coordinates or Station)		11. DATUM FOR ELEVATION SHOWN (GS or MSL)	
3. DRILLING AGENCY		12. MANUFACTURER'S DESIGNATION OF DRILL	
4. HOLE NO. (As shown on drawing title and this report)		13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: Disturbed / Undisturbed	
5. NAME OF DRILLER		14. TOTAL NUMBER CORE BOXES	
6. DIRECTION OF HOLE ☐ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.		15. ELEVATION GROUND WATER	
7. THICKNESS OF OVERBURDEN		16. DATE HOLE: STARTED / COMPLETED	
8. DEPTH DRILLED INTO ROCK		17. ELEVATION TOP OF HOLE	
9. TOTAL DEPTH OF HOLE		18. TOTAL CORE RECOVERY FOR BORING %	
		19. SIGNATURE OF INSPECTOR	

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Descriptions) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling rate, water loss, depth of weathering, etc., if significant) g

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE. PROJECT HOLE NO.

0000574

005169

Send original copy by certified mail to: Texas Water Commission, P.O. Box 13087, Austin, Texas 78711

Please use black ink.

ATTENTION OWNER: *Confidentiality Privilege Notice on Reverse Side*

State of Texas
WELL REPORT

Texas Water Well Drillers Board
P.O. Box 13087
Austin, Texas 78711

1) OWNER _____ (Name) ADDRESS _____ (Street or RFD) (City) (State) (Zip)

2) LOCATION OF WELL:
County _____ . _____ miles in _____ (NE, SW, etc.) direction from _____ (Town)

Driller must complete the legal description below with distance and direction from two intersecting section or survey lines, or he must locate and identify the well on an official Quarter- or Half-Scale Texas County General Highway Map and attach the map to this form.

☐ LEGAL DESCRIPTION:
Section No. _____ Block No. _____ Township _____ Abstract No. _____ Survey Name _____
Distance and direction from two intersecting section or survey lines _____
☐ SEE ATTACHED MAP

3) TYPE OF WORK (Check):
☐ New Well ☐ Deepening ☐ Reconditioning ☐ Plugging

4) PROPOSED USE (Check):
☐ Domestic ☐ Industrial ☐ Monitor ☐ Public Supply ☐ Irrigation ☐ Test Well ☐ Injection ☐ De-Watering

5) DRILLING METHOD (Check):
☐ Driven ☐ Mud Rotary ☐ Air Hammer ☐ Jetted ☐ Bored ☐ Air Rotary ☐ Cable Tool ☐ Other _____

6) WELL LOG:
Date Drilling:
Started _____ 19 __
Completed _____ 19 __

DIAMETER OF HOLE		
Dia. (in.)	From (ft.)	To (ft.)
	Surface	

7) BOREHOLE COMPLETION:
☐ Open Hole ☐ Straight Wall ☐ Underreamed
☐ Gravel Packed ☐ Other _____
If Gravel Packed give interval . . . from _____ ft. to _____ ft.

From (ft.)	To (ft.)	Description and color of formation material

0000575

005170

Please use black ink.

File WHITE COPY with:
Texas Water Commission
P.O. Box 13087
Austin, Texas 78711
Phone (512) 371-6299

State of Texas

PLUGGING REPORT

(This form must be completed and filed with the TWC within 30 days following the date the well is plugged as required by current statutory law.)

Texas Water Well Drillers Board
P.O. Box 13087
Austin, Texas 78711
Phone (512) 371-6299

A. Well Identification and Location Data

1) Owner _____ (Name) Address _____ (Street or RFD) (City) (State) (Zip)

2) Owner's Well Number _____

3) Location of Well: County _____ _____ miles in _____ (N.E., S.W., etc.) direction from _____ (Town)

Driller or other person performing the plugging operations must complete the legal description to the right with distance and direction from two intersecting section or survey lines, or he must locate and identify the well on an official Quarter- or Half-Scale Texas County General Highway Map and attach the map to this form

☐ Legal description:

Section No. _____ Block No. _____ Township _____

Abstract No. _____ Survey Name _____

Distance and direction from two intersecting section lines or survey lines: _____

_____

☐ See Attached map.

B. Historical Data on Well To Be Plugged (if available)

4) Driller _____ License Number _____ City _____

5) Drilled _____ 19___; 6) Diameter of hole _____ inches; 7) Total depth of well _____ feet.

C. Current Plugging Data

8) Date well plugged _____, 19_____.

9) Sketch of well: Using space at right, show method of plugging the well including all casing and cemented intervals.

10) Name of Driller or other person actually performing the plugging operations _____

_____

if a water well driller plugged the well, give the driller's license no. _____.

11) Casing and cementing data relative to the plugging operations:

Diameter (inches)	Casing Left in Well	
	From (feet)	To (feet)

Cement Plug(s) Placed in Well		Sack(s) of cement used
From (feet)	To (feet)	

D. Validation of Information Included in Form

I hereby certify that this well was plugged by me (or under my supervision) and that all of the statements herein are true and accurate to the best of my knowledge and belief.

Company or Individual's Name _____ (Type or Print)

Address _____ (Street or RFD) (City) (State) (Zip)

(Signed) _____ (Person performing plugging operations) (Signed) _____ (Owner of Well)

For TWC use only
Well No. _____
Location on map _____

WWD-008 (Rev. 07/27/88)

TEXAS WATER COMMISSION'S COPY

U.S. ARMY CORPS OF ENGINEERS
TULSA DISTRICT, TULSA, OKLAHOMA

PANTEX PLANT (DOE)

MONITOR WELLS
URNING GROUND WELL #_____

ATE:_____TIME:_____

SEMI-VOLATILES

METHOD: 8250/8270
REFRIGERATED @ 4'C BRIM FULL

CHECKED FOR BUBBLES? [Y] [N]

IGNATURE:_____

U.S. ARMY CORPS OF ENGINEERS
TULSA DISTRICT, TULSA, OKLAHOMA

PANTEX PLANT (DOE)

BURNING GROUND WELL #

DATE:_____TIME:_____

NITRATES

4'C

SIGNATURE:_____

000577 00005?

ORIGINAL

QC REPORT

SOUTHWESTERN DIVISION LABORATORY, CORPS OF ENGINEERS
4815 CASS STREET
DALLAS, TEXAS 75235-8011
(214) 905-9130

CASE NARRATIVE REQUIRED

005172

REQUEST FOR ANALYSES

LABORATORY: NDRC LABORATORY

PROJECT: FORT SILL

DATE RESULTS REQUIRED: 7 APRIL 1992

DATE SAMPLES SENT: 24 MARCH 1992

Must have Due 4/3/92
2 Ambers water ~~liquid~~ per SX WC

TEST THE FOLLOWING SAMPLES AS INDICATED BELOW:

FIELD ID	SWD NO.	DATE SAMPLED	2858
FS43-01	2- 1018	23 MARCH 1992	-1
FS43-02	2- 1019	23 MARCH 1992	2
FS43-03	2- 1020	23 MARCH 1992	3
FS43-03/EB	2- 1021	23 MARCH 1992	4
FS43-03/DC	2- 1022	23 MARCH 1992	5
	MS		6
	MSD		7
	method Blank		8
	Blank spike		9

ANALYZE FIVE WATER SAMPLES FOR EXPLOSIVES INCLUDING: HMX, RDX, TNT, TNB, 2-4 DNT, 2-6 DNT) (8330)

**** THESE SAMPLES ARE TWO WEEK TURN AROUND. REQUEST THE HARD COPY REPORT BY DUE DATE. ****

	RELINQUISHED BY:	RECEIVED BY	DATE	TIME
1	Judy A. Johns	[illegible]	3-24-92	1220
2	David Miller	David Meyer	3/24/92	1315

0000578

COOLER RECEIPT FORM

~~0000578~~

Date Received _____ Project _____ 005173

Number of Coolers _____ Cooler Numbers _____

Date Checked in _____ By (sign) _____

1. Shipping slip.....Yes.....No

   If yes, carrier and bill number _____

2. Custody seals on cooler.....Yes.....No

   If yes, how many and where _____

3. Custody seals intact.....Yes.....No

4. Chain-of-Custody in plastic.....Yes.....No

5. Chain-of-Custody filled out properly.....Yes.....No

6. SWD signed Chain-of-Custody properly.....Yes.....No

7. Enough ice and packing.....Yes.....No

   Type of packing _____

8. All bottles sealed.....Yes.....No

9. Any bottles broken.....Yes.....No

10. Labels in good condition and complete.....Yes.....No

11. Labels agree with COC.....Yes.....No

12. Correct containers used.....Yes.....No

13. Preserved properly.....Yes.....No

14. Sufficient sample.....Yes.....No

15. Bubbles absent from VOA.....Yes.....No

16. Client called.....Yes.....No

    Details _____

_____

17. Comments _____

_____

_____

_____

APPENDIX B

TABLES

TABLE B.1 SAMPLE CONTAINERS, PRESERVATION, AND PREPARATION FOR WATER SAMPLES

PARAMETER	SIZE AND TYPE OF CONTAINER	# OF CONTAINERS	ICE	METHOD OF PRESERVATION
pH	½ pint glass	1	N	field test
conductivity	½ pint glass	1	N	field test
temperature	½ pint glass	1	N	field test
metals	liter plastic	1	Y	nitric acid to pH <2
volatiles	40 ml glass vial	3	Y	no head space, air bubbles or agitation,
semivolatiles	liter amber glass	2	Y	
explosives	liter amber glass	2	Y	
anions	liter glass	1	Y	
pesticides/PCBs	liter amber glass	2	Y	
herbicides	liter amber glass	1	Y	
total organic carbon	liter amber glass	1	Y	sulfuric acid to pH <2
total organic halogen	liter amber glass	1	Y	sulfuric acid to pH <2
phenols	liter amber glass	1	Y	sulfuric acid to pH <2
TCLP (See note 1)				
volatiles				
semivolatiles				
pesticides				
herbicides				
metals				

Note 1. Sample containers for aqueous samples to be analyzed for TCLP are identical to the sample containers for the corresponding total analysis.

TABLE B.2 MAXIMUM HOLDING TIMES AND ANALYTICAL METHODS IN SOIL AND WATER

ANALYTICAL METHOD PARAMETER	EXTRACTION	ANALYSIS	REFERENCE	METHOD #
Field tests				
pH	-	immediate		
conductivity	-	immediate		
temperature	-	immediate		
Metals				
antimony	-	6 months	SW-846(1)	7041
arsenic	-	6 months	SW-846	7060
selenium	-	6 months	SW-846	7740
lead	-	6 months	SW-846	7421
mercury in water	-	28 days	SW-846	7470
mercury in soil	-	28 days	SW-846	7471
thallium	-	6 months	SW-846	7841
others	-	6 months	SW-846	6010
Volatiles	-	14 days	SW-846	8240
Semivolatiles			SW-846	8270
in water	7 days	40 days		
in soil	14 days	40 days		
Explosives				
in water	7 days	40 days	SW-846	8330
in soil	14 days	40 days	SW-846	8330
Anions			EPA-600(2)	300.0
nitrate	-	14 days		
chloride	-	28 days		
sulfate	-	28 days		
Pesticides/PCBs				
in water	7 days	40 days	SW-846	8080
in soil	14 days	40 days	SW-846	8080
Herbicides				
in water	7 days	40 days	SW-846	8150
in soil	14 days	40 days	SW-846	8150
Total Organic Carbon		28 days	SW-846	9060
Total Organic Halogen		14 days	SW-846	9020
Phenols		28 days	SW-846	9066
TCLP				
volatiles		14 days	SW-846	1311/8240
semivolatiles	7 days(3)	40 days	SW-846	1311/8270
pesticides	7 days(3)	40 days	SW-846	1311/8080
herbicides	7 days(3)	40 days	SW-846	1311/8150
metals (except mercury)		6 months	SW-846	1311/various
(mercury)		28 days	SW-846	1311/7470

(1) SW-846 reference 6;
(2) EPA-600 reference 4
(3) There is a holding time of 7 days from field collection to TCLP extraction, 7 days from TCLP extraction to preparative extraction and 40 days from preparative extraction to determinative analysis for a total elapsed time of 54 days.

TABLE B.3 METHODS FOR PHYSICAL TESTS

TEST	METHOD SOURCE
grain size	ASTM D421, D422, D1140
atterberg limits	ASTM D4318
moisture content	ASTM D2216
asbestos	NIOSH/OSHA

005177

NIOSH/OSHA National Institute of Occupational Safety and Health/ Occupational Safety and Health Administration

ASTM American Society of Testing and Materials.

TABLE B.4 QUANTITATION LIMITS FOR VOLATILE ANALYSES IN SOIL AND WATER BY METHOD 8240

PARAMETER	WATER (ug/l)	LOW LEVEL SOIL/SEDIMENT (ug/kg)
chloromethane	10	10
bromomethane	10	10
vinyl chloride	10	10
chloroethane	10	10
methylene chloride	5	5
acetone	10	10
carbon disulfide	5	5
1,1-dichloroethane	5	5
1,1-dichloroethene	5	5
cis-1,2-dichloroethene	5	5
trans-1,2-dichloroethene	5	5
chloroform	5	5
1,2-dichloroethane	5	5
2-butanone (MEK)	10	10
1,1,1-trichloroethane	5	5
carbon tetrachloride	5	5
vinyl acetate	10	5
bromodichloromethane	5	5
1,2-dichloropropane	5	5
trichloroethene	5	5
dibromochloromethane	5	5
1,1,2-trichloroethane	5	5
benzene	5	5
trans-1,3-dichloropropene	5	5
4-methyl-2-pentanone	10	10
2-hexanone	10	10
tetrachloroethene	5	5
toluene	5	5
1,1,2,2-tetrachloroethane	5	5
chlorobenzene	5	5
ethylbenzene	5	5
styrene	5	5
xylenes (total)	5	5
acrolein	5	5
acrylonitrile	10	10
dibromomethane	5	5
dichlorodifluoromethane	5	5
1,4-dichloro-2-butene	10	10
ethyl methacrylate	5	5
1,2,3-trichloropropane	5	5
dichloromethane	5	5
iodomethane	10	10
trichlorofluoromethane	5	5

TABLE B.5 QUANTITATION LIMITS FOR SEMIVOLATILE ANALYSIS IN SOIL AND WATER BY METHOD 8270

005179

PARAMETER	WATER (ug/l)	LOW-LEVEL SOIL/SEDIMENT (ug/kg)
phenol	10	330
bis(2-chloroethyl) ether	10	330
2-chlorophenol	10	330
1,3-dichlorobenzene	10	330
1,4-dichlorobenzene	10	330
benzyl alcohol	10	330
1,2-dichlorobenzene	10	330
2-methylphenol	10	330
bis(2-chloroisopropyl) ether	10	330
4-methylphenol	10	330
n-nitrosodi-n-propylamine	50	1600
hexachloroethane	10	330
nitrobenzene	10	330
isophorone	10	330
2-nitrophenol	10	330
2,4-dimethylphenol	10	330
benzoic acid	50	1600
bis(2-chloroethoxy) methane	10	330
2,4-dichlorophenol	10	330
1,2,4-trichlorobenzene	10	330
naphthalene	10	330
4-chloroaniline	10	330
hexachloro-1,3-butadiene	10	330
4-chloro-3-methylphenol	10	330
2-methylnaphthalene	10	330
hexachlorocyclopentadiene	10	330
2,4,6-trichlorophenol	10	330
2,4,5-trichlorophenol	50	1600
2-chloronaphthalene	10	330
2-nitroaniline	50	1600
dimethyl phthalate	10	330
acenaphthylene	10	330
2,6-dinitrotoluene	10	330
3-nitroaniline	50	1600
acenaphthene	10	330
2,4-dinitrophenol	50	1600
4-nitrophenol	50	1600
dibenzofuran	10	330
2,4-dinitrotoluene	10	330
diethyl phthalate	10	330
4-chlorophenyl phenyl ether	10	330
fluorene	10	330
4-nitroaniline	50	1600
4,6-dinitro-2-methylphenol	50	1600
N-nitrosodiphenylamine	10	330
4-bromophenyl phenyl ether	10	330
hexachlorobenzene	10	330
pentachlorophenol	50	1600
phenanthrene	10	330
anthracene	10	330
di-n-butyl phthalate	10	330
fluoranthene	10	330
pyrene	10	330
butyl benzyl phthalate	10	330
3,3'-dichlorobenzidine	20	660
benzo(a)anthracene	10	330
chrysene	10	330
bis(2-ethylhexyl)phthalate	10	330

TABLE B.5 (cont.) QUANTITATION LIMITS FOR SEMIVOLATILE ANALYSIS IN SOIL AND WATER BY METHOD 8270

PARAMETER	WATER (ug/l)	LOW-LEVEL SOIL/SEDIMENT (ug/kg)
di-n-octyl phthalate	10	330
benzo(b)fluoranthene	10	330
benzo(k)fluoranthene	10	330
benzo(a)pyrene	10	330
indeno(1,2,3-cd)pyrene	10	330
dibenz(a,h)anthracene	10	330
benzo(g,h,i)perylene	10	330
1-chloroanaphthalene	10	660
3-methylphenol	10	330
diphenylamine	20	1000
1,2-diphenylhydrazine	50	1600

Medium soil/sediment quantitation limits are 60 times the low soil/sediment quantitation limits.

TABLE B.6 QUANTITATION LIMITS FOR PESTICIDE ANALYSES IN SOIL AND WATER BY METHOD 8080

PARAMETER	WATER (ug/l)	LOW-LEVEL SOIL/SEDIMENT (ug/kg)
aldrin	0.4	63.2
alpha-BHC	0.3	47.4
beta-BHC	0.6	94.8
delta-BHC	0.9	142.2
gamma-BHC	0.4	63.2
chlordane	1.4	221.2
4,4'-DDD	1.1	173.8
4,4'-DDE	0.4	63.2
4,4'-DDT	1.2	189.6
dieldrin	0.2	31.6
endosulfan I	1.4	221.2
endosulfan II	0.4	63.2
endosulfan sulfate	6.6	1042.8
endrin	0.6	94.8
endrin aldehyde	2.3	363.4
heptachlor	0.3	47.4
heptachlor epoxide	8.3	1311.4
methoxychlor	18	2844
toxaphene	24	3792
arochlor-1018	1	158
arochlor-1221	1	158
arochlor-1232	1	158
arochlor-1242	1	158
arochlor-1248	1	158
arochlor-1254	1	158
arochlor-1260	1	158

TABLE B.7 REQUIRED QUANTITATION LIMITS FOR EXPLOSIVES IN SOIL AND WATER BY METHOD 8330

PARAMETER	WATER (ug/l)	LOW-LEVEL SOIL/SEDIMENT (ug/g)
	EXPLOSIVES	
HMX		2.2
RDX	0.836	1.0
1,3,5-TNB	0.258	0.25
1,3-DNB	0.108	0.25
Tetryl		0.65
NB		0.26
2,4,6-TNT	0.113	0.25
4-Am-DNT	0.060	
2-Am-DNT	0.035	
2,6-DNT	0.314	0.26
2,4-DNT	0.021	0.25
2-NT		0.25
4-NT		0.25
3-NT		0.25

TABLE B.8 QUANTITATION LIMITS FOR OTHER ANALYSES IN SOIL AND WATER

PARAMETER	WATER (mg/l)	LOW-LEVEL SOIL/SEDIMENT (mg/kg)
METALS		
antimony	0.03	1.0
arsenic	0.01	1.0
barium	0.02	10.0
cadmium	0.005	1.0
chromium	0.01	1.0
lead	0.002	1.0
mercury	0.002	0.1
nickel	0.05	1.0
selenium	0.01	1.0
silver	0.07	1.0
thallium	0.01	1.0
COMMON ANIONS		
nitrate	0.1	0.1
chloride	2.0	-
sulfate	2.0	-
HERBICIDES		
2,4-D	0.01	1.0
2,4,5-TP	0.002	0.2
MISCELLANEOUS		
total organic carbon	1.0	
total organic halogen	0.005	
phenols	0.002	

TABLE B - 9
CHEMICAL SAMPLING PLAN SUMMARY
RI PHASE I FIELD INVESTIGATIONS

SITE	TYPE OF SAMPLE: SURFACE WATER			SEDIMENT			SHALLOW SOIL / WASTE			SOIL FROM SOIL BORINGS (SB) AND WELL BORINGS (MW)									GROUND WATER FROM SOIL BORINGS (SB) AND WELLS (MW)					TRAVEL BLANK	EQUIP BLANK
	SAMPLE TYPE			SAMPLE TYPE			SAMPLE TYPE			LOCATION		EST. AVG. DEPTH WTR.	EST. AVG. DEPTH		SAMPLING FREQUENCY	SAMPLE TYPE			LOCATION		SAMPLE TYPE			TB	EB
LHAAP NO.	WATER QTY	QA QTY	QC QTY	SOIL QTY	QA QTY	QC QTY	SOIL QTY	QA QTY	QC QTY	SB QTY	MW QTY	FEET	SB FEET	MW FEET	FEET	SOIL QTY	QA QTY	QC QTY	SB QTY	MW QTY	WATER QTY	QA QTY	QC QTY	QTY	QTY
11	2	0	0	2	0	0	0	0	0	6	0	16	18	-	5.0	30	3	3	6	0	6	1	1	4	2
13	0	0	0	0	0	0	0	0	0	4	1	25	27	45	5.0	30	3	3	4	1	5	1	1	4	2
14	0	0	0	0	0	0	0	0	0	2	1	24	26	45	5.0	18	2	2	2	1	3	1	1	3	2
16	5	1	1	5	1	1	0	0	0	4	11	19	21	40	5.0	75	8	8	25	12	37	4	4	12	4
17	3	2	0	3	0	0	0	0	0	7	1	5	7	25	2.5	24	3	3	7	3	10	1	1	6	3
18 & 24	8	1	1	8	1	1	0	0	0	0	0	-	-	-	-	0	0	0	0	39	39	4	4	13	3
29	17	2	2	17	2	2	8	1	1	15	0	20	22	-	5.0	75	8	8	15	6	21	3	3	10	4
12	3	0	0	3	0	0	2	0	0	0	7	18	-	40	5.0	35	4	4	0	9	9	1	1	8	3
32	7	1	1	7	1	1	4	0	0	13	0	10	12	-	2.5 & 5.0	39	4	4	8	1	9	1	1	7	3
1	7	1	1	7	1	1	0	0	0	8	0	5	7	-	2.5	24	3	3	8	1	9	1	1	7	2
XX	7	1	1	7	1	1	0	0	0	7	0	20	22	-	2.5 & 5.0	29	3	3	4	2	6	1	1	6	2
27	4	0	0	4	0	0	4	1	1	10	0	8	10	-	5.0	30	3	3	10	2	12	2	2	6	3
TOTALS	63	7	7	63	7	7	18	2	2	76	21	-	-	-	-	409	44	44	89	77	166	21	21	86	33

- DENOTES NOT APPLICABLE

NOTES:

1. ALL SAMPLES WILL BE ANALYZED FOR VOLATILE ORGANIC COMPOUNDS (VOC'S), SEMIVOLATILE ORGANIC COMPOUNDS (SVOC'S), EXPLOSIVE COMPOUNDS, 11 SELECTED METALS, NITRATE, CHLORIDE, AND SULFATE, WITH THE FOLLOWING EXCEPTIONS:
   a. TRIP BLANKS WILL BE ANALYZED FOR VOC'S ONLY.
   b. GROUND WATER FROM SOIL BORINGS WILL BE ANALYZED FOR TOTAL ORGANIC HALIDES (TOX), TOTAL ORGANIC HALIDES (TOX), EXPLOSIVE COMPOUNDS, NITRATE, CHLORIDE, SULFATE, AND TOTAL PHENOLS ONLY.
2. SITES LHAAP 13, 32, AND 27 WILL INCLUDE PESTICIDES AND HERBICIDE ANALYSES.
3. BACKGROUND MONITOR WELL GROUND-WATER SAMPLE AT LHAAP 16 WILL BE ANALYZED FOR VOCS, SVOCS, EXPLOSIVE COMPOUNDS, 11 SELECTED METALS, NITRATE, CHLORIDE, SULFATE, TOX, TOC, AND TOTAL PHENOLS.
4. SITE LHAAP 16 ALSO INCLUDES THREE 150-FT DEEP STRATIGRAPHIC TEST BORINGS FOR GEOPHYSICAL LOGGING. GROUND-WATER SAMPLES WILL BE TAKEN EVERY 20 FEET.

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APPENDIX C

INVESTIGATION-DERIVED WASTE MANAGEMENT PLAN

005186
0000591

LONGHORN ARMY AMMUNITION PLANT

RI/FS WORKPLAN

INVESTIGATION-DERIVED WASTE

MANAGEMENT PLAN

PREPARED BY:

U.S. ARMY CORPS OF ENGINEERS
Tulsa District

JUNE 1992

PREPARED FOR:

Longhorn Army Ammunition Plant
Karnack, Texas

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1. Introduction. Longhorn Army Ammunitions Plant (LHAAP) was placed on the National Priority List (NPL) in August 1990. This document will serve as an Investigations-Derived Waste (IDW) management plan for the investigations to be performed per the Remedial Investigations/Feasibility Study (RI/FS) Workplan under Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). Twelve locations have been identified as having 13 sites within the installation.

1.1. Purpose of Management Plan. The purpose of this plan is to describe the anticipated approach and procedures for IDW management. During the investigations,waste will be generated that may contain hazardous substances as defined by CERCLA, be characteristically hazardous under the Resource Conservation and Recovery Act (RCRA), listed hazardous waste under RCRA, or industrial solid waste. The intent of the IDW management is to leave the site in no worse condition after the investigation than existed prior to the investigation and to comply with ARARS to the extent practicable. In accordance with the guidance this document will be written as a stand-alone plan but will only provide the briefest details other than those specific to waste management. Detailed information about facility, the sites, and the investigations is provided in the Volume 1 of the RI/FS Workplan.

1.2. IDW Management Approach. The approach will be to utilize the Area of Contamination (AOC) unit concept as outlined in the EPA guidance document, Superfund Management of Investigation-Derived Wastes During Site Inspections, May 1991, (Appendix C-1). The most important elements of the IDW management approach as listed in the above referenced guidance are as follows:"

- Leaving a site in no worse condition than existed prior to the investigations.
- Removing those waste that pose an immediate threat to human health or the environment.

- Leaving on-site wastes that do not require off-site disposal or extended above-ground containerization.
- Storing on site waste that is contaminated but is not hazardous for treatment during the remedial action.
- Complying with federal ARARs, to the extent practicable.
- Complying with state ARARs, to the extent practicable.
- Careful planning and coordination for IDW management.
- Minimizing the quantity of generated wastes."

1.3. Facility Description Summary. LHAAP is a US Army facility with restricted access. It is located in the northeast corner of Harrison County of east Texas. The facility consists of 8,493 acres located between State Highway and the western shore of Caddo Lake. It's primary mission is to load, assemble, and packout pyrotechnic and illuminating/signal ammunition and solid propellant rocket motors. The facility was established in 1942 and has a long history of producing high explosives (HE), pyrotechnic and illuminating ammunition by various contractors.

1.3.1. Climate. LHAAP is located in a moist, humid, mild climate and receives an average rainfall of 46 inches.

1.3.2. Terrain. It is situated on gently rolling land with an average slope of 3 percent. All surface water drains into Caddo Lake via four drainage systems across the facility.

1.3.3. Regional Groundwater. Groundwater is generally unconfined, it can vary in depth beneath land surface (BLS) from 1 to 20 feet and is approximately 120 to 130 feet thick.

1.4. Current Sites To Be Investigated. There are thirteen separate operable units located at twelve sites included in this investigation. The locations of the project sites are provided as Figure C-1. The LHAAP designation numbers and names of the thirteen sites are:

LHAAP 11 - Suspected TNT Burial Site at Avenues P & Q

LHAAP 13 - Suspected TNT Burial Site between the Old and Active Landfills/Acid Dump

LHAAP 14 - Area 54 Burial Ground

LHAAP 16 - Old Landfill

LHAAP 17 - Burning Ground No.2/Flashing Area

LHAAP 18 - Burning Ground No. 3 and Unlined Evaporation

LHAAP 24 - Pond/Rocket Motor Washout Lagoon (same site as LHAAP 18)

LHAAP 29 - Former TNT Production Area

LHAAP 12 - Active Landfill

LHAAP 32 - Former TNT Disposal Plant

LHAAP 01 - Inert Burning Grounds

LHAAP XX - Ground Signal Test Area

LHAAP 27 - South Test Area

1.5. Past investigations. The facility has been shown by past investigations to contain contaminated surface soils, sediment, vadose zone soils, groundwater, and surface water to varying degrees at the different sites as described in Volume 1. Table C-1 provides a brief summary of the highest concentrations of contaminants at the individual sites from past investigations.

Figure C-1.

Table C-1
SITE PAST CONTAMINATION SUMMARY
LONGHORN RI IDW MANAGEMENT INFORMATION

LHAAP UNIT NO.	SITE NAME	SOIL CONTAMINATION TYPE (depth)	SOIL MAXIMUM CONC. (mg/Kg)	DEPTH TO GROUND WATER	GROUND WATER CONTAMINATION TYPE	GROUND WATER MAXIMUM CONC. (ug/l)
11	Suspected TNT Burial Site at Ave.'s P & Q	2,4,6,-TNT (2.5') 1,3,5-TNB (1.5')	1.86 117.0	3.0'	NO INFORMATION (NI)	NI
13	Suspected TNT Burial Site Between Old & Active Landfills/Acid Dump	(Suspected) 2,4,6,-TNT Acidic waste	NI	25.0'	NI	NI
14	Area 54 Burial Ground	Suspected Demolition Debris Explosives/Acidic waste	NI	24.0'	1,3,5-TNB (BH-12)	6.1
16	Old Landfill	1,3-DNB (sed./017) 2,6-DNT (sed./017) 2,4,6-TNT(sed./017) 1,3,5-TNB(SS/Q-II) 2,4,6-TNT(SS/704T) 2,4-DNT (15'/Q-IV) 2,6-DNT (10'/Q-IV) TCE (15'/Q-I) DCE (10'/Q-I) VCl (10'/Q-I) 1,1-DCA (15'/Q-IV)	12.2 15.0 3.9 0.153 13.6 73.0* 173.0 1.0 1.9 2.1 2.6	8.5'	Strontium (SW-017) Sulphate (SW-017) 2,6-DNT (MW-122) VCl (MW-122) Cadmium (MW-122) Chromium(MW-122) Barium (MW-122) Nitrate (BH-12) Phosphates (BH-13) Sulphate (BH-13) Stronium (BH-16)	80.0 8,170.0 8.6 10.5 6.84 55.8 217.0 1213.0 3930.0 122,000.0 1,790.0
17	Burning Ground No. 2 /Flashing Area	1,3,5-TNB /SS 2,4,6-TNT /SS 1,3-DNB /SS MEC /SS TCE /SS 1,4-DCB /SS 1,3-DNB (5') 2,4,6-TNT (5') 1,3,5-TNB (5') 2,4-DNT (5') 2,6-DNT (5') MEC (5') TCE (5') 1,4-DCB (5')	.127 .153 .180 .26 .53* .21 .470 .040 .060 .14* .053 .13 .56* .86	5.0'	Phenol (sw-016) Chromium (sw-016) Nitrate (sw-016) Sulphate (sw-016) Chloride (sw-016) MEC (mw130) Tetrahydrofuran (mw130) Chloride (BG-2) Strontium (BG-2) Chloroform (mw130)	14.0 34.5 940.0 10,500.0 4,000.0 153.0 46.0 2,348,000.0 1,116.0 16.0

Table C-1
SITE PAST CONTAMINATION SUMMARY
LONGHORN RI IDW MANAGEMENT INFORMATION

LHAAP UNIT NO.	SITE NAME	SOIL CONTAMINATION TYPE (depth)	SOIL MAXIMUM CONC. (mg/Kg)	DEPTH TO GROUND WATER	GROUND WATER CONTAMINATION TYPE	GROUND WATER MAXIMUM CONC. (ug/l)
18 & 24	Burning Ground No. 3 & Unlined Evaporations Pond/ Rocket Motor Washout Lagoon	Tetryl (8A-902, 14') TNT (8A-905, 8') MEC (8A-940, 10') TCE (8A-940, 4') 1,2-DCE (8A-902, 14') Toluene (8A-940, 4')	26.6 9.5 420.0 430.0* 153.3 34.0	22'	MEC (120) Acetone 1,2-DCE 1,2-DCA TCE (120) PCA Barium (MW-2) Chloride (MW-2) TOX (MW-2) Nitrates (123)	17,000,000.0 810.0 120.0 52.0 1,400,000.* 17,000.0 3,600.0 890,000.0 3,644,000.0 6,300.0
29	Former TNT Production Area	2,4,6-TNT (sediment) 1,3-DNB (SS) 2,4,6-TNT (SS) 1,3,5-TNB (SS) 2,4-DNT (SS) 2,6-DNT (SS) 1,3-DNB (1'-3.5') 2,4,6-TNT (2.5') 1,3,5-TNB (3.5') 2,4-DNT (1.5') 2,6-DNT (1-3.5')	0.78 0.52 7645.68 64.65 16.8* <0.61 <.01 .73 0.63 0.093 <.01	20'	2,4,6-TNT (SW) 2,4-DNT (SW) 2,6-DNT (SW) 1,3,5-TNB (MW-114 & 118) (All other groundwater samples below detection limit.)	206.9 23.4 13.6 1.4
12	Active Landfill	Sediment samples taken in 1991 investigations - no results over detection limits for explosives, VOC, and SVO.		12'-19'	1,3-DNB (BH-18) Aluminum (MW-103) Manganese (BH-17) Strontium BH-19) Chloride (BH-19) Sulphate (BH-18) Nitrate (BH-17) MEC (BH-17)	2.25 361.0 1,990.0 1,160.0 2,725,000.0 235,000.0 1,120.0 48.0
32	Former TNT Disposal Plant	Soil samples taken indicate no results over detection limits for explosives.		10'	2,4,6-TNT (SW)	7.6

Table C-1
SITE PAST CONTAMINATION SUMMARY
LONGHORN RI IDW MANAGEMENT INFORMATION

LHAAP UNIT NO.	SITE NAME	SOIL CONTAMINATION TYPE (depth)	SOIL MAXIMUM CONC. (mg/Kg)	DEPTH TO GROUND WATER	GROUND WATER CONTAMINATION TYPE	GROUND WATER MAXIMUM CONC. (ug/l)
1	Inert Burning Grounds	Soil samples taken indicate no results over detection limits for explosives and anions. No high samples were reported for metals. Nitrate (103) Sulphate (103)	 8.33 40.48	5'	1,3,5-TNB (104) Nitrobenzene (104) Strontium (104) Chloride (104) Nitrate (104) Sulphate (104) No VOC's or SVO detected.	9.74 1.82 96.0 8,000.0 3,500.0 5,710.0
xx	Ground Signal Test Area	Soil samples taken indicate no results over detection limits for explosives and anions.No high results were reported for metals. Aluminum (0102)	 1,435.0	10'-15'	Manganese (127) Strontium (104) Chloride (104) Sulphate (104) No Explosives, VOC's or SVO detected.	1,860.0 4,120.0 1,000,000.0 1,622,000.0
27	South Test Area	2,4,6-TNT (0401)	10.15	4'	Aluminum (MW-132) Manganese (MW-132) Strontium (MW-132) Chloride (MW-131) Sulphate (MW-132)	232.0 1,448.0 2,640.0 850,000.0 337,000.0

DCA = dichloroethane
DCB = dichlorobenzene
DCE = dichloroethene
DNB = dinitrobenzene
DNT = dinitrotoluene
MEC = methylene chloride
PCA = tetrachlorethane
TCE = trichloroethylene
TNB = trinitrobenzene
TNT = trinitrotoluene
VCl = vinyl chloride
VOC = volatile organic carbons
SVO = semivolatile organic carbon
TOX = total organic halides
MW = monitoring well
SB = soil boring
NI = no information available
* = concentration greater then the TCLP regulatory limits

1.6. Site Descriptions.

1.6.1. (11) Suspected TNT Burial Site at Ave.'s P & Q. This site consists of a cleared, grassy area at the intersection of two roads. The site was reported by USATHAMA as a possible burial site used to dispose of TNT in the 1940's. A borrow pit was later created in the central part to the wooded area north of the site, leaving a depression approximately 5 feet deep. This depression is apparent in aerial photographs taken in 1963, is inactive at present, and is not a candidate for the investigation. There is no operational activity presently scheduled at the suspected burial site.

The explosive compounds 2,4,6-TNT and 1,3,5-TNB have been found in soils at this site down to at least 5-foot depths, the maximum depth sampled. Maximum concentrations were 1.86 ug/g of TNT and 117 ug/kg of TNB.

1.6.2. (13) Suspected TNT Burial Site Between Old & Active Landfills/Acid Dump. This site is located in a clearing in a heavily wooded area immediately south of a power line easement. Based on conversations with employees at LHAAP, there was a suspected one-time disposal of TNT and/or acid at this site. No other known or suspected disposals have occurred.

The site contains a number of bare patches that support little of no vegetation. The patches vary in size from 1 to 10 feet in diameter. The three larger bare patches stand out very well in the surrounding grass which is 1 to 2 feet tall. Based on the presence of the bare patches it appears reasonable to suspect something may have been disposed of at these locations which is preventing the native grasses from re-establishing themselves.

The site has not been previously investigated. Based on the statements of plant employees and the continued presence of bare spots at the site, it is reasonable to investigate the site for possible soil and groundwater contamination due to the suspected burial of explosives and associated wastes, or the possible dumping of pesticides, herbicides, or acids.

1.6.3. (14) Area 54 Burial Ground. This site is approximately 150 feet in size and contains a small 25 by 30 foot asphalt parking lot. It was reportedly used during the 1940's and early 1950's for the disposal of demolition debris, explosives, and acids. The parking lot may cap the burial pit.

The site has not been previously investigated. Based on the statements of plant employees and the presence of contaminants which have been found near the site, possible soil and groundwater contamination will be investigated for explosives, demolition debris, and acids.

1.6.4. (16) Old Landfill. This site is defined as an open area bounded along the western and northern edges by a gravel road and along the eastern and southern edges by a wooded area. A large rectangular paved area that is designated as the Retail Sales Area for LHAAP is located on the western edge of the site. In the past, equipment auctions were held at this location. A tributary of Harrison Bayou runs closely along the eastern edge of the site.

The Old Landfill area was used for the disposal of inert materials and mission related hazardous wastes. The area was used to dispose of TNT redwater ash material from 1942 to 1944. In the mid to late 1950's, three rocket motor casings were burned and possibly buried on the eastern side of this landfill. A large bermed depression, once located near the center of the Old Landfill, served as an all-purpose junkyard for the disposal of such materials as substandard TNT, barrels of chemicals, oil, paint, scrap iron and wood. This area was filled in and the pond no longer exists. The landfill operation started at original ground level at the north-south mid-line of the site and ended 15 feet above original grade at the eastern edge of the site. Currently, all inert solid wastes are disposed of in the Active Landfill located elsewhere on the installation. The Old Landfill site is now used for the deposition of inert rubble only.

Soil contamination due to explosives has been verified at the site to depths of at least 15 feet. Sediments in the adjacent tributary to Harrison

Bayou also are contaminated with explosive compounds. No explosives have been detected in groundwater downgradient of the site, and none have been found in surface waters. The only contaminant exceeding TDH drinking water standards identified in the groundwater downgradient of the landfill is cadmium. Major contaminants and their maximum concentrations are presented in Table C-1. Reference: Longhorn Army Ammunition Plant RI/FS Workplan, Volume 1, February 1992.

1.6.5. (17) Burning Ground No. 2 /Flashing Area. This site is situated within a heavily wooded section of LHAAP. It consists of two 185 by 305 foot cleared areas separated by a gravel entrance road. The east area of the entrance road was once fenced, and the area west of the road is open. Harrison Bayou flows approximately 1200 feet northwest of the site.

Burning Ground No. 2 was used for burning bulk TNT, photo flash powder, and reject material when LHAAP was operated by Universal Match Corporation. Although it has been reported that bulk TNT was uncovered at the site in 1954, there is no documentation to support bulk TNT burial at the site. In 1959, all of the materials removed from the TNT Production Area (LHAAP 29) during razing were burned or flashed at this site. A 1958 aerial photograph shows a possible man-made pond on the western side of the road entering the site. This depression does not appear in 1954 or 1963 photos. There are no records of the pond's existence or the nature of its use over this 9 year period other than the 1958 photo. It is suspected that this was a burn pit or trenching operation. The site was used until 1980 as a flashing area to decontaminate recoverable metal by products. Burning trenches were located around the inside perimeter of the fenced area. As each trench filled with ash, the trench was covered and a new trench was dug. The waste residues were reportedly removed in 1984 and the site was allowed to revegetate. The site is presently inactive.

Soils at the location of the suspected pond have been identified as being contaminated with explosives, metals, and trace amounts of volatile organic compounds to a depth of at least 5 feet, the maximum sampling depth. Although a

monitoring well exists downgradient of the previously fenced flashing area, it is inconclusive whether groundwater has been impacted. It is possible that explosive residues and other contaminants may be present in the surface soils of old burn trenches that have not been investigated. Some of the significant contaminant maximum concentrations found at the site are presented in Table C-1.
Reference: Longhorn Army Ammunition Plant RI/FS Workplan, Volume 1, February 1992

1.6.6. (18 & 24) Burning Ground No. 3 & Unlined Evaporations Pond/Rocket Motor Washout Lagoon. Burning Ground No. 3 is a fenced 34.5 acre secured area currently used for the disposal of explosives and explosive-contaminated wastes through open burning. It is a cleared area within a heavily wooded section of LHAAP. The UEP, now closed and capped, is located in the northern corner of Burning Ground No. 3. Harrison Bayou flows within 1,000 feet of the western edge and within 500 feet of the northern edge of the burning grounds site.

Burning Ground No. 3 has been in operation since 1955. The area has been used for the treatment, storage, and disposal of solid and liquid explosive, pyrotechnic, and combustible solvent wastes by open burning, incineration, evaporation, and burial. Historical waste management units include open burning pits, an unlined evaporation pond (UEP), stockpiles of solvent soaked sawdust, and suspected waste burial pits. The UEP was constructed at the burning grounds in 1963 as a holding pond to store explosive wastes resulting from the washout of rocket motor casings, which was performed at the northern corner of the pond. In 1973, the pond also began receiving wash water containing solvent residues and solids collected from LHAAP operations involving pyrotechnic material preparation and mixing. Sawdust soaked with methylene chloride and other solvents that were used to clean and scour mixers used for mixing illuminants were stockpiled along the southern berm of the pond as well as burned in trenches in the western portion of the burning ground. An air curtain destructor (ACD) was built in 1979 in the western corner of the burning grounds

for the purpose of disposing of explosive and explosive-contaminated wastes by burning. Use of burn pits and trenches was reportedly discontinued in 1984. Use of the UEP was discontinued in 1984 when it was discovered that the pond was contaminating groundwater beneath the site. The UEP was closed as a RCRA interim status surface impoundment in 1986 by removing all waste and capping the impoundment. As part of the INF Treaty activities being conducted at LHAAP, a burn cage was added in 1989 for the open burning of Pershing II missile motors. Current operations include disposal of explosive and explosive-contaminated wastes by burning in the ACD, three open burning cages, and two open burning pans, as well as a burn cage for Pershing II motor elimination.

A summary of the major contaminants detected in groundwater and their maximum concentrations is provided in Table C-1. Contaminants found in shallow soils include tetryl (26.6 ug/g), TNT (5.7 ug/g), and reportedly high concentrations of unspecified volatile compounds.

Reference: Longhorn Army Ammunition Plant RI/FS Workplan, Volume 1, February 1992.

1.6.7. (29) Former TNT Production Area. The Former TNT Production Area is an 85-acre site located in the west central portion of LHAAP. With the exception of the former Bulk Toluene Storage Area, the site is bounded by Avenue E on the southwest, 1st Street on the northwest, 18th Street on the southeast and Avenue D on the northeast. The Former Bulk Toluene Storage Area, once a part of the TNT production area, is a 500 by 500 foot area located across Avenue D from the production area. It is a wooded area bounded by 33rd Street on the north and Avenue D on the west.

The Former TNT Production Area operated from April 1943 until August 1945 as a six line plant with a supporting acid plant which produced over 180 million kg of TNT. All six production lines, lines A through F, operated throughout this period with line F used as a reserve line for production when other lines were inactive. Redwater from the wash houses associated with each of these lines flowed via underground wood stave pipelines to a pumphouse located on the

northern end of the site adjacent to 16th Street, and then on to the TNT Waste Disposal Plant. Cooling water (blue water) drain lines from the former production lines flow to the northeast and empty into an open ditch alongside 16th Street approximately 550 feet from Avenue D. A toluene bulk storage facility, servicing the TNT production operation, was located across Avenue D from the production area. The TNT production plant was not operated after World War II and was razed, except for foundations, in 1959. There are presently no industrial activities conducted in these two areas.

The site contains high levels of TNT in the surface soil. Explosives were also found in sediments and surface water drainage from the production area site. The abandoned Bulk Toluene Storage Area has not been investigated. Explosives have been identified in soils down to at least 42 inches at random locations across the production area site. Pieces of crystallized DNT have been found in the abandoned cooling water drain line and where the line discharges into an open ditch. Two locations have been identified where sediments are contaminated with 2,4,6-TNT. One of these locations also had surface water contaminated with low levels of various explosive compounds. Groundwater has apparently not been impacted by soil contamination at the production area site. It is not known if contamination from the bulk storage of toluene at the storage area exists. Major contaminants and their maximum concentrations are provided in Table C-1.

Reference: Longhorn Army Ammunition Plant RI/FS Workplan, Volume 1, February, 1992.

1.6.8. <u>(12) Active Landfill</u>. The Active Landfill is located in the central portion of LHAAP. The center of the site is about 1,700 feet east-northeast of the intersection of Avenue P and Avenue Q. The entrance to the site's graveled access road is on Avenue Q about 0.2 mile east of Avenue P.

Aerial photography taken in 1954 reveals the construction of a diversion ditch between Central Creek and one of its principal tributaries which collects surface runoff from the southern part of the Magazine Area. The apparent

purpose of the ditch was to divert flow in the area where a railroad crossed the tributary system, eliminating the need for a bridge. The diversion ditch remained functional until 1963 when aerial photography shows waste material disposed in the ditch system. 1970 photographs show that enough waste material had been disposed to block the flow of the system, but the site appeared to be inactive. Sometime between 1970 and 1978, the site was reactivated for waste disposal. By 1978 the entire ditch system had been filled with waste material and an adjacent undisturbed hillside had also been used for disposal. Since 1978, the site has been in continuous use for disposal of industrial solid wastes generated at LHAAP. An area southeast of the original ditch system has been cleared and is now used for the disposal of non-hazardous combustible and non-combustible wastes. The types of waste disposed of at this site since 1963 are largely unknown. It is possible that the Active Landfill site has been used for the disposal of similar wastes which were disposed of at the Old Landfill which include substandard TNT, barrels of chemicals, oils, paints, scrap iron, and wood.

The site contains elevated concentrations of metals in the soil and groundwater along with trace amounts of 1,3-DNB at one monitoring well location and volatile organics at three locations. Major contaminants and their maximum Reference: LHAAP RI/FS Workplan, Volume 1, February 1992.

1.6.9. <u>(32) Former TNT Disposal Plant</u>. The site is situated in the west central portion of LHAAP and is located approximately 400 feet northwest of Avenue C and 600 feet southeast of 6th Street.

The Former TNT Waste Disposal Plant was constructed in 1942 to treat and dispose of wastewaters generated at the nearby Former TNT Production Area (LHAAP 29). The disposal plant was operated by Monsanto Chemical Co. from April 1943 until August 1945 and disposed of wastewaters resulting from the production of over 397 million pounds of 2,4,6-TNT. The plant was not operated after August 1945. In 1959, most of the buildings and tanks used in the disposal process were removed, leaving only the concrete foundations, access roads, underground

utilities, and constructed surface water drainage. The disposal process involved neutralization and storage of the waste until it could be burned by incineration.

Explosive compounds were not detected at the site with the exception of 7.6 ug/l of 2,4,6-TNT found in surface water adjacent to the former Neutralized Wastes Storage Tank. Concentrations of aluminum, chromium, lead, manganese, and nickel are also present in surface water above local background levels. Major contaminants and their maximum concentrations are provided in Table C-1. Reference: Longhorn Army Ammunition Plant RI/FS Workplan, Volume 1, , February 1992.

1.6.10. (1) Inert Burning Grounds. This site is situated in the extreme northwestern portion of LHAAP. The center of the site is at least 2,000 feet from the LHAAP boundary and approximately 400 feet west of the intersection of Avenue P and 32nd Street.

The Inert Burning Grounds was originally used during World War II by Monsanto Chemical Company for burning trash, ashes, scrap lumber, and waste from burned 2,4,6-TNT. Bulk 2,4,6-TNT may also have been burned at the site. The site was not used between August 1945 and February 1952 when LHAAP was is a standby status. Universal Match Corporation later used the site to burn wastes, including photo flash powder, for a few years during the 1950's until most burning operations were transferred to the Burning Ground No. 2/Flash Area (LHAAP 17). Intermittent, small-scale burning may have continued into the early 1960s. Burn residues were most likely not removed. It is also suspected that some wastes may have been dumped without burning and were subsequently covered by or mixed with fill material.

Previous investigations indicate elevated levels of metals in the soil and groundwater. Explosives nitrobenzene and 1,3,5-TNB exceed background levels in the groundwater at concentrations of 1.82 and 9.74 ug/l respectively. Major contaminants and their maximum concentrations are provided in Table C-1. Reference: Longhorn Army Ammunition Plant RI/FS Workplan, Volume 1,

February 1992.

1.6.11. (xx) Ground Signal Test Area. This site is located in the southeastern portion of LHAAP. Access to the site is provided by an asphalt gravel road that intersects Long Point Road just east of its intersection with Avenue Q.

The Ground Signal Test Area is currently used for aerial and on-ground testing of various pyrotechnic, illuminant, and signal devices manufactured at LHAAP. Since late in 1988, the site has also been used for the burn-out of Pershing missile rocket motors destroyed in accordance with the INF Treaty.

The site has been used intermittently since April 1963 for aerial and on-ground testing and destruction of a variety of devices, including red phosphorus smoke wedges, infrared flares, illuminating 60 and 81 mm mortar shells, illuminating 40 to 155 mm cartridges, button bombs, and various types of explosive simulators. Prior to 1963 the site was used intermittently for testing and burn-out of rocket motors from Nike-Hercules, Pershing, and Sargent missiles. In 1970 a rocket motor was inadvertently destroyed when it exploded in the center of the site. Debris from the explosion was placed in the crater and backfilled.

Previous investigations indicate elevated levels of metals in the soil and groundwater. No detectable levels of explosives or organics where found at the site. Major contaminants and their maximum concentrations are provided in Table C-1.

Reference: Longhorn Army Ammunition Plant RI/FS Workplan, Volume 1, February 1992.

1.6.12. (27) South Test Area. This site is located in the south central portion of LHAAP. The earthen test pad is approximately 2,000 feet southeast of Avenue P and the Magazine Area. A deteriorated asphalt and gravel road runs from the entrance to the Test Pad. The concrete bunkers and Observation Building are situated alongside the road about halfway between the

entrance and the Test Pad. A circular, 50 foot wide fire lane with a 2,000 foot diameter is centered at the Test Pad. The fire lane is now overgrown with brush and small trees.

The South Test Area was constructed in 1954 and was used by Universal Match Corporation for testing photo flash bombs that they produced at LHAAP until about 1956. The bombs were tested by exploding them in the air over an elevated, semi-elliptical earthen Test Pad with the floodplain of Harrison Bayou. During the late 1950s, illuminating devices were demilitarized within pits excavated in the vicinity of the Test Pad. During the early 1960s, leaking 3 to 4 pound canisters of white phosphorus were possibly demilitarized in the vicinity of the Test Pad. In the early 1980s photo flash cartridges were demilitarized in an area just east of the Observation Building.

Aerial photographs taken in 1954 when the area was under construction indicate an area of apparent vegetation distress. This area may have been used for toxic waste disposal during early stages in construction. The vegetation distress has persisted for over 37 years.

Previous investigations indicate elevated levels of metals in the soil along with low levels of 2,4,6-TNT. Elevated levels of metals are also present in the groundwater along with trace amounts of semivolatile organic compounds. Major contaminants and their maximum concentrations are provided in Table C-1. Reference: Longhorn Army Ammunition Plant RI/FS Workplan, Volume 1, February 1992.

1.7. Investigation Summary. This IDW Management Plan pertains to the following investigations:

- Soil sampling from bore holes at 76 locations
- Soil sampling from monitoring well bore holes at 21 locations
- Groundwater sampling from the 68 soil borings
- Groundwater sampling from the 21 new wells and the 56 existing monitoring wells for a total of 77 samples
- Surface water sampling from 63 locations

- Sediment sampling from 63 locations
- Shallow soil/waste sampling from 18 locations

Detailed information about the investigations is provided in Volume 1 and Volume 2, Chemical Data Acquisition Plan (CDAP38) of which this plan is an Appendix. Information about the investigations on an individual site basis is provided in Table C-2.

1.8. Methods of Waste Quantity Minimization. There are many ways in which waste generation will be kept to a minimum. During the investigations personnel are directed to:

- Avoid walking through areas of obvious or known contamination
- Avoid handling or touching materials directly
- Take care to limit the amount of contamination that comes in contact with equipment
- If contaminated tools are to be placed on non-contaminated equipment for transport use plastic to keep non-contaminated surfaces clean to limit decontamination waste

Table C-2
SITE SUMMARY SHEET
LONGHORN RI WASTE MANAGEMENT INFORMATION

LHAAP UNIT NO.	SITE NAME	INVESTIGATIONS						ESTIMATED WASTE QUANTITIES			
		Monitoring wells (depth)	Borings (depth)	samples				SOIL CUTTINGS (cf)	PURGE WATER (gal)	DECON. FLUIDS (gal)	PPE & DISP. EQUIPMENT (20 gal bags)
				Sediment	Soil	Groundwater	Surface water				
11	Suspected TNT Burial Site at Ave.'s P & Q	0	6 (18')	2	30	6 [6(SB) + 0(mw)]	2	25.92	0	363	26
13	Suspected TNT Burial Site Between Old & Active Landfills/Acid Dump	1 (45')	4 (27')	0	30	5 [4(SB) + 1(MW)]	0	49.77	658.24	323.25	23
14	Area 54 Burial Ground	1 (45')	3 (26')	0	18	3 [2(SB) + 1(MW)]	0	42.57	691.16	241.75	15
16	Old Landfill	5 (40') 6 (+40')	3 (150') 4 (21')	5	75	16 [4(SB) + 12(MW)]	5	361.36	11,922.03	1,208.5	69
17	Burning Ground No. 2 /Flashing Area	1 (25')	7 (7')	3	24	10 [7(SB) + 3(MW)]	3	25.01	1,316.48	445.5	28
18 & 24	Burning Ground No. 3 & Unlined Evaporations Pond/ Rocket Motor Washout Lagoon	0	0	8	0	39 [0(SB) + 39(MW)]	8	0	16,365.49	219	28
29	Former TNT Production Area	0	15 (22')	17	75	21 [15(SB) + 6(MW)]	17	79.2	1,777.25	988.5	80
12	Active Landfill	7 (40')	0	3	35	9 [0(SB) + 9(MW)]	3	148.4	6,450.74	474	32

005208
00000513

Table C-2
SITE SUMMARY SHEET
LONGHORN RI WASTE MANAGEMENT INFORMATION

LHAAP UNIT NO.	SITE NAME	INVESTIGATIONS						ESTIMATED WASTE QUANTITIES			
		Monitoring wells (depth)	Borings (depth)	samples				SOIL CUTTINGS (cf)	PURGE WATER (gal)	DECON. FLUIDS (gal)	PPE & DISP. EQUIPMENT (20 gal bags)
				Sediment	Soil	Groundwater	Surface water				
32	Former TNT Disposal Plant	0	5 (5') 8 (12')	7	39	9 [8(SB) + 1(MW)]	7	29.04	329.12	694.25	44
1	Inert Burning Grounds	0	8 (7')	6	24	9 [8(SB) + 1(MW)]	6	13.44	164.56	445.0	31
xx	Ground Signal Test Area	0	3 (5') 4 (22')	7	29	6 [4(SB) + 2(MW)]	7	24.72	82.28	414.75	32
27	South Test Area	0	4 (1') 9 (10')	4	30	12 [10(SB) + 2(MW)]	4	22.56	362.03	675.5	38
		21	83	61	409	68 (SB) 77 (MW) 145 TOTAL	61	821.99	40,119.38	6,493.0	446

0005209
0000514

2. Waste Description.

2.1. Types and Estimated Quantities of IDW. Table C-2 provides a listing of the estimated waste quantities for each site and the sections below provide a description and total amount for each type.

2.1.1. Drill Cuttings. The drill cutting will consists of soil removed from borings and monitoring well installations. All of the bore holes will be drilled at least 2 feet into the saturated groundwater zone. To prevent spread of contamination the bore holes will be grouted after soil and bore hole water sampling. All borings and monitoring wells will be drilled in the AOC's with the exception of the background investigations that by nature is not expected to be contaminated. No borings or monitoring wells are planned for outside the facility. A total of 30.44 cubic yards of drill cuttings are expected to be generated.

2.1.2. Purge and Development Water. The new monitoring wells will be purged of at least 5 volumes of water during development and an additional five volumes of water prior to sampling new and existing monitoring wells as described in the CDAP, section 4.5. The soil borings will not be purged for water sampling. This water will be taken directly from the saturated groundwater zone. A total of 40,120 gallons of purge and development water is expected to be generated.

2.1.3. Decontamination Fluids. The drilling equipment will be decontaminated between each hole as described on page 23 of the CDAP.

Purging equipment will be scrubbed and rinsed with Type II reagent grade water each it is used.

Sampling equipment will be washed with a non-phosphate detergent, tap water, distilled water, and hexane, in that order, allowed to air dry, and sealed back in clean containers prior to use.

Personnel decontamination will be minimal with the use of disposable suits, gloves, and boot covers. A boot wash will be utilized, if chemically resistent boots (rather than covers) are used. If PPE Level C or higher is implemented additional decontamination washes will be utilized.

A total of 6,493 gallons of purge and development water is expected to be generated.

2.1.4. Personnel Protective Equipment (PPE). A modified Level D PPE will initially apply for all intrusive investigations. This is described in detail in the Site Safety and Health Plan in Volume III of this workplan. Disposable items will include the following items:

- Tyvek full body coveralls
- Chemically resistant surgical type gloves (inner)
- Cotton work gloves (outer)
- Chemical resistent boot covers
- Respiratory dual cartridge filters for air purifying and a combination organic vapor/HEPA filter (respirators will be added if needed based upon the air monitoring action levels)

A total of 446 20 gallon plastic bags are expected to be generated.

2.2. IDW Applicable of Relevant and Appropriate Requirements (ARARs). A comprehensive list of ARARs is presented in Section 7 of the Workplan.

2.3. Methods for Characterizing RCRA Hazardous/Non-hazardous IDW. The primary method for characterizing the IDW has been review of historical use of the sites and past investigation results. For LHAAP 13 that has no past investigation the assumption was made that the waste would be similar to LHAAP 11 and 14. Past experience and professional judgement was also utilized. All liquid waste will be tested for TCLP parameters to determine if it is characteristically hazardous.

3. Area of Contamination Description. The Area of Contamination (AOC) Unit 005212 boundary to the waste unit and the surrounding contamination present in the soil, groundwater, sediment, and surface water. This provides a conceptual area in which investigations activities, storage and storage of IDW will not degrade the site so as to increase the hazard to human health and the environment. This provides a mechanism for practical and efficient investigation without negative impact to the environment. Figure C-2 shows the entire facility with the site locations and the seven AOC's.

3.1. AOC-A. Figure C-3 shows the AOC-A with the LHAAP 1 investigations.

3.2. AOC-B. Figure C-4 shows the AOC-B with the LHAAP 32 investigations.

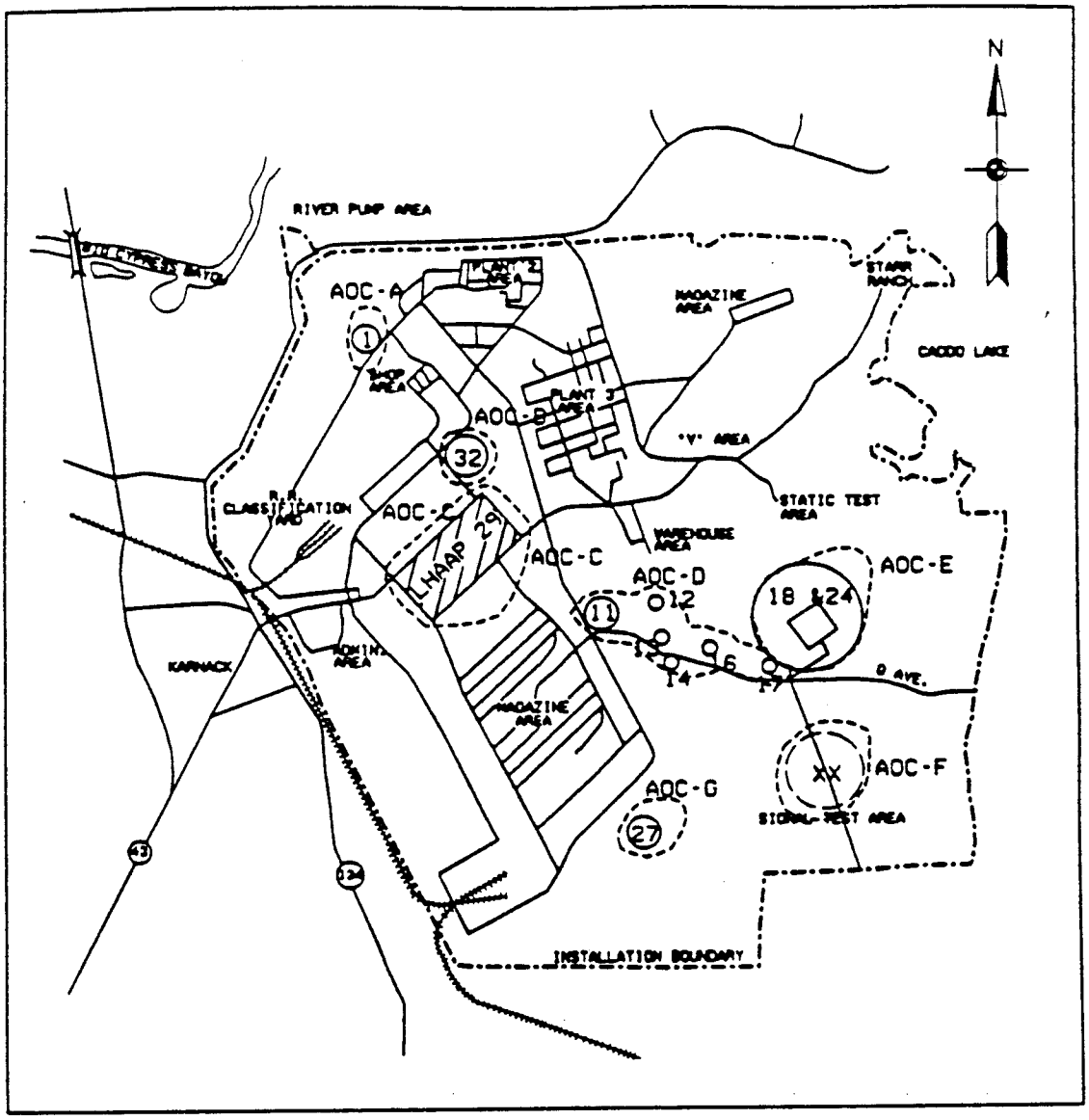
3.3. AOC-C. Figure C-5 shows the AOC-C with the LHAAP 29 investigations.

3.4. AOC-D. Because LHAAP 11, 12, 13, 14, 16, and 17 are so physically close together and extent of spread of contamination is unknown, these 6 sites were included in one AOC unit. Figure C-6 shows the AOC-D with the LHAAP 11 investigations. Figure C-7 shows the AOC-D with the LHAAP 12 investigations. Figure C-8 shows the AOC-D with the LHAAP 13 investigations. Figure C-9 shows the AOC-D with the LHAAP 14 investigations. Figure C-10 shows the AOC-D with the LHAAP 16 investigations. Figure C-11 shows the AOC-D with the LHAAP 17 investigations.

3.5. AOC-E. Figure C-12 shows the AOC-E with the LHAAP 18 & 24 investigations.

3.6. AOC-F. Figure C-13 shows the AOC-F with the LHAAP XX investigations.

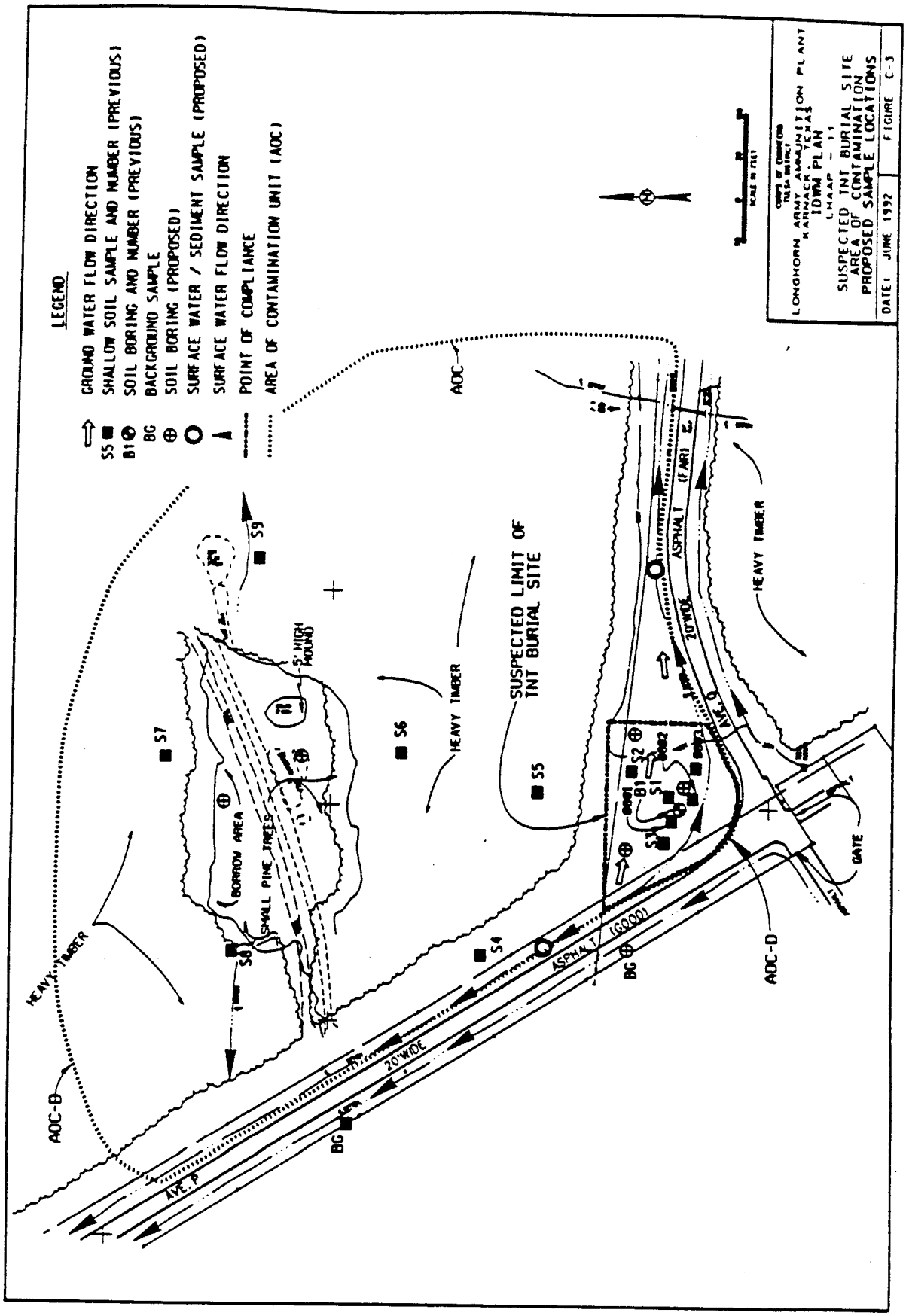
3.7. AOC-G. Figure C-14 shows the AOC-G with the LHAAP 27 investigations.

