Y/TS-1611

Y-12

OAK RIDGE
Y-12
PLANT

LOCKHEED MARTIN

MANAGED BY
LOCKHEED MARTIN ENERGY SYSTEMS, INC.
FOR THE UNITED STATES
DEPARTMENT OF ENERGY

UCN-13672 (26 6-95)

MONITORING WELL PLUGGING AND ABANDONMENT PLAN, Y-12 PLANT, OAK RIDGE, TENNESSEE (REVISED)

May 1997

Prepared by
Water Compliance Department
Environmental Compliance Organization

Oak Ridge Y-12 Plant
Oak Ridge, Tennessee 37831
Managed by
LOCKHEED MARTIN ENERGY SYSTEMS, INC.
for the
U.S. DEPARTMENT OF ENERGY
Under Contract No. DE-AC05-84OR21400

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ACRONYMS AND ABBREVIATIONS

DOE	U.S. Department of Energy
Energy Systems	Lockheed Martin Energy Systems, Inc.
ESP	Environmetnal Surveillance Procedure
GWPP	Groundwater Protection Program
P&A	plugging and abandonment
PVC	polyvinyl chloride
QA/QC	quality assurance/quality control
RCRA	Resource Conservation and Recovery Act
TDEC	Tennessee Department of Environment and Conservation

1.0 INTRODUCTION

Plugging and abandonment (P&A) of defunct groundwater monitoring wells is a primary element of the Oak Ridge Y-12 Plant Groundwater Protection Program (GWPP) (AJA Technical Services, Inc. 1996). This document is the revised groundwater monitoring well P&A plan for the U.S. Department of Energy (DOE) Y-12 Plant located in Oak Ridge, Tennessee (Fig. 1-1). This plan describes the systematic approach employed by Y-12 Plant GWPP to identify wells that require P&A, the technical methods employed to perform P&A activities, and administrative requirements. Original documentation for Y-12 Plant GWPP groundwater monitoring well P&A was provided in HSW, Inc. (1991). The original revision of the plan specified that a comprehensive monitoring well P&A schedule be maintained. Wells were added to this list by issuance of both a P&A request and a P&A addendum to the schedule. The current Updated Subsurface Data Base (Jones, Thompson, and Field 1995) includes a single mechanism to track the status of monitoring wells. In addition, rapid growth of the groundwater monitoring network and new regulatory requirements have resulted in constant changes to the status of wells. As a result, a streamlined mechanism to identify and track monitoring wells scheduled for P&A has been developed and the plan revised to formalize the new business practices. These changes are detailed in Section 3.0.