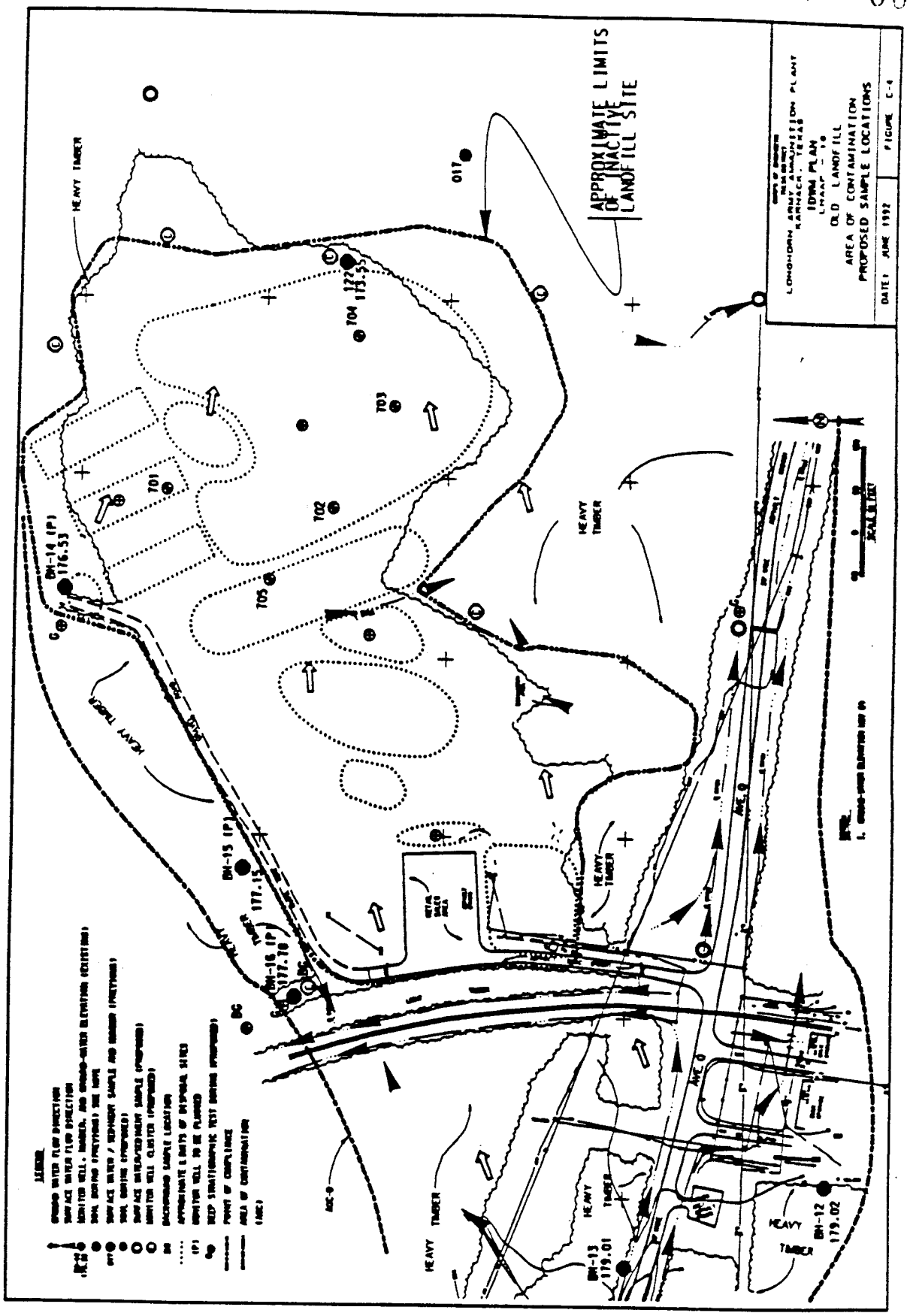


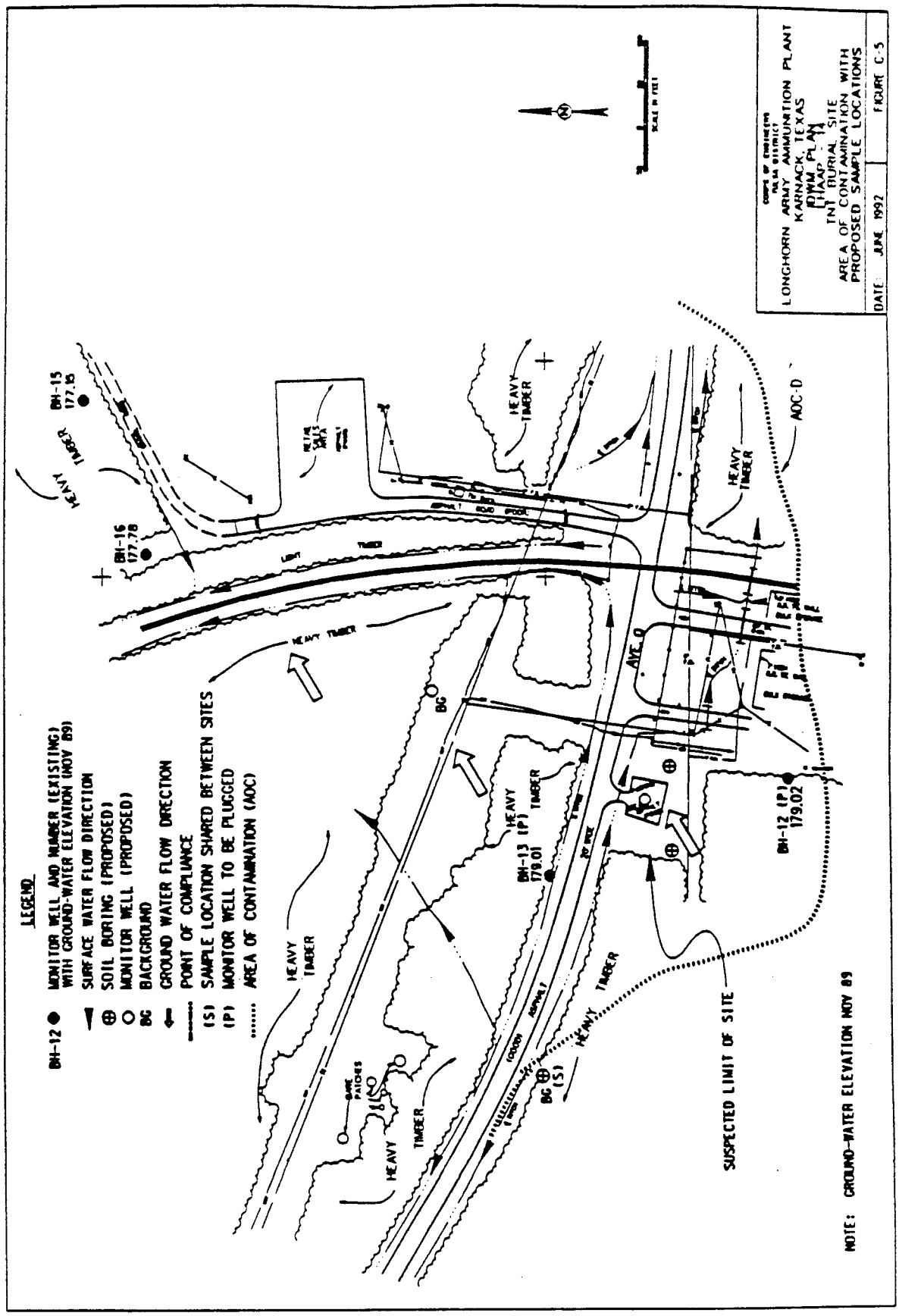
APPROX. SCALE IN FEET

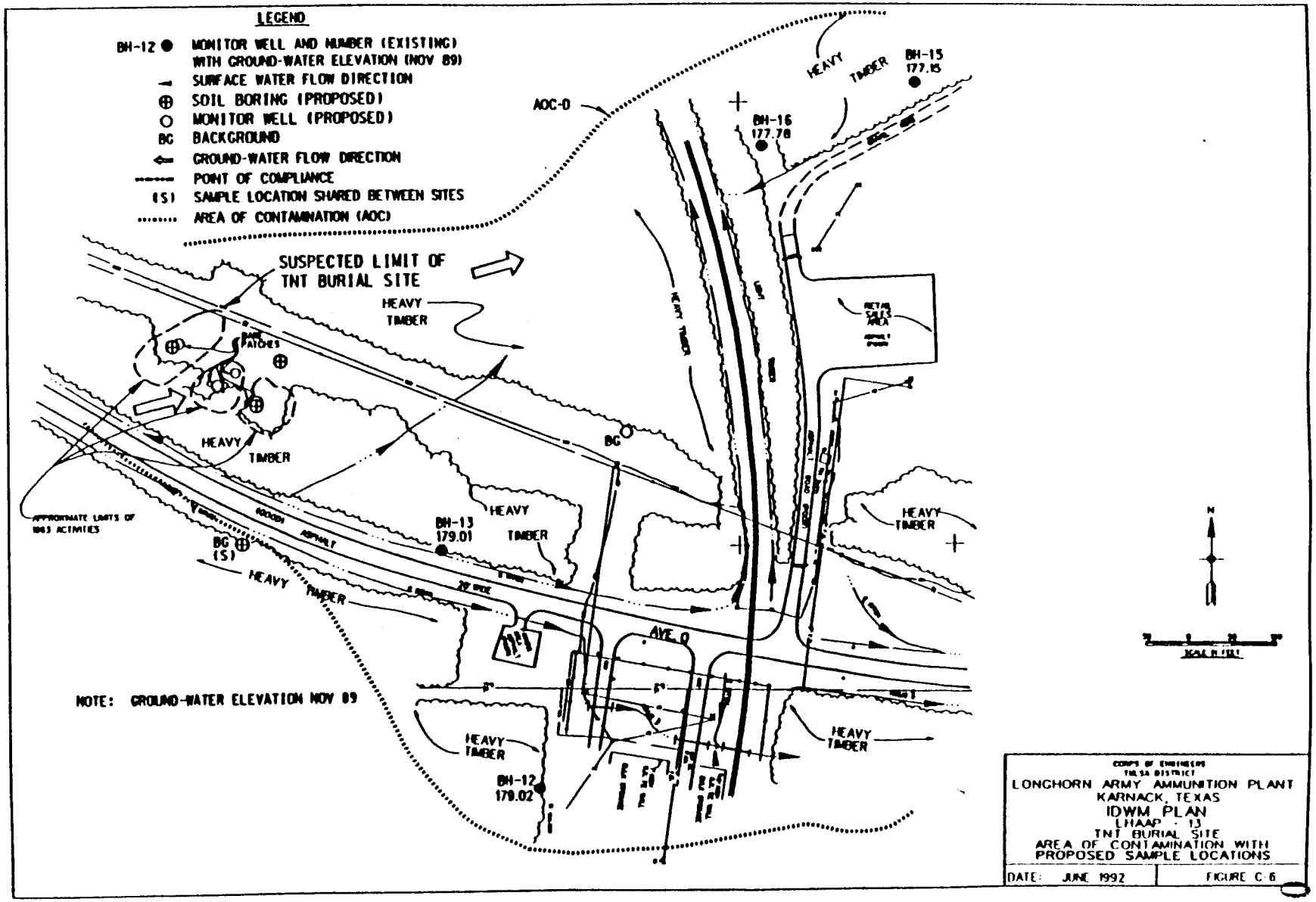
LONGHORN ARMY AMMUNITION PLANT
RI/FS WORK PLAN
LOCATION MAP FOR AREA OF CONTAMINATION UNITS
WITH LHAAP CERCLA SITES
IDW MANAGEMENT PLAN

FIGURE C-2


LEGEND
GROUND WATER FLOW DIRECTION
SHALLOW SOIL SAMPLE AND NUMBER (PREVIOUS)
SOIL BORING AND NUMBER (PREVIOUS)
BACKGROUND SAMPLE
SOIL BORING (PROPOSED)
SURFACE WATER / SEDIMENT SAMPLE (PROPOSED)
SURFACE WATER FLOW DIRECTION
POINT OF COMPLIANCE
AREA OF CONTAMINATION UNIT (AOC)
SUSPECTED LIMIT OF TNT BURIAL SITE
AOC
AOC-B
AOC-D
HEAVY TIMBER
BORROW AREA
SMALL PINE TREES
5' HIGH MOUND
ASPHALT (FAIR)
ASPHALT (GOOD)
20' WIDE
AVE. P
AVE. Q
GATE
BG
S1
S2
S3
S4
S5
S6
S7
S8
S9
B1
B2
LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS
IDW PLAN
LHAAP - 11
SUSPECTED TNT BURIAL SITE
AREA OF CONTAMINATION
PROPOSED SAMPLE LOCATIONS
DATE: JUNE 1992
FIGURE C-3

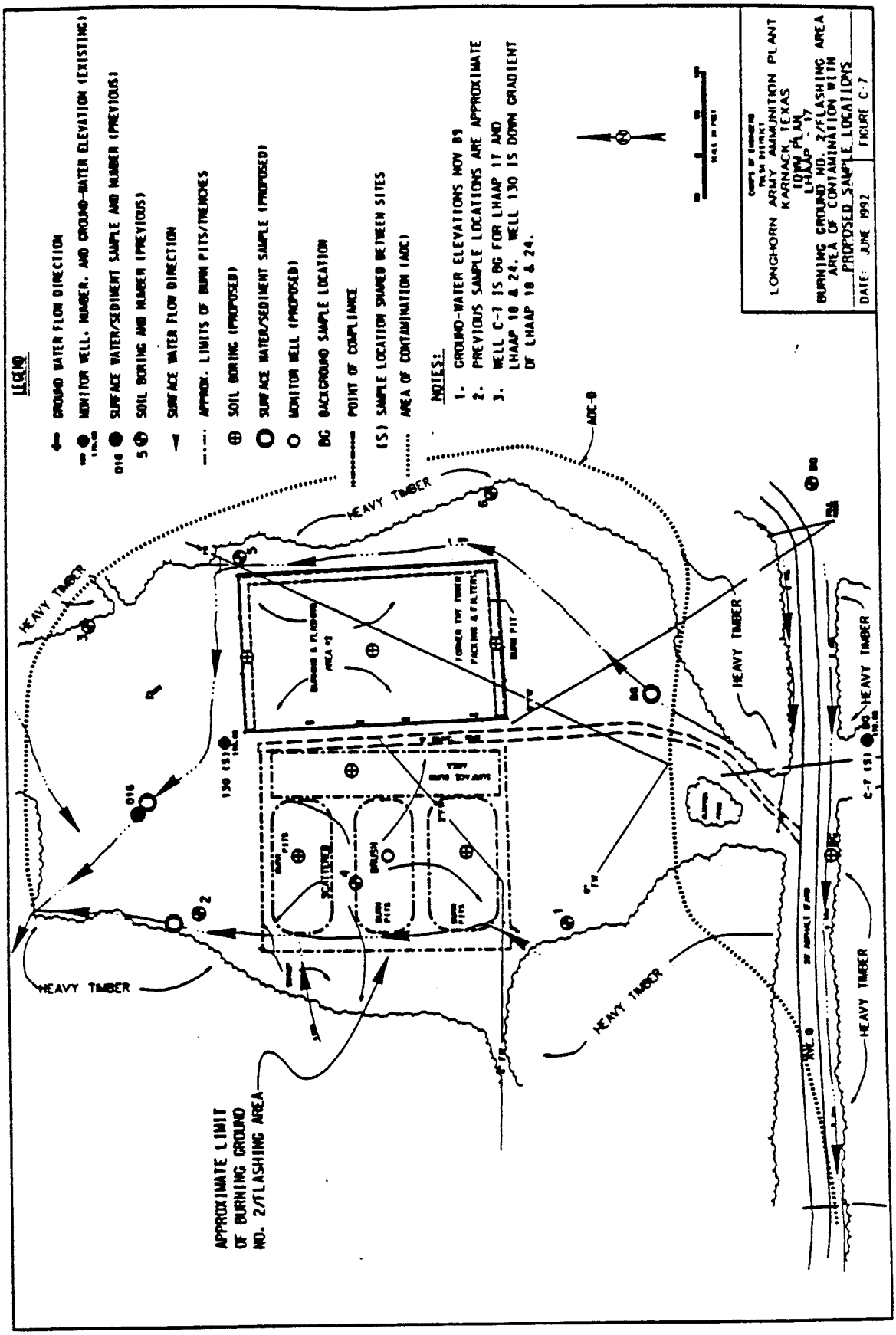

APPROXIMATE LIMITS OF INACTIVE LANDFILL SITE
HEAVY TIMBER
TD1
TD2
TD3
TD4
TD5
BH-14 (P)
176.53
BH-15 (P)
177.15
BH-16 (P)
177.78
BH-13
179.01
BH-12
179.02
017
BG
AUGUST 1992
FIGURE C-4
OLD LANDFILL
AREA OF CONTAMINATION
PROPOSED SAMPLE LOCATIONS

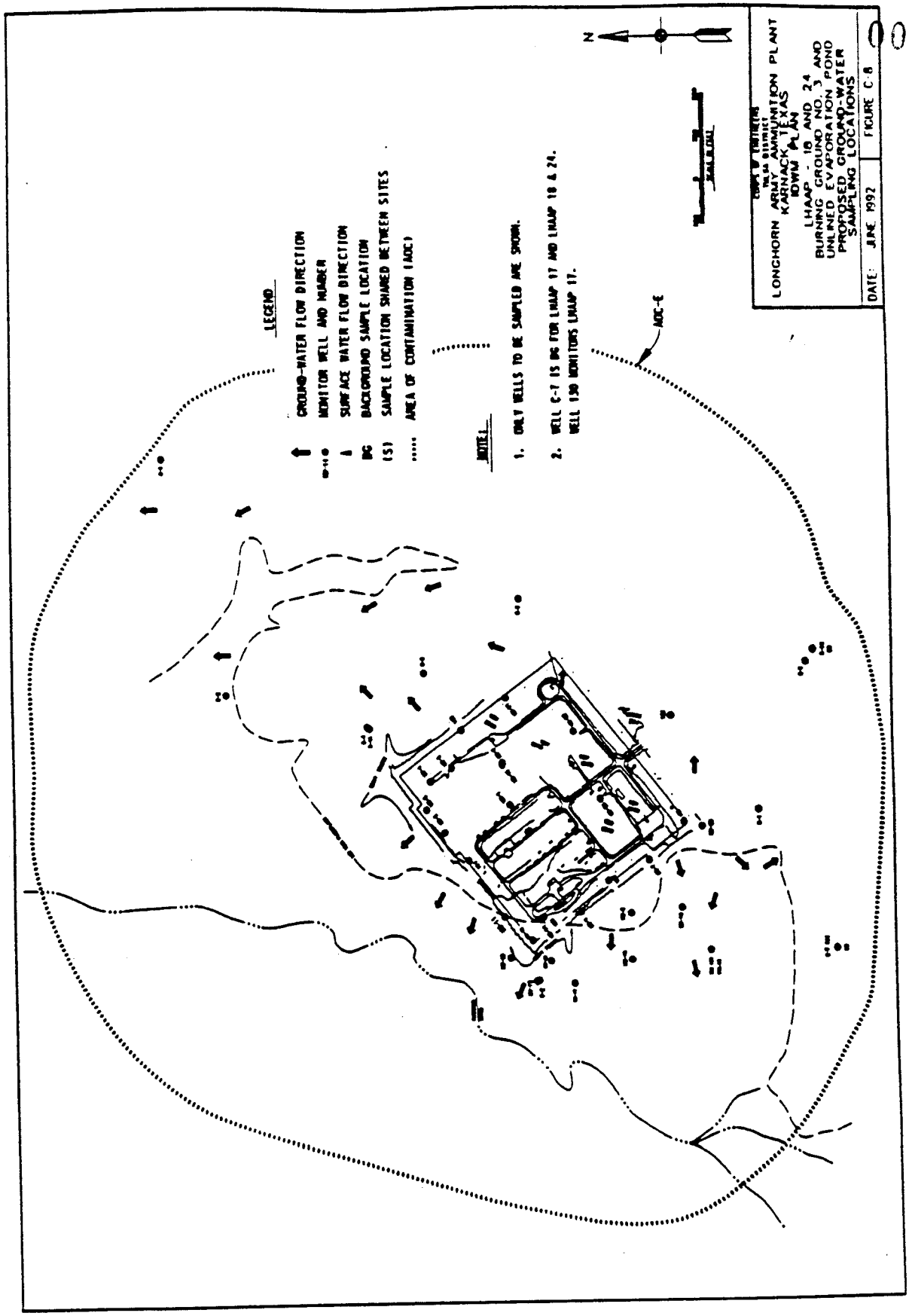

LEGEND
BH-12 ● MONITOR WELL AND NUMBER (EXISTING) WITH GROUND-WATER ELEVATION (NOV 89)
SURFACE WATER FLOW DIRECTION
SOIL BORING (PROPOSED)
MONITOR WELL (PROPOSED)
BG BACKGROUND
GROUND WATER FLOW DIRECTION
POINT OF COMPLIANCE
(S) SAMPLE LOCATION SHARED BETWEEN SITES
(P) MONITOR WELL TO BE PLUGGED
AREA OF CONTAMINATION (AOC)
NOTE: GROUND-WATER ELEVATION NOV 89
SUSPECTED LIMIT OF SITE
BH-15 177.15
BH-16 177.78
BH-13 (P) 179.01
BH-12 (P) 179.02
HEAVY TIMBER
AOC-D
AOC-Q
BG
BG (S)
LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS
IOWA PLANT 1
HAAP
TNT BURIAL SITE
AREA OF CONTAMINATION WITH
PROPOSED SAMPLE LOCATIONS
DATE JUNE 1992
FIGURE C-5

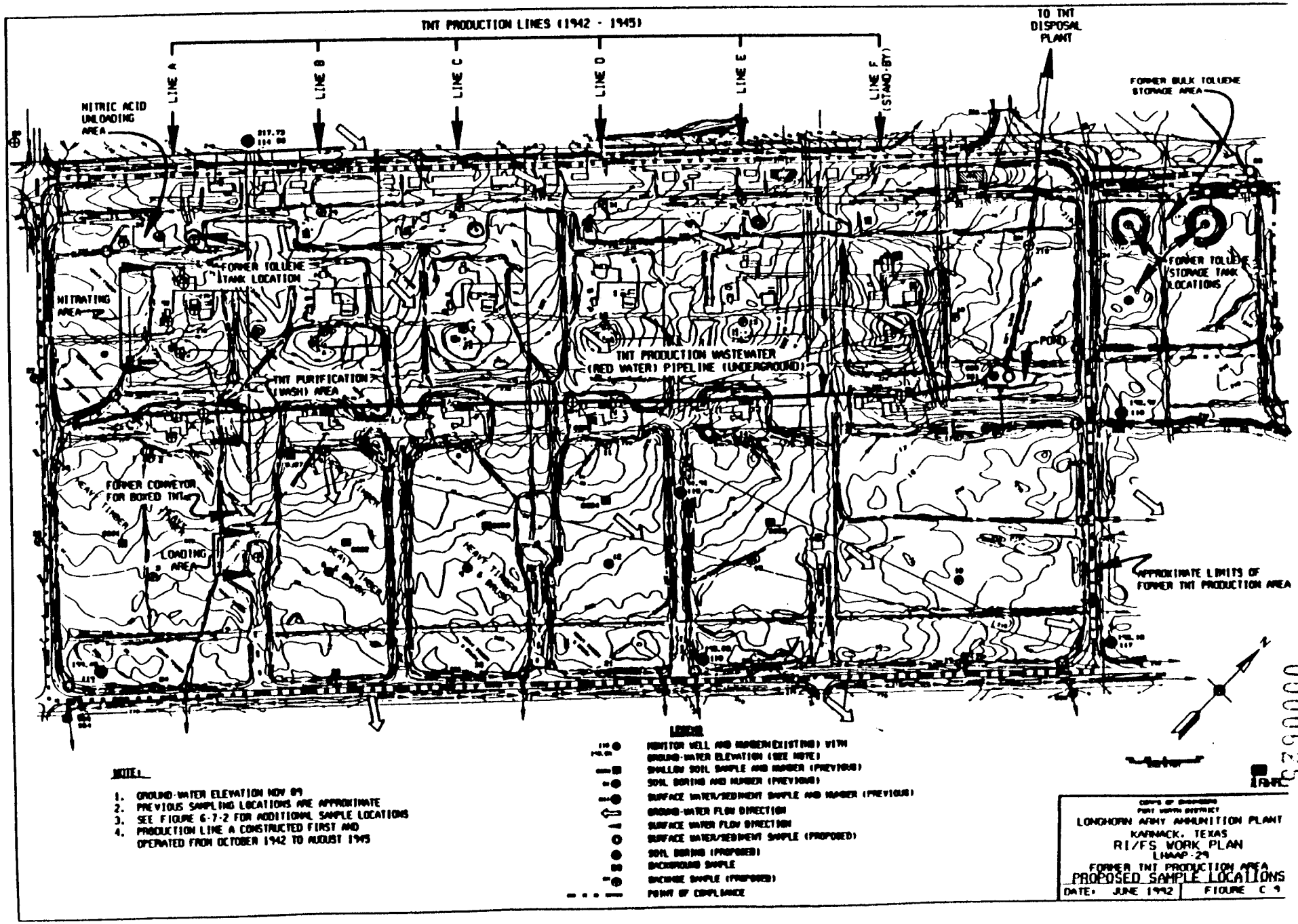


0005211
0000622

005218


LEGEND
GROUND WATER FLOW DIRECTION
MONITOR WELL, NUMBER, AND GROUND-WATER ELEVATION (EXISTING)
SURFACE WATER/SEDIMENT SAMPLE AND NUMBER (PREVIOUS)
SOIL BORING AND NUMBER (PREVIOUS)
SURFACE WATER FLOW DIRECTION
APPROX. LIMITS OF BURN PITS/TRENCHES
SOIL BORING (PROPOSED)
SURFACE WATER/SEDIMENT SAMPLE (PROPOSED)
MONITOR WELL (PROPOSED)
BG BACKGROUND SAMPLE LOCATION
POINT OF COMPLIANCE
(S) SAMPLE LOCATION SHARED BETWEEN SITES
AREA OF CONTAMINATION (AOC)
NOTES:
1. GROUND-WATER ELEVATIONS NOV 89
2. PREVIOUS SAMPLE LOCATIONS ARE APPROXIMATE
3. WELL C-7 IS BG FOR LHAAP 17 AND LHAAP 18 & 24. WELL 130 IS DOWN GRADIENT OF LHAAP 18 & 24.
LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS
LHAAP PLAN 17
BURNING GROUND NO. 2/FLASHING AREA
AREA OF CONTAMINATION WITH
PROPOSED SAMPLE LOCATIONS
DATE: JUNE 1992
FIGURE C-7
HEAVY TIMBER
APPROXIMATE LIMIT
OF BURNING GROUND
NO. 2/FLASHING AREA
AOC-0
BURN PITS
BRUSH
C-7 (S)
130 (S)

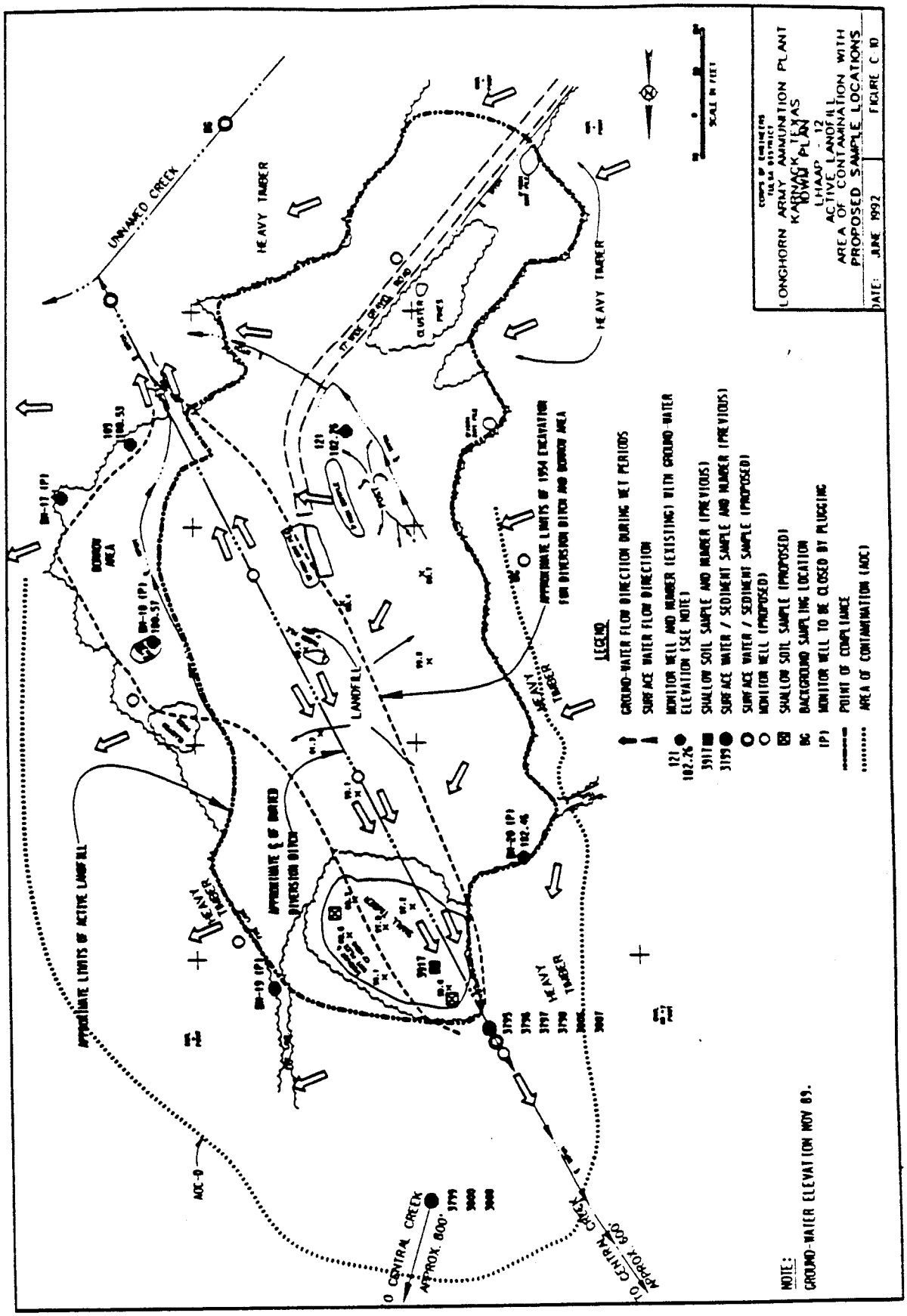

LEGEND
GROUND-WATER FLOW DIRECTION
MONITOR WELL AND NUMBER
SURFACE WATER FLOW DIRECTION
BACKGROUND SAMPLE LOCATION
SAMPLE LOCATION SHARED BETWEEN SITES
AREA OF CONTAMINATION (AOC)
NOTES:
1. ONLY WELLS TO BE SAMPLED ARE SHOWN.
2. WELL C-7 IS BG FOR LHAAP 17 AND LHAAP 18 & 24.
WELL 130 MONITORS LHAAP 17.
AOC-E
N
LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS
RDWW PLAN
LHAAP - 18 AND 24
BURNING GROUND NO. 3 AND
UNLINED EVAPORATION POND
PROPOSED GROUND-WATER
SAMPLING LOCATIONS
DATE: JUNE 1992
FIGURE C-8

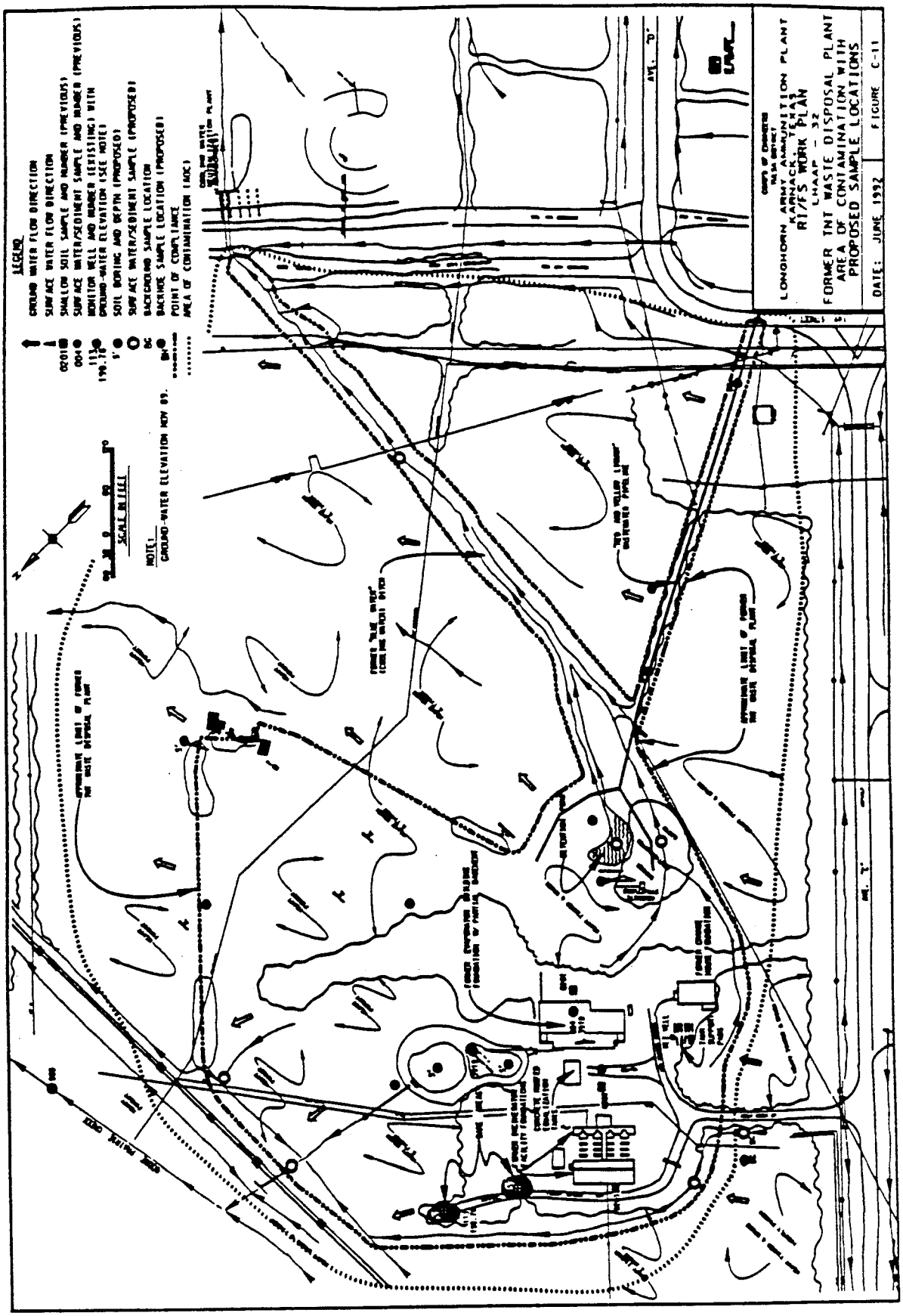

TNT PRODUCTION LINES (1942 - 1945)
LINE A
LINE B
LINE C
LINE D
LINE E
LINE F (STAND-BY)
TO TNT DISPOSAL PLANT
NITRIC ACID UNLOADING AREA
FORMER BULK TOLUENE STORAGE AREA
FORMER TOLUENE TANK LOCATION
NITRATING AREA
FORMER TOLUENE STORAGE TANK LOCATIONS
TNT PRODUCTION WASTEWATER (RED WATER) PIPELINE (UNDERGROUND)
POND
TNT PURIFICATION (WASH) AREA
FORMER CONVEYOR FOR BOXED TNT
LOADING AREA
APPROXIMATE LIMITS OF FORMER TNT PRODUCTION AREA
NOTES:
1. GROUND-WATER ELEVATION NOV 89
2. PREVIOUS SAMPLING LOCATIONS ARE APPROXIMATE
3. SEE FIGURE 6-7-2 FOR ADDITIONAL SAMPLE LOCATIONS
4. PRODUCTION LINE A CONSTRUCTED FIRST AND OPERATED FROM OCTOBER 1942 TO AUGUST 1945
LEGEND
MONITOR WELL AND NUMBER (EXISTING) WITH GROUND-WATER ELEVATION (SEE NOTE)
SHALLOW SOIL SAMPLE AND NUMBER (PREVIOUS)
SOIL BORING AND NUMBER (PREVIOUS)
SURFACE WATER/SEDIMENT SAMPLE AND NUMBER (PREVIOUS)
GROUND-WATER FLOW DIRECTION
SURFACE WATER FLOW DIRECTION
SURFACE WATER/SEDIMENT SAMPLE (PROPOSED)
SOIL BORING (PROPOSED)
BACKGROUND SAMPLE
BACKHOE SAMPLE (PROPOSED)
POINT OF COMPLIANCE
LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS
RI/FS WORK PLAN
LHAAP-29
FORMER TNT PRODUCTION AREA
PROPOSED SAMPLE LOCATIONS
DATE: JUNE 1992
FIGURE C-9

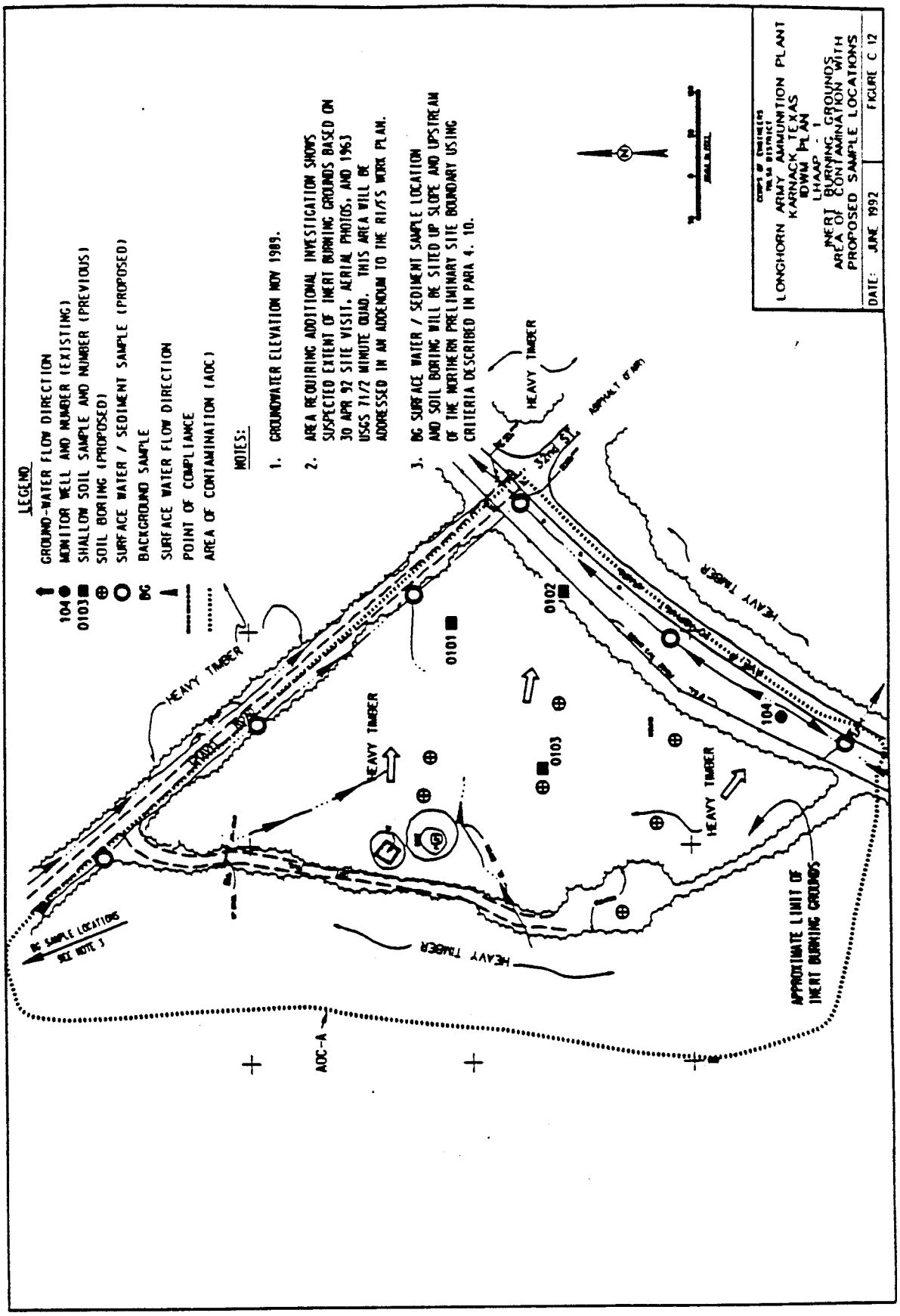
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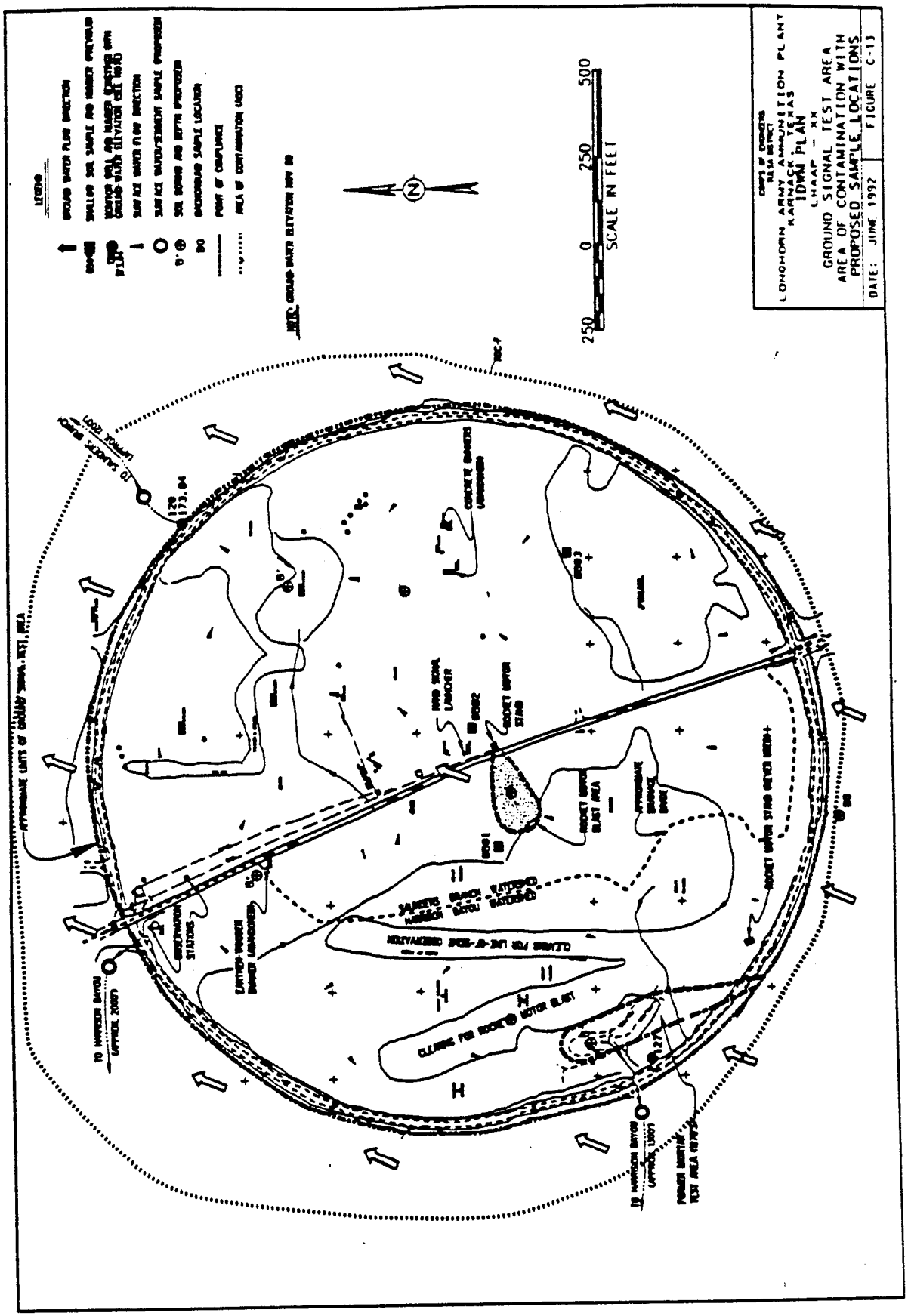
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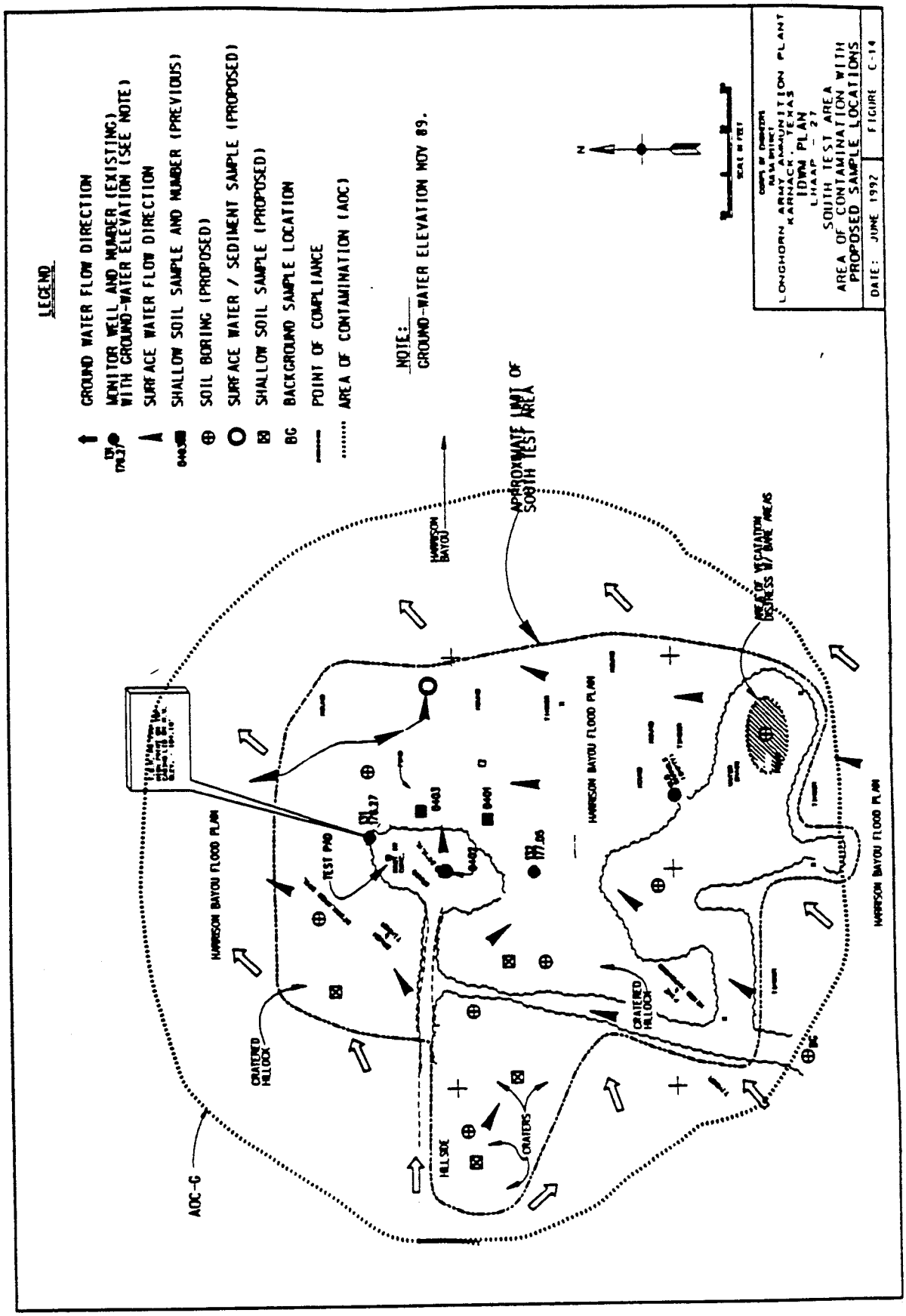
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LEGEND
GROUND WATER FLOW DIRECTION
SURFACE WATER FLOW DIRECTION
SHALLOW SOIL SAMPLE AND NUMBER (PREVIOUS)
SURFACE WATER/SEDIMENT SAMPLE AND NUMBER (PREVIOUS)
MONITOR WELL AND NUMBER (EXISTING) WITH GROUND-WATER ELEVATION (SEE NOTE)
SOIL BORING AND DEPTH (PROPOSED)
SURFACE WATER/SEDIMENT SAMPLE (PROPOSED)
BACKGROUND SAMPLE LOCATION
BACKHOE SAMPLE LOCATION (PROPOSED)
POINT OF COMPLIANCE
AREA OF CONTAMINATION (AOC)
NOTE:
GROUND-WATER ELEVATION NOV 89.
SCALE IN FEET
LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS
RI/FS WORK PLAN
LHAAP - 32
FORMER TNT WASTE DISPOSAL PLANT
AREA OF CONTAMINATION WITH
PROPOSED SAMPLE LOCATIONS
DATE: JUNE 1992
FIGURE C-11


LEGEND
GROUND-WATER FLOW DIRECTION
MONITOR WELL AND NUMBER (EXISTING)
SHALLOW SOIL SAMPLE AND NUMBER (PREVIOUS)
SOIL BORING (PROPOSED)
SURFACE WATER / SEDIMENT SAMPLE (PROPOSED)
BACKGROUND SAMPLE
SURFACE WATER FLOW DIRECTION
POINT OF COMPLIANCE
AREA OF CONTAMINATION (AOC)
NOTES:
1. GROUNDWATER ELEVATION NOV 1989.
2. AREA REQUIRING ADDITIONAL INVESTIGATION SHOWS SUSPECTED EXTENT OF INERT BURNING GROUNDS BASED ON 30 APR 92 SITE VISIT, AERIAL PHOTOS, AND 1963 USGS 7 1/2 MINUTE QUAD. THIS AREA WILL BE ADDRESSED IN AN ADDENDUM TO THE RI/FS WORK PLAN.
3. BG SURFACE WATER / SEDIMENT SAMPLE LOCATION AND SOIL BORING WILL BE SITED UP SLOPE AND UPSTREAM OF THE NORTHERN PRELIMINARY SITE BOUNDARY USING CRITERIA DESCRIBED IN PARA 4. 10.
LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS
IDIW PLAN
LHAAP - 1
INERT BURNING GROUNDS
AREA OF CONTAMINATION WITH
PROPOSED SAMPLE LOCATIONS
DATE: JUNE 1992
FIGURE C 12
HEAVY TIMBER
0101
0102
0103
104
AOC-A
APPROXIMATE LIMIT OF INERT BURNING GROUNDS
BG SAMPLE LOCATIONS SEE NOTE 3


LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS
IDWM PLAN
LHAAP - XX
GROUND SIGNAL TEST AREA
AREA OF CONTAMINATION WITH
PROPOSED SAMPLE LOCATIONS
DATE: JUNE 1992
FIGURE C-13
SCALE IN FEET
250
0
250
500
N
LEGEND
GROUND WATER FLOW DIRECTION
SURFACE WATER FLOW DIRECTION
SOIL BORING AND DEPTH PROPOSED
BACKGROUND SAMPLE LOCATION
POINT OF COMPLIANCE
AREA OF CONTAMINATION (AOC)
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SB03
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SB07
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SB09
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SB13
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LEGEND
GROUND WATER FLOW DIRECTION
MONITOR WELL AND NUMBER (EXISTING) WITH GROUND-WATER ELEVATION (SEE NOTE)
SURFACE WATER FLOW DIRECTION
SHALLOW SOIL SAMPLE AND NUMBER (PREVIOUS)
SOIL BORING (PROPOSED)
SURFACE WATER / SEDIMENT SAMPLE (PROPOSED)
SHALLOW SOIL SAMPLE (PROPOSED)
BG BACKGROUND SAMPLE LOCATION
POINT OF COMPLIANCE
AREA OF CONTAMINATION (AOC)
NOTE:
GROUND-WATER ELEVATION NOV 89.
APPROXIMATE LIMIT OF SOUTH TEST AREA
HARRISON BAYOU
HARRISON BAYOU FLOOD PLAIN
TEST PAD
CRATERED HILLOCK
HILLSIDE
CRATERS
AOC-G
LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS
IDW PLAN
LHAAP - 27
SOUTH TEST AREA
AREA OF CONTAMINATION WITH
PROPOSED SAMPLE LOCATIONS
DATE: JUNE 1992
FIGURE C-14

4. Waste Management Plan (WMP).

4.1. Drill Cuttings WMP. On site disposal immediately upon generation is planned at background investigations. On-site disposal of containerized soil cuttings will occur after test results from site characterization soil samples indicate that hazardous constituents are all below regulatory limits at sites LHAAP 11, 13, 14, 16, 17, 29, 12, 32, 1, xx, and 27, where the borings and monitoring wells will be installed within the AOC's and there is no evidence indicating that the disposal of drill cuttings on-site will in any way degrade the surface conditions at the site or cause harm to human health or the environment beyond what is presently existing at these sites. No cuttings will be generated from LHAAP 18 & 24. If borings are performed at LHAAP 18 & 24 during the second phase of investigations, the cuttings will be managed as RCRA hazardous waste.

4.1.1. Containerization. The cuttings from all investigations except background investigations will be containerized within D.O.T. approved drums, containers, roll-off bins, dumpsters, or vessels and properly labeled stored. The containers will be made of material that is non-reactive with the waste constituents present at the site. The labels will include the type of material contained, (soil, water, etc.) site name, boring or well number, accumulation start date, EPA waste number (obtained from the EPA) and telephone number(s) for the site manager and/or installation site coordinator. The containers will be labeled using a permanent, non-soluble substance or devise. Containers will be labeled on the side not on the top, or lid. Cuttings from different borings will not be mixed.

4.1.2. Sampling. The IDW cutting samples will be collected in accordance with the CDAP and TCLP testing will be performed to determine if cuttings are characteristically hazardous waste. TCLP testing will include inorganic and organic species identification and quantification by the method described in the CDAP under procedures set forth in 40 CFR 260.20 and 260.21.

° LHAAP 11, 13, 14, 17, 29, 12, 32, 1, xx, and 27 - only required if site characterization samples indicate that TCLP constituents are present within

regulatory limits (samples will be taken every five feet as part of the site characterization)

° Background sites - not required (these sites are by definition in non-contaminated areas)

° LHAAP 16 (and 18 & 24 if later borings) - required

4.1.3. Storage. After filling or when the boring is completed the containers will be stored, on a location within the AOC that is outside the floodplain limits, until test results are received. If no storage area outside of the floodplain is available at an AOC the waste will be stored at an adjacent AOC storage area. If metal drums are utilized, they will be stored on pallets and covered with a plastic tarp. After test results are received if any of the waste are determined to be above the TCLP regulatory limits, that container will be taken to the LHAAP 90 day RCRA storage facility to await TCLP results and disposal. Waste that is determined to be contaminated but not characteristically hazardous will be stored on site until the remedial activity is constructed. If remedial construction is expected to take over 1 year to begin, a more permanent storage facility will be required. IDW cuttings from LHAAP 16 (and 18 & 24, if later borings are required) will be stored as hazardous waste at the LHAAP 90 day RCRA storage facility.

4.1.4. Disposal.

° LHAAP 11, 13, 14, 17, 29, 12, 32, 1, xx, 27, and background - On-Site if not contaminated - Off-Site if characteristically hazardous

° LHAAP 16 (and 18 & 24 if later borings) - Off-Site

4.1.4.1. On-Site. If the cuttings are not contaminated disposal will be on site. The cuttings will be spread around the bore hole and monitoring well locations in such a manner to minimize wind or surface water erosion. This will be accomplished by spreading the soil out over a minimum area at least 10 feet from the well in a downgradient area within the AOC. If the cuttings are spread thicker than 4 inches then, grass seed suitable for the area will be spread over the cuttings and raked in.

4.1.4.2. RCRA Hazardous Waste. If the test results (or for LHAAP 18 & 24 there is listed RCRA hazardous waste) indicate that cuttings are

characteristically hazardous, the waste will be disposed of at a fully permitted RCRA Subtitle C facility that is permitted to receive CERCLA waste. The facility must meet the requirements of Land Disposal Restrictions (LDR) (waste may require pretreatment for constituents listed in the LDR before disposal) and the CERCLA section 121(d)(3) and the Off-Site Policy.

4.1.4.3. Contaminated Non-Hazardous. If the test results indicate that cuttings are not characteristically hazardous but do contain hazardous constituents, the waste will be stored and treated on-site during remediation at the site.

4.1.4.4. Stored Off-Site Non-Contaminated. If the test results do not indicate the presence of any contamination, the cuttings will be disposed on the LHAAP facility as inert materials.

4.2. Development, Purge, and Decontamination Water MMP. On site storage of water is planned at 11 of the sites (LHAAP 11, 13, 14, 16, 17, 29, 12, 32, 1, xx, and 27) and at background investigations outside of the AOC's in accordance with Reference 1. On site disposal will occur at the sites where the water is determined to be non-contaminated. Contaminated non-hazardous IDW water will be stored on site and processed during the remedial action. Off-site disposal is anticipated at one site (LHAAP 18 & 24) in accordance with the EPA guidance document, Superfund Management of Investigation-Derived Wastes During Site Inspections, May 1991. Review of past investigations and site history indicate that the IDW water at this site will be classified as hazardous waste after the test results are in.

4.2.1. Containerization. The IDW water will be containerized within D.O.T. approved drums, containers, roll-off bins, dumpsters, or vessels and properly labeled. The labels will include the type of material contained, (soil, water, etc.) site name, boring or well number, accumulation start date, EPA waste number (obtained from the EPA) and telephone(s) for the site manager and/or installation site coordinator. The containers will be labeled using a permanent, non-soluble substance or devise. Containers will be labeled on the side not on the top, or lid.

4.2.2. Sampling. The IDW samples will be collected in accordance with the CDAP. TCLP testing will be performed to determine if the IDW waters are characteristically hazardous waste. TCLP testing will include inorganic and organic species identification and quantification by the method described in the CDAP under procedures set forth in 40 CFR 260.20 and 260.21.

If contaminated, IDW water from LHAAP 18 & 24 will be classified as listed hazardous waste due to the contained in rule from the F listed waste code present in the soil and groundwater.

4.2.3. Storage. On site storage of IDW water is planned at 11 of the sites (LHAAP 11, 13, 14, 16, 17, 29, 12, 32, 1, xx, and 27) and at background investigations outside of the AOC's. After filling or when the purging of site wells are completed the containers from LHAAP 18 & 24 will be taken to the LHAAP 90 day RCRA storage facility to await test results.

4.2.4. Disposal.

4.2.4.1. RCRA Hazardous Waste. If the test results (or for LHAAP 18 & 24 there is listed RCRA hazardous waste) indicate that cuttings are characteristically hazardous, the waste will be disposed of at a fully permitted RCRA Subtitle C facility that is permitted to receive CERCLA waste. The facility must meet the requirements of Land Disposal Restrictions and the CERCLA section 121(d)(3) and the Off-Site Policy.

4.2.4.2. Contaminated Non-Hazardous. If the test results indicate that the water is not characteristically hazardous but is contaminated with hazardous constituents, the water will be classified according to TWC rules, and then treated along with the other water present at the site during remedial action.

4.2.4.3. Non-Contaminated. If the test results indicate that the water is not contaminated, it will be placed in the on-site waste water treatment plant facility.

4.3. Personnel Protective Equipment (PPE) and Disposable Equipment (DE) WMP.

4.3.1. Containerization. At sites LHAAP 11, 13, 14, 16, 17, 29, 12,

32, 1, xx, and 27 the PPE and DE from each site will be contained in double, ultraviolet degradation resistant, 20 gallon plastic bags. The bags will be tagged with a label that gives date, sample location, and site name. Review of the past investigations results does not indicate that this IDW will be hazardous. PPE and DE from LHAAP will be bagged as above and placed in a dumpster (or other suitable container).

4.3.2. Sampling. No sampling of this IDW is required.

4.3.3. Storage. At sites LHAAP 11, 13, 14, 16, 17, 29, 12, 32, 1, xx, and 27 the PPE and DE from each site will be stored in a dumpster on site. PPE and DE from LHAAP 18 & 24 will be stored at the LHAAP RCRA 90-day storage facility.

4.3.4. Disposal. At sites LHAAP 11, 13, 14, 16, 17, 29, 12, 32, 1, xx, and 27 the PPE and DE from each site will be disposed in the LHAAP active landfill. PPE and DE from LHAAP 18 & 24 will be disposed of at a fully permitted RCRA Subtitle C facility that is permitted to receive CERCLA waste. The facility must meet the requirements of Land Disposal Restrictions and the CERCLA section 121(d)(3) and the Off-Site Policy.

4.5. Documentation/Notification. The information contained in this section applies to all IDW managed during these investigations. Field records will be kept of all disposal activities the logs will contain the following information:

1) Description Generating Activities
2) Location of Generation (including depth if applicable)
3) Type of Waste
4) Date and Time of Generation
5) Date and Time of Disposal of each Type
6) Disposal Location of each Type
7) Disposal Method
8) Description of any waste sampling including:
   type of test
   laboratory sample to be sent to
   sampling method

name of sampler

9) Name of person recording information

10) Name of Field Manager at time of Generation and at time of Disposal

11) The test results must also be provided

4.5.1. RCRA Hazardous Waste. All hazardous waste must be accompanied by a Hazardous Waste Manifest (and other forms required by Texas Law). The treatment, disposal (not restricted waste), storage (TDS) facility must be notified prior to sending the IDW. The following items must accompany the Notification:

1) EPA hazardous waste codes

2) Manifest number

3) Wasted analysis data

4) If the waste is also restricted, corresponding concentration-based or technology-based treatment standards, or prohibition

4.5.2. Contaminated Non-Hazardous. If it is transported off-site the IDW must have a Bill of Lading.

4.5.3. Non-Contaminated. No notification or other documentation is required.

5. **References**.

1. USEPA/540/G-91/009, Superfund Management of Investigation-Derived Wastes During Site Inspections, May 1991.

2. USEPA, OSWER 9934.0-1A, Land Disposal Restrictions, Summary of Requirements, February 1991.

3. USACE, Longhorn Army Ammunitions Plant RI/FS Work Plan Volume 1, General, February 1992.

APPENDIX C-1

EPA/540/G-91/009, Superfund Management of Investigation-Derived Wastes During Site Inspections, May 1991

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Environmental Protection
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Washington DC 20460

EPA/540/G-91/009
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Management of Investigation-Derived Wastes During Site Inspections

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Management of Investigation-Derived Wastes During Site Inspections

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Washington, DC 20460

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This guidance presents a general regulatory background and options for management of investigation-derived wastes (IDW) generated during Superfund site inspections (SIs). These wastes include soil cuttings, drilling muds, purged ground water, decontamination fluids (water and other fluids), disposable sampling equipment (DE), and disposable personal protective equipment (PPE). The National Contingency Plan (NCP) requires that management of IDW generated during SIs complies with all applicable or relevant and appropriate requirements (ARARs) to the extent practicable. In addition, other legal and practical considerations may affect the handling of IDW. Therefore, site inspection managers and other involved parties should be familiar with this guidance, as well as the requirements of the NCP, ARARs, and EPA's interpretation of these requirements.

IDW from SIs may contain hazardous substances as defined by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). Some CERCLA hazardous substances are hazardous wastes under Subtitle C of the Resource Conservation and Recovery Act (RCRA), while other substances are regulated by other federal laws such as the Safe Drinking Water Act (SDWA), Clean Air Act (CAA), Toxic Substances Control Act (TSCA), and the Clean Water Act (CWA). EPA estimates that RCRA hazardous IDW have been generated at fewer than 15 percent of CERCLA sites. However, RCRA regulations, and in particular the RCRA Land Disposal Restrictions (LDRs), are very important as potential ARARs since they regulate treatment, storage, and disposal of many of the most toxic and hazardous materials.

EPA's strategy for managing RCRA hazardous IDW presented in this guidance is based on:

- The NCP directive that SIs comply with ARARs to the extent practicable.
- The Area of Contamination (AOC) unit concept.

The most important elements of the IDW management approach are as follows:

- Leaving a site in no worse condition than existed prior to the investigation.
- Removing those wastes that pose an immediate threat to human health or the environment.
- Leaving on-site wastes that do not require off-site disposal or extended above-ground containerization.
- Complying with federal ARARs, to the extent practicable.
- Complying with state ARARs, as practicable.
- Careful planning and coordination for IDW management.
- Minimizing the quantity of generated wastes.

The specific elements of the approach are as follows:

- Characterizing IDW through the use of existing information (manifests, Material Safety Data Sheets, previous test results, knowledge of the waste generation process, and other relevant records) and best professional judgment.
- Delineating an AOC unit for leaving RCRA hazardous soil cuttings within the unit.

- Containerizing and disposing of RCRA hazardous ground water, decontamination fluids, and PPE and DE (if generated in excess of 100 kg/month) at RCRA Subtitle C facilities.

- Leaving on-site RCRA nonhazardous soil cuttings, ground water, and decontamination fluids preferably without containerization and testing.

EPA does not recommend removal of wastes from all sites and, in particular, from those sites where IDW do not pose any immediate threat to human health or the environment. Removing wastes from all sites would not benefit human health and the environment and would result in spending a significant portion of the total funds available for the site assessment program, thus impairing EPA's ability to successfully meet the goals of the program.

1.0 INTRODUCTION

In the process of collecting environmental samples during Superfund site inspections (SIs), site investigators generate many different types of potentially contaminated investigation-derived wastes (IDW) that include soil, ground water, used personal protective equipment (PPE), decontamination fluids, and disposable sampling equipment (DE). The National Contingency Plan (NCP)[1] requires that managing (handling) of IDW attains all applicable or relevant and appropriate requirements (ARARs) to the extent practicable considering the exigencies of the situation. To comply with ARARs, site managers need to be familiar with these requirements and how the Environmental Protection Agency interprets them.

1.1 PURPOSE

This document provides guidance on determining and interpreting ARARs, and highlights EPA's recommended approach to handling IDW in compliance with these requirements. The guidance is intended to assist site inspection managers (SM), EPA regional project officers (RPOs), EPA Site Assessment Managers (SAMs), state environmental agencies, potentially responsible parties (PRPs), and others involved in Superfund site assessment work. The approach presented reflects EPA's goal to protect human health and the environment, addresses the most typical scenarios that the SM may encounter, and describes cost-efficient methods of handling both hazardous and non-hazardous IDW.

1.2 ORGANIZATION OF THE GUIDANCE

This guidance consists of seven sections:

- Section 1 - Introduction.
- Section 2 describes regulatory requirements and policy concerns, with emphasis on Resource Conservation and Recovery Act (RCRA)[2] regulations.
- Section 3 discusses the distinction between IDW containing Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) hazardous substances and RCRA hazardous wastes based on their regulatory definitions.
- Section 4 stresses planning for IDW generation and management as the most important factor of the comprehensive approach to handling IDW. This section also presents the IDW disposal decision tree intended as a quick reference for site inspection managers.
- Section 5 describes the implementation of the IDW management plan.
- Section 6 discusses costs involved in both on-site and off-site IDW handling.
- Section 7 briefly describes available subcontracting procedures for IDW transportation and disposal.

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2.0 REGULATORY REQUIREMENTS AND POLICY CONCERNS

A variety of IDW are generated during CERCLA SIs. Many of these wastes contain substances considered hazardous under CERCLA or regulated under various federal statutes such as the Toxic Substances Control Act (TSCA), Clean Water Act (CWA), Safe Drinking Water Act (SDWA), Clean Air Act (CAA), and RCRA. Even though all of these statutes can be ARARs for CERCLA actions, the application of these laws to handling IDW generated during the SI can be difficult and confusing, since none specifically addresses the management of IDW generated during the SI.

The National Contingency Plan (NCP)[1] and the proposed amendment to the NCP[2] ("Procedures for Planning and Implementing Off-Site Response Actions") codifying the CERCLA off-site policy[4], present EPA's interpretation of how these laws apply to response actuon investigations such as SIs.

2.1 REQUIREMENTS OF CERCLA AND THE NCP

CERCLA authorizes EPA to respond to releases or threats of releases of hazardous substances into the environment. CERCLA response actions include removal actions, remedial investigations, and other response actions financed by Superfund. CERCLA Section 101 (23) defines "removal" to include actions that may be necessary to monitor, assess, and evaluate the release or threat of release of hazardous substances. Thus, CERCLA studies, site assessments, and field investigations are considered removal actions. The NCP directs that removal actions attain ARARs "to the extent practicable considering the exigencies of the situation" (unless the ARAR is waived) (see Section 300.415 (i) of the NCP). Practicability is assessed by examining factors such as the urgency of the situation and the scope of the removal action to be conducted. Section 2.2 of this guidance discusses procedures for CERCLA off-site actions.

The preamble to the NCP clarifies the extent to which ARARs apply to removal actions:

> "[Because] the purpose of removal actions generally is to respond to a release or threat of release of hazardous substances, pollutants, or contaminants so as to prevent, minimize, or mitigate harm to human health and the environment... [and] removals are distinct from remedial actions in that they may mitigate or stabilize the threat rather than comprehensively address all threats at a site... removal actions cannot be expected to attain all ARARs...Indeed, the imposition by Congress of limits on the amount of time and Fund money that may be spent conducting a removal action often precludes comprehensive remedies by removal actions alone" (55 FR 8695, March 8, 1990) (emphasis added).

Because investigative activities are categorized as removal actions, the preamble to the NCP sets out the following IDW management approach:

> "... the field investigation team should, when handling, treating or disposing of investigation-derived waste on-site, conduct such activities in compliance with ARARs to the extent practicable, considering the exigencies of the situation. Investigation-derived waste that is transported off-site (e.g., for treatability studies or disposal) must comply with applicable requirements of the CERCLA off-site policy" (55 FR 8756, March 8, 1990) (emphasis added).

In determining what is "practicable" in the context of an SI, the Agency may take into account the very limited scope and purpose of the activity, and in particular the fact that it is not intended to address contamination at the site (other than to gather information about it). This means that, as a general matter, actions taken at the SI that leave conditions essentially unchanged (such as returning soil cuttings to the location from which they were taken) should not require a detailed analysis of ARARs or assurance that conditions at the site after the action is taken will comply with ARARs. At the same time, site personnel should ensure that their handling of IDW does not create

additional hazards at the site. (For example, leaving highly contaminated soil cuttings on the surface could create an additional risk of direct exposure.)

Potential ARARs include (but are not limited to) RCRA[2], TSCA, CWA, CAA, and state legally enforceable regulations. The most important ARARs for managing IDW are RCRA and TSCA (addressed in Sections 2.4 and 2.5 of this guidance). The preamble to the NCP discusses when CERCLA actions (including activities during SIs) constitute "land disposal," which triggers several significant requirements, including RCRA land disposal restrictions (LDRs)[3] (55 FR 8759-8762).

Section 300.400(g)(4) of the NCP defines state ARARs as "those state standards that are promulgated, are identified by the state in a timely manner, and are more stringent than federal requirements." Section 2.7 of this guidance discusses the issue of state ARARs.

Before ARARs can be determined, it is necessary to determine what contaminants, if any, are present in the IDW. Section 3.0 of this guidance discusses the process of identifying contaminants. In general, such identification should be done based on available information about the site and professional judgment rather than testing.

In brief, compliance with the NCP can generally be assured by:

(1) Identifying contaminants, if any, present in IDW based on existing information and best professional judgment; testing is not required in most circumstances.

(2) Determining ARARs (particularly RCRA and state laws), and the extent to which it is practicable to comply with them.

(3) Delineating an area of contamination (AOC) unit based on existing information and visual observation if soil cuttings are RCRA hazardous (see Section 2.4.2).

(4) Burying RCRA hazardous soil cuttings within the AOC unit, so long as no increased hazard to human health and the environment will be created. Containerization and testing are not required.

(5) Containerizing RCRA hazardous ground water and other RCRA hazardous IDW such as PPE, DE, and decontamination fluids for off-site disposal.

The following sections of this guidance provide guidelines for determining ARARs and identifying IDW.

2.2 OFF-SITE RESPONSE ACTIONS POLICY

CERCLA Section 121 (d)(3) requires that hazardous substances, pollutants, or contaminants that are transferred off-site for treatment, storage, or disposal during CERCLA response actions must be sent to facilities operating in compliance with RCRA and other applicable laws or regulations. In 1987, EPA issued a more detailed policy (the "off-site policy" – OSWER Directive No. 9834.11, November 13, 1987[4]) that describes procedures that must be followed when a response action under CERCLA involves off-site management of CERCLA wastes. This policy applies to all IDW that are transported to an off-site disposal facility, but does not itself require that all RCRA hazardous wastes and CERCLA hazardous substances be disposed off-site. Sections 2.4.3, 2.4.4, 2.5 and 2.6 of this guidance present the criteria that RCRA Subtitle C facilities, RCRA Subtitle D facilities, TSCA and CWA-regulated facilities must meet. The off-site policy is complex, and questions that arise should be referred to the appropriate EPA Office of Regional Counsel.

The off-site policy provides acceptability criteria for facilities that receive wastes from CERCLA-authorized or -funded response actions, including RCRA land disposal, treatment, storage, and permit-by-rule facilities, and for

non-RCRA Subtitle C facilities (such as facilities permitted to receive waste under TSCA) that receive non-RCRA wastes. Section 2.4.3 of this guidance discusses requirements for RCRA facilities that receive such wastes. In addition, the off-site policy lists procedures for implementing off-site response actions, incorporates the SARA requirements, and provides detailed procedures for issuing and reviewing unacceptability determinations. Off-site actions must comply with applicable requirements of this policy.

The off-site policy also establishes criteria for selecting an appropriate disposal facility. The policy requires that all RCRA hazardous wastes and CERCLA hazardous substances (which include RCRA hazardous wastes as a subset) generated during CERCLA response actions that are transferred off-site be managed in facilities that are not only in compliance with RCRA and other federal and state requirements, but also meet the compliance and release criteria outlined in the policy.

EPA has proposed an off-site rule (Part 300.440 of the NCP) that would codify the requirements of CERCLA Sections 121 (d) (3) and the off-site policy, and prevent CERCLA response actions from contributing to present or future environmental problems "by directing these wastes to management units determined to be environmentally sound" (53 FR 48218, November 29, 1988[9]). Once the rule is issued in final form, it will supersede the policy. Note that the proposed off-site rule contains provisions regarding materials sent to laboratories for testing and analysis. These provisions do not relate to the types of IDW discussed in this guidance.

2.3 APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

ARARs must be identified on a site-specific basis, and the site manager must determine whether a requirement is applicable and, if not, whether the requirement is relevant and appropriate. A requirement under environmental laws may be either "applicable" or "relevant and appropriate," but not both.

For dealing with IDW, the most important federal ARAR is RCRA because it specifically regulates all aspects of transportation, treatment, storage, and disposal of hazardous wastes. Other major federal ARARs of concern include CWA, CAA, SDWA, and TSCA. State ARARs should be attained where they are promulgated and legally enforceable (see Section 2.7 of this guidance).

Much of what is discussed in this guidance is directly applicable; however, there are instances where requirements may not be legally applicable, but are nonetheless relevant (addressing a similar situation or problem) and appropriate (being well-suited to a particular site). Relevant and appropriate requirements should be considered in the same way as those that are directly applicable. For instance, such situations might include circumstances where a highly toxic waste constituent is suspected, a large volume of waste may be generated or the nature of the property (e.g. residential or proximity to public facilities) is of concern. Section 4.6 of this guidance discusses factors identified for off-site disposal of IDW and management options when an ARAR has been determined.

2.4 RESOURCE CONSERVATION AND RECOVERY ACT (RCRA)

The Resource Conservation and Recovery Act (RCRA) of 1976, an amendment to the Solid Waste Disposal Act (SWDA) of 1965, was passed to protect human health and the environment, to conserve energy and natural resources, and to quickly reduce or eliminate the generation of hazardous wastes. RCRA currently has 10 discrete sections (Subtitles) that address specific waste management activities. Two of these Subtitles, and their implementing regulations, may be ARARs for IDW handling: Subtitle C (Hazardous Waste Management) and Subtitle D (Solid Waste Management).

The RCRA Hazardous and Solid Waste Amendments (HSWA) of 1984 established land disposal restrictions (LDRs) for RCRA hazardous wastes and mixtures of RCRA hazardous wastes with other substances, including those regulated under TSCA. Under RCRA regulations, restricted RCRA wastes may only be land disposed after treatment to specified levels. RCRA may be an ARAR for IDW handling if the IDW generated during the SI contain RCRA hazardous wastes. In that case, the SM should evaluate compliance (to the extent practicable) with LDRs.

2.4.1 LAND DISPOSAL RESTRICTIONS

Land disposal, as defined by RCRA Section 3004 (k), includes any placement of RCRA hazardous waste in a landfill, surface impoundment, waste pile, injection well, land treatment facility, salt dome or salt bed formation, or underground mine or cave. For LDR purposes, the Agency commonly uses "land disposal" and "placement" as synonymous terms.

For the purpose of the LDRs, HSWA divides RCRA hazardous wastes into several groups (e.g., First Third, Second Third, California list wastes) and specifies dates, referred to as the statutory deadlines, by which treatment standards for each group must be established. The final statutory deadline for wastes listed or identified before November 8, 1984 was May 8, 1990. For wastes identified after November 8, 1984, EPA must determine whether these wastes will be prohibited from land disposal within 6 months of listing or identification. If EPA fails to promulgate treatment standards within 6 months for newly identified wastes, the wastes can be land disposed without restriction until the appropriate treatment standards are promulgated. After the statutory deadline for wastes identified before November 8, 1984, the wastes are "restricted" or "prohibited" and cannot be disposed in land unless:

- The wastes are treated to meet promulgated treatment standards.
- It can be demonstrated that hazardous constituents will not migrate from the land disposal unit as long as the wastes remain hazardous.
- The wastes are subject to treatment standard variances.
- The specific waste has received a national capacity variance.

It should be noted that the NCP establishes a presumption that treatment to best demonstrated available technology (BDAT) standards is inappropriate as a standard for soil removed from CERCLA sites, and that a treatability variance is appropriate in such circumstances (see 55 FR 8760-8762).

To determine if LDRs are applicable to IDW management, the SM must evaluate whether:

(1) The IDW are RCRA hazardous waste.

(2) The RCRA hazardous waste is regulated under the LDRs.

(3) The anticipated approach to IDW management constitutes "placement" (land disposal) of the generated wastes. (For the purpose of the LDRs, EPA considers itself a waste generator when the response action involves treatment, storage, or disposal of RCRA hazardous wastes. If the SI does not involve RCRA hazardous IDW disposal, RCRA regulations are not triggered.)

LDRs apply only if the answer to all three questions is "yes." In some cases, as discussed in section 2.3, LDRs may be "relevant and appropriate" even if not strictly applicable.

2.4.2 AREA OF CONTAMINATION CONCEPT AND ITS IMPLICATIONS

An important consideration in determining whether LDRs apply is whether land disposal of IDW has occurred. If IDW are merely being moved within the same "area of contamination" (AOC), EPA does not consider "land disposal" to have occurred, so that LDRs are not triggered, even if IDW contain RCRA hazardous material. Therefore, if IDW are being moved only within an AOC, it is unnecessary to determine whether they are subject to LDRs.

EPA has not promulgated a regulatory definition of an AOC. However, the preamble to the NCP (55 FR 8760) states that "EPA generally equates the CERCLA area of contamination with a single RCRA land-based unit, usually a landfill." EPA noted that under RCRA, the term " 'landfill' could include a non-discrete land area on or in which there is generally dispersed contamination." The contamination in an AOC may vary in concentration and type of contaminant. Further guidance on the AOC concept is provided in 55 FR 8760 (March 8, 1990), 53 FR 51444 (December 21, 1988), and in Superfund LDR Guide #5 (OSWER Directive 9347.3-05, July 1989).

The AOC concept applies only to contaminated soil (and sediments) from the inspected site. The AOC concept does not affect the approach for managing IDW that did not come from the AOC, such as PPE, DE, decontamination fluids, and ground water. The latter materials, if RCRA hazardous, must be containerized and disposed off-site.

Examples of AOCs include: a waste source such as waste pit, landfill, waste pile along with the surrounding contaminated soil, or the sediments in a contaminated stream. Depending on site characteristics, one or more AOCs may be delineated. CERCLA sites often consist of several AOCs. To determine if separate AOCs can be delineated within the site, and if RCRA regulated wastes are present within the AOCs, the site manager should collect sufficient information about the site as early as possible, preferably prior to starting field work. Determining AOCs may prove difficult if there is little available information or no visual contamination. In such cases, site managers may use their best professional judgment to delineate AOCs (e.g., a small area immediately adjacent to a borehole may be part of an AOC if the area is covered with surface soil similar to soil from the borehole).

Once the AOC units are determined, the site manager must evaluate whether an anticipated IDW handling approach constitutes land disposal. In general, land disposal does not occur when wastes are:

- Moved within the unit.
- Capped in place.
- Treated in situ (without placing the waste in another unit for treatment).
- Processed within the AOC to improve structural stability (without placing the waste into another unit for processing).

Superfund LDR Guide #5, "Determining when Land Disposal Restrictions (LDRs) are Applicable to CERCLA Response Actions,"[3] states that land disposal occurs when:

- Wastes from different AOCs are consolidated into one AOC.
- Wastes are moved outside of an AOC (for treatment and storage) and returned to the same or a different AOC.
- Wastes are excavated from an AOC, transferred to a separate unit such as a tank, surface impoundment, or incinerator that is within the AOC, and then redeposited into the AOC.

In addition, land disposal occurs if wastes removed from an AOC are stored (e.g., placed in drums outside the AOC) prior to being returned to the AOC.

Thus, under the NCP, the AOC unit concept means that:

- Land disposal does not occur when wastes are left in place, or moved or stored within a single AOC unit.
- Leaving RCRA hazardous soil on-site within the AOC unit does not constitute disposal and does not

trigger RCRA regulations, unless the SM determines that the wastes would significantly increase risks to human health and the environment (e.g., fire or explosion) and must be disposed of off-site.

- RCRA hazardous ground water, decontamination fluids, PPE, and DE should be containerized and disposed off-site.

- Moving RCRA hazardous soil cuttings from one AOC to another AOC triggers the LDRs.

If IDW cannot be deposited within the delineated AOC, the site manager must comply with all LDRs to the extent practicable. This means that the IDW should be transferred to an off-site RCRA Subtitle C hazardous waste treatment, storage, or disposal facility that complies with the off-site policy.

2.4.3 REQUIREMENTS FOR RCRA SUBTITLE C TREATMENT, STORAGE, AND DISPOSAL FACILITIES

The RCRA Subtitle C standards[39] cover hazardous waste treatment, storage, and disposal (TSD) facilities. The specific standards govern installation, operation, inspection, and closure of containers, tanks, surface impoundments, waste piles, land treatment units, landfills, incinerators, and other units.

Off-site TSD facilities receiving IDW must have RCRA permits to operate. Facilities that are permitted under another statute to receive hazardous wastes are eligible for RCRA permits without filing RCRA permit applications. These facilities, referred to as "permit-by-rule," include ocean disposal barges or vessels, injection wells, and publicly-owned treatment works (POTWs). The NCP exempts EPA from the RCRA permitting requirement while conducting CERCLA actions on-site. However, EPA should attempt to consider RCRA storage regulations as relevant and appropriate when containerizing and storing wastes on-site, even though a permit application will not be filed.

Generally, the RCRA storage regulations require a generator to: (1) place the waste in containers or tanks; (2) satisfy the standards for containers or tanks; (3) clearly indicate the waste accumulation date on the containers; (4) mark the containers and tanks as "hazardous waste"; and (5) comply with the requirements for owners and operators of hazardous waste TSD facilities. In addition, LDRs prohibit the storage of RCRA restricted waste unless the storage is to accumulate sufficient quantities of the waste to promote proper disposal, treatment, or recovery. When storing hazardous waste for more than 90 days, the SM should consider the storage requirements of 40 CFR Parts 262 and 264 as relevant and appropriate and comply with them to the extent practicable unless the site falls within one of the following categories of waste generators:

1. Conditionally exempt small quantity generators (producing no more than 100 kilograms of hazardous waste in a calendar month), and

2. Small quantity generators producing between 100 kg and 1,000 kg of hazardous waste in a calendar month.

In the cases listed above, the SM will have to comply with the guidelines provided in 40 CFR Part 261.5(g)(2) and 40 CFR Part 262.34.

Any facility receiving IDW containing hazardous wastes must comply with all RCRA Subtitle C design, operation, and closure requirements. In addition, the off-site policy presents additional criteria for selecting an appropriate disposal facility. The most important criteria[40] that a RCRA Subtitle C facility must meet if it receives RCRA hazardous IDW are:

- There must be no record of any relevant violations at or affecting the receiving unit.

- There must be no releases at receiving units of land disposal, treatment, or storage facilities. Note that

a land disposal facility may consist of one or more land disposal units, including landfills, surface impoundments, land treatment units, and piles.

- There must be no significant releases (as determined by EPA) from non-receiving units at treatment and storage facilities that are not controlled by corrective action.
- Waste cannot be disposed of at any unit of a land disposal facility, if any one unit at the facility has releases that are not controlled by corrective action.
- The land disposal facility must demonstrate compliance with the minimum technology requirements of RCRA Section 3004 (o).

The off-site policy also applies to RCRA permit-by-rule facilities receiving RCRA hazardous waste. These facilities are subject to the same requirements as other RCRA Subtitle C facilities and must be inspected for compliance with the applicable RCRA requirements, as well as be inspected by the appropriate authorities for compliance with other applicable laws. Permit-by-rule facilities that receive only nonhazardous materials do not need RCRA permits but must be inspected by local agencies for compliance with applicable laws.

2.4.4 APPLICATION OF RCRA REQUIREMENTS TO IDW MANAGEMENT

RCRA requirements apply to management of IDW during SIs in the following manner: if IDW is stored or disposed off-site, then the SM must comply with all RCRA and ARAR storage requirements; if IDW are stored on-site, then the SM must comply with RCRA to the extent practicable.

Off-site management of RCRA hazardous IDW may also involve treatment, storage, and disposal of RCRA hazardous wastes in accordance with all applicable guidelines. For TSD facilities constructed solely as part of a CERCLA response action, RCRA operating permits are not required.

IDW generated during the SI may require on-site storage in containers while awaiting off-site disposal. Although CERCLA exempts response actions conducted entirely on-site from permit requirements (see CERCLA Section 121 (e) (1)), EPA's policy is to follow the storage regulation practices required for RCRA generators who wish to avoid obtaining permits (40 CFR Parts 240-280). These requirements are applicable if the site manager determines that the containerized IDW are RCRA hazardous waste. RCRA hazardous IDW containerized and stored on-site must be properly disposed within a regulatory timeframe. There are cases where this may not be possible and storage does not require a permit, although EPA should try to expedite removal as much as possible. Note that accumulation of IDW, even on-site, in units other than containers or tanks may result in creation of RCRA units that are subject to various RCRA requirements such as closure, permitting, and ground water monitoring.

2.4.5 CRITERIA FOR RCRA SUBTITLE D FACILITIES

RCRA Subtitle D[20] regulates disposal of nonhazardous wastes in facilities such as municipal landfills. RCRA nonhazardous IDW, such as personal protection equipment (PPE) and disposable equipment (DE), may be disposed of in a Subtitle D facility. Other RCRA nonhazardous IDW (e.g., soil cuttings or ground water) should go to a Subtitle D facility only in very rare circumstances (these wastes should be disposed on-site). The off-site policy establishes requirements for selecting an appropriate RCRA Subtitle D facility for IDW disposal:

- The facility must have a compliance inspection prior to receiving CERCLA IDW and this inspection must not identify any noncompliance with relevant federal and state regulations at or affecting the receiving unit.
- Environmentally significant releases (as determined by EPA) of hazardous substances must be controlled by corrective action.

2.5 TOXIC SUBSTANCES CONTROL ACT

RCRA nonhazardous IDW containing PCBs or asbestos must, in certain circumstances, be disposed of at facilities regulated under the Toxic Substances Control Act (TSCA). While asbestos is not a common contaminant at CERCLA sites, PCBs can be found at about 17 percent of CERCLA sites. Regulations governing the management of IDW containing PCBs, which are generally based on PCB concentrations in waste, are found at 40 CFR 761.60.

TSCA requirements for handling PCBs[m] call for incineration of PCB-contaminated liquid material with concentrations greater than 500 ppm. For liquid material with PCB concentrations between 50 and 500 ppm, the principal alternative to incineration is disposal in a TSCA chemical waste landfill. Any receiving unit must meet the compliance and release criteria for non-RCRA units as set out in the off-site policy, in order to be acceptable. These PCBs may also be destroyed by using a TSCA-approved method that provides a level of performance equivalent to incineration. Nonliquid PCBs at concentrations greater than or equal to 50 ppm may be incinerated, treated by a equivalent TSCA-approved method, or disposed in a TSCA chemical landfill. PCB-contaminated material with concentrations less than 50 ppm are generally not regulated under TSCA, and may be disposed in acceptable Subtitle D facilities.

Even though IDW containing PCBs alone are not RCRA hazardous wastes, IDW containing PCBs mixed with RCRA hazardous wastes are regulated under RCRA LDRs as part of the California list wastes[n,o]. Since PCBs can be governed by RCRA and TSCA, the SM must determine whether RCRA (in the case of PCBs mixed with RCRA wastes) or TSCA regulations, or both, are applicable.

2.6 CLEAN WATER ACT

The Clean Water Act (CWA) addresses site-specific pollutant discharge limitations and performance standards for specified industries to protect surface water quality. At the SI, the most likely situation involves indirect discharge of IDW water, regulated under CWA, to POTWs for treatment and disposal. A less likely situation may involve direct discharge, either on-site or off-site, to surface water.

RCRA hazardous wastewater can be disposed of at POTWs that have a RCRA permit-by-rule and that meet the off-site policy criteria for a facility receiving RCRA hazardous waste. Disposal at a POTW of nonhazardous wastewaters from CERCLA sites is an option[n,o] if the POTW is acceptable under the off-site policy (Appendix C). EPA regulations cover general and specific prohibitions on discharges[m] to POTWs.

The following criteria [m] should be used in selecting an appropriate POTW facility:

- Compliance with all applicable laws.
- The quantity and quality of the CERCLA IDW must be compatible with the POTW.
- The POTW must have no unpermitted "releases."
- The concentration of any hazardous substance must meet applicable pretreatment standards (CERCLA IDW cannot upset the facility's operation and violate the permit).
- The POTW must be in compliance with its National Pollutant Discharge Elimination System (NPDES) permit.
- The transport of IDW to the POTW and its placement in an impoundment must not create a potential for ground water contamination.

2.7 STATE REQUIREMENTS

State ARARs present an array of specific problems for CERCLA sites because their goals and methods often differ from federal environmental laws. CERCLA Section 121 and Section 300.400 (g) of the NCP provide that only those state standards that are promulgated, identified by the state in a timely manner, and more stringent than federal requirements may generally be ARARs. To be considered "promulgated," a standard must be legally enforceable and of general applicability. A waiver is available if the state standard is applied only to CERCLA sites[11]. When dealing with IDW, SMs must comply (to the extent practicable) with state promulgated and enforceable requirements that are more stringent than federal requirements.

State hazardous waste regulations are among the most important environmental laws that may differ, in some states, from federal law. EPA has authorized some states to administer and enforce RCRA hazardous waste management programs. Regulations in these states may be more stringent or have a greater scope of coverage than the federal RCRA requirements. If the CERCLA site is in a state with an authorized RCRA program, the RCRA requirements promulgated by the state will replace the federal requirements as potential ARARs.

In addition to state RCRA regulations, other state legally enforceable standards may govern the handling of wastes. However, the SM should be aware that ARAR waivers are generally available for state requirements specifically aimed at CERCLA sites (see CERCLA section 121(d)(4)(E); 40 CFR 300.430(f)(1)(ii)(C)(5).

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3.0 IDENTIFICATION OF INVESTIGATION-DERIVED WASTES

To properly deal with IDW from SIs, the SM must know whether IDW contain CERCLA hazardous substances, and whether these hazardous substances constitute either RCRA hazardous wastes or contaminants regulated under other statutes. This section is intended to help the SM ascertain the types of IDW generated during the SI and, in particular, to determine whether IDW are either RCRA listed or characteristic hazardous waste.

There are several types of IDW generated during the SI. Examples include the following: (1) soil cuttings and drill mud from soil boring or monitoring well installations; (2) purge water removed from wells before ground water samples are collected; (3) water, solvents, or other fluids used to decontaminate field equipment and PPE; and, (4) PPE and DE. These IDW can be contaminated with various CERCLA hazardous substances. To handle IDW in compliance with regulations, reasonable efforts should be made to characterize the wastes.

3.1 EXTENT OF EFFORTS TO CHARACTERIZE WASTES

The efforts made to characterize IDW should be consistent with the limited scope and purpose of the SI. In most cases, the limited scope of an SI makes it impracticable to characterize wastes to the same extent that might be done in a remedial investigation/feasibility study (RI/FS). In particular, Contract Laboratory Program (CLP) testing would not be warranted in most cases; instead, the nature of the wastes should be assessed by applying best professional judgment, using readily available information about the site (such as manifests, storage records, preliminary assessments, and results of earlier studies that may have been conducted and are available to the Agency, as well as direct observation of the IDW for discoloration, odor, or other indicators of contamination). The Agency has specifically indicated that IDW may be assumed not to be "listed" wastes under RCRA unless available information about the site suggests otherwise (53 FR 51444, December 21, 1988). Similarly, RCRA procedures for determining whether a waste exhibits RCRA hazardous characteristics do not require testing if the decision can be made by "applying knowledge of the hazard characteristic in light of the materials or process used" (40 CFR 262.11(c)). The level of such knowledge required to make a determination with respect to IDW may take into account considerations of practicability and should reflect the limited scope of the activity. In most instances, a determination may be possible based on available information and professional judgment.

The fact that extensive resources need not be used in characterizing IDW does not mean that IDW can be assumed to be nonhazardous unless clearly proven otherwise. Rather, the question is whether, given the limited information that is likely to be available, the SM considers it more likely than not that the wastes are hazardous.

It should be noted that characterizing IDW is only the first step. For example, once it has been determined that a RCRA hazardous waste is involved, the guidelines discussed in Section 2.4 for determining the extent to which RCRA requirements must be complied with should be considered. Furthermore, the degree of certainty with which IDW are characterized during site inspections will be less than during remedial actions. Therefore, even if the waste is deemed not to be RCRA hazardous, RCRA requirements may be considered relevant and appropriate under the specific circumstances at the site (see section 3.2.1).

3.2 RCRA HAZARDOUS WASTES AND CERCLA HAZARDOUS SUBSTANCES

Some CERCLA hazardous substances are RCRA hazardous wastes. Another category of CERCLA hazardous substances are PCBs, which are fairly common at CERCLA sites. Identification of RCRA hazardous wastes and PCB-contaminated IDW is important for making appropriate management decisions (see Sections 2.5, 3.2.1, and 3.2.2 of this guidance). The SM must know the difference between RCRA hazardous wastes and other CERCLA hazardous substances because the presence of RCRA hazardous IDW invokes special technical considerations and

management decisions due to RCRA regulations (particularly the LDRs). EPA recommends using knowledge of IDW rather than testing the wastes to characterize them.

The SM should not assume that all IDW contaminated with CERCLA hazardous substances are RCRA hazardous wastes, in the absence of positive evidence (e.g., manifests, records, knowledge of generation processes) to support such an assumption. At the same time, however, the SM should determine whether IDW are RCRA hazardous wastes, to the extent practicable, as discussed above.

The most important characterization decision is whether IDW contain "hazardous waste" under RCRA. This is relevant to the ARAR status of LDRs and other RCRA requirements, and whether waste disposed of off-site must be disposed of in a Subtitle C or Subtitle D facility. A solid waste is a RCRA hazardous waste[m] if it contains a listed waste or exhibits any of the hazardous characteristics and is not excluded from regulation as a hazardous waste. (For purposes of the RCRA Subtitle C regulations, a solid waste is any discarded material,(solid, sludge, liquid, and compressed gas) that is not excluded under SWDA.) IDW generated during the SI may either exhibit a RCRA characteristic or contain RCRA listed waste.

Under EPA regulations, soil and ground water may be considered contaminated environmental media. If they contain listed hazardous waste, they must be managed as RCRA hazardous wastes as long as they "contain" the listed waste. If IDW exhibit RCRA characteristics, they also have to be managed as RCRA hazardous wastes.

To properly handle IDW, the SM must make a reasonable effort to ascertain if they are RCRA hazardous. When the SM determines that IDW do not fall in any listed waste category and does not display RCRA characteristics, the wastes are not RCRA hazardous. Sections 3.2.1 and 3.2.2 help determine if IDW are RCRA characteristic wastes or if they contain RCRA hazardous listed wastes.

Even if the IDW do not contain RCRA "hazardous waste," the SM should determine whether they contain other CERCLA hazardous substances. CERCLA hazardous substances include, in addition to RCRA hazardous wastes, substances, elements, compounds, solutions, or mixtures designated as hazardous or toxic under CERCLA itself or under the authority of other laws such as TSCA, CWA, CAA, and SDWA. Therefore, even where RCRA is not applicable, one of these statutes may be an ARAR. EPA presents a list of these hazardous substances in 40 CFR Part 302.4, Table 302.4.

3.2.1 RCRA CHARACTERISTIC WASTES

A solid waste is a RCRA characteristic hazardous waste if it exhibits the characteristic of ignitability, corrosivity, reactivity (as defined in 40 CFR Part 261, Subpart C), or toxicity (toxicity characteristic leaching procedure, TCLP, as described in 55 FR 11796-11877, March 29, 1990[111]).

IDW exhibit ignitability if:

- They are a liquid, other than an aqueous solution containing less than 24 percent alcohol by volume, and have a flash point lower than 60°C (140°F).
- They are not a liquid and are capable, under standard temperature and pressure, of causing fire and, when ignited, create a hazard.
- They are an ignitable compressed gas as defined in 49 CFR 173.300.
- They are an oxidizer as defined in 49 CFR 173.151.

IDW exhibit corrosivity if:

- They are aqueous and have a pH less than or equal to 2 or greater than or equal to 12.5.
- They are a liquid and corrode steel at a rate greater than 6.35 mm (0.25 inch) per year at a test temperature of 55°C (130°F).

IDW exhibit reactivity if:

- They are normally unstable and readily undergo violent change without detonating.
- They react violently with water.
- They form potentially explosive mixtures with water.
- When mixed with water, they generate toxic gases, vapors or fumes that pose a danger to human health or the environment.
- They are a cyanide- or sulfide-bearing waste capable of (at the pH range of 2 to 12.5) generating toxic gases that can present a danger to human health or the environment.
- They are capable of detonation or explosive decomposition.
- They are a forbidden explosive as defined in 49 CFR 173.51.

IDW exhibit TCLP-toxicity when its leachate contains certain contaminants at levels exceeding their regulatory thresholds[10]. The TCLP has replaced the EP-toxicity test for identifying RCRA characteristic wastes. The new procedure expands the number of chemicals regulated as hazardous wastes by adding 25 organic constituents to the previous RCRA list of toxic chemicals, and by establishing regulatory levels for these chemicals (Appendix C). The TCLP is designed to determine the mobility of both organic and inorganic contaminants present in liquid, solid, and multiphasic wastes. A water containing less than 0.5 percent dry solid material, filtered through a 0.6 to 0.8-um glass fiber filter, is defined as the TCLP extract. If this extract contains a regulated compound above its threshold level, then the water is hazardous by TCLP characteristic. If the filtered extract from the solid phase contains a regulated compound above its threshold level, then the solid material is RCRA hazardous.

To identify RCRA characteristic waste[11], the SM may rely on knowledge of the properties of the substances from, for example, the Material Safety Data Sheets (MSDS) prepared by manufacturers, or on the results of tests described in 40 CFR 261.21 - 261.24. EPA recommends using knowledge of the properties of materials instead of testing since most CERCLA wastes do not exhibit these RCRA characteristics. Therefore, the SM should not test IDW, particularly if they are a soil of known RCRA characteristics, the AOC concept is applicable, and the wastes will be burned on-site.

3.2.2 RCRA LISTED HAZARDOUS WASTES

Any type of IDW that contains listed hazardous wastes should be considered a RCRA hazardous waste. EPA has developed four lists of RCRA hazardous wastes according to the sources of their origin and toxicity (40 CFR Part 261, Subpart D). These lists contain:

- Wastes from nonspecific sources (F wastes). Examples include spent halogenated solvents (tetrachloroethylene, methylene chloride), nonhalogenated solvents (xylene, acetone, ethyl ether), still bottoms from the recovery of these spent solvents, and some wastewater treatment sludges.

- Wastes from specific sources (K wastes). Examples include wastewater treatment sludges from the production of zinc yellow and chrome green pigments, and still bottoms from the distillation of benzyl chloride.

- Discarded commercial chemical products, manufacturing intermediates, off-specification (off-spec) chemicals (which, if they met specifications, would be listed), and container and spill residues that are "acutely hazardous" (P-wastes). Examples include aldrin and phosgene.

- Discarded commercial chemical products, manufacturing chemical intermediates, or off-spec commercial chemical products that are "toxic" (U-wastes). Examples include chlorobenzene and mercury.

To ascertain whether IDW constitute RCRA listed hazardous waste, the SM must first determine if the IDW contain a component that may be a listed hazardous waste, and then decide whether that component meets the regulatory description of that listed waste.

For example, to determine if solvents contaminating IDW are RCRA spent solvent F001-F005 wastes, the SM must know if:

- The solvents are spent and cannot be reused without reclamation or cleaning.

- The solvents were used exclusively for their solvent properties.

- The solvents are spent mixtures and blends that contained, before use, a total of 10 percent or more (by volume) of the solvents listed in F001, F002, F004, and F005.

If the solvents contained in the IDW are RCRA listed wastes, the IDW are RCRA hazardous waste. When the SM does not have guidance information on the use of the solvents and their characteristics before use, the IDW cannot be classified as containing a listed spent solvent. When the solvents are not listed and IDW are not a characteristic waste, the IDW should be declared nonhazardous.

For other F and K wastes, the SM must know the generation process information (about each waste contained in the RCRA waste) described in the listing. For example, for IDW to be identified as containing K001 wastes that are described as "bottom sediment sludge from the treatment of wastewaters from wood preserving processes that use creosote and/or pentachlorophenol," the SM must know the manufacturing process that generated the wastes (treatment of wastewaters from wood preserving process), feedstocks used in the process (creosote and pentachlorophenol), and the process identification of the wastes (bottom sediment sludge).

P and U wastes cover only unused and unmixed commercial chemical products, particularly spilled or off-spec products. Not every waste containing a P or U chemical is a hazardous waste. To determine whether a CERCLA IDW contains a P or U waste, the SM must have direct evidence of product use. In particular, the SM should ascertain, if possible, whether the chemicals are:

- Discarded (as described in 40 CFR 261.2(a) (2)).

- Either off-spec commercial products or a commercially sold grade.

- Not used (soil contaminated with spilled unused wastes is a P or U waste).

- The sole active ingredient in a formulation.

Identification of a listed waste requires a great deal of care on the part of the SM, particularly if the IDW have to be disposed off-site. For instance, depending on its source and prior use benzene may be an F waste, U waste, or not a RCRA hazardous waste at all. The waste identification process requires access to manifests, storage records, records of waste sources and their prior use, and other information that is reasonably ascertainable during the SI. Visual inspection of the site or the waste generating process will sometimes be sufficient.

IDW from many SIs will not fit the definition of RCRA hazardous listed waste due to limited information. If there is a probability that investigation-derived soil cuttings contain a RCRA listed waste, and a site manager intends to leave them on-site within the AOC unit, a thorough evaluation of the waste is not necessary.

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4.0 PLANNING FOR IDW GENERATION AND MANAGEMENT

The most important phase of IDW management is planning for waste generation and handling before field activity starts. In the planning phase of work, the SM must decide if IDW can be left on-site or must be disposed off-site. Since some sites may have both RCRA hazardous and RCRA nonhazardous IDW, the SM must be familiar with the NCP, and appropriate sections of RCRA, TSCA, CWA, and other relevant statutes.

Handling of RCRA hazardous IDW and IDW with high PCB concentrations (greater than 50 ppm) may involve either moving the IDW within an AOC unit, or containerization, storage, testing, treatment, and off-site disposal. Handling of RCRA nonhazardous IDW usually involves various methods of on-site disposal. EPA prefers to leave both RCRA hazardous and nonhazardous IDW on-site whenever it complies with regulations and does not pose any immediate threat to human health and the environment. This approach speeds up the site assessment process while avoiding high costs of off-site disposal, particularly when off-site disposal does not result in any benefits to human health and the environment.

The approach to IDW generating and handling must be described in the SI work plan which is subject to EPA approval. The SM must base the approach on available information and best professional judgment. The work plan should describe the logic behind the proposed approach to IDW handling, and in particular:

- Methods of waste quantity minimization.
- Types of waste.
- Quantity of waste.
- ARARs of concern, and limits of practicability in light of the scope of the SI.
- On-site and off-site handling methods, where necessary.
- Delineated AOCs for RCRA waste to be handled on-site.
- Containerization, storage, testing, and pick-up methods for wastes to be disposed off-site.

The description of the approach to IDW handling must be as detailed as possible, so the inspection team can execute the work plan without any major problems in the field. If the SI results in generating any IDW off-site, they should be handled the same way as if they were generated on-site.

4.1 AUTHORITY TO MANAGE IDW

EPA views IDW management as an inherent part of the site investigation process authorized under CERCLA Section 104 (e) (4). Should a site owner refuse to provide access, EPA has the authority to issue an administrative order, or seek a court order, to gain site access for environmental sampling. Non-compliance with such an order may result in imposing the sanctions authorized under CERCLA Section 104 (e) (5), including penalties.

EPA believes the approach contained in this guidance to be reasonable and protective of human health and the environment. The limited scope and purpose of the SI activity is not intended to address contamination at a particular site (other than to gather information about it). Generally, SI activities that leave conditions essentially unchanged (e.g., returning soil cuttings to the location from which they were taken) will comply with ARARs. The SM should seek to obtain the appropriate management approach for IDW outlined in this guidance when negotiating site access agreements.

Note, however, that some site circumstances may warrant exceptions to the IDW management approach outlined in this guidance. The SM should use professional judgment in recognizing situations where special steps are required to avoid creating additional threats to human health and the environment. When substantial doubt exists regarding the scope of EPA's authority to carry out the proposed plan for IDW management, the SM should consult legal counsel.

4.2 WASTE MINIMIZATION

The SM should select investigation methods that minimize the generation of IDW, particularly RCRA hazardous wastes. The SI team should limit contact with contaminants, and use drilling and decontamination methods (such as steam cleaning) that minimize PPE, DE, decontamination fluids, and soil cuttings. In particular, the inspection team should minimize the amounts of solvents used for decontamination or eliminate solvents. Minimizing the amount of wastes generated reduces the number of IDW handling problems and costs of disposal. The waste minimization approach should be addressed in the SI workplan.

4.3 TYPES, HAZARDS, AND QUANTITIES OF IDW

To handle IDW properly, the SM must determine the types (such as soil cuttings, ground water, decon fluids, PPE or DE), characteristics (whether RCRA hazardous or containing other CERCLA hazardous substances), and quantities of anticipated wastes. As discussed in Section 3.1, testing will generally not be required to characterize waste to the extent appropriate for an SI. In addition to direct observation of the IDW for evidence of contamination, the SM should review and analyze all available information about the site such as:

- Results of previous EPA preliminary assessments or site investigations.
- Environmental permits.
- Results of inspections by state, local, or federal agencies, or private parties.
- Records from community relations interviews.
- Any other helpful data such as tax records or aerial photography.

Upon ascertaining the types of anticipated IDW, the SM should determine IDW characteristics, in particular whether the anticipated waste is RCRA hazardous (see Section 3.2 of this guidance) or contains high concentrations of PCBs. For RCRA hazardous IDW, the SM should determine whether the IDW pose an increased hazard to human health and the environment relative to conditions that existed prior to the SI. Whenever field analytical screening instruments are used during the SI, the SM may plan to evaluate the analytical results as helpful indicators of IDW characteristics. However, the SM must remember that most of these tests are not RCRA tests, and that the test results usually do not identify RCRA hazardous wastes. The SM must also determine the exact properties of RCRA nonhazardous IDW to select an appropriate disposal facility (e.g., POTW) when the circumstances require off-site disposal.

Upon determining the types and characteristics of IDW to be generated, the SM must assess the anticipated quantities which vary depending on the size of a site and the scope of the SI. As a point of reference, a typical SI may result in generating a range of 1 to 3 drums of PPE and DE, 50 to 1,500 gallons of decontamination water, 1 to 3 pints of other decontamination fluids (e.g., organic solvents) and, depending on the number of wells installed or sampled, 0 to 13 drums of soil cuttings and 0 to 200 gallons of well purge water. The SM should calculate the quantity of the anticipated soil cuttings and ground water from the dimensions of wells and the depth to the ground water table. The SM should use experience to assess the amount of decontamination fluids (decontamination water and organics), PPE, and DE.

4.4 DECISION TREE

Upon designating IDW either RCRA hazardous or RCRA nonhazardous, the SM should determine the appropriate handling approach. The SM should use the decision tree (Figures 1, 2, and 3) which, combined with the SM's best professional judgment, will help select the best approach for IDW management and the steps that are involved in executing the approach. The decision tree indicates when and how IDW should be handled on-site or disposed off-site.

The decision tree summarizes basic elements of planning for IDW handling such as waste minimization, characterization, and management. It shows the steps that must be followed in the process. For example, the "Plan for Waste Management According to IDW Characteristic" branch (Figure 1) indicates that the SM has two options: either to handle IDW on-site or to dispose of it off-site. If the SM's decision is to leave IDW on-site, then the "On-Site Handling" branch (Figure 2) indicates what choices and steps can be involved in this approach depending on the type of IDW. The "Off-Site Disposal" branch (Figure 3) of the decision tree presents options available for handling IDW off-site and steps involved in executing these options. The SM should select one of the available options for a given type of IDW.

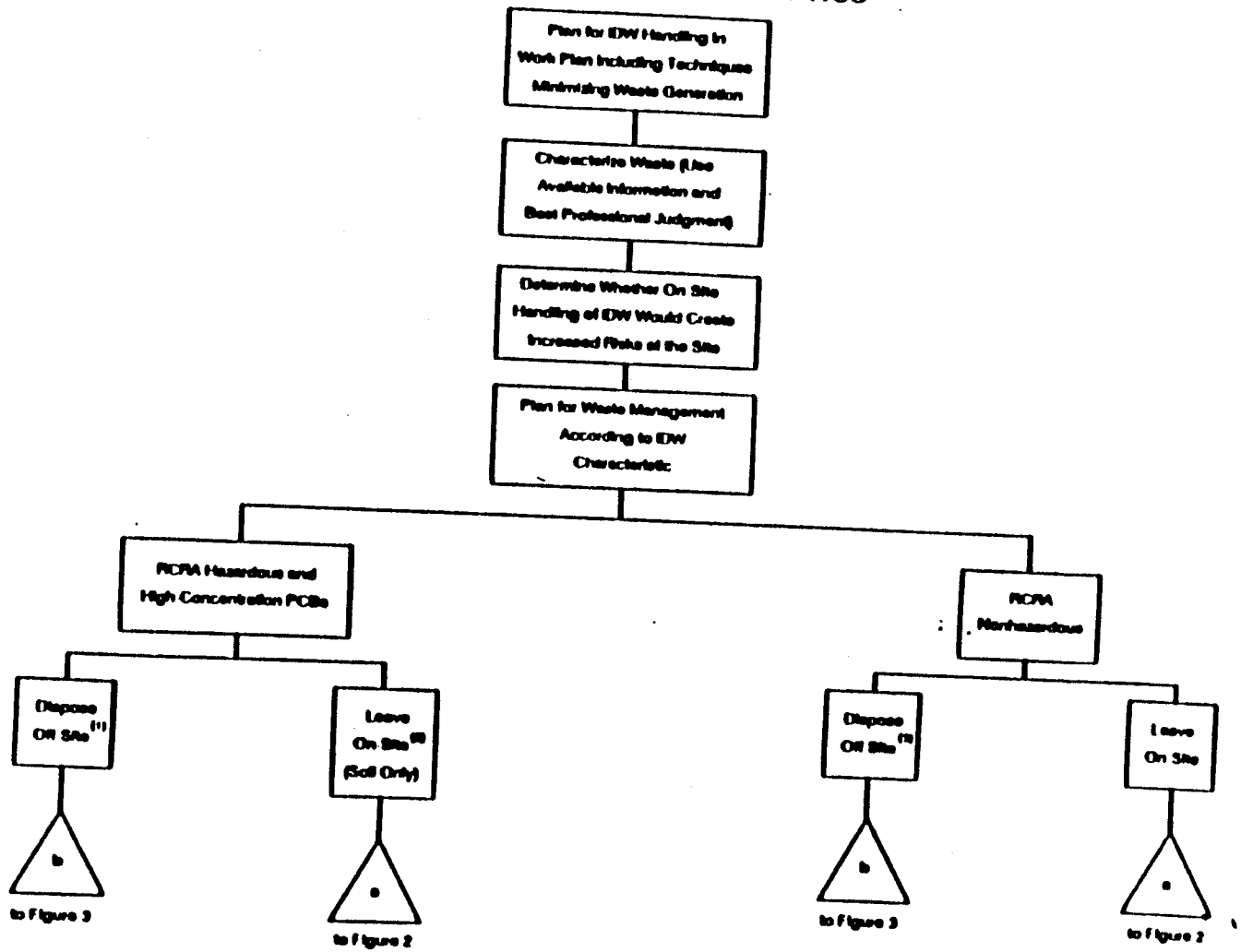
For example, when IDW from the same site are expected to encompass ground water, PPE, DE, decontamination fluids, and soil cuttings that are RCRA hazardous (or contaminated with PCBs) wastes, the decision tree (Figures 1, 2) calls for either handling the cuttings on-site in an AOC unit, or in the site's existing treatment or disposal unit (TDU), or disposing of them off-site. EPA prefers to handle most IDW on-site, but if circumstances require, the off-site option is also available. If PPE and DE can be decontaminated and, according to the SM's best professional judgment, rendered nonhazardous, the decision tree indicates (Figure 3) that these wastes should be double-bagged, and deposited either in an industrial dumpster (on-site or at the EPA warehouse), or in a municipal landfill (RCRA Subtitle D facility). If the SM anticipates that PPE and DE cannot be rendered RCRA nonhazardous after decontamination and the total quantity of IDW generated exceeds 100 kg at an individual site, the decision tree indicates (Figures 1,2) that the wastes should be drummed and disposed off-site at an appropriate facility by a subcontractor, and the SM should start the subcontracting process before field activity begins. If the total quantity of RCRA hazardous PPE and DE is less than 100 kg and this quantity represents the entire amount of IDW generated during the SI, the small quantity waste generator exemption applies and the wastes can be disposed of in a municipal landfill with state approval. However, EPA prefers to send even small quantities of RCRA hazardous PPE and DE to RCRA hazardous waste facilities.

The decision tree points out that when the ground water is RCRA nonhazardous (the most common situation), the water may be managed on-site (Figure 2) using one of a few simple techniques. If decontamination fluids are RCRA nonhazardous, they should be handled similarly. The decision tree indicates (Figure 3) that RCRA hazardous organic decontamination fluids should be handled off-site.

Sections 4.5 and 4.6 of this guidance present the details of EPA-preferred approaches to IDW management.

Figure 6

IDW Management Decision Tree



(1) Soil cuttings, ground water, and decontamination fluids creating increased hazards at the site should be disposed off-site. Before end after the SI, determine anticipated waste quantity and applicable regulations for waste generators.

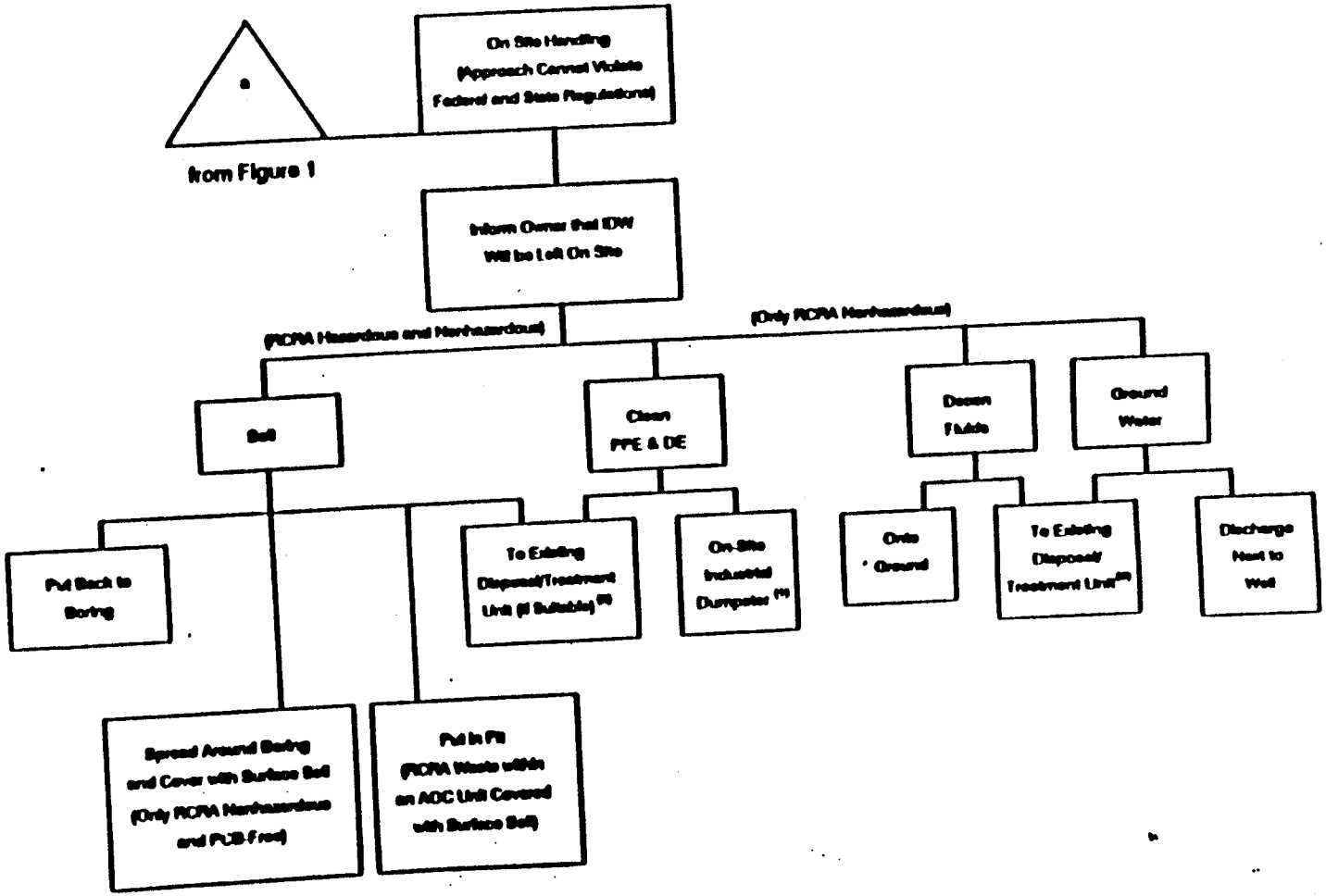
(2) If not prohibited by other legally enforceable requirements such as state ARARs.

(3) Justified only in rare circumstances when a RCRA nonhazardous waste is a state hazardous waste and state legally enforceable requirements call for waste removal, or if leaving the waste on site would significantly affect human health and the environment.

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Figure 2

IDW Management Decision Tree



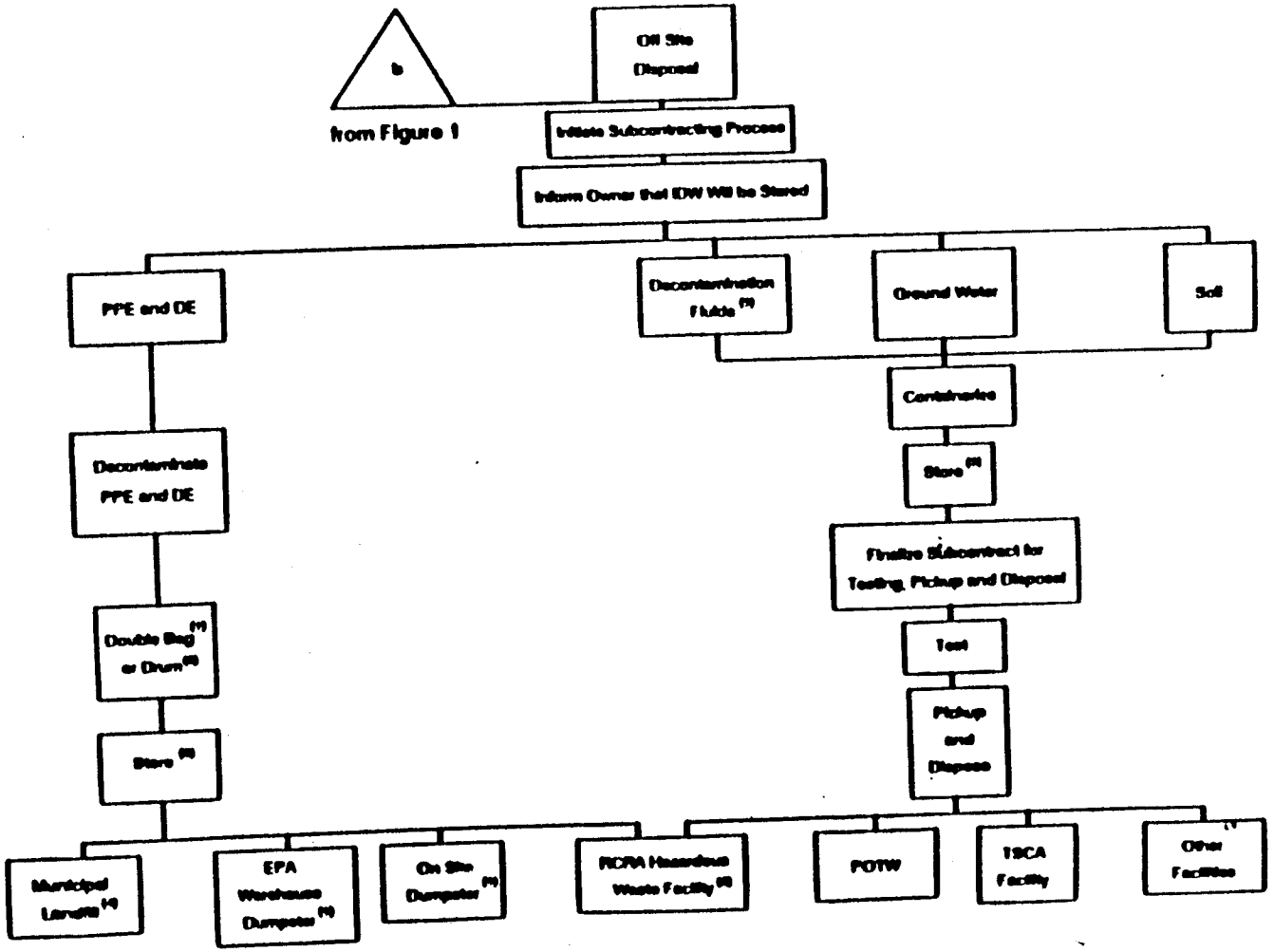
(1) Clean PPE and DE may also go to the nearest landfill or to an EPA warehouse dumpster.

(2) If the receiving unit meets the off-site policy acceptability criteria.

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Figure 3

IDW Management Decision Tree



(1) Only RCRA nonhazardous waste.

(2) Only RCRA hazardous waste generated in quantities greater then 100 kg/month when sent off-site.

(3) In accordance with accumulation requirements for RCRA hazardous wastes.

(4) Only if the conditionally exempt small quantity generator exception applies.

(5) If the conditionally exempt small quantity generator exception applies, off-site disposal of decon fluids may not require subcontracting

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4.5 ON-SITE IDW HANDLING AND MANAGEMENT OPTIONS

If IDW are RCRA nonhazardous soil or water, they should be left on-site unless other circumstances, such as a state ARAR or a high probability of serious community concerns, require off-site disposal. RCRA hazardous soil also may be left on-site within an AOC unit. The SM must determine procedures for handling IDW on-site and notify the site owner in the site access agreement form that IDW such as soil cuttings and water will be left on-site. If the SM intends to leave IDW on-site, the waste should not be containerized and tested.

The on-site handling options available to the SM when IDW are RCRA nonhazardous are listed below.

- For soil cuttings:

  1. Spread around the well
  2. Put back to the boring
  3. Put into a pit within an AOC
  4. Dispose of at the site's operating TDU.

- For ground water:

  1. Pour onto ground next to the well to allow infiltration
  2. Dispose of at the site's TDU.

- For decontamination fluids:

  1. Pour onto ground (from containers) to allow infiltration
  2. Dispose of at the site's TDU.

- For decontaminated PPE and DE:

  1. Double bag and deposit in the site or EPA dumpster, or in any municipal landfill
  2. Dispose of at the site's TDU.

If IDW are considered RCRA nonhazardous due to lack of information on the waste hazard, the inspection team should have an alternative plan for handling IDW if field conditions indicate that these wastes are hazardous. In such a case, the minimum requirement is to have an adequate number of containers available for collecting ground water, decontamination water, or soil cuttings.

If IDW consist of RCRA hazardous soils that pose no immediate threat to human health and the environment, the SM should plan on leaving it on-site within a delineated AOC unit. However, before deciding to leave RCRA hazardous soil on-site, the SM must consider the proximity of residents and workers in the surrounding area. The SM must always use best professional judgment to make such decisions. Planning for leaving RCRA hazardous soil on-site involves:

- Delineating the AOC unit.
- Determining pit locations close to the borings within the AOC unit for waste burial.
- Covering hazardous IDW in the pits with surficial soil.
- Not containerizing and testing wastes designated to be left on-site.

Another alternative for handling RCRA hazardous soil is disposal in a TDU located on the same property as the AOC under investigation. If the TDU is outside the AOC, it must comply with the off-site policy. If any organic decon fluids are generated (which are RCRA hazardous wastes), they should be disposed of off-site in compliance with the off-site policy or in compliance with the conditionally exempt small quantity generator exemption. Small quantities (i.e., no more than 100 kg/month) of organic decon fluids may be containerized off-site prior to delivery to a hazardous waste facility.

4.6 OFF-SITE DISPOSAL OF IDW AND MANAGEMENT OPTIONS

IDW should be disposed off-site in the following situations:

- They are RCRA hazardous water.
- They are RCRA hazardous soil that may pose a substantial risk if left at the site.
- They are RCRA hazardous PPE and DE.
- If leaving them on-site would create increased risks at the site.

RCRA nonhazardous wastes could be disposed of off-site at appropriate RCRA nonhazardous facilities that are in compliance with CERCLA section 121(d)(3) and the off-site policy when it is necessary to comply with legally enforceable requirements such as state ARARs that preclude onsite disposal. IDW designated for off-site disposal must be properly containerized, tested, and stored before pick-up and disposal. Decontaminated PPE and DE should be double-bagged if sent to an off-site dumpster or a municipal landfill.

Planning for off-site disposal should include the following EPA guidelines:

- Incorporating a provision in the site access agreement form to inform the site owner that containerized IDW may be temporarily stored on-site while awaiting pickup for off-site disposal. The agreement should also request the owner's cooperation.
- Initiating the bidding process for IDW testing, pick-up, and disposal. If there are any subcontracting needs in planning for off-site disposal, EPA should specify what means of disposal will be needed (i.e. various types of treatment, landfilling, etc.). Since RCRA hazardous IDW must go to RCRA hazardous waste disposal facilities that comply with the off-site policy, the SM should obtain a list of available facilities from the RPO. Each EPA region maintains a list of RCRA hazardous TSD facilities that meet the conditions of the off-site policy. The recent addition of 25 new toxicity characteristic constituents to the list of toxic chemicals subject to RCRA hazardous waste regulations may result in fewer facilities available to handle IDW in the future. The SM must also check the selected facility's compliance before IDW pick-up. If IDW are RCRA nonhazardous, the SM must also check if the receiving RCRA nonhazardous waste facility complies with the off-site policy.
- Coordinating IDW generation with testing and pick-up. IDW samples should be collected in accordance with the "Test Methods for Evaluating Solid Waste" guidance manual (SW 846), and shipped for RCRA tests (and other tests, if necessary) as early as possible during the SI. This approach shortens the storage time and reduces the number of site visits to pick up waste. IDW need not be analyzed by a CLP laboratory. The SM should use the laboratory services of the pickup and disposal subcontractor, obtain an EPA ID number and manifest form for RCRA hazardous IDW, and a bill of lading for RCRA nonhazardous IDW.

- Preparing adequate numbers and types of containers. Drums should be used for collecting small amounts of IDW. Larger amounts of soil and water can be contained in Baker tanks, poly tanks, and bins. PPE and DE should be double-bagged for disposal at a municipal landfill or collected in drums for disposal at a hazardous waste facility.

- Designating a storage area (either within the site's existing storage facility, existing fenced area, or within a temporary fence constructed for the SI). No humans, children in particular, may have access to the storage area. If a temporary storage facility is to be constructed, its location and size must be agreed upon with the site owner, and all construction materials should be delivered to the site before or on the first day of the SI.

EPA expects that complying with this guidance will limit on-site storage to, at most, the time required to complete any testing (usually less than 6 weeks) required by subcontractors in order to arrange for transportation. In most cases, this will not result in exceeding the regulatory 90 day storage time for quantities greater than 1,000 kg/month regardless of the quantity of IDW. In cases where the regulatory 90 day storage time for quantities greater than 1,000 kg/month is exceeded, the SM must initiate a subcontract bidding process to remove IDW wastes off-site and a permit is not required.

All IDW shipped off-site, whether RCRA hazardous or not, must go to facilities that comply with the off-site policy, and the SM must check that subcontractors operate in accordance with this policy.

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5.0 IMPLEMENTING THE IDW MANAGEMENT PLAN

The work plan describing the anticipated approach and procedures for IDW management should be clear, detailed, and concise to allow the field team to follow without problems. The plan should also be flexible enough to allow slight modifications due to unexpected and unforeseen field conditions. The SM should document implementation of the work plan in the field log book and describe the appearance of IDW as well as any modifications to the original handling approach. The SM must also ensure that IDW is handled in a fashion that does not generate public concerns.

5.1 ON-SITE IDW MANAGEMENT

If ground water or decontamination fluids are to be collected during the SI, adequate numbers and types of containers must be delivered to the site before the SI starts. The SM must check if the containers are clean and measure the pH of containerized waters even if these waters were originally determined to be RCRA nonhazardous. When the work plan calls for ground water to be poured onto the ground next to the well, then the SM must verify the original determination (e.g., pH testing) before allowing the water to infiltrate the ground.

If the SM, using best professional judgment, renders PPE and DE RCRA nonhazardous after decontamination, the materials are to be double-bagged and the SI team should take them to either the on-site or EPA warehouse dumpster, or to a municipal landfill. The location of PPE and DE disposal should be described in the field log book.

If the work plan calls for on-site management of RCRA hazardous soil cuttings, a shallow pit should be made close to the borings within a delineated AOC unit. IDW should then be buried in this pit and covered with surficial soil. The SM may decide to have more than one IDW burial pit within an AOC unit. The appearance of the generated IDW, and the size and location of the pit, must be described in the field log book.

If the work plan indicates that both RCRA hazardous and nonhazardous IDW are to be disposed in an operating treatment and disposal unit located on the same property as the IDW sources (but outside the AOC), then the SM must verify that the unit complies with the requirements of the off-site policy at the time of disposal.

5.2 OFF-SITE DISPOSAL OF IDW

Off-site disposal of RCRA hazardous and nonhazardous IDW involves the following common elements:

- Coordinating IDW handling.
- Identifying and verifying an acceptable disposal facility before the SI.
- Finalizing the subcontract.
- Containerizing IDW.
- Labeling containers.
- Storing containers.
- Sampling and testing of IDW.
- Transporting IDW off-site.

- Disposing at a disposal facility.
- Documenting the process.

Coordination of IDW handling is important because it affects the schedule and costs of the SI. Most coordination must be done before field activity starts. Before starting the field work, a subcontractor should be selected so the SM can coordinate field work and IDW generation with the subcontractor's sampling, testing, pick-up, and disposal activities. Before containerizing IDW, the SM should check the containers to ensure they are clean and do not contain any residues from past use. All filled containers should be dated and labeled as either RCRA hazardous or RCRA nonhazardous and stored in a safe manner in compliance with relevant regulations. The SM should also obtain an EPA ID number for a RCRA hazardous waste from the RPO.

If a temporary storage facility must be constructed, the SM should have all construction materials, such as chain-link fencing, posts, and other needed materials, delivered to a location agreed upon with the site owner before the SI. The SM should ensure that the storage time is short and never exceeds the regulatory 90 days for RCRA hazardous waste even if the small quantity generator exemption applies.

The SM should check that the subcontractor collects IDW analytical samples for the disposal facility "profile analysis" using EPA-recommended methods described in "Test Methods for Evaluating Solid Waste Physical/Chemical Methods" - SW 846. One composite sample should be collected from each large container or from a group of drums. Small samples of soil cuttings or drilling mud should be taken from several locations and depths of the handling containers, homogenized in a decontaminated bucket, and placed in sampling jars. Sampling of PPE and DE should be avoided. The SM should also ensure that the chain-of-custody form for shipping IDW samples is used. When the subcontractor's analysis confirms that IDW is a RCRA restricted hazardous waste, the SM should check that the subcontractor:

- Treats the IDW to meet the treatment standards (if needed) before land disposal.
- Complies with the LDR notification requirements of 40 CFR Part 268.

Containerized and tested RCRA hazardous IDW must be accompanied by a Hazardous Waste Manifest (and other forms required by state laws) if hauled off-site. RCRA nonhazardous IDW should have a bill of lading if transported off-site. The SM must obtain all required forms, fill them out clearly and completely, and have the forms signed by the RPO. The SM, if authorized, may sign the forms on behalf of EPA. Before transporting IDW to the selected facility, the SM must verify the facility's compliance with the off-site policy at the time of disposal. If the facility's status has changed since the award of the contract, (due to receiving citations or fines), the SM is responsible for finding a replacement facility without delay. The SM must receive a copy of the IDW analytical results and a confirmation of disposal from the subcontractor.

6.0 IDW HANDLING COSTS AND SUBCONTRACTING

This section presents and compares the costs of both on-site and off-site IDW management with emphasis on the costs of off-site disposal. The costs presented here are for general reference.

The costs of off-site IDW disposal have been increasing for several years and this trend is expected to continue in the future. Off-site IDW handling involves the use of a subcontractor to haul and dispose IDW in an appropriate facility that complies with the off-site policy. Most wastes generated during the SI and designated for off-site disposal are liquids, either RCRA hazardous or nonhazardous, which go to either RCRA wastewater treatment plants or POTWs. Solid IDW usually go to land disposal facilities.

On-site IDW handling, the EPA-preferred approach, involves the use of a variety of simple techniques for leaving the IDW in existing waste areas. These techniques include pouring RCRA nonhazardous decontamination fluids and ground water onto the ground, and burying soil cuttings in a shallow pit in the investigation area.

6.1 ON-SITE IDW MANAGEMENT

On-site IDW handling generally incurs no costs and does not delay the SI. Drums may be needed for collecting water. However, these drums will be recovered and reused on other SIs, so the cost of purchasing drums, distributed over several SIs, is negligible. The cost of digging shallow pits can be covered under the drilling subcontract. Spreading soil cuttings around the boring, or pouring ground water onto the ground, incurs no costs.

6.2 OFF-SITE DISPOSAL OF IDW

Handling IDW off-site involves hiring a subcontractor to provide transportation, testing, and disposal services. This approach allows the waste generator to select the most technically advanced and economically suitable disposal facility that complies with regulations. However, off-site management has several disadvantages including: (1) increasing costs of the services; (2) loss of control over the fate of IDW while still being liable for the waste; (3) potential for accidental spills during transportation; (4) difficulty in finding a suitable disposal facility; and (5) the reluctance of states to accept out-of-state wastes for disposal.

The costs of off-site IDW handling consist of the following elements: (1) containerization; (2) testing; (3) transportation; and (4) disposal. The costs of containers (usually 55-gallon drums) used to collect waste is about $50/drum. These containers may be purchased by either EPA or the subcontractor. The cost of containers purchased by subcontractors is usually higher, therefore, the SM may decide to purchase all necessary containers.

The cost of the "profile analysis," performed by the subcontractor to verify the waste hazard prior to transport is between $40 and $300/sample. The total cost of the analysis depends on the number of samples and the parameters analyzed. The cost of transportation varies depending on factors such as the distance between the site and the disposal facility, the number of drums (the price per drum is lower when more drums are transported), and whether the pickup service is set for an individual generator or for several waste generators which is less expensive. In 1990, the estimated price range for waste transportation (regardless of whether IDW are hazardous) was between $35 to $600/drum.

The costs of disposal depend on the waste hazard, matrix, and amount. The ranges of costs per drum are presented below:

- RCRA nonhazardous liquid: $12.50 - 345/drum
- RCRA hazardous liquid: $155 - 550/drum
- RCRA nonhazardous solid: $66 - 135/drum
- RCRA hazardous solid: $145 - 615/drum

Additional costs of handling IDW off-site include:

- Storage.
- Field trips (to assist in waste sampling and pickup).
- Procurement expenses.

If IDW on-site storage is not available before pickup, a chain-link fence can be built at an average cost of $600 ($300 for the materials and $300 for labor). The cost of procurement is estimated at about $300 per site. The cost of the field trips depends on the coordination of waste generation, testing, and pickup.

The site manager must select a subcontractor before field work is completed, so the subcontractor can collect IDW samples for the "profile analysis" while the SM is still on-site. This approach requires only one more field trip to assist in the waste pickup. If two additional trips are needed (one for collecting IDW samples and one for IDW pickup), the costs of IDW disposal increase significantly. For example, if there are two drums to dispose of, the transportation, testing, and disposal cost is $700, and one field trip costs $500, the total cost of IDW handling is $1,200. An additional field trip would result in a total cost of $1,700, a 42 percent increase.

The approximate cost ranges of managing one drum of IDW off-site, depending on the waste hazard, are presented below:

WASTE	CONTAINER ($)	TEST ($)	TRANSPORTATION ($)	DISPOSAL ($)	STORAGE PROCUREMENT AND FIELD TRIPS ($)	TOTAL* ($)
RCRA Hazardous Solid	50	20-150	35-600	145-615	233	500-1650
RCRA Non-Hazardous Solid	50	20-150	35-600	66-135	233	400-1200
RCRA Hazardous Liquid	50	20-150	35-600	155-550	233	500-1600
RCRA Non-Hazardous Liquid	50	20-150	35-600	12.50-345	233	350-1400

* Based on the following assumptions: (1) 6 drums/site, (2) 1 sample/2 drums and, (3) only one field trip required for waste pickup at a cost of $500/6 drums ($83/drum).

The role of the SM in coordinating field activities, the subcontracting process, and IDW management is crucial to reducing the costs of IDW management. Disposing IDW off-site always results in high costs regardless of the waste hazard because there is no significant difference between the costs of disposal of hazardous and nonhazardous wastes. The SM should apply the most efficient management techniques to lower the costs of IDW handling whenever possible, and when such practices do not threaten human health and the environment.

6.3 SUBCONTRACTING

To implement subcontracting services for off-site disposal of IDW, the SM should refer to Federal guidelines. These guidelines are available from the Federal Aquisition Regulations (FAR). Federal Superfund contractors generally follow these guidelines.

Names of these subcontractors are available from either a local telephone directory, a state environmental agency list (in some states), or from the Hazardous Materials Control Directory (published annually by the Hazardous Materials Control Research Institute. Waste management facilities of all prospective bidders must be in compliance with the off-site policy during the bidding process and when the IDW are transported and disposed of. The SM and EPA are responsible for verifying the subcontractor's facility compliance with the policy. If the selected facility's status changes before the date of transport and disposal, the subcontract should be immediately awarded to the next lowest bidder if this bidder is able to meet the regulatory storage time limits.

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REFERENCES

1. 40 CFR Part 300, National Oil and Hazardous Substances Pollution Contingency Plan, Final Rule, 55 FR 8666-8865, March 8, 1990 (see Appendix A - Relevant Parts of the NCP).

2. 40 CFR Parts 240-280, Solid Waste Regulations, 1988.

3. 40 CFR Part 300.440, Amendment to the National Oil and Hazardous Substances Pollution Contingency Plan; Procedures for Planning and Implementing Off-Site Response Actions; Proposed Rule, 53 FR 48218-48234, November 29, 1988.

4. OSWER Directive 9834.11, November 13, 1987 - "EPA Off-Site Policy."

5. OSWER Directive 9347.3-05 FS, July 1989 - Superfund LDR Guide #5 (see Appendix B).

6. 40 CFR 761.60 - 761.79 - TSCA Regulations, 1988.

7. OSWER Directive 9330.2-4, April 15, 1986 - "Discharge of Wastewater from CERCLA Sites into POTWs" (see Appendix C).

8. "CERCLA Site Discharges to POTWs" - Guidance Manual (EPA/540/G-90/005, August 1990).

9. 40 CFR 403.5 CWA Regulations, 1988.

10. "CERCLA Compliance with Other Laws Manual" (Part I - EPA/540/G-89/006, Part II - EPA/540/G-89/009, 1989).

11. 40 CFR Part 261 et al., Hazardous Waste Management System; Identification and Listing of Hazardous Waste; Toxicity Characteristics Revisions; Final Rule 1990 (see Appendix D - TCLP Constituents Table).

APPENDIX A to EPA/540/G-91/009

RELEVANT PARTS OF THE NCP

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Federal Register

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Part II

Environmental Protection Agency

40 CFR Part 300
National Oil and Hazardous Substances Pollution Contingency Plan; Final Rule

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300.420(c)(5) describes the information contained in a lead-agency report following completion of a remedial site investigation, including documentation as well as sampling data and potential risks to humans and the environment.

Response to comments: A commenter asked that the NCP state that reasonable efforts will be made during the site investigation phase to identify PRPs and provide them copies of the preliminary assessment/site investigation (PA/SI) report and an opportunity to comment.

The removal and remedial processes as currently outlined in the NCP provide PRPs with a reasonable opportunity to review and comment on lead agency actions at a site when the proposed plan is made available. Before this time, documents placed in the administrative record, including the PA/SI, are available for public inspection. In addition, PRPs that are interested in more extensive involvement in the investigation process may agree to undertake removal or remedial actions through a settlement agreement with EPA. They may be granted substantially more site involvement than non-settling PRPs.

Extending the formal review and comment period to PRPs as far back in the removal and remedial process as the PA/SI stage would unnecessarily slow down preliminary fact-gathering at a site. In cases where removal actions are considered emergency or time-critical, such review and comment time would unjustifiably delay response to a dangerous situation. Also, in most cases, the PRP search has not been completed or even started in a comprehensive manner at the time of the PA/SI. Accordingly, specifying formal procedures for PRP involvement at that time is not practical.

Final rule: EPA is promulgating §§ 300.410(c)(2) and 300.420(c)(5) as proposed.

Name: Section 300.410(g). Notification of natural resource trustee.

Final rule: Section 300.410(g) is revised as follows (see preamble discussion on § 300.615):

> If natural resources are or may be injured by the release, the OSC or lead agency shall ensure that state and federal trustees of the affected natural resources are promptly notified in order that the trustees may initiate appropriate actions, including those identified in subpart G of this part. The OSC or lead agency shall seek to coordinate necessary assessments, evaluations, investigations, and planning with such state and federal trustees.

Name: Sections 300.415(b)(4) and

Proposed rule: Proposed § 300.415 did not describe sampling requirements. Proposed § 300.420(c)(4) described the procedures necessary for preparing a site-specific sampling plan for a remedial site inspection.

Response to comments: One commenter stated that EPA should revise § 300.420(c)(4) to specify review of the sampling plan to ensure that appropriate sampling and quality control procedures are followed. In response, EPA is revising the description of the site-specific sampling plan in proposed § 300.420(c)(4) to conform with the purpose of the quality assurance project plan (QAPP) defined in § 300.5 and the QAPP and sampling and analysis plan described in § 300.430(b)(8), which states that such plans will be approved by EPA. This change emphasizes the similarity of these activities in the site evaluation and remedial investigation parts of the program. In addition, EPA believes that, when samples will be taken, it is appropriate to describe sampling requirements for non-time-critical removal actions to ensure that data of sufficient quality and quantity will be collected for this type of action.

EPA also notes that portions of the QAPP may incorporate by reference non-site-specific standardized portions of already-approved QAPPs, especially those portions addressing policy and organization, or describing general functional activities to be conducted at a site to ensure adequate data. This eliminates the necessity to reproduce non-site-specific quality assurance procedures for every site.

Final rule: Proposed §§ 300.415(b)(4) and 300.420(c)(4) are revised as follows:

1. In § 300.415(b)(4), a requirement has been added for developing a sampling and analysis plan, when samples will be taken.

2. Section 300.420(c)(4) is revised to better describe the required contents of the sampling and analysis plan.

Section 300.415. Removal Action.

Name: Section 300.415(b)(5)(ii). Removal action statutory exemption.

Proposed rule: CERCLA section 104(c)(1)(C) provides a new exemption to the statutory limits on Fund-financed removal actions of $2 million and 12 months. This exemption, stated in the NCP in § 300.415(b)(5)(ii), is applicable when continued response is otherwise appropriate and consistent with the remedial action to be taken. EPA expects to use the exemption primarily for proposed and final NPL sites, and

Response to comments: One commenter supported EPA's proposal to allow waiver of the limits on Fund-financed removal payments if such an exemption is consistent with remedial actions.

One commenter stated that the decision to engage in a removal action should be based on site conditions and their impact on health and the environment, not cost or time; that once EPA concludes that a removal action is appropriate, the various alternatives should be analyzed at both likely NPL and non-NPL sites equally. The commenter felt that EPA should use the consistency exemption more liberally where time, rather than money, was the complicating factor.

In response, Congress has made the determination that cost and time are relevant factors in deciding how extensive a Fund-financed removal action may be; thus, contrary to the commenter's remark, EPA will continue to consider such factors. Further, Congress did not differentiate between time and dollar limits in setting the exemptions; EPA notes that exceeding the time limit will often also increase the cost of a removal action, even though it does not necessarily raise the cost to over $2 million. Thus, EPA does not believe it should set different criteria for their use.

The new exemption from the time and dollar limits applies to any Fund-financed removal and thus encompasses state-lead as well as EPA-lead responses. Actions where EPA has the lead, but is to be reimbursed by private parties or other federal agencies, are still subject to the statutory limits and provisions for exemption.

Because the exemption requires consistency with the remedial action to be taken, its use is well suited to proposed or final NPL sites where remedial action is likely to be taken. It may also be appropriate to use this exemption at some non-NPL sites where justified on a case-by-case basis.

Final rule: EPA is promulgating the rule as proposed.

Name: Section 300.415(i). Removal action compliance with other laws.

Existing rule: The current NCP in § 300.65(f) requires that Fund-financed removal actions and removal actions pursuant to CERCLA section 106 attain or exceed, to the greatest extent practicable considering the exigencies of the circumstances, applicable or relevant and appropriate federal public health and environmental requirements,

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responses and responses conducted by PRPs (emergency and time-critical removals are not covered by this policy). This notification should specify the type and quantity of waste involved, the name and location of the receiving facility and the expected schedule for the transfer of the CERCLA waste. Such notification will enable the recipient state to obtain from its permitted facilities any other information it may need in order to support the out-of-state action. Although this notification is neither mandated by CERCLA nor required by this regulation, EPA believes that adherence to this procedure will help to ensure that these waste transfers occur in a safe and expedient manner. The policy is explained in more detail in OSWER Directive No. 9330.2-07 (September 14, 1989).

Because CERCLA actions may be carried out under a number of mechanisms and by a number of parties (e.g., lead state agencies, other federal agencies, PRPs), EPA plans to issue additional guidance or regulations, if appropriate, to implement this notification policy.

Final rule: There is no rule language on this issue.

Applicable or Relevant and Appropriate Requirements

Introduction. The November 20, 1985 revisions to the NCP required that, for all remedial actions, the selected remedy must attain or exceed the federal applicable or relevant and appropriate requirements (ARARs) in environmental and public health laws. It also required removal actions to attain ARARs to the greatest extent practicable, considering the exigencies of the circumstances. The preamble to the 1985 revisions to the NCP stated that ARARs could be determined only on a site-by-site basis, and it included from EPA's October 2, 1985 Compliance Policy a list of potentially applicable or relevant and appropriate requirements. The preamble also provided a list of federal non-promulgated criteria, advisories and guidance, and state standards "to be considered," called TBCs. EPA also provided five limited circumstances in which ARARs could be waived.

On October 17, 1986, CERCLA was reauthorized with additional new requirements. Section 121 of CERCLA requires that, for any hazardous substance that will remain on-site, remedial actions must attain requirements under federal environmental or state environmental or facility siting laws that are applicable or relevant and appropriate under the circumstances of the release or threatened release at the completion of the remedial action. The statute also retained most of the waivers, with a few additions.

Although section 121(d)(2) basically codified EPA's 1985 policy regarding compliance with other laws, the section also requires that state standards are also potential ARARs for CERCLA remedial actions when they are promulgated, more stringent than federal standards, and identified by the state in a timely manner.

Furthermore, the CERCLA amendments provide that federal water quality criteria established under the Clean Water Act (CWA) and maximum contaminant level goals (MCLGs) established under the Safe Drinking Water Act, must be attained when they are relevant and appropriate under the circumstances of the release.

Today's revision to the NCP continues the basic concept of compliance with ARARs for any remedy selected (unless a waiver is justified). ARARs will be determined based upon an analysis of which requirements are applicable or relevant and appropriate to the distinctive set of circumstances and actions contemplated at a specific site. Unlike the 1985 revisions to the NCP, where alternatives were developed based on their relative attainment of ARARs, in today's rule recognition is given to the fact that ARARs may differ depending on the specific actions and objectives of each alternative being considered (for more discussion of this point, see preamble of proposal at 53 FR 51438, section B).

In today's rule, EPA retains its policy established in the 1985 NCP of requiring attainment of ARARs during the implementation of the remedial action (where an ARAR is pertinent to the action itself), as well as at the completion of the action, and when carrying out removal actions "to the extent practicable considering the exigencies of the situation."

For ease of identification, EPA divides ARARs into three categories: chemical-specific, location-specific, and action-specific, depending on whether the requirement is triggered by the presence or emission of a chemical, by a vulnerable or protected location, or by a particular action. (More discussion of these types can be found in the preamble of the proposal at 53 FR 51437, section B).

Response to comments: EPA received a few comments on general ARARs policies. One commenter argued that the remedial action should not necessarily have to attain the most stringent applicable or relevant and appropriate requirement if a less stringent requirement provides adequate protection of human health and the environment.

EPA disagrees. CERCLA requires that remedial actions comply with all requirements that are applicable or relevant and appropriate. Therefore, a remedial action has to comply with the most stringent requirement that is ARAR to ensure that all ARARs are attained. In addition, CERCLA requires that the remedies selected be protective of human health and the environment *and* attain ARARs. A requirement does not have to be determined to be necessary to be protective in order to be an ARAR. Conversely, the degree of stringency of a requirement is not relevant to the determination of whether it is an ARAR at a site and must be attained (except for state ARARs).

Another commenter asked for confirmation that variance or exemption provisions in a regulation can be potential ARARs as well as the basic standards. EPA agrees that meeting the conditions and requirements associated with a variance or exemption provision can be a means of compliance with an ARAR. For example, EPA expects that CERCLA sites will frequently be complying with the terms of the treatability variance under the RCRA land disposal restrictions (LDR) for soil and debris when LDR is an ARAR.

Limitations in a regulation, such as the quantity limitations that define small quantity generators under RCRA and affect what requirements a generator must comply with, will also affect what requirements are applicable at a CERCLA site. However, it is possible that a requirement could be relevant and appropriate even though the requirement is not applicable because of a limitation in the regulation.

Indian tribe commenters contended that ARARs should not be defined as promulgated laws, regulations, or requirements because some Indian tribe laws, which could apply to a Superfund cleanup, may not be promulgated in the same fashion as state or federal laws. CERCLA section 126 directs EPA to afford Indian tribes substantially the same treatment as states for certain specified subsections of CERCLA sections 103, 104 and 105. EPA believes, as a matter of policy, that it is similarly appropriate to treat Indian tribes as states for the purpose of identifying ARARs under section 121(d)(2). EPA realizes that tribal methods for promulgating laws may vary, so any evaluation of tribal ARARs will have to

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water; thus, the removal action might be limited to removal of the drums and surface debris and excavation of highly contaminated soil. Requirements pertaining to the cleanup of groundwater contamination would not be ARARs for that action because the removal action is not intended to address ground water; rather, requirements pertaining to the drums, surface debris, or contaminated soil may be ARARs for the specific removal action. Once the lead agency makes the determination that the requirements are ARARs for a removal, then it must determine whether compliance is practicable.

It will generally be practicable for removal actions to comply with ARARs that are consistent with the goals and focus of the removal. However, as stated above, removals are intended to be responses to near-term threats, with the ability to respond quickly when necessary; thus, ARARs that would delay rapid response when it is necessary, or cause the response to exceed removal goals, may be determined to be impracticable. Of course, even where compliance with specific ARARs is not deemed practicable, the lead agency for a removal must use its best judgment to ensure that the action taken is protective of human health and the environment within the defined objectives of the removal action.

In order to better explain how a lead agency can determine when compliance with an ARAR is practicable, the preamble to the proposed NCP included three factors for consideration: Exigencies of the situation, scope of the removal action and the statutory limits (53 FR 51410–11). Upon consideration of comments, EPA has decided to enumerate in the rule only two of these three factors as important for determining practicability: Urgency (simply renaming exigencies) of the situation, and scope of the removal action. EPA believes that statutory limits, because they relate to the authority to conduct removal actions, are easier to consider within, rather than apart from, the factor of scope of the removal action when determining whether compliance with an ARAR is practicable.

The factor of urgency of the situation relates to the need for a prompt response. In many cases, appropriate response activities must be identified and implemented quickly in order to ensure the protection of human health and the environment. For example, if leaking drums pose a danger of fire or explosion in a residential area, the drums must be addressed immediately, and it will generally be impracticable to identify and comply with all potential ARARs.

The second factor, the scope of the removal action relates to the special nature of removals in that they may be used to minimize and mitigate potential harm rather than totally eliminate it. Removals are further limited in the amount of time and Fund money that may be expended at any particular site in the absence of a statutory exemption. Again, using the example above, even though standards requiring cleanup of the lower level soil contamination would be an ARAR to that medium, they would be outside the scope of the removal action when such cleanup is not necessary for the stabilization of the site, or when it would cause an exceedance of the statutory limits and no exemption applied. Hence, such soil standards, while ARARs, would not be practicable to attain considering the exigencies of the situation. Of course, such standards may be ARARs for any remedial action that is subsequently taken at the site.

EPA disagrees with the comment that requiring PRPs to comply with ARARs to the extent practicable discourages PRPs from conducting removals because the statutory limits do not apply to non-Fund-financed actions. Although the limits apply by law to Fund-financed actions only, EPA has the discretion under CERCLA section 104(c)(1) to take removal actions that exceed those limits, in emergency situations or where the action is otherwise appropriate and consistent with the remedial action that may be taken at the site. EPA will select the appropriate remedy, even where an extensive removal action is warranted, regardless of whether the site is Fund-lead or PRP-based. The only difference is that if the site is Fund-lead, an exemption must first be invoked in order to proceed with the action. Thus, the time and dollar limitations generally will not result in PRPs performing a more extensive removal than EPA itself would conduct. That is, EPA's selection of a removal action, including what ARARs will be attained, will not be based on who will be conducting the removal.

Finally, as stated in the preamble to the proposed NCP (53 FR 51411), even if attainment of an ARAR is practicable under the factors described above, the lead agency may also consider whether one of the statutory waivers from compliance with ARARs is available for a removal action. EPA is developing guidance on the process of complying with ARARs during removal actions. EPA generally will only require documentation of ARARs for which compliance is determined to be practicable, in order not to burden OSCs with substantial paperwork requirements.

Final rule: Proposed § 300.415(j) (renumbered as final § 300.415(i)) is revised as follows:

1. The following has been added to identify factors that are appropriate for consideration in determining the practicability of complying with ARARs:

In determining whether compliance with ARARs is practicable, the lead agency may consider appropriate factors, including the following:

(1) The urgency of the situation; and

(2) The scope of the removal action to be conducted.

2. The reference to advisories, criteria or guidance has been modified (see preamble section below on TBCs).

3. The description of ARARs has been reworded (see preamble section below on the definition of "applicable.")

Name: Sections 300.5, 300.415(g) and (h), 300.500(a), 300.505 and 300.525(a). State involvement in removal actions.

Existing rule: Sections 300.61 and 300.62 of the current NCP encourage states to undertake actions authorized under subpart F. Such actions include removal and remedial actions pursuant to CERCLA section 104(a)(1). The regulation notes further that CERCLA section 104(d)(1) authorizes the federal government to enter into contracts or cooperative agreements with the state to take Fund-financed response actions authorized under CERCLA, when the federal government determines that the state has the capability to undertake such actions.

Proposed rule: Proposed § 300.415(h) and (i) (renumbered as final § 300.415(g) and (h)) and § 300.525(a) would codify EPA's existing policy of entering into cooperative agreements with states to undertake Fund-financed removal actions, provided that states follow all the provisions of the NCP removal authorities. The preamble to the proposed rule suggested that non-time-critical actions are the most likely candidates for state-lead removals (53 FR 51410). Proposed § 300.510(b) provided further that facilities operated by a state or political subdivision require a minimum cost share of 50 percent of the total response costs if a remedial action is taken. Section 300.505 describes what EPA and a state may agree to in a Superfund Memorandum of Agreement (SMOA) regarding the nature and extent of interaction on EPA-lead and state-lead response. The preamble clarified that, where practicable, a SMOA may include general provisions

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considered, as appropriate, in formulating a removal action.

Proposed rule: Proposed § 300.415(j) (renumbered as 300.415(i) in the final rule) required that removal actions attain, to the extent practicable considering the exigencies of the situation, all state as well as federal applicable or relevant and appropriate requirements (ARARs).[9] Other federal and state criteria, advisories, and guidance shall, as appropriate, be considered in formulating the removal action. The proposed revisions also note that statutory waivers from attaining ARARs may be used for removal actions. In addition, the preamble to the proposed revisions provided guidance clarifying three factors to be considered in determining the "practicability" of complying with ARARs: The exigencies of the situation, the scope of the removal action to be taken, and the effect of ARAR attainment on the removal statutory limits for duration and cost (53 FR 51410–11).

Response to comments: Several commenters supported the proposed revision to the NCP requiring that both federal and state ARARs be complied with when conducting removal actions. One commenter asked what documentation is required to show that ARARs have been identified and requested that EPA develop guidance providing hypothetical conditions describing the extent to which ARAR analysis should be performed. Another commenter stated that non-Fund-financed removal actions conducted at federal facilities also should be required to comply with ARARs.

In opposition to the proposal, a number of commenters pointed out that Congress did not intend that removal actions be required to comply with ARARs. The commenters suggested that, based on the legislative history, Congress intended that only remedial actions be subject to compliance with ARARs. According to one commenter, the legislative history states that ARARs do not apply during removal actions because removal actions are short-term, relatively low-cost activities of great urgency that should be free of the delays that may arise if it is necessary to identify and attain ARARs.

Other commenters suggested that attainment of ARARs should not be required during removal actions because removal actions are not intended to completely clean up a site, but rather to quickly eliminate or control an immediate threat. The commenters argued that compliance with ARARs is based on what remains on site after an entire remedy is completed, not after a particular problem is controlled. In addition, several commenters argued that the main purpose of the removal program is quick mitigation of threats, and that requiring ARARs to be complied with during removal actions undermines this purpose by slowing down the cleanup process. The commenters suggested that such procedural delays as identification of ARARs will hinder the removal program's ability to respond to emergencies swiftly.

Several additional commenters suggested that requiring attainment of ARARs discourages PRPs from undertaking removal actions. Fund-financed removals can use the statutory limits to limit attainment of ARARs; those limits do not apply to PRP actions.

One commenter opposed the provision that requires OSCs to justify why they are not attaining ARARs during a specific removal action. The commenter argued that the prospect of an OSC being required to justify why he or she is not attaining all ARARs is inconsistent with removal program objectives.

Other commenters believed that the current policy concerning compliance with ARARs during removal actions should be replaced with a more discretionary policy. They suggested that OSCs should only be required to comply with ARARs that are most crucial to the proper stabilization of the site and protection of public health and the environment.

In response, EPA has carefully reviewed this issue in light of the public comments, and believes a number of clarifying points need to be made. First, as a threshold matter, EPA agrees that Congress did not, in the 1986 amendments to CERCLA, "require" EPA to meet ARARs during removal actions. However, it has been EPA's policy since 1985, established in the NCP, to attain ARARs during removals to the extent practicable, considering the exigencies of the situation. EPA believes that this is still a sound policy. Reference to requirements under other laws (i.e., ARARs) help to guide EPA in determining the appropriate manner in which to take a removal action at many sites.

If, for example, a component of the removal action is to discharge treated waste to a nearby river or stream, effluent limitations based on federal or state water quality criteria will be useful in determining the extent of such treatment. Today's policy is consistent with section 105 of CERCLA which directs that the NCP include methods and criteria for determining the appropriate extent of removals. Thus, EPA is maintaining the policy described in the preamble to the proposed NCP, although EPA has modified the factors to be considered in determining practicability.

A number of other comments questioned the extent to which removals should attempt to attain ARARs. In responding to such comments, it is important to note that the policy that removals comply with ARARs to the extent practicable is defined in large part by the purpose of removal actions.

The purpose of removal actions generally is to respond to a release or threat of release of hazardous substances, pollutants, or contaminants so as to prevent, minimize, or mitigate harm to human health and the environment. Although all removals must be protective of human health and the environment within their defined objectives, removals are distinct from remedial actions in that they may mitigate or stabilize the threat rather than comprehensively address all threats at a site. Consequently, re[illegible] actions cannot be expected to att[illegible] ARARs. Remedial actions, in con[illegible] must comply with all ARARs (or invoke a waiver). Indeed, the imposition by Congress of limits on the amount of time and Fund money that may be spent conducting a removal action often precludes comprehensive remedies by removal actions alone. Removal authority is mainly used to respond to emergency and time-critical situations where long deliberation prior to response is not feasible. All of these factors—limits on funding, planning time, and duration, as well as the more narrow purpose of removal actions—combine to circumscribe the practicability of compliance with ARARs during individual removal actions. Indeed, the vast majority of removals involve activities where consideration of ARARs is not even necessary, e.g., off-site disposal, provision of alternate water supply, and construction of fences, dikes and trenches.

Further, it should be noted that requirements are ARARs only when they pertain to the specific action being conducted. If, for example, a site has leaking drums, widespread soil contamination, and significant g[illegible] water contamination, the remov[illegible] at the site might only involve act[illegible] necessary to reduce the near-term threats, such as direct contact and further deterioration of the ground

[9] Note that proposed § 300.415(e) has been deleted (see preamble section above on "Listing sites in CERCLIS," and the remaining sections in § 300.415 have been renumbered.

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be made on a case-by-case basis. Tribal requirements, however, are still subject to the same eligibility criteria as states, as described in § 300.400(g)(4).

Another commenter disagreed with EPA's position that environmental laws do not apply to a CERCLA response action unless incorporated by CERCLA section 121(d). This commenter argued that EPA has confused the ARARs concept with one of preemption of state law.

In response, SARA established a process, in CERCLA sections 121(d)(2) and (d)(4), for how federal and state environmental laws should apply to on-site CERCLA remedial actions, i.e., the ARARs process. Based on these provisions, CERCLA remedies will incorporate (or waive) state standards, as appropriate under CERCLA. Thus, although other environmental laws do not independently apply to CERCLA response actions, the substantive requirements of such laws will be applied to such actions, consistent with section 121(d) and NCP § 300.400(g).