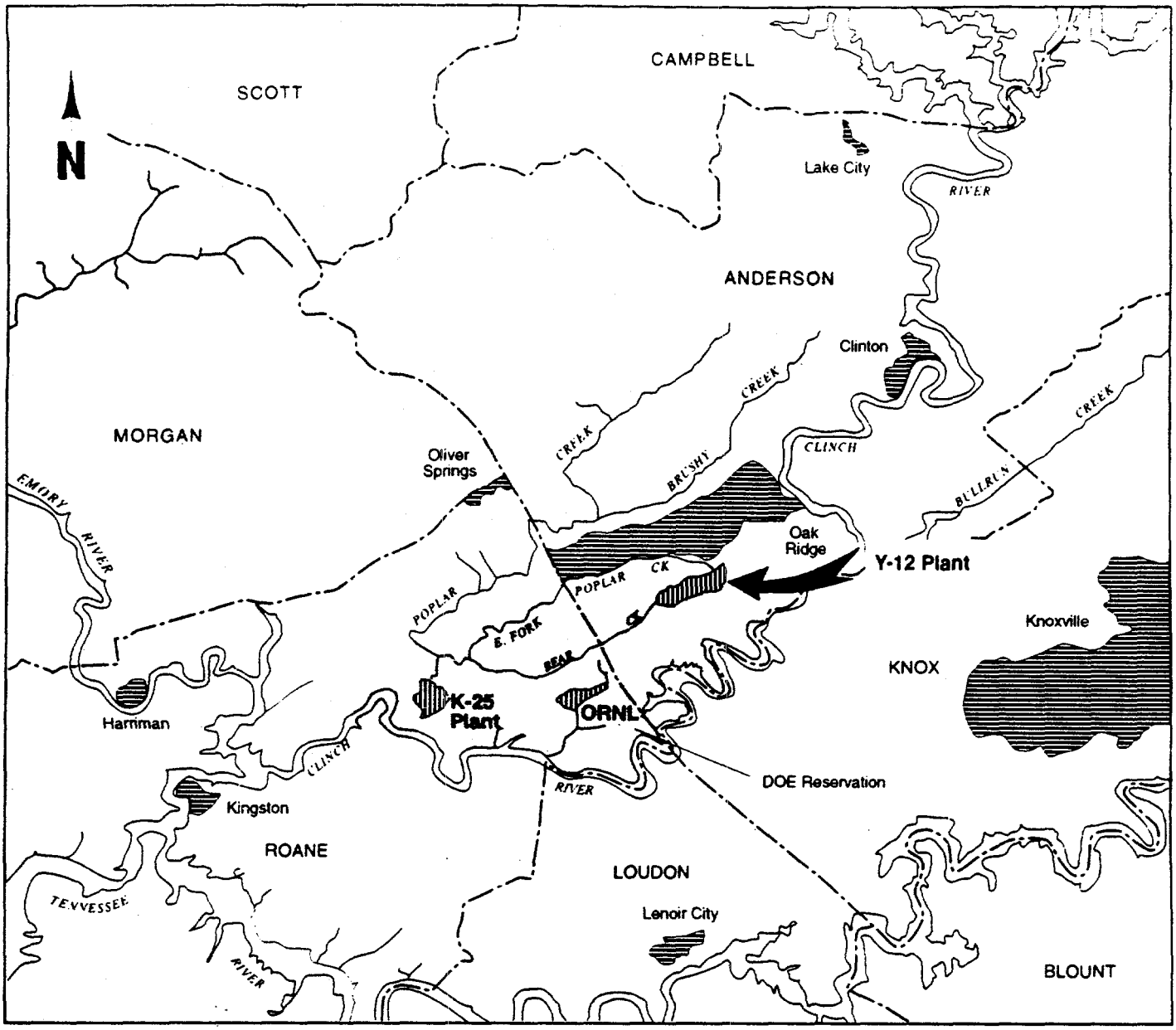
1.1 OBJECTIVES

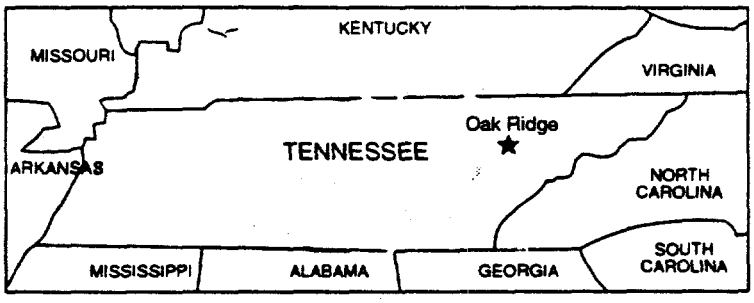
The objectives of this plan are to:

- outline the monitoring well P&A program at the Y-12 Plant;
- define criteria for determining those monitoring wells that require P&A;
- describe administrative requirements and technical P&A objectives; and
- provide a detailed procedure for conducting P&A activities at the Y-12 Plant.

1.2 BACKGROUND

As of September 1996, 1181 monitoring wells, borings, and core holes have been installed or drilled at the Y-12 Plant in support of various groundwater quality monitoring programs (Jones, Thompson, and Field 1995). Of these, approximately 406 have been destroyed, abandoned, or plugged and abandoned. Two hundred seventy-seven of these wells have been plugged and





Y-12 Plant, Oak Ridge, Tennessee

Figure 1-1. Regional Location of the Y-12 Plant.

abandoned in accordance with either formal guidance or written procedures first established in 1989. Most of the monitoring wells at the Y-12 Plant that have been plugged and abandoned were installed prior to 1986 and were not constructed in accordance with standards outlined under current state and federal guidance documents. Other wells have been plugged and abandoned because they represented a liability or impediment. These wells were damaged beyond practical repair, were located in areas which impeded site operations, were of questionable security or identity, or no longer served any useful purpose.

2.0 GENERAL TECHNICAL APPROACH

2.1 CRITERIA FOR WELL PLUGGING AND ABANDONMENT

A decision to P&A a monitoring well is based on one or more of four general criteria:

- well construction does not meet current standards;
- the well has been irreparably damaged or has deteriorated beyond practical repair;
- the well location interferes with or otherwise impedes site operations, construction, or closure activities; or
- under special circumstances defined on a case-by-case basis and approved by the Y-12 Plant GWPP Manager (i.e., loss of well security or identity or other liability issue).

2.1.1 Substandard Well Construction

Substandard well construction is a primary consideration in the selection of wells for P&A, particularly for wells installed before 1986. Not all wells having substandard construction will be selected for P&A. A number of these wells may be used to provide information and/or groundwater data in some areas, primarily within the Y-12 Plant complex, where new wells have not been installed. Because wells installed prior to 1986 provide the only groundwater monitoring coverage in some areas, P&A of these wells will be evaluated on a case-by-case basis.

2.1.2 Well Damage or Deterioration

Monitoring wells that have been irreparably damaged or have deteriorated beyond practical repair will be identified during regularly scheduled inspections. Inspection of monitoring wells is performed to determine their physical condition and to identify maintenance needs that will extend the life of each well and ensure that representative groundwater quality samples and hydrologic data are collected from the wells. Details of the well inspection and maintenance program are described in the *Monitoring Well Inspection and Maintenance Plan, Y-12 Plant, Oak Ridge, Tennessee (Revised)* [Lockheed Martin Energy Systems, Inc. (Energy Systems) 1996].

The components of the monitoring wells examined during the inspection are classified into primary and secondary inspection items. Primary inspection items are those well components that are critical to the collection of representative groundwater quality samples and hydrologic data. Primary inspection items include well security, well identity, well casing, annular grout seal conditions, and the downhole condition of the well (well screen or open-hole interval). Secondary inspection items are those well components that generally do not affect the collection of representative groundwater quality samples or hydrologic data. Secondary inspection items include well accessibility, and the physical condition of the surficial concrete pad, protective surface casing, and guard posts.

Plugging and abandonment of a well may be required if primary components have been damaged or have deteriorated. If field inspections indicate damage to a monitoring well, the Y-12 Plant GWPP Manager or authorized designee will determine if the damage or deterioration is repairable or if P&A of the well is warranted.

2.1.3 Site Operation, Construction, or Closure Activities

Groundwater monitoring wells sometimes impede the operation, construction, or closure of a facility. If a well represents an impediment, P&A of the well may be warranted. Such a decision will be made by the Y-12 Plant GWPP Manager or authorized designee in conjunction with appropriate facility or site planning personnel. Where possible, existing wells are retained by use of modifications such as casing extensions or site grading plan changes.

2.1.4 Special Circumstances

In addition to the criteria described in the preceding sections, other conditions may arise that could require the P&A of a monitoring well. For example, a well may be completed in an aquifer zone which does not yield sufficient groundwater for sampling and analysis; thus, it may be determined that the well should be plugged and abandoned. Unidentified wells for which little or no construction data exists are also typically candidates for P&A. The Y-12 Plant GWPP Manager or authorized designee will evaluate well-specific conditions to determine if P&A of a well is warranted.

2.2 METHODS

Four methods (A, B, C, and D) to plug and abandon wells at the Y-12 Plant were originally devised in 1989 (Haase and Gillis 1989). These four methods were formalized and updated in Procedure G-003, Well Plugging and Abandonment Procedure (Appendix B). Variations between methods are related to differences in well construction. The monitoring well P&A procedure ensures removal of appropriate well components (e.g., well casing, surface casing, grout, and filter pack material), as applicable, and directs the borehole to be sealed to prevent fluid migration into or between water-bearing zones. The procedure also allows flexibility in the P&A methods to minimize the amount of waste materials generated during removal of the well. In some cases, deviations from the specified methods may be necessary because of unique well construction or subsurface conditions encountered during P&A operations.

In general, each P&A method involves first removing the surface components of the well (i.e., the surficial concrete pad, guard posts, and protective surface casing). The annular grout seal is drilled out using a washover pipe that fits over the well casing and the casing string is removed from the borehole. Where appropriate, a tri-cone drill bit may be used to drill out polyvinyl chloride (PVC) or small diameter stainless steel well casing without use of a washover pipe. Depending on the presence and nature of the contaminants in the well, or the location of the well with respect to areas with known groundwater contamination, a diverter assembly may be set up to direct well returns to a containment system.

If the well was completed in bedrock, the borehole is normally reamed to expose fresh bedrock and ensure an effective bond between the cement or bentonite plug and the borehole wall. Cement mixed with potable water is then tremied from the bottom of the borehole to within 4 ft of the ground surface, if the well was completed without a surface/conductor casing extending through the unconsolidated material. If a conductor casing is present, the well is grouted to within 4 ft of the bottom of the surface/conductor casing.

If the well was completed with a surface/conductor casing, a washover pipe is used to drill out the annular grout seal after the initial cement plug has cured for an appropriate period of time, and the surface/conductor casing is then removed. Where appropriate, a tri-cone drill bit may be used to drill out PVC surface/conductor casing without use of a washover pipe. Cement is then tremied from the top of the existing plug to within 4 ft of the ground surface. In all cases, after the completed cement plug has cured, the remainder of the borehole is capped with compacted, non-contaminated soil.

2.3 DEVIATIONS

Well P&A methods are based on standard well construction characteristics and the premise that components may be removed as expected. In some cases, adherence to specific provisions of each method may be impractical or technically impossible. In such cases, deviations from the P&A methods are employed based on considerations such as waste minimization, health and safety, technical limitations, and cost. In all cases, deviations are pre-approved by the Y-12 Plant GWPP Manager or authorized designee. Common deviations include, but are not limited to:

- In situ P&A – where part or all of the casing and screen components are left in place and the well grouted. This deviation may be employed in highly contaminated areas where waste minimization and environmental or human health issues are of particular concern.

- Sheared casing – whereby the overwashing process cuts casing components at depth, leaving the remainder in place. In such cases, the borehole is plugged to the extent practicable in accordance with the appropriate method.

- Grouting to within more or less than 4 ft of the ground surface – grout column height in a borehole is not a critical concern so long as possible cross-migration of groundwater through the borehole is adequately eliminated. In paved areas, grouting flush with asphalt surface is recommended. In cases where grout plugs are slightly more than 4 ft below ground surface, it is often not economically feasible nor technically justified for crews to return to the site to add small quantities of grout.

- Plug materials – in some cases, materials such as bentonite or gravel may be used to plug the borehole or bridge loss zones. Consideration is given to waste minimization, costs, and environmental impacts prior to approval of these types of deviations.

3.0 DOCUMENTATION AND ADMINISTRATION

Descriptions of the administration, recordkeeping, and reporting activities associated with the monitoring well P&A program at the Y-12 Plant are provided in the following sections.

The Y-12 Plant GWPP Manager or authorized designee will be responsible for the administration of the monitoring well P&A program. Administrative responsibilities include:

- approving all P&A activities;
- scheduling and coordinating activities of subcontractors involved in the P&A program;
- supervising subcontractor performance;
- ensuring that appropriate P&A procedures are followed;
- approving any deviations from, or modifications to, the specified P&A methods; and
- maintaining central documentation of P&A activities.

3.1 RELEVANT GUIDANCE/PROCEDURES

Two procedures are available to provide technical direction for well P&A activities. Environmental Surveillance Procedure (ESP) Number 603 provides general guidance in accordance with the Energy Systems Environmental Surveillance Procedures Quality Control Program (Energy Systems 1988). The Y-12 Plant GWPP Well Plugging and Abandonment Procedure (G-003) provides detailed direction for well P&A for each of the four methods described in Section 2.0 (Appendix B). No state or federal regulations have been promulgated to date regarding well P&A methods or procedures.

3.2 DOCUMENTATION

Detailed records of the P&A program at the Y-12 Plant will be maintained. These records include:

- Well Plugging and Abandonment Requests;
- Well Plugging and Abandonment Diagrams;
- Well Plugging and Abandonment Activity/Progress Reports;

- Well Plugging and Abandonment Waste Management Plans and associated documentation; and
- Equipment Decontamination Inspection Summaries.

The Y-12 Plant GWPP Manager or authorized designee will be responsible for maintaining these records. Examples of these forms are provided in Appendix C.

3.2.1 Well Plugging and Abandonment Request Form

This form will be used to initiate P&A operations and document the rationale for P&A of a well (Appendix C.1). The form will be completed by the Y-12 Plant GWPP Manager or authorized designee. When P&A of the well is scheduled, the completed form will be transmitted to the Y-12 Plant personnel responsible for monitoring well P&A, or to an appropriate subcontractor.

3.2.2 Well Plugging and Abandonment Waste Management Plan

This plan (Appendix C.2) will be completed by the Y-12 Plant GWPP Manager or authorized designee consistent with the guidelines contained in Appendix D. The plan will contain information regarding the estimated volume of cuttings and fluids that will be generated during P&A and the types and concentrations of contaminants (if any) known to be present in the well. The appropriate type of waste containment (i.e., discharged to the ground surface or to a containment system), the estimated number and types of samples (e.g., cuttings) to be collected, required analyses, and the proposed disposal or treatment of contained materials are also specified in the P&A Waste Management Plan. When completed, the plan will be transmitted to the field personnel supervising the P&A operations.

3.2.3 Well Plugging and Abandonment Diagrams

Well P&A Diagrams will be completed by the field personnel overseeing the P&A activities. The particular diagram used will depend on the type of well construction and the P&A method employed (Appendix C.3).