EPA's interpretation that CERCLA response actions are required to meet state (and other federal) environmental law standards only to the limited degree set out in CERCLA is also necessary to comply with the special mandates in CERCLA to respond quickly to emergencies, and to perform Fund-balancing. The position that on-site CERCLA response actions are not independently subject to other federal or state environmental laws is a long-standing one, based on a theory of implied repeal or pre-emption. See, e.g., 50 FR 47912, 47917-18 (Nov. 20, 1985); 50 FR 5862, 5865 (Feb. 12, 1985); "CERCLA Compliance With Other Environmental Laws" Opinion Memorandum, Francis S. Blake, General Counsel, to Lee M. Thomas, Administrator, Nov. 22, 1985.

Following are summaries of major comments and EPA's responses on specific sections of the ARARs policy.

Name: Sections 300.5 and 300.400(g)(1), Definition of "applicable."

Proposed rule: "Applicable requirements" means those cleanup standards, standards of control, or other substantive environmental protection requirements, criteria, or limitations promulgated under federal or state law that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA site. The preamble to the proposed rule pointed out that there is generally little discretion in determining whether the circumstances at a site match those specified in a requirement (53 FR 51435-37).

Response to comments: One commenter suggested that language used in § 300.400(g)(4) of the proposed NCP which provides that "only those state standards that are promulgated and more stringent than federal requirements may be applicable or relevant and appropriate" be added to the definition of ARARs found in § 300.5.

In response, EPA notes that the definition it proposed already includes the condition that standards, whether federal or state, must be promulgated in order to be potential ARARs. EPA accepts this comment on stringency and has revised both §§ 300.5 and 300.400(g) to specify that in order to be considered ARARs, state requirements must be more stringent than federal requirements. EPA notes that, in general, state regulations under federally authorized programs are considered federal requirements.

A commenter supported the discussion of ARARs in the preamble to the proposed NCP, but remarked that the definitions of ARARs do not adequately reflect many of the important aspects mentioned in the preamble. EPA believes that the definitions stated in the rule are sufficiently comprehensive and that the information contained in the preamble to the proposed and final rules will help the public in applying the definitions.

One commenter asked why EPA had deleted rule language that applicable requirements are those requirements that would be legally applicable if the response action were not undertaken pursuant to CERCLA. In working with this definition, EPA found the previous definition confusing because it was stated in the conditional, i.e., requirements that would apply if the action were not under CERCLA. EPA revised the definition to explain more specifically what it means by applicable requirements to avoid any confusion. However, the 1985 wording is still a correct statement of the applicability concept. EPA is modifying the definition, however, to make it clear that the standards, etc. do not have to be promulgated specifically to address CERCLA sites.

Final rule: The proposed definition of "applicable" in §§ 300.5 and 300.400(g)(1) are revised as follows:

1. Consistent with the language in CERCLA section 121(d)(2), the description of federal and state laws in § 300.5 is revised to read:

"* * * requirements, criteria or limitations promulgated under federal *environmental* or state *environmental or facility siting law* * * * *"

[Comparable changes are made in §§ 300.415(i), 300.430(e)(2)(i)(A), 300.430(e)(9)(iii)(B) and 300.430(f)(1)(ii)(C).]

2. The following sentence is added to § 300.5: "Only those state standards that are identified by a state in a timely manner and that are more stringent than federal requirements may be applicable."

3. In §§ 300.5 and 300.400(g)(1), the word "found" is added before "at a CERCLA site."

Name: Sections 300.5 and 300.400(g)(2), Definition of "relevant and appropriate."

Proposed rule: "Relevant and appropriate requirements" means those cleanup standards, standards of control, and other substantive environmental protection requirements, criteria, or limitations promulgated under federal or state law that, while not "applicable" to a hazardous substance, pollutant, contaminant, remedial action, location, or circumstance at a CERCLA site, address problems or situations sufficiently similar to those encountered at the CERCLA site that their use is well suited to the particular site.

Section 300.400(g)(2) identified criteria that must be considered, where pertinent, to determine whether a requirement addresses problems or situations that are sufficiently similar to the circumstances of the release or remedial action that it is relevant and appropriate. The preamble to the proposed rule emphasized that a requirement must be both relevant and appropriate; this determination is based on best professional judgment. Also, the preamble stated that with respect to some statutes or regulations, only some of the requirements may be relevant and appropriate to a particular site, while others may not be (53 FR 51436-37).

Response to comments: 1. *General.* Several commenters expressed support in general for the revised definition of relevant and appropriate requirements and for the approach described in the proposal to identifying such requirements. Commenters in particular supported statements that a requirement must be both relevant, in that the problem addressed by a requirement is similar to that at the site, and appropriate, or well-suited to the circumstances of the release and the site, to be considered a relevant and appropriate requirement.

A few commenters recommended changes to the definition of relevant and appropriate requirements. One commenter suggested adding to the proposed definition that a relevant and appropriate requirement must be

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"generally pertinent," a phrase used in the preamble of the proposed NCP in discussing the analysis of the relevance of a requirement, while another suggested adding "pertinent" to the circumstances of the site, expressing concern that "generally pertinent" was overly broad. EPA believes that the concept of "pertinence" is adequately considered as part of the evaluation of what is relevant and appropriate (see discussion of factors for determining relevant and appropriate requirements, below). EPA does not believe that the suggested changes should be made in the definition itself.

Another commenter suggested revising the definition to emphasize the jurisdictional prerequisites of a potentially relevant and appropriate requirement, recommending that a relevant and appropriate requirement be defined as one that, "while not applicable, sufficiently satisfies the jurisdictional prerequisites for legal enforceability." EPA disagrees, because the jurisdictional prerequisites, while key in the applicability determination, are not the basis for relevance and appropriateness. Rather, the evaluation focuses on the purpose of the requirement, the physical characteristics of the site and the waste, and other environmentally- or technically-related factors.

Another commenter objected to the policy that some portions of a regulation could be found relevant and appropriate, while other portions would not be. The commenter believed that this policy would lead to confusion and inconsistency, although the commenter agreed that the application of this policy to RCRA closure requirements, described in the proposal, was useful. EPA believes that this policy is appropriate and reflects its experience in evaluating RCRA closure requirements and other requirements as relevant and appropriate. Finding some parts of a regulation relevant and appropriate, and others not, allows EPA to draw on those standards that contribute to and are suited for the remedy and the site, even though all components of a regulation are not appropriate.

This approach has been particularly valuable as applied to RCRA closure, where the two applicable regulations, clean closure and landfill closure, address only the two poles of a potential continuum of closure responses. When RCRA closure is relevant and appropriate, Superfund may use a combination of these two regulations, known as hybrid closure, to fashion an appropriate remedy for a site that is protective of both ground water and direct contact (for more discussion of hybrid closure, see preamble to the proposed NCP at 53 FR 51446).

2. *Factors for determining relevant and appropriate requirements.* One commenter suggested referencing the criteria described in § 300.400(g)(2) in the definition. EPA believes this is not appropriate because it could lead to confusion about the role of the criteria and result in greater emphasis on rigidly applying the criteria than is warranted.

Based on this latter comment and others about specific criteria in the proposal, EPA wants to clarify the role of the factors. (Note that the rule now refers to "factors" rather than "criteria.") EPA intends that the factors in § 300.400(g)(2) should be considered in identifying relevant and appropriate requirements, but does not want to imply that the requirement and site situation must be similar with respect to each factor for a requirement to be relevant and appropriate. At the same time, similarity on one factor alone is not necessarily sufficient to make a requirement relevant and appropriate. Rather, the importance of a particular factor depends on the nature of the requirement and the site or problem being addressed and will vary from site to site. While the factors are useful in identifying relevant and appropriate requirements, the final decision is based on professional judgment about the situation at the site and the requirement as a whole.

In addition, as EPA discussed in the proposal, a requirement must be both "relevant," in that it addresses similar situations or problems, and "appropriate," which focuses on whether the requirement is well-suited to the particular site. Consideration of only the similarity of certain aspects of the requirement and the site situation constitutes only half of the analysis of whether a requirement is relevant and appropriate.

After review of comments it received, EPA has revised the language in § 300.400(g)(2) because it is concerned that it was misleading. Some commenters viewed the analysis required by this section as requiring consideration only of the similarity of the requirement and the problems or situation at the CERCLA site. While non-substantive for the most part, the changes to § 300.400(g)(2) make clearer that a requirement and a site situation must be compared, based on pertinent factors, to determine both the relevance and appropriateness of the requirement. The rule also now uses the term "factors," rather than "criteria," a change instituted to avoid confusion with the nine criteria for remedy selection in § 300.430.

One commenter suggested that factors be developed for use in evaluating whether a requirement is "appropriate." EPA does not believe this is necessary. Decisions about the appropriateness of a requirement are based on site-specific judgments using the same set of factors already identified. In the abstract it is very difficult to separate out those factors to be considered for relevance and those to be considered for appropriateness. In specific cases it would be possible to say, for example, that a requirement is relevant in terms of the substances but not appropriate in terms of the facility covered.

Several commenters questioned whether certain factors could legitimately be considered in identifying relevant and appropriate requirements. These and other comments on individual factors are discussed below; a brief description of each factor as described in the proposed NCP is given after the name of the factor.

(i): Purpose of the requirement. This factor compared the purpose of a requirement to the specific objectives of the CERCLA action. One commenter was concerned that the "objectives for the CERCLA action" could include the implementability of the remedy, its cost, and even the acceptability of the action to the community. This is not what EPA meant by "objectives." Rather, EPA intended that this factor consider the technical, or health and environmental purpose of the requirement compared to what the CERCLA action is trying to achieve. For example, MCLs are promulgated to protect the quality of drinking water; this is similar in purpose to a CERCLA action to restore ground water aquifers to drinkable quality. To avoid confusion, EPA has simplified the factor, which now states, "the purpose of the requirement and the purpose of the CERCLA action."

(ii): The medium regulated by the requirement. This factor compared the medium addressed by a requirement to the medium contaminated or affected at a CERCLA site. No comments were received on this factor, and the final rule is essentially unchanged from the proposal.

(iii): The substances regulated by the requirement. This factor compared the substances addressed by a requirement to the substances found at a CERCLA site. Several commenters argued that RCRA requirements for hazardous waste should not be potentially relevant and appropriate to wastes "similar" but not identical to a hazardous waste, and

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that this criterion should be dropped. EPA disagrees and has discussed this issue in the section of this preamble on RCRA ARARs.

(iv): The entities or interests affected or protected by the requirement. This factor compared the entities or interests addressed by a requirement and those affected by a CERCLA site. Two commenters expressed concern about this factor. One commenter was concerned that it could be used to disqualify standards from being relevant and appropriate simply because the requirement regulated entities different from those at a CERCLA site. In contrast, another commenter was concerned that EPA would broadly apply requirements to entities that were never intended to be subject to the requirement. EPA agrees that this factor is confusing. EPA believes that the characteristics intended to be addressed by this factor are adequately covered under other factors, such as purpose and type of facility. Therefore, this factor has been eliminated.

(v): The actions or activities regulated by the requirement. This factor compared the actions or activities addressed by a requirement to those undertaken in the remedial action at a CERCLA site. No comments were received on this factor, and the final rule is essentially unchanged from the proposal.

(vi): Any variances, waivers, or exemptions of the requirement. This factor considered the availability of variances, waivers, or exemptions from a requirement that might be available for the CERCLA site or action. One commenter asked for clarification on this factor and expressed his view that the CERCLA waiver provisions for ARARs were the only waivers allowable. However, EPA believes that it is reasonable to consider the existence of waivers, exemptions, and variances under other laws because generally there are environmental or technical reasons for such provisions. These provisions are generally incorporated into national regulations because there are specific circumstances where compliance with a requirement may be inappropriate for technical reasons or unnecessary to protect human health and the environment. Again, this factor is only one that should be considered; even if a waiver provision in a requirement matches the circumstances at the CERCLA site, there may be other reasons why the requirement is still relevant and appropriate.

(vii): The type and size of structure or facility regulated by the requirement. This factor compared the characteristics of the structure or facility addressed by a requirement to that affected by or contemplated by the remedial action. One commenter argued that regulations routinely contain cut-offs based on type or size of the structure or facility for administrative or enforcement convenience. EPA agrees that cut-offs based solely on administrative reasons may not be critical in determining whether a requirement is relevant and appropriate. However, EPA believes that it is necessary and appropriate to consider the physical type or size of structure regulated because requirements may be neither relevant nor appropriate to structures or facilities that are dissimilar to those that the requirement was intended to regulate. In many cases, this factor is a very basic one: in identifying requirements relevant to landfills, one would turn to standards for landfills, not for tanks.

(viii): Consideration of use or potential use of affected resources in the requirement. This factor compared the resource use envisioned in a requirement to the use or potential use at a CERCLA site. One commenter objected to this factor based primarily on opposition to EPA's proposed ground water policy, which, along with the comments EPA has received on this issue, is discussed in the section on ground-water policy in the preamble discussion of § 300.430. EPA believes it is appropriate to compare the resource use considerations in a requirement with similar considerations at a CERCLA site.

Final rule: 1. The following sentence is added to the proposed definition of "relevant and appropriate" in § 300.5 (see preamble discussion above on "applicable"): "Only those state standards that are identified by a state in a timely manner and that are more stringent than federal requirements may be relevant and appropriate."

2. Proposed § 300.400(g)(2) is revised as follows:

(2) If, based upon paragraph (g)(1) of this section, it is determined that a requirement is not applicable to a specific release, the requirement may still be relevant and appropriate to the circumstances of the release. In evaluating relevance and appropriateness, the factors in paragraphs (g)(2)(i) through (viii) shall be examined, where pertinent, to determine whether a requirement addresses problems or situations sufficiently similar to the circumstances of the release or remedial action contemplated, and whether the requirement is well-suited to the site, and therefore is both relevant and appropriate. The pertinence of each of the following factors will depend, in part, on whether a requirement addresses a chemical, location, or action. The following comparisons shall be made, where pertinent, to determine relevance and appropriateness:

(i) The purpose of requirement and the purpose of the CERCLA action.

(ii) The medium regulated or affected by the requirement and the medium contaminated or affected at the CERCLA site.

(iii) The substances regulated by the requirement and the substances found at the CERCLA site.

(iv) The actions or activities regulated by the requirement and the remedial action contemplated at the CERCLA site.

(v) Any variances, waivers, or exemptions of the requirement and their availability for the circumstances at the CERCLA site.

(vi) The type of place regulated and the type of place affected by the release or CERCLA action.

(vii) The type and size of structure or facility regulated and the type and size of structure or facility affected by the release or contemplated by the CERCLA action.

(viii) Any consideration of use or potential use of affected resources in the requirement and the use or potential use of the affected resource at the CERCLA site.

Name: Section 300.400(g)(3). Use of other advisories, criteria or guidance to-be-considered (TBC).

Proposed rule: The preamble to the proposed rule provided that advisories criteria or guidance to-be-considered (TBC) that do not meet the definition of ARAR may be necessary to determine what is protective or may be useful in developing Superfund remedies (53 FR 51436). The ARARs preamble described three types of TBCs: health effects information with a high degree of credibility, technical information on how to perform or evaluate site investigations or remedial actions, and policy.

For example, proposed § 300.400(g)(3) stated that other advisories, criteria, and guidance to be considered (TBCs) shall be identified, as appropriate, because they may be useful in developing CERCLA remedies. Proposed § 300.415(j)(§ 300.415(i) in the final rule) stated that other federal and state criteria, advisories, and guidance shall, as appropriate, be considered in formulating the removal action. Proposed § 300.430(b) stated that during project scoping the lead agency shall initiate a dialogue with the support agency on potential ARARs and TBCs. Proposed § 300.430(e)(2) provided that other pertinent information may be used to develop remediation goals. Proposed § 300.430(e)(8) provided that the lead agency shall notify the support agency of the alternatives to be analyzed to facilitate the identification of ARARs and TBCs. Proposed § 300.430(f) on selecting a remedy, however, referred to compliance with ARARs only, not TBCs. Proposed subpart F required that the

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Final rule: References to TBCs will be changed in the following sections to make it clear that their use is discretionary rather than mandatory: §§ 300.400(g)(3), 300.415(i), 300.430(b)(9), 300.430(d)(3), 300.430(e) (8) and (9), 300.505(d)(2)(iii), 300.515(d) and (d) (1) and (2), and 300.515(h)(2).

Name: Sections 300.400 (g)(4) and (g)(5), ARARs under state laws.

Proposed rule: Section 300.400(g) specified that only promulgated state standards may be considered potential ARARs. A promulgated state standard must be legally enforceable and of general applicability. The term "legally enforceable," according to the preamble to the proposed NCP, means that state laws or standards which are considered potential ARARs must be issued in accordance with state procedural requirements and contain specific enforcement provisions or be otherwise enforceable under state law. The preamble also explained that "of general applicability" means that potential state ARARs must be applicable to all remedial situations described in the requirement, not just CERCLA sites (53 FR 51437–38).

The preamble also discussed a dispute resolution process to be followed if there is disagreement about the identification of ARARs, as well as policies to be followed if a state insists that a remedy attain a requirement not determined to be ARAR (see 53 FR 51437 and 51457).

Response to comments: Commenters on this subject called for EPA to establish a formal procedure to be followed by states to demonstrate that proposed state ARARs are legally enforceable and of generally applicability. Commenters suggested that states be required to provide legal citations from appropriate sections of state laws, as well as appropriate citations to legal authority for issuing compliance orders, obtaining injunctions, or imposing civil or criminal penalties in the event of noncompliance. These citations, according to commenters, would demonstrate that proposed ARARs are legally enforceable.

Commenters suggested that general applicability could be demonstrated by requiring states to identify the chemicals, locations, and cleanup actions to which a proposed ARAR would apply.

The proposed NCP did not prescribe a specific procedure to be used in evaluating state standards as potential ARARs. A formal process for demonstrating that state requirements are promulgated is not required by CERCLA. EPA believes that the imposition of a formal procedure on states would be a large administrative burden and could impede the cleanup process.

EPA expects, however, that states will substantiate submissions of potential ARARs by providing basic evidence of promulgation, such as a citation to a statute or regulation and, where pertinent, a date of enactment, effective date, or description of scope. Because a citation is the minimum needed to positively identify a requirement, EPA has added regulatory language requiring both lead and support agencies to provide citations when identifying their ARARs.

Section 300.400(g)(4) specifies that only promulgated state standards that are more stringent than federal requirements and are identified by the state in a timely manner may be considered potential ARARs. If a question is raised as to whether a requirement identified by a state conforms to the requirements for being a potential state ARAR or is challenged on the basis that it does not conform to the definition, the state would have the burden of providing additional evidence to EPA to demonstrate that the requirement is of general applicability, is legally enforceable, and meets the other prerequisites for being a potential ARAR. If EPA does not agree that a state standard identified by a state is an ARAR, EPA will explain the basis for this decision.

Furthermore, the language of CERCLA section 121(d)(2)(A) makes clear, and program expediency necessitates, that the specific requirements that are applicable or relevant and appropriate to a particular site be identified. It is not sufficient to provide a general "laundry" list of statutes and regulations that might be ARARs for a particular site. The state, and EPA if it is the support agency, must instead provide a list of requirements with specific citations to the section of law identified as a potential ARAR, and a brief explanation of why that requirement is considered to be applicable or relevant and appropriate to the site.

Other comments on this section raised objections to EPA's acceptance of general goals as potential ARARs. One commenter questioned whether such general goals were implementable and satisfied the requirements of a promulgated standard, requirement, criteria, or limitation contained in CERCLA section 121(d). Another commenter argued that attempts to interpret compliance with a general goal will lead to confusion and delay. Several commenters requested clarification of the status of state nondegradation goals and whether such goals qualified as potential ARARs.

In response, it is necessary to examine the nature of a general goal in order to determine whether it may be an ARAR. General goals that merely express legislative intent about desired outcomes or conditions but are non-binding are not ARARs. EPA believes, however, that general goals, such as nondegradation laws, can be potential ARARs if they are promulgated, and therefore legally enforceable, and if they are directive in intent. The more specific regulations that implement a general goal are usually key in identifying what compliance with the goal means.

For example, in the preamble to the proposed NCP, EPA cited the example of a state antidegradation statute that prohibits the degradation of surface water below a level of quality necessary to protect certain uses of the water body (53 FR 51438). If promulgated, such a requirement is clearly directive in nature and intent. State regulations that designate uses of a given water body and state water quality standards that establish maximum in-stream concentrations to protect those uses define how the antidegradation law will be implemented are, if promulgated, also potential ARARs.

Even if a state has not promulgated implementing regulations, a general goal can be an ARAR if it meets the eligibility criteria for state ARARs. However, EPA would have considerable latitude in determining how to comply with the goal in the absence of implementing regulations. EPA may consider guidelines the state has developed related to the provision, as well as state practices in applying the goal, but such guidance or documents would be TBCs, not ARARs.

Final rule: 1. EPA has revised § 300.400(g)(4) as follows.

(4) Only those state standards that are promulgated, are identified by the state in a timely manner, and are more stringent than federal requirements may be applicable or relevant and appropriate. For purposes of identification and notification of promulgated state standards, the term "promulgated" means that the standards are of general applicability and are legally enforceable.

2. Also, language has been added to § 300.400(g)(5) requiring that specific requirements for a particular site be identified as ARARs, and that citations be provided.

Name: Section 300.515(d)(1) Timely identification of state ARARs.

Proposed rule: Section 300.515(d)(1) stated that the lead and support agencies shall identify their respective

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case of "applicable" requirements. However, the determination of whether a requirement is relevant and appropriate is not based on its stringency; rather, other criteria are used, as discussed in the section on relevance and appropriateness, and the remedy must comply with the most stringent requirement determined to be ARAR. EPA also believes that, in some situations, the availability of certain requirements that more fully match the circumstances of the site may result in a decision that another requirement is not relevant and appropriate. EPA believes that one such situation is when an MCL or non-zero MCLG and an FWQC for human health are available for the same contaminant when a current or potential source of drinking water is of concern, and there are no impacts to aquatic organisms.

As discussed in this preamble, EPA believes that an MCL or non-zero MCLG is generally the relevant and appropriate requirement for ground water that is a current or potential source of drinking water. EPA also believes that an MCL or non-zero MCLG, promulgated specifically to protect drinking water, generally is the appropriate standard for ground water even if an FWQC for human health is also available for the contaminant, for the following reasons.

CERCLA section 121(d)(2)(B)(i) lists, among other factors, the purpose for which the criteria were developed and the designated or potential use of the water as factors in determining whether FWQC are relevant and appropriate. Since FWQC for human health are promulgated for exposures that include drinking water and consuming fish, on the one hand, and consuming fish only, on the other, it is not directly the purpose of such criteria to provide drinking water standards per se, although levels that protect such a use can be mathematically derived from these two values. Furthermore, such derived values for drinking water will not reflect the contribution of other sources (through an apportionment factor), as MCLs and MCLGs do. Finally, for carcinogens FWQC are recommended at zero, although values corresponding to risks of 10^{-5}, 10^{-6}, and 10^{-7} are also given. For the reasons given in the discussion of MCLs and MCLGs above, the zero value is not considered relevant and appropriate under CERCLA. MCLs, however, represent a level determined to be both protective of human health for drinking water and attainable by treatment.

For the same reasons, EPA believes that MCLs or non-zero MCLGs generally will be the relevant and appropriate standards for surface water designated as a drinking water supply, unless the state has promulgated water quality standards (WQS) for the water body that reflect the specific conditions of the water body. However, surface water bodies may be designated for uses other than drinking water supply, and therefore an FWQC intended to be protective of such uses, such as the FWQC for consumption of fish or for protection of aquatic life, may very well be relevant and appropriate in such cases. Also, where a contaminant does not have an MCL or MCLG, FWQC adjusted to reflect drinking water use may be used as relevant and appropriate requirements.

Final rule: EPA is including in the final rule at § 300.430(e)(2)(i)(E) language stating that FWQC are to be attained where relevant and appropriate under the circumstances of the release or threatened release.

Name: Section 300.435(b)(2). Compliance with applicable or relevant and appropriate requirements (ARARs) *during* the remedial action.

Proposed rule: CERCLA section 121 requires that, at the completion of a remedial action, a level or standard of control required by an ARAR will be attained for wastes that remain on-site. However, consistent with the 1985 NCP (§ 300.68(i), § 300.435(b)) of the proposed NCP also required compliance with ARARs during implementation of the action, stating that *during the course of the remedial design/remedial action (RD/RA)*, the lead agency shall be responsible for ensuring that all federal and state ARARs identified for the action are being met, unless a waiver is invoked. Examples of such requirements given in the preamble to the proposed rule included RCRA treatment, storage, and disposal requirements, Clean Air Act national ambient air quality standards, and Clean Water Act effluent discharge limitations (53 FR 51440).

Response to comments: EPA received a number of comments that the NCP should not require compliance with ARARs during the remedial action. Commenters argued that this policy is inconsistent with the statute, which requires compliance with ARARs only at the completion of the remedial action, and questioned EPA's authority to require compliance with ARARs during remedial design/remedial action.

Several commenters pointed out that CERCLA section 121(d)(1) states that remedial actions must be protective and "must be relevant and appropriate under the circumstances," and argued that this standard should govern how the action itself is carried out. Design and operation of the remedial action should be based on best professional judgment and undertaken in a manner that is protective. Other commenters suggested requiring compliance only with those ARARs that "can reasonably be achieved," or listing specific types of ARARs that must be met during RD/RA.

Commenters were particularly concerned about problems created by requiring compliance with RCRA requirements and the land disposal restrictions in particular for remedial actions.

EPA disagrees with these commenters. EPA believes that it is appropriate to require that remedial activities comply with the substantive requirements of other laws that apply or are relevant and appropriate to those activities. The reasons for complying with such laws during the conduct of the remediation are basically the same as the reasons for applying ARARs as remediation objectives: the laws help define how the activity can be carried out safely and with proper safeguards to protect human health and the environment. EPA is concerned that, if the narrowest possible interpretation were applied to ARARs compliance, compliance with laws critical to protection of health and the environment would become subject to debate. laws such as those that govern surface water discharges or air emissions, or that set operational standards for incineration of hazardous waste.

Several commenters also stated that chemical-specific ARARs used as remediation goals, such as MCLs as ARARs for ground water remediation, cannot be attained during implementation. EPA wants to clarify that it recognizes that ARARs that are used to determine final remediation levels apply only at the completion of the action.

It is worthwhile to point out, in the context of this policy on complying with ARARs pertaining to the remedial activity itself, that CERCLA provides waiver from ARARs for interim actions provided the final action will attain waived standard. If there is doubt as whether an ARAR represents a final remediation goal or an interim standard and it cannot be met during the activity this waiver could be invoked.

Comments were also received on EPA's discussion of compliance with ARARs during remedial investigations in the preamble to the proposed NCP (53 FR 51442-43). In that discussion, EPA stated that on-site handling, treatment or disposal of investigation-derived waste must satisfy ARARs and that

field investigation teams should use best professional judgment in determining when such wastes contain hazardous substances. One commenter recommended that investigation-derived samples be required to be handled, treated, and disposed in accordance with applicable RCRA requirements.

In response, EPA wishes to clarify the discussion in the preamble to the proposed NCP. CERCLA section 101(23) defines "removal" to include "such actions as may be necessary to monitor, assess, and evaluate the release or threat of release of hazardous substances * * * [including] action taken under section 104(b) of [CERCLA]." EPA has stated, therefore, that studies and investigations undertaken pursuant to CERCLA section 104(b), such as activities conducted during the RI/FS, are considered removal actions (54 FR 13298, March 31, 1989). EPA's policy, explained elsewhere in today's preamble, is that removal actions will comply with ARARs to the extent practicable, considering the exigencies of the circumstances. Thus, the field investigation team should, when handling, treating or disposing of investigation-derived waste on-site, conduct such activities in compliance with ARARs to the extent practicable, considering the exigencies of the situation. Investigation-derived waste that is transported off-site (e.g., for treatability studies or disposal) must comply with applicable requirements of the CERCLA off-site policy (OSWER Directive No. 9834.11 (November 13, 1987)) and § 300.440 when finalized (see 53 FR 48218, November 29, 1988).[58] EPA notes that CERCLA section 104(c)(1) provides that the statutory limits on removals do not apply to investigations, monitoring, surveying, testing and other information-gathering performed under CERCLA section 104(b).

Final rule: EPA is promulgating the rule as proposed except for minor editing revisions.

Name: 300.5. Distinction between substantive and administrative requirements.

Proposed rule: The proposed definitions of "applicable" and "relevant and appropriate" stated that they are cleanup standards, standards of control, and other substantive environmental protection requirements, criteria or limitations. The preamble to the proposed rule explained that requirements that do not in and of themselves define a level or standard of control are considered administrative (53 FR 51443). Administrative requirements include the approval of, or consultation with, administrative bodies, issuance of permits, documentation, and reporting and recordkeeping. Response actions under CERCLA are required to comply with ARARs, which are defined not to include administrative requirements.

Response to comments: Many comments were received on EPA's differentiation between substantive and administrative requirements. Some commenters supported the distinction between substantive and administrative requirements. Other commenters disagreed with EPA's interpretation for various reasons.

Several commenters argued that Superfund actions should not be exempt from consultation requirements. One commenter argued that consultation with a state may be necessary to determine how state ARARs apply to the remedy. A commenter contended that it is virtually impossible to meet substantive requirements without consultation. One commenter asserted that state procedures or methodology necessary to determine permit levels should be considered state ARARs. Another argued that not requiring consultation runs opposite to the spirit of cooperation with states. One commenter suggested narrowing the exemption to allow for consultation through existing Superfund mechanisms such as consent orders, SMOAs, and cooperative agreements.

Commenters also objected to the exemption from reporting and recordkeeping requirements. One contended that EPA had no legal authority for such exemption. Others argued that reporting and recordkeeping are necessary to ensure proper control of hazardous substances that will remain on-site and are also necessary for activities with local impacts: Long-term water diversions and air or surface water releases. Commenters asserted that the lead agency must meet reporting requirements to avoid gaps in a state's environmental data. One commenter noted that there are a number of federal and state programs that require the maintenance of complete databases and that the NCP's approach is inconsistent with such programs. Under these programs, a state needs all discharge information in order to evaluate surface water toxicity impacts in a stream or to establish total maximum daily loads.

The concern was also raised that maintaining reporting and recordkeeping procedures on a site-by-site basis would undermine a state's standardized reporting requirements, e.g., groundwater monitoring report forms, NPDES forms, etc. Also, unique site approaches to reporting and recordkeeping may result in problems not detected by a state. Further, these commenters stated that they were not aware of Superfund recordkeeping and reporting requirements. One commenter stated that reporting requirements and compliance mechanisms during remedy implementation and O&M periods should be specified through Superfund mechanisms, as appropriate. One commenter contended that if Superfund insists on this distinction, a determination whether a requirement is substantive or administrative must be documented.

EPA has reviewed these comments, but concludes, as stated in the preamble to the proposed NCP (53 FR 51443), that CERCLA response actions should be subject only to substantive, not administrative, requirements. EPA believes that this interpretation is most consistent with the terms of CERCLA and with the goals of the statute. Section 121(d)(2) provides that remedial actions should require "a level or standard of control" which attains ARARs; only substantive standards set levels or standards of control. Moreover, Congress made clear in sections 121 (d)(2) and (d)(4) that the "standards" or "requirements" of other laws that are ARARs should be applied to actions conducted on-site, and specifically provided in section 121(e)(1) that federal and state permits would not be required for such on-site response actions. These subsections reflect Congress' judgment that CERCLA actions should not be delayed by time-consuming and duplicative administrative requirements such as permitting, although the remedies should achieve the substantive standards of applicable or relevant and appropriate laws. Indeed, CERCLA has its own comparable procedures for remedy selection and state and community involvement. EPA's approach is wholly consistent with the overall goal of the Superfund program, to achieve expeditious cleanups, and reflects an understanding of the uniqueness of the CERCLA program, which directly impacts more than one medium (and thus overlaps with a number of other regulatory and statutory programs). Accordingly, it would be inappropriate to formally subject CERCLA response actions to the multitude of administrative requirements of other federal and state offices and agencies.

[58] The CERCLA off-site policy requires that receiving facilities are in compliance with "applicable laws." Note that many treatability study wastes are exempt from the permitting requirement under RCRA (see 40 CFR 261.4(e) and (f)).

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At the same time, EPA recognizes the benefits of consultation, reporting, etc. To some degree, these functions are accomplished through the state involvement and public participation requirements in the NCP. In addition, EPA has already strongly recommended that its regional offices (and states when they are the lead agency) establish procedures, protocols or memoranda of understanding that, while not recreating the administrative and procedural aspects of a permit, will ensure early and continuous consultation and coordination with other EPA programs and other agencies. CERCLA Compliance with Other Laws Manual, OSWER Directive No. 9234.1-01 (August 8, 1988). In working with states, EPA generally will coordinate and consult with the state Superfund office. That state superfund office should distribute to or obtain necessary information from other state offices interested in activities at Superfund sites.

The basis for this recommendation is a recognition that such coordination and consultation is often useful to determine how substantive requirements implemented under other EPA programs and by other agencies should be applied to a Superfund action. For example, although the Superfund office will make the final decisions on using ARARs, a water office may provide information helpful in determining ARARs when a surface water discharge is part of the Superfund remedy. Such information may include surface water classifications, existing use designations, technology-based requirements, and water quality standards. A water office may also be able to provide advice during the detailed analysis of alternatives on the effectiveness and implementability of treatment alternatives and the likely environmental fate and effects of surface or ground-water discharges. Other offices or agencies with different environmental responsibilities may similarly provide useful information, if it is given in a timely manner.

EPA also recognizes the importance of providing information to other programs and agencies that maintain environmental data bases. This is particularly true where the remedy includes releases of substances into the air or water and the extent of such releases is integral for air and water programs to maintain accurate information on ambient air and surface water quality in order to set statutorily-specified standards. Monitoring requirements themselves are considered substantive requirements and are necessary in order to document attainment of cleanup levels and compliance with emission limitations or discharge requirements identified as ARARs in the decision document. EPA strongly encourages its OSCs or RPMs, or the agency that is responsible for maintaining the operation and maintenance of an action (e.g., pump and treat system), to provide reports on monitoring activities to other offices in a form usable to those offices.

In summary, cleanup standards must be complied with, although administrative procedures such as consultation are not required, they should be observed when, for example, they are useful in determining the cleanup standards for a site. EPA believes that in order to ensure that Superfund actions proceed as rapidly as possible it must maintain a distinction between substantive and administrative requirements.

Final rule: EPA is promulgating the reference to "substantive" in the § 300.5 definitions of "applicable" and "relevant and appropriate" as proposed.

Name: Section 300.430(f)(1)(ii)(B). Consideration of newly promulgated or modified requirements.

Proposed rule: The preamble to the proposed rule discussed how new requirements or other information developed subsequent to the initiation of the remedial action should be addressed (53 FR 51440). It explained that new requirements or other information should be considered as part of the five-year review (as provided for in § 300.430(f)(3)(v)) (renumbered as final § 300.430(f)(5)(iii)(C)) to ensure that the remedial action is still protective of human health and the environment. That is, if a requirement that would be applicable or relevant and appropriate to the remedy is promulgated after the initiation of remedial action, the remedy will be evaluated in light of the new requirement to ensure that the remedy is still protective.

Response to comments: Several commenters objected to EPA's policy requiring consideration of new requirements on the grounds that the statute requires the five-year review only to determine that a remedy is still protective. These commenters were concerned that consideration of new requirements would require additional analysis and perhaps drastic changes in design; would impose an open-ended liability on PRPs; and would violate PRPs' right to due process. Two commenters suggested that making new requirements part of a negotiation process based on a reopener in the settlement agreement could alleviate the second and third concern.

Based on the comments and its experience in carrying out remedies, EPA is modifying its policy on considering newly promulgated or modified requirements to address those requirements that are promulgated or modified after the ROD is signed, rather than those requirements promulgated or modified after the initiation of remedial action, as discussed in the proposal. Once a ROD is signed and a remedy chosen, EPA will not reopen that decision unless the new or modified requirement calls into question the protectiveness of the selected remedy. EPA believes that it is necessary to "freeze ARARs" when the ROD is signed rather than at initiation of remedial action because continually changing remedies to accommodate new or modified requirements would, as several commenters noted, disrupt CERCLA cleanups, whether the remedy is in design, construction, or in remedial action. Each of these stages represents significant time and financial investments in a particular remedy. For instance, the design of the remedy (treatment plant, landfill, etc.) is based on ARARs identified at the signing of the ROD. If ARARs were not frozen at this point, promulgation of a new or modified requirement could result in a reconsideration of the remedy and a re-start of the lengthy design process, even if protectiveness is not compromised. This lack of certainty could adversely affect the operation of the CERCLA program, would be inconsistent with Congress' mandate to expeditiously cleanup sites and could adversely affect PRP negotiations, as noted by commenters. The policy of freezing ARARs will help avoid constant interruption, re-evaluation, and re-design during implementation of selected remedies.

EPA believes that this policy is consistent with CERCLA section 121(d)(2)(A), which provides that "the remedial action selected * * * shall require, at the completion of the remedial action," attainment of ARARs. EPA interprets this language as requiring attainment of ARARs identified at remedy selection (i.e., those identified in the ROD), not those that may come into existence by the completion of the remedy.[51] Neither the explicit statutory language nor the legislative history supports a conclusion that a ROD may be subject to indefinite revision as a result of shifting

[51] No commenters objected to the position in the preamble to the proposed rule that CERCLA remedial actions should attain ARARs identified at the initiation—versus completion—of the action.

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requirements. Rather, given the need to ensure finality of remedy selection in order to achieve expeditious cleanup of sites, and given the length of time often required to design, negotiate, and implement remedial actions, EPA believes that this is the most reasonable interpretation of the statute.

As EPA discusses elsewhere in this preamble, one variation to this policy occurs when a component of the remedy was not identified when the ROD is signed. In that situation, EPA will comply with ARARs in effect when that component is identified (e.g., during remedial design) which could include requirements promulgated both before and after the ROD was signed. EPA notes that newly promulgated or modified requirements may directly apply or be more relevant and appropriate to certain locations, actions or contaminants than existing standards and, thus, may be potential ARARs for future responses.

It is important to note that a policy of freezing ARARs at the time of the ROD signing will not sacrifice protection of human health and the environment, because the remedy will be reviewed for protectiveness every five years, considering new or modified requirements at that point, or more frequently, if there is reason to believe that the remedy is no longer protective of health and environment.

In response to the specific comments received, EPA notes that under this policy, EPA does not intend that a remedy must be modified solely to attain a newly promulgated or modified requirement. Rather, a remedy must be modified if necessary to protect human health and the environment; newly promulgated or modified requirements contribute to that evaluation of protectiveness. For example, a new requirement for a chemical at a site may indicate that the cleanup level selected for the chemical corresponds to a cancer risk of 10^{-3} rather than 10^{-4}, as originally thought. The original remedy would then have to be modified because it would result in exposures outside the acceptable risk range that generally defines what is protective.

This policy that newly promulgated or modified requirements should be considered during protectiveness reviews of the remedy, but should not require a reopening of the ROD during implementation every time a new state or federal standard is promulgated or modified, was discussed in the preamble to the proposed rule (53 FR at 51440) but not in the rule section itself. For the reasons outlined above, EPA believes that this concept is critical to the expeditious and cost-effective accomplishment of remedies duly selected under CERCLA and the NCP, and thus is appropriate for inclusion in § 300.430(f)(1)(ii)(B) of the final NCP. This will afford both the public and implementing agencies greater clarity as to when and how requirements must be considered during CERCLA responses, and thus will allow the CERCLA program to carry out selected remedies with greater certainty and efficiency. Of course, off-site CERCLA remedial actions are subject to the substantive and procedural requirements of applicable federal, state, and local laws at the time of off-site treatment, storage or disposal.

Final rule: EPA is adding the following language to the rule at § 300.430(f)(1)(ii)(B):

(B) On-site remedial actions selected in a ROD must attain those ARARs that are identified at the time of ROD signature or provide grounds for invoking a waiver under § 300.430(f)(1)(ii)(C)(*3*).

(*3*) Requirements that are promulgated or modified after ROD signature must be attained (or waived) only when determined to be applicable or relevant and appropriate and necessary to ensure that the remedy is protective of human health and the environment.

(*2*) Components of the remedy not described in the ROD must attain (or waive) requirements that are identified as applicable or relevant and appropriate at the time the amendment to the ROD or the explanation of significant differences describing the component is signed.

Name: Applicability of RCRA requirements.

Proposed rule: The preamble to the proposed rule discussed when RCRA subtitle C requirements will be applicable for site cleanups (53 FR 51443). It described the prerequisites for "applicability" at length, which are that: (1) The waste must be a listed or characteristic RCRA hazardous waste and (2) treatment, storage or disposal occurred after the effective date of the RCRA requirements under consideration (for example, because the activity at the CERCLA site constitutes treatment, storage, or disposal, as defined by RCRA).

The preamble explained how EPA will determine when a waste at a CERCLA site is a listed RCRA hazardous waste. It noted that it is often necessary to know the origin of the waste to determine whether it is a listed waste and that, if such documentation is lacking, the lead agency may assume it is not a listed waste.

The preamble discussed how EPA will determine that a waste is a characteristic hazardous waste under RCRA. It stated that EPA can test to determine whether a waste exhibits a characteristic or can use best professional judgment to determine whether testing is necessary, "applying knowledge of the hazard characteristic in light of the materials or process used."

The preamble also discussed when a CERCLA action constitutes "land disposal," defined as placement into a land disposal unit under section 3004(k) of RCRA, which triggers several significant requirements, including RCRA land disposal restrictions (LDRs) and closure requirements (when a unit is closed). It equated an area of contamination (AOC), consisting of continuous contamination of varying amounts and types at a CERCLA site, to a single RCRA land disposal unit, and stated that movement within the unit does not constitute placement. It also stated that placement occurs when waste is redeposited after treatment in a separate unit (e.g., incinerator or tank), or when waste is moved from one AOC to another. Placement does not occur when waste is consolidated within an AOC, when it is treated in situ, or when it is left in place.

Response to comments: EPA received many comments on its discussion of when RCRA requirements can be applicable to CERCLA response actions. On the issue of compliance with RCRA in general, most of these commenters argued that RCRA requirements are not intended for site cleanup actions, that such compliance will result in delays and that RCRA requirements are often unnecessary to protect human health and the environment at CERCLA sites. Other commenters argued, however, that EPA is trying to avoid compliance with RCRA requirements. Most of the comments, however, focused on when LDRs are applicable to CERCLA actions and on EPA's discussion of what actions associated with remediation trigger LDRs.

Some commenters opposed EPA's interpretation of "land disposal" or "placement" as too lenient, believing that EPA is trying to avoid compliance with RCRA laws, particularly LDRs. These commenters argued that LDRs should be applicable when hazardous wastes are managed, excavated, or moved in any way. One argued that ARARs waivers are available to address situations when the LDR levels cannot be achieved and should be used as necessary, rather than trying to narrowly define the universe of ARARs to avoid waivers. This commenter was also concerned with EPA's use of the term "unit," calling it an inappropriate concept for Superfund sites because it

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will allow the excavation and redeposition of waste within very large areas without ever meeting RCRA design and operating standards and LDR. One commenter asserted that EPA concerns on LDRs stem from an unjustifiable belief that LDR cleanup levels cannot be achieved.

Other commenters believed that the definition of "placement" should provide more flexibility. One asserted that replacement of treated residuals in the proximate area should not constitute placement. The commenter argued that Congress intended to address, preventively or prospectively, the original act of disposal, and that an innocent government or public entity should not be required to assume the entire environmental responsibility of the original disposers. The commenter also argued that establishing that replacement of treated waste triggers LDRs will be a serious disincentive to treating wastes. Some commenters argued that LDRs should not be relevant and appropriate where the CERCLA waste to be disposed on land is merely similar in composition to RCRA banned waste.

Other commenters argued that LDRs are inappropriate for CERCLA remedial actions. They noted an inherent conflict between LDRs, which require treatment to BDAT levels, and the CERCLA process, and claimed that LDRs will supplant CERCLA's "carefully articulated and balanced approach to remedy selection." Commenters asserted that compliance with LDRs will create technical problems because of differences between CERCLA wastes and those evaluated for LDRs. The solutions recommended by these commenters primarily focused on narrowing or eliminating RCRA applicability, but included suggestions for creating treatability groups for CERCLA-type waste and seeking legislative waivers from LDRs, e.g., a waiver from LDRs for Superfund actions at NPL sites.

One commenter believed that the concept of "unit" is not readily transferable to CERCLA sites due to the age and former uses of many of the sites undergoing remediation. Given the ramifications of LDRs, the commenter argued, it may be more reasonable to create a presumption of treating the entire site as one "unit," even if remediation includes a series of operable units.

Some comments were received on EPA's statements on consolidating waste. One stated that consolidation of small amounts of waste across units should not be considered placement, because that will lead to less environmentally sound and less cost-effective solutions, particularly if LDRs are triggered. Another recommended that EPA should allow consolidation of small volumes of waste anywhere on-site, for purposes of storage or treatment, without triggering otherwise applicable RCRA standards. Another commenter requested clarification that consolidation within a unit included normal earthmoving and grading operations.

1. *Actions constituting land disposal.* EPA disagrees with commenters who considered EPA's interpretation of the definition of "land disposal" under RCRA section 3004(k) to be too narrow. These commenters argued that any movement of waste should be considered "placement" of waste, and thus "land disposal" under RCRA section 3004(k).

The definition of "land disposal" is central to determining whether the RCRA LDRs are applicable to a hazardous waste which is being managed as part of a CERCLA response action, or RCRA closure or corrective action. The term "land disposal" is defined under RCRA section 3004(k) as including, but not limited to, "any placement of such hazardous waste in a landfill, surface impoundment, waste pile, injection well, land treatment facility, salt dome formation, salt bed formation, or underground mine or cave." The terms "landfill", "surface impoundment," and the others, refer to specific types of units defined under RCRA regulations. Thus, Congress generally defined the scope of the LDR program as the placement of hazardous waste in a land disposal unit, as those units are defined under RCRA regulations.

EPA has consistently interpreted the phrase "placement • • • in" one of these land disposal units to mean the placement of hazardous wastes into one of these units, not the movement of waste within a unit. See e.g., 51 FR 40577 (Nov. 7, 1986) and 54 FR 41566–67 (October 10, 1989)(supplemental proposal of possible alternative interpretations of "land disposal"). EPA believes that its interpretation that the "placement • • • in" language refers to a transfer of waste into a unit (rather than simply any movement of waste) is not only consistent with a straightforward reading of section 3004(k), but also with the Congressional purpose behind the LDRs. The central concern of Congress in establishing the LDR program was to reduce or eliminate the practice of disposing of untreated hazardous waste at RCRA hazardous waste facilities. The primary aim of Congress was prospective rather than directed at already-disposed waste within a land disposal unit. See 51 FR 40577 (Nov. 7, 1986). Moreover, interpreting section 3004(k) to require application of the LDRs to any movement of waste could be difficult to implement and could interfere with necessary operations at an operating RCRA facility. For instance, when hazardous waste is disposed of in a land disposal unit at an operating RCRA facility, there may well be some "movement" of the waste already in the unit. Under the commenters' approach, such movement without pretreatment of the moved waste could be in violation of the LDRs. Thus, under the commenters' interpretation, virtually no operational activities could occur at any RCRA land disposal unit containing hazardous waste without pretreatment of any waste disturbed by the operation: clearly an infeasible approach.

EPA also believes that this interpretation of section 3004(k) is supported by the legislative history for this provision (see 129 Cong. Rec. H8139 (Oct. 8, 1983)(statement of Rep. Breaux)), and by the Congressional choice to define "land disposal" more narrowly for purposes of application of the LDRs than the already-existing term "disposal", which has a much broader meaning under RCRA. Under RCRA section 1004(3), the term "disposal" is very broadly defined and includes any "discharge, deposit, injection, dumping, spilling, leaking, or placing" of waste into or on any land or water. Thus, "disposal" (in a statutory, rather than the regulatory subtitle C meaning of the term) would include virtually any movement of waste, whether within a unit or across a unit boundary. In fact, the RCRA definition of "disposal" has been interpreted by numerous courts to include passive leaking, where no active management is involved (see, e.g., *U.S. v. Waste Industries, Inc.*, 734 F.2d 159 (4th Cir. 1984)). However, Congress did not use the term "disposal" as its trigger for the RCRA land disposal restrictions, but instead specifically defined the new, and more narrow, term "land disposal" in section 3004(k). The broader "disposal" language continues to be applicable to RCRA provisions other than those in subtitle C, such as section 7003. Thus, for the reasons outlined above, EPA believes that the existing interpretation, that movement of waste within a unit does not constitute "land disposal" for purposes of application of the RCRA LDRs, is reasonable.

With respect to the commenter who asked whether normal earthmoving and grading operations within a land disposal unit constitute "placement into

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the unit", under EPA's interpretation of RCRA section 3004(k), such activity would not be "placement into the unit" and thus the RCRA LDRs and other subtitle C disposal requirements would not be applicable (nor would the requirement to obtain a permit under RCRA or minimum technology requirements in RCRA section 3004(o) apply).

Given this interpretation of section 3004(k), EPA does not believe that it is necessary to invoke ARAR waivers of LDRs for any movement of waste within a unit, which was the alternative suggested by the commenters. Nor does EPA believe that the widespread use of such waivers would be practical or desirable. 54 FR 41568–69 (October 10, 1989).

EPA also does not fully agree with the commenters who argued that the RCRA concept of "unit" does not apply to CERCLA sites. The commenters who criticized the application of the RCRA "unit" to the CERCLA area of contamination for purposes of section 3004(k) believed it to be either too broad, allowing large areas to escape the LDRs, or too narrow, not allowing entire CERCLA sites to be considered a single "unit". In contrast to hazardous waste management units at a RCRA facility, CERCLA sites often do not involve discrete waste management units, but rather involve land areas on or in which there can be widespread areas of generally dispersed contamination. Thus, determining the boundaries of the RCRA land disposal "unit," for which section 3004(k) would require application of the LDRs at these sites, is not always self-evident.

EPA generally equates the CERCLA area of contamination with a single RCRA land-based unit, usually a landfill. 54 FR 41444 (December 21, 1988). The reason for this is that the RCRA regulatory definition of "landfill" is generally defined to mean a land disposal unit which does not meet the definition of any other land disposal unit, and thus is a general "catchall" regulatory definition for land disposal units. As a result, a RCRA "landfill" could include a non-discrete land area on or in which there is generally dispersed contamination. Thus, EPA believes that it is appropriate generally to consider CERCLA areas of contamination as a single RCRA land-based unit, or "landfill". However, since the definition of "landfill" would not include discrete, widely separated areas of contamination, the RCRA "unit" would not always encompass an entire CERCLA site.

Waste consolidation from different units or AOCs at a CERCLA site are subject to any applicable RCRA requirements regardless of the volume of the waste or the purpose of the consolidation. Thus, EPA disagrees with those commenters that asserted that small volumes of hazardous waste at a CERCLA site can be consolidated anywhere on-site for storage or treatment purposes without consideration of any applicable RCRA requirements. Such requirements may, however, be subject to ARAR waivers in appropriate circumstances.

The remaining comments received with respect to EPA's interpretation of section 3004(k) discussed the achievability of LDR cleanup levels, questioned the appropriateness of applying the LDRs to remedial actions, and requested more flexibility regarding the LDRs. These comments were the basis for EPA's supplemental notice and proposed reinterpretation of section 3004(k), which is discussed below.

In light of the numerous comments received on the interpretation of "land disposal" in RCRA section 3004(k), as it relates to removal, treatment, and redeposition of hazardous wastes generated by CERCLA and RCRA remedial and other activities, and in view of the important policy decisions that RCRA LDRs pose for the CERCLA and RCRA programs, EPA decided to separately and more fully discuss the issue, the interpretation outlined in the proposed NCP, and possible alternative interpretations of "land disposal". In a supplemental notice to the proposed NCP (54 FR 41566 (Oct. 10, 1989)), EPA outlined several technical, policy, and legal issues concerning LDR applicability to removal, treatment, and redeposition of hazardous wastes, and requested comment on two alternative interpretations of "land disposal". The first alternative would allow the excavation and replacement of previously disposed hazardous wastes in the same unit or area of contamination; since the same wastes would remain in the same unit, this activity would not constitute "land disposal". Under the second alternative, hazardous wastes could be excavated and redeposited either within the original unit or area of contamination, or elsewhere at the site in a new or existing unit. These interpretations would allow greater flexibility in remedial decision-making, in the context of both CERCLA actions and RCRA corrective actions and closures.

On November 6 and 7, 1989, EPA held a forum on contaminated soil and groundwater ("Contaminated Media Forum") to provide an opportunity for interested groups to further address these issues. The Contaminated Media Forum was attended by representatives from EPA, states, environmental groups, Congress, and the regulated community. A summary of the concerns raised and suggested solutions appears in the public docket for this rulemaking.

2. *Selection of LDR treatment standards.* Upon further examination, EPA believes that many of the problems discussed in the supplemental notice, and raised by commenters, result from treatment standards developed pursuant to the RCRA LDR program that are generally inappropriate or infeasible when applied to contaminated soil and debris. As discussed in the October 1989 notice, EPA's experience under CERCLA has been that treatment of large quantities of soil and debris containing relatively low levels of contamination using LDR "best demonstrated available technology" (BDAT) is often inappropriate. 54 FR 41567, 41568 (October 10, 1989). EPA noted that:

> Experience with the CERCLA program has shown that many sites will have large quantities—in some cases, many thousands of cubic meters—of soils that are contaminated with relatively low concentrations of hazardous wastes. These soils often should be treated, but treatment with the types of technologies that would meet the standard of BDAT may yield little if any environmental benefit over other treatment based remedial options.

54 FR 41568 (October 10, 1989). Examples of these and other situations reflecting EPA's experience concerning the inappropriateness of incinerating contaminated soil and debris are included in the record for this rule. In addition, as discussed below, EPA has experienced problems in achieving the current noncombustion LDRs for contaminated soil and debris. Based on EPA's experience to date and the virtually unanimous comments supporting this conclusion, EPA has determined that, until specific standards for soils and debris are developed, current BDAT standards are generally inappropriate or unachievable for soil and debris from CERCLA response actions and RCRA corrective actions and closures. Instead, EPA presumes that, because contaminated soil and debris is significantly different from the wastes evaluated in establishing the BDAT standards, it cannot be treated in accordance with those standards and thus qualifies for a treatability variance from those standards under 40 CFR 268.44.

Accordingly, persons seeking a treatability variance from LDR treatment standards for contaminated soil and debris do not need to demonstrate on a case-by-case basis

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believes that it is unnecessary for petitioners (or the lead Agency in CERCLA response actions) to make site-specific demonstrations that BDAT standards are inappropriate for contaminated soil and debris. The numerous comments and Agency experience supporting a presumption that the BDAT standards are inappropriate or not achievable is clearly warranted at this time because the criteria in 40 CFR 268.44 for treatability variances are generally met for soil and debris. As a result, under EPA's established treatability variance procedures (40 CFR 268.44), variance applications for contaminated soil and debris do not need to demonstrate that the physical and chemical properties differ significantly from wastes analyzed in developing the treatment standard and that, therefore, the waste cannot be treated to specified levels or by specified methods. Petitions need only focus on justifying the proposed alternative levels of performance, using existing interim guidance containing suggested treatment levels for soil and debris (Superfund LDR Guidance #8A, "Obtaining a Soil and Debris Treatability Variance for Remedial Actions", EPA OSWER Directive 9347.3-06FS, July 1989) as a benchmark.

Although the presumption is that BDAT standards are not appropriate for soil and debris, there may be special circumstances where EPA determines that the existing BDAT standards are appropriate for contaminated soils and debris at a particular site, such as where high levels of combustible organics in soil are present. In these circumstances, the Agency would make a determination that treatment to the BDAT standards was appropriate and would require such treatment.

EPA regulations provide that treatability variances may be issued on a site-specific basis. 40 CFR 268.44(h).[22] Thus, they may be approved simultaneously with the issuance of a RCRA permit, the approval of a RCRA closure plan, or the selection of a remedy in a CERCLA response action in the ROD. In the case of an on-site CERCLA response action, the procedural requirements of the variance process do not apply. See CERCLA sections 121(e)(1) and 121(d)(2). The variance decision will be made as part of EPA's remedy selection process, during which data justifying alternative treatment levels will be included in the administrative record files, and public participation opportunities and Agency response to comment will be afforded as appropriate under this rule.

In EPA's view, the Agency's determination that the BDAT standards are generally inappropriate for contaminated soil and debris addresses many of the practical concerns raised by commenters in the supplemental notice on the Agency's interpretation of the term "land disposal". For this reason, and because EPA has had insufficient time to review and evaluate the many lengthy and complex issues raised by commenters on the supplemental notice, EPA is deferring any final decision to modify that interpretation. (EPA will respond to comments on the alternatives in the supplemental notice when the Agency makes a final decision on the proposed reinterpretation of land disposal.) Until a final decision is made, the interpretation announced in the preamble to the proposed NCP and discussed in section 1 above will remain in effect.

Final rule: There is no rule language on this issue.

Name: Determination of whether a waste is a hazardous waste.

Proposed rule: The preamble to the proposed rule discussed how to determine whether hazardous waste regulated under RCRA Subtitle C was present at a site (53 FR 51444).

Response to comments: Some commenters raised questions about EPA's discussion about determining whether a waste exhibits a hazardous characteristic. One argued that EPA cannot assume a waste is not a characteristic waste in the absence of testing and should therefore adopt a liberal and inclusive approach to determining whether RCRA applies to avoid expensive and time-consuming testing. Another commenter asked for clarification on who was responsible for applying "process knowledge" to determine whether a waste was a hazardous waste in the absence of testing. The commenter asserted that, under RCRA, EPA exercises prosecutorial discretion if a generator, acting in good faith, decides incorrectly that his waste is not hazardous. EPA notes that when it determines that there is a violation there will normally be some kind of enforcement action taken; the level and type of prosecutorial response will depend on a number of factors, for example, the size of the company, the significance of the violation, the intent, etc.

Under RCRA rules, a generator is not required to test, but may use knowledge of the waste and its constituents to judge whether the waste exhibits a characteristic. (See 40 CFR 262.11(c).) EPA believes this should also apply if the lead agency or PRP at a CERCLA site is the "generator." EPA wants to make clear, however, that a decision that a waste is not characteristic in the absence of testing may not be arbitrary, but must be based on site-specific information and data collected on the constituents and their concentrations during investigations of the site. Based on site data, it will be very clear in some cases that a waste cannot be characteristic; for example, if a waste does not contain a constituent regulated as EP toxic, a decision that the waste does not exhibit this characteristic can reliably be made without testing for EP toxicity. EPA does not expect to undertake testing when it can otherwise be determined with reasonable certainty whether or not the waste will exhibit a characteristic.

In response to the second concern, the determination whether a waste is a hazardous waste may be made by EPA, the state, or a PRP, depending on the nature of the action. EPA will take any necessary or appropriate action if decisions about the hazardous nature of the waste are in error or are made without proper basis.

Several commenters discussed the question of whether RCRA requirements can be applicable to RCRA hazardous waste disposed of before the RCRA requirements went into effect in 1980. One commenter argued that they could not be, unless the waste exhibited a characteristic at the time of the CERCLA action. However, as one commenter noted, EPA has consistently maintained in enforcement actions that RCRA requirements apply to any waste

[22] In light of today's determination, the application of this rule requires clarification in two respects. First, although EPA is today establishing a general presumption that BDAT standards are inappropriate or not achievable for treating soil and debris, the Agency does not believe that this presumption triggers the rulemaking variance procedures in 40 CFR 268.44(a). Even with the presumption, treatment levels will be determined on a case-by-case basis, and commenters may submit information contending that the presumption is not applicable in a particular case. Thus, it is EPA's view that the site-specific, non-rulemaking procedures in 40 CFR 268.44(h) are entirely appropriate. See 53 FR 31199-31200 (August 17, 1988).

Second, EPA does not interpret its site specific variance procedures as invariably requiring applicants to demonstrate that they cannot meet applicable treatment levels or methods. The first sentence of 40 CFR 268.44(h) makes it clear that an applicant may make one of two demonstrations to qualify for a variance: he may show either that he cannot meet a treatment standard, or that a treatment method (or the method underlying the standard) is inappropriate for his waste. The final sentence of § 268.44(h), identifying the showing an applicant must include in his variance application, on its terms applies only to applications submitted under the first criterion. EPA's presumption, however, applies to soil and debris regardless of which of the two types of variances apply.

APPENDIX B to EPA/540/G-91/009

OSWER DIRECTIVE 9347.3-05 FS
SUPERFUND LDR GUIDE #5

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United States Environmental Protection Agency | Office of Solid Waste and Emergency Response | Superfund Publication: 9347.3-05FS July 1989

EPA

Superfund LDR Guide #5

Determining When Land Disposal Restrictions (LDRs) Are Applicable to CERCLA Response Actions

CERCLA Section 121(d)(2) specifies that on-site Superfund remedial actions shall attain "other Federal standards, requirements, criteria, limitations, or more stringent State requirements that are determined to be legally applicable or relevant and appropriate (ARAR) to the specified circumstances at the site." In addition, the National Contingency Plan (NCP) requires that on-site removal actions attain ARARs to the extent practicable. Off-site removal and remedial actions must comply with legally applicable requirements. This guide outlines the process used to determine whether the Resource Conservation and Recovery Act (RCRA) land disposal restrictions (LDRs) established under the Hazardous and Solid Waste Amendments (HSWA) are "applicable" to a CERCLA response action. More detailed guidance on Superfund compliance with the LDRs is being prepared by the Office of Solid Waste and Emergency Response (OSWER).

For the LDRs to be applicable to a CERCLA response, the action must constitute placement of a restricted RCRA hazardous waste. Therefore, site managers (OSCs, RPMs) must answer three separate questions to determine if the LDRs are applicable:

(1) Does the response action constitute placement?

(2) Is the CERCLA substance being placed also a RCRA hazardous waste? and if so

(3) Is the RCRA waste restricted under the LDRs?

Site managers also must determine if the CERCLA substances are California list wastes, which are a distinct category of RCRA hazardous wastes restricted under the LDRs (see Superfund LDR Guide #2).

(1) DOES THE RESPONSE CONSTITUTE PLACEMENT?

The LDRs place specific restrictions (e.g., treatment of waste to concentration levels) on RCRA hazardous wastes prior to their placement in land disposal units. Therefore, a key determination is whether the response action will constitute placement of wastes into a land disposal unit. As defined by RCRA, land disposal units include landfills, surface impoundments, waste piles, injection wells, land treatment facilities, salt dome formations, underground mines or caves, and concrete bunkers or vaults. If a CERCLA response includes disposal of wastes in any of these types of off-site land disposal units, placement will occur. However, concept of a RCRA unit less useful for actions involving on-site disposal of wastes. Therefore, to assist in defining when "placement" does and does not occur for CERCLA actions involving on-site disposal of wastes, EPA uses the concept of "areas of contamination" (AOCs), which may be viewed as equivalent to RCRA units, for the purposes of LDR applicability determinations.

An AOC is delineated by the areal extent (or boundary) of contiguous contamination. Such contamination must be continuous, but may contain varying types and concentrations of hazardous substances. Depending on site characteristics, one or more AOCs may be delineated. Highlight 1 provides some examples of AOCs.

Highlight 1: EXAMPLES OF AREAS OF CONTAMINATION (AOCs)

- A waste source (e.g., waste pit, landfill, waste pile) and the surrounding contaminated soil.
- A waste source, and the sediments in a stream contaminated by the source, where the contamination is continuous from the source to the sediments.*
- Several lagoons separated only by dikes, where the dikes are contaminated and the lagoons share a common liner.

* The AOC does not include any contaminated surface or ground water that may be associated with the land-

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For on-site disposal, placement occurs when wastes are moved from one AOC (or unit) into another AOC (or unit). Placement does not occur when wastes are left in place, or moved within a single AOC. Highlight 2 provides scenarios of when placement does and does not occur, as defined in the proposed NCP. The Agency is current reevaluating the definition of placement prior to the promulgation of the final NCP, and therefore, these scenarios are subject to change.

Highlight 2: PLACEMENT

Placement does occur when wastes are:

- Consolidated from different AOCs into a single AOC;
- Moved outside of an AOC (for treatment or storage, for example) and returned to the same or a different AOC; or
- Excavated from an AOC, placed in a separate unit, such as an incinerator or tank that is within the AOC, and redeposited into the same AOC.

Placement does not occur when wastes are:

- Treated in situ;
- Capped in place;
- Consolidated within the AOC; or
- Processed within the AOC (but not in a separate unit, such as a tank) to improve its structural stability (e.g., for capping or to support heavy machinery).

In summary, if placement on-site or off-site does not occur, the LDRs are not applicable to the Superfund action.

(2) IS THE CERCLA SUBSTANCE A RCRA HAZARDOUS WASTE?

Because a CERCLA response must constitute placement of a restricted RCRA hazardous waste for the LDRs to be applicable, site managers must evaluate whether the contaminants at the CERCLA site are the two types of RCRA hazardous wastes --listed and characteristic wastes.

Highlight 3: RCRA HAZARDOUS WASTES

A RCRA solid waste* is hazardous if it is listed or exhibits a hazardous characteristic.

Listed RCRA Hazardous Wastes

Any waste listed in Subpart D of 40 CFR 261, including:

- F waste codes (Part 261.31)
- K waste codes (Part 261.32)
- P waste codes (Part 261.33(e))
- U waste codes (Part 261.33(f))

Characteristic RCRA Hazardous Wastes

Any waste exhibiting one of the following characteristics, as defined in 40 CFR 261:

- Ignitability
- Corrosivity
- Reactivity
- Extraction Procedure (EP) Toxicity

* A solid waste is any material that is discarded or disposed of (i.e., abandoned, recycled in certain ways, or considered inherently waste-like). The waste may be solid, semi-solid, liquid, or a contained gaseous material. Exclusions from the definition (e.g., domestic sewage sludge) appear in 40 CFR 261.4(a). Exemptions (e.g., household wastes) are found in 40 CFR 261.4(b).

Site managers are not required to presume that a CERCLA hazardous substance is a RCRA hazardous waste unless there is affirmative evidence to support such a finding. Site managers, therefore, should use "reasonable efforts" to determine whether a substance is a RCRA listed or characteristic waste. (Current

remedial site investigations should be sufficient for this purpose.) For listed hazardous wastes, if manifests or labels are not available, this evaluation likely will require fairly specific information about the waste (e.g., source, prior use, process type) that is "reasonably ascertainable" within the scope of a Superfund investigation. Such information may be obtained from facility business records or from an examination of the processes used at the facility. For characteristic wastes, site managers may rely on the results of the tests described in 40 CFR 261.21 - 261.24 for each characteristic or on knowledge of the properties of the substance. Site managers should work with Regional RCRA staff, Regional Counsel, State RCRA staff, and Superfund enforcement personnel, as appropriate, in making these determinations.

In addition to understanding the two categories of RCRA hazardous wastes, site managers will also need to understand the derived-from rule, the mixture rule, and the contained-in interpretation to identify correctly whether a CERCLA substance is a RCRA hazardous waste. These three principles, as well as an introduction to the RCRA delisting process, are described below.

Derived-from Rule (40 CFR 261.3(c)(2))

The derived-from rule states that any solid waste derived from the treatment, storage, or disposal of a listed RCRA hazardous waste is itself a listed hazardous waste (regardless of the concentration of hazardous constituents). For example, ash and scrubber water from the incineration of a listed waste are hazardous wastes on the basis of the derived-from rule. Solid wastes derived from a characteristic hazardous waste are hazardous wastes only if they exhibit a characteristic.

Mixture Rule (40 CFR 261.3(a)(2))

Under the mixture rule, when any solid waste and a listed hazardous waste are mixed, the entire mixture is a listed hazardous waste. For example, if a generator mixes a drum of listed F006 electroplating waste with a non-hazardous wastewater (wastewaters are solid wastes - see Highlight 3), the entire mixture of the F006 and wastewater is a listed hazardous waste. Mixtures of solid wastes and characteristic hazardous wastes are hazardous only if the mixture exhibits a characteristic.

Contained-in Interpretation (OSW Memorandum dated November 13, 1986)

The contained-in interpretation states that any mixture of a non-solid waste and a RCRA listed hazardous waste must be managed as a hazardous waste as long as the material contains (i.e., is above health-based levels) the listed hazardous waste. For example, if soil or ground water (i.e., both non-solid wastes) contain an F001 spent solvent, that soil or ground water must be managed as a RCRA hazardous waste, as long as it "contains" the F001 spent solvent.

Delisting (40 CFR 260.20 and .22)

To be exempted from the RCRA hazardous waste "system," a listed hazardous waste, a mixture of a listed and solid waste, or a derived-from waste must be delisted (according to 40 CFR 260.20 and .22). Characteristic hazardous wastes never need to be delisted, but can be treated to no longer exhibit the characteristic. A contained-in waste also does not have to be delisted; it only has to "no longer contain" the hazardous waste.

If site managers determine that the hazardous substance(s) at the site is a RCRA hazardous waste(s), they should also determine whether that RCRA waste is a California list waste. California list wastes are a distinct category of RCRA wastes restricted under the LDRs (see Superfund LDR Guide #2).

(3) IS THE RCRA WASTE RESTRICTED UNDER THE LDRs?

If a site manager determines that a CERCLA waste is a RCRA hazardous waste, this waste also must be restricted for the LDRs to be an applicable requirement. A RCRA hazardous waste becomes a restricted waste on its HSWA statutory deadline or sooner if the Agency promulgates a standard before the deadline. Because the LDRs are being phased in over a period of time (see Highlight 4), site managers may need to determine what type of restriction is in

APPENDIX C to EPA/540/6-91/009

OSWER DIRECTIVE 9330.2-04
DISCHARGE OF WASTEWATER FROM CERCLA SITES INTO POTWs

Highlight 4: LDR STATUTORY DEADLINES

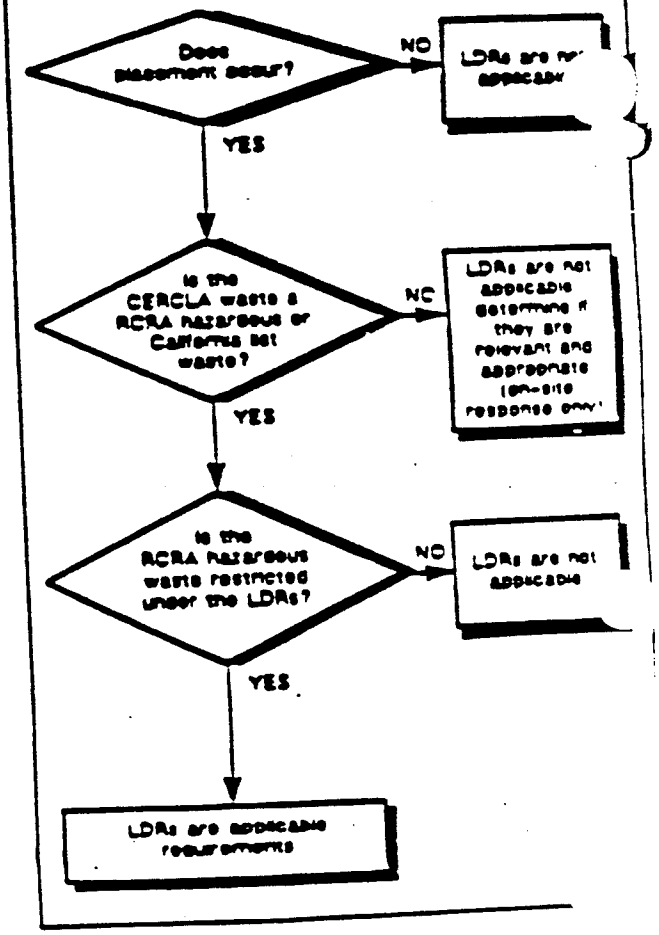
Waste	Statutory Deadline
Spent Solvent and Dioxin-Containing Wastes	November 8, 1986
California List Wastes	July 8, 1987
First Third Wastes	August 8, 1988
Spent Solvent, Dioxin-Containing, and California List Soil and Debris From CERCLA/RCRA Corrective Actions	November 8, 1988
Second Third Wastes	June 8, 1989
Third Third Wastes	May 8, 1990
Newly Identified Wastes	Within 6 months of identification as a hazardous waste

effect at the time placement is to occur. For example, if the RCRA hazardous wastes at a site are currently under a national capacity extension when the CERCLA decision document is signed, site managers should evaluate whether the response action will be completed before the extension expires. If these wastes are disposed of in surface impoundments or landfills prior to the expiration of the extension, the receiving unit would have to meet minimum technology requirements, but the wastes would not have to be treated to meet the LDR treatment standards.

APPLICABILITY DETERMINATIONS

If the site manager determines that the LDRs are applicable to the CERCLA response based on the previous three questions, the site manager must: (1) comply with the LDR restriction in effect, (2) comply with the LDRs by choosing one of the LDR compliance options (e.g., Treatability Variance, No Migration Petition), or (3) invoke an ARAR waiver (available only for on-site actions). If the LDRs are determined not to be applicable, then, for on-site actions only, the site manager should determine if the LDRs are relevant and appropriate. The process for determining whether the LDRs are applicable to a CERCLA action is summarized in Highlight 5.

Highlight 5 - DETERMINING WHEN LDRS ARE APPLICABLE REQUIREMENTS



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

APR 15 1986

OSWER Directive 9330.2-4

MEMORANDUM

SUBJECT: Discharge of Wastewater from CERCLA Sites into POTWS

FROM: Henry L. Longest II, Director
Office of Emergency and Remedial Response

Rebecca Hanmer, Director
Office of Water Enforcement and Permits

Gene A. Lucero, Director
Office of Waste Programs Enforcement

TO: Waste Management Division Directors
Regions I - X

Water Management Division Directors
Regions I - X

A number of emergency removals and remedial cleanup actions under CERCLA will involve consideration of publicly owned treatment works (POTWs) for discharge of wastewater. The current off-site policy (issued on May 6, 1985) does not address the set of concerns and issues unique to POTWs that must be evaluated during the Remedial Investigation and Feasibility Study (RI/FS) for discharge of CERCLA wastewater to POTWs.

Recently, we have had meetings with representatives of the Association of Metropolitan Sewerage Authorities (AMSA) to discuss technical and policy concerns related to the POTW/CERCLA issue. This memorandum is to highlight some of the major points under consideration which were shared with AMSA at their recent Winter Technical Conference. The Agency intends to develop policy on the use and selection of POTWs for CERCLA wastewater. Your comments are sought on the proposed criteria set forth herein. These criteria may be useful in evaluation of POTWs for response actions (fund financed or responsible party financed) to be taken in the interim.

Our position is that no CERCLA discharges to a POTW should occur unless handled in a manner demonstrated to be protective of human health and the environment. Full compliance with all applicable requirements of the Clean Water Act (CWA), the Resource Conservation and Recovery Act (RCRA), and any other relevant or appropriate environmental statutes will be necessary.

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The national pretreatment program, under the Clean Water Act, requires an analysis to determine whether the discharge of an industrial user of a POTW may pass through the POTW to cause receiving water quality problems or may interfere with POTW operations (including sludge disposal). If the analysis suggests that limits on the industrial user's discharge are needed to prevent pass through or interference, local limits or other safeguards, as necessary, must be established by the POTW and/or the NPDES permitting authority. The national pretreatment program requirements apply to the introduction of all non-domestic wastewater into any POTW, and include, among other things, the following elements:

- o Prohibited discharge standards - prohibit the introduction of pollutants to the POTW which are ignitable, corrosive, excessively high in temperature, or which may cause interference or pass through at the POTW.

- o Categorical discharge standards - include specific pretreatment standards which are established by EPA for the purpose of regulating industrial discharges in specific industrial categories.

- o Local limits - where no categorical standards have been promulgated or where more stringent controls are necessary.

POTWs under consideration as potential receptors of CERCLA wastewaters may include those POTWs either with or without an approved pretreatment program. POTWs <u>with</u> an approved pretreatment program are required to have the mechanisms necessary to ensure compliance by industrial users with applicable pretreatment standards and requirements.* POTWs <u>without</u> an approved pretreatment program must be evaluated to determine whether sufficient mechanisms exist to allow the POTW to meet the requirements of the national pretreatment program in accepting CERCLA wastewaters. As noted above, pass through and interference are always prohibited, regardless of whether a POTW has an approved pretreatment program. POTWs without an approved pretreatment program must therefore have mechanisms which are adequate to apply the requirements of the national pretreatment program to specific situations.

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*POTWs with approved pretreatment programs must, among other things, establish procedures to notify industrial users (IUs) of applicable pretreatment standards and requirements, receive and analyze self-monitoring reports from IUs, sample and analyze industrial effluents, investigate noncompliance, and comply with public participation requirements.

Determination of a POTW's ability to accept CERCLA wastewater as an alternative to on-site treatment and direct discharge to receiving waters must be made during the Remedial Investigation/ Feasibility Study (RI/FS) process. During the remedial alternatives analysis, the appropriateness of using a POTW must be carefully evaluated. Water Division officials and their state counterparts should participate in the evaluation of any remedial alternatives recommending the use of a POTW, and should concur on the selection of the POTW.

If an alternative considers the discharge of wastewater from a CERCLA site into a POTW, the following points should be evaluated in the RI/FS prior to the selection of the remedy for the site:

- The quantity and quality of the CERCLA wastewater and its compatibility with the POTW (The constituents in the CERCLA wastewater must not cause pass through or interference, including unacceptable sludge contamination or a hazard to employees at the POTW; in some cases, control equipment at the CERCLA site may be appropriate in order to pretreat the CERCLA discharge prior to introduction to the POTW).