3.2.4 Well Plugging and Abandonment Activity/Progress Report

The P&A Activity/Progress Report will be completed by the field personnel who supervise the P&A operations (Appendix C.4). This form will be used to document the daily activities performed during P&A operations, as well as any deviations from the specified P&A methods.

3.2.5 Equipment Decontamination Inspection Summaries

An equipment decontamination inspection summary (Appendix C.5) will be completed by the oversight geologist. The form is completed following an inspection of the drilling rig, hand tools, and drilling tools prior to each P&A activity.

3.3 REPORTING

An annual well P&A report will be issued by the Y-12 Plant GWPP to formally document P&A activities. The annual report will compile Well P&A Requests, Well P&A Diagrams, P&A Activity/Progress Reports, and P&A Waste Management Plans issued during the previous 12-month period.

A record copy of this plan will be kept on file by the Y-12 Plant GWPP Manager or authorized designee. The plan will be reviewed on an annual basis for obsolescence, and the Annual Well P&A Schedule will be updated to reflect pending P&A activities and incorporate P&A requests from the previous year that were not completed. A triennial review of the plan and the P&A procedure will be documented by a memorandum denoting any changes in business practices.

As required, the Y-12 Plant GWPP Manager or authorized designee will update and reissue this plan and associated P&A procedure with information from triennial reviews. Revisions to the plan and P&A procedure will involve incorporation of new material to reflect changing business practices or to update obsolete information.

In certain cases involving compliance monitoring locations, DOE and Tennessee Department of Environment and Conservation (TDEC) regulatory staff concurrence is required prior to P&A of a well. Such notification and concurrence is specifically denoted in landfill facility operating or Resource Conservation and Recovery Act (RCRA) post-closure permits. Upon completion of P&A of these locations, separate reports are provided to DOE and TDEC regarding each P&A action.

3.4 WASTE MANAGEMENT

It is the goal of the Y-12 Plant GWPP to handle drilling effluents generated by well P&A in a manner that is consistent with applicable Energy Systems procedures and regulations and that is safe for human health and the environment. A well P&A waste management plan for each P&A task is prepared for direction in handling well P&A wastes. The well P&A waste management plan is completed by the Y-12 Plant GWPP Manager or authorized designee for each well installation project. Guidelines for handling of drilling effluents are contained in Appendix D. Each well P&A waste management plan includes: (1) the estimated volume of cuttings and fluids that will be generated during the well P&A event, (2) the types and concentrations of contaminants (if any) known to be present at the well site, (3) the appropriate waste containment method required during the well P&A operations, (4) an estimate of the number and types of samples to be collected during well installation and the required analysis of the samples prior to disposal or treatment, and (5) the proposed disposition or treatment of any containerized material. The oversight geologist provides regular screenings of drill cuttings and development water during well P&A activities. Drill cuttings and development water are screened for: radioactivity, volatile organics, specific conductance, and pH. In the event that drill cuttings and/or development water exceed acceptable disposal limits, the Y-12 Plant GWPP Manager or authorized designee will direct the oversight geologist and subcontractor personnel in the proper disposal techniques. Copies of the well P&A waste management plan for the GWPP are included in Appendix C.

3.5 QUALITY ASSURANCE/QUALITY CONTROL

Quality assurance/quality control (QA/QC) for well P&A activities will conform with applicable provisions outlined in the Y-12 Plant GWPP Quality Program Plan (SAIC 1994) and Energy Systems Environmental Surveillance Quality Control Program (Energy Systems 1988). A registered geologist in the state of Tennessee will serve as well P&A oversight personnel and will direct well P&A subcontractor staff. Deviations to standard operating procedures will be documented on the well P&A Activity/Progress Report and approved in advance by the Y-12 Plant GWPP Manager or authorized designee. In accordance with the Y-12 Plant GWPP Quality Program Plan, an annual self-assessment of well P&A activities will be conducted if activity schedules allow. External audits or assessments of well P&A activities may be conducted by Energy Systems Quality or Central Compliance Organization, DOE, or TDEC staff.

3.6 HEALTH AND SAFETY

It is the goal of Energy Systems to conduct well P&A activities in a manner that ensures safety and health for Energy Systems and subcontractor personnel. All installation activities adhere to the *Health and Safety Plan for Well Installation and Plugging and Abandonment Activities, Y-12 Plant, Oak Ridge, Tennessee* (SAIC 1992). It is the responsibility of all site personnel to ensure adherence to this plan. All personnel working at a site are required to: have completed the 40-hr Hazardous Waste Site Operations training in accordance with 29 CFR 1910.120 and applicable annual refresher requirements, have had a respirator fit test within the previous year, and be enrolled in a medical monitoring program. In addition, the oversight geologist and/or Site Health and Safety Officer is required to have been Red Cross-certified in first aid and CPR techniques. Prior to any well P&A activities, a site-specific health and safety checklist must be completed. Also prior to site well installation activities, a site-specific health and safety briefing is conducted for all site personnel. A copy of the site-specific health and safety checklist is included in Appendix C.

In addition to the site-specific health and safety checklist, other specific documentation may be required based on site conditions. These include radiological safety work permits, operational safety work permits, or job hazard analyses. The need for these types of task reviews and documentation will be determined during preparation of the site-specific health and safety checklist. These reviews and documentation will be completed using resources from Industrial Safety, Radiological Control, and Facility Safety organizations as required. Welding/Burning/Hotwork permits are required if such activities are necessary at any point during the well P&A task.

4.0 REFERENCES

AJA Technical Services, Inc. 1996. Oak Ridge Y-12 Plant Groundwater Protection Program Management Plan. Y/SUB/96-KDS15V/1.

HSW Environmental Consultants, Inc. 1991. Monitoring Well Plugging and Abandonment Plan for the Department of Energy Y-12 Plant, Oak Ridge, Tennessee. Y/SUB/91-YP507C/6.

Haase, C.S. and G.A. Gillis. 1989. Plugging and Abandonment Procedures for the Oak Ridge Y-12 Plant. Y/TS-531.