- The ability (i.e., legal authority, enforceable mechanisms, etc.) of the POTW to ensure compliance with applicable pretreatment standards and requirements, including monitoring and reporting requirements.

- The POTW's record of compliance with its NPDES permit and pretreatment program requirements to determine if the POTW is a suitable disposal site for the CERCLA wastewater.

- The potential for volatilization of the wastewater at the CERCLA site and POTW and its impact upon air quality.

- The potential for groundwater contamination from transport of CERCLA wastewater or impoundment at the POTW, and the need for groundwater monitoring.

- The potential effect of the CERCLA wastewaters upon the POTW's discharge as evaluated by maintenance of water quality standards in the POTW's receiving waters, including the narrative standard of "no toxics in toxic amounts".

- The POTW's knowledge of and compliance with any applicable RCRA requirements or requirements of other environmental statutes (RCRA permit-by-rule requirements may be triggered if the POTW receives CERCLA wastewaters that are classified as "hazardous wastes" without prior mixing with domestic sewage, i.e., direct delivery to the POTW by truck, rail, or dedicated pipe; CERCLA wastewaters are not all necessarily considered hazardous wastes; case by case determinations have to be made).

- The various costs of managing CERCLA wastewater, including all risks, liabilities, permit fees, etc. (It may be appropriate to reflect these costs in the POTW's connection fees and user charge system).

Based upon consideration of the above elements, the discharge of CERCLA wastewater to a POTW should be deemed inappropriate if the evaluation indicates that:

- The constituents in the CERCLA discharge are not compatible with the POTW and will cause pass through, interference, toxic pollutants in toxic amounts in the POTW's receiving waters, unacceptable sludge contamination, or a hazard to employees of the POTW.

- The impact of the transport mechanism and/or discharging of CERCLA wastewater into a POTW would result in unacceptable impacts upon any environmental media.

- The POTW is determined to be an unacceptable receptor of CERCLA wastewaters based upon a review of the POTW's compliance history.

- The use of the POTW is not cost-effective.

If consideration of the various elements indicates that the discharge of CERCLA wastewater to a POTW is deemed appropriate:

- There should be early public involvement, including contact with POTW officials and users, in accordance with the CERCLA community relations plan and public participation requirements.

- The NPDES permit and fact sheet may need to be modified to reflect the conditions of acceptance of CERCLA wastewaters; permit modification may be necessitated by the need to incorporate specific pretreatment requirements, local limits, monitoring requirements and/or limitations on additional pollutants of concern in the POTW's discharge or other factors.

Policy to be developed in the future will apply to all removal, remedial, and enforcement actions taken pursuant to CERCLA and Section 7003 of RCRA. We would appreciate your feedback on this memorandum and any experience in the use of POTWs for CERCLA removal or remedial actions that you have to offer.

If you have any comments or questions on this issue, please submit written comments to the workgroup co-chairs: Shirley Ross (FTS-382-5755) from the Office of Emergency and Remedial Response, or Victoria Price (FTS-382-5681) from the Office of Water.

cc: Ed Johnson
Russ Wyer
Tim Fields
Steve Lingle

APPENDIX D to EPA/540/G-91/009

TCLP CONSTITUENTS

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TOXICITY CHARACTERISTIC CONSTITUENTS AND REGULATORY LEVELS

Constituent	Regulatory level (mg/L)
Arsenic	5.0
Barium	100.0
Benzene	0.5
Cadmium	1.0
Carbon tetrachloride	0.5
Chlorodane	0.03
Chlorobenzene	100.0
Chloroform	6.0
Chromium	5.0
o-Cresol	200.0
m-Cresol	200.0
p-Cresol	200.0
2,4-D	10.0
1,4-Dichlorobenzene	7.5
1,2-Dichloroethane	0.5
1,1-Dichloroethylene	0.7
2,4-Dinitrotoluene	0.13
Endrin	0.02
Heptachlor (and its hydroxide)	0.008
Hexachlorobenzene	0.13
Hexachloro-1,3-butadiene	0.5
Hexachlorethane	3.0
Lead	5.0
Lindane	0.4
Mercury	0.2
Methoxychlor	10.0
Methyl ethyl ketone	200.0
Nitrobenzene	2.0

TOXICITY CHARACTERISTIC CONSTITUENTS AND REGULATORY LEVELS

Constituent	Regulatory level (mg/L)
Pentachlorophenol	100.0
Pyridine	5.0
Selenium	1.0
Silver	5.0
Tetrachloroethylene	0.7
Toxaphene	0.5
Trichlorethylene	0.5
2,4,5-Trichlorophenol	400.0
2,4,6-Trichlorophenol	2.0
2,4,5-TP (Silvex)	1.0
Vinyl chloride	2.0

APPENDIX E to EPA/540/G-91/009

GLOSSARY OF TERMS

GLOSSARY OF TERMS

AOC - Area of Contamination

ARARs - Applicable or Relevant and Appropriate Requirements

BDAT - Best Demonstrated Available Technology

BOA - Basic Ordering Agreement

CAA - Clean Air Act

CERCLA - Comprehensive Environmental Response, Compensation, and Liability Act

CLP - Contract Laboratory Program

CWA - Clean Water Act

DE - Disposable Equipment

FIT - Field Investigation Team

HSWA - Hazardous and Solid Waste Amendments

IDW - Investigation - Derived Wastes

LDRs - Land Disposal Restrictions

NCP - National Contingency Plan

PCB - Polychlorinated Biphenyls

PPE - Personal Protective Equipment

POTW - Publicly Owned Treatment Works

PRPs - Potentially Responsible Parties

RCRA - Resource Conservation and Recovery Act

RI/FS - Remedial Investigation/Feasibility Study

RPO - Regional Project Officer

SDWA - Safe Drinking Water Act

SI - Site Inspection

SM - Site Inspection Manager

SWDA - Solid Waste Disposal Act

TSD - Treatment, Storage, and Disposal

TCLP - Toxicity Characteristic Leaching Procedure

TSCA - Toxic Substances Control Act

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LONGHORN ARMY AMMUNITION PLANT

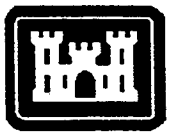
RI/FS

WORK PLAN

VOLUME 3
SITE SAFETY AND HEALTH PLAN

PREPARED FOR:
LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS

PREPARED BY:
U.S. ARMY CORPS OF ENGINEERS



JUNE 1992

005321

LONGHORN ARMY AMMUNITION PLANT
REMEDIAL INVESTIGATION/FEASIBILITY STUDY WORK PLAN
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LIST OF ACRONYMS

ACD	Air Curtain Destructor
ACGIH	American Conference of Governmental Industrial Hygienists
AMCCOM	U.S. Army Armament, Munitions, and Chemical Command
COE	U.S. Army Corps of Engineers
DNT	Dinitrotoluene
GOCO	Government Owned Contractor Operated
LHAAP	Longhorn Army Ammunition Plant
MSHA	Mine Safety and Health Administration
NIOSH	National Institute for Occupational Safety and Health
OEW	Ordnance and Explosive Waste
PEL	Permissible Exposure Limits
PID	Photoionization Detector
SCBA	Self Contained Breathing Apparatus
SEC	Site Emergency Coordinator
SSHO	Site Safety and Health Officer
SSHP	Site Safety and Health Plan
TLV	Threshold Limit Value
TNT	Trinitrotoluene
UEP	Unlined Evaporation Pond
WBGT	Wet Bulb Globe Temperature Index

SECTION 1.0

GENERAL

This Site Safety and Health Plan establishes procedures to protect Corps of Engineers (COE) and Contractor employees from potential safety and health hazards resulting from investigative activities conducted in support of this project. This plan has been prepared in accordance with OSHA regulations set forth in 29 CFR 1910.120. This plan applies to all personnel, including authorized visitors, working in the identified areas included in the scope of this project. Supervisors are to ensure that personnel understand and follow the guidelines and procedures contained within this plan. Contract personnel will be required to submit to the Contracting Officer specific items listed below:

- An organization chart outlining the responsibilities and lines of authority of key safety and health personnel.

- A copy of the corporate Safety and Health Program developed to protect employees, including a written respiratory program as required by 29 CFR 1910.134.

- Employee training assignments to assure compliance with 29 CFR 1910.120 (e). Documentation of training shall consist of a copy of training certificates.

- Medical Surveillance requirements for employees working on the site, including a physician's written opinion of an employees ability to wear a respirator.

- Air monitoring, personnel monitoring, and environmental sampling logs including maintenance and calibration records.

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SECTION 2.0

SITE LOCATION AND HISTORY

2.1 Site Location. Longhorn Army Ammunition Plant (LHAAP) is located in east central Texas in the northeast corner of Harrison County, approximately 14 miles northeast of Marshall, Texas, and approximately 40 miles west of Shreveport, Louisiana. The installation occupies 8,493 acres between State Highway 43 and the western shore of Caddo Lake. State Highways 43 and 134 access the installation. A location map is provided as Figure 1.

The plant is bounded to the north and east by Caddo Lake, a large fresh water lake lying on the Texas-Louisiana state line. The eastern fence of the installation is 3-1/2 miles from the state border. The small communities of Uncertain and Karnack, Texas, are located immediately north and west of the installation boundary, respectively. The remaining surrounding area is sparsely populated and is known as the Pineywoods of east Texas.

2.2 Site History. Longhorn Army Ammunition Plant is a government-owned, contractor-operated (GOCO) industrial facility under the jurisdiction of the U.S. Army Armament, Munitions, and Chemical Command (AMCCOM). Its primary mission is to load, assemble, and pack pyrotechnic and illuminating/signal ammunition and solid propellant rocket motors. The Longhorn Division of Thiokol Corporation is the current operating contractor.

LHAAP was established in October 1942 with the primary mission of producing 2,4,6-trinitrotoluene (TNT) flake in the Plant 1 area. Monsanto Chemical Company was the first contractor of the plant. Production of TNT continued through World War II until August 1945 when Monsanto's role ceased and the plant went on standby status until February 1952. From 1952 until 1956, Universal Match Corporation was the operating contractor, producing such pyrotechnic ammunition as photoflash bombs, simulators, hand signals, and tracers for 40mm.

In November 1955, Thiokol Corporation began operation of the Plant 3 area rocket motor facility. Thiokol assumed responsibility for total

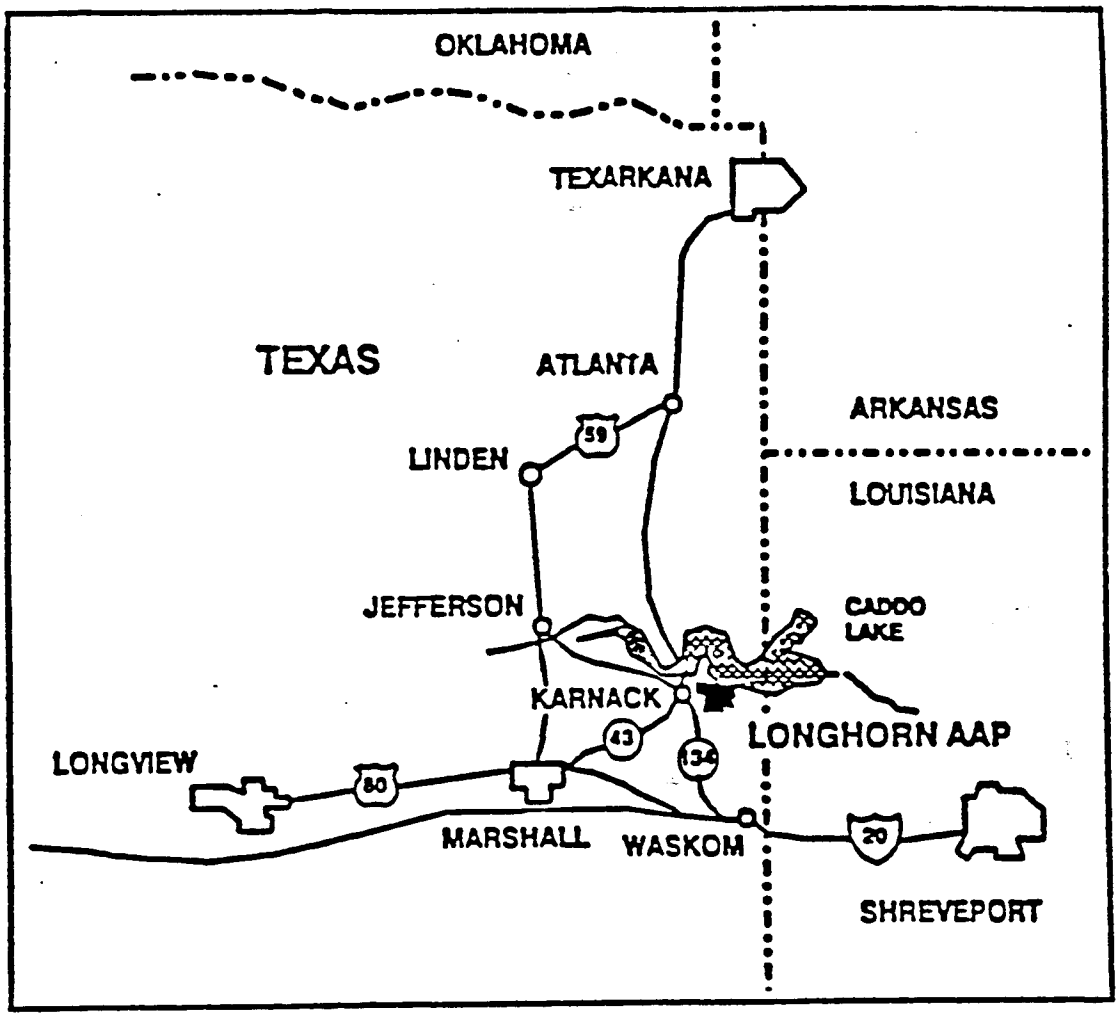
operation of the plant with the departure of Universal Match Corporation in 1956. Production of rocket motors continued to be the primary mission of LHAAP until 1965, when the production of pyrotechnic and illuminating ammunition was reestablished.

Industrial operations at LHAAP resulted in the disposal of various hazardous wastes into ditches, streams, and earthen impoundments where contamination has been identified.

FIGURE 1 GENERAL SITE LOCATION MAP

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LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS



2.3 **Current Site To Be Investigated.** There are thirteen SWMUs located at twelve sites included in this investigation. The location of the project sites is provided as Figure 2. The names of the twelve sites are:

LHAAP 11 - Suspected TNT Burial Site at Avenues P & Q

LHAAP 13 - Suspected TNT Burial Site between the Old and Active Landfills/Acid Dump

LHAAP 14 - Area 54 Burial Ground

LHAAP 16 - Old Landfill

LHAAP 17 - Burning Ground No.2/Flashing Area

LHAAP 18 - Burning Ground No. 3 and Unlined Evaporation

LHAAP 24 - Pond/Rocket Motor Washout Lagoon

LHAAP 29 - Former TNT Production Area

LHAAP 12 - Active Landfill

LHAAP 32 - Former TNT Disposal Plant

LHAAP 01 - Inert Burning Grounds

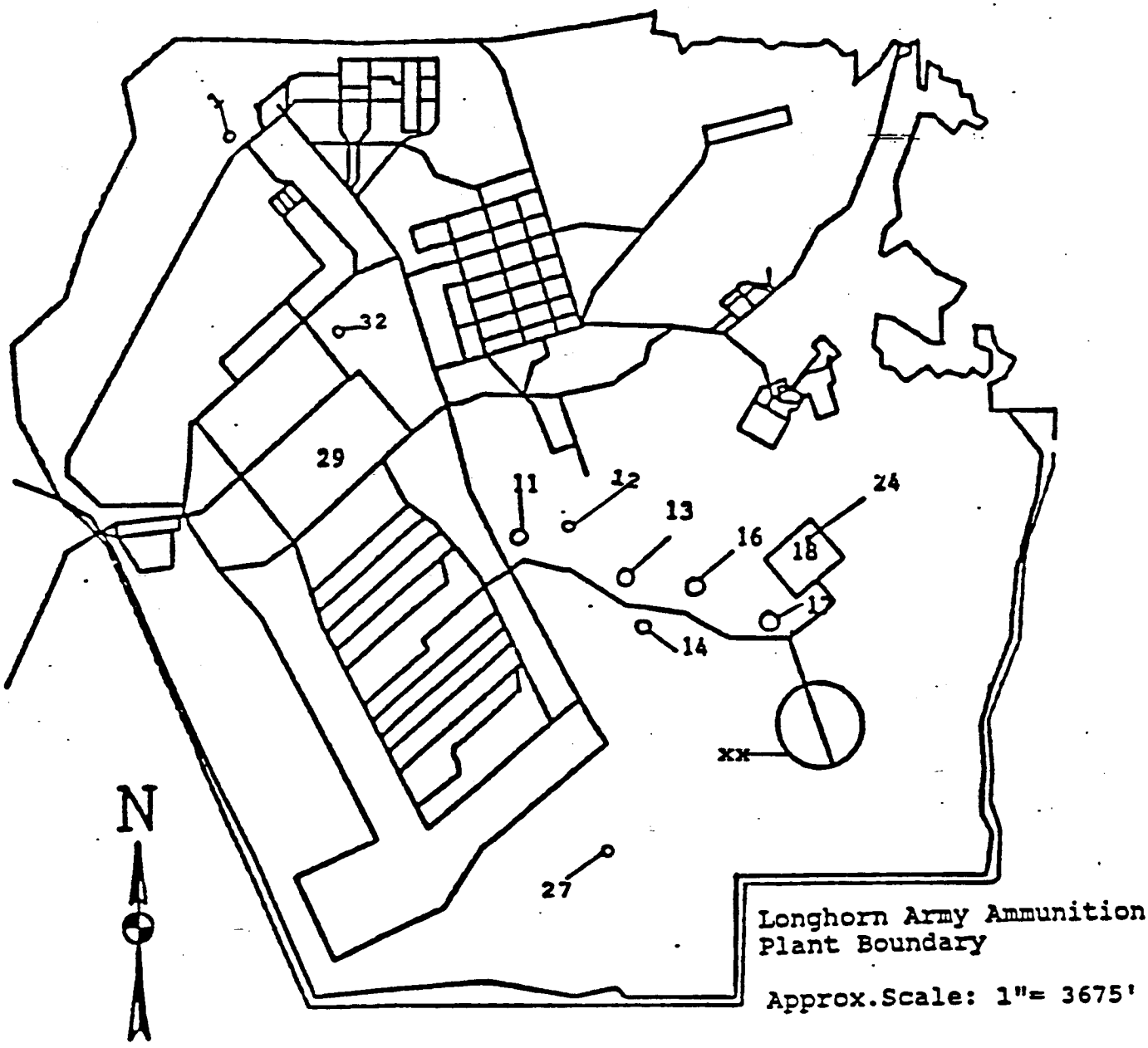
LHAAP XX - Ground Signal Test Area

LHAAP 27 - South Test Area

FIGURE 2 SITE LAYOUT

LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS

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11. Suspected TNT Burial Site at Avenues P and Q
13. Suspected TNT Burial Site between Old and Active Landfills/Acid Dump
14. Area 34 Burial Ground
16. Old Landfill
17. Burning Ground No.2/Flashing Area
18. Burning Ground No.3
24. Unlined Evaporated Pend/Rocket Motor Washout Lagoon
29. Former TNT Production Area
12. Active Landfill
32. Former TNT Disposal Plant
1. Inhert Burning Grounds
xx. Ground Signal Test Area
27. South Test Area

2.3.1 **LHAAP 11 - Suspected TNT Burial Site at Avenues P & Q.** This site consists of a cleared, grassy area at the intersection of two roads. The site was reported by USATHAMA as a possible burial site used to dispose of TNT in the 1940's. A borrow pit was later created in the central part to the wooded area north of the site, leaving a depression approximately 5 feet deep. This depression is apparent in aerial photographs taken in 1963, is inactive at present, and is not a candidate for the investigation. There is no operational activity presently scheduled at the suspected burial site.

The explosive compounds 2,4,6-TNT and 1,3,5-TNB have been found in soils at this site down to at least 5-foot depths, the maximum depth sampled. Maximum concentrations were 1.86 ug/g of TNT and 117 ug/kg of TNB.

2.3.2 **LHAAP 13 - Suspected TNT Burial Site between Old and Active Landfills/Acid Dump.** This site is located in a clearing in a heavily wooded area immediately south of a power line easement. Based on conversations with employees at LHAAP, there was a suspected one-time disposal of TNT and/or acid at this site. No other known or suspected disposals have occurred.

The site contains a number of bare patches that support little of no vegetation. The patches vary in size from 1 to 10 feet in diameter. The three larger bare patches stand out very well in the surrounding grass which is 1 to 2 feet tall. Based on the presence of the bare patches it appears reasonable to suspect something may have been disposed of at these locations which is preventing the native grasses from re-establishing themselves.

The site has not been previously investigated. Based on the statements of plant employees and the continued presence of bare spots at the site, it is reasonable to investigate the site for possible soil and groundwater contamination due to the suspected burial of explosives and associated wastes, or the possible dumping of pesticides, herbicides, or acids.

2.3.3 **LHAAP 14 - Area 54 Burial Ground.** This site is approximately 150 feet in size and contains a small 25 by 30 foot asphalt parking lot. It was reportedly used during the 1940's and early 1950's for the disposal of

demolition debris, explosives, and acids. The parking lot may cap the burial pit.

The site has not been previously investigated. Based on the statements of plant employees and the presence of contaminants which have been found near the site, possible soil and groundwater contamination will be investigated for explosives, demolition debris, and acids.

2.3.4 LHAAP 16 - Old Landfill. This site is defined as an open area bounded along the western and northern edges by a gravel road and along the eastern and southern edges by a wooded area. A large rectangular paved area that is designated as the Retail Sales Area for LHAAP is located on the western edge of the site. In the past, equipment auctions were held at this location. A tributary of Harrison Bayou runs closely along the eastern edge of the site.

The Old Landfill area was used for the disposal of inert materials and mission related hazardous wastes. The area was used to dispose of TNT redwater ash material from 1942 to 1944. In the mid to late 1950's, three rocket motor casings were burned and possibly buried on the eastern side of this landfill. A large bermed depression, once located near the center of the Old Landfill, served as an all-purpose junkyard for the disposal of such materials as substandard TNT, barrels of chemicals, oil, paint, scrap iron and wood. This area was filled in and the pond no longer exists. The landfill operation started at original ground level at the north-south mid-line of the site and ended 15 feet above original grade at the eastern edge of the site. Currently, all inert solid wastes are disposed of in the Active Landfill located elsewhere on the installation. The Old Landfill site is now used for the deposition of inert rubble only.

Soil contamination due to explosives has been verified at the site to depths of at least 15 feet. Sediments in the adjacent tributary to Harrison Bayou also are contaminated with explosive compounds. No explosives have been detected in ground water downgradient of the site, and none have been found in surface waters. The only contaminant exceeding TDH drinking water standards

identified in the ground water downgradient of the landfill is cadmium. Major contaminants and their maximum concentrations are presented in Table 1.

TABLE 1

Old Landfill (LHAAP 16) - Maximum Concentrations of Major Contaminants Detected in Previous Investigations

Parameter	Maximum Concentration Groundwater (ug/l)	Soil (ug/g)
1,3-DNB	<1.0	<10.0 ug/kg
2,4,6-TNT	<1.0	<10.0 ug/kg
1,3,5-TNB	<1.0	0.153
2,4-DNT	<1.0	0.073
2,6-DNT	8.60	0.073
aluminum	24,100.0	16900.0
antimony	1.0	0.2
arsenic	<3.0	4.5
barium	850.0	700.0
beryllium	20.0	1.5
cadmium	20.0	3.4
chromium	41.0	104.0
copper	30.0	244.0
lead	66.0	2000.0
manganese	190.0	2020.0
mercury	<1.0	0.1
silver	10.0	3.9
strontium	1790.0	35.8
thallium	<1	<3
zinc	1300.0	796.0
sulfate	58	740.0
chloride	1180.0	190.0
fluoride	4.3	93.0
vinyl chloride	10.5	2.1

Reference: Longhorn Army Ammunition Plant RI/FS Workplan, Volume 1, February 1992.

2.3.5 **LHAAP 17 - Burning Ground No.2/Flashing Area.** This site is situated within a heavily wooded section of LHAAP. It consists of two 185 by 305 foot cleared areas separated by a gravel entrance road. The east area of the entrance road was once fenced, and the area west of the road is open. Harrison Bayou flows approximately 1200 feet northwest of the site.

Burning Ground No. 2 was used for burning bulk TNT, photo flash powder, and reject material when LHAAP was operated by Universal Match Corporation. Although it has been reported that bulk TNT was uncovered at the site in 1954, there is no documentation to support bulk TNT burial at the site. In 1959,

all of the materials removed from the TNT Production Area (LHAAP #29) during razing were burned or flashed at this site. A 1958 aerial photograph shows a possible man-made pond on the western side of the road entering the site. This depression does not appear in 1954 or 1963 photos. There are no records a the pond's existence or the nature of its use over this 9 year period other than the 1958 photo. It is suspected that this was a burn pit or trenching operation. The site was used until 1980 as a flashing area to decontaminate recoverable metal by products. Burning trenches were located around the inside perimeter of the fenced area. As each trench filled with ash, the trench was covered and a new trench was dug. The waste residues were reportedly removed in 1984 and the site was allowed to revegetate. The site is presently inactive.

Soils at the location of the suspected pond have been identified as being contaminated with explosives, metals, and trace amounts of volatile organic compounds to a depth of at least 5 feet, the maximum sampling depth. Although a monitoring well exists downgradient of the previously fenced flashing area, it is inconclusive whether groundwater has been impacted. It is possible that explosive residues and other contaminants may be present in the surface soils of old burn trenches that have not been investigated. Contaminants and their maximum concentrations in soil are presented in Table 2.

TABLE 2
Burning Ground No. 2/Flashing Area (LHAAP 17)
Maximum Concentrations of Major Contaminants
Detected in Previous Investigations

Parameter	Maximum Concentration in Soil (ug/g)
1,3-DNB	0.470
2,4,6-TNT	0.040
1,3,5-TNB	0.127
2,4-DNT	0.138
2,6-DNT	0.053
aluminum	12500.0
antimony	10.0
arsenic	4.7
barium	610.0
beryllium	0.6
cadmium	1.8
chromium	75.6
copper	19.8
lead	670.0
manganese	740.0
mercury	40.1
silver	0.4
strontium	500.0
thallium	5.0
zinc	220.0
methylene chloride	0.26 ug/kg
trichloroethene	0.56 ug/kg
1,4-dichlorobenzene	0.86 ug/kg

Reference: Longhorn Army Ammunition Plant RI/FS Workplan, Volume 1, February 1992

the surface soils of old burn trenches that have not been investigated.

2.3.6 LHAAP 18 & 24 - Burning Ground No.3 and Unlined Evaporation Pond/Rocket Motor Washout Lagoon. Burning Ground No. 3 is a fenced 34.5 acre secured area currently used for the disposal of explosives and explosive-contaminated wastes through open burning. It is a cleared area within a heavily wooded section of LHAAP. The UEP, now closed and capped, is located in the northern corner of Burning Ground No. 3. Harrison Bayou flows within 1,000 feet of the western edge and within 500 feet of the northern edge of the burning grounds site.

Burning Ground No. 3 has been in operation since 1955. The area has been used for the treatment, storage, and disposal of solid and liquid explosive, pyrotechnic, and combustible solvent wastes by open burning, incineration, evaporation, and burial. Historical waste management units include open burning pits, an unlined evaporation pond (UEP), stockpiles of

solvent soaked sawdust, and suspected waste burial pits. The UEP was constructed at the burning grounds in 1963 as a holding pond to store explosive wastes resulting from the washout of rocket motor casings, which was performed at the northern corner of the pond. In 1973, the pond also began receiving wash water containing solvent residues and solids collected from LHAAP operations involving pyrotechnic material preparation and mixing. Sawdust soaked with methylene chloride and other solvents that were used to clean and scour mixers used for mixing illuminants were stockpiled along the southern berm of the pond as well as burned in trenches in the western portion of the burning ground. An air curtain destructor (ACD) was built in 1979 in the western corner of the burning grounds for the purpose of disposing of explosive and explosive-contaminated wastes by burning. Use of burn pits and trenches was reportedly discontinued in 1984. Use of the UEP was discontinued in 1984 when it was discovered that the pond was contaminating groundwater beneath the site. The UEP was closed as a RCRA interim status surface impoundment in 1986 by removing all waste and capping the impoundment. As part of the INF Treaty activities being conducted at LHAAP, a burn cage was added in 1989 for the open burning of Pershing II missile motors. Current operations include disposal of explosive and explosive-contaminated wastes by burning in the ACD, three open burning cages, and two open burning pans, as well as a burn cage for Pershing II motor elimination.

A summary of the major contaminants detected in ground water and their maximum concentrations is provided in Table 3. Contaminants found in shallow soils include tetryl (26.6 ug/g), TNT (5.7 ug/g), and reportedly high concentrations of unspecified volatile compounds.

TABLE 3
Burning Ground No. 3/Unlined Evaporation Pond and
Rocket Motor Washout Facility (LHAAP 18 and LHAAP 24)
Maximum Concentrations of Major Contaminants Detected
in Previous Investigations

Parameter	Maximum Concentration in Groundwater (ug/l)
HMX	<26.0
RDX	<22.0
tetryl	<26.0
TNT	<14.0
2,4-DNT	<10.0
silver	<5.0
arsenic	8.8
barium	3600.0
cadmium	29.0
chromium	27.0
mercury	0.42
lead	70.0
nickel	100.0
selenium	2.6
zinc	260.0
methylene chloride	17000000E
acetone	810a
1,2-dichloroethene	57a
1,2-dichloroethane	52a
trichloroethene	1400000
tetrachloroethene	17000J
chloride	980 mg/l
nitrates	590 mg/l
Total organic halogens	4030 mg/l

Reference: Longhorn Army Ammunition Plant RI/FS Workplan, Volume 1, February 1992.

2.3.7 **LHAAP 29 - Former TNT Production Area.** The Former TNT Production Area is an 85-acre site located in the west central portion of LHAAP. With the exception of the former Bulk Toluene Storage Area, the site is bounded by Avenue E on the southwest, 1st Street on the northwest, 18th Street on the southeast and Avenue D on the northeast. The Former Bulk Toluene Storage Area, once a part of the TNT production area, is a 500 by 500 foot area located across Avenue D from the production area. It is a wooded area bounded by 33rd Street on the north and Avenue D on the west.

The Former TNT Production Area operated from April 1943 until August 1945 as a six line plant with a supporting acid plant which produced over 180 million kg of TNT. All six production lines, lines A through F, operated throughout this period with line F used as a reserve line for production when

other lines were inactive. Redwater from the wash houses associated with each of these lines flowed via underground wood stave pipelines to a pumphouse located on the northern end of the site adjacent to 16th Street, and then on to the TNT Waste Disposal Plant. Cooling water (blue water) drain lines from the former production lines flow to the northeast and empty into an open ditch alongside 16th Street approximately 550 feet from Avenue D. A toluene bulk storage facility, servicing the TNT production operation, was located across Avenue D from the production area. The TNT production plant was not operated after World War II and was razed, except for foundations, in 1959. There are presently no industrial activities conducted in these two areas.

The site contains high levels of TNT in the surface soil. Explosives were also found in sediments and surface water drainage from the production area site. The abandoned Bulk Toluene Storage Area has not been investigated. Explosives have been identified in soils down to at least 42 inches at random locations across the production area site. Pieces of crystallized DNT have been found in the abandoned cooling water drain line and where the line discharges into an open ditch. Two locations have been identified where sediments are contaminated with 2,4,6-TNT. One of these locations also had surface water contaminated with low levels of various explosive compounds. Groundwater has apparently not been impacted by soil contamination at the production area site. It is not known if contamination from the bulk storage of toluene at the storage area exists. Major contaminants and their maximum concentrations are provided in Table 4.

TABLE 4
Former TNT Production Area (LHAAP # 29) -
Maximum Concentrations of Major Contaminants
Detected in Previous Investigations

Parameter	Maximum Concentration in: Surface Water (ug/l)	Sediment (ug/kg)	Soil (ug/kg)
2,4,6-TNT	206.9	780	7,600,000
2,4-DNT	23.4	-	<93
2,6-DNT	13.6	-	-
1,3,5-TNB	-	-	913
1,3-DNB	-	-	<52

Reference: Longhorn Army Ammunition Plant RI/FS Workplan, Volume 1, February, 1992.

2.3.8 **LHAAP 12 - Active Landfill.** The Active Landfill is located in the central portion of LHAAP. The center of the site is about 1,700 feet east-northeast of the intersection of Avenue P and Avenue Q. The entrance to the site's graveled access road is on Avenue Q about 0.2 mile east of Avenue P.

Aerial photography taken in 1954 reveals the construction of a diversion ditch between Central Creek and one of its principal tributaries which collects surface runoff from the southern part of the Magazine Area. The apparent purpose of the ditch was to divert flow in the area where a railroad crossed the tributary system, eliminating the need for a bridge. The diversion ditch remained functional until 1963 when aerial photography shows waste material disposed in the ditch system. 1970 photographs show that enough waste material had been disposed to block the flow of the system, but the site appeared to be inactive. Sometime between 1970 and 1978, the site was reactivated for waste disposal. By 1978 the entire ditch system had been filled with waste material and an adjacent undisturbed hillside had also been used for disposal. Since 1978, the site has been in continuous use for disposal of industrial solid wastes generated at LHAAP. An area southeast of the original ditch system has been cleared and is now used for the disposal of non-hazardous combustible and non-combustible wastes. The types of waste

disposed of at this site since 1963 are largely unknown. It is possible that the Active Landfill site has been used for the disposal of similar wastes which were disposed of at the Old Landfill which include substandard TNT, barrels of chemicals, oils, paints, scrap iron, and wood.

The site contains elevated concentrations of metals in the soil and groundwater along with trace amounts of 1,3-DNB at one monitoring well location and volatile organics at three locations. Major contaminants and their maximum concentrations are provided in Table 5.

TABLE 5
Active Landfill (LHAAP 12)
Maximum Concentrations of Major Contaminants
Detected in Previous Investigations

Parameter	Maximum Concentrations in: Groundwater (ug/l)	Surface Water (ug/l)	Sediment (ug/g)
Aluminum	361.00	3150	1100
Arsenic	-	-	.4
Barium	75.10	-	25
Cadmium	11.52	10	1.3
Chromium	27.70	50	4.6
Copper	-	60	5000
Iron	-	2250000	22800
Lead	54.40	12	4.9
Manganese	1990.00	25000	2010
Nickel	71.+	-	1.0
Silver	-	-	0.2
Zinc	-	580	90
Methylene Choride	48.	-	-

Reference: Longhorn Army Ammunition Plant RI/FS Workplan, Volume 1, February 1992.

2.3.9 **LHAAP 32 - Former TNT Waste Disposal Plant.** The site is situated in the west central portion of LHAAP and is located approximately 400 feet northwest of Avenue C and 600 feet southeast of 6th Street.

The Former TNT Waste Disposal Plant was constructed in 1942 to treat and dispose of wastewaters generated at the nearby Former TNT Production Area (LHAAP #29). The disposal plant was operated by Monsanto Chemical Co. from April 1943 until August 1945 and disposed of wastewaters resulting from the production of over 397 million pounds of 2,4,6-TNT. The plant was not operated after August 1945. In 1959, most of the buildings and tanks used in

the disposal process were removed, leaving only the concrete foundations, access roads, underground utilities, and constructed surface water drainage. The disposal process involved neutralization and storage of the waste until it could be burned by incineration.

Explosive compounds were not detected at the site with the exception of 7.6 ug/l of 2,4,6-TNT found in surface water adjacent to the former Neutralized Wastes Storage Tank. Concentrations of aluminum, chromium, lead, manganese, and nickel are also present in surface water above local background levels. Major contaminants and their maximum concentrations are provided in Table 6.

TABLE 6
Former TNT Waste Disposal Plant (LHAAP 32) -
Maximum Concentrations of Major Contaminants
Detected in Previous Investigations

Parameter	Maximum Concentration in: Soil (ug/g)	Groundwater (ug/l)	Surface Water (ug/g)
2,4,6-TNT	-	-	7.6 ug/l
Aluminum	-	-	47.70
Chromium	-	-	34.20
Lead	-	-	52.50
Manganese	-	-	34.00

Reference: Longhorn Army Ammunition Plant RI/FS Workplan, Volume 1, February 1992.

2.3.10 **LHAAP 01 - Inert Burning Grounds.** This site is situated in the extreme northwestern portion of LHAAP. The center of the site is at least 2,000 feet from the LHAAP boundary and approximately 400 feet west of the intersection of Avenue P and 32nd Street.

The Inert Burning Grounds was originally used during World War II by Monsanto Chemical Company for burning trash, ashes, scrap lumber, and waste from burned 2,4,6-TNT. Bulk 2,4,6-TNT may also have been burned at the site. The site was not used between August 1945 and February 1952 when LHAAP was is a standby status. Universal Match Corporation later used the site to burn wastes, including photo flash powder, for a few years during the 1950's until most burning operations were transferred to the Burning Ground No. 2/Flash

Area (LHAAP 17). Intermittent, small-scale burning may have continued into the early 1960s. Burn residues were most likely not removed. It is also suspected that some wastes may have been dumped without burning and were subsequently covered by or mixed with fill material.

Previous investigations indicate elevated levels of metals in the soil and groundwater. Explosives nitrobenzene and 1,3,5-TNB exceed background levels in the groundwater at concentrations of 1.82 and 9.74 ug/l respectively. Major contaminants and their maximum concentrations are provided in Table 7.

TABLE 7
Inert Burning Grounds (LHAAP 01) -
Maximum Concentrations of Major Contaminants
Detected in Previous Investigations

Parameter	Maximum Concentration in: Soil (ug/g)	Groundwater (ug/l)
Nitrobenzene	<	1.82
1,3,5-TNB	<	9.74
Aluminum	1361.4	372.0
Barium	106.6	67.00
Cadmium	<	0.97
Chromium	14.4	45.70
Copper	17.4	<
Lead	29.4	34.30
Manganese	122.1	85.00
Nickel	6.	57.+
Strontium	10.1	96.00
Zinc	56.4	<

Reference: Longhorn Army Ammunition Plant RI/FS Workplan, Volume 1, February 1992.

2.3.11 **LHAAP XX - Ground Signal Test Area.** This site is located in the southeastern portion of LHAAP. Access to the site is provided by an asphalt gravel road that intersects Long Point Road just east of its intersection with Avenue Q.

The Ground Signal Test Area is currently used for aerial and on-ground testing of various pyrotechnic, illuminant, and signal devices manufactured at LHAAP. Since late in 1988, the site has also been used for the burn-out of Pershing missile rocket motors destroyed in accordance with the INF Treaty.

The site has been used intermittently since April 1963 for aerial and on-ground testing and destruction of a variety of devices, including red phosphorus smoke wedges, infrared flares, illuminating 60 and 81 mm mortar shells, illuminating 40 to 155 mm cartridges, button bombs, and various types of explosive simulators. Prior to 1963 the site was used intermittently for testing and burn-out of rocket motors from Nike-Hercules, Pershing, and Sargent missiles. In 1970 a rocket motor was inadvertently destroyed when it exploded in the center of the site. Debris from the explosion was placed in the crater and backfilled.

Previous investigations indicate elevated levels of metals in the soil and groundwater. No detectable levels of explosives or organics where found at the site. Major contaminants and their maximum concentrations are provided in Table 8.

Table 8
Ground Signal Test Area (LHAAP XX) -
Maximum Concentrations of Major Contaminants
Detected in Previous Investigations

Parameter	Maximum Concentration in: Soil (ug/g)	Groundwater (ug/l)
Aluminum	1128.6	353.00
Barium	227.8	51.50
Cadmium	<	9.99
Chromium	9.4	11.60
Copper	3.3	<
Lead	27.6	<
Manganese	742.0	1860.00
Nickel	5.	157.+
Strontium	11.8	4120.00
Thallium	<	140.+
Zinc	11.1	<

Reference: Longhorn Army Ammunition Plant RI/FS Workplan, Volume 1, February 1992.

2.3.12 LHAAP 27 - South Test Area. This site is located in the south central portion of LHAAP. The earthen test pad is approximately 2,000 feet southeast of Avenue P and the Magazine Area. A deteriorated asphalt and gravel road runs from the entrance to the Test Pad. The concrete bunkers and Observation Building are situated alongside the road about halfway between the entrance and the Test Pad. A circular, 50 foot wide fire lane with a 2,000 foot diameter is centered at the Test Pad. The fire lane is now overgrown with brush and small trees.

The South Test Area was constructed in 1954 and was used by Universal Match Corporation for testing photoflash bombs that they produced at LHAAP until about 1956. The bombs were tested by exploding them in the air over an elevated, semielliptical earthen Test Pad with the floodplain of Harrison Bayou. During the late 1950s, illuminating devices were demilitarized within pits excavated in the vicinity of the Test Pad. During the early 1960s, leaking 3 to 4 pound canisters of white phosphorus were possibly demilitarized in the vicinity of the Test Pad. In the early 1980s photoflash cartridges were demilitarized in an area just east of the Observation Building.

Aerial photographs taken in 1954 when the area was under construction indicate an area of apparent vegetation distress. This area may have been used for toxic waste disposal during early stages in construction. The vegetation distress has persisted for over 37 years.

Previous investigations indicate elevated levels of metals in the soil along with low levels of 2,4,6-TNT. Elevated levels of metals are also present in the groundwater along with trace amounts of semivolatile organic compounds. Major contaminants and their maximum concentrations are provided in Table 9.

TABLE 9
South Test Area (LHAAP 27) -
Maximum Concentrations of Major Contaminants
Detected in Previous Investigations

Parameter	Maximum Concentration in: Soil (ug/g)	Groundwater (ug/l)
2,4,6-TNT	10.15	4.61
Aluminum	1426.1	232.00
Barium	136.6	53.40
Cadmium	<	9.24
Chromium	16.3	14.50
Copper	41.1	<
Lead	26.3	16.30
Manganese	199.2	1448.00
Nickel	2.2	102.+
Strontium	9.0	2640.00
Thallium	<	100.+
Zinc	17.4	<
Diethyl phthalate	<	52.

Reference: Longhorn Army Ammunition Plant RI/FS Workplan, Volume 1, February 1992.

SECTION 3.0

PROJECT DESCRIPTION

Investigative activities planned in support of this project consist of soil boring and sampling, surface water sampling, sediment sampling and groundwater sampling. Investigative activities planned at each site are listed below:

LHAAP 11 site survey screening
- (6) 18-foot soil boring and soil and groundwater sampling
- (2) surface water sampling
- (2) sediment sampling

LHAAP 13
- (4) 27-foot soil boring and soil and groundwater sampling
- (1) 45-foot monitoring well installation and soil sampling
- (1) monitoring well to be sampled

LHAAP 14 site survey screening
- (3) 26-foot soil boring and soil and groundwater sampling
- (1) 45-foot monitoring well installation and soil sampling
- (1) monitoring well to be sampled

LHAAP 16
- (3) 150-foot stratigraphic test borings and logging
- (1) boring continuously sampled
- (4) 21-foot soil boring and soil and groundwater sampling
- (5) surface water sampling
- (5) sediment sampling
- (5) 40-foot monitoring well installation and soil sampling
- (5) monitoring wells to be sampled
- (6) 40-foot monitoring well installation and soil sampling
- (6) monitoring wells to be sampled
- (12) existing monitoring well sampling
- (5) existing monitoring wells to be plugged

LHAAP 17
- (7) 7-foot soil boring and soil and groundwater sampling
- (3) surface water sampling
- (3) sediment sampling
- (1) 25-foot monitoring well installation and soil sampling
- (1) monitoring well to be sampled

LHAAP 18 (8) surface water sampling
24 (8) sediment sampling
(40) existing monitoring well sampling
(7) existing monitoring wells to be plugged

LHAAP 29 (4) explosive waste line sampling
(8) 22-foot soil boring and soil and groundwater sampling
(13) surface water sampling
(13) sediment sampling
(6) existing monitoring well sampling

LHAAP 12 (2) 1-foot shallow soil/waste pile sampling
(3) surface water sampling
(3) sediment sampling
(7) 40-foot monitoring well installation and soil sampling
(7) monitoring well sampling
(9) existing monitoring well sampling
(4) existing monitoring wells to be plugged

LHAAP 32 (2) explosive waste line sampling
(5) 5-foot soil boring and soil sampling
(8) 12-foot soil boring and soil and groundwater sampling
(6) surface water sampling
(1) existing monitoring well sampling

LHAAP 01 (8) 7-foot soil boring and soil and groundwater sampling
(6) surface water sampling
(6) sediment sampling
(1) existing monitoring well sampling

LHAAP XX (3) 5-foot soil borings and soil and groundwater sampling
(4) 22-foot soil boring and soil and groundwater sampling
(7) surface water sampling
(7) sediment sampling
(2) existing monitoring well sampling

LHAAP 27 (4) 1-foot soil sampling
(9) 10-foot soil boring and soil and groundwater sampling
(4) surface water sampling
(4) sediment sampling
(2) existing monitoring well sampling

SECTION 4.0

STAFF ORGANIZATION AND RESPONSIBILITIES

4.1 **COE Industrial Hygienist.** The COE Industrial Hygienists responsible for the development and oversight of this SSHP, are located in the Tulsa and Fort Worth District Corps of Engineers offices.

4.2 **Project Industrial Hygienist.** The Project Industrial Hygienist designated by the Contractor is responsible for the implementation of this SSHP. Modifications to this SSHP must be approved by the Project Industrial Hygienist along with necessary engineering controls and personal protective equipment upgrades. The Project Industrial Hygienist is responsible for oversight of site specific training.

4.3 **Site Safety and Health Officer (SSHO).** The SSHO selected by the Project Industrial Hygienist is responsible for the on-site implementation of this SSHP and assuring that all portions of the SSHP are followed. The SSHO is also responsible for site specific training, air monitoring and necessary record keeping required by this plan. The SSHO will also serve as the Site Emergency Coordinator (SEC).

4.4 **Field Crews.** All field crews, both government and contractor, are responsible for reading and following all provisions contained within this SSHP. At least one member of each field crew will have an individual certified in CPR and First Aid by the American Red Cross or an equivalent program.

SECTION 5.0

TRAINING

All personnel (including COE, Contractor and authorized visitors) entering the site during field investigative activities must meet training requirements outlined in 29 CFR 1910.120(e). Certificates documenting employee participation in the training program within the last 12 months must be submitted to the Contracting Officer. Additional site specific training will be conducted in the following areas before field investigative activities begin:

- Names of personnel and alternates responsible for site safety and health
- Safety, health and other hazards present on the site
- Use of personal protective equipment
- Work practices by which the employee can minimize risks from hazards
- Recognition of symptoms and signs which might indicate overexposure.
- Monitoring to be conducted.
- History of the site.
- Field activities planned.
- Potential safety and health hazards.
- Safety and worker protection requirements.
- Decontamination procedures.
- Emergency decontamination.
- Safe use of engineering controls and equipment on the site.
- Ordnance and explosive waste identification and hazards.

5.1 **Site Safety and Health Training.** The Site Safety and Health Officer (SSHO) will conduct health and safety training covering all the items found in this SSHP and other areas relating to health and safety at this site. Training on the recognitions and hazards associated with ordnance and

explosive waste will be conducted by a qualified OEW Contractor or a representative from the Huntsville Division Safety and Occupational Health Office. All personnel are required to participate in this training on site before field operations begin. Daily safety briefings will be conducted to discuss activities planned for the day and employee safety concerns. All visitors to the site during field operations will receive a safety and health briefing.

SECTION 6.0

SITE WORK ZONES AND COMMUNICATION

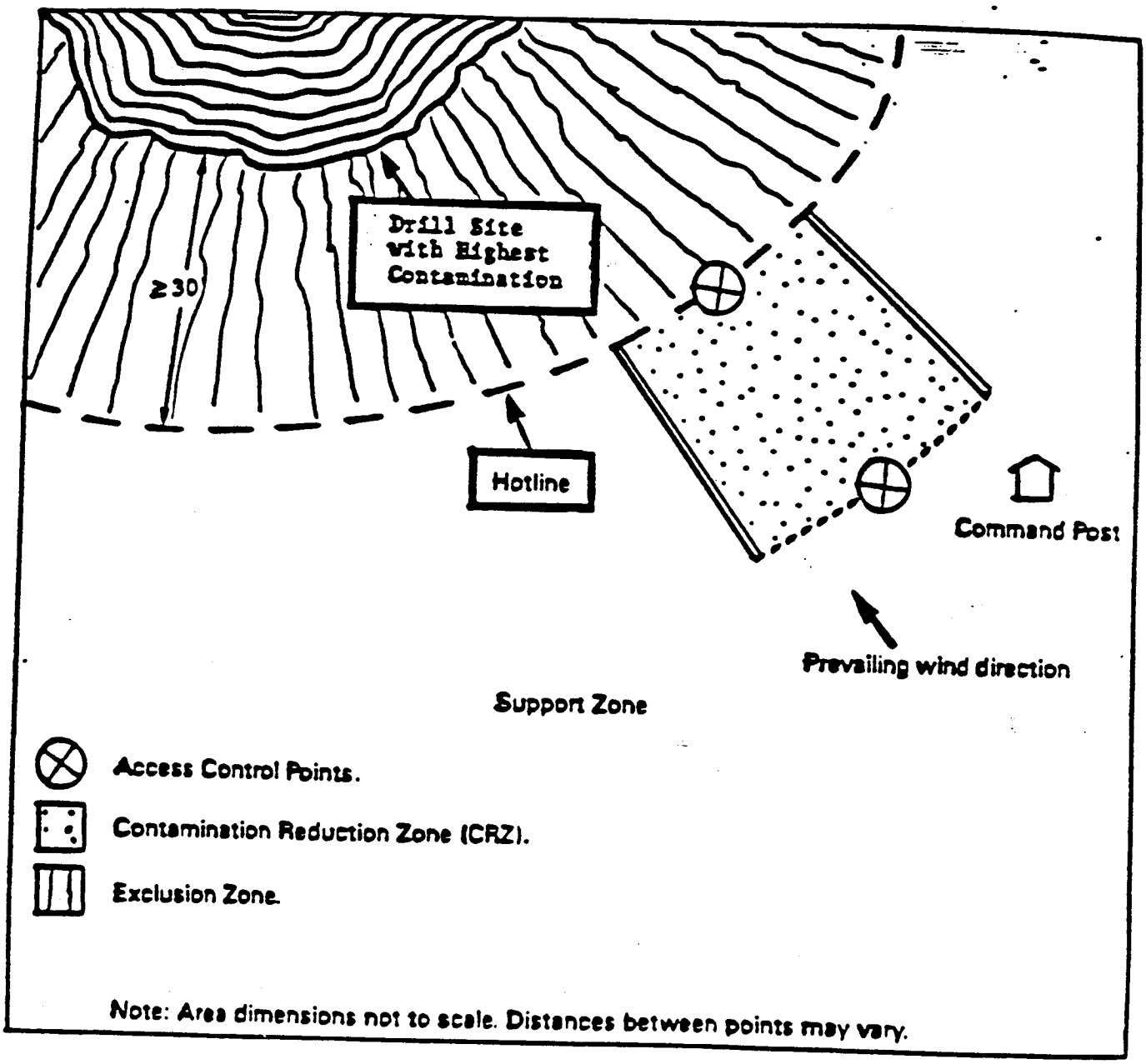
6.1 **Site Zonation.** An illustration of the site work zones described below is provided as Figure 3.

6.1.1 **Exclusion Zone.** The exclusion zone shall be a 30-foot radius around the drilling rig or work area indicated by printed hazard tape. This zone is considered contaminated, therefore, necessary personal protective equipment is required for entry.

6.1.2 **Control Zone.** The control zone (contamination reduction zone) will consist of a site specific work area just outside the exclusion zone if space allows as a 25-foot radius. This zone is considered a non-contaminated zone.

6.1.3 **Support Zone.** The support zone is a staging area for equipment and personnel. It is within this zone that a log will be kept of all personnel entering and leaving the site. Access of personnel and equipment into the exclusion zone will be controlled through this zone.

FIGURE 3 SITE WORK ZONES



6.2 Communications.

6.2.1 Telephones. A mobile telephone for emergency use will be available on site. Emergency numbers will be posted beside the telephone. No work will be conducted without access to a telephone at the site.

6.2.2 Air Horns. These will be maintained at the Command Post for initiation of emergency evacuation procedures.

SECTION 7.0

HAZARD ASSESSMENT

The hazards associated with operation of this project are both chemical and physical. Good general safety consciousness on the part of employees will promote an accident-free project.

7.1 **Chemical Hazards.** The compounds detected in previous investigations at the site include metals, solvents, explosives, and vinyl chloride. A summary of major contaminants found or expected at the sites included in this project and their exposure standards is presented in Table 10. No potential military chemical agent hazards have been identified at LHAAP.

Metals were found at LHAAP in high concentrations in both soil and groundwater. Many metals are carcinogenic, and most are toxic by ingestion, inhalation, and/or skin absorption. Exposure to metals can occur through inhalation and ingestion. The possibility of ingestion will be minimized by wearing personal protective clothing and observing good personal hygiene. Exposure via inhalation will be controlled by minimizing dust generation during drilling and soil sampling operations.

Solvents identified at the site in very high concentrations were trichlorethene and methylene chloride. The major route of exposure to solvents is through the respiratory system. Another route of exposure is through skin absorption. Solvents can be Central Nervous System depressants, narcotics, hepatotoxin or hematopoietic toxins. Most are both skin and eye irritants. In addition, ethylene dichloride, methylene chloride and trichloroethene have been classified as potential human carcinogens. However, due to the rapid volatility of most of these compounds and the unconfined spaces to be sampled at this site, the possibility of exposure via inhalation is low to moderate. Air monitoring and proper PPE will minimize the exposure potential. The possibility of skin contact is greater; therefore, protective clothing shall be worn. The possibility of exposure to these compounds is greatest at LHAAP 18 and LHAAP 24. Particular care will be taken to protect

against splash hazards when sampling and closing monitor wells. Air-purifying respirators with organic vapor cartridges will be available on site.

Contamination by various explosives has been found over most of the sites at LHAAP. The primary routes of exposure to these compounds are through skin contact/absorption and inhalation of dust. Nitrobenzene, a potential contaminant, is a poisonous yellow oily liquid which is rapidly absorbed through the skin. TNT may also be absorbed through the skin; both of these compounds can cause headache, weakness, drowsiness, and/or vomiting. The primary acute effect from exposure to tetryl is dermatitis. Conjunctivitis may be caused by rubbing the eyes with contaminated hands or by exposure to air-borne dust. Anemia can also result from exposure to either TNT or tetryl. Skin contact/absorption is possible during drilling and sampling activities; therefore, protective clothing and especially eye protection will be important to prevent exposure. Air-purifying respirators will be available on-site if needed.

Vinyl chloride, found at the Old Landfill, is a human carcinogen and is dangerous to skin, eyes and mucous membranes. Exposure may occur via inhalation or absorption. Air monitoring and proper PPE will minimize the possibility of exposure.

7.2 **Ambient Air Hazards.** Ambient air hazards are expected to be very minimal at this site due to the unconfined spaces to be sampled, the depth of containment of contamination, and minimal disturbance of contaminated material. No perimeter monitoring is needed because of these factors and because of the large size of the site.

7.3 **Physical Hazards.** Temperature related stresses can be a significant hazard to employees working at this site. Appendix B, SOP 3 addresses actions to monitor and treat temperature related stresses.

7.4 **Biological Hazards.** Biological hazards potentially present at the site include but are not limited to insects and poisonous snakes. Employee awareness to these hazards will reduce associated risk. Appendix B, SOP 2 addresses recommended actions in the event of a snakebite.

7.5 **Equipment Operation Hazards.** Rotary drilling rig and heavy equipment operation present inherent safety hazards. Employee experience in the use of such equipment and awareness to potential hazards will reduce risk. Equipment operation must be in accordance with guidelines set forth in applicable OSHA regulations and U.S. Army Corps of Engineers Safety and Health Requirements Manual EM 385-1-1.

7.6 **Unexploded Ordnance and Explosives Hazards.** Explosive ordnance, explosives and pyrotechnic fillers were manufactured at LHAAP. It is reasonable to assume the same were destroyed and/or buried at LHAAP. To ensure maximum safety for on-site personnel, all intrusive activities will be preceded by a magnetometer survey of the intrusion site by qualified OEW experts. All magnetometer anomalies should be avoided, and only nonmagnetic areas will be selected for intrusion activities.

All personnel will receive site-specific training on the recognition of manufactured explosive ordnance items and bulk TNT.

7.7 **Noise Hazards.** Suitable ear protection (ear plugs) will be required during work operations where noise levels exceed 85 dB. Periodic noise monitoring will be performed using a portable sound level indicator.

TABLE 10a - CHEMICAL HAZARD EVALUATION

005357

Site Specific Compounds	Threshold Limit Value (TLV) ACGIH	Permissible Exposure Limit (PEL) OSHA	Route of Exposure	STEL
Extremely Toxic			Nicotine	
Beryllium, A2	0.002 mg/m3	0.002 mg/m3	Ih	
Mercury, (Skin)	0.05 mg/m3	0.05 mg/m3	Ih,Ab,Cn	
Cadmium	0.05 mg/m3	0.2 mg/m3	Ih,Ig	
Silver	0.1 mg/m3	0.01 mg/m3	Ih,Ig,Cn	
Thallium, (Skin)	0.1 mg/m3	0.1 mg/m3	Ih,Ig,Cn,Ab	
Lead	0.15 mg/m3	0.05 mg/m3	Ih,Ig,Cn	
1,3-DNB, (Skin)	0.15 ppm	0.15 ppm	Ih,Ig,Cn,Ab	
Arsenic	0.2 mg/m3	0.01 mg/m3	Ih,Ig,Cn,Ab	
Vinyl Chloride, A1	5 ppm	1 ppm	Ih	
Highly Toxic			Parathion	
Antimony	0.5 mg/m3	0.5 mg/m3	Ih,Cn	
Barium	0.5 mg/m3	0.5 mg/m3	Ih,Ig,Cn	
Chromium	0.5 mg/m3	1 mg/m3	Ih,Ig	
2,4,6-TNT	0.5 mg/m3	0.5 mg/m3	Ih,Ig,Cn,Ab	
DNT, (Skin)	1.5 mg/m3	1.5 mg/m3	Ih,Ig,Cn,Ab	
Cyclonite (RDX), (Skin)	1.5 mg/m3	1.5 mg/m3	Ih,Ig,Cn,Ab	
Copper	1 mg/m3	1 mg/m3	Ih,Ig,Cn	
Manganese	5 mg/m3	5 mg/m3	Ih,Ig	
Aluminum	10 mg/m3	15 mg/m3	Ih,Ig	
Ethylene Dichloride	10 ppm	1 ppm	Ih,Ig,Cn,Ab	
Moderately Toxic			DDT	
Methylene Chloride, A2	50 ppm	500 ppm	Ih,Ig,Cn	
Perchloroethylene	50 ppm	25 ppm	Ih,Ig,Cn	200 ppm
Trichloroethene	50 ppm	50 ppm	Ih,Ig,Cn	220 ppm
Dichlorobenzene	75 ppm	75 ppm	Ih,Ig,Cn	110 ppm
Slightly Toxic			Salt	
Acetone	750 ppm	750 ppm	Ih,Ig,Cn	100 ppm
Nontoxic			Ethyl Alcohol	
Harmless			Oil	

STEL - Short Term Exposure Limit
(Skin) - Skin Notation
A1 - Confirmed Human Carcinogen
A2 - Suspected Human Carcinogen
1h = Inhalation
1g = Ingestion
Cn = Contact
Ab = Absorption

TABLE 10b - CHEMICAL AND PHYSICAL PROPERTIES

COMPOUND	MW	BP(F)	FLP(F)	IP	UEL%	LEL%
Beryllium	9.0	4532	NA	NA	NA	NA
Mercury	200.6	674	NA	NA	NA	NA
Cadmium	112.4	1409	NA	NA	NA	NA
Silver	107.9	3632	NA	NA	NA	NA
Lead	207.2	3164	NA	NA	NA	NA
1,3-DNB	168.1	570	182	10.43	NA	NA
Arsenic	74.9	subl	NA	NA	NA	NA
Vinyl Chloride	62.5	7	NA	9.99	33.0	3.6
Antimony	121.8	2975	NA	NA	NA	NA
Barium	208.4	2840	NA	NA	NA	NA
Chromium	52.0	4788	NA	NA	NA	NA
2,4,6-TNT	227.1	464	epld	10.59	NA	NA
DNT	182.2	572	404	NA	NA	NA
Copper	63.5	4703	NA	NA	NA	NA
Manganese	54.9	3564	NA	NA	NA	NA
Ethylene Dichloride	99.0	182	56	11.05	16	6.2
Methylene Dichloride	84.9	104	NA	11.32	22	14
Perchloroethylene	165.8	250	NA	9.32	NA	NA
Trichloroethene	131.4	189	90	9.45	10.5	8
Dichlorobenzene	147.0	357	151	9.06	9.2	2.2
Acetone	58.1	133	0	9.69	13	2.5

Source: Pocket Guide to Chemical Hazards, US Department of Health and Human Services, NIOSH, June 1990.

SECTION 8.0

MONITORING PROCEDURES AND ACTION LEVELS

8.1 **Monitoring.** The designated Site Safety and Health Officer (SSHO) will be responsible for the on-site implementation of the monitoring procedures contained within this plan including recordkeeping. In the event of changing site conditions or if action levels are exceeded, the SSHO will contact the Project Industrial Hygienist for recommended actions including necessary engineering controls and PPE upgrades.

8.1.1 **Photoionization Detector (PID).** A PID with a 10.2 eV probe will be used to monitor employee exposure to ionizable compounds continuously during drilling operations and at intervals not to exceed 30 minutes during soil, sediment, and water sampling.

8.1.2 **Combustible Gas/Oxygen Meter.** Continuous monitoring with a combination combustible gas/oxygen meter will be used for measuring combustible gases and oxygen content.

8.1.3 **Draegar Pump.** A Draegar pump will be used for initial screening and randomly throughout all work operations to verify the presence or absence of site specific chemicals with low PELs such as vinyl chloride and ethylene dichloride. Personnel air sampling techniques, using a low flow pump with compound specific sampling media, may be implemented during work activities with increased potential for exposure as determined by the Project Industrial Hygienist.

8.1.4 **Organic Vapor Monitor.** 3M Type 3500 organic vapor monitors will be used on a representative number of employees in each drilling and sampling crew. Analysis will be performed for site specific compounds including vinyl chloride and ethylene dichloride.

8.2 **Action Levels.**

8.2.1 **Photoionization Detector.** A value of 10 PID units above background in the breathing zone will require the site to be evacuated. After 15-30 minutes the SSHO will take additional readings. If a value of 5-10 PID

units above background is still present the Project Industrial hygienist shall be notified for recommended actions. Work may resume if PID readings are less than 5 PID units above background. At sustained readings of 5-10 PID units above background in the breathing zone, PPE will be upgraded to Level C.

8.2.2 **Combustible Gases/Oxygen Meter.** Alarms will be set at 10% of the lower explosive limit (LEL) and <19.5% and >23% oxygen. Should the alarms activate, work operations will immediately be terminated and the site evacuated. After 15-30 minutes, the SSHO will again monitor the work area. If alarm activating conditions are still present, the Project Industrial Hygienist will be notified for recommended actions. If alarm activating conditions are no longer present, work may resume.

8.2.3 **Organic Vapors.** At sustained readings of 5-10 PID units above background in the breathing zone, Draegar Pump sampling for vinyl chloride and ethylene dichloride will be performed.
Action levels, requiring PPE upgrade to Level C, for site specific chemicals will be based upon one half the OSHA PEL or the ACGIH TLV whichever is lower.

8.2.4 **Temperature Stress.** Work-rest schedules for heat/cold stress will be based upon published American Conference of Governmental Industrial Hygienist (ACGIH) standards referenced in Appendix B, SOP 3, Table 1. Work operations conducted in impermeable clothing, including Tyvek coveralls, will be based on recommendations outlined in NIOSH/OSHA/USCG/EPA Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities referenced in Appendix B, SOP 3, Table 2.

TABLE 11
ACTION LEVELS BASED ON BREATHING ZONE MEASUREMENTS

CONTAMINANT	INSTRUMENT	ACTION LEVEL	ACTION
Ionizable Compounds	HNU PI-101	0-5 PID	Continue work.
		5-10 PID	Monitor breathing zone with detector tubes.
		> 10 PID	Evacuate exclusion zone, notify Project Industrial Hygienist. Upgrade PPE to Level C.
Organic Vapors	Draegar	1/2 TLV or PEL	Evacuate exclusion zone, notify Project Industrial Hygienist. Upgrade PPE to Level C.
Combustible Gases	Industrial Scientific HMX271	<10% LEL	Continue work.
		10% LEL (alarm)	Shut down electrical and fuel powered motors. Evacuate exclusion zone, notify Project Industrial Hygienist.
Oxygen Content	Industrial Scientific HMX271	<19.5% (alarm)	Stop work. Evacuate exclusion zone. Oxygen deficient atmosphere, notify Project Industrial Hygienist.
		19.5-23%	Continue work.
		>23%	Stop work. Evacuate exclusion zone. Oxygen enriched atmosphere, notify Project Industrial Hygienist.

SECTION 9.0

PERSONAL PROTECTIVE EQUIPMENT

9.1 **Personal Protection.** Since the most likely route of exposure to contaminants at this site will be via skin contact/absorption, preventing skin contact will be very important. Exposure potential via inhalation will be minimized by controlling dust generation.

In order to minimize bodily contact with hazardous substances, modified Level D PPE will initially apply for all intrusive investigative activities. Upgrades or downgrades in PPE will be based upon action levels referenced in Section 8.2 OF this plan. Changes is PPE will be determined by the SSHO after consultation with the Project Industrial Hygienist.

Level D (modified)

- Cotton poly blend or Tyvek full body coveralls
- Chemical resistant surgical type glove (inner)
- Cotton work glove (outer)
- Steel toe work boots
- Hard hat (when overhead hazards exist)
- Safety glasses
- Chemical resistant boot covers
- Hearing protection (as needed)
- Chemical splash face shield (as needed)

9.2 **Respiratory Protection.** All personnel will have fit tested respirators which are MSHA or NIOSH approved dual cartridge, air purifying, equipped with a combination organic vapor/HEPA filter. Respirators will be added to the minimum equipment listed in section 8.1 in the event Level C PPE is necessary based upon air monitoring action levels as determined by the SSHO and Project Industrial Hygienist.

SECTION 10.0

DECONTAMINATION PROCEDURES

10.1 Contamination Prevention. One of the most important aspects of decontamination is the prevention of contamination. Good contamination prevention should minimize worker exposure and help ensure valid sample results by precluding cross-contamination. Procedures for contamination prevention include:

Personnel

- do not walk through areas of obvious or known contamination;
- do not handle or touch contaminated materials directly;
- make sure all PPE is free of cuts or tears prior to donning;
- fasten all closures on suits, covering with tape if necessary;
- particular care should be taken to protect any skin injuries;
- stay upwind of airborne contaminants;
- do not carry cigarettes, gum, etc. into contaminated areas.

Equipment

- take care to limit the amount of contamination that comes in contact with heavy equipment;
- if contaminated tools are to be placed on noncontaminated equipment for transport, use plastic to keep noncontaminated surfaces clean;
- keep excavated soils contained and out of the way of workers.

10.2 Personnel Decontamination. Decontamination procedures necessary for site personnel consist of disposal of Tyvek coveralls and gloves in trash bags, placing cotton coveralls in laundry bags, and washing off chemical

resistant boots or boot covers. Washing of hands and face is required before eating, drinking, or smoking. Decontamination procedures for Level D are outlined in Figure 4. Level C decontamination procedures are outlined in Figure 5.

FIGURE 4 LEVEL D DECONTAMINATION PROCEDURES

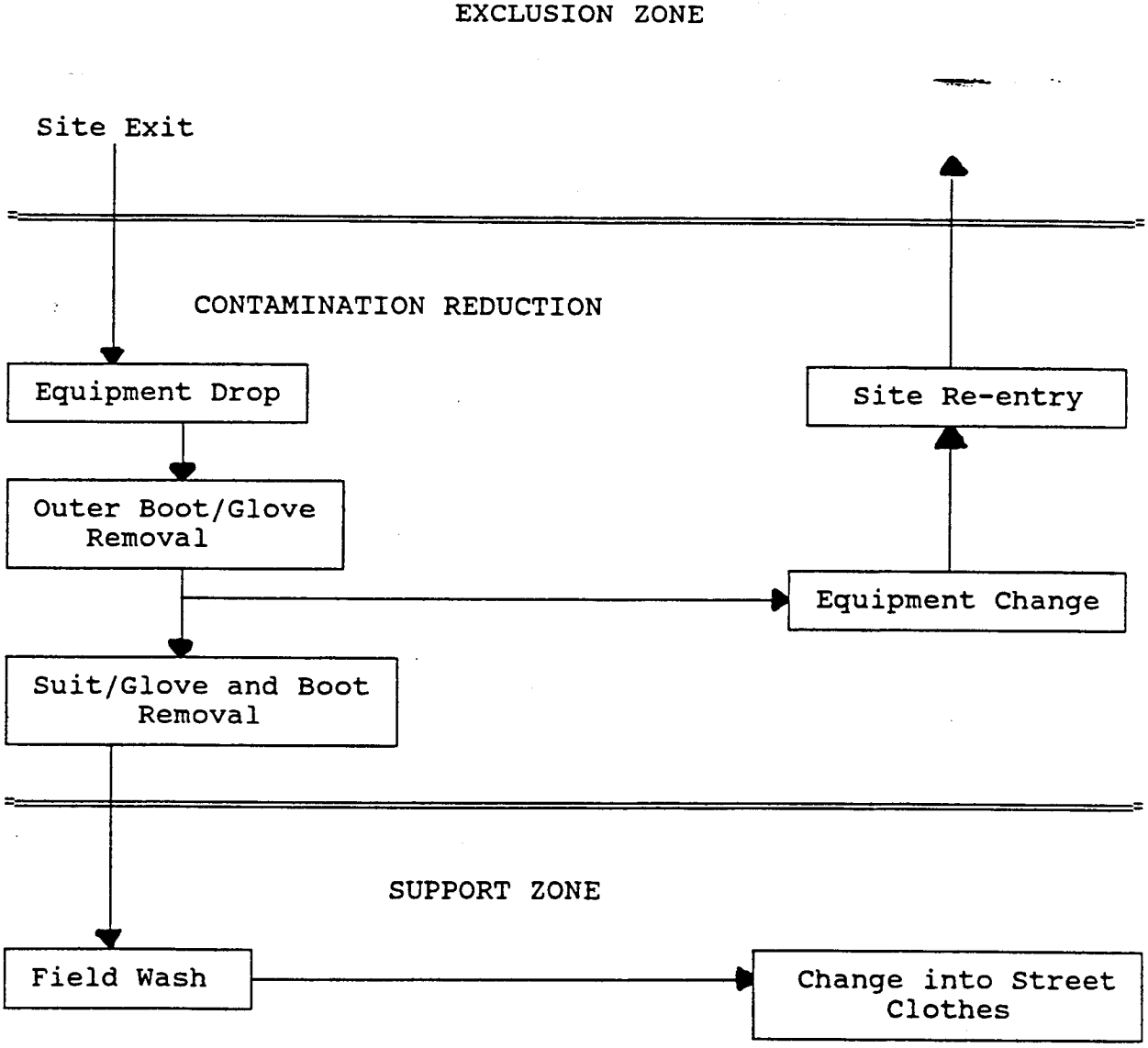
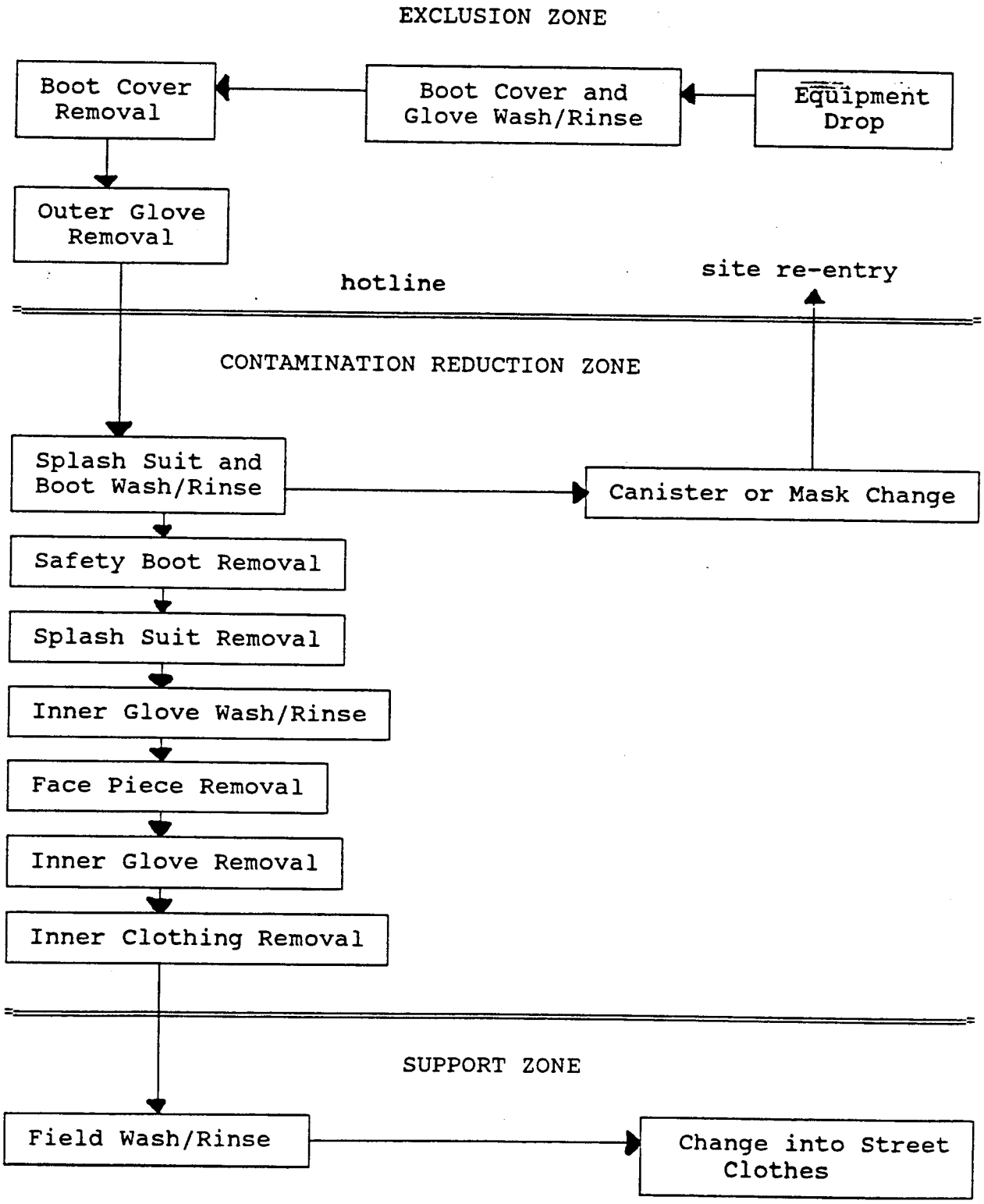


FIGURE 5 LEVEL C DECONTAMINATION PROCEDURES



SECTION 11.0

MEDICAL SURVEILLANCE

The COE provides their employees with an annual indepth physical examination including blood chemistry with complete blood count and differential, urinalysis, medical history, required chest x-rays, audiogram, pulmonary function testing, and a physicians interpretation of the employees ability to wear a respiratory. As required, the examination may also include testing for heavy metals. Contractor personnel must participate in a program which at a minimum meets requirements of 29 CFR 1910.120(f). Documentation of contractor employee participation in a medical surveillance program within the last 12 months, including a physician's written opinion of an employees ability to wear a respirator, must be submitted for all site personnel to the Contracting Officer.

SECTION 12.0

EMERGENCY RESPONSE PLAN

An emergency plan is included in Appendix A. The following is a list of response agencies that may be contacted in the event of an emergency. A map from project sites to the nearest medical facility is provided as Figure 5.