Jones, S.B., B.K. Thompson, and S.M. Field. 1995. Updated Subsurface Data Base for Bear Creek Valley, Chestnut Ridge, and Parts of Bethel Valley on the U.S. Department of Energy Oak Ridge Reservation. Y/TS-881/R3.

Lockheed Martin Energy Systems, Inc. (Energy Systems). 1996. Monitoring Well Inspection and Maintenance Plan, Y-12 Plant, Oak Ridge, Tennessee (Revised). Y/TS-1215.

Energy Systems. 1988. Environmental Surveillance Quality Control Program Manual. ES/ESH/INT-14.

Science Applications International Corporation (SAIC). 1994. Groundwater Protection Program Quality Program Plan. Y/SUB/94-99069C/Y13/1.

SAIC. 1992. Health and Safety Plan for Well Installation and Plugging and Abandonment Activities, Y-12 Plant, Oak Ridge, Tennessee. Y/SUB/92-99928C(Y11)/1.

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APPENDIX A

ANNUAL Y-12 PLANT WELL PLUGGING AND ABANDONMENT SCHEDULE

APPENDIX B

MONITORING WELL PLUGGING AND ABANDONMENT PROCEDURE

Oak Ridge Y-12 Plant
Groundwater Protection Program
Standard Practice Procedure

Monitoring Well Plugging and Abandonment Procedure

G-003
Rev. 2., May 1997

Approved by: W. Kevin Sago Date: 4-28-97

Effective Date: 5-1-97

Record of Changes

Change No.	Affected Pages	Approved Date	Expiration Date	Change No.	Affected Pages	Approved Date	Expiration Date

Next 3-year review required no later than: May 2000

CONTENTS

1.0 PURPOSE

This procedure contains guidelines and methods for monitoring well plugging and abandonment (P&A) at the Oak Ridge Y-12 Plant. Wells of similar construction materials and design are classified into one of four groups, and a specific P&A method is defined for each group. The methods are designed to remove all well components, seal the borehole to prevent fluid migration into or between water-bearing zones, and to minimize the amount of waste-materials generated during P&A operations.

2.0 APPLICABILITY

This procedure applies to all monitoring wells at the Y-12 Plant, which are designated for P&A by the Y-12 Plant Groundwater Protection Program Manager (GWPPM) or authorized designee.

3.0 DEFINITIONS

Annular Seal - material (grout or cement) which prevents fluid migration through the space between the well casing and borehole wall or outer casing.

Conductor Casing - an initial casing, typically steel or PVC, installed in the unconsolidated zone to support the borehole and provide drilling rig stability. This casing may be removed during completion of the monitoring well or grouted in place.

Containment System - excavated pit, drums, tanks or other containers used to collect and contain drill cuttings and fluids generated during P&A.

Diverter Assembly - apparatus used to direct drill cuttings and fluids to the containment system.

Groundwater Protection Program (GWPP) - a program developed per DOE Order 5400.1 to characterize the hydrogeology and monitor and protect groundwater quality at the Y-12 Plant.

GWPP Manager (GWPPM) - person responsible for day-to-day management of the Y-12 Plant GWPP.

On-Site Geologist - a geologist or professional geologist, registered in the State of Tennessee, responsible for field supervision of P&A operations.

Open-Hole Interval - a portion of a monitoring well designed so that groundwater enters the well

through a segment of borehole that is open to the water-bearing formation.

Primary Inspection Item - those components of a monitoring well that are critical to the collection of representative groundwater quality samples and hydrologic information. Primary inspection items include the well casing and screen, annular grout seal, hasp, lock, cap, well identification, and condition of the screened or open-hole interval.

Protective Surface Casing - a section of large-diameter steel or polyvinyl chloride (PVC) pipe that is emplaced over the surface extension of a smaller diameter well casing to provide structural protection to the well and restrict unauthorized access to the well.

Surface Casing - steel or PVC piping set from the ground surface into the top of bedrock to support the unconsolidated section of the borehole. The surface casing in a core hole extends into bedrock to the top of the open-hole interval.

Tremie Method - a method for placing cement in the borehole. Cement is pumped through a small diameter pipe (usually 2-in or less) extending to at least 1-ft above the bottom of the borehole or the top of a previously placed annular seal. The pipe is raised as the cement is emplaced. Use of this method reduces the potential for the cement to bridge and ensures placement of cement along the entire length of the borehole.

Washover Pipe - a drill pipe which fits over the well casing and is used to drill out the annular grout seal.

Well Casing - steel, stainless steel or PVC piping which provides unobstructed access to the monitored interval.

4.0 REFERENCES

4.1 Use References

4.1.1 "Environmental Surveillance Quality Control Program," ES/ESH/INT-14, Martin Marietta Energy Systems, Inc. 1988.

4.1.2 "Monitoring Well Inspection and Maintenance Plan, Y-12 Plant, Oak Ridge, Tennessee (Revised)," Y/TS-1215, Lockheed Martin Energy Systems, Inc. 1996.

4.1.3 "Halliburton Cementing Tables," Little's, Duncan, Oklahoma, Halliburton Services, Inc., 1981.

4.1.4 "Updated Subsurface Data Base for Bear Creek Valley, Chestnut Ridge, and Parts of Bethel Valley on the U.S. Department of Energy Oak Ridge Reservation," Y/TS-881/R3, July 1995 (or most recent revision).

4.2 Source References

4.2.1 Aller, Linda, Truman W. Bennett, Gene Hackett, Rebecca J. Petty, Jay H. Lehr, Helen Sedoris, and David M. Nielsen. Handbook of Suggested Practices for the Design and Installation of Groundwater Monitoring Wells, National Water Well Association, Dublin, Ohio, 398 p.

4.2.2 Driscoll, Fletcher G. 1986. Groundwater and Wells, Johnson Division, St. Paul, Minnesota, 1089 p.

4.2.3 Martin Marietta Energy Systems, Inc. 1987. Plugging and Abandonment Procedures for the Oak Ridge Y-12 Plant, Y/TS-531.

4.2.4 "Oak Ridge Y-12 Plant Groundwater Protection Program Management Plan (Revised)," Y/SUB/96-KDS15V/1, June 1996 (or most recent revision).

5.0 PRECAUTIONS AND LIMITATIONS

5.1 Cavities and Fractures

Cavities, fractures, joints, bedding planes, or other voids may be encountered during removal of the well casing and reaming of the borehole, resulting in a greater volume of cement to plug the borehole than calculated from the borehole depth and diameter. Additionally, lost-circulation additives may be required to minimize fluid loss during P&A operations.

5.2 Method Selection

Because of differences in monitoring well construction and conditions that may occur during drilling operations, not all of the monitoring wells at the Y-12 Plant can be classified into one of the four categories of well construction. A flexible policy is necessary to determine the most appropriate P&A method for each monitoring well and to allow some deviation from the specified method as conditions warrant.

5.3 Safety

Established general safety standards and requirements of Lockheed Martin Energy Systems, Inc., the Department of Energy (DOE), and the Occupational Safety and Health Administration (OSHA) will apply to all P&A field operations. Specific safety requirements applicable to P&A are outlined in *Health and Safety Plan for Well Installation and Plugging and Abandonment Activities, Y-12 Plant, Oak Ridge, Tennessee*, Y/SUB/92-99928C(Y11)/1, July 1992.

5.4 Cement Slurry Weights and Curing Schedules

The length of the column of cement emplaced at one time should not exceed 300 ft so that the weight of the cement is less than the fracture pressure of the monitored formation. This will also minimize infiltration of cement into the formation. Cement cure times shall be determined by the on-site geologist. Cure times will be specified depending on temperature and required compressive strength using guidelines established in Reference 4.1.3.

5.5 Casing Extraction

Certain monitoring wells have been constructed using substandard annular seals or no annular seal. In such cases, casings may be extracted without use of overwashing techniques. In cases where the construction of the well allows, an attempt to extract the well casing may be made using the drilling rig head and appropriate lifting device, such as lifting bell, clevis, wire rope, or chain. Casing extraction jacks may alternately be used. Drilling rig leveling jacks or winches shall not be used to attempt to extract casings prior to overwashing. The decision to attempt to extract a well casing shall be made by the on-site geologist, in conjunction with the GWPPM or authorized designee, and documented as specified in Section 7.0.

5.6 Monitoring Well Construction Information

Data contained in Reference 4.1.4 is compiled from best available records. However, erroneous and missing construction data exists, particularly for older wells that pre-date the GW Series. Where monitoring well construction data is unavailable, best technical judgment as to casing set points or monitoring well depths will be employed by the on-site geologist in consultation with the GWPPM or authorized designee. As a result, deviations from the standard P&A likely will be required. All deviations shall be recorded as outlined in Section 9.0.

5.7 Setting Cement Plugs

Grout column height within a borehole is not a critical concern so long as potential cross-migration of groundwater is eliminated. A 4-ft depth for a completed plug is a standard target depth. Depths more or less than 4-ft may be technically justified and/or economically feasible.

6.0 EQUIPMENT, TOOLS AND SUPPLIES

6.1 Drilling Equipment

Drilling equipment includes, but is not limited to, drill bits, washover pipe, diverter assembly, etc.

6.2 Grouting Supplies and Equipment

Required items include, but are not limited to, cement, additives, potable water, mixer, pump, and tremie pipe.

6.3 Containment System

As directed by the Waste Management Plan, pits, drums, tanks, and/or other containers may be required.

6.4 Safety Equipment

Standard safety equipment is denoted in a site-specific health and safety checklist and includes, but is not limited to, safety shoes, company work clothes or tyvek coveralls, protective eye-wear, hard hat, and rubber gloves.

6.5 Decontamination Equipment

Includes steam cleaner, potable water, and mild detergent.

7.0 DOCUMENTATION

7.1 Well Plugging and Abandonment Request Form

This form is used to initiate P&A activities, and is completed by the Y-12 Plant GWPPM or authorized designee if: (1) a monitoring well impedes site operations, construction or closure, (2) inspection of a monitoring well has indicated significant damage to or deterioration of a Primary Inspection Item, or (3) the Y-12 Plant GWPPM or authorized designee determines that P&A of a monitoring well is warranted for other reasons. The completed form is transmitted to the on-site geologist when P&A operations are scheduled.

7.2 Well Plugging and Abandonment Waste Management Plan

This form is completed by the Y-12 Plant GWPPM or authorized designee. The plan includes: (1) the estimated volume of cuttings and fluids that will be generated during P&A, (2) the types and concentrations of contaminants (if any) known to be present in the monitoring well, (3) the appropriate waste containment method required during P&A operations (i.e., discharge to ground surface or containment system), (4) an estimate of the number and types of samples (e.g., cuttings) to be collected during P&A and the required analyses of the samples prior to disposal or treatment, and (5) the proposed disposition or treatment of any containerized materials.

7.3 Well Plugging and Abandonment Diagram

This form is completed by the Y-12 Plant GWPP Manager or authorized designee, and the on-site geologist. Before P&A operations begin, the Y-12 Plant GWPP Manager or authorized designee completes the following sections of the diagram: (1) the monitoring well location (site), (2) the drilling subcontractor, (3) the rationale for P&A of the monitoring well, (4) the P&A method (including any proposed deviations from the specified method), and (5) applicable monitoring well construction details (e.g., borehole diameter). During P&A operations, the on-site geologist completes the diagram with specific P&A details for the monitoring well (e.g., depth to the top of the cement plug).

7.4 Well Plugging and Abandonment Activity/Progress Report

This report is completed by the on-site geologist and includes descriptions of the daily activities performed during P&A operations.

8.0 PLUGGING AND ABANDONMENT

8.1 Site Preparation

8.1.1 Confirm the monitoring well identification and site access, and mobilize drilling and grouting equipment to the work site.

8.1.2 Remove the surface components of the monitoring well (lock, well cap, guard posts, surficial concrete pad, protective well casing or manhole cover) as applicable.