EMERGENCY PHONE NUMBERS

Marshall Police	(903) 935-7831
Marshall Fire Dept	(903) 938-6711
Ambulance Service	(903) 938-6711
Marshall Hospital	(903) 935-9311
Poison Control Center	1-800-822-9761
National Response Center	1-800-424-8802
Texas Water Commission	(903) 595-5466
Longhorn AAP Fire Department	(903) 679-2315
Longhorn AAP Ambulance	(903) 679-2315
Longhorn AAP Security	(903) 679-2327

NON EMERGENCY PHONE NUMBERS

LONGHORN ARMY AMMUNITION PLANT

Environmental Coordinator

Lynn Muckelrath (903) 679-2980

TULSA DISTRICT

Safety and Occupational Health Office

Bob Vandegriff (918) 581-7316

HTW Quality Assurance and Industrial Hygiene Section

Ramona Wagner (918) 581-6283

Greg Snider (918) 581-6101

Derp Section (Project Manager)

Wade Anderson (918) 581-6106

FORT WORTH DISTRICT

Safety and Occupational Health Office

Rene Moradel (813) 334-2195

Hazardous Waste Management Section (Project Manager)

Deborah Fitzgerald (817) 334-3221

HUNTSVILLE DIVISION

Safety and Occupational Health Office - Explosives MCX

David Douthat (205) 955-5785

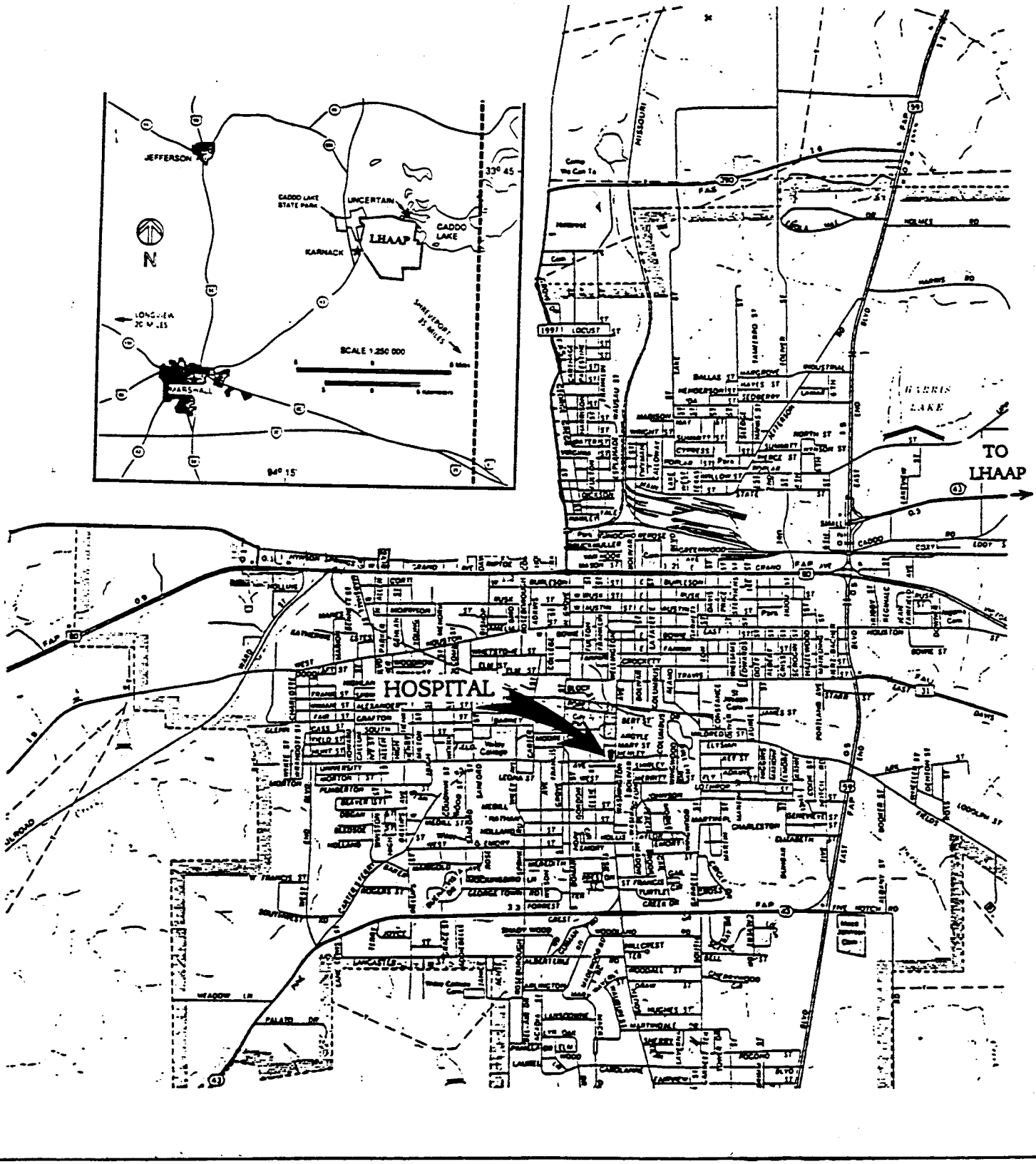


FIGURE 5
LONGHORN ARMY AMMUNITION PLANT (LHAAP)
HOSPITAL ROUTE

SECTION 13.0

REFERENCES

American Conference of Governmental Industrial Hygienists, Threshold limit Values and Biological Exposure Indices. 1990-91.

Ebasco, Draft RCRA Facility Investigation Site Safety and Health Plan, Eight Sites in RCRA Permit. 1990.

NIOSH, Pocket Guide to Chemical Hazards, 1990

NIOSH/OSHA/USCG/EPA, "Occupational Safety and Health, Guidance Manual for Hazardous Waste Site Activities", October 1985.

U.S. Army Corps of Engineers, Occupational Health Requirements Engineering Regulation, EM 385-1-1, revised October 1987.

U.S. Army Corps of Engineers, Safety and Occupational Health Document Requirements for HTRW Activities, ER 385-1-92, December 1991.

U.S. Army Corps of Engineers, Tulsa District Respiratory Protection Program.

U.S. Dept of Labor, Occupational Safety and Health Administration, 29 CFR Part 1910, Hazardous Waste Operations and Emergency Response.

U.S. Dept of Labor, Occupational Safety and Health Administration, 29 CFR 1926, Construction Industry Standards.

U.S. Dept of Labor, Occupational Safety and Health Administration, 29 CFR 1910, General Industry Standards.

SECTION 14.0

PLAN APPROVAL

This Health and Safety Plan for investigative activities at Longhorn Army Ammunition Plant has been prepared and approved by the following personnel:

PREPARED BY:

Dean Griffin for
Greg Snider
Industrial Hygienist
HTW QA/IH Section

DATE: 8-5-92

APPROVED BY:

William B. Hinkle for
Bob W. Vandegriff
Chief, Safety and Occupational
Health Office

DATE: 5 August 1992

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APPENDIX A

EMERGENCY PLAN

EMERGENCY PLAN

1.0 GENERAL

Careful consideration has been given to the relative possibility to fire, explosion, or release of vapors, dusts, or gases which may impinge on nearby facilities. The most likely offsite impact from this investigation involves the potential for increased airborne contaminants as a result of intrusive activities. Control measures will be employed as necessary to preclude any possibility of offsite migration of contaminants. As a result of the hazards on site and the conditions under which investigations will be conducted, the possibility of an emergency situation exists. An emergency plan is required by 29 CFR 1910.120 to be available for use and is included below.

1.1 SITE SAFETY AND HEALTH OFFICER

The Site Safety and Health Officer (SSHO) shall implement this emergency plan whenever conditions at the site warrant such action. The SSHO will be responsible for assuring the evacuation, emergency treatment, emergency transport of site personnel as necessary, and notification of emergency response units and the appropriate management staff.

1.2 EVACUATION

In the event of an emergency situation, such as fire, explosion, significant release of contaminants, etc., the Emergency Coordinator will notify all site personnel indicating the initiation of evacuation procedures. All personnel in both the restricted and nonrestricted areas will evacuate and assemble in the support zone or other safe area as identified by the SEC. The SEC will have authority to initiate proper action if outside services are required. Under no circumstances will incoming personnel or visitors be allowed to proceed into the area once the emergency has been identified. The SEC shall see that access for emergency equipment is provided and that all equipment has been shut down once the emergency has been identified. Once the safety of all personnel is established, the emergency response groups will be notified of the emergency. Other personnel listed in paragraph 2.1 shall then be notified.

1.3 PERSONNEL EXPOSURE

In the event of personnel exposure, skin contact, inhalation, or ingestion the following procedures shall be followed:

1.3.1 Skin Contact: Wash/rinse affected area thoroughly with copious amounts of soap and water, then provide appropriate medical attention if required. Eyes should be rinsed for at least 15 minutes following chemical contamination.

1.3.2 Inhalation: Move to fresh air and if necessary decontaminate and transport to nearest hospital.

1.3.3 Ingestion: Decontaminate and transport to nearest hospital.

1.3.4 Puncture Wound or Laceration: Decontaminate and transport to nearest hospital for professional medical attention. The SEC will provide medical data sheets to appropriate medical personnel as required.

2.0 FIRE OR EXPLOSION

Immediately evacuate the site and notify the local fire and police departments, and other appropriate emergency response groups.

Fire Department (903) 938-7831
Police Department (903) 935-7831

2.1 ENVIRONMENTAL INCIDENT

Secure spread of contamination if possible. Notify fire, sheriff, and police departments to inform them of the possible need for assistance to evacuate nearby areas. If a significant release has occurred, the National Response Center should be contacted. Emergency phone numbers are located in Appendix B. Those groups will alert the National or Regional Response Teams as necessary. Following these emergency calls, the following personnel listed below shall be notified:

TULSA DISTRICT

Bob Vandegriff, Safety Office	(918) 581-6742
Greg Snider, Industrial Hygienist	(918) 581-6101
Wade Anderson, Project Manager	(918) 581-6106

FORT WORTH DISTRICT

Rene Moradell, Safety Office	(817) 334-2195
Madeline Morgan, Industrial Hygienist	(817) 334-2185
Deborah Fitzgerald, Project Manager	(817) 334-3221

2.2 ADVERSE WEATHER

In the event of adverse weather, the Site Safety and Health Officer will determine if work can continue without sacrificing the health and safety of site personnel. Some of the items to be considered prior to determining if work should continue are:

- Heavy Rainfall
- Potential for heat stress
- Tornadoes
- Limited visibility
- Electrical storms
- Potential for accidents
- Malfunctioning of monitoring equipment

2.3 INCIDENT INVESTIGATION

Upon receiving a report of an incident on the site, the Site Safety and Health Officer will investigate the circumstances surrounding the incident. The COE Occupational Safety and Health Office may be requested to participate in the investigation of serious incidents.

2.4 INCIDENT REPORTING

All serious incidents resulting in a fatality, emergency response, lost work time, or medical treatment will be reported immediately by the appropriate Site Safety and Health Officer. A written report will be forwarded to the COE Occupational Safety and Health Office, at the address listed below, within 48 hours of the incident. An incident follow-up report will be distributed within one week of the incident.

U.S. Army Corps of Engineers
Safety and Occupational Health Office
P.O. Box 61
Tulsa, Oklahoma 74121

U.S. Army Corps of Engineers
Safety and Occupational Health Office
P.O. Box 17300
Fort Worth, Texas 76102-0300

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APPENDIX B

STANDARD OPERATING PROCEDURES

STANDARD OPERATING PROCEDURE 1 - CONFINED SPACE

1.0 DEFINITION

An enclosed space which is large enough and so configured that an employee can bodily enter and perform work, has limited or restricted means for entry or exit, is not designed for continuous employee occupancy, and has one or more of the following characteristics:

(1) Contains a potentially hazardous atmosphere.

(2) Contains a material with the potential for suffocation of an entrant.

(3) Has an internal configuration such that a entrant could be trapped or asphyxiated by inwardly converging walls, or a floor which slopes downward and tapers to smaller cross-section.

(4) Or contains any other recognized safety or health hazard.

2.0 CONFINED SPACE ENTRY

No entry shall be permitted into a confined space except as outlined in this section.

2.1 PERMIT SYSTEM

Personnel required to enter a confined space shall be required to obtain a permit (attachment 1) authorizing the entry. A new permit shall be obtained at the start of each work shift during which confined space entry will be required.

2.2 TESTING AND MONITORING

Prior to entry, the atmosphere of the confined space shall be tested for oxygen content, explosibility, and toxic chemicals. Monitoring shall be continuously conducted while the confined space is occupied.

2.2.1 Qualified Person: Testing and monitoring shall be conducted by a qualified person under the direction of an Industrial Hygienist.

2.2.2 Equipment: Equipment required to conduct the testing and monitoring shall consist of the following:

(1) Combination oxygen/combustible gas meter with monitoring capabilities for a toxic substance such as hydrogen sulfide.

(2) A photoionization detector (PID) for the monitoring of ionizable compounds.

(3) Detector tubes appropriate for the suspected contaminants within the confined space.

3.0 EMERGENCY RESCUE

A person trained in emergency rescue and assigned to remain on the outside of the confined space and to be in communication with those working inside shall be designated as the standby person and have primary responsibility to perform emergency rescue. Rescue procedures shall be specifically designed for each confined space entry and recorded on the permit.

3.1 EQUIPMENT

Minimum equipment required on site, while the confined space is occupied, to perform emergency rescue shall consist of the following:

(1) A supplied air respirator or a self-contained breathing apparatus (SCBA).

(2) A harness with attached lifeline.

(3) Tripod if the confined space is more than six feet deep.

3.2 TRAINING

No person shall enter a confined space until they have been trained in the hazards associated with the confined space and informed of the emergency rescue procedures.

005380

ALL COPIES OF PERMIT WILL REMAIN AT JOB SITE UNTIL JOB IS COMPLETED

☐ CONFINED SPACE ENTRY PERMIT
☐ HAZARDOUS AREA ENTRY PERMIT

1

LOCATION and DESCRIPTION of Confined Space _____ Date _____

PURPOSE of Entry _____ Time _____ M

DEPARTMENT _____ Expiration _____ M

PERSON in Charge of Work _____

2

SUPERVISOR (S) in Charge of Crews	Type of Crew	Phone

3

SPECIAL REQUIREMENTS	Yes	No		Yes	No
Lock Out – De-energize			Escape Harness		
Lines Broken – Capped or Blanked			Tripod emergency escape unit		
Purge – Flush and vent			Lifelines		
Ventilation			Fire Extinguishers		
Secure Area			Lighting		
Breathing Apparatus			Protective Clothing		
Resuscitator – Inhalator			Respirator		

4

TEST(S) TO BE TAKEN (Valid for one 8-hour work period)	P.E.L. *	YES	NO	DATE M	DATE M	DATE M	DATE M	DATE M	DATE M	DATE M	DATE M
% of Oxygen	19.5% +21%										
% of L.E.L. *	Any % over 10										
Carbon Monoxide	50 ppm										
Aromatic Hydrocarbon	10 ppm										
Hydrocyanic Acid	10 ppm										
Hydrogen Sulfide	10 ppm										
Sulfur Dioxide	5 ppm										
Ammonia	25 ppm										

Name

GAS TESTER _____

Note: Continuous/periodic tests shall be established before beginning job. Any questions pertaining to test requirements contact certified division gas tester, Plant Gas Coordinator or the Industrial Hygienist

5

INSTRUMENTS USED Name	Type	Ident. No.

SAFETY STANDBY PERSON(S) Name	Ck. No.

YES ☐
NO ☐

AMBULANCE
FIRE

Supv. authorizing all above conditions satisfied _____

* P.E.L. Permissible Entry Level
* L.E.L. Lower Explosion Level

Orig. to Dept.
Copy to Safety

STANDARD OPERATING PROCEDURE 2 - SNAKE BITE

Normally, the noise created by a person approaching a snake habitat is sufficient to frighten the snake off. However, extreme caution is necessary when exploring areas where snakes might be found, such as behind rocks, under bushes, or in holes, crevices, and abandoned pipes.

The rules to follow if bitten by a snake are:

- **Do not** cut the bite area as it will exacerbate the effect of the venom.
- **Do not** apply suction to the wound as it is minimally effective in removing venom.
- **Do not** apply a tourniquet since venom is most dangerous when concentrated in a small area.
- **Do not** allow the victim to run for help as this will accelerate circulation.
- **Do** seek immediate medical attention.
- **Do** keep the victim calm and immobile.
- **Do** have the victim hold the affected extremity lower than the body while waiting for medical assistance.

STANDARD OPERATING PROCEDURE 3 - TEMPERATURE STRESS

1.0 HEAT STRESS

Heat produced by the body and the environmental heat together determine the total heat load. Therefore, if work is to be performed under hot environmental conditions, the workload of each job shall be established and the heat exposure limit pertinent to the workload evaluated against the applicable standard in order to protect the employee from exposure beyond the permissible limit. For the purpose of this SOP, the American Conference of Governmental Industrial Hygienist published Threshold Limit Values and Biological Exposure Indices, latest edition shall be considered the standard for work operations conducted in permeable protective clothing. NIOSH/OSHA/USCG/EPA heat stress monitoring recommendations shall be considered the standard for work operations conducted in impermeable protective clothing.

1.1 HEAT STRESS MONITORING

1.1.1 Permeable Work Ensembles

Since measurement of deep body temperature is impractical for monitoring the employees' heat load, the measurement of environmental factors is required which most nearly correlate with deep body temperature and other physiological response to heat. At the present time Wet Bulb Globe Temperature Index (WBGT) is the simplest and most suitable technique to measure the environmental factors. WBGT values are calculated by the following equations:

Outdoor with solar load: WBGT = 0.7 NWB + 0.2 GT + 0.1 DB
Indoors or outdoors with no solar load: WBGT = 0.7 NWB + 0.3 GT
Where:
WBGT = Wet Bulb Globe Temperature Index
NWB = Natural Wet-Bulb Temperature
DB = Dry-Bulb Temperature
GT = Globe Temperature

The determination of WBGT requires the use of a black globe thermometer, a natural (static) wet-bulb thermometer, and a dry-bulb thermometer, such as the Reuter-Stokes, Thermo-environmental Monitor, (WIBGET).

TABLE 1 - PERMISSIBLE HEAT EXPOSURE THRESHOLD LIMIT VALUES
Values are given in degrees Fahrenheit WBGT

	WORK LOAD		
Work-Rest Regimen	Light	Moderate	Heavy
Continuous Work	86	80	77
75% Work 25% Rest each hour	87	82	78
50% Work 50% Rest each hour	89	85	82
25% Work 75% Rest each hour	90	88	86

1.1.2 Impermeable Work Ensembles

For workers wearing semipermeable or impermeable encapsulating ensembles, the ACGIH work/rest standard cannot be used. For these situations workers should be monitored as described below when the temperature in the work area exceeds 70 degrees fahrenheit.

Count the radial pulse during a 30-second period as early as possible in the rest period. If the heart rate exceeds 110 beats per minute at the beginning of the rest period, shorten the next work cycle by one-third and keep the rest period the same. If the heart rate still exceeds 110 beats per minute at the next rest period, shorten the following work cycle by one-third.

1.2 HEAT STRESS PREVENTION

Proper training and preventive measures will avert serious illness and loss of work productivity. Preventing heat stress is particularly important because once someone suffers from heat stroke or heat exhaustion, that person may be predisposed to additional heat injuries. To avoid heat stress, the following steps should be taken:

- Adjust work schedules
- Provide shelters
- Maintain body fluids
- Encourage physical fitness
- Utilize cooling devises
- Recognize heat stress warning symptoms

TABLE 2 - SIGN AND SYMPTOMS OF HEAT STRESS

Heat rash may result from continuous exposure to heat or humid air.

Heat cramps are caused by heavy sweating with inadequate electrolyte replacement. To reduce occurrence of heat cramps increase amount of water consumption. Sign and symptoms include:

- muscle spasms
- pain in the hands, feet and abdomen

Heat exhaustion occurs from increased stress on various body organs including inadequate blood circulation due to cardio-vascular insufficiency or dehydration. In the event of heat exhaustion measures need to be taken to cool the body and replace body electrolytes. Signs and symptoms include:

- pale, cool, moist skin
- heavy sweating
- dizziness
- nausea
- fainting

Heat stroke is the most serious form of heat stress. Temperature regulation fails and the body temperature rises to critical levels. Immediate action must be taken to cool the body before serious injury and death occur. Competent medical attention must be obtained. Signs and symptoms are:

- red, hot, usually dry skin
- lack of or reduced perspiration
- nausea
- dizziness and confusion
- strong, rapid pulse
- coma

2.0 COLD STRESS

Fatal exposure to cold among workers have almost always resulted from accidental exposures involving failure to escape from low air temperatures or from immersion in low temperature water. The single most important aspect of life-threatening hypothermia is the fall in deep core temperature of the body. Employees should be protected from exposure to cold so that the deep core temperatures does not fall below 36 degrees Celsius (96.8 F); lower body temperature will very likely result in reduced mental alertness, reduction

in rational decision making, or loss of consciousness with the threat of fatal consequences.

2.1 EVALUATION AND CONTROL

For exposed skin, continuous exposure should not be permitted when the air speed and temperature results in an equivalent chill temperature of -32 degrees Celsius. At temperatures of 2 degrees Celsius or less it is imperative that employees who become immersed in water or whose clothing becomes wet be immediately provided with a change of clothing and treatment for hypothermia. Special protection of the hands is required to maintain manual dexterity for the prevention of accidents.

2.1.1 Provisions for additional total body protection is required if work is performed at or below 4 degrees Celsius as follows:

- The employees shall wear cold protective clothing appropriate for the level of cold and physical activity.

- If the air velocity at the site is increased by wind or artificial ventilation, the cooling effect of the wind shall be reduced by shielding the work area, or by wearing a removable outer windbreak garment.

- If the available clothing does not give adequate protection to prevent hypothermia or frostbite, work shall be modified or suspended until adequate clothing is made available or until weather conditions improve.

- Employees handling evaporative liquids at temperatures below 4 degrees Celsius shall take special precautions to avoid soaking of clothing or gloves because of the added danger of cold injury due to the evaporative cooling.

2.1.2 For work practices at or below -12 degrees Celsius the following shall apply:

- The worker shall be under constant protective observation (buddy system).

- If work must be done, rest periods must be taken in heated shelters and opportunity for changing into dry clothing shall be provided.

- New employees shall not be required to work full-time in cold in the first few days until they have become accustomed to the working conditions and required protective clothing.

- The work shall be arranged in such a way that sitting still or standing for long periods is minimized.

- The workers shall be instructed in safety and health procedures. The training program shall include as a minimum instruction in:

a. Proper rewarming procedures and appropriate first aid treatment.
b. Proper clothing practices.
c. Proper eating and drinking habits.
d. Recognition of impending frostbite.
e. Recognition signs and symptoms of impending hypothermia or excessive cooling of the body even when shivering does not occur.
f. Safe work practices.

2.2 SPECIAL WORKPLACE RECOMMENDATIONS

Special caution shall be exercised when working with toxic substances and when workers are exposed to vibration. Cold exposure may require reduced exposure limits. Eye protection shall be provided to workers employed out-of-doors in snow and/or ice terrain. Trauma sustained in freezing or subzero conditions requires special attention because an injured worker is predisposed to secondary cold injury. Special provisions must be made to prevent hypothermia and secondary freezing of damaged tissues in addition to providing for first aid treatment.

STANDARD OPERATING PROCEDURES 4 - THUNDERSTORMS AND TORNADOES

Meteorological conditions shall be closely watched, especially in the spring, when severe thunderstorms and tornadoes are most likely to occur. Thunderstorms and tornadoes often occur late in the afternoon on hot spring days, but can occur at any time of the day in any season of the year. Tornadoes are usually preceded by severe thunderstorms with frequent lightning, heavy rainfall, and strong winds.

A **severe thunderstorm watch** or a **tornado watch** announcement on radio or television indicates that a severe thunderstorm or tornado is possible. Work may continue at the work site during severe thunderstorm watches or tornado watches if conditions allow. A **severe thunderstorm warning** or a **tornado warning** signifies that a severe thunderstorm or a tornado has been sighted or detected by radar and may be approaching. All work on site shall cease during a thunderstorm, severe thunderstorm warning, or a tornado warning.

Personnel of site during a tornado shall take the following steps:

- evacuate office trailers or vehicles.
- If outdoors, lie flat in a nearby ditch.
- Stay away from power poles, electrical appliances, and metal objects.
- Do not try to outrun a tornado.

APPENDIX C

SITE SPECIFIC TRAINING FORMS

FORM 1

005389

SITE SPECIFIC TRAINING RECORD FORM

Site Name: _____

Location: _____

Meeting Date: _____ Meeting Time: _____

Meeting Conducted By: _____

The following topics shall be discussed:

Biological Hazards
Chemical Hazards
Radiological Hazards
Toxicology
Personal Hygiene
Rights and Responsibilities under OSHA
Monitoring Plan
Site Safety and Health Plan
Standard Operating Procedures
Personal Protective Equipment
Medical Monitoring Program
Decontamination
Emergencies
Public Relations

Suggestions/Comments: _____

_____

_____

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Meeting Participants' Signature:

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FORM 2

SAFETY MEETING RECORD FORM

005390

Site name: _____

Location: _____

Meeting date: _____ Meeting time: _____

Meeting conducted by: _____

Topics Discussed

_____

_____

_____

_____

Accidents Reviewed

_____

_____

_____

_____

Suggestions/Comments Made

_____

_____

_____

005391

DEPARTMENT OF THE ARMY
LONGHORN/LOUISIANA ARMY AMMUNITION PLANTS
MARSHALL, TEXAS 75671-1059

REPLY TO
ATTENTION OF

June 01, 1992

RECEIVED
1992 JUN -2 PM 1:2

SMCLO-EV

SUBJECT: Meeting, Longhorn Army Ammunition Plant, for Technical Review Committee (TRC) and Program Managers - June 10, 1992

Environmental Protection Agency
ATTN: Lisa M. Price (6H-ET)
1445 Ross Avenue
Dallas, Texas 75202

Dear Ms. Price:

Enclosed is a tentative agenda for the TRC and Program Manager's Meetings. This will be the second meeting for the TRC, and we hope that you will be able to attend.

If you have any questions or suggestions regarding the meeting or agenda, contact Mr. Lynn Muckelrath (903) 679-2980.

Sincerely,

for Randall J. Miller, Captain
Robert W. Bringman
Lieutenant Colonel, U.S. Army
Commanding Officer

Enclosure

005392

LONGHORN ARMY AMMUNITION PLANT MEETING AGENDA

MEETING: Technical Review Committee (TRC)

LOCATION: Longhorn Army Ammunition Plant - Karnack, Texas, Bldg 703

TIME: June 10, 1992, 9:00 A.M.

SIGN IN: At entrance of LHAAP there is a gate house where you can sign in. The guard will issue a temporary badge and vehicle permit. If you bring a camera please request a camera permit.

AGENDA

I. OPENING REMARKS: LTC Robert W. Bringman

II. Phased Approach in Remedial Investigation - Wade Anderson

III. Schedule Update.

005393

LONGHORN ARMY AMMUNITION PLANT MEETING AGENDA

MEETING: Project Managers

LOCATION: Longhorn Army Ammunition Plant - Karnack, Texas, Bldg 703

TIME: June 10, 1992, Following TRC Meeting

AGENDA

I. Status of Actions

II. Field Trip - TNT Acid Plant, Typical Hazardous Waste Sumps and other areas as required.

III. Discussion of Interim Remediation and addition of new sites to Federal Facility Agreement.

DEPARTMENT OF THE ARMY
LONGHORN/LOUISIANA ARMY AMMUNITION PLANTS
MARSHALL, TEXAS 75671-1059

0052[illegible]

REPLY TO
ATTENTION OF

June 11, 1992

SMCLO-EV

Environmental Protection Agency
ATTN: Ms. Lisa Marie Price
1445 Ross Avenue, Suite 1200
Dallas, Texas 75202-2733

Dear Ms. Price:

As required by the Federal Facility Agreement, we are submitting the Draft Final Remedial Investigation/Feasibility Study Work Plan and the responses to comments received from the Environmental Protection Agency and the Texas Water Commission. An Investigation Derived Waste Management Plan has been included as an appendix to Volume 2. Please send all comments to Longhorn Army Ammunition Plant by July 12, 1992.

For further information, please contact Mr. Lynn Muckelrath, 903-679-2980.

Sincerely,

R Bringman

Robert W. Bringman
Lieutenant Colonel, U.S. Army
Commanding Officer

Enclosure

Copy Furnished:
CESWT-EC-GR (Anderson)

RESPONSE TO COMMENTS
LONGHORN ARMY AMMUNITION PLANT (LHAAP)
REMEDIAL INVESTIGATION/FEASIBILITY STUDY (RI/FS)
WORK PLAN (DRAFT)

EPA

General Comments on RI/FS Work Plan for Longhorn AAP

1) Concur. Table 2-1 has been revised to identify all wells in the area that monitor each site, to identify background wells and to identify wells shared between different sites. The elevation of ground surface at each well location is shown on Table 2-1. The depths of screened intervals have been added to Table 2-1. Depth of ground water, as recorded 14 and 15 November 1989, is shown on Table 2-1. Because ground-water zones at LHAAP have not been identified as such, screened intervals show the depths currently being monitored relative to the ground-water surface. Figure 2-2 has been revised to show site locations at LHAAP. Well locations for each site are shown on individual site maps; background wells are designated as such. Wells shared between sites have been identified on Figures 4-2-1, 4-3-1, 4-5-1 and 4-6-2. Wells to be closed (plugged) are shown on proposed sampling plans for each site in Section 4. Table 2-1 has been revised to show these wells. The strategy for determining proposed monitoring well depths has been added and is discussed for each site in Section 4.

2) Concur. A proposed schedule incorporating additional field studies was submitted to EPA and TWC on 19 May 1992 and is contained in Section 8.0 of the RI/FS Work Plan. The phased approach for investigating each site has been added and discussed in the appropriate sections of the Work Plan.

3) Concur. Phased approach will address these concerns.

4) Concur. These statements have been deleted or reworded so as not to imply that a conclusion has been reached before proper data collection and analyses have been performed.

5) Exception. RCRA Subpart F (40 CFR 264.101) requires that LHAAP must institute corrective action for any release from a Solid Waste Management Unit (SWMU). This requirement does not specify ground-water monitoring, but implies that releases will be addressed on a site-by-site basis. Corrective action ground-water monitoring, as addressed under 40 CFR 264.90 (a)(2), is required only for surface impoundments, land treatment units and landfills that received hazardous waste after July 26, 1982. The Unlined Evaporation Pond (UEP), LHAAP 24, was the only regulated unit for which it is known that hazardous waste was received after July 26, 1982. The Old Landfill, LHAAP 16, was no longer active by this date, and the Active Landfill, LHAAP 12, was

receiving only industrial solid waste at this time. Therefore, LHAAP 24 is the only candidate requiring corrective action ground-water monitoring under RCRA Subpart F at this time. Other units addressed under the RI may require corrective action ground-water monitoring should it be determined that a release has occurred and ground water is threatened or has been impacted. For this reason, a point of compliance has been established for each site and is shown on all revised site maps in Sections 3 and 4. Should ground-water monitoring be necessary, the point of compliance will be used to determine proper siting of upgradient and downgradient wells.

6) Concur. Operable units will be identified as early as possible.

7) Concur. These sites will be identified and addressed in an addendum to the RI/FS Work Plan. Funding has been requested to develop plans for the sites.

8) Concur. An OEW Officer will conduct initial training of field personnel on the recognition and hazards associated with the OEW. The OEW Officer will also inspect and grant clearance to each site before field operations begin. Contingency procedures for contacting the OEW Officer, if OEW items are encountered, will be set up during site specific training.

EPA ENCLOSURE 1

COMMENTS ON DRAFT RI/FS WORK PLAN VOLUME 1

Text and Figures have been edited to reflect changes made in response to the Comments. New Figures added to the Work Plan are designated with an alphabetical suffix to the preceding Figure number to preclude renumbering subsequent Figures.

SECTION	PAGE/ PARA.	RESPONSE
3.4.4	3-38/3	Concur. Unit "mg/kg" has been added.
3.4.4 and 4.4.2.3	3-43/3 and 4-18/1	2,6-DNT was detected in surface water/sediment sample 017 located downslope from and adjacent to the site. A fifth surface water/sediment sampling location has been added to the sampling plan. This location will be in the Bayou, directly east of the easternmost proposed monitoring well. The surface water/sediment sampling plan will serve to verify if LHAAP 16 is a source of explosives in these sediments of Harrison Bayou.
3.4.5.4	3-46	The screen setting for Well 122 is 8.5 to 23.5 feet, which is shallow ground water. This comment is now addressed under paragraph 3.4.3.
3.4.6	3-47/2	Concur. Text revised.
3.5.4	3-55/1	Concur. Text revised.
3.6.4	3-92/1	Cluster well and monitoring depths at LHAAP 18 & 24 have been clarified in paragraph 3.6.3.
3.6.4	3-92/2	Shallow wells are monitoring the base of the suspected uppermost saturated zone underlying Burning Ground No. 3 area, as addressed in paragraph 3.6.3.
3.6.6	3-98/2	Concur. Text revised.
3.6.7	3-100	Concur. The need for initial remedial action will be evaluated and is now addressed in paragraphs 3.6.7, 4.6.1, and 4.6.2.
3.6.7	3-100	Concur. Revised.

3.8.3	3-136/2 and 3	The screen setting for Well 103 is 9.5 to 24.5 feet. The screen setting for Well 121 is 19 to 34 feet. Both wells monitor shallow ground water. Text revised.
3.8.6	3-147/2	Concur. Text revised.
3.9.3	3-155/1	The screen setting for Well 113 is 14 to 29 feet, which is shallow ground water. Text revised.
3.10.2	3-167	As a result of the comment, another site visit was performed, installation personnel were interviewed, and aerial photographs were reexamined. It was determined from the information gathered that the limits of the site appear to encompass an additional area approximately twice as large as the site is currently defined. The area extends to the west and northwest of the current site and contains mounds of debris and trenches believed to be associated with the Inert Burning Grounds operations. Figures 3.10.2 and 4.10.1 are revised to show new suspected limits. An addendum to the Work Plan will be prepared to address the full extent of the site and is addressed in paragraph 3.10.2.
3.11.4	3-186	The screen setting for Well 127 is 10 to 25 feet. The screen setting for Well 128 is 17.5 to 32.5 feet. Both wells monitor shallow ground water. Text revised.
4.1.1	4-2/1	Concur. A non-intrusive site screening survey has been added to the work plan.
4.3.2	4-10	Concur. A monitoring well will be drilled in the center area and is addressed in paragraph 4.2.2 and on Figure 4-2-1.
4.4.2	4-14	Concur. All proposed monitoring wells will be cluster wells and will monitor two zones. Revised.
4.5.2	4-22	Exception. As requested by TWC, a monitoring well will be installed in the center of the burn pit area to determine if the burn pits have impacted ground water. Revised.
4.6.1	4-25/1	The two ground-water zones being monitored at LHAAP 18 & 24 are now addressed in more detail in Section 3.6.3.

4.6.2	4-26/1	No. No additional sources are suspected other than those previously investigated. Quantifying sources will be part of evaluating the need for initial remediation. Quantifying sources will also be a requirement of the Feasibility Study.
4.7.1 and 4.7.2.4	4-32/2 and 4-37	The shallow ground-water zone being monitored at LHAAP 29 is now addressed in more detail in Section 3.7.3.
4.7.2.2	4-33	Do not concur. Process information indicates that explosives (TNT) are the only likely contaminant of concern expected in the waste lines.
4.7.2.2	4-36/1	The plan for site investigation has been revised.
4.8.2	4-38	Concur. Revised.
4.9.2 and Figure 4-9-1	4-44 and 4-45	Concur. Revised.
4.9.2.5	4-51	Concur. Revised.
4.10.2	4-52	Concur. Additional soil borings have been added.
4.11.2	4-57	Concur. Placement of wells will depend on the direction of ground-water flow and the location of sources for the elevated concentrations of contaminants identified. These data will be gathered during the first phase of investigations. Wells will then be added during the second phase of investigations. Text revised.
4.12.2	4-64	Exception. Two soil borings are already proposed downgradient of the activities performed in this area. Grab samples of the ground water from these borings will determine if contamination is leaving the site.
5.0	5-1/1	Concur.
5.0 and 5.1.3	5-1/3 and 5-5	Concur.

5.2	5-6/1	Treatability Studies will not replace full-scale pilot testing if required for the remedial design. But, information gained from the Treatability Study will be very useful in the scale-up for design of the pilot study and any treatment used in the remedial action.
5.2.1	5-6	Concur.
5.2.2	5-8	Concur.
5.3.2	5-9	Concur.
8.2	8-1	The revised schedule has been included which accounts for all previously granted extensions and additional field work required for any Phase 2 investigations. The final Record of Decision has only been delayed by 40 days.

EPA ENCLOSURE 2

COMMENTS ON DRAFT RI/FS WORK PLAN VOLUME 2: CHEMICAL DATA ACQUISITION PLAN

SECTION	PAGE/ PARA.	RESPONSE
4.2.1.6	13	Concur. Figure 4.1 will be changed to 2 feet.
4.2.2	13	The text will be modified to state that at least 5 casing volumes will be removed during well development.
4.4.1.1	14	No. Fuel layers which would cause problems with water level indicators are not anticipated. Text revision is not necessary.
4.5.1.1	15	Five casing volumes will be purged from the wells as discussed in 4.5.1.2. The text will be revised to state that Ph, conductivity, and temperature must have stabilized in three consecutive readings before purging will be completed.
4.5.1.5	17	Either method may be used. Ground-water sampling from open boreholes will be performed as a field screening method only, with analyses to be used as a tool for developing additional investigation at a site. Two methods are specified to give the contractor an option. Either method is a valid means for obtaining ground-water samples for their intended use.
B-4		No. Table B-4 is for volatile organics by Method 8240. Table B-7, Method 8330, detects explosives. Three of the most common decomposition products of explosives (2-Am-DNT, 4-Am-DNT, and 1,3,5-TNB) are all compounds detected by Method 8330 and are listed in Table B-7. No text change is necessary.

EPA ENCLOSURE 3

COMMENTS ON DRAFT RI/FS WORK PLAN VOLUME 3: SITE SAFETY AND HEALTH PLAN

SECTION	PAGE/ PARA.	RESPONSE
1.0	1/3	Concur.
4.3	30	The SSHO will be on-site at all times during investigative activities.
7.1	37	Action levels will ensure that the site is evacuated or PPE is upgraded prior to any potential overexposure, therefore 5 minute escape packs will not be necessary. Work will not be performed in an IDLH atmosphere.
9.1	45	Concur. Proper use of PPE will ensure employees are protected from exposure via all pathways.
9.1	45	Refer to response above.
12.0	51	Concur.
12.0	52	The COE project manager will be responsible for contacting EPA and TWC project coordinators as necessary.

EPA ENCLOSURE 4

Risk Assessment

General Comments (from Jon Rauscher, Toxicologist)

Site Concept Model: Concur. See Section 6 for discussion on Site Conceptual Model.

Contaminants of Concern: Concur. See Section 6 for discussion referencing RAGS Manual for procedures in identifying Contaminants of Concern.

Exposure Assessment: Concur. See Section 6 for discussion on development of land use scenarios, the use of the RAGS Supplemental Guidance, and data evaluation.

Toxicity Assessment: Concur. See Section 6 for statement on consulting the EPA RPM concerning chemicals having no RfD of cancer slope factor.

Risk Characterization: Comment Noted. See Section 6 for statement on the identification of COCs after proper data evaluation.

Ecologic Risk Assessment: Concur. An Ecological Risk Assessment will be included in the baseline risk assessment. RAGS, Vol 2, will be used to prepare the Ecological Assessment. In addition, EPA Region 6 Biological Technical Assistance coordinators will be consulted regarding the planning of the Ecological Risk Assessment. See Section 6 for discussion.

RESPONSE TO COMMENTS
LONGHORN ARMY AMMUNITION PLANT (LHAAP)
REMEDIAL INVESTIGATION/FEASIBILITY STUDY (RI/FS)
WORK PLAN (DRAFT)

EPA
METCALF AND EDDY

Volume I:

General Comments

1) The time required to incorporate comments from the regulatory agencies is specified in the Federal Facility Agreement as 30 calendar days. Contractors will be used in all phases of the remedial activities.

2) Do not concur. Monitoring wells to be plugged are noted on the drawings labeled "Proposed Sampling Plan" because plugging of wells is part of the RI field work to be performed. Other drawings illustrate existing site conditions.

3) Do not concur. Background samples should be site-specific. Should it be shown that background contamination occurs on a large scale, then the scope of the investigation will need to be defined to examine the source of widespread contamination. For example, if ground water is contaminated from an upgradient source, this contamination needs to be taken into consideration when evaluating the impact of contamination present at the site on the ground water beneath it. Proposed background locations have been selected to best represent site-specific background conditions.

4) Concur. Those borings from which ground water is to be sampled will be taken at least 2 feet below detected ground water. Text has been modified to address depths of soil borings.

5) Exception. Soil borings are proposed for investigating potential sources, and ground-water sampling from soil borings is intended as a screening tool only. Ground-water samples intended to characterize the saturated zone will be obtained from monitoring wells screened a sufficient depth to account for "sinkers". Ground-water monitoring for each site is now addressed.

6) Concur. All 5-foot soil borings will now be sampled at 2.5-foot intervals, beginning at the ground surface. Text has been modified.

Volume I:

Specific Comments

Section 1.0

Page 1-3, Section 1.1

Concur.

Page 1-3, Table 1-2

Concur.

Page 1-6, Section 1.3.1, Line 9

Do not concur. In response to EPA general comment 6, identification of operable units will be made as soon as possible.

Page 1-6, Section 1.3.1, Lines 19 and 20

Concur.

Page 1-6, Section 1.3.1, Lines 23-25

Concur. Identification of operable units will be made as soon as possible. Operable units may be changed or modified throughout the RI/FS process until the Record of Decision is developed.

Page 1-7, Section 1.3.2

Exception. Table 4-1 has been created with this information, but will be included in Section 4.0 only.

Page 1-8, Section 1.3.3

Concur.

Page 1-8, Section 1.4

Concur.

Section 2.0

Page 2-1, Section 2.2

Concur. Uncertain is incorporated, but Karnack is not. Text has been modified to reflect the change.

Page 2-3, Section 2.3

Concur. Text has been modified to reflect the change.

Page 2-5, Figure 2-2

Concur. Sites have been added to the figure.

Page 2-12, Table 2-1

Concur. Table has been revised.

Page 2-18, Section 2.4.8, Line 12

Do not concur. The term "skinks" is correct. Skinks are reptiles; skunks are not.

Page 2-20

Concur. Table 2-2 has been updated to 1992.

Section 3.0

Concur.

Concur.

Concur. Text has been modified to incorporate the information included in Table 1 of the M&E Comments.

Section 3.6. Areas 18&24.

Concur.

Page 3-92. Section 3.6.4. Areas 18&24.

Cluster wells are constructed in separate boreholes. Text has modified to clarify cluster well locations and well depths.

Page 3-93. Section 3.6.4. Areas 18&24.

Two sources have created two ground-water contaminant plumes that appear to overlap one another beneath the Burning Ground No. 3 area. Although one area of high concentration is associated with each plume, lower concentrations can be contoured to encompass both plumes into a single plume. A limited number of wells were sampled to obtain this data, which is one reason why a complete round of ground-water sampling should be performed to get the best plume definition possible.

Page 3-100. Section 3.6.7. Areas 18&24.

Concur.

Section 4.0

General Comments.

1) Concur. See response to M&E Volume 1 General Comment 4.

2) Exception. See response to M&E Volume 1 General Comment 5.

3) Concur. See response to M&E Volume 1 General Comment 6.

4) Concur. The sites LHAAP 11, 13, 14, 1, XX, and 27 will be further considered as candidates for an operable unit.

Concur. Monitoring wells and points of compliance have been added to the Work Plan.

Specific Comments.

Page 4-7, Section 4.2.2.1, 5th Sentence

Concur.

Page 4-11, Section 4.3.2, 2nd line

Concur.

Page 4-53, Figure 4-10-1, Site 1

As a result of the comment, another site visit was performed, installation personnel were interviewed, and aerial photographs were reexamined. It was determined from the information gathered that the limits of the site appear to encompass an additional area approximately twice as large as the site as it is currently defined. The area extends to the west and northwest of the current site and contains trenches and mounds of debris believed to be associated with the Inert Burning Grounds operations. Figures 3.10.2 and 4.10.1 are revised to show new suspected limits. An addendum to the Work Plan will be prepared to address the full extent of the site and is addressed in paragraph 3.10.2.

Site 16

Page 4-13, Section 4.4.1, 1st sentence

Concur.

First paragraph, last sentence

Concur.

Page 4-18, Section 4.4.2.2

See response to M&E Volume 1 General Comment 5.

Page 4-19, Section 4.4.2.4.1, 3rd paragraph

Concur. Text has been modified to address screen settings.

Site 17

Page 4-20, Section 3.5.1, 1st paragraph

Concur. Sampling plan has been revised, changing one originally proposed soil boring to a monitoring well. Screen setting will be deep enough to intercept any free-phase DNAPLs.

Sites 18 and 24

Exception. Wells MW-2 and 120 are screened at depths which monitor the uppermost ground-water zone, which is extends down to elevation 155 MSL. The presence of any free-phased DNAPLs perched on this aquiclude should be indicated by analyses of samples from these wells; therefore no additional borings are necessary.

Site 29

Page 4-32, Section 4.7.2, 1st paragraph

Do not concur. Toluene is the VOC contaminant of concern for this site. Chlorinated organics are not anticipated. However, if they are found, wells will be screened at sufficient depths to intercept any free-phase DNAPLs.

Site 12

No comment. No response required.

Site 32

See response to Site 29 comment.

Section 5.0.

Page 5-1, Section 5.0, Lines 20 and 21

Concur.

Page 5-2, Section 5.1, Lines 9 and 10

Concur. Text has been modified.

Page 5-2, Section 5.1.1, Line 6

Concur.

Page 5-4, Section 5.1.2, Line 4

Do not concur. According to EPA guidance, initial screening is based on the three listed criteria not based on the nine criteria specified by CERCLA.

Section 6.0

Comment noted. See Section 6. All models to be used will be EPA and TWC approved, but no models will be specifically cited until existing conditions are better defined.

Section 7.0.

Page 7-6, Table 2-2

Concur. Table 7-2 has been modified to reflect the change.

Volume II:

General Comments.

1) No. Improper cleaning by the manufacturer would show up in the field blanks.

2) A validation report and the ER will be furnished as Attachments 1 and 2 to the comment responses. A lab summary report, a short document accepting the contractor's QC report and adding QA comparability results, has not been written by District personnel. None are available.

SPECIFIC COMMENTS

Section 1.0

Page 1, Section 1.1

Concur. Section will be added.

Page 1, Paragraph 1, Line 13

Concur. The reference was cited incorrectly. The text will be modified to delete the "SW-846".

Section 2.0.

Page 2, Section 2.1.

Concur. Reference to training will be added.

Page 2, Paragraph 5, Line 6

Concur. Change will be made.

Page 3, Section 2.4.

Do not concur. Army regulations have established sampling and analytical procedures which exceed data quality level III. These are described in detail in ER 1110-1-263 and are summarized in Attachment A. These procedures are sufficient to meet project objectives. Also, CLP protocols are not available for explosives or some of the other significant parameter groups for this project. Also, in a meeting on 09 April 1992 between COE, EPA, and TWC, Lisa Price agreed to waive the CLP requirement. No text change is needed.

Page 3, Paragraph 3, Lines 1 through 3

Yes. Any additional handling has the potential for problems. However, on this project, sampling will be performed by contractors who will ship directly to their own labs (except for QA samples) as discussed in Section 2.4.2. No text change is needed.

Page 3, Paragraph 5, Lines 1 through 5

COE laboratory validation is described in detail in this document. Data validation is also described in this document, Attachment 3, and in the COE memo on minimum chemistry data reporting requirements, Attachment 4.

No. Most of the analytical procedures listed are from SW-846.

No change to the text is necessary.

Pages 3 - 8, Sections 2.3 - 3.6; Page 20, Paragraph 2, Lines 4 and 5; Page 26, Paragraph 2, Lines 1-13 and Page 27, Table 8.1

No. EPA's SW-846 methods are somewhat different in analytical procedure, validation method, and reporting requirements. All items not submitted with the original data package, such as chromatograms and calibration checks are kept at the laboratory and are available if needed.

The data will be acceptable if the data quality management elements as discussed in the references listed above and Attachment 1 are deemed as acceptable when subject to a validation review.

No text change is necessary.

Section 3.0

Page 3, Section 3.0, 10th Line.

Do not concur. These tables are already part of the document. Please contact us if they have been omitted from your review draft. No text change is necessary.

Section 4.0.

Page 11, Figure 4-1.

If monitoring of more than one zone is needed, cluster wells will be installed. No change will be made to the text.

Page 14, Section 4.4.1.2, 5th Line.

Concur. Spelling will be corrected.

Page 15, Section 4.5.1.2. 3rd Line

Do not concur. Sample clarity is a reliable indicator of proper development. If the sample appears dirty, then additional development may be performed before sampling operations.

Page 17, Section 4.5.1.5.

Do not concur. Water sampling in open boreholes will only be performed as a very general screening technique and only borings which do not collapse will be sampled.

Page 18, Section 4.5.3

A shovel is adequate to obtain a sample of the uppermost foot of material. No text change is necessary.

Page 19, Section 4.7.1. 4th Line.

Concur. Text will be added.

Page 21, Section 4.9. 6th Line.

Concur. Section on waste management will be expanded, see Appendix C to the CDAP.

Page 21, Section 4.9. last Line.

Concur. Text will be added stating that other materials contacting potentially hazardous waste will be placed in containers and later tested. The section on waste management will be expanded, see Appendix C to the CDAP.

Page 22, Paragraph 2, Lines 6 and 7

Concur. Field personnel will be aware of holding times and in nearly all cases will ship samples the day they are collected. If the CDAP required same day shipment, the samplers would be in violation of the project requirements if, occasionally, circumstances prevented shipping the day of collection. Bus shipment may be used if it does not take an excessive period of time. No text change is necessary.

Page B-1, Table B.1

Concur. Reference will be deleted.

Volume III:

General Comment.

1) A hazard assessment is provided in Section 7.0 of the SSHP. Additional assessment information has been added.

2) Maintenance and calibration logs will be submitted by the Contractor performing this investigation. Manufacturers' maintenance and calibration procedures will be followed.

3) Concur. A chemical and physical properties chart has been added to the SSHP.

RESPONSE TO COMMENTS
LONGHORN ARMY AMMUNITION PLANT (LHAAP)
REMEDIAL INVESTIGATION/FEASIBILITY STUDY (RI/FS)
WORK PLAN (DRAFT)

EPA
RMC ENVIRONMENTAL AND ANALYTICAL LABORATORIES

Tab A

Draft CDAP Comments

1. Concur. The Work Plan states at the beginning of Section 4.0 that all samples will be analyzed for explosive compounds following the analytical procedures listed in the CDAP. The analysis for explosives, shown in the CDAP as Method 8330, includes the degradation products listed in the comment, as well as other explosive compounds.

2. Exception. Should aluminum be present in the soil, any reaction with water will have already taken place. The UXO clearance to be performed prior to investigations of a site will detect metallic containers which may contain this compound. The SSHP identifies procedures for clearing a site prior to performing drilling and sampling activities.

3. Concur. Leaching of constituents down to the water table is a primary concern for most of the sites to be investigated. This is why soil borings and soil samples will be taken down to ground water to determine the vertical extent of soil contamination and whether it has impacted ground water. Explosive analyses of all samples will detect any byproducts present.

RESPONSE TO COMMENTS
LONGHORN ARMY AMMUNITION PLANT (LHAAP)
REMEDIAL INVESTIGATION/FEASIBILITY STUDY (RI/FS)
WORK PLAN (Draft)

TWC

General comments on RI/FS Work Plan Volume 1 (General):

CMT #	RESPONSE
1	Exception. Some maps and figures have been edited to ensure clarity. Maps are intended to show surface features. Subsurface profiles have been added to illustrate any subsurface information available for the installation or individual sites.
2	Copies of aerial photographs and information for ordering can be obtained by contacting: USDA ASCS Aerial Photography Field Office 2222 West 2300 South P.O. Box 30010 Salt Lake City, UT 84130-0010 (801) 524-5856

Photographs used in developing the Work Plan were:

Photograph Number	Date Taken
CFX-3N-78	20 May 1954
CFX-3N-79	20 May 1954
CFX-3N-80	20 May 1954
CFX-1DD-60	30 Apr 1963
CFX-1DD-61	30 Apr 1963
CFX-1DD-62	30 Apr 1963
CFX-ILL-61	30 Jan 1970
CFX-1LL-62	30 Jan 1970
58 48203 178-2	17 Dec 1978
58 48203 178-3	17 Dec 1978
58 48203 178-4	17 Dec 1978
40 48203 180-177	5 Nov 1980
40 48203 180-178	5 Nov 1980
40 48203 180-179	5 Nov 1980

329416 HAP 83 F 543-19	16 Feb 1985
329416 HAP 83 F 543-20	16 Feb 1985
329416 HAP 83 F 543-21	16 Feb 1985

3 Concur. Personnel decontamination stations will be set up at each site and are addressed in the SSHP.

Do not concur. The equipment decontamination station will be located at the discretion of the contractor. He may choose to locate it at a central area accessible to several sites. The text of the SSHP has been revised to indicate location alternatives.

Hydrogeology/Geology/Subsurface Stratigraphy

4 Do not concur. Investigations of all media are grouped by site.

5 The literature states that ground water occurs under both confined and unconfined conditions in the Wilcox Group. Previous drilling data at LHAAP indicates that in most instances ground water stabilizes within approximately 2 feet of where it was first encountered during drilling. However, as stated in paragraph 2.4.4, perched or locally confining conditions can occur within the Wilcox due to the high clay content and highly variable stratigraphy.

6 Hydraulic conductivity data are not presented as assumptions but were calculated from slug test data obtained from previous investigations, as stated in the text. Much of the detailed information presented for the Wilcox Group was developed from the extensive studies previously performed at LHAAP 18 & 24.

7 Concur. Any statements implying that discharge to surface drainage will occur have been revised to state that discharge may occur. Elevation data along surface drainage channels will aid in determining if surface drainage channels are a discharge point for ground water. These data will be obtained when surface water samples are taken during the RI.

8 Concur. Grab sampling of the ground water in boreholes is intended to be used only as a screening tool to provide information on whether the ground water has been impacted at a site. Water levels will aid in siting monitoring wells. Ground-water grab samples from soil borings are not intended to be representative of the transmissive zone beneath a site. Analytical results will not be used to make a determination whether ground water has or has not been impacted with respect to determining the need for remedial action for a site. All ground-water samples intended to

represent the transmissive zone for making remedial action determinations will be obtained from monitoring wells. The Work Plan has been revised to address phasing the installation of monitoring wells at each site to best use all the data obtained from first phase RI efforts, including any information obtained from sampling the ground water from boreholes. The procedure for obtaining water levels from boreholes is described in the CDAP.

9 Do not concur. Soil samples will be taken at a frequency to be representative of the strata encountered. Drill action and examination of the auger flights and cuttings will be used to fill in missing information. The CDAP has been modified to clarify the frequency of soil sampling in borings. The text of the Work Plan has been revised to address an attempt at continuous sampling in one of the 150-foot deep stratigraphic test borings.

10 Concur. This statement has been deleted where used. Monitoring wells at all sites are now addressed.

11 Concur. Monitoring well installation depths and screened intervals are now addressed accordingly for all new wells to be installed. However, borings will only be advanced approximately 2 feet past the depth at which ground water is encountered. The intent of soil borings is to investigate possible sources and the horizontal and vertical extent of soil contamination at a site. Therefore, there is no need to advance a boring any deeper than ground water. The text has been revised.

12 Concur. The text of the CDAP has been revised to state that the potential for cross-contamination will be reduced by using a hollow stem auger and sampling through the auger. If a potentially contaminated aquifer is penetrated, it will be cased off with casing before drilling continues.

13 Concur. The text of the CDAP has been revised to state that indicators have stabilized and at least 3 volumes of water have been removed during well development.

14 Concur. The text of the CDAP has been revised to address these procedures for well sampling.

Soil, Surface Water, and Sediment Samples

15 Exception. Sampling frequencies for soil borings are specified in each site's work plan. Specific depths where soil samples are taken will be determined in the field as being representative of that specified interval. The sample depth will be recorded on the sample container and all necessary documents. Sediment samples will be taken by push

tube. After extraction from the tube, the upper 5 inches of sediment will be collected in a sample jar. Approximately 5 inches of soil are necessary to completely fill a jar. Sediment samples will not be composited from different locations.

Identification of Potential Receptors

16 Concur. Public supply wells are addressed in Section 2.0 and are shown on Figure 2-7. Reference to the nearest public water supply wells has been clarified for each site under the paragraph entitled "Identification of Potential Receptors" in Section 3.0. No testing has been performed for contaminants of concern.

17 Comment noted. Source of statement that "Caddo Lake...supplies about 16,600 Louisiana residents..." is based on the rounded sum of city populations listed in Section 2.4.5.

The cities of Marshall and Shreveport do not currently use Caddo Lake water. Marshall uses water from Big Cypress Bayou upstream from Caddo Lake (according to Mr. Bill Gibson, City of Marshall). Shreveport uses Cross Lake as its principle water supply and occasionally takes supplemental water downstream from Caddo Lake. According to city officials, Shreveport is constructing a water line to Caddo Lake as a future supplemental source. See discussion in Section 6.

As land use scenarios are further defined during the baseline risk assessment, populations affected will be better defined.

18 Concur. The statement that "there is low probability that any endangered or threatened species occur in the suspected contaminated area" has been deleted. Such determination will be made during the ecological risk assessment.

19 Concur. The statement that "The existing site is of relatively low ecological value" has been deleted. Such determination will be made during the ecological risk assessment.

Specific comments on RI/FS Work Plan Volume 1 (General):

CMT #	PAGE #	PARA #	RESPONSE
1	2-15	2	No, the Army has never sampled any of the public water supply wells which are located near LHAAP.
2	2-15	2	Concur. Information has been added.
3	2-17	3-	Comment noted. The basic source of information for Section 2.4.8, Ecological Conditions, was taken from the "Supplemental Environmental Assessment for the Proposed Elimination of Intermediate-Range and Shorter-Range Missiles at Longhorn Army Ammunition Plant" (Department of Army, August 1988).
4	2-19	3	Concur with spelling but the fountain darter was deleted from the discussion. See response to Comment 5.
5	2-21	1	Comment noted. After further discussion with the Texas Department of Parks and Wildlife (TDPW), it was discovered that fountain darters are basically confined to the San Marcos River and the adjacent Comal Springs area in central Texas. Although these darters are endangered, they are not listed as present in Harrison County. Therefore, the last two sentences of Section 2.4.8 were deleted.
6	3-1	--	Concur. Figure 2-2 has been revised to show locations of all sites.
7	3-4	3-	The correct units in this paragraph are "ug/kg".
8	3-7	2	Concur.
9	3-77	1	Concur. The text states that assumptions were drawn from slug test data only.
10	3-77	1	Concur. Procedures for determining groundwater velocities and hydraulic gradients are detailed in the referenced COE, 1989b. The reference for these data has been added to the text.

11	3-93	2	Concur. The distribution of other contaminant concentrations are not conducive for contouring, especially since many of the wells needed to close isoconcentration lines have not been sampled. This is one of the reasons why a complete round of ground-water sampling is needed.
12	3-107	3-	Previous sampling locations are discussed in more detail in paragraph 4.7.1. Most were selected using a grid system only.
13	3-123	4	No. See revised discussion in text and response to Comment 12.
14	3-129	3	Concur. The SSHP addresses the immediate removal of any explosive wastes found on-site.
15	3-143	3	Concur. Text has been modified.
16	3-143	Table	Concur. Table has been removed and text has been modified.
17	3-157	2	Concur. See response to Comment 15.
18	4-1	1-	Concur. Initially, a "blanket" analysis will be conducted to ensure that all potential contaminants, including Contaminants of Concern, have been investigated at each site, as explained at the beginning of Section 4.0. Constituents were selected not only to identify contaminants of concern at each site, but also to eliminate the need for additional analyses should no contamination be identified. Results of initial sampling will determine which specific parameters will require additional investigation at each site should it be necessary. Table 4.1 has been added to Section 4.0 showing the numbers and types of samples to be obtained for each site. Test methods are detailed in the CDAP. The Contaminants of Concern are listed for each site on Table 7-1, and are addressed for each site under paragraphs 3.X.5 and 6.2.X.1 (where X is site-specific).
19	4-2	1	Concur. A non-intrusive preliminary screening survey has been added to the site work plan.

20	4-3	2	Concur. Monitoring wells and their probable locations are now addressed.
21	4-5	2	Do not concur. Sampling procedures and methods are listed in the CDAP, as referenced in paragraph 4.0. Samples will be discrete, with the depth where the sample is taken to be noted by the sampler when it is taken. Except in borings anticipated to be 5 feet deep or less, samples will be taken at least once every 5 feet as described in the Work Plan and the CDAP.
22	4-7	1	Concur. A preliminary screening survey has been added to the site work plan.
23	4-9	2	Concur. Text has been revised and geophysical survey has been added.
24	4-10	1	Concur. Monitoring wells are now addressed.
25	4-10	3	Concur. Soil borings will be advanced at least 2 feet into ground water. Actual boring depths will vary depending on the subsurface conditions encountered. Monitoring wells will screen the entire saturated zone to a maximum thickness of 20 feet. The Work Plan has been revised to address these procedures.
26	4-15	2	Concur. Deep stratigraphic boring locations have been moved outside the limits of the landfill to decrease the chance of cross-contamination during drilling. The CDAP has been revised to address the drilling of these borings. It is anticipated that a single boring will be used and casing will be telescoped downward, with each water-bearing zone sealed off from the next lower one. Continuous sampling will be attempted in at least one of the borings for visual logging and characterization to help correlate subsurface materials with the geophysical logs. No chemical analyses will be done because the borings are now located outside the limits of the landfill.
27	4-15	2	Concur. These well plugging procedures are now detailed in the CDAP.

28	4-19	2-	Exception. Ground-water contamination has been identified in the one downgradient well at the site. The plan of investigation has been revised to install cluster wells at each of the originally proposed well locations along the landfill boundary.
29	4-19	1	Concur. A pump test will best characterize hydrogeologic conditions at the site. However, more information about the nature of contaminants, the extent of contamination, and the nature of subsurface materials are necessary before determining if a pump test is necessary and where wells should be placed for performing one.
30	4-19	4	Concur. Monitor wells will screen the entire upper saturated zone for a maximum depth of 20 feet below the ground-water surface. The bottom of the well will be placed into a confining material if a confining material is encountered. If no confining material is encountered, the well will screen the upper 20 feet of ground water. The text has been revised to address determining monitoring well depths where new wells are to be installed.
31	4-21	4	Exception. One proposed soil boring has been changed to a monitoring well within the burn pit area to characterize the ground-water impact at the site. Additional monitoring wells and their probable locations are now addressed.
32	4-22	2	Do not concur. Surface soil samples will be taken at each boring location as part of the standard sampling frequency for soil borings.
33	4-22	3	Do not concur. It is difficult to define a single ground-water zone due to the variability of the stratigraphy as shown on the subsurface profiles that have been added to the Work Plan. Considering that DNAPLs are of primary concern at both LHAAP 17 and LHAAP 18 & 24, Well C-7 appears to be screened at a sufficient depth to monitor background conditions for these areas. Well C-7 is chosen as a background well for LHAAP 18 & 24 because it also appears to be outside the limit of the ground-water mound underlying this site. A closer background well may need to be designated or installed for LHAAP 17

			after initial investigations for these two areas are complete because of the proximity of the sites addressed in the comment. If well C-7 is contaminated due to activities performed at LHAAP XX, this contamination does not discount its use as a background well; rather, as a background well it will be performing its function of showing the quality of the ground water prior to its passing beneath the sites downgradient from LHAAP XX.
34	4-24	4	Concur. Ground-water monitoring is now addressed.
35	4-30	1	Concur. Monitor wells monitoring the next deeper water-bearing zone are already in place. The text has been modified to clarify this information. A pump test will be considered after the ground-water contaminant plume is fully defined. This information is necessary to determine where wells should be placed and which wells should be used for performing a pump test.
36	4-32	2	Concur. The plan of investigation for this site has been revised to intensely investigate one production line as being representative of all six lines. Soil borings are now sited to best reflect production line activities where releases may have occurred. Soil borings are also sited within each of the three bermed toluene tank locations in the Bulk Storage Area. Additional monitoring wells are also addressed.
37	4-36	1	Concur. The plan of investigation has been revised. See response to Comment 36.
38	4-37	2	Concur. Additional monitoring wells are now addressed.
39	4-39	2	Concur. Surface casing for drilling through wastes is now addressed in the CDAP. Proposed soil borings have been converted to monitoring wells. Additional borings for determining the extent of soil contamination are now addressed.
40	4-41	1	Do not concur. Both originally proposed surface water and sediment sample locations are shown on Figure 4-8-1.

41	4-41	3-	Concur. Soil borings have been changed to monitoring wells.
42	4-42	2	Concur. See response to Comment 30.
43	4-44	2	Concur. Monitoring wells are now addressed. The frequency of soil sampling in 5-foot soil borings has been changed to one sample every 2.5 feet, beginning at the ground surface.
44	4-46	3	Do not concur. The previously proposed shallow soil sample location at the eastern corner of the leveed area is shown on Figure 4-9-1. All proposed shallow soil sample locations have been changed to 5-foot soil borings.
45	4-48	2	Concur. Referenced paragraph changed to 3.9.1.
46	4-52	1	Do not concur. There is not enough information about the nature and extent of contamination at the site and the direction of ground-water flow to make the determination that contaminants identified in Well 104 originated from the site.
47	4-52	3	Concur. Monitoring wells are now addressed.
48	4-53	2	Concur. Additional soil borings are now addressed. The Work Plan addresses the extent of the site as it was defined by previous investigations. As a result of the comment, an additional site visit was performed, installation personnel were interviewed, and aerial photos were reexamined. It was determined from the information gathered that the limits of the site appear to encompass an additional area approximately twice as large as the site as it is currently defined. The area extends to the west and northwest of the current site and contains mounds of debris and trenches. Figures 3.10.2 and 4.10.1 are revised to show new suspected limits. An addendum to the Work Plan will be prepared to address the full extent of the site and is now addressed in paragraph 3.10.2.
49	4-52	4	All soil borings will be drilled 2 feet below where ground water is encountered. The text has been modified.

50	4-55	2	Concur. The rocket motor should be detected by the magnetometer used when performing the UXO clearance in the Rocket Motor Blast Area. The proposed soil boring will be placed as close as safely possible to any anomaly discovered in this area. The text has been modified.
51	4-55	3	Do not concur. Monitoring wells will be installed at locations where contamination is identified.
52	4-57	4	Exception. All previously proposed shallow soil sample locations have been changed to 5-foot soil borings. No sources have been verified at this site to be able to site monitoring wells prior to performing the proposed field work. Actual use of the Mortar Test Area is questionable.
53	4-63	2-	Do not concur. The number of sample locations is adequate for investigating suspected contaminant sources at the site. An additional boring has been added in the drum disposal area. Monitoring wells are now addressed.
54	5-1	--	The risk assessment results will be used in the evaluation of "Overall Protection of Human Health and the Environment" during the Detailed Analysis of Alternatives.
55	Table 7-2		Concur. Tables 7-2 and 7-3 are revised.

Comments on RI/FS Work Plan Volume 2 (Chemical Data Acquisition Plan):

CMT #	SECTION	RESPONSE
1	4.1	Concur. The text will be changed to state that the potential for cross-contamination will be reduced by using a hollow stem auger and sampling through the auger. If a potentially contaminated aquifer is penetrated, it will be cased off with casing before drilling continues.
2	4.1 & 4.1.1.3	Do not concur. Text will be modified to clarify the method of collecting soil samples from auger flights and to state that this method will only be used if other methods such as split spoon and shelby tube do not work.
3	4.1.2	Do not concur. Text will be modified to state that soil samples will be taken at a frequency to be representative of the strata encountered and that drill action and examination of the auger flights will be used to fill in missing information.
4	4.2.2	Concur. Text has been modified to state that indicators have stabilized and at least 5 volumes have been removed.
5	4.4.1.2	Concur. Text will be modified to reflect this change.
6	4.5.1.2	Do not concur. Sample clarity is a reliable indicator of proper development. If the sample appears dirty, then additional development may be performed before sampling operations begin.
7	4.5.1.3	Concur. Effective purging allows fresh formation water representative of the screened interval to enter the well as described in Section 4.5.1.2 and in Comment 6. Additional text modification is not necessary.

8	4.5.1.5	Concur. Water sampling from open boreholes is not intended to be representative of the transmissive zone(s) beneath the site. Analyses of ground-water samples from open boreholes are intended to be used only as a screening tool. All ground-water samples intended to be representative of the transmissive zone(s) beneath the sites will be obtained from monitoring wells.
9	4.7	Concur. Personnel decon stations will be set up at each site. This subject is discussed in the SSHP. Do not concur. The equipment decon station will be located at the discretion of the contractor. He may choose to locate it at a central area accessible to several sites. The text will be revised to indicate location alternatives.
10	4.7.1	Do not concur. The specific layout of the decon station will be at the discretion of the contractor to meet his needs. The CDAP does, however, specify what needs to be cleaned and the frequency of cleaning. The CDAP also specifies that wastewater will be collected. Disposal of wastewater will be discussed in the waste management section. No text change is necessary.
11	4.9	It is not anticipated that much, if any, of the waste will be classified as hazardous. EPA guidance, "Management of Investigation-Derived Waste During Site Inspections" (EPA/540/G-91/009), developed for CERCLA investigations, states that investigation-derived wastes may be assumed not to be listed unless information about the site suggests otherwise. The drill cuttings and other waste have a low probability of being characteristically hazardous. The new Investigation-Derived Waste Management Plan is included as Appendix C of the CDAP.

12	Appendix B	Exception. The parameters listed in Table 5-1 are the Contaminants of Concern for each of the sites. The CDAP lists all parameters to be analyzed as part of the "blanket" analysis which will be performed for all samples and contains the detection limits for each parameter in each medium. Do not concur. Asbestos was erroneously included in the original table, and has now been deleted.

Comments on RI/FS Work Plan Volume 3 (Site Safety and Health Plan):

CMT #	SECTION	RESPONSE
1	Table of Contents	Concur.
2	7.3	Concur.
3	8.2.4	Concur.
4	9.1	Modified Level D personal protective equipment, with upgrade capabilities to Level C, was determined to protect employees from all potential exposures.
5	10.2	Site work zonation and decontamination procedures are outlined in Section 6.0 and 10.0 of the SSHP, respectively. Management of decontamination wastes is part of the waste management plan, not the SSHP.

005430

U.S. ARMY CORPS OF ENGINEERS
SOUTHWESTERN DIVISION LABORATORY

OKLAHOMA ORDNANCE WORKS
MID-AMERICAN INDUSTRIAL PARK
FUDS SITE
Groundwater and Soil Sampling
QA/QC Report

August 1991 Chemical Data

EXAMPLE DATA VALIDATION REPORT

Prepared by: Tulsa District Corps of Engineers

Attachment 1

Oklahoma Ordnance, Pryor Oklahoma

QA/QC Report

Lab Reports 15355 and 15355A

1.0 Discussion.

During the Oklahoma Ordnance soil and groundwater investigation, fifty-nine soil samples, twenty-one groundwater samples, fourteen travel blanks, one equipment blank, three rinsate blanks, four quality control duplicate samples, and ten quality assurance duplicate samples were collected. Investigations were conducted in August of 1991.

All samples were collected and shipped by representatives of Ebasco Environmental to the U.S. Army Corps of Engineers (COE) Southwestern Division Laboratory (SWD), NDRC Laboratories, and Raba-Kistner Consultants Inc.. SWD and all contract laboratories have been validated by Missouri River Division COE. Samples shipped to SWD were distributed to ARDL Laboratory and TMA Laboratory. Distribution of the samples and their analyses are shown in Table 1. Sample analyses were reported in five separate reports. Quality assurance samples are compiled in the SWD lab report #15355. All other samples are compiled in four, three-ringed binders and will be referred to as lab report #15355A in this QA/QC report. Detailed data quality evaluations are organized by individual laboratory report in the following sections of this report.

Details of this data validation; actual holding times achieved, recoveries of surrogates and spikes, relative percent difference (RPDs), and blank summaries are available on data validation check sheets from the Tulsa District COE, HTW Quality Assurance and Industrial Hygiene Section, upon request.