8.1.3 If specified in the Well Plugging and Abandonment Waste Management Plan, set up the diverter assembly and the containment system.

8.2 Equipment Decontamination

If specified in the Well Plugging and Abandonment Waste Management Plan, decontaminate the drilling and associated equipment (e.g., drill bits, drill rods, tremie pipe) when P&A operations at each monitoring well have been completed.

8.3 Method A

Method A is for monitoring wells constructed of 7 inch (in) outside diameter (OD) or smaller steel or stainless steel well casing, and typically completed with 5 to 20-ft well screens and sand filter packs. Monitoring wells completed in bedrock may also have 8- to 12-in-OD steel or PVC surface casing extending from ground surface to the top of bedrock. Some monitoring wells may also be completed with a conductor casing.

8.3.1 Remove the Well Casing

Drill out the annular grout seal using a washover pipe advanced to the bottom of the borehole. Retrieve the washover pipe and remove the well casing. Staged removal of the casing string may be necessary if it cannot be removed in one operation. Stainless steel casing may be drilled out (milled) with a tri-cone drill bit and the borehole conditioned simultaneously. If this approach is feasible, the bit size must be at least 0.25-in larger than the original borehole diameter to ensure that the casing and annular grout seal are completely removed.

8.3.2 Condition the Borehole

If the monitoring well was completed in bedrock, ream the borehole to the total depth with a tri-cone drill bit that is at least 0.25-in larger in diameter than the original borehole. This will expose fresh bedrock and help ensure an effective bond between the cement plug and the borehole wall. Monitoring wells completed within the unconsolidated zone do not require borehole conditioning.

8.3.3 Set the Plug

Tremie API Class A neat cement, mixed with potable water to a slurry density of 12 to 15 pounds per gallon (lbs/gal), from the bottom of the borehole. If no surface/conductor casing is present, tremie the cement to within approximately 4 ft of ground surface. If a surface/conductor casing is present, tremie the cement to the bottom of the casing.

8.3.4 Remove the Surface/Conductor Casing

If the monitoring well was completed with surface/conductor casing, drill out the annular grout seal using a washover pipe advanced to the bottom of the casing. Retrieve the washover pipe and remove the casing. Using a tri-cone drill bit at least 0.25-in larger in diameter than that of the original borehole, ream the borehole to the top of the existing cement plug. Tremie cement, mixed to a density of 12 to 15 lbs/gal, from the top of the existing plug to within approximately 4 ft of the ground surface (or to the bottom of the conductor casing, if removing a surface casing).

It may be possible to remove PVC surface/conductor casing by milling with a tri-cone drill bit. If this approach is feasible, the bit size must be at least 0.25-in larger than the original borehole diameter to ensure that the casing and annular grout seal are completely removed.

8.3.5 Verify Plug Depth

Measure the depth to the top of the cement plug to verify that it is within approximately 4 ft of the ground surface. If not, add more cement until the specified depth is reached.

8.3.6 Cap the Plug

Fill the remainder of the borehole to ground surface with compacted non-contaminated soil.

8.4 Method B

Method B is for monitoring wells constructed of 7-in-OD or smaller steel or PVC well casing completed with open-hole intervals in competent bedrock. The well casing typically extends from the ground surface to the top of the open-hole interval, which typically extends from 5 to 100 ft below the bottom of the well casing. The monitoring wells may also be completed with 8- to 12-in-OD steel or PVC surface casing extending from ground surface to the top of bedrock. Some monitoring wells may also be completed with a conductor casing.

8.4.1 Condition the Open-Hole Interval

Lower a drill string and tri-cone drill bit into the monitoring well to the bottom of the open-hole interval. Circulate air and potable water containing additives such as QUIK-GEL or QUICK-MUD to remove any old cuttings and debris that may have accumulated at the bottom of the well.

8.4.2 Set the Lower Plug

Tremie API Class A neat cement, mixed with potable water to a slurry density of 12 to 15 lbs/gal, from the bottom of the open-hole interval to the bottom of the well casing.

8.4.3 Remove the Well Casing

Drill out the annular grout seal surrounding the well casing using a washover pipe advanced to the top of the open-hole interval. Retrieve the washover pipe and remove the casing. Staged removal of the casing string may be necessary if it cannot be removed in one operation.

It may be possible to remove PVC well casing by milling with a tri-cone drill bit. If this approach is feasible, the bit size must be at least 0.25-in larger than the original borehole diameter to ensure that fresh bedrock is exposed and that the casing and annular grout seal are completely removed.

8.4.4 Condition the Borehole

Ream the borehole with a tri-cone drill bit that is at least 0.25-in larger in diameter than the original borehole. This will expose fresh bedrock and help ensure an effective bond between the cement plug and the borehole wall.

8.4.5 Set the Upper Plug

Tremie cement, mixed to a density of 12 to 15 lbs/gal, from the top of the lower plug. If no surface/conductor casing is present, tremie the cement to within approximately 4 ft of ground surface. If a surface/conductor casing is present, tremie the cement to the bottom of the casing.

8.4.6 Remove the Surface/Conductor Casing

If the monitoring well was completed with surface/conductor casing, drill out the annular grout seal using a washover pipe advanced to the bottom of the casing. Retrieve the washover pipe and remove the casing. Using a tri-cone drill bit at least 0.25-in larger in diameter than the original borehole, ream the borehole to the top of the existing cement plug. Tremie cement, mixed to a density of 12 to 15 lbs/gal, from the top of the existing plug to within approximately 4 ft of the ground surface (or bottom of the conductor casing, if removing a surface casing).

It may be possible to remove PVC surface/conductor casing by milling with a tri-cone drill bit. If this approach is feasible, the bit size must be at least 0.25-in larger than the original borehole diameter to ensure that the casing and annular grout seal are completely removed.

8.4.7 Verify Plug Depth

Measure the depth to the top of the cement plug to verify that it is within approximately 4 ft of the ground surface. If not, add more cement until the specified depth is reached.

8.4.8 Cap the Plug

Fill the remainder of the borehole to ground surface with compacted non-contaminated soil.