Table 1
Sample Distribution for Analyses

Sample Date / Sample#	NDRC#	Ma	VOA	SVOA	PCB	Mt	EX	Msc	CN	Report#
			--------ANALYSES---------							
Sampling 8/12/91										
CS-SB-47-1 (7-10')	6797-2	SL	2	2	3	2	3	3	3	15355A
TL-SB-46 (2-7')	-3	SL	2	2	3	2	3	3	3	"
CS-SB-44 (2-5')	-5	SL	2	2	3	2	3	3	3	"
TL-SB-25 (2-7')	-10	SL	2	2	3	2	3	3	3	"
Sampling 8/13/91										
CS-SB-48 (2-7')	6797-1	SL	2	2	3	2	3	3	3	15355A
CS-SB-45 (2-6')	-4	SL	2	2	3	2	3	3	3	"
CS-SB-43 (2-4')	-6	SL	2	2	3	2	3	3	3	"
CS-SB-41 (2-7')	-7	SL	2	2	3	2	3	3	3	"
TL-SB-20-01 (2-5')	-8	SL	2	2	3	2	3	3	3	"
TL-SB-21 (0-5')	-9	SL	2	2	3	2	3	3	3	"
TL-SB-26 (0-5')	-13	SL	2	2	3	2	3	3	3	"
CS-SB-13 (2-7')	-15	SL	2	2	3	2	3	3	3	"
Sampling 8/14/91										
TL-SB-24 (0-5')	6797-11	SL	2	2	3	2	3	3	3	15355A
TL-SB-23 (0-5')	-12	SL	2	2	3	2	3	3	3	"
TL-SB-02 (2-7')	-14	SL	2	2	3	2	3	3	3	"
CS-SB-14 (1-4')	-16	SL	2	2	3	2	3	3	3	"
RW-SB-06 (0-5')	-21	SL	2	2	3	2	3	3	3	"
RW-SB-27 (0-5')	-24	SL	2	2	3	2	3	3	3	"
CS-SBD-13 (2-7')		**QA**	4	4	4	4	5	4	4	15355

Notes:
1 - Analysis performed by Southwestern Division Laboratory
2 - Analysis performed by NDRC Laboratories
3 - Analysis performed by RKCI Laboratories
4 - Analysis performed by ARDL Laboratories
5 - Analysis performed by TMA Laboratories
Ma - Matrix or specific sample designation
GW - Groundwater, SL - Soil, TB - Travel Blank
EB - Equipment Blank, FP - Free Product
RB - Rinsate Blank, QC - Quality Control Duplicate
QA - Quality Assurance Duplicate

Table 1 (continued)
Sample Distribution for Analyses

Sample Date / Sample#	NDRC#	Ma	ANALYSES VOA	SVOA	PCB	Mt	EX	Msc	CN	Report#
Sampling 8/15/91										
RW-SB-08 (2-7')	6797-18	SL	2	2	3	2	3	3	3	15355A
CS-SB-42 (0-2.5')	-19	SL	2	2	3	2	3	3	3	"
TL-SB-03 (2-7')	-20	SL	2	2	3	2	3	3	3	"
TL-SB-22 (0-7')	-22	SL	2	2	3	2	3	3	3	"
TL-SBD-22 (0-7')		QA	4	4	4	4	5	4	4	15355
TL-SB-04 (0-5')	6797-23	SL	2	2	3	2	3	3	3	15355A
Trip Blank 1	-17	TB	2							"
TL-SB-01 (0-5')	6860-3	SL	2	2	3	2	3	3	3	"
TN-SB-38 (0-5')	-7	SL	2	2	3	2	3	3	3	"
Sampling 8/16/91										
TN-SB-32 (1-7.5')	6860-1	SL	2	2	3	2	3	3	3	15355A
RW-SB-28 (2-7')	-2	SL	2	2	3	2	3	3	3	"
TN-SB-37 (0-5')	-4	SL	2	2	3	2	3	3	3	"
TN-SB-35 (0-5')	-5	SL	2	2	3	2	3	3	3	"
TN-SB-36 (0-5')	-6	SL	2	2	3	2	3	3	3	"
FB-1	-8	RB	2	2	3	2	3	3	3	"
Trip Blank 2	-9	TB	2							"
TN-SB-31 (12-17')	6916-1	SL	2	2	3	2	3	3	3	"
TN-SB-11 (0-5')	-2	SL	2	2	3	2	3	3	3	"
Sampling 8/17/91										
FB-02	6916-3	RB	2	2	3	2	3	3	3	15355A
Trip Blank-3	-4	TB	2							"
TN-SB-33 (0-5')	-5	SL	2	2	3	2	3	3	3	"

Notes:
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4 - Analysis performed by ARDL Laboratories
5 - Analysis performed by TMA Laboratories
Ma - Matrix or specific sample designation
GW - Groundwater, SL - Soil, TB - Travel Blank
EB - Equipment Blank, FP - Free Product
RB - Rinsate Blank, QC - Quality Control Duplicate
QA - Quality Assurance Duplicate

Table 1 (continued)
Sample Distribution for Analyses

Sample Date / Sample#	NDRC#	Ma	VOA	SVOA	PCB	Mt	EX	Msc	CN	Report#
Sampling 8/17/91 (continued)										
TN-SB-29 (2-7')	6916-6	SL	2	2	3	2	3	3	3	15355A
TN-SB-34 (0-5')	-7	SL	2	2	3	2	3	3	3	"
TN-SBD-34 (0-5')-QC	-8	QC	2	2	3	2	3	3	3	"
TN-SB-09 (2-7')	-9	SL	2	2	3	2	3	3	3	"
TN-SBD-09 (2-7')-QC	-10	QC	2	2	3	2	3	3	3	"
TN-SB-10 (0-5')	-11	SL	2	2	3	2	3	3	3	"
TN-SB-12 (2-7')	-12	SL	2	2	3	2	3	3	3	"
Sampling 8/18/91										
ST-SB-15 (2-7')	6916-13	SL	2	2	3	2	3	3	3	15355A
ST-SB-19 (2-7')	-14	SL	2	2	3	2	3	3	3	"
BK-SB-16 (2-7')	-15	SL	2	2	3	2	3	3	3	"
Sampling 8/19/91										
ST-SB-18 (2-7')	6916-16	SL	2	2	3	2	3	3	3	15355A
ST-SBD-18 (2-7')		QA	4	4	4	4	5	4	4	15355
RW-SB-05 (0-7')	6916-17	SL	2	2	3	2	3	3	3	15355A
RW-SBD-05 (0-7')		QA	4	4	4	4	5	4	4	15355
TN-SB-40 (7-11')	6916-18	SL	2	2	3	2	3	3	3	15355A
TN-SBD-40 (7-11')		QA	4	4	4	4	5	4	4	15355
RW-SB-07 (0-5')	6916-19	SL	2	2	3	2	3	3	3	15355A
Trip Blank-4	-20	TB	2							"
TN-SB-39 (2-7')	7028-1	SL	2	2	3	2	3	3	3	"
ST-SB-17 (0-5')	-2	SL	2	2	3	2	3	3	3	"
TN-SB-30 (0-5')	-3	SL	2	2	3	2	3	3	3	"

Notes:
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3 - Analysis performed by RKCI Laboratories
4 - Analysis performed by ARDL Laboratories
5 - Analysis performed by TMA Laboratories
Ma - Matrix or specific sample designation
GW - Groundwater, SL - Soil, TB - Travel Blank
EB - Equipment Blank, FP - Free Product
RB - Rinsate Blank, QC - Quality Control Duplicate
QA - Quality Assurance Duplicate

Table 1 (continued)
Sample Distribution for Analyses

Sample Date / Sample#	NDRC#	Ma	VOA	SVOA	PCB	Mt	EX	Msc	CN	Report#
Sampling 8/20/91										
BK-SS-01	7028-4	SL	2	2	3	2	3		3	15355A
DA-SO-01	-5	SL	2	2	3	2	3		3	"
BK-SS-02	-6	SL	2	2	3	2	3		3	"
BK-SS-03	-7	SL	2	2	3	2	3		3	"
RW-SD-01	-8	SL	2	2	3	2	3		3	"
RW-SD-02	-9	SL	2	2	3	2	3		3	"
RW-SD-03	-10	SL	2	2	3	2	3		3	"
RW-SS-01	-11	SL	2	2	3	2	3		3	"
TL-SS-01	-12	SL	2	2	3	2	3		3	"
DA-SO-02	-13	SL	2	2	3	2	3		3	"
CS-MW-13-01	-14	GW	2	2	3	2	3	3	3	"
FB-03	-15	RB	2	2	3	2	3		3	"
TL-MW-02-01	-16	GW	2	2	3	2	3	3	3	"
Trip Blank-6	-17	TB	2							"
PP-SS-01		SL					3			"
RW-SDD-01-QA		QA	4	4	4	4	5		4	15355
Trip Blank-5		TB	4							"
PP-SSD-01-QA		QA			4					"
Sampling 8/21/91										
FB-04	7028-18	EB	2	2	2&3	2	3		3	15355A
RW-SW-01	-19	GW	2	2	3	2	3		3	"
CS-SW-03	-20	GW	2	2	3	2	3		3	"
Trip Blank-07	-21	TB	2							"
Trip Blank-08	-22	TB	2							"
TL-SW-02	7067-1	GW	2	2	3	2	3		3	"
PP-SW-04	-2	GW	2	2	3	2	3		3	"
TN-MW-33-01	-3	GW	2	2	3	2	3	3	3	"

Notes:
1 - Analysis performed by Southwestern Division Laboratory
2 - Analysis performed by NDRC Laboratories
3 - Analysis performed by RKCI Laboratories
4 - Anlaysis performed by ARDL Laboratories
5 - Analysis performed by TMA Laboratories
Ma - Matrix or specific sample designation
GW - Groundwater, SL - Soil, TB - Travel Blank
EB - Equipment Blank, FP - Free Product
RB - Rinsate Blank, QC - Quality Control Duplicate
QA - Quality Assurance Duplicate

Table 1 (continued)
Sample Distribution for Analyses

Sample Date / Sample#	NDRC#	Ma	VOA	SVOA	PCB	Mt	EX	Msc	CN	Report#
			--------ANALYSES---------							
Sampling 8/22/91										
TN-MW-12-01	7067-4	GW	2	2	3	2	3	3	3	15355A
TN-MW-09-01	-5	GW	2	2	3	2	3	3	3	"
TN-MWD-09-01-QC	-6	QC	2	2	3	2	3	3	3	"
TN-MWD-09-01-QA		QA	4	4	4	4	5	4	4	15355
ST-SW-05	7067-7	GW	2	2	3	2	3		3	15355A
ST-SW-05-QA		QA	4	4	4	4	5	4	4	15355
ST-MW-15-01	7067-8	GW	2	2	3	2	3	3	3	15355A
ST-MWD-15-01-QC	-9	QC	2	2	3	2	3	3	3	"
ST-MWD-15-01-QA		QA	4	4	4	4	5	4	4	15335
TB-09	7067-10	TB	2							15335A
TB-10	-11	TB	2							"
TB-11		TB	4							15355
TB-12		TB	4							15355
TB-13		TB	4							15355
TB-14	7067-12	TB	2							15355A
Sampling 8/23/91										
TN-MW-11-01	7116-1	GW	2	2	3	2	3	3	3	15355A
BK-MW-16-01	-2	GW	2	2	3	2	3	3	3	"
TN-PW-02-01	-3	GW	2	2	3	2	3	3	3	"
RW-MW-07-01	-4	GW	2	2		2	3			"
RW-PW-03-01	-5	GW	2	2	3	2	3	3	3	"
TN-PW-01-01	-6	GW	2	2	3	2	3	3	3	"
PW-05-01	-7	GW	2	2	3	2	3	3	3	"
PW-04-01	-8	GW	2	2	3	2	3	3	3	"
RW-MW-27		GW					3			"
RW-MW-08-01		GW					3			"
Sampling 8/24/91										
Trip Blank-15	7116-9	TB	2							15355A

Notes:
1 - Analysis performed by Southwestern Division Laboratory
2 - Analysis performed by NDRC Laboratories
3 - Analysis performed by RKCI Laboratories
4 - Analysis performed by ARDL Laboratories
Ma - Matrix or specific sample designation
GW - Groundwater, SL - Soil, TB - Travel Blank
EB - Equipment Blank, FP - Free Product
RB - Rinsate Blank, QC - Quality Control Duplicate
QA - Quality Assurance Duplicate

List of Analysis Abbreviations For Table 1

VOA - Volatile Organics
SVOA - Semivolatile Organics
PCB - Polychlorinated Biphenyls and Pesticides
Mt - Metals
EX - Explosives
Msc - Miscellaneous Analysis which may include more than one of the following analyses; Total suspended solids (TSS), Total Organic Compounds (TOC), and Anions.
CN - Cyanide

2.0 Metals Analysis.

A majority of metals were analyzed using SW-846 method 6010. These are aluminum, antimony, barium, beryllium, cadmium, calcium, chromium, cobalt, copper, iron, magnesium, manganese, nickel, silver, sodium, vanadium, and zinc. Other metals were analyzed using different SW-846 methods. These are arsenic (method 7060), lead (method 7421), mercury (method 7470/7471), selenium (method 7740), and thallium (method 7841). Analytical variations of these methods were sometimes used and substituted for certain metals. The reasons are generally due to problems associated with the sample matrix or the laboratory's endeavor to achieve lower detection levels. Some of these variations include the use of method 7061 for 7060 (arsenic) and method 7741 for 7740 (selenium).

The majority of analyses were performed at two contract laboratories. Review of the data suggests that the samples were analyzed within their individual holding times.

2.0.1 Accuracy. Matrix spike results were generally reported as acceptable. Percent recoveries were generally reported as acceptable. Occasionally, both contract laboratories indicated difficulties with percent recoveries due to matrix interferences. Matrix interferences are commonly attributed to soil samples.

2.0.2 Precision. Matrix spike duplicate results were generally reported as acceptable. Relative percent differences were generally reported as acceptable. Occasionally, relative percent differences fell outside of QC limits. Again, the laboratories cited matrix interferences as the source of error in spike recoveries.

Quality control was conducted on a number of samples. The following table lists these samples and their corresponding QC duplicates. Results are listed in ug/l for groundwater and mg/kg for soil. PQL refers to the practical quantitation limit.

Table 2-0-2
QC Duplicate - Soil Data Comparison

	PQL	TN-SB-34	TN-SBD-34
Arsenic	0.5	6	6
Mercury	0.1	< 0.1	< 0.1
Selenium	0.5	< 0.5	< 0.5
Sodium	2.5	3477	4148
	PQL	TN-SB-09	TN-SBD-09
Arsenic	0.5	6	5
Mercury	0.1	< 0.1	< 0.1
Selenium	0.5	< 0.5	< 0.5
Sodium	2.5	5773	5804

Table 2-0-2 (continued)
QC Duplicate - Soil Data Comparison

	PQL	TN-MW-09-01	TN-MW-09-01 QC
Arsenic	2	< 2	< 2
Lead	2	3	2
Mercury	0.2	< 0.2	< 0.2
Selenium	2	< 2	< 2

	PQL	ST-MW-15-01	ST-MW-15-01 QC
Arsenic	2	< 2	< 2
Lead	2	3	13
Mercury	0.2	< 0.2	< 0.2
Selenium	2	< 2	< 2

	PQL	TN-SB-34 (0-5')	TN-SBD-34 (0-5')
Silver	1.0	< 1.0	< 1.0
Aluminum	100	11600	8670
Barium	1.0	103	65.9
Beryllium	1.0	< 1.0	< 1.0
Calcium	1.0	1710	1890
Cadmium	1.0	8.3	5.7
Cobalt	1.0	11.3	2.0
Chromium	1.0	67.6	57.2
Copper	1.0	3.1	1.7
Iron	100	28800	20300
Magnesium	1.0	911	904
Manganese	1.0	1080	653
Sodium	1.0	< 1.0	< 1.0
Nickel	1.0	30.0	22.1
Lead	1.0	6.0	< 1.0
Antimony	1.0	< 1.0	< 1.0
Thallium	1.0	< 1.0	< 1.0
Vanadium	0.1	56.5	40.3
Zinc	1.0	56.2	55.9

Table 2-0-2 (continued)
QC Duplicate - Soil Data Comparison

	PQL	TN-SB-09 (2-7')	TN-SBD-09 (2-7')
Silver	1.0	< 1.0	< 1.0
Aluminum	100	11700	8960
Barium	1.0	200	124
Beryllium	1.0	< 1.0	< 1.0
Calcium	1.0	2860	2670
Cadmium	1.0	5.4	5.2
Cobalt	1.0	6.5	5.2
Chromium	1.0	31.9	21.7
Copper	1.0	2.7	1.7
Iron	100	18900	18200
Magnesium	1.0	644	543
Manganese	1.0	1280	533
Sodium	1.0	13.2	< 1.0
Nickel	1.0	18.8	14.2
Lead	1.0	12.4	6.9
Antimony	1.0	< 1.0	< 1.0
Thallium	1.0	< 1.0	< 1.0
Vanadium	0.1	39.5	23.0
Zinc	1.0	16.3	13.4

	PQL	TN-MW-09-01	TN-MW-09-01 QC
Silver	1.0	< 1.0	< 1.0
Aluminum	10	4200	2100
Barium	2	47	35
Beryllium	0.1	0.4	0.4
Calcium	500	120000	119000
Cadmium	1.0	1.5	< 1.0
Cobalt	5.0	< 5.0	< 5.0
Chromium	7	10	< 7
Copper	6	< 6	< 6
Iron	6	16600	8360
Magnesium	10	6140	5340
Manganese	1.0	1540	1220
Sodium	100	17600	16800
Nickel	10	17	< 10
Lead	1.0	11.3	5.5
Antimony	40	< 40	< 40
Thallium	100	< 100	< 100
Vanadium	10	16	< 10
Zinc	0.5	60.5	22.5

Table 2-0-2 (continued)
QC Duplicate - Groundwater Data Comparison

	PQL	ST-MW-15-01	ST-MW-15-01 QC
Silver	1.0	< 1.0	< 1.0
Aluminum	10	14900	14000
Barium	2	111	108
Beryllium	0.1	10.6	10.6
Calcium	5000	470000	457000
Cadmium	1.0	1.0	1.0
Cobalt	5.0	< 5.0	< 5.0
Chromium	7	29	14
Copper	6	10	10
Iron	6	14900	16600
Magnesium	1000	163000	182000
Manganese	1.0	4940	5220
Sodium	1000	511000	52500
Nickel	10	41	54
Lead	1.0	14.2	22.6
Antimony	40	< 40	< 40
Thallium	100	< 100	< 100
Vanadium	10	28	22
Zinc	0.5	149	120

A review of the QC data indicates that laboratory performance is generally consistent and acceptable.

2.0.3 Representativeness. Method blanks were generally reported as acceptable. Four field blanks were sampled. One of these field blanks is an equipment blank; i.e., a blank collected from groundwater sampling equipment. All rinsate and equipment blanks indicated notable amounts of contamination, specifically FB-2. Due to the number and level of contaminants detected in FB-2, all samples collected on 8/17/91 are suspected to have been cross-contaminated. Ebasco did note the problems associated with FB-2, mentioning the "presence of carbon steel flakes from several core barrels." Ebasco theorized that these flakes may account for the contamination noted in FB-1 and FB-2. Further evaluation, as suggested by Ebasco officials, indicates that there may have been "method/reagent blank contamination." Overall, all suspected samples should be reviewed carefully.

All four field blanks have been listed in table 2-0-3 with their contaminants. PQL represents the practical quantitation limit.

Table 2-0-3
Metals - Field Blank Results
(results reported in ug/l)

	PQL	FB-1	FB-2	FB-03	FB-04
Silver	1.0		1.4		
Aluminum	10		827		30
Barium	2		8		
Beryllium	0.1	0.1	0.1		
Calcium	50	196	928	345	326
Cadmium	1.0				**3.2**
Cobalt	5.0		163	10	9
Chromium	7		510		
Copper	6		1900		
Iron	6	55	2250		
Magnesium	10	45	6460	56	56
Manganese	1.0		38		
Sodium	10	484	2440		286
Nickel	10		1680		
Lead	1.0		7.0	4.6	**31.1**
Antimony	40				
Thallium	100				
Vanadium	10		29		
Zinc	0.5	6	854		

No field data forms were provided with the samples. Chain of custody (COC) forms were generally acceptable, however some problems were noted. NDRC COCs were used for NDRC, RKCI, and the QA laboratory. Specific COC forms should be used to indicate the number of samples distributed to the lab listed on the form(s), otherwise generic forms should be created by the sampling firm. This action reduces the number of errors and enables the documentation to be reviewed quickly and efficiently. Analytical methods should be noted on the COC forms to eliminate confusion about which type of analysis to perform. Information on field blanks should include the type and time of field blank creation and what sample batch it was distributed with. If contamination is discovered, this information will aid the reviewer in isolating the time and place where contamination most likely occurred.

2.0.4 Comparability. Quality assurance was conducted on a number of samples. The following table lists these samples and their corresponding QA duplicates. Results are listed in ug/l for water and mg/kg for soil. PQL values were provided but not indicated in this report.

Table 2-0-4
QA Duplicate - Soil Data Comparison
(reported in mg/kg)

	NDRC CS-SB-13 (2-7')	ARDL CS-SBD-13 (2-7')
Silver	< 1.0	<1.2
Aluminum	21200	47000
Barium	170	200
Beryllium	1.1	11
Calcium	2370	3800
Cadmium	4.0	< 0.6
Cobalt	5.4	17
Chromium	21.0	29
Copper	5.6	12
Iron	13700	22000
Magnesium	1890	2000
Manganese	407	480
Sodium	871	1300
Nickel	14.7	28
Lead	5.3	**42**
Antimony	< 1.0	6.8
Thallium	< 1.0	< 0.59
Vanadium	30.3	21
Zinc	22.9	42
Selenium	Not requested at NDRC	< 0.36

	NDRC TL-SB-22 (0-7')	ARDL TL-SBD-22 (0-7')
Silver	< 1.0	< 1.2
Aluminum	15500	37000
Barium	226	350
Beryllium	1.3	15
Calcium	1530	2600
Cadmium	7.4	< 0.47
Cobalt	13.1	20
Chromium	21.8	32
Copper	6.9	12
Iron	27500	35000
Magnesium	1270	3000
Manganese	1020	1200
Sodium	28.9	250
Nickel	25.6	37
Lead	2.8	**81**
Antimony	< 1.0	< 7.1
Thallium	< 1.0	0.86
Vanadium	37.2	66
Zinc	33.9	60
Selenium	Not requested at NDRC	< 0.35

Table 2-0-4 (continued)
QA Duplicate - Soil Data Comparison
(reported in mg/kg)

	NDRC ST-SB-18 (2-7')	ARDL ST-SBD-18 (2-7')
Silver	< 1.0	< 1.1
Aluminum	17500	15000
Barium	189	220
Beryllium	1.4	9.2
Calcium	1070	2700
Cadmium	11.3	< 0.43
Cobalt	25.5	16
Chromium	37.2	6.2
Copper	9.5	8.0
Iron	42500	25000
Magnesium	1090	1900
Manganese	1440	660
Sodium	256	630
Nickel	24.5	28
Lead	40.5	17
Antimony	< 1.0	< 3.5
Thallium	< 1.0	< 0.53
Vanadium	55.6	22
Zinc	37.2	49
Selenium	Not requested at NDRC	< 0.32

	NDRC RW-SB-05 (0-7')	ARDL RW-SBD-05 (0-7')
Silver	< 1.0	< 1.1
Aluminum	12000	10000
Barium	530	1500
Beryllium	< 1.0	11
Calcium	10600	15000
Cadmium	5.0	3.6
Cobalt	7.6	28
Chromium	17.5	3.8
Copper	6.4	16
Iron	18300	28000
Magnesium	1540	1700
Manganese	2220	5600
Sodium	1830	1900
Nickel	32.0	64
Lead	4.7	6.5
Antimony	< 1.0	< 6.8
Thallium	1.4	< 0.56
Vanadium	17.2	17
Zinc	48.4	66
Selenium	Not requested at NDRC	< 0.34

Table 2-0-4 (continued)
QA Duplicate - Soil Data Comparison
(reported in mg/kg)

	NDRC TN-SB-40 (7-11')	ARDL TN-SBD-40 (7-11')
Silver	< 1.0	1.6
Aluminum	9170	15000
Barium	27.8	88
Beryllium	< 1.0	21
Calcium	3130	9500
Cadmium	9.9	< 0.66
Cobalt	8.8	16
Chromium	47.8	38
Copper	1.6	3.2
Iron	26400	63000
Magnesium	1040	1800
Manganese	559	2300
Sodium	1.3	150
Nickel	32.2	62
Lead	4.3	2.8
Antimony	< 1.0	< 5.4
Thallium	5.3	< 0.82
Vanadium	37.0	53
Zinc	62.1	65
Selenium	Not requested at NDRC	< 0.49

	NDRC RW-SD-01	ARDL RW-SDO-01 QA
Silver	< 1.0	< 1.1
Aluminum	9060	20000
Barium	175	170
Beryllium	< 1.0	6.6
Calcium	1590	2200
Cadmium	5.9	< 0.57
Cobalt	8.8	14
Chromium	36.0	20
Copper	3.7	2.7
Iron	21700	41000
Magnesium	525	1100
Manganese	1040	1100
Sodium	< 1.0	100
Nickel	14.8	19
Lead	11.2	47
Antimony	< 1.0	< 4.9
Thallium	< 1.0	< 0.57
Vanadium	36.8	74
Zinc	41.0	88
Selenium	Not requested at NDRC	< 0.33

Table 2-0-4 (continued)
QA Duplicate - Groundwater Data Comparison
(reported in ug/l)

	NDRC TN-MW-09-01	ARDL TN-MW-09-01 QA
Silver	< 1.0	10
Aluminum	4200	2400
Barium	47	< 50
Beryllium	0.4	< 5
Calcium	120000	115000
Cadmium	< 5.0	< 5
Cobalt	< 5.0	< 50
Chromium	10	23
Copper	< 6	< 25
Iron	16600	6800
Magnesium	6140	10000
Manganese	1540	1300
Sodium	17600	23000
Nickel	17	< 40
Lead	11.3	< 2
Antimony	< 40	< 60
Thallium	< 100	< 5
Vanadium	16	< 50
Zinc	41.0	28
Selenium	Not requested at NDRC	< 3

	NDRC ST-SW-05	ARDL ST-SW-05 QA
Silver	22	< 10
Aluminum	< 10	< 200
Barium	124	140
Beryllium	0.2	< 5
Calcium	32400	28000
Cadmium	< 1.0	< 5
Cobalt	< 5.0	< 50
Chromium	< 7	< 10
Copper	< 6	< 25
Iron	106	140
Magnesium	8780	10000
Manganese	756	920
Sodium	33400	43000
Nickel	< 10	< 40
Lead	**39.8**	< 2
Antimony	< 40	72
Thallium	< 100	< 5
Vanadium	< 10	< 50
Zinc	52.5	55
Selenium	Not requested at NDRC	< 3

Table 2-0-4 (continued)
QA Duplicate - Groundwater Data Comparison
(reported in ug/l)

	NDRC ST-MW-15-01	ARDL ST-MW-15-01 QA
Silver	< 1.0	18
Aluminum	14900	28
Barium	111	300
Beryllium	10.6	13
Calcium	470000	470000
Cadmium	< 1.0	< 5
Cobalt	< 5.0	72
Chromium	29	95
Copper	16	27
Iron	14900	45000
Magnesium	163000	170000
Manganese	4940	6400
Sodium	51100	640000
Nickel	41	87
Lead	14.2	7.5
Antimony	< 40	< 60
Thallium	< 100	< 5
Vanadium	28	85
Zinc	149	210
Selenium	Not requested at NDRC	< 3

A review of the QA data indicates that laboratory performance is comparable and acceptable.

3.0 Volatile Organics.

A volatile organics analysis was requested for the majority of samples using SW-846 method 8240. Tentatively identified compounds were also reported along with the regular 8240 method.

The majority of analyses were performed at one of the contract laboratories. Review of the data suggests that the samples were analyzed within the fourteen day holding time.

3.0.1 Accuracy. Matrix spike recoveries were acceptable. Surrogate recoveries were reported as acceptable.

3.0.2 Precision. Matrix spike duplicate recoveries were acceptable. Relative percent differences (RPDs) fell within acceptable QC limits. Samples collected on 8/23/91 and analyzed by NDRC were not accompanied by a report on RPD values.

Quality control was conducted on a number of samples. These include samples TN-SB-34 (0-5'), TN-SB-09 (2-7'), TN-MW-09-01, and ST-MW-15-01. Some of these samples did not report any detectable compounds, i.e. TN-SB-34 (0-5'), TN-SB-09 (2-7'), and ST-MW-15-01. The Table 3-0-2 list the field sample and its

corresponding QC duplicate which reported results. Results are listed in ug/l for groundwater and ug/kg for soil.

Table 3-0-2
QC Duplicate - Groundwater Data Comparison

	PQL	TN-SB-34 (0-5')	TN-SB-34 (0-5')
Ethylbenzene	10	19.2	16.8
Xylenes	10	333	320

Comparison of the field samples and their QC duplicates indicates that the results appear to be both consistent and acceptable.

3.0.3 Representativeness. Method blanks were reported as acceptable by the two contract laboratories. However, a notable amount of laboratory contamination occurred at the QA laboratory. Of the six separate sampling events, five method blank samples reported contamination as shown in SWD lab report #15355. The use of "freon 113" represents the common name for 1,1,2-trichloro-1,2,2-trifluoroethane. This compound was detected in the tentatively identified compound scan, which only qualifies compounds and does not adequately quantitate them. These events are listed in table 3-0-3a.

Table 3-0-3a
Volatile Organics - Method Blank Results
(results reported in ug/l)

Event #1	PQL	Result
Methylene chloride	5	49
Acetone	10	5J
Chloroform	5	1J
Tentatively Identified Compounds		
Freon 113	no PQL	15

Event #2	PQL	Result
Methylene chloride	5	3J
Acetone	10	8J
Chloroform	5	2J
Tentatively Identified Compounds		
Freon 113	no PQL	12

Table 3-0-3a (continued)
Volatile Organics - Method Blank Results
(results reported in ug/l)

Event #3	PQL	Result
Methylene chloride	5	3J
Acetone	10	5J
Chloroform	5	1J
Tentatively Identified Compounds		
Freon 113	no PQL	15

Event #4	PQL	Result
Methylene chloride	5	3J
Acetone	10	8J
Chloroform	5	2J
Tentatively Identified Compounds		
Freon 113	no PQL	12

Event #5	PQL	Result
Methylene chloride	5	3J
Acetone	10	11
Tentatively Identified Compounds		
Freon 113	no PQL	36
Dichlorobenzene	no PQL	15

* J indicates result below PQL value

All of these compounds are common laboratory solvents. Most likely, this contamination is being generated from an inadequate laboratory ventilation system, i.e., air passing through the extraction portion of the lab is being distributed to the equipment performing volatile organic analyses.

Fifteen travel blanks (noted as trip blanks) were collected. The travel blanks were generally reported as acceptable except for low levels of chloroform. Their results are listed below in table 3-0-3b. Chloroform is commonly found in travel blanks and is due to the use of chlorinated water which has not been properly prepared or filtered.

Table 3-0-3b
Volatile Organics - Travel Blank Results
(results in ug/l)

		PQL	Result
Trip Blank 1			
	Chloroform	5	15.3
Trip Blank 2			
	Chloroform	5	18.7
Trip Blank 3			
	Chloroform	5	16.2
Trip Blank-4			
	Chlorform	5	15.6
Trip Blank-5			
	Nothing detected		
Trip Blank-6			
	Chloroform	5	18
Trip Blank-07			
	Chloroform	5	17.4
Trip Blank-08			
	Chloroform	5	18.5
TB-09			
	Chloroform	5	23.0
TB-10			
	Chloroform	5	22.6
TB-11			
	Chloroform	5	17
TB-12			
	Chloroform	5	17
TB-13			
	Chloroform	5	16
TB-14			
	Chloroform	5	23.0
Trip Blank-15			
	Chloroform	5	17.8

Three rinsate blanks and one equipment blank were also collected. All the field blanks indicated notable amounts of chloroform with a PQL of 5 ug/l.

Table 3-0-3

FB-1 at 12.3 ug/l	FB-2 at 11.7 ug/l
FB-03 at 37.3 ug/l	FB-04 at 44.8 ug/l

Equipment blank FB-04 also indicated notable amounts of methylene chloride at 39.3 ug/l (PQL of 5 ug/l) and 2-butanone at 70 ug/l (PQL of 50 ug/l). Method blanks were reported to be acceptable at the laboratory which analyzed these samples. It is possible that laboratory contamination did occur or that the preparation of the equipment blank water was inadequate.

For a discussion of the field data and chain of custody forms, see Section 2.0.3 Representativeness of metals.

3.0.4 Comparability. Quality assurance was conducted on a number of samples. These include the following samples

CS-SB-13 (2-7')	TL-SB-22 (0-7')
ST-SB-18 (2-7')	RW-SB-05 (0-7')
TN-SB-40 (7-11')	RW-SD-01
TN-MW-09-01	ST-SW-05
ST-MW-15-01	

The following table lists the field samples and their corresponding QA duplicates which reported results. Results are listed in ug/l for groundwater and ug/kg for soil.

Table 3-0-4a
QA Duplicate - Soil Data Comparison

	PQL	NDRC CS-SB-13 (2-7')	ARDL CS-SBD-13 (2-7')
Vinyl chloride	10	ND	130
Methylene chloride	5	ND	52B
Acetone	10	ND	56B
1,4-dichloroethane	2	ND	2
1,2-dichloroethene	40	ND	40
2-butanone	10	ND	42
Toluene	5	ND	11
Xylene	5	ND	9

Abbreviations:
- ND - Not detected
- NR - Not reported
- J - Detected at a concentration lower than PQL
- B - Detected in the method blank

Table 3-0-4a (continued)
QA Duplicate - Soil Data Comparison

	PQL	NDRC TL-SB-22 (0-7')	ARDL TL-SBD-22 (0-7')
Methylene chloride	5	ND	24B
Acetone	10	ND	15B
Chloroform	5	ND	1JB
Tentatively Identified Compounds			
Freon 113	NR	ND	28

	PQL	NDRC ST-SB-18 (2-7')	ARDL ST-SBD-18 (2-7')
Acetone	10	ND	30
2-butanone	10	ND	42
Toluene	5	ND	2J
Tentatively Identified Compounds			
Tetrahydrofuran	NR	ND	47

	PQL	NDRC RW-SB-05 (0-7')	ARDL RW-SBD-05 (0-7')
Vinyl chloride	10	ND	4J
Methylene chloride	5	ND	62B
Acetone	10	ND	28B
1,2-dichloroethene	5	ND	7
Toluene	5	ND	3J
Tentatively Identified Compounds			
Freon 113	NR	ND	40

	PQL	NDRC TN-SB-40 (7-11')	ARDL TN-SBD-40 (7-11')
Methylene chloride	5	ND	7J
Toluene	5	ND	14
Xylene	5	ND	57

Abbreviations:
- ND - Not detected
- NR - Not reported
- J - Detected at a concentration lower than PQL
- B - Detected in the method blank
- D - Compound diluted out

Table 3-0-4a (continued)
QA Duplicate - Groundwater Data Comparison

	PQL	NDRC TN-MW-09-01	ARDL TN-MW-09-01 QA
Run #1			
Xylene	10	333	
	5		210E
Run #2			
Methylene chloride	10	ND	
	5		22JBD
Xylene	10	333	
	25		260
Tentatively Identified Compounds			
Freon 113	NR	ND	780

	PQL	NDRC ST-SW-05	ARDL ST-SWD-05 QA

No volatile organics detected in any of the samples

	PQL	NDRC ST-MW-15-01	ARDL ST-MW-15-01-QA
Acetone	100	ND	
	10		96

Abbreviations:
- ND - Not detected
- NR - Not reported
- J - Detected at a concentration lower than PQL
- B - Detected in the method blank
- D - Compound diluted out

Comparison of the field samples and their QA duplicates indicates that the results appear to be generally acceptable. However, there are notable events. Several of the detectable compounds in the QA laboratory's method blanks are due to laboratory contamination. Other compounds such as dichloroethane, dichloroethene, toluene, 2-butanone, and xylenes detected in these blanks, may be due several factors, i.e., carryover from earlier samples, contamination already present in the carrier lines, or the compounds may actually be present in the sample. This latter theory is not supported by any of the field samples analyzed at the primary contract laboratory.

QA sample ST-SBD-18 (2-7') indicated that tetrahydrofuran was detected in the sample. This is an uncommon chemical which if detected should be substantiated by mass spectra, especially since it was detected by the tentatively identified compound scan.

Volatile organic compounds were not detected in sample RW-SD-01 and its QA duplicate. Two of the three surrogate recoveries for the QA duplicate were unacceptable and were reanalyzed. The same two surrogates in the duplicate run were reported as unacceptable. No reason was given in the case narrative as to why surrogate recoveries were unacceptable. The surrogates and their recoveries are listed below.

Table 3-0-4b
RW-SDD-01 Surrogate recoveries

	RW-SDD-01 QA Run #1	RW-SDD-01 QA Run #2	QC limits
Toluene-d8	70% recovery	73% recovery	81-117
Bromofluorobenzene	127% recovery	128% recovery	74-121

With regards to the following sample, TN-MW-09-01, the QA laboratory had to reanalyze the QA sample twice. The first analysis indicated that the xylenes exceeded the standard calibration range for that run, i.e. indicated in run #1 by the symbol "E". The field sample was run only once.

4.0 Semivolatile Organics.

A semivolatile organics analysis was requested for the majority of samples using SW-846 method 8270. Tentatively identified compounds were also reported along with the regular 8270 method.

The majority of analyses were performed at one of the contract laboratories. Almost all the samples were extracted within the fourteen (soil) or seven (water) day holding times. They were also analyzed within the forty day holding time.

Sample FB-02 was collected on 8/17/91 and was indicated as having been extracted on 9/5/91. However, an initial extraction occurred on 8/23/91. Do to low surrogate recoveries the sample was re-extracted on 9/5/91, which exceeds the extraction holding time of seven days. Surrogate recoveries from this analysis were reported to be acceptable, but this is not an adequate justification to validate the sample. If no semivolatile results were detected in the initial and subsequent runs, then it would appear that nothing was detected. Further, FB-02 should be void of contaminants since it is a rinsate blank. NDRC laboratory noted this problem in a case narrative not originally provided in the lab data reports.

Samples RW-SS-01, TL-SS-01, and DA-SD-2 were indicated as being "prepared" on 9/11/91 when they had been sampled on 8/20/91. Sample extraction should have occurred prior to 9/3/91. The laboratory noted the problems in the case narrative. Samples are generally noted as having been compromised and resampling may be needed if samples indicated significant results.

4.0.1 Accuracy. Matrix spike recoveries were generally reported as acceptable. Surrogate recoveries were generally reported as acceptable. As commonly seen with semivolatile spike and surrogate recoveries, not all of the recoveries fell within the acceptable QC limits. Sample ST-MW-15-01 indicated low surrogate recoveries and was reextracted and analyzed on 9/8/91. It produced similar low surrogate recoveries. The laboratory indicated that these recoveries were due to the soil matrix interferences. Sample TN-MW-11-01 also reported similar problems with low surrogate recoveries and underwent a reextraction and analysis. The sample indicated acceptable recoveries.

4.0.2 Precision. Matrix spike duplicate recoveries were generally reported as acceptable. As was indicated earlier, a small number of semivolatile spike and surrogate recoveries fell outside the acceptable QC limits. Low recoveries are commonly attributed to matrix interferences. With regards to these problems, relative percent differences (RPD) generally fell within acceptable QC limits. RPDs were not reported for samples collected on 8/23/91.

Quality control was conducted on a number of samples. These include samples TN-SB-34 (0-5'), TN-SB-09 (2-7'), TN-MW-09-01, and ST-MW-15-01. Some of these samples did not report any detectable compounds, i.e. TN-SB-34 (0-5'), TN-SB-09 (2-7'), and ST-MW-15-01. The following table list the field sample and its corresponding QC duplicate which reported results. Results are listed in ug/l for groundwater and ug/kg for soil.

Table 4-0-2
QC Duplicate - Groundwater Data Comparison

	PQL	TN-SB-09-01	TN-SBD-09-01 QC
2,6-dinitrotoluene	10	342	369
2,4-dinitrotoluene	10	507	500
Diethylphthalate	10	46.9	14

4.0.3 Representativeness. Method blanks were reported as acceptable. Three rinsate blanks and one equipment blank were collected. Sample FB-1 indicated 29 ug/l of isopropanol as a tentatively identified compound. Sample FB-04 indicated bis(2-ethylhexyl)phthalate at 53.6 ug/l (PQL of 10 ug/l). This phthalate is frequently found and is a known plasticizer found in rubber tubing which has been improperly substituted for other tubing.

For discussion of the field data and chain of custody forms, see Section 2.0.3.

4.0.4 Comparability. Quality assurance was conducted on a number of samples. These include the following samples

CS-SB-13 (2-7')	TL-SB-22 (0-7')
ST-SB-18 (2-7')	RW-SB-05 (0-7')
TN-SB-40 (7-11')	RW-SD-01
TN-MW-09-01	ST-SW-05
ST-MW-15-01	

The following table lists the field sample, TN-MW-09-01 and its corresponding QA duplicate. No semivolatile organics were detected in the other results. Results are listed in ug/l for groundwater and ug/kg for soil.

Table 4-0-4
QA Duplicate - Groundwater Data Comparison

	PQL	NDRC TN-MW-09-01	ARDL TN-MW-09-01 QA
Run #1			
Nitrobenzene	10	ND	6J
2,4-dimethyl phenol	10	ND	7J
2,6-dinitrotoluene	10	342	250E
2,4-dinitrotoluene	10	507	430E

	PQL	NDRC TN-MW-09-01	ARDL TN-MW-09-01 QA
Run #2			
Nitrobenzene	10	ND	
	25		7JD
2,4-dimethyl phenol	10	ND	
	25		7JD
2,6-dinitrotoluene	10	342	
	25		430D
2,4-dinitrotoluene	10	507	
	25		600D

Abbreviations:
ND - Not detected
J - Detected at a concentration lower than PQL
D - Compound diluted out

With regards to the sample, TN-MW-09-01, the QA laboratory had to analyze the QA sample twice. The first analysis indicated that 2,4-dinitrotoluene and 2,6-dinitrotoluene exceeded the standard calibration range for that run, as indicated by the symbol "E". The field sample was run only once.

Comparison of the field samples and their QA duplicates indicates that the results appear to be acceptable.

5.0 Polycholrinated Biphenyls and Pesticides.

Polychlorinated biphenyls/pesticides were analyzed for using SW-846 method 8080. Lindane was specifically requested. The analysis was primarily performed at one of the two contract laboratories.

All samples were indicated as having been analyzed within the fourteen (soil) and seven (groundwater) day holding times. The samples were also indicated as having been analyzed within the forty day holding time.

5.0.1 Accuracy. Matrix spike recoveries were reported as acceptable. Surrogate recoveries were indicated as acceptable.

5.0.2 Precision. Matrix spike duplicate recoveries were reported as acceptable. Relative percent differences ranged from 0% to 20%, well within acceptable QC limits.

Quality control was conducted on four samples. Lindane was not detected in any of the four. A comparison of the field samples and QC duplicates indicates that the results are consistent and acceptable.

5.0.3 Representativeness. Method blanks were reported as acceptable. Three rinsate blanks and one equipment blank did not detect any contamination.

For a discussion of the field data and chain of custody forms, see section 2.0.3.

5.0.4 Comparability. Quality assurance was conducted on a number of samples. These include the following samples

CS-SB-13 (2-7')	TL-SB-22 (0-7')
ST-SB-18 (2-7')	RW-SB-05 (0-7')
TN-SB-40 (7-11')	TN-MW-09-01
ST-SW-05	RW-SD-01
ST-MW-15-01	PP-SS-01

None of the field or QA samples detected any compounds. Comparison of the data indicates that the results are acceptable.

6.0 Explosives.

Explosives were analyzed by SW-846 method 8330. The majority of sampling was performed by one of the contract laboratories.

All the samples were indicated as having been analyzed within the seven day holding time.

6.0.1 Accuracy. Matrix spike recoveries were reported as acceptable.

6.0.2 Precision. Matrix spike duplicate recoveries were reported as acceptable. Relative percent differences ranged from 0% to 49.5%, well within acceptable QC limits.

Quality control was conducted on four samples. Only one of these samples detected any compounds. Sample TN-MW-09-01 is listed in table 6-0-2. Results are expressed in ug/l.

Table 6-0-2
QC Duplicate - Groundwater Data Comparison

	PQL	NDRC TN-MW-09-01	RCKI TN-MWD-09-01
2,6-dinitrotoluene	0.11	340	320
2-nitrotoluene	0.04	300	265

Comparison of the field and QC duplicate samples indicates that results are consistent and acceptable.

6.0.3 Representativeness. Method blanks were reported as acceptable. Three field blanks and one equipment blank did not detect any compounds.

For an inclusive evaluation of the field data and chain of custody forms, see section 2.0.3.

6.0.4 Comparability. Quality assurance was conducted on a number of samples. These include the following samples

CS-SB-13 (2-7')
ST-SB-18 (2-7')
TN-SB-40 (7-11')
TN-MW-09-01
ST-MW-15-01
TL-SB-22 (0-7')
RW-SB-05 (0-7')
RW-SD-01
ST-SW-05

Only one sample detected any explosives. Sample TN-MW-09-01 is listed below in table 6-0-4. Results are reported in ug/l.

Table 6-0-4
QA Duplicate - Groundwater Data Comparison

	PQL	RCKI TN-MW-09-01	TMA TN-MW-09-01 QA
2,4-dinitrotoluene	0.11	ND	
	0.25		460
2,6-dinitrotoluene	0.11	340	
	0.25		260
2-nitrotoluene	0.04	300	
	0.25		730
3-nitrotoluene	0.11	ND	
	0.25		800

A comparison of the field and QA samples indicates that results are generally acceptable. However, sample TN-MW-09-01 reported some inconsistencies with regards to 2,4-dinitrotoluene and 3-nitrotoluene.

7.0 Other Parameters.

Several other analyses were requested using the SW-846 and EPA methods. These are cyanide (method 9010), total organic carbon (method 9060), total suspended solids (method 160), chloride (method 300), nitrate (method 300), nitrite (method 300), phosphate (method 300), fluoride (method 300), and sulfate (method 300). In certain instances, variations or substitutions of SW-846 methods were used due to problems attributed to sample matrix interferences and in order to confirm actual results. For example, phosphate (method 300) was confirmed by the colorimetric EPA method 365.2 due to the interference of chloride. EPA method 340.2 was substituted for fluoride method 300 due to the interference of chloride. The majority of these analyses were performed at one contract laboratory.

All samples were indicated as having been analyzed within their appropriate holding times.

7.0.1 Accuracy. Matrix spike recoveries were reported as acceptable.

7.0.2 Precision. Matrix spike duplicate recoveries were reported as acceptable. Relative percent differences (RPDs) fell within acceptable QC limits.

Quality control was conducted on four samples, TN-SB-34, TN-SB-09, TN-MW-09-01, and ST-MW-15-01. No anions were detected in any of the field and QC duplicate samples. Comparison of the field and QC duplicates indicates that the results are consistent and acceptable.

7.0.3 Representativeness. Method blanks were reported acceptable. The three rinsate blanks and one equipment blank did not report any contamination.

For a discussion of the field data and chain of custody forms, see Section 2.0.3.

7.0.4 Comparability. Quality assurance was conducted on a number of samples. These include the following samples

CS-SB-13 (2-7')	TL-SB-22 (0-7')
ST-SB-18 (2-7')	RW-SB-05 (0-7')
TN-SB-40 (7-11')	TN-MW-09-01
ST-SW-05	ST-MW-15-01

Table 7-0-4 lists the various analyses and their results. The QA laboratory reported the PQL for TOC in mg/l for the soil. Huffman laboratory reported results in % and ARDL laboratory reported results in mg/l.

Table 7-0-4
QA Duplicate - Soil Data Comparison
(results reported in % and mg/l)

		Huffman	ARDL
	PQL	CS-SB-13 (2-7')	CS-SBD-13 (2-7')
TOC	0.01%	0.28%	
	1.0 mg/l		3200
	PQL	TL-SB-22 (0-7')	TL-SBD-22 (0-7')
TOC	0.01%	0.53%	
	1.0 mg/l		9500
	PQL	RW-SB-05 (0-7')	RW-SBD-05 (0-7')
TOC	0.01%	0.11%	
	1.0 mg/l		3600
	PQL	ST-SB-18 (2-7')	ST-SBD-18 (2-7')
TOC	0.01	0.59%	
	1.0 mg/l		6200
	PQL	TN-SB-40 (7-11')	TN-SBD-40 (7-11')
TOC	0.01	0.13%	
	1.0 mg/l		870

Table 7-0-4
QA Duplicate - Groundwater Data Comparison
(results reported in mg/l)

	PQL	RCKI ST-MW-15-01	ARDL ST-MWD-15-01 QA
Chloride	1	255	
	0.10		280
Nitrate	0.5	< 0.5	
	0.20		0.27
Nitrite	NR	NR	
	0.20		< 0.21
Sulfate	1	2504	
	1.0		2900
Phosphate	0.5	< 0.5	
	NR		NR
Fluoride	0.01	0.34	
	NR		NR

	PQL	RCKI TN-MW-09-01	ARDL TN-MW-09-01 QA
Chloride	1	16	
	0.10		14
Nitrate	0.5	3	
	0.20		2.8
Nitrite		Not tested	
	0.20		0.94
Sulfate	1	80	
	1.0		80
Phosphate	0.5	< 0.5	
			Not tested
Fluoride	0.01	0.27	
			Not tested

Cyanide was not detected in any of the field samples or their QA duplicates. Total suspended solids were provided by the various laboratories. These analyses were not reviewed in detail. Fluoride and phosphate were not analyzed by the QA laboratory as they were in the contract laboratory. The TOC analyses were subcontracted by Huffman Laboratories Inc after approval from COE MRD was given. TOC was not performed nor was it requested to be performed at the QA laboratory for the QA sample RW-SD-01 as indicated in table 1. The contract laboratory reported their TOC results by reporting the percentage difference between total carbon and total inorganic carbon (carbonate carbon). It is difficult to adequately compare the results from both laboratories. The QA laboratory analyzed for nitrate and nitrite while the contract laboratory analyzed only for nitrate. Overall, a comparison of the field samples and QA duplicate samples indicates that the results are acceptable.

8.0 Summary of Problems.

Chain of custody forms and field data forms should be improved. Generic COC forms should be used if laboratories cannot provide forms for samples they will receive. Generic field data forms should be created and provided with the COC forms to document such things as travel and field blank (rinsate/equipment) collection and dispersal.

Field blanks reported notable levels of metal contamination. Information concerning what field blank related to what equipment and site was not evident from the COC forms. No field data information was provided. An adequate review of the results is difficult to achieve without this data. The contamination found in FB-2 indicates that sampling done that day should be carefully reviewed.

Travel blanks were contaminated with a notable amount of chloroform. Adequate preparation of sampling/laboratory grade water should eliminate this problem.

There was QA laboratory contamination evident from the method blanks. Adequate laboratory ventilation and technique should reduce this problem.

When uncommon chemicals have been detected by the tentatively identified compound scan, a mass spectra should be included and mention should be made in the case narrative.

The laboratories should report the appropriate units for the PQL values with regards to the various analytical methods.

9.0 Conclusion.

The data is generally acceptable. The exceptions to that include lead values in groundwater and selected volatiles appearing in field travel and equipment blanks.

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RW/ck

DEPARTMENT OF THE ARMY
U. S. Army Corps of Engineers
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CEMP-RT

Regulation
No. 1110-1-263

1 October 1990

Engineering and Design
CHEMICAL DATA QUALITY MANAGEMENT FOR
HAZARDOUS WASTE REMEDIAL ACTIVITIES

1. Purpose. This regulation prescribes Chemical Data Quality Management (CDQM) responsibilities and procedures for all chemical contamination investigative and remedial activities to assure that the analytical data obtained is of sufficient quality to meet intended usages within the project.

2. Applicability. This regulation applies to HQUSACE/OCE elements, major subordinate commands, districts, laboratories, and separate field operating activities.

3. References.

a. PL 98-212, Department of Defense (DOD) Appropriation Act, Fiscal Year 1984, Environmental Restoration, enacted 8 December 1983, and following legislation.

b. PL 96-510, Comprehensive Environmental Response, Compensation and Liability Act of 1980.

c. PL 99-499, Superfund Amendments and Reauthorization Act of 1986.

d. Interagency Agreement between the USACE and the U.S. Environmental Protection Agency (EPA) in executing PL 96-510, 10 February 1982, and following extensions or modifications.

e. EPA OSWER Directive 9355.3-01, Guidance for Conducting Remedial Investigations (RI) and Feasibility Studies (FS) Under CERCLA (Interim Final), October 1988.

f. EPA OSWER Directive 9355.0-4A, Superfund Remedial Design and Remedial Action Guidance, June 1986.

g. EPA OSWER Directive 9345.1-02, Expanded Site Inspection Transitional Guidance for FY 1988.

This regulation supersedes ER 1110-1-263 dated 30 December 1985

Attachment 2

h. EPA 540/G-87/003, Data Quality Objectives for Remedial Response Activities, March 1987.

i. ER 1180-1-6.

j. ER 1110-1-261.

k. ER 415-1-11.

l. EP 1110-2-6.

4. Discussion.

a. The intent of this ER is to conduct CDQM activities in full compliance with all applicable federal and state regulatory requirements. Standard methods and procedures promulgated by the EPA and the American Society of Testing Materials (ASTM) will be followed when available and applicable. ASTM is developing a document entitled "Standard Practice for Generation of Environmental Data Related to Waste Management Activities". When finalized, the ASTM document is expected to be adopted by the EPA and the Industry as standard practice. Accordingly, this ER is intended to be in compliance with the ASTM standard.

b. The U.S. Army Toxic and Hazardous Material Agency (CETHA), now an FOA of USACE, has developed and is practicing a separate approach to CDQM activities. Insofar as the CETHA CDQM program meets the federal, state and ASTM requirements set forth above, the CETHA CDQM program may be utilized for activities CETHA independently executes.

5. General.

a. Hazardous waste programs under which USACE currently executes remedial activities include:

(1) EPA Superfund

(2) Defense Environmental Restoration Program (DERP)

(a) Installation Restoration Program (IRP) (Army, Air Force and Navy)

(b) Formerly Used Defense Sites (FUDS)

b. Chemical analysis of environmental samples is usually required during the following activities under the programs listed in the previous section.

(1) Preliminary Assessment (PA) and Site Inspection (SI)

(2) Remedial Investigation/Feasibility Study (RI/FS)

(3) Remedial Design (RD) and Pre-Design Activities

(4) Remedial Action (RA)

(5) Post Remedial Action Monitoring

c. Acquisition of chemical analytical data is an integral part of chemical contamination investigative and remedial activities. There are a multitude of purposes for which chemical analytical data are acquired; however, they generally can be divided into eight categories.

(1) Site investigation

(2) Health and safety; hazard assessment

(3) Determination of potential responsible parties

(4) Engineering decisions

(5) Construction contractor payment

(6) Post remedial action monitoring

(7) Legal support of government actions

(8) Determination of proper disposal

d. The purpose of CDQM is to insure that chemical analytical data, acquired during investigative, remedial and monitoring activities, are of sufficient quality to meet intended usages. Data quality depends not only on how carefully an analytical method is carried out, but also on the sample point selection, sampling procedures, sample integrity and analytical methods selected. Data quality objectives (DQO) will be defined in the scope of services or design specifications for contract services

and in the Chemical Data Acquisition Plan (CDAP) for in-house work for which a scope of services is not generated.

e. CDQM during chemical contamination investigative, remedial ard monitoring activities includes roles for both the government (USACE) and its contractors. Planning and reporting CDQM documents/tasks required of USACE or its contractors are listed in Tables 1, 2, and 3 shown at Appendix A. An estimate of the time required to prepare and review each submittal is also included. Table 1 contains investigation activities, Table 2 design activities, and Table 3 construction activities. In most cases, investigation activities will be conducted by Architect-Engineer (AE) firms; however, the listed documents/tasks are pertinent to all activities in which both planning and execution are carried out under a single contract or by utilizing in-house government personnel. In contrast, the documents/tasks listed under design and construction activities are pertinent to all activities in which planning and execution are carried under separate contracts. Specific guidance for carrying out the tasks in Appendix A are found in Appendices B through F, and a glossary is provided in Appendix G.

6. Responsibilities.

a. The Environmental Restoration Division, Directorate of Military Programs, Headquarters (CEMP-R), is responsible for program management, technical oversight, and USACE policy and guidance development and dissemination.

b. The Investigation District or FOA is responsible for executing investigation activities for chemical contamination cleanup projects and informing the local district of their activity.

c. The Design District or FOA is responsible for executing design activities for chemical contamination projects and coordination with the local district throughout design.

d. The Construction District or FOA is responsible for executing construction chemical contamination remedial action projects within its geographical area. It is also responsible for cooperating with activities undertaken by other Investigation and Design Districts or FOA within its geographical area.

e. Divisions are responsible for monitoring and oversight of activities of their districts to assure that program policies and procedures are implemented.

f. CEMRD has primary responsibility for implementation of CDQM requirements for all aspects of HTW activities conducted in support of the Superfund, DERP, and non-mission HTW assignments. To execute this overall responsibility CEMRD is responsible for identifying shortfalls and drafting technical guidance; training; conducting selected technical reviews of documents and chemical data; coordinating review with CDQM personnel in other districts and divisions; providing technical assistance; receiving and analyzing quality assurance samples; evaluating contract laboratories; and validating USACE division laboratories to participate in the above activities. These responsibilities are discharged through the assigned tasks of the Chemical Review Branch (CEMRD-ED-GC) and the Missouri River Division Laboratory HTW Chemistry Unit (CEMRD-ED-GL), which is designated the lead USACE QA laboratory for HTW projects.

g. CEMRD has review and approval authority for all work brokered by CEMRD to other FOA until that authority is transferred to the parent division with the approval of HQUSACE.

h. The QA Laboratory is responsible for executing CDQM activities delegated to it through the procedures specified in the Appendix E, USACE Chemical Quality Assurance.

i. Additional definition of organizational responsibilities for CDQM activities is described in Tables 4, 5, and 6 shown at Appendix A.

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7 Appendices
App. A - Tables
App. B - Guide to USACE Chemical Quality Assurance Procedures and Notifications
App. C - Commercial Laboratory Validation Procedures

Appendices (cont'd)
App. D - Guide to the Preparation of the Chemical Data Acquisition Plan
App. E - USACE Chemical Quality Assurance
App. F - Sample Handling Protocol for Low, Medium and High Concentration Samples of Hazardous Waste
App. G - Glossary

APPENDIX A

TABLES

TABLE 1

DOCUMENTS/TASKS FOR INVESTIGATIVE ACTIVITIES*

Activities	Estimated Window
Designation of a USACE Quality Assurance (QA) Laboratory	1 Week
Scope of Services	Preparation - 3 weeks Review - 3 weeks
Validation of AE's Laboratory	Begin as soon as lab is identified - allow 6-12 weeks
Chemical Data Acquisition Plan (CDAP)	Expect 1 month after scope is provided to AE - allow 3-4 weeks for review
Daily Quality Control Reports (DQCR)	Prepared daily, submitted USACE project manager daily by regular mail and to QA Lab by the USACE project manager
Submission of AE's Chemical Data to the QA Laboratory	As soon as possible
Quality Control Summary Report (QCSR)/Site Inspection Report	Expect 2-3 months after completion of field work - 3-4 weeks for review
Chemical Quality Assurance Report (CQAR)	Expect within 30 days of submission of data to the QA laboratory.

* These include SI, RI/FS, and Pre-Design investigative activities.

TABLE 2

DOCUMENTS/TASKS FOR DESIGN ACTIVITIES

Activities	Estimated Window
Scope of Services	Preparation - 3 weeks Review - 3 weeks
Design Documents, to include Design Analysis Reports and Plans and Specifications	Project manager sets deadlines for Design Analysis Reports and 30%, 60% and 90% submittals. These are reviewed by District/Division technical personnel. Copies are sent to CEMRD and program management personnel for review of each submittal.

TABLE 3

DOCUMENTS/TASKS FOR CONSTRUCTION ACTIVITIES

Activities	Estimated Window
Designation of USACE Quality Assurance (QA) Laboratory for Construction	1 Week
Contractor Laboratory Validation	Begin as soon as laboratory is identified. Allow 6-12 weeks.
Chemical Data Acquisition Plan (CDAP)	Expect 1 month after contract is awarded. Allow three weeks for review.
Daily Quality Control Reports (DQCR)	Prepared daily by contractor, submitted to contracting officer daily by regular mail and to the QA lab by the contracting officer when relevant.
Submission of Contractor's Data to the QA Laboratory	As soon as available.
Quality Control Summary Report (QCSR)/Contractor Final Report	Expect 2-3 months after completion of field work. Allow 3-4 weeks for review.
Chemical Quality Assurance Report (CQAR)	Expect within 30 days of submission of data to the QA Lab.

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TABLE 4

ADDITIONAL ORGANIZATONAL RESPONSIBILITIES FOR INVESTIGATION CDQM DOCUMENTS/TASKS

Activity	Investigation* District	Investigation* Division	QA Laboratory	MRD	CEMP-R
Designation of a USACE QA Laboratory	I	I		E, A	O
Scope of Services (SOS)	E	R, A	R, M	O	
Disposition of SOS Comments	E	R, A	R	M	O
Contract Laboratory Validation	I, A	I	R	E, M, A	M, O
Chemical Data Acquisition Plan (CDAP)	E	R, A	R	R, M	O**
Disposition of CDAP Comments	E	R, A	R	M	O
Notice to Proceed (field work)	E	M	M	M	O
Daily Quality Control Reports (DQCR)	E	R	R	M	O
Inspection and Analyses of QA Samples,			E	R, M	O
Quality Control Summary Report (QCSR)/Site Inspection Report	E	R, A	R	M	O
Disposition of Site Inspection Report Comments	E	R, A	R	M	O
Chemical Quality Assurance Report (CQAR)	R	R	E	R, M	O

KEY: I = initiate, E = execution, R = review, A = approve, M = monitor, and O = oversight

* = **These responsibilities are for district in-house work.** For AE/Contractor work, the contracting officer in the district has approval authority.

** = Documents will be provided to HQUSACE (CEMP-R) for monitoring and oversight. On an exception basis, CEMP-R will audit specific projects and will require that all project documents be submitted.

The local district/division should be kept informed of the progress of any work in their geographic area, and should be furnished copies of documents if they so desire.

TABLE 5
ADDITIONAL ORGANIZATIONAL RESPONSIBILITIES FOR DESIGN CDQM DOCUMENTS/TASKS

Activity	Design*		Construction		QA		
	District	Division	District	Division	Laboratory	MRD	CEMP-R
Designation of a USACE QA Laboratory for Design	I	I	R	R	R	M	O
Scope of Services (SOS)	E	R, A	R	R	R	R	O
Disposition of SOS Comments	E	R, A	R	R	R	R	O
AE Laboratory Validation	I, A	I			R	E, M	M, O
Chemical Data Acquisition Plan (CDAP)	E	R, A	R	R	R	R	O
Daily Quality Control Reports	E	R	R	R	R	M	O
Quality Control Summary Report/ Investigation Report	E	R, A	R	R	R	M	O**
Chemical Quality Assurance Report	R	R	R	R	E	M	O**
Design Analyses Reports and Design Plans and Specifications	E	R, A	R	R	R	R	O**
Disposition of Design Comments	E	R, A	R	R	R	R	O
Advertise and Award Construction Contract	E			O			

KEY: I = initiate, E = execution, R = review, M = monitor, and O = oversight

* = These responsibilities are for district in-house work. For AE/Contractor work, the contracting officer in the district has approval authority. For design brokered by CEMRD, review and approval authority is retained by CEMRD until transferred to the Division.

** = Documents will be provided to HQUSACE (CEMP-R) for monitoring and oversight. On an exception basis, CEMP-R will audit specific projects and will require that all project be submitted.

The local district/division should be kept informed of the progress of any work in their geographical area, and should be furnished copies of documents if they so desire.

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TABLE 6

ADDITIONAL ORGANIZATIONAL RESPONSIBILITIES FOR CONSTRUCTION CDQM DOCUMENTS/TASKS

Activity	Design		Construction		QA		
	District	Division	District	Division	Laboratory	MRD	CEMP-R
Designation of a USACE QA Laboratory			I	I		E	O
Contract Laboratory Validation			I	I	R	E	O
Chemical Data Acquisition Plan (CDAP)	R		E, A	R	R	R	O
Disposition of CDAP Comments	R		E	R	R	M	O
Daily Quality Control Reports			E	R	R	M	O
Inspection and Analysis of QA Samples					E	M	O
Quality Control Summary Report (QCSR)/Contractor Final Report			E, A	R	R	M	O**
Disposition of Final Report Comments			E, A	R	R	M	O
Chemical Quality Assurance Report (CQAR)			R	R	E	R, M	O**

KEY: I = initiate, E = execution, R = review, A = approve, M = monitor and O = oversight
** = Documents will be provided to HQUSACE (CEMP-R) for monitoring and oversight. On an exception basis, CEMP-R will audit specific projects and will require that all project documents be submitted.

The local district/division should be kept informed of the progress of any work in their geographical area, and should be furnished copies of documents if they so desire.

APPENDIX B

GUIDE TO USACE CHEMICAL QUALITY ASSURANCE PROCEDURES AND NOTIFICATIONS

1. Purpose. Chemical quality assurance in chemical contamination investigation, design, and remedial action activities requires the interface and coordination of several USACE units. This appendix outlines the procedures involved and provides suggested formats to aid in the coordination process. The responsibility for initiation and coordination lies with the USACE project manager for investigation and design and with the contracting officer (CO) or his representative (COR) for construction.

2. Applicability. This appendix applies to all HTW investigative, design, and remedial activities executed by USACE either in-house or utilizing the services of a contractor.

3. Procedures for Chemical Quality Management.

a. Site Investigation and Pre-Design Activities.

(1) Investigation district solicits AE services.

(2) Investigation district writes Scope of Services with data quality objectives and submits it for review to division, program management personnel and CEMRD.

(3) Project Manager obtains the services of a USACE division laboratory for quality assurance using protocols established by CEMRD (memorandum or attached Request for Government Quality Assurance Services).

(4) District negotiates and awards AE contract.

(5) AE identifies subcontract laboratory and supplies Laboratory Quality Management Manual (LQMM) or required information. See Appendix C.

(6) Project Manager verifies validation status of the laboratory with CEMRD or requests validation be initiated (memorandum or attached Request for Evaluation of Commercial Laboratory).

(7) LQMM is submitted to CEMRD, performance audit samples are sent if necessary, laboratory is inspected by CEMRD, and a recommendation for approval/disapproval is sent to the USACE project manager. Personnel from the QA laboratory or investigation district will be notified of a scheduled inspection and may assist with this process. If approval is not given, AE will select another laboratory.

(8) AE submits CDAP for investigation district's approval.

(9) CEMRD-ED-GC and QA laboratory review CDAP and make approval/disapproval recommendation to investigation district.

(10) Field work begins if CDAP is approved.

(11) AE Daily Quality Control Report is filled out daily and submitted to the investigation district. Copies are sent to the QA laboratory whenever sampling or analytical activities are included.

(12) Field work completed.

(13) AE's analytical results are submitted to the QA lab as they become available, and to the executing FOA.

(14) AE's Site Inspection or Investigation Report together with the Quality Control Summary Report is submitted to the investigation district. These are reviewed by the same offices that reviewed the CDAP.

(15) QA laboratory prepares the Chemical Quality Assurance Report and submits it to the investigation district.

b. Design Activities.

(1) Design district solicits AE services.

(2) Design district writes Scope of Services and submits it to design division, CEMRD, and program management personnel for review/approval.

(3) Design district negotiates and awards AE design contract.

(4) If investigative activities are included in the design contract, steps 5-15 of Section 3.a. should be followed.

(5) AE submits Design Analysis Reports which contain a section that specifically addresses chemical quality management concerns. AE also submits plans and specifications which include chemical quality management at the preliminary, intermediate, final and 100% phases. The chemical section of the plans and specifications should give the Construction Contractor instructions for writing the CDAP in addition to including all necessary site specific chemical detail. Relevant requirements in this ER and appendices should be addressed. These submittals are sent to the design division, CEMRD, and program management personnel for technical review, and comments are sent back to the design district.

(6) Design district assures that the comments are addressed and incorporated into the appropriate documents or provides an explanation if comments are not used. Revised documents and annotated comments are sent to the offices generating comments at the next submittal stage.

(7) 100% plans and specifications are approved by the design district and the district advertises and awards the construction contract.

c. Construction.

(1) The contractor submits a CDAP (which may be a section in his overall Quality Control Plan). The contract laboratory (if needed) along with the Contractor's proposed quality control officers are identified for the Construction District's approval.

(2) CEMRD at request of the CO designates the Construction Division Lab or CEMRD-ED-GL to be the government QA laboratory for construction (forms provided) and validate the contractor's laboratory.

(3) The designated QA laboratory together with CEMRD assists the Construction District in reviewing the CDAP. The contractor's proposed laboratory is validated by CEMRD according to protocols discussed in Appendices C and E.

(4) Construction district approves/disapproves the contractor's laboratory and/or CDAP.

(5) Construction cleanup begins after CDAP and contractor's laboratory are approved.

(6) Contractor's Daily Quality Control Report is submitted to the Contracting Officer's Representative (COR) daily. The COR submits copies to the QA laboratory when sampling or analyses are involved. Analytical results are submitted to the QA laboratory as soon as they are available.

(7) Construction work is completed.

(8) The contractor submits the Quality Control Summary Report to the construction district. This should include a complete data package.

(9) The QA laboratory prepares the Chemical Quality Assurance Report and submits it to the construction district.

4. The following pages contain suggested formats which may be used to initiate interaction among various Corps elements regarding chemical data quality management. These would initiate a request for government quality assurance services, laboratory validation or document review. If these services are initiated by memoranda, the information called for on these pages should be supplied. Examples of formats which might be used for Daily Quality Control Reports and Chemical Quality Assurance Reports are also included.

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(SAMPLE FORMAT)

TO: CEMRD-ED-GC FROM: _____ DATE__/__/__

SUBJECT: **Request for Evaluation of Commercial Laboratory**

Project Name:_____Contract No.:_____

Superfund _____ FUDS _____ IRP _____ Other _____ Phase _____

Location:_____State:_____

A-E/Contractor:_____State:_____

USACE Project Manager:_____
Phone:_____Address:_____

Approximate Sampling Dates:_____
Laboratory Name:_____
Address:_____
Phone:_____
POC:_____

Laboratory Quality Management Manual Request ON __/__/__

Required analytical methods and approximate number of samples to be taken for above project.

METHOD	# OF WATER SAMPLES	# OF SOIL/SEDIMENT SAMPLES

State or other laboratory certification which will be required for this project:_____

If the laboratory is planning to subcontract any samples to another laboratory or location, all of these are to be evaluated separately. This request should be sent for verification of laboratory status regardless of expiration date on the list of validated laboratories.

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(SAMPLE FORMAT)

TO:_____ FROM:_____ DATE:__/__/__

SUBJECT: **Request for Government Quality Assurance Services** (To be sent to the requested USACE Laboratory with a copy to CEMRD-ED-GC)

Project Name:_____ Contract No.:_____

Superfund ____ FUDS ____ IRP ____ Other _____ Phase _____
Location:_____ State:_____

A-E/Contractor:_____ State:_____
USACE Project
Manager:_____
Phone:_____ Address:_____

Laboratory Name:_____
Address:_____
Phone:_____
POC:_____

Approximate Sampling Dates:_____

The following QA Laboratory support is requested for the subject project: USACE Division Laboratory:_____

____ Review and comment on Draft _____
_____
_____
_____

____ Analysis and Reports of Quality Assurance Samples

METHOD	NO. OF WATER SAMPLES*	NO. OF SOIL/SEDIMENT SAMPLES†

* Includes Blanks

† Includes Background Soil Sample

CF: CEMRD-ED-GC

(SAMPLE FORMAT)

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DATE _____

DAY

S	M	T	W	TH	F	S

A-E DAILY QUALITY CONTROL REPORT

WEATHER	Bright Sun	Clear	Overcast	Rain	Snow
TEMP	To 32	32-50	50-70	70-85	85 up
WIND	Still	Moder	High	Report No.	
HUMIDITY	Dry	Moder	Humid		

COE PROJECT MANAGER _____

PROJECT _____

JOB NO. _____

CONTRACT NO. _____

SUB-CONTRACTORS ON SITE:

EQUIPMENT ON SITE.

WORK PERFORMED (INCLUDING SAMPLING):

SHEET ____ OF ____

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(Continuation Sheet)

PROJECT _____ REPORT NO. _____

JOB NO. _____ DATE _____

QUALITY CONTROL ACTIVITIES (INCLUDING FIELD CALIBRATIONS)
HEALTH AND SAFETY LEVELS AND ACTIVITIES.
PROBLEMS ENCOUNTERED/CORRECTION ACTION TAKEN:
SPECIAL NOTES.
TOMORROW'S EXPECTATIONS:

BY _____ TITLE _____

(SAMPLE FORMAT)

_____ LAB NO.

DEPARTMENT OF THE ARMY
_____ DIVISION, CORPS OF ENGINEERS
DIVISION LABORATORY

_____, _____, _____
(city) (state) (zip)

Subject: Chemical Quality Assurance Report

Project:_____
Intended Use:_____
Source of Material:_____

Submitted by:_____
Date Sampled: _____, Date Received:_____
Method of Test or Specification: See attached Tables 1 - _____

References:_____

-- REMARKS --

1. CONTRACTOR DATA EVALUATION: (General comments)

   a. ACCURACY:

   b. PRECISION:

   c. LABORATORY CONTMINATION:

2. QA/QC DATA COMPARISON:

3. OTHER PROBLEMS:

4. CORRECTIVE ACTION:

Submitted by:

Director,_____Laboratory

APPENDIX C

COMMERCIAL LABORATORY VALIDATION PROCEDURES

1. Purpose. This appendix specifies the procedure used to evaluate a commercial laboratory for hazardous and toxic chemical analysis either for AE/Contractor work or for in-house projects conducted by USACE in hazardous waste activities. The latter includes chemical analyses contracted by the quality assurance laboratory.

2. Applicability. These procedures apply to all chemical analyses conducted to support investigative and remedial actions undertaken by USACE.

3. Initiation Procedures. A project manager from a Corps District or Division contacts CEMRD-ED-GC requesting validation of a contract laboratory. A form is provided in Appendix A or a memorandum may be written. The name of the project, the contract number, analytical methods to be used, numbers of samples of each matrix, estimated dates of sampling, and any special certification requirements should be included.

4. Implementation Procedures. Ordinarily each step in this sequence is completed before the subsequent step is initiated.

a. Step 1. The laboratory must submit its qualifications. This submittal may be in the form of an off-the-shelf Quality Management Manual (LQMM) or in some other format. Blank information tables can be requested from CEMRD. The submittal includes the following information:

- General Lab Information:
  (1) Lab name, address, POC, phone #; lab age, number of employees; square footage, etc.
  (2) Type of analytical work routinely performed;
  (3) Organizational chart and floor plan;
  (4) Special capabilities.

- List of previous evaluation/validation programs and most recent results.

- List of EPA and USACE contracts held in the last two years.

- Copy of lab certificates for other environmental programs or states.

• Chart of employee training and experience or chronological resumes.

• Copy of QA manual and/or in-house SOP's for analyses to be conducted for the contract including all internal quality control practices.

• List of instruments to be used for the contract and date of purchase.

The laboratory is requested to furnish above information promptly for review. If it appears that the capabilities of the laboratory are adequate to meet project requirements, CEMRD will initiate Step 2.

b. Step 2. The Corps of Engineers will provide the laboratory with performance audit (PA) samples through CEMRD-ED-GC. Arrangements will be made with the laboratory for the analysis of these samples. The results will be submitted as directed within 20 working days after receipt of the PA samples. Failure to analyze these samples correctly and within the required time frame may result in termination of the validation process. Ordinarily the laboratory is not reimbursed for costs involved in the analysis of the PA samples. The details of payment must be clarified in advance. If any of the results are unacceptable, a second set of PA samples may be allowed.

(1) The performance audit samples are method and matrix specific. The results are considered passing if a particular method has no results outside three standard deviations as determined by USACE, and no more than two parameters outside two standard deviations. Often a laboratory will be contacted if problems such as dilution or calculation errors can be identified.

c. Step 3. On-site inspection. A representative of CEMRD will inspect the contract laboratory only after Steps 1 and 2 have been successfully completed. All in-house SOPs will be reviewed. Any problems encountered with the performance audit samples will be discussed with laboratory management at the time of the inspection. The inspecting team will prepare a detailed report using the format specified by CEMRD and submit this to CEMRD-ED-GC. An exit interview will be held with lab personnel in which any problems encountered are discussed. The project manager or contracting officer and/or the assigned QA laboratory will be invited to send a representative to the inspection.

5. Conclusion. CEMRD will evaluate lab performance on the preceding steps and make a validation decision. A letter and a copy of the inspection report will be sent to the USACE personnel who initiated the validation process and to the laboratory. Ordinarily the letter will specify the methods and matrices, the project(s) and the time period (usually 18 months) for which the validation is granted. If specific recommendations are made by the inspectors, the lab is required to respond to CEMRD within a given time frame. Centralized records of validations and lab performances are kept at CEMRD-ED-GC. If a laboratory obtains a second contract within the eighteen month period, previous performances will be checked. If different analytes/matrices are involved in the second contract, only those performance audit samples will be sent. If work done for the Corps by the lab has been satisfactory, no further action will be necessary. **A validated laboratory may not subcontract USACE samples to a second laboratory without the knowledge and approval of the contracting officer and unless the second laboratory is validated for the parameters concerned.**

6. Renewal of Validation. Towards the close of the eighteen month period CEMRD-ED-GC will notify USACE users of laboratories of the pending expiration of validation. When the next contract is awarded, the validation will be renewed. After considering use of the lab and previous performance, CEMRD-ED-GC will determine which of the steps in Part II will apply to the revalidation process.

APPENDIX D

GUIDE TO THE PREPARATION OF
THE CHEMICAL DATA ACQUISITION PLAN

1. Definition and Responsibility. Chemical Data Acquisition Plan (CDAP)--a document prepared by an Architect-Engineer firm, a Contractor or USACE for all field activities, laboratory activities, and contract deliverables related to the acquisition and reporting of chemical data for HTW investigation or remedial activities. For the convenience of the sampling team, field activities may be bound separately; however for purposes of cost this should not be considered a separate document. The CDAP must be approved by the CO prior to initiation of field work. In the event corrections and comments on the draft are provided by the CO, the changes shall be incorporated by the authors in a revised plan before final approval is given. It should be noted that the purpose and content of the CDAP are essentially the same as the Quality Assurance Project Plan (QAPjP) required for Superfund investigations by the EPA. On Superfund projects QAPjP guidance may be followed as an alternative to this appendix, but ordinarily the Contract Laboratory Program (CLP) should not be used in its entirety (CLP analytical methods may be specified as well as a CLP type data validation).

2. Applicability. This guide applies to all HTW investigative, pre-design, and remedial activities undertaken by USACE. A CDAP will be prepared for each activity and submitted to the appropriate USACE personnel for review, comments, and recommendations. The identification of these reviewers for each type of project is found in Tables 4, 5, and 6 in Appendix A. Once approved, the CDAP is considered part of the contract and is enforceable as such.

3. USACE Chemical Quality Data Management. USACE requires that quality control (QC) and quality assurance (QA) samples be collected and analyzed by the contract laboratory and the USACE QA laboratory, respectively. These QC and QA samples include splits or replicates of field samples, rinsate blanks, trip blanks and background soil and groundwater samples. QC samples, which represent approximately 10% of the field samples, help the prime contractor to identify and diagnose problems related to sampling and analysis. QA samples, which represent approximately 10% of the field samples, are sent to a USACE QA laboratory by overnight delivery for government monitoring of sampling and contract laboratory performance. For additional guidance on chemical quality assurance, see Appendix E. When

the following procedures, performed by the USACE QA laboratory, demonstrate that contract requirements for chemical quality control were not met, contractor resampling and reanalysis may be required by the contracting officer.

a. Inspection of QA samples to insure that sampling procedures correspond to Chemical Data Acquisition Plan (CDAP) with regard to sample containers, preservation, labeling, and chain of custody.

b. Analyses of QA samples.

c. Evaluation of contractor deliverables specified in Chemical Data Acquisition Plan (CDAP).

d. Comparison of analytical results obtained by contract laboratory and USACE QA laboratory from split or replicate samples. The procedures for obtaining QA laboratory services are in Appendix E to ER 1110-1-263.

4. Contract Laboratory Validation. Any laboratory performing chemical analyses shall be validated by USACE Missouri River Division (MRD). Laboratories are validated for each environmental matrix and each specific analytical method to be employed. If the prime contractor selects a laboratory which has a current (within one year) validation for all analytes and matrices specific to its project, additional evaluation will not be necessary. A request for the evaluation of commercial laboratory should be sent to CEMRD to verify the status of the contract laboratory(ies). If the prime contractor selects a laboratory which does not have a current validation, the laboratory shall be validated prior to approval of the CDAP. Commercial laboratory validation procedures are in Appendix C to ER 1110-1-263. **Samples may not be subcontracted to another laboratory without knowledge and approval of the contracting officer and unless the second laboratory is validated for the parameters concerned.**

5. The CDAP shall address the following topics, not necessarily in the presented order within subsections.

SECTION 1.0 TABLE OF CONTENTS
SECTION 2.0 PROJECT DESCRIPTION
SECTION 3.0 CHEMICAL DATA QUALITY OBJECTIVES - GENERAL DISCUSSION
SECTION 4.0 AE CONTRACTOR PROJECT ORGANIZATION AND FUNCTIONAL AREA RESPONSIBILITIES.
SECTION 5.0 FIELD ACTIVITIES

5.1 List of Field Equipment, Containers, and Supplies
5.2 Sampling Locations
5.3 General Information and Definitions
5.4 Sampling and Preservation Procedures
5.4.1 Matrix 1
5.4.1.1 Locations
5.4.1.1.1 Sampling Procedure
5.4.1.1.2 Analytical Parameters
5.4.1.1.3 Sample Containers, Preservation Procedure and Holding Time
5.4.2 Matrix 2
5.4.2.1 Locations(s)
5.4.2.1.1 Sampling Procedure
5.4.2.1.2 Analytical Parameters
5.4.2.1.3 Sample Containers, Preservation Procedure and Holding Time
5.4.3 Matrix 3, etc.
5.5 Field Documentation

SECTION 6.0 SAMPLE CHAIN OF CUSTODY, PACKING AND TRANSPORTATION

SECTION 7.0 LABORATORY ANALYTICAL PROCEDURES
7.1 Analytical Method 1
7.1.1 Matrix 1
7.1.1.1 Sample Preparation
7.1.2 Matrix 2
7.1.2.1 Sample Preparation
7.1.3 Matrix 3, etc.
7.1.4 Analytical Method (if not standard)
7.1.5 Method Specific Data Quality Objectives
7.1.6 Preventive Maintenance
7.1.7 Instrument Calibration and Frequency
7.1.8 Internal Quality Control Checks
7.1.9 Corrective Action
7.1.10 Data Reduction, Validation, and Documentation
7.2 Analytical Method 2
7.2.1 Matrix 1
7.2.1.1 Sample Preparation
7.2.2 Matrix 2, etc.
7.2.3 Matrix 3, etc.
7.2.4 Analytical Method
7.2.5 Method Specific Data Quality Objectives
7.2.6 Preventive Maintenance
7.2.7 Instrument Calibration and Frequency

7.2.8 Internal Quality Control Checks
7.2.9 Corrective Action
7.2.10 Data Reduction, Validation, and Documentation
7.3 Analytical Method 3, etc.

SECTION 8.0 CDQM DELIVERABLES
SECTION 9.0 REFERENCES

6. Project Description (SECTION 2.0 in Table of Contents). This section of the CDAP shall include a description of the work site and any unusual conditions. Anticipated project start and completion dates shall be estimated. This section shall also provide a summary of past and future work at the site including past chemical data of significance as well as a presentation of the multi-media sampling to be carried out in the present work effort.

7. Chemical Data Quality Objectives (SECTION 3.0 in Table of Contents). This section of the CDAP shall include a description of the general scope of work and relevant background information as it relates to the acquisition of chemical analytical data. State the objectives of the project: what questions must be answered and what decisions must be made; one specific objective may be completion of the USACE Hazardous Ranking System. Describe the level and extent of chemical data required to answer questions and support decisions during the project: the approach for sample collection, sample analysis, and QA/QC which will result in the required chemical data. The extent of analytical effort and data validation procedures to be required must be specified. Guidance for this requirement can be found in "Data Quality Objectives for Remedial Response Activities", EPA 540/G-87/003.

8. Contractor Project Organization and Functional Area Responsibilities (SECTION 4.0 in Table of Contents). The project organization for the prime contractor and any subcontractors shall be clearly defined with a discussion of quality control responsibilities. The prime contractor's Quality Assurance (QA) Officer shall report to a responsible senior officer of the company (i.e., QA management shall be separate from project management). A list of all individuals shall be provided and will include QC officers for the various components (those responsible for initiating and carrying out corrective actions and those involved in the data reporting sequence) and all analytical laboratory personnel (supervisors, chemists, and technicians). Resumes of all non-laboratory AE/Contractor personnel listing education and experience are

required, including personnel collecting samples. List the names of field personnel that will wear monitoring equipment. The name of the contract laboratory with a brief description of location, facilities and capabilities should be included.

9. Field Activities. Briefly summarize types of field activities required by the project.

10. List of Equipment, Containers, and Supplies to be taken to the Field (SECTION 5.1 in the Table of Contents). This section of the CDAP shall include all sample screening equipment to be used (brand, model, serial number) and a description of its calibration as well as sampling equipment, decontamination supplies and sample containers (specific numbers and types).

11. Sampling Locations (SECTION 5.2 in Table of Contents). This section of the CDAP shall provide the location of each sampling point on a site map. These locations shall be identified by the AE/Contractor after a visual inspection if they are not already specified in their Scope of Services or in the Specifications. In addition, at least one soil sample and one groundwater sample shall be collected in areas presenting the least potential for contamination and shall be used as background samples if this data has not been obtained in a previous phase. This section shall describe the rationale that governed the selection of sampling locations.

12. General Information and Definitions (SECTION 5.3 in Table of Contents). Some commonly used definitions are given below.

a. Contractor Laboratory. The laboratory performing analysis of the field samples. This may be an AE laboratory, a Remedial Action contractor laboratory or a laboratory subcontracted by either.

b. QA and QC Samples. Samples analyzed for the purpose of assessing the quality of the sampling effort and of the analytical data. QA and QC samples include splits or replicates of field samples, rinsate blanks, trip blanks, and background (up gradient) samples.

c. QC Samples. Quality Control samples are collected by the sampling team for use by the contractor's laboratory. The identity of these samples is held blind to the analysts and laboratory personnel until data are in deliverable form. The purpose of the sample is to provide site specific field originated checks that the data generated by the contractor's

analytical lab are of suitable quality. QC samples represent approximately 10% of the field samples.

d. QA Samples. Samples sent to a USACE QA laboratory by overnight delivery and analyzed to evaluate AE and contractor laboratory performance. QA samples represent approximately 10% of the field samples. The contractor shall coordinate with the designated QA laboratory not less than 48 hours before sampling to assure that the QA laboratory is alerted to receive the QA samples
and process them within the time limits specified by applicable EPA regulations and guidelines.

e. Split Samples. Samples that are collected as a single sample, homogenized, divided into two or more equal parts, and placed into separate containers. The sample shall be split in the field prior to delivery to a laboratory. Ordinarily split samples are analyzed by two different laboratories.

f. Replicate (duplicate, triplicate, etc.) Samples. Multiple grab samples, collected separately, that equally represent a medium at a given time and location. This is the required type of collocated sample for volatile organic analyses and most groundwater and surface water samples.

g. Rinsate Blank. Samples consisting of reagent water collected from a final rinse of sampling equipment after the decontamination procedure has been performed. The purpose of rinsate blanks is to determine whether the sampling equipment is causing cross contamination of samples.

h. Trip Blank. Containers of organic-free reagent water that are kept with the field sample containers from the time they leave the laboratory until the time they are returned to the laboratory. The purpose of trip blanks is to determine whether samples are being contaminated during transit or sample collection. Trip blanks pertain only to volatile organic analyses; therefore, the containers must contain no headspace. Only one trip blank is needed for one day's sampling and shall satisfy trip blank requirements for all matrices for that day if the volatile samples are shipped in the same cooler.

13. Sampling and Preservation Procedures (SECTION 5.4 in Table of Contents). The CDAP shall include a table, which lists sampling locations, matrix (waste, soil, water, etc.), number of field samples, number of split or replicate samples, and number of rinsate or trip blank samples. Specific sampling, preservation, etc. details shall be included. All details

shall meet the requirements of one of the following: (a) EPA SW-846 method; (b) another EPA method; (c) ASTM method; (d) NIOSH method (for air sampling); or (e) another accepted published method. Container and preservation requirements shall meet the USACE Sample Handling Protocol (Appendix F to ER 1110-1-263). Each table entry shall include the reference, if any, from which the specifications were taken. Any modifications to the standard methods must be approved by the CO with the concurrence of the QA laboratory prior to their use. All methods should be referenced to the most recent edition of their source. If a standard method is not available, the AE/Contractor or subcontractors shall propose a nonstandard method with validation data for approval by the CO.

14. Details of Sampling and Preservation Procedures. The composition and volume of sample containers shall be specified along with a description of their preparation and cleaning. Sampling equipment directly contacting the sample shall be stainless steel or Teflon. The CDAP shall describe the cleaning of equipment and precautions for prevention of sample cross contamination during collection. Any field screening methods employed to select samples for analysis shall be discussed in detail. Compositing and homogenizing procedures shall be included. Sample containers, volumes, preservatives and holding times for the common analyses in low concentration are presented in Table D-1. A more detailed table is presented in the Sample Handling Protocol (Appendix F).

a. Soil Sampling Procedure. Using stainless steel or Teflon sampling equipment enough solid is removed from a specified depth to fill the required containers. The volatile organic samples should be removed first with as little mixing as possible. The remaining soil shall be placed in a clean stainless steel bowl and mixed thoroughly with stainless steel implements (spoons, spades, etc.), then divided among the sample containers to be filled and properly preserved. QC and/or QA sample containers shall be filled from the same mixture as one of the samples.

b. Groundwater Sampling Procedure. Valid, representative samples must be obtained. Before a sample is collected from a well, the water level shall be measured and recorded. Then the well shall be pumped or bailed with clean equipment to remove a quantity of water equal to at least three times the submerged volume of the casing and filter pack. If the well does not recharge fast enough to permit removing three casing volumes, the well shall be pumped or bailed dry, and sampled as soon as sufficient recharge has occurred. The field parameters of pH,

conductivity and temperature must be stable before sampling. Containers to be analyzed for volatiles should be filled first allowing no headspace and with as little disturbance of the water as possible. If preservative is added to the bottles prior to shipment to the field, care must be taken not to overfill the containers and pH must be measured on samples where a value is specified.

c. Other Matrices. Sampling methods and equipment used shall meet the requirements of EPA or NIOSH methods.

15. Field Documentation (SECTION 5.5 in Table of Contents). The system for identifying and tracking the samples shall be described, and shall include the recording of field data in permanently bound notebooks along with the method of relating the field data to the proper samples. All field documentation shall be done in indelible ink. Daily Quality Control Reports shall be prepared daily, dated, signed by the site manager, and sent to the CO. These reports shall include (with respect to chemistry) weather information at the time of sampling, samples taken with reference given to appropriate sections of the CDAP, field instrument measurements and calibrations. Any deviations from the CDAP shall be stated. All field documentation will become part of the project files.

16. Sample Chain of Custody and Transportation (SECTION 6.0 in Table of Contents). All sample labeling, packing, transportation and chain of custody procedures shall follow the USACE Sample Handling Protocol (Appendix F to ER 1110-1-263).

17. Laboratory Analytical Procedures (SECTION 7.0 in Table of Contents). Specific laboratory procedural details shall be included. Each method shall be specified exactly and in detail by one of the following: (a) reference to an EPA SW-846 method; (b) reference to another EPA method; (c) reference to an ASTM method; (d) reference to a NIOSH method (for air analysis); (e) reference to another accepted published method; (f) reference to an accepted published method with a description of any deviations from the published procedure; or (g) complete description of the procedure, e.g., copies of laboratory instructions. EPA SW-846 methods shall be used where possible. Generally, nonstandard methods are not allowed. In special cases that require the consideration of nonstandard methods, the contract laboratory shall be prepared to provide validation data. The use of proposed nonstandard methods requires prior approval of the CO. A list of sample preparation and analytical methods most frequently used is presented in Table D-2. A table shall be included which lists for each matrix

sample preparation method number, analytical method number, analytes and laboratory quantitation limits.

18. Preventive Maintenance. The instrument, including manufacturer, model, accessories, etc., shall be specified and preventive maintenance shall be described. Preventive maintenance shall be performed by qualified personnel. Records of repairs, adjustments and calibrations shall be maintained and available for inspection by the CO on request.

19. Instrument Calibration and Frequency. Description of the procedure used for calibration and frequency of checks is required for each instrument or method. These shall be consistent with the requirements of the contract and the analytical method.

20. Analytical Methods. Include the required concentration range and data on the sensitivity (detection limits), precision, and accuracy when this information is not included in the method. Indicate how preexisting data on sensitivity, precision, and accuracy were determined, and procedures to be used to validate the method. State source and purity of analytical reference materials and laboratory chemicals necessary to perform the analyses. Nominal detection limits for common analytes are given in Tables D-3 and D-5. DQO's for specific projects will affect the value of required detection limits and goals for precision, accuracy and completeness.

21. Method Specific Data Quality Objectives. Provide objectives for precision, accuracy, detection limits, and completeness. DQO's for accuracy and precision established for each measurement parameter will be based on prior knowledge of the specific measurement system used and method validation studies employing replicate analyses, spikes, standards, calibrations, recoveries, control charts and project specific requirements. Completeness refers to the amount of valid data obtainable (by the specific method in the laboratory used with the instrument to be employed) from a measurement system compared to the expected amount of data, and is usually expressed as a percentage.

22. Quality Control Checks. Quality control checks are necessary to evaluate performance reliability for each measurement parameter. Describe procedures to assess the precision, accuracy and completeness of the measurement. The numbers and types of internal laboratory QC checks and samples proposed (e.g., blanks, duplicates, splits, spikes, surrogates, and reference standards, as applicable) shall be defined

clearly. At a minimum these must be run at the rates prescribed in the individual methods. The laboratory's established practice for including control samples among the samples analyzed and any additional controls required by the present project shall be described. Describe the feedback systems used to identify problems by means of the results obtained from control samples. Limits of data acceptability shall be included. Results from laboratory internal quality control checks shall be reported with the analytical data. Standard forms should be used, preferably CLP or SW-846 recommended format.

23. Corrective Action. Plans for corrective actions to be taken when results appear unusual, questionable, or limits of acceptability are exceeded shall be included. When limits of acceptability are exceeded, information justifying the poor recovery or precision shall be documented. Describe how reestablishment of control is demonstrated.

24. Data Reduction, Validation, and Documentation. Equations, including units, required to calculate the concentration or value of the measured parameter, shall be included. Describe the data management systems which collect raw data, store data, and document quality control data. If statistical procedures are used for data review before reporting, include descriptions. Data validation procedures and organization shall be specified. Data validation shall be conducted as determined by the Data Quality Objectives.

25. CDQM Deliverables (SECTION 8.0 in Table of Contents). The contractor shall address the frequency and content of chemical data quality control reports that shall be submitted during the project.

a. Daily Quality Control Report (DQCR) during field activities.

b. Daily Quality Control Report from the contract laboratory if this is required in the specifications or Scope of Work.

c. Departure From Approved Plans. Include problems identified, corrective actions, and verbal/written instructions from USACE personnel for sampling or re-analysis. These reports of significant problems should be sent to the CO within 48 hours of the occurrence.

d. Data Report to the QA Laboratory. The contractor's data must be submitted to the designated quality assurance laboratory (for data validation and comparison purposes) as soon as it is available. This submittal should include all sample, blank and internal quality control results such as spike and surrogate recoveries and agreement between replicate analyses. Interim data reports may be requested if the project warrants. A complete data set should also be submitted to the executing FOA for evaluation. If the submission of raw data such as chromatograms is required, it should be specified in the approved CDAP.

e. Quality Control Summary Report (QCSR)/Final Investigation Report. Ordinarily these reports are completed within thirty days of the availability of results. The QCSR addresses quality control practices employed and summarizes the DQCR. For investigative activities the QCSR may be included in the Final Investigation Report.

f. Final Investigation Report. (For investigation projects).

TABLE D-1

SAMPLE CONTAINERS, PRESERVATION AND HOLDING TIMES

Matrix	Parameter[1]	Container[2]	Preservation[3]	Maximum Holding Times[4] Extrac-tion)	Analysis
Water	Volatiles	2 x 40 mL G, Septa vial	Ice to 4°C 4 drops con HCl or $NaHSO_4$ to pH < 2	-	14 d
Water	B/N/A	2 x 1 L amber G	Ice to 4°C	7 d	40 d
Water	PCBs, Pesticides	2 x 1 L amber G	Ice to 4°C	7 d	40 d
Water mo[5]	Metals[5]	1 x 1 L P	HNO_3 to pH<2	-	6
Water	TRPH	2 x 1 L amber G	Ice to 4°C HCl to pH<2	-	28 d
Water	Common anions[6]	1 x 1 L G	Ice to 4°C	-	28 d[6]
Water	Explosives	2 x 1 L amber G	Ice to 4°C	7 d	40 d
Water	Cyanide	1 x 1 L P	Ice to 4°C NaOH to pH > 12	-	14 d
Soils/ Sed.	Volatiles	2 x 40 mL or 2 x 125 mL G, Septa vial	Ice to 4°C	-	14 d
Soils/ Sed.	B/N/A, PCBs Pesticides	1 x 8 oz G	Ice to 4°C	14 d	40 d
Soils/ Sed.	Metals, Cyanid TRPH	1 x 8 oz G	Ice to 4°C	-	6mo[5] (TRPH: 28d)
Soils/ Sed.	Explosives	1 x 4 oz G	Ice to 4°C	14 d	40 d

TABLE D-1 (cont'd)

1. B/N/A = Base/Neutral/Acid extractable organics; TRPH = Total Recoverable Petroleum Hydrocarbons.

2. All containers must have Teflon-lined seals (Teflon-lined septa for VOA vials). G = Glass; P = High density polyethylene.

3. Sample preservation will be done in the field immediately upon sample collection. If preservative is added to the bottles prior to shipment, care must be taken not to overfill them and pH should be checked. If samples are filtered in the field, differential pressure methods and 45 micron filters will be used. (Preservative is added after filtration.) VOA samples must never be filtered.

4. When only one holding time is given, it implies total holding time from sampling until analysis.

5. Total Recoverable Metals for water samples. Holding time for Hg is 28 days; for Cr(VI) is 24 hours.

6. Cl^-, Br^-, F^-, NO_3^-, NO_2^-, PO_4^{3-}, SO_4^{2-}; 1 L for each method; orthophosphate requires filtration. Holding time for analysis is 48 hours for NO_2^-, NO_3^-, and PO_4^{3-} if not preserved with H_2SO_4 to pH < 2.

TABLE D-2
EPA METHODS FOR SAMPLE ANALYSIS

Part 1. General Information. All sample analyses of water or soils will be performed using standard EPA methods as listed below. All procedures specified must be followed exactly with no deviations unless modifications are specifically authorized by the government's QA laboratory. All method QC requirements will be followed explicitly. The running of QC duplicates and spike samples shall be in accordance with the laboratory QA/QC Plan as set forth in the LQMP, or at a minimum rate of 1 in 20 but at least 1 per batch. The detection limits stated in each method must be met by the AE laboratory. All samples must be extracted and analyzed within the specific holding times specified by each method. All analyses must be performed by the validated laboratory (in-house) and may not be subcontracted out to another laboratory. EPA-CLP methods may be substituted for analytical parameters included in the CLP Statements of Work.

Part 2. Methods for the Determination of Metals (RCRA and Priority Pollutants) by Atomic Absorption and Inductively Coupled Plasma

		Extraction and Analysis Method[2]		
Metal	Technique[1]	Soil/Sed.	Groundwater[2]	Surface Water[2]
Antimony (Sb)	DA	CLP[4]/7040	3005/7040	204.1
	GF	CLP[4]/7041	3020/7041	204.2
	ICP	CLP[4]/6010	3005/6010	200.7
Arsenic (As)	GF	3050/7060	Inc[3]/7060	206.2
	H	Inc[3]/7061	Inc[3]/7061	206.3
Barium (Ba)	DA	3050/7080	3005/7080	208.1
	GF	3050/7081	3020/7081	208.2
	ICP	3050/6010	3005/6010	200.7
Beryllium (Be)	DA	3050/7090	3005/7090	210.1
	GF	3050/7091	3020/7091	210.2
	ICP	3050/6010	3005/6010	200.7
Cadmium (Cd)	DA	3050/7130	3005/7130	213.1
	GF	3050/7131	3020/7131	213.2
	ICP	3050/6010	3005/6010	200.7
Calcium (Ca)	DA	3050/7140	3005/7140	215.1
	GF	-	-	-
	ICP	3050/6010	3005/6010	200.7

Table D-2 (Cont'd)

Metal	Technique[1]	Extraction and Analysis Method Soil/Sed.	Groundwater[2]	Surface Water[2]
Chromium (Cr)	DA	3050/7190	3005/7190	218.1
	GF	3050/7191	3020/7191	218.2
	ICP	3050/6010	3005/6010	200.7
Copper (Cu)	DA	3050/7210	3005/7210	220.1
	GF	3050/7211	3020/7211	220.2
	ICP	3050/6010	3005/6010	200.7
Iron (Fe)	DA	3050/7380	3005/7380	236.1
	GF	3050/7381	3020/7381	236.2
	ICP	3050/6010	3005/6010	200.7
Lead (Pb)	DA	3050/7420	3005/7420	239.1
	GF	3050/7421	3020/7421	239.2
	ICP	3050/6010	3005/6010	200.7
Manganese (Mn)	DA	3050/7460	3005/7460	243.1
	GF	3050/7461	3020/7461	243.2
	ICP	3050/6010	3005/6010	200.7
Mercury (Hg)	CV	Inc[3]/7471	Inc[3]/7470	245.1
Nickel (Ni)	DA	3050/7520	3005/7520	249.1
	GF	-	-	249.2
	ICP	3050/6010	3005/6010	200.7
Selenium (Se)	GF	3050/7740	Inc[3]/7740	270.2
	H	Inc[3]/7741	Inc[3]/7741	270.3
Silver (Ag)	DA	3050/7760	Inc[3]/7760	272.1
	GF	3050/7761	Inc[3]/7761	272.2
	ICP	3050/6010	3005/6010	200.7
Sodium (Na)	DA	3050/7770	3005/7770	273.1
	GF	-	-	273.2
	ICP	3050/6010	3005/6010	200.7
Thallium (Tl)	DA	3050/7840	3005/7840	279.1
	GF	3050/7841	3020/7841	279.2
	ICP	3050/6010	3005/6010	200.7
Zinc (Zn)	DA	3050/7950	3005/7950	289.1
	GF	3050/7951	3020/7951	289.2
	ICP	3050/6010	3005/6010	200.7

Table D-2 (Cont'd)

Part 2. Methods for the Determination of Metals (RCRA and Priority Pollutants) by Atomic Absorption and Inductively Coupled Plasma (continued)

NOTES:
1. Abbreviations: DA = Direct Aspiration; GF = Graphite Furnace; H = Hydride; CV = Cold Vapor; ICP = Inductively Coupled Plasma.

2. (a) Any water samples may be analyzed by the groundwater techniques. Groundwater samples must be analyzed by these techniques. Surface water and other water samples (drinking, silo, leachate, etc.) may be analyzed by the 200-series or the SW-846 series methods.

(b) Other extraction procedures may be appropriate instead of those listed. Methods 3010 (for flame and ICP) and 3020 (for graphite furnace) are used as extraction procedures for Total Metals and are used in TCLP methodology. Method 3040 is used to extract metals from oily wastes (greases, waxes, etc.).

(c) All 200 series methods are from EPA 600/4-79-020 (1983) "Methods for Chemical Analysis of Water and Wastes"; all other methods are from SW-846 (1986), "Test Methods for Evaluation of Solid Waste".

3. Method-specific extraction procedure is incorporated into method.

4. Follow CLP sample preparation procedures. Existing guidance in SW-846 is inadequate in this regard.

Table D-2 (Cont'd)

Part 3. Methods for the Determination of Non-Metallic Analytes

Organic Analytes	Technique[1]	Analytical Methods Soil/Sed	Groundwater[2]	Surface Water[2]
Halogenated Volatile Organics	GC	5030/8010	5030/8010[3]	601[3]
Non-Halogenated Volatile Organics	GC	5030/8015	5030/8015[3]	602[3]
Aromatic Volatile Organics	GC	5030/8020	5030/8020[3]	602[3]
Organochlorine Pesticides and PCBs	GC	3540/8080 3550/8080	3510/8080 3520/8080	608
Organophosphorus Pesticides	GC	3540/8140 3550/8140	3510/8140 3520/8140	
Chlorinated Herbicides	GC	Inc[4]/8150	Inc[4]/8150	509B[10]
Volatile Organics	GC/MS	Inc[4]/8240	Inc[4]/8240	624
Base/Neutral Semi-volatile Organics	GC/MS[5]	3540/8250 3550/8250 3540/8270 3550/8270	3510/8250 3520/8250 3510/8270 3520/8270	625
Acid Semivolatile Organics	GC/MS	3540/8250 3550/8250 3540/8270 3550/8270	3510/8250 3520/8250 3510/8270 3520/8270	625
Dioxins, etc.	GC/MS	Inc[4]/8280	Inc[4]/8280	613
Polynuclear Aromatic Hydrocarbons	HPLC	3540/8310 3550/8310	3510/8310 3520/8310	

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Table D-2 (Cont'd)

		Analytical Methods		
Inorganic Analytes	Technique[1]	Soil/ Sediment	Ground-water[2]	Surface Water[2]
Total and Amenable Cyanide		9010 or 9012		335
Sulfide		9030	9030	376
Sulfate		9035, 9036, or 9038		375
Nitrate		9200	9200	353
Chloride		9250, 9251, or 9252		325
Common Anions[6]	IC			300.0 429[10]
Total Organic Carbon			9060	415
Oil and Grease	IR	9071/413.2	413.2	413.2
TRPH[7]	IR	9071/418.1[7]	418.1	418.1
Ignitability		1010 or 1020		
Corrosivity		9045	9040/1110	9040/1110
Reactivity		(Section 7.3.3 and 7.3.4 of SW-846)		
EP Toxicity		1310[8]	1310[8]	
TCLP		1311[8,9]	1311[8,9]	
pH		9045	9040	
Gross alpha and beta		9310	9310	
Explosives		____[11]	____[11]	____[11]

Table D-2 (Cont'd)

Part 3 continued:
NOTES:
1. Abbreviations: GC = Gas Chromatograph; GC/MS = Gas Chromatograph/Mass Spectroscopy; IC = Ion Chromatograph; IR = Infrared Spectroscopy; HPLC = High Pressure Liquid Chromatograph.

2. (a) All water samples may be analyzed by these techniques. Groundwater samples must be analyzed by these techniques. Surface water and other water samples (drinking, silo, leachate, etc.) may be analyzed by the 200-series or the SW-846 series methods. Soil or sediment preparation unless otherwise specified involves extration of a predetermined weight of the dried samples with a fixed anount (500 mL) of water.

(b) All 300-600 series methods are from EPA 600/4-79-020 (1983) "Methods for Chemical Analysis of Water and Wastes"; all other methods are from SW-846 (1986), "Test Methods for Evaluation of Solid Waste".

3. Direct injection may be used for high concentrations of contaminates in water. It is preferable to use Method 8240. If Method 8010, 8015, 8020, 601, or 602 is used, it is necessary to confirm results with a second GC column or a validation by GC/MS.

4. Method-specific extraction procedure is incorporated into method.

5. Either method may be used. Extract cleanup by Methods 3600 is usually also required.

6. Common anions are fluoride (F^-), chloride (Cl^-), bromide (Br^-), nitrite (NO_2^-), nitrate (NO_3^-), orthophosphate (PO_4^{3-}), and sulfate (SO_4^{2-}).

7. Total Recoverable Petroleum Hydrocarbons. Follow extraction procedures 9071 through Step 7.11 and then dilute with Freon-113 to 100 mL.

8. Extraction procedure only. Analysis must follow.

9. Federal Register March 29, 1990. TCLP leachates are analyzed by one or more of the following methods. Scope must specify which analyses are to be performed on TCLP leachate extracts.

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Table D-2 (Cont'd)

Metals: Methods 6010, 7060, 7470, and 7740
Pesticides: Method 8080
Herbicides: Method 8150
Volatile organics: Method 8240 (Zero headspace TCLP extraction required)
Semi-volatile organics: Method 8270

10. Standard Methods for the Examination of Water and Wastewater, 16th Edition, 1985.

11. USACE method developed by Cold Regions Research and Engineering Laboratory to be obtained from CEMRD.

Table D-3. Inorganic Analysis Nominal Values for Instrument Detection Limits[a].

Analyte:	User's Guide to CLP ug/L	SW-846 ICP ug/L	SW-846 AA-DA ug/L	SW-846 AA-GF ug/L
Aluminum, Al	200	45	100	-
Antimony, Sb	60	32	200	3
Arsenic, As	10	53	2[b]	1
Barium, Ba	200	2	100	-
Beryllium, Be	5	0.3	5	0.2
Cadmium, Cd	5	4	5	0.1
Calcium, Ca	5000	10	10	-
Chromium, Cr	10	7	50	1
Cobalt, Co	50	7	50	1
Copper, Cu	25	6	20	-
Iron, Fe	100	7	30	-
Lead, Pb	5	42	100	1
Magnesium, Mg	5000	30	1	-
Manganese, Mn	15	2	10	-
Mercury, Hg	0.2	-	0.2[c]	-
Nickel, Ni	40	15	40	-
Potassium, K	5000	-	10	-
Selenium, Se	5	75	2[b]	2
Silver, Ag	10	7	10	-
Sodium, Na	5000	29	2	-
Thallium, Tl	10	10	100	1
Vanadium, V	50	8	200	4
Zinc, Zn	20	2	5	-
Cyanide, CN^-	10	-	-	-

Important Note: These estimated instrument detection limits are to be used as a guide. The actual detection limits are matrix dependent and sample dependent. For ICP, each instrument must have an established analyte interference table as per Method 6010. See Method 6000 or 7000 for further guidance.

a. AA-DA = Atomic Absorption - Direct Aspiration
AA-GF = Atomic Absorption - Graphite Furnace

b. Gas hydride technique

c. Cold vapor technique

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Table D-4. Volatile Organic Analysis Nominal Values for Practical Quantitation Limits

Analyte:	Ground Water ug/L	Low Soil Sediment ug/kg
Chloromethane	10	10
Bromomethane	10	10
Vinyl Chloride	10	10
Chloroethane	10	10
Methylene Chloride	5	5
Acetone	100	100
Carbon Disulfide	5	5
1, 1-Dichloroethene	5	5
1, 1-Dichloroethane	5	5
1, 2-Dichloroethene	5	5
Chloroform	5	5
1, 2-Dichloroethane	5	5
2-Butanone	100	100
1,1,1-Trichloroethane	5	5
Carbon Tetrachloride	5	5
Vinyl Acetate	50	50
Bromodichloromethane	5	5
1,2-Dichloropropane	5	5
cis-1,3-Dichloropropene	5	5
Trichloroethene	5	5
Dibromochloromethane	5	5
1,1,2-Trichloroethane	5	5
Benzene	5	5
trans-1,3-dichloropropene	5	5
Bromoform	5	5
2-Chloroethyl Vinyl Ether	10	10
4-Methyl-2-pentanone	50	50
2-Hexanone	50	50
Tetrachloroethene	5	5
Toluene	5	5
1,1,2,2-Tetrachloroethane	5	5
Chlorobenzene	5	5
Ethyl Benzene	5	5
Styrene	5	5
Xylenes (Total)	5	5

Table D-5. Semivolatile Organic Analysis Nominal Values for Practical Quantitation Limits

Analyte:	Ground Water ug/L	Low Soil Sediment ug/kg
Phenol	10	660
Bis (2-chloroethyl) ether	10	660
2-Chlorophenol	10	660
1,3-Dichlorobenzene	10	660
1,4-Dichlorobenzene	10	660
Benzyl alcohol	20	1300
1,2-Dichlorobenzene	10	660
2-Methylphenol	10	660
Bis (2-chloroisopropyl)ether	10	660
4-Methylphenol	10	660
N-Nitroso-di-n-dipropylamine	10	660
Hexachloroethane	10	660
Nitrobenzene	10	660
Isophorone	10	660
2-Nitrophenol	10	660
2,4-Dimethylphenol	10	660
Benzoic Acid	50	3300
Bis(2-chloroethoxy)methane	10	660
2,4-Dichlorophenol	10	660
1,2,4-Trichlorobenzene	10	660
Naphthalene	10	660
4-Chloroaniline	20	1300
Hexachlorobutadiene	10	660
4-Chloro-3-methylphenol	20	1300
2-Methylnaphthalene	10	660
Hexachlorocyclopentadiene	10	660
2,4,6-Trichlorophenol	10	660
2,4,5-Trichlorophenol	50	3300
2-Chloronaphthalene	10	660
2-Nitroaniline	50	3300
Dimethylphthalate	10	660
Acenaphthylene	10	660
2,6-Dinitrotoluene	10	660
3-Nitroaniline	50	3300
Acenaphthene	10	660
2,4-Dinitrophenol	50	3300
4-Nitrophenol	50	3300
Dibenzofuran	10	660
2,4-Dinitrotoluene	10	660
Diethylphthalate	10	660
4-Chlorophenyl phenyl ether	10	660
Fluorene	10	660
4-Nitroaniline	50	3300
4,6-Dinitro-2-methylphenol	50	3300

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Table D-5. (Cont'd)

Analyte:	Ground Water ug/L	Low Soil Sediment ug/kg
N-Nitrosodiphenylamine	10	660
4-Bromophenyl phenyl ether	10	660
Hexachlorobenzene	10	600
Pentachlorophenol	50	3600
Phenanthrene	10	660
Anthracene	10	660
Di-n-butylphthalate	10	660
Fluoranthene	10	660
Pyrene	10	660
Butylbenzylphthalate	10	660
3,3'-Dichlorobenzidine	20	1300
Benzo(a)anthracene	10	660
Chrysene	10	660
Bis(2-ethylhexyl)phthalate	10	660
Di-n-octylphthalate	10	660
Benzo(b)fluoranthene	10	660
Benzo(k)fluoranthene	10	660
Benzo(a)pyrene	10	660
Indeno(1,2,3-cd)pyrene	10	660
Dibenzo(a,h)anthracene	10	660
Benzo(g,h,i)perylene	10	660

Table D-6. Pesticide/PCB Analysis Nominal Values for Practical Quantitation Limits

Analyte:	Ground Water ug/L	Low Soil Sediment ug/kg
Aldrin	0.04	2.7
alpha-BHC	0.03	2.0
beta-BHC	0.06	4.0
delta-BHC	0.09	6.0
gamma-BHC (Lindane)	0.04	2.7
Chlordane (technical)	0.14	9.4
4,4'-DDD	0.11	7.5
4,4'-DDE	0.04	2.7
4,4'-DDT	0.12	8.0
Dieldrin	0.02	1.3
Endosulfan I	0.14	9.4
Endosulfan II	0.04	2.7
Endosulfan sulfate	0.66	44.2
Endrin	0.06	4.0
Endrin aldehyde	0.23	15.4
Heptachlor	0.03	2.0
Heptachlor epoxide	0.83	55.6
Methoxychlor	1.76	117.9
Toxaphene	2.4	160.8
Aroclor-1016	0.5	80.0
Aroclor-1221	0.5	80.0
Aroclor-1232	0.5	80.0
Aroclor-1242	0.65	43.6
Aroclor-1248	0.5	80.0
Aroclor-1254	1.0	160.0
Aroclor-1260	1.0	160.0

APPENDIX E

USACE CHEMICAL QUALITY ASSURANCE

1. Purpose. This appendix defines the components of USACE HTW chemical quality assurance and delineates the responsibilities of those USACE elements which provide these services.

2. Applicability. The policies in this appendix apply to all HTW projects executed by USACE districts, divisions and other FOA and their contractors. Every project must be assigned a QA Laboratory. QA functions may not be contracted out directly by the FOA to commercial enterprises. Sample analysis may be performed by a commercial lab under direct contract to the USACE QA Laboratory.

3. Elements and Responsibilities of USACE Chemical Quality Assurance. CEMRD is appointed by HQUSACE to exercise the lead in Corps-wide chemical data quality management and maintain consistency in this effort for all HTW activities. The elements of chemical data quality management involved in quality assurance are document review, analysis of field quality assurance samples, generation of the Chemical Quality Assurance Report (CQAR), validation of commercial laboratories, and assignment of quality assurance responsibilities. The first three are responsibilities transferred to the assigned quality assurance laboratory for a given project. The latter two activities remain the responsibility of CEMRD.

4. Procedures. The following procedures are followed for each investigation and remedial activity involving chemical analysis.

a. The project manager/COR notifies CEMRD and the preferred QA Laboratory (CEMRD-ED-GL or the geographic USACE Division Laboratory) of the need for chemical quality assurance services. A suggested format is provided for this purpose. If a memorandum is preferred the same information should be included.

b. The proposed QA laboratory requests project specific assignment providing CEMRD with information on procedures which will be employed to discharge their responsibilities. The suggested format provided in this appendix or a memorandum which addresses the same information should be sent.

c. CEMRD confirms the assignment in writing to the project manager/COR and the Division Laboratory and monitors the chemical data quality management through oversight review of

documents and review of the Chemical Quality Assurance Report. To facilitate this the quality assurance laboratory should send copies of their comments and of the CQAR to CEMRD as soon as these are available.

d. The quality assurance laboratory will either analyze the QA samples in-house or send them to a USACE validated commercial laboratory for analysis. Analysis in-house requires method and matrix-specific validation by CEMRD. Ongoing retention of validation requires periodic analysis of performance audit samples and laboratory site audits. Internal quality control specified in the methods--blanks, replicate analyses, spikes, surrogates, etc. must be included and reported in the analyses of the QA samples and results must be reported.

e. USACE quality assurance laboratories are required to maintain a Laboratory Quality Management Manual which is updated regularly. The manual should contain chronological resumes of all HTW chemistry personnel, a list of instruments and accessories with dates of purchase, and SOP's for the following activities:

(1) sample check-in, logging, and cooler packing procedure,

(2) in-house chain of custody,

(3) glassware cleaning,

(4) analytical procedures used in-house,

(5) data analysis and reporting,

(6) quality control procedures employed for each analytical method.

A copy of updated pages or the revised LQMM should be sent to CEMRD when these are generated.

f. The validation of commercial laboratories for nationwide USACE work is centralized at CEMRD. If a Division Quality Assurance Laboratory assists in this effort by sending an inspector to a commercial laboratory, CEMRD will be notified immediately by phone of general inspection results. A written report will be prepared by the inspector and sent to CEMRD within two weeks of the inspection date, and should not specify approval but rather make recommendations based on the inspection. The formats of the inspection checklist to be used and of the report will be provided to the inspector by CEMRD.

CEMRD will take into account all aspects of laboratory performance during evaluation and determine extent and length of validation, and make an approval recommendation to the requesting FOA.

5. Guidance on Field Quality Assurance Sample Rates. Quality Assurance Samples are duplicates and/or splits and field blanks which are sent to one of the USACE Division Laboratories to be analyzed and later compared in the CQAR with the contractor's results. Some attempt should be made to select contaminated samples for QA, as based on physical evidence such as appearance, odor, or field screening tests. Prior to determining the QA rates on a site, the following should be ascertained:

a. Number of Matrices - groundwater, surface water, soil, sediment, and waste are those most commonly encountered.

b. Whether dedicated sampling equipment will be used for each sampling event or decontamination in the field will be an issue.

c. Whether the QA splits or duplicates will be taken on the same sample as the contractor's QC or whether these will be staggered.

d. Whether the rinsates will be associated with samples which will be split for QA purposes (in most cases this would be advisable).

(1) In general samples which are taken for volatiles analyses are discrete collocated samples. Most groundwater and surface water samples also fall under this category. Soil and sediment samples which are taken for analytical methods other than volatiles should be thoroughly mixed in the field and then split for QC and/or QA purposes, with a portion going to the contractor as a regular sample.

(2) Trip blanks are relevant only when water samples are taken for volatile organics analysis. Ordinarily one trip blank is shipped in each cooler containing aqueous volatile samples. To reduce the number of trip blanks needed, it is recommended that all VOA samples be shipped in the same cooler. The trip blank is not to be opened at any time between its preparation and its analysis.

(3) The rinsates should be associated by sample number with the sample for which the equipment was decontaminated.

Rinsates taken for government quality assurance samples should be taken just prior to the QA sample. If the sample is analyzed first, and is clean, the rinsate and trip blanks need not be analyzed. If dedicated sampling equipment is used for each sampling event, rinsate blanks are not required.

(4) The Scope of Services or the CDAP for the site should contain a Data Quality Objectives section which discusses in some detail the rationale for the rates of QA which are selected for the site. The following are proposed minimum rates for the USACE QA samples.

a. DERP Site Inspection Confirmation Studies (usually a sample set of 1 to 20 samples per matrix).

(1) Soil or sediment -- 1 duplicate/split to be analyzed for all site specific analytes. Under some circumstances such as suspected heavy contamination, a rinsate may be advisable. See Section 5.d.(3) above.

(2) Groundwater -- 1 duplicate, 1 rinsate analyzed for all groundwater parameters, 1 trip blank analyzed only for volatiles.

(3) Surface water -- 1 duplicate, 1 rinsate analyzed for all surface water parameters. If volatiles are included among the parameters, ship VOA vials with groundwater VOA's to avoid the necessity of an additional trip blank.

(4) A background soil sample with no attendant blanks to be analyzed for metals, total recoverable petroleum hydrocarbons, volatiles, BNAs and PCBs/Pesticides if these are site-specific analytes for soils.

b. RI/FS or Pre-Design CDQM.

(1) Include 5-10% duplicates/splits or at least one per matrix for both QC and QA. If there is a possibility of litigation, the higher rate should probably be selected.

(2) A background soil sample should be included and analyzed for metals, volatiles, BNA's, PCB's/Pesticides, and total recoverable petroleum hydrocarbons if these are site-specific soil analytes. Additional background samples may be specified depending upon the degree of confidence needed in establishing background levels.

(3) Rinsates at the rate of one per day for water samples.

(4) Include 1 trip blank per shipping cooler containing water samples to be analyzed for volatiles.

c. Construction and other activities. Special projects such as pilot plant treatability studies, kinetic studies, leachate tests, etc. undertaken in Design/Construction stages require separate consideration. The rates of quality assurance should be decided on a case-by-case basis by the project manager or COR in concurrence with CEMRD. Ordinarily they will be somewhat less than 10%.

6. The Chemical Quality Assurance Report. The CQAR is written by the USACE Quality Assurance Laboratory and sent to the project manager within 30 days of receipt of the contractor's data and completion of the quality assurance data. This report should address the following concerns:

a. Overall performance of the laboratory--commercial or USACE--that analyzed the site primary samples,

b. Detailed evaluation of the contractor's data--laboratory blanks, replicate analyses, agreement between duplicates/splits, acceptability of spike and surrogate recoveries,

c. Comparison of the quality assurance analytical results with those of the project laboratory,

d. Any other problems or issues encountered such as packing and shipment errors, chain of custody failures, etc.

Tables should be prepared which compare the results for duplicates, splits and blanks sent to both laboratories. The quality assurance data with internal quality control results should be appended.

7. In-House Work. When a USACE Division Laboratory is functioning as the primary laboratory on a project, special arrangements for quality assurance should be made. If the samples are contracted out by the division laboratory, and only the QA samples are analyzed in-house, the final report written by the division laboratory would have to be modified to accommodate this arrangement. If the division laboratory is analyzing all of the project samples or a method subset of the samples in-house, ordinarily a second USACE Division Laboratory should be selected as the quality assurance laboratory for the project.

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8. When the following procedures, performed by the designated USACE QA laboratory, demonstrate that contract requirements are not being met, resampling and/or reanalysis may be required by the COR at the expense of the contractor.

a. Inspection of QA samples to insure that sampling procedures correspond to the CDAP with regard to containers, preservation, labeling, packing, chain of custody, etc.

b. Analyses of QA samples,

c. Evaluation of contractor analytical deliverables specified in the CDAP,

d. Comparison of analytical results obtained by contract laboratory and USACE QA laboratory from split or duplicate samples.

ER 1110-1-263
1 Oct 90

(SAMPLE FORMAT)

TO: CEMRD-ED-GC FROM:_____ DATE:__/__/__

SUBJECT: **Request for USACE Project Specific Chemical Quality Assurance Assignment** (To be filled out by the Quality Assurance Laboratory)

Project Name:_____ Contract No.:_____

Superfund ___ FUDS ___ IRP ___ Other ___ Phase _____
Location:_____ State:_____

A-E/Contractor:_____ State:_____
USACE Project Manager:_____
Phone:_____ Address:_____

Approximate Sampling Dates:_____

Document to be reviewed: _____
_____
_____
_____

Reviewer: _____

QUALITY ASSURANCE SAMPLES:

MATRIX	METHOD	NO. OF SAMPLES	ANALYTICAL LABORATORY*	ESTIMATED COST‡

* Name of USACE validated laboratory to be used or designated "in-house" analyses.
‡ Include cost of review, sample checks, etc.

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ER 1110-1-263
1 Oct 90

(SAMPLE FORMAT)

TO:_____ FROM:_____ DATE:__/__/__

SUBJECT: **Request for Government Quality Assurance Services**
(To be sent to the requested USACE Laboratory with a copy to CEMRD-ED-GC)

Project Name:_____ Contract No.:_____

Superfund ___ FUDS ___ IRP ___ Other ___ Phase _____
Location:_____ State:_____

A-E/Contractor:_____ State:_____
USACE Project Manager:_____
Phone:_____ Address:_____

Laboratory Name:_____
Address:_____
Phone:_____
POC:_____

Approximate Sampling
Dates:_____

The following QA Laboratory support is requested for the subject project: USACE Division Laboratory:_____

____ Review and comment on Draft _____
_____
_____
_____

____ Analysis and Reports of Quality Assurance Samples

METHOD	NO. OF WATER SAMPLES*	NO. OF SOIL/SEDIMENT SAMPLES‡

* Includes Blanks

‡ Includes Background Soil Sample

CF: CEMRD-ED-GC

APPENDIX F

SAMPLE HANDLING PROTOCOL FOR LOW, MEDIUM AND HIGH CONCENTRATION SAMPLES OF HAZARDOUS WASTE

1. Purpose. This protocol provides guidance on sample volumes, containers, packing, and shipping for low, medium, and high concentration environmental samples taken for chemical analysis.

2. Applicability. The guidance in this appendix applies to all samples taken by USACE for HTW chemical analysis. The requirements are consistent with those of the Environmental Protection Agency and all standard chemical methods generally used are included.

3. Low Concentration Samples. Low level samples are considered to be those collected off-site, around the perimeter of a waste site, or in areas where hazards are thought to be significantly reduced by normal environmental processes.

a. Waters.

(1) Organics.

(a) Bottle and Preservative Requirements.

- Four 1-liter amber glass bottles (Teflon-lined caps), iced to 4°C (may not be held at site over 24 hours). Remember: Leave some headspace!

- Two 40 mL glass VOA vials (with Teflon septa), iced to 4°C (may not be held at site over 24 hours). Fill completely! All air bubbles must be excluded. Add HCl (4 drops of concentrated HCl) or $NaHSO_4$ to pH < 2.

- The samples above are needed when Method 8240 is used to analyze for volatile (or purgeable) organics, when Methods 8250 or 8270 are used to analyze for Base/Neutral/Acid (B/N/A) extractable organics, and when Method 8080 is used to analyze for pesticides and PCB's. Two of the 1-L bottles are needed for 8250 or 8270 and two for 8080.

- o Oil and Grease, Total Organic Carbon (TOC) or TRPH. For each analyte, two 1-liter glass bottle (Teflon-lined cap), 5 mL 1:1 HCl (to pH < 2), and 4°C. Leave headspace.

(b) Paperwork/Labels.

- o (ENG Form 5021-R) Chain of Custody Record. See attached example. It is important to note that only one site may be listed per form even if the sites have the same project number. Top original goes with the samples; a copy should be saved for the sampler's files.

- o Receipt for Samples. See attached example. This form complies with the requirements that the owner, operator, or agent-in-charge is legally entitled to: (1) a receipt describing the samples obtained from the site and; (2) a portion of each sample equal in weight or volume to the portion retained, if requested. The original form is retained for the Project Coordinator and a copy is given to the owner, operator, or agent-in-charge.

- o Sample Labels/Tags. See attached example. You must label the sample with a date, time of collection, site name, and brief description on a label that will not float/soak off - no masking tape, please. Use only indelible ink on all labels. Numbered sample labels should be used on all samples. Some projects may also require the use of sample tags in addition to labels.

(c) Packaging and Shipping.

- o Waterproof metal (or equivalent strength plastic) ice chests or coolers only.

- o After filling out the pertinent information on the sample label and tag, put the sample in the bottle or vial and screw on the lid. For bottles other than VOA vials, secure the lid with strapping tape. (Tape on VOA vials may cause contamination.) Then, secure the string from the numbered approved tag around the lid.

- o Mark volume level on bottle with grease pencil.

- Place about 3 inches of inert cushioning material such as vermiculite in the bottom of the cooler.

- Enclose the bottles in clear plastic bags through which sample tags and labels are visible, and seal the bag. Place bottles upright in the cooler in such a way that they do not touch and will not touch during shipment.

- Put in additional inert packing material to partially cover sample bottles (more than halfway). Place bags of ice around, among, and on top of the sample bottles. If chemical ice is used, it should be placed in a plastic bag.

- Fill cooler with cushioning material.

- Put paperwork (chain of custody record) in a waterproof plastic bag and tape it with masking tape to the inside lid of the cooler.

- Tape the drain shut.

- Secure lid by taping. Wrap the cooler completely with strapping tape at a minimum of two locations. Do not cover any labels.

- Attach completed shipping label to top of the cooler.

- Put "This Side Up" labels on all four sides and "Fragile" labels on at least two sides.

- Affix numbered and signed custody seals on front right and back left of cooler. Cover seals with wide, clear tape.

Remember that each cooler cannot exceed the weight limit set by the shipper.

(2) Inorganics.

(a) Bottle and Preservative Requirements.

- Metals. One 1-liter high density polyethylene bottle (Teflon-lined cap), adjust to pH < 2 with 1:1 HNO_3 (usually 3 mL).

- o Cyanides. One 1-liter high density polyethylene bottle (Telfon-lined cap), adjust to pH > 12 with NaOH (usually 2 mL of 10N NaOH or 4 pellets), and 4°C.

- o Sulfide. One 1-liter high density polyethylene bottle (Teflon-lined cap), 4 mL 2.0 N zinc acetate and adjust pH > 9 with NaOH, and 4°C.

- o Fluoride. One 1-liter high density polyethylene bottle (Teflon-lined cap), no preservative, and 4°C.

- o pH. No preservative. Must be measured twice immediately in field. Do not ship.

- o Ammonia, Total Kjeldahl Nitrogen, Nitrate/Nitrite. For each analyte, one 1-liter high density polyethylene bottle (Telfon-lined cap), adjust to pH < 2 with H_2SO_4 (usually 4 mL 1:1 H_2SO_4), and 4°C.

(b) Paperwork/Labels.

- o Inorganic Paperwork is the same as described for organics (see Section 3.a.(1).(b). above) and includes the Chain of Custody Record, Receipt for Samples, and Labels/Sample Tags. See previous examples and explanations.

(c) Packaging and Shipment.

- o Follow packaging and shipping requirements listed for organics (see Section 3.a.(1).(c). above). "Fragile" labels are optional for coolers not containing glass bottles. In cases where ice is not required (metals), fill cooler with only packing material. Once again, remember that the cooler must not exceed the shipper's weight limit.

b. Soils/Sediments (Organics and Inorganics).

(1) Bottle and Preservative Requirements.

- o Two 8-ounce glass wide mouth jars at least 3/4 full (Teflon-lined caps), iced to 4°C - one jar for organics (non-VOA) and one jar for inorganics. For analysis of volatiles in soil, two 40 mL VOA vials or two 125 mL jars with Teflon septa are used. These shoudl be completely filled and iced to 4°C.

(2) Paperwork/Labels.

- Follow paperwork requirements listed for water samples in Section 3.a.(1).(b). above. See attached examples of forms.

(3) Packaging and Shipping.

- Follow packaging and shipping requirements in Section 3.a.(1).(c). above. Be sure that the shipping cooler does not exceed the shipper's weight limits.

4. Medium Concentration Samples. Medium level samples are most often those collected on-site, in areas of moderate dilution by normal environmental processes.

a. Water/Liquids (Organics and Inorganics).

Note: Samples are not known to contain highly toxic compounds.

(1) Bottle and Preservative Requirements.

- Four 32-ounce wide mouth glass jars (Teflon-lined caps), no preservatives, and iced to 4°C for B/N/A extractable organics and PCB/Pesticides (two jars for each method). Remember: Leave some headspace.

- Two 40 mL glass VOA vials (Teflon septa), Iced to 4°C. Fill completely. No headspace.

- Two 16-ounce wide mouth glass jars nearly full (Teflon-lined caps) one for metals and one for cyanides. (Preserved as for low level. See Section 3.a.(2).(a).)

(2) Paperwork/Labels.

- See previous examples. Follow paperwork requirements in Section 3.a.(1).(b). for low concentration samples.

(3) Packaging and Shipping

- Secure sample jar lids with strapping tape or evidence tape. At the same time secure string from USEPA numbered tag around lid.

- Mark volume level of bottle with grease pencil.
- Position jar in Ziploc bag so that tags may be read.
- Place about 1/2 inch of cushioning material in the bottom of metal can.
- Place jar in can and fill remaining volume of can with cushioning material.
- Close the can using three clips to secure lid.
- Write sample number on can lid. Indicate "This Side Up" by drawing an arrow and place "Flammable Liquid N.O.S." label on can. Personnel who ship samples must be sure to comply with DOT shipping regulations and not knowingly over-classify a sample prior to shipment. If the person shipping a sample knows that the sample is not a "Flammable Liquid" (i.e., a water phase sample or a soil sample), he should not classify it as "Flammable Liquid."
- Place about 1 inch of packing material in bottom of cooler.
- Place cans in cooler and fill remaining volume of of cooler with packing material. Add ice bags if required.
- Put paperwork in plastic bags and tape with masking tape to inside lid of cooler.
- Tape drain shut.
- After acceptance by shipper, tape cooler completely around with strapping tape at two locations. Secure lid by taping. Do not cover any labels.
- Place lab address on top of cooler.

Note: Write "Flammable Liquid N.O.S." on side of cooler if this is not marked on the margin of your DOT label.

- For all medium and high concentration shipments, complete shipper's hazardous material certification form.

- Put "This Side Up" labels on all four sides sides, "Flammable Liquid N.O.S." and "Danger-Peligro" on all sides.

Note: "Danger-Peligro" labels should be used only when net quantity of samples in cooler exceeds 1 quart (32 ounces) for liquids or 25 pounds for solids. In other words, for our purposes "Danger-Peligro" labels will never be used for Flammable Solids N.O.S.

- Affix number custody seals on front right and back left of cooler. Cover seals with wide, clear tape.

b. Soils/Sediments/Solids (Organics and Inorganics).

(1) Bottles and Preservatives Requirements.

- For analysis of volatiles, two 40 mL VOA vials or two 125 mL jars with Teflon septa are used. These should be completely filled and iced to 4 °C.

- Two 8-ounce wide mouth glass jars, 3/4 full (Teflon-lined caps), no preservatives, one jar for organics (non-VOA) and one jar for inorganics (metals and cyanide) or

- Four 4-ounce wide mouth glass jars each 3/4 full (Teflon-lined caps), no preservative; two jars for organics (non-VOA) and two jars for inorganics.

(2) Paperwork/Labels.

- See previous examples. Follow paperwork requirements listed in Section 3.a.(1).(b). for low concentration samples.

(3) Packaging and Shipping.

- Follow packaging and shipping requirements listed in Section 3.a.(1).(c). for medium concentration water/liquids above substituting "Flammable Liquid N.O.S." with "Flammable Solid N.O.S."

5. High Concentration Samples (Hazardous: Determined Not to be D.O.T.-Defined Poison A). High concentration samples include those from drums, surface impoundments, direct discharges, and chemical spills, where there is little or no evidence of environmental dilution. High concentration (or high

hazard) samples are suspected to contain greater than 15% concentration of any individual chemical substituent.

a. Liquids (Organics and Inorganics).

(1) Bottle and Preservative Requirements.

- o One 8-ounce wide mouth glass jar filled 1/2 to 3/4 full (Teflon-lined cap). No preservative.

(2) Paperwork/Labels.

(a) See previous examples. Follow paperwork requirements listed in Section 3.a.(1).(b). above.

(b) Shipper may require special forms to be completed before shipment of high hazard concentration samples.

(3) Packaging and Shipping.

- o Follow packaging and shipping requirements listed in Section 3.a.(1).(c). above for medium concentration water/liquids.

b. Soils/Sediments/Solids (Organics and Inorganics).

(1) Bottle and Preservative Requirements.

- o One 8-ounce wide-mouth glass jar filled 1/2 to 3/4 full (Teflon-lined cap). No preservative.

(2) Paperwork/Labels.

- o See attached examples. Follow paperwork requirements in Section 3.a.(1).(b). above.

(3) Packaging and Shipping.

- o Follow packaging and shipping requirements listed in Section 3.a.(1).(c). for medium concentration water/liquids, substituting "Flammable Liquid N.O.S." with "Flammable Solid N.O.S."

TABLE F-1

SAMPLE CONTAINERS, PRESERVATIVES, AND HOLDING TIMES

Low Concentration Samples

Matrix	Parameter[1]	Container[2]	Preservation[3]	Maximum Holding Times: Extraction[4]	Maximum Holding Times: Analysis
Water	Volatiles	2 x 40 mL[8] G, Septa vial	Ice to 4°C 4 drops con HCl or $NaHSO_4$ to pH<2	-	14 d
Water	B/N/A	2 x 1 L[5,8] amber G	Ice to 4°C	7 d	40 d
Water	PCBs, Pesticides	2 x 1 L[5,8] amber G	Ice to 4°C	7 d	40 d
Water	Metals[6]	1 x 1 L P	HNO_3 to pH<2	-	6 mo[6]
Water	TRPH	2 x 1 L G	Ice to 4°C HCl to pH<2	-	28 d
Water	Common anions[7]	1 x 1 L[7] G	Ice to 4°C	-	28 d[7]
Water	Explosives	2 x 1 L G (amber)	Ice to 4°C	7 d	40 d
Water	Cyanide	1 x 1 L P	NaOH to pH>12 Ice to 4°C	-	14 d
Soils/ Sed.	Volatiles	2 x 40 ml G or 2 x 125 mL G, Septa vial	Ice to 4°C	-	14 d
Soils/ Sed.	B/N/A, PCBs, Pesticides	1 x 8 oz G	Ice to 4°C	14 d	40 d
Soils/ Sed.	Metals, Cyanide, TRPH	1 x 8 oz G	Ice to 4°C (Cyanide & TRPH)	-	6 mo[6] (TRPH: 28d)
Soils/ Sed.	Explosives	1 x 4 oz G	Ice to 4°C	14 d	40 d

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TABLE F-2

SAMPLE CONTAINERS AND PRESERVATIVES[9]

Medium Concentration Samples

Matrix	Parameter[1]	Container[2]	Preservation[3]
Water/Liquid	Volatiles	2 x 40 mL G, Septa vial	Ice to 4°C[8]
Water/Liquid	B/N/A[5]	2 x 32 oz wide mouth jars, G	Ice to 4°C[8]
Water/Liquid	PCBs[5], Pesticides	2 x 32 oz wide mouth jars, G	Ice to 4°C[8]
Water/Liquid	Metals	1 x 16 oz wide mouth jar, G	HNO_3 to pH<2
Water/Liquid	Cyanide	1 x 16 oz wide mouth jar, G	Ice to 4°C
Water/Liquid	Explosives	2 x 1 L G (Amber)	Ice to 4°C
Soils/ Sediments	Volatiles	2 x 40 ml G or 2 x 125 mL G	Ice to 4°C
Soils/ Sediments	B/N/A, PCBs, Pesticides	1 x 8 oz wide mouth jar, G	---
Soils/ Sediments	Metals, Cyanide, TRPH	1 x 8 oz wide mouth jar, G	Ice to 4°C (Cyanide & TRPH)
Soils/ Sediments	Explosives	1 x 4 oz wide mouth jar, G	Ice to 4°C

High Concentration Samples

Matrix	Parameter[1]	Container[2]	Preservation
Liquid	All organic and inorganic analyses	1 x 8 oz wide mouth jar, G	---
Solid	All organic and inorganic analyses	1 x 8 oz wide mouth jar, G	---

1. B/N/A = Base/Neutral/Acid extractables; TRPH = Total Recoverable Petroleum Hydrocarbons

2. All containers must have Teflon-lined seals (Teflon-lined septa for VOA vials). G = Glass; P = High density polyethylene.

3. Sample preservation will be done in the field immediately upon sample collection. If water samples are filtered in the field, differential pressure methods using 45 micron filters will be used, and preservative added after filtration. VOA samples should never be filtered.

4. When only one holding time is given, it implies total holding time from sampling until analysis.

5. Three bottles are required on at least 5-10% (but at least one) sample so that laboratory can perform all method QC checks for SW-846 method.

6. Total Recoverable Metals for water samples. Holding time for Hg is 28 days in glass; for Cr(VI) is 24 hours.

7. Cl^-, Br^-, F^-, NO_3^-, NO_2^-, PO_4^{3-}, SO_4^{2-}; 1 L for each method; orthophosphate requires filtration. Holding time for extraction is 48 hours for NO_2^-, NO_3^-, and PO_4^{3-} if not preserved with H_2SO_4 to pH < 2.

8. Samples with residual chlorine present will be dechlorinated with sodium thiosulfate as specified in SW-846 (Third edition).

9. Holding times for medium concentration samples are the same as those specified for low concentration samples.

U.S. Army Corps of Engineers

Chain of Custody Record

(ER 1110-1-263)

Proj. No.	Project Name					Number of Containers								Remarks
Sampler : (Signature)														
Date	Time	Pres.	Grab	Comp	Site Code/Sample Number									

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Sampler Relinquished by:	Date/Time	Received by: (Sig.)	Date/Time	Hazards Associated with Samples
Relinquished by: (Sig.)	Date/Time	Received by: (Sig.)	Date/Time	
Relinquished by: (Sig)	Date/Time	Received for Laboratory by: (Sig.)	Date/Time	Remarks at time of receipt:
Custody Seal No.		Lab case No.:		

ENG Form 5021-R, Oct 90

Proponent: CEMP-RT

SAMPLE

U.S. Army Corps of Engineers

Chain of Custody Record
(ER 1110-1-263)

Proj. No. 027 | Project Name: ANY ARMY AMMUNITION PLANT

Sampler: (Signature) Marcia C Davis

Date	Time	Pres.	Grab	Comp	Site Code/Sample Number	Number of Containers	Volatile Organics	B/N/A	Total Metals	TRPH	Explosives			Remarks:
90														
9/4	0930	4°C	X		AAAP-SB01-0001	2	X							Strong hydrocarbon odor
9/4	0935	4°C	X		AAAP-SB01-0001	1		X	X		X			" " "
9/4	0937	4°C	X		AAAP-SB01-0001	1				X				" " "
9/4	1035	pH<2 HNO3 4°C	X		AAAP-MW02-0001	2	X							No visual turbidity
9/4	1036	4°C	X		AAAP-MW02-0001	2		X						" " "
9/4	1040	pH<2 HNO3 4°C	X		AAAP-MW02-0001	1			X					" " "
9/4	1050	pH<2 HCL 4°C	X		AAAP-MW02-0001	2				X				" " "
9/4	1055	4°C	X		AAAP-MW02-0001	1					X			" " "

Sample Relinquished by: Marcia C Davis	Date/Time 9/4 1400	Received by: (Sig.)	Date/Time	Hazards Associated with Samples: NONE
Relinquished by: (Sig.)	Date/Time	Received by: (Sig.)	Date/Time	
Relinquished by: (Sig)	Date/Time	Received for Laboratory by: (Sig.)	Date/Time	Remarks at time of receipt:
Custody Seal No. 1535		Lab case No.:		

Proponent: CEMP-RT

ENG Form 5021-R, Oct 90

ER 1110-1-263
1 Oct 90

F-13

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ER 1110-1-263
1 Oct 90

SAMPLE LABELS

SITE NAME	DATE
ANALYSIS	TIME
	PRESERVATIVE
LOT # 9085023	

SPECIALTY CLEANED CONTAINER

SITE NAME	DATE
Atlas Missile Site	6/1/89
ANALYSIS	TIME
Total Metals	1200
Sampler → KC	PRESERVATIVE
	HNO3
LOT # 9085023	

SPECIALTY CLEANED CONTAINER

SAMPLE TAGS

Designate: Grab / Comp.
Time
Month/Day/Year
Station No.
Proj. Code
Samplers (Signatures)
Station Location

Preservative: Yes ☐ or No ☐

ANALYSES

BOD Anions Solids (TSS) (TDS) (SS)	
COD, TOC, Nutrients	
Phenolics	
Mercury	
Metals	
Cyanide	
Oil and Grease	
Organics GC/MS	
Priority Pollutants	
Volatile Organics	
Pesticides	
Mutagenicity	
Bacteriology	

Remarks:

Tag No. | Lab Sample No.

Designate: Grab ✓ / Comp.
Time: 1007
Month/Day/Year: 5-28-83
Station No.: MW 26 SS-11(6)
Proj. Code: wb53 10.001 21.SM10.0
Samplers (Signatures): Jane Doe
Station Location: Monitoring Well #26 Split Spoon # 11

Preservative: Yes ☐ No ☑

ANALYSES

BOD Anions Solids (TSS) (TDS) (SS)	
COD, TOC, Nutrients	
Phenolics	
Mercury	
Metals	
Cyanide	
Oil and Grease	
Organics GC/MS	X
Priority Pollutants	X
Volatile Organics	X
Pesticides	X
Mutagenicity	
Bacteriology	

Remarks: Case 1746
ITR # HE0637
Bottle Lot # 63129

Tag No.: H0502 | Lab Sample No.:

APPENDIX G

GLOSSARY

1. **Chemical Contamination Activities** - All activities related to the cleanup of chemical contamination at a site including investigation and remedial activities. This definition includes activities defined by EPA as "removal activities" and "remedial activities".

2. **Chemical Data Acquisition Plan (CDAP)** - A submittal document which describes the site specific implementation of CDQM requirements. For investigation and design contracts, CDQM guidance and requirements for CDAP preparation and implementation are found in the Scope of Services. For construction contracts, these requirements are found in the contract technical specifications in language which is clearly biddable and enforceable. The CDAP shall include detailed plans for sampling, analysis, and chemical QC activities. A guide for preparation of the CDAP is found in Appendix D. A CDAP is required for both in-house and contracted work. The EPA equivalent is called a Quality Assurance Project Plan (QAP_jP) and may be substituted for the CDAP.

3. **Chemical Data Quality Management (CDQM)** - The combination of activities establishing a government quality assurance (QA) program and specifying quality control (QC) operations for the AE, construction contractor, or USACE District. CDQM includes the maintenance of field and laboratory practices/checks which insure that Data Quality Objectives (DQO) are met.

4. **Chemical Data Management Specifications** - Construction Contract technical specifications prepared during design which describe all construction contractor sampling, sample handling and custody, documentation, analytical procedures, and data reporting. The specifications outline contractor QC responsibilities and the requirements of the Chemical Data Acquisition Plan for construction. Appropriate chemical concerns should be addressed at each design submittal phase.

5. **Chemical Quality Assurance (QA)** - The government activities required to assure desired and verifiable levels of quality in chemical data for a specific project. Chemical Quality Assurance activities are defined in Appendix E.

6. **Chemical Quality Assurance Report (CQAR)** - Prepared by the designated QA laboratory; approved by the investigation/design/construction division; and normally ready for distribution within 30 days of receipt of the AE/contractor analytical data. The report will include an overall evaluation of the contractor's/AE's data and quality assurance data, a comparison of the contractor's and government results, problems in accomplishing the CDAP, and lessons learned. The CQAR shall be prepared in accordance with the guidance found in Appendix E.

7. **Chemical Quality Control (QC)** - Specific activities for insuring that data of the required quality will be obtained for a specific project by the AE, construction contractor, or government (for in-house chemical analyses). Normally this consists of the analysis of field blanks, duplicate samples and the inclusion of laboratory internal quality control procedures as required by the methods or otherwise specified.

8. **Construction District** - The district assigned the responsibility to administer the construction contract.

9. **Construction Division** - The geographic USACE division in which the Construction District is located.

10. **Contract Laboratory** - The laboratory retained by a USACE AE/contractor or QA laboratory to perform chemical analyses of field samples. These laboratories are evaluated in accordance with the procedures in Appendix C, and must be validated by CEMRD prior to performing chemical analyses for HTW projects.

11. **Daily Quality Control Report (DQCR)** - A daily report prepared by an AE in accordance with the Scope of Services or by a construction contractor per contract specifications and submitted to the Contracting Officer (CO) during chemical contamination investigation and remedial activities. Copies are sent by the COR to the QA laboratory whenever sampling and analytical activities are involved. The DQCR shall contain at a minimum the following with respect to chemistry:

(a) Work performed. Sections in the CDAP that specify the sampling procedure and the analytical procedure shall be referenced. Weather information at the time of sampling shall be included. Information concerning all field samples, sample shipping, and field instrument measurements and calibration shall be included.

(b) Departures from the approved sampling plan. Include problems identified, corrective actions, and verbal/written instructions from USACE personnel. These shall be reported to the contracting officer (CO) in writing within two working days.

12. **Data Quality Objectives (DQO)** - DQOs are qualitative and quantitative statements specifying the level and extent of chemical data required to support decisions during remedial activities. They are determined based on the end uses of the data to be collected. DQOs are established prior to data collection and are not considered a separate deliverable. Rather, the DQO development process is integrated with the project planning process and the results are incorporated into Scopes of Work and Work Plans for the site. The levels and responsibility for data validations should be determined with the DQOs.

13. **Design Analysis Reports** - Documents prepared during design to support the Plans and Specifications. Technical Design Analysis Reports should have a section or chapter dedicated to design chemical evaluations and to the level of sampling, analysis, and CDQM required to support and document construction.

14. **Design District** - The USACE district assigned the responsibility for coordinating, reviewing, and completing design documents, including plans and specifications for HTW site design activities either in-house or through contracted services. Other Design District responsibilities include procuring AE services and construction contracts when work is not done in-house.

15. **Design Division** - The USACE Division overseeing the Design District.

16. **HQUSACE (CEMP-R)** - Headquarters office responsible for CDQM requirements and other supporting issues related to the proper implementation and execution of all phases of HTW program activities under USACE management.

17. **Internal Quality Control** - Measures which a laboratory implements to ensure data reliability. These include the analysis of blanks of various types, replicate sample or extract analysis, lab duplicates, blind standards, matrix spikes, matrix spike duplicates, surrogate compound analysis, calibrations, generation of control charts, etc. Minimal requirements are

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usually specified in the analytical methods. Internal quality control needs and requirements should be determined as a part of the Data Quality Objectives. All internal quality control results should be reported with the sample results.

18. **Investigation District** - The USACE district assigned the responsibility for coordinating, reviewing, and completing an HTW site investigation activity either in-house or through contracted services.

19. **Investigation Division** - The USACE Division overseeing the Investigation District.

20. **Laboratory Validation** - An ongoing assessment of laboratory capabilities, including evaluation of personnel, equipment, QA/QC procedures, results from performance evaluation samples and an on-site laboratory inspection.

21. **Matrix** is the environmental medium which is sampled; e.g. groundwater, surface water, soil, sediment, waste, etc.

22. **Quality Assurance** - Measures taken by USACE to oversee the work of contractors.

23. **QA Laboratory** - The validated USACE Division Laboratory performing or coordinating CDQM activities for a project. These activities ordinarily include: document review, inspection and analysis of quality assurance samples, technical assistance to project managers and preparation of the Chemical Quality Assurance Reports. A given Division Laboratory may not have capability for in house performance of all these activities. The QA laboratory is assigned on a project specific basis by CEMRD. QA functions may not be contracted out directly by the FOA to commercial enterprises. QA sample analysis may be performed under contract to the USACE QA laboratory.

24. **Quality Assurance and Quality Control Samples**. Samples analyzed for the purpose of assessing the quality of the sampling effort and of the analytical data. QA and QC samples include splits or replicates of field samples, rinsate blanks, trip blanks, and background (up gradient) samples. The purpose of the sample is to provide site specific field originated checks that the data generated by the contractor's analytical lab are of suitable quality.

25. **Quality Control** - Measures taken by contractors and to verify the reliability of their own work and to oversee subcontractors.

26. **Quality Control Summary Report (QCSR)** - A report submitted by the AE/construction contractor at the conclusion of a chemical contamination remedial activity. For an investigation activity, the QCSR may be included in the Investigation Report. The QCSR should include the following.

(a) An outline of QC practices employed by the AE/construction contractor, including any problems and corrective actions taken;

(b) A consolidation and summary of the DQCR, as prescribed in the contract.

27. **Replicate (duplicate, triplicate, etc.) Samples**. Multiple grab samples, collected separately, that equally represent a medium at a given time and location. This is the required type of collocated sample for volatile organic analyses and most groundwater and surface water samples.

28. **Rinsate blanks** (equipment blanks) are field blanks generated by passing analyte-free reagent water through sampling equipment after it has been decontaminated between uses. Rinsates are analyzed by the same methods as the samples for which they are blanks and are a check on sampling and decontamination procedures.

29. **Split** is a field sample taken, homogenized, divided in the field, contained and sent to one or more laboratories for analysis.

30. **Trip Blank**. 40 mL vials of organic-free reagent water that are kept with the field sample containers from the time they leave the laboratory until the time they are returned to the laboratory. The purpose of trip blanks is to determine whether samples are being contaminated during transit or sample collection. Trip blanks pertain only to volatile organic analyses; therefore, the containers must contain no headspace. Only one trip blank is needed for one day's sampling and shall satisfy trip blank requirements for all matrices for that day if the volatile samples are shipped in the same cooler.

31. **Scope of Services** - Prepared by a District or Field Operation Activity (FOA) and provided to a contractor for the purposes of work definition and fee negotiation. The Scope of Services for an investigation activity shall have attached guidance to the AE including Guide for Preparing a Chemical Data Acquisition Plan (CDAP) (Appendix D), and the Sample Handling Protocol (Appendix F). The Scope of Services for design shall provide the AE with guidance including any appropriate Guide Specifications for Chemical Data Quality Management and the Sample Handling Protocol (Appendix F).

32. **Site Inspection Report or Investigation Report** - Prepared by the AE firm or the investigating district (in-house work) and includes a summary of work done, departures from the CDAP, analytical results, results from all testing, field observations, and regulatory or action level factors which impact on decisions to be made as a result of the investigation.

ATTACHMENT 3

DATA QUALITY MANAGEMENT IN THE CORPS OF ENGINEERS

The primary elements of the Corps of Engineers data quality management program are as follows:

(1) use of data quality objectives as defined in EPA/540/G-87/003 in project planning and execution;

(2) use of an approved Quality Assurance Project Plan for all sampling and analysis;

(3) requirement for field control samples including QA and QC splits, rinsate blanks, travel blanks, and background samples;

(4) field oversight of sampling activities being performed by a contractor;

(5) use of chain-of-custody consistent with National Enforcement Investigations Center procedures;

(6) matrix/parameter specific and general validation of all fixed and mobile laboratory operations;

(7) utilization of SW-846 procedures with all method-defined internal QC mandatory;

(8) minimum data reporting requirements which include method blanks, surrogate spike and matrix spike recoveries, lab duplicate relative percent differences, reported field control sample results, and retention of all raw data in the laboratory for 5 years;

(9) analysis of 10% of all samples to include a duplicate (or split) QC sample to be tested by the contractor's lab and a QA sample to be tested by an independent lab; and

(10) a data validation report which assesses the quality of the analytical data based on accuracy, precision, representativeness, and comparability through an evaluation of items 1 through 9 above.

Attachment 3

DEPARTMENT OF THE ARMY
MISSOURI RIVER DIVISION, CORPS OF ENGINEERS
P.O. BOX 103, DOWNTOWN STATION
OMAHA, NEBRASKA 68101-0103

REPLY TO ATTENTION OF

CEMRD-ED-GC (200)

16 August 1989

MEMORANDUM FOR SEE DISTRIBUTION

SUBJECT: Minimum Chemistry Data Reporting Requirements for DERP and Superfund HTW Projects

1. In generating the QA/QC Report, one major task for the QA Laboratory is to assess the adequacy of method specific internal quality control in terms of satisfying method and contract requirements. MRD Lab and other Corps Division QA Labs continue to receive data sets lacking sufficient reporting of analytical data to allow proper QA/QC reporting. To affect a contractually binding remedy to this problem, the "Minimum Data Reporting Requirements" listed below will be specified, as written, in all Scopes of Work when applicable analytical testing is being tasked. Further, the SOW will require that the subsequent Chemical Data Acquisition Plan, (mandated by ER 1110-1-263), contain general data and internal quality control data reporting examples for project specific analytes for approval during technical review of the document.

2. Minimum Data Reporting Requirements:

a. Sample IDs - The contractor shall prepare a tabular presentation which matches contract laboratory sample IDs to QA laboratory sample IDs. This table shall identify all Field Duplicates and Field Blanks (including rinsates and trip blanks) as such. This table shall also match all rinsates with their corresponding field samples as well as matching each trip blank with the samples that accompanied it during shipment.

b. Sample Receipt - The contractor shall complete and report a "Cooler Receipt Form" for all shipments for purposes of noting problems in sample packaging, chain-of-custody, and sample preservation. An example form is available from CEMRD-ED-GL.

c. General Organic and Inorganic Reporting - For each analytical method run, the contractor shall report all analytes for each sample as a detected concentration or as less than the specific limits of quantitation. Generally, all samples with out-of-control spike recoveries being attributed on matrix interferences shall be designated as such. All soil/sediment and solid waste samples shall be reported on a dry-weight basis with per cent moisture also reported. The contractor shall also report

Attachment 4

dilution factors for each sample as well as the date of extraction (if applicable) and date of analysis.

d. Internal Quality Control Reporting (at a minimum, internal quality control samples shall be analyzed at rates specified in the specific methods or as specified in the SOW if higher rates are required to meet project specific Data Quality Objectives):

(1) Laboratory Blanks (Method Blanks and Instrument Blanks) - All analytes shall be reported for each laboratory blank. All non-blank sample results shall be designated as corresponding to a particular laboratory blank in terms of analytical batch processing.

(2) Surrogate Spike Samples - Surrogate Spike Recoveries shall be reported with all organic method reports where appropriate (i.e. when the method requires surrogate spikes). The report shall also specify the control limits for surrogate spike results as well as the spiking concentration. Any out-of-control recoveries (as defined in the specified method) shall result in the sample being rerun (both sets of data are to be reported) or data being flagged.

(3) Matrix Spike Samples - Matrix Spike Recoveries shall be reported for all organic and inorganic analyses. All general sample results shall be designated as corresponding to a particular matrix spike sample. The report shall indicate what field sample was spiked even if it was not a Corps of Engineers project sample. The report shall also specify the control limits for matrix spike results for each method for each matrix.

(4) Laboratory Duplicates and/or Matrix Spike Duplicate Pairs - Relative Percent Difference shall be reported for all duplicate pairs as well as analyte/matrix specific control limits.

(5) When run for internal quality control, Laboratory Control Standards results shall be reported with the corresponding field sample data. Control limits for LCSs shall also be specified.

CEMRD-ED-GC (200)
SUBJECT: Minimum Chemistry Data Reporting Requirements and Superfund HTW Projects

e. Field Duplicates and Field Blanks - These sampl be identified as such by the contractor and reported as a field sample. Relative Percent Differences shall be rep all field duplicate pairs.

3. The SOW will identify a pre-draft final report deliv which all items specified in Section 2 above are sent t Laboratory as soon as possible after review by th contractor for completeness in terms of the "minim reporting requirements" detailed above. This will allow utility/timeliness of the QA/QC Report in terms of analyt monitoring/corrective action.

4. The SOW will specify that the contract laboratory prime contractor hold and make available all project raw a period of two years after samples have been analyzed.

5. If there are any questions or comments please ca Coats, CEMRD-ED-GC, 402/221-7416.

FOR THE COMMANDER:

WILLIAM P. TODSEN, P.E.
Chief, Engineering Division

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