8.5 Method C

Method C is for monitoring wells constructed of 7-in-OD or smaller PVC well casing, and typically completed with 5 to 20-ft well screens and sand filter packs. Monitoring wells completed in bedrock may also have 8 to 12-in-OD steel or PVC surface casing extending from ground surface to the top of bedrock. Some monitoring wells may also be completed with a conductor casing.

8.5.1 Remove the Well Casing

Remove the PVC well casing and annular grout seal by milling with a tri-cone drill bit. The bit size must be at least 0.25-in larger than the original borehole diameter to ensure that fresh bedrock is exposed (bedrock wells only) and that the casing and annular grout seal are completely removed.

If milling is not feasible, drill out the annular grout seal around the well casing using a washover pipe advanced to the bottom of the borehole. Retrieve the washover pipe and remove the well casing. Staged removal of the casing string may be necessary if it cannot be removed in one operation.

8.5.2 Condition the Borehole

If the monitoring well was completed in bedrock and washover techniques were used, ream the borehole with a tri-cone drill bit that is at least 0.25-in larger in diameter than the original borehole. This will expose fresh bedrock and help ensure an effective bond between the cement plug and the borehole wall.

8.5.3 Set the Plug

Tremie API Class A neat cement, mixed with potable water to a slurry density of 12 to 15 lbs/gal, from the bottom of the borehole. If no surface/conductor casing is present, tremie the cement to within approximately 4 ft of ground surface. If a surface/conductor casing is present, tremie the cement to the bottom of the casing.

8.5.4 Remove the Surface/Conductor Casing

If the monitoring well was completed with surface/conductor casing, drill out the annular grout seal using a washover pipe advanced to the bottom of the casing. Retrieve the washover pipe and remove the casing. Using a tri-cone drill bit at least 0.25-in larger in diameter than the original borehole, ream the borehole to the top of the existing cement plug. Tremie cement, mixed to a density of 12 to 15 lbs/gal, from the top of the existing plug to within approximately 4 ft of the ground surface.

It may be possible to remove PVC casing by milling with a tri-cone drill bit. If this approach is feasible, the bit size must be at least 0.25-in larger than the original borehole diameter to ensure that the casing and annular grout seal are completely removed.

8.5.5 Verify Plug Depth

Measure the depth to the top of the cement plug to verify that it is within approximately 4 ft of the ground surface. If not, add more cement until the specified depth is reached.

8.5.6 Cap the Plug

Fill the remainder of the borehole from the top of the cement plug to ground surface with compacted non-contaminated soil.

8.6 Method D

Method D is for exploratory core holes constructed of 4.5-in-OD or smaller steel surface casing, which typically extends from ground surface into competent bedrock, with an open-hole interval below the bottom of the casing. The core holes may also have 8 to 12-in-OD steel or PVC conductor casing extending through the unconsolidated material.

8.6.1 Condition the Open-Hole Interval

The open-hole interval of the core holes will not be conditioned (i.e., fluid circulation or reamed to expose fresh bedrock). This would require the prior removal of the 4.5-in-OD surface casing, which may risk collapse of the upper portion of the core hole before P&A operations are completed. In addition, core hole diameters are normally 3.5-in. or less, which are smaller than standard tri-cone bits.

8.6.2 Set the Lower Plug

Tremie API Class A neat cement, mixed with potable water to give a slurry density of 12 to 15 lbs/gal, from the bottom of the open-hole portion of the core hole. Because of the long open hole intervals in typical core holes, the cement must be installed in stages of approximately 300 ft or less. During placement, tremie the cement from the bottom to the top of the particular interval being plugged, and allow the cement to cure according to cementing schedules. In the final stage, tremie the cement to the bottom of the surface casing.

8.6.3 Remove the Surface Casing

Drill out the annular grout seal around the surface casing using a washover pipe advanced to the bottom of the casing. Retrieve the washover pipe and remove

the casing. Staged removal of the casing may be necessary if it cannot be removed in one operation.

8.6.4 Condition the Borehole

Ream the borehole to the top of the existing cement plug using a tri-cone drill bit that is at least 0.25 larger than the original borehole diameter. This will expose fresh bedrock and help ensure an effective bond between the cement plug and the borehole wall.

8.6.5 Set the Upper Plug

Tremie cement, mixed to a density of 12 to 15 lbs/gal, from the top of the lower plug. If no conductor casing is present, tremie the cement to within approximately 4 ft of ground surface. If a conductor casing is present, tremie the cement to the bottom of the conductor casing.

8.6.6 Remove the Conductor Casing

If the core hole was completed with conductor casing, drill out the annular grout seal using a washover pipe advanced to the bottom of the conductor casing. Retrieve the washover pipe and remove the conductor casing. Using a tri-cone drill bit at least 0.25-in larger in diameter than the original borehole, ream the upper portion of the borehole to the top of the existing cement plug. Tremie cement, mixed to a density of 12 to 15 lbs/gal, from the top of the existing plug to within approximately 4 ft of the ground surface.

It may be possible to remove PVC conductor casing by milling with a tri-cone drill bit. If this approach is feasible, the bit size must be at least 0.25-in larger than the original borehole diameter to ensure that the casing and annular grout seal are completely removed.

8.6.7 Verify Plug Depth

Measure the depth to the top of the cement plug to verify that it is within approximately 4 ft of the ground surface. If not, add more cement until the specified depth is reached.

8.6.8 Cap the Plug

Fill the remainder of the borehole to the ground surface with compacted non-contaminated soil.

9.0 ACCEPTANCE CRITERIA

The on-site geologist will verify that P&A operations were performed in accordance with the specified method. Any deviations from the specified P&A method must be pre-approved by the Y-12 Plant GWPPM or authorized designee. Requests for deviations may be verbal, but must be recorded immediately in the field log book and include date, time, and authorizing personnel. Deviations will also be noted on Activity/Progress Forms and P&A Diagrams as appropriate.

10.0 POST PERFORMANCE WORK ACTIVITIES

10.1 The on-site geologist will submit the well P&A documentation to the Y-12 Plant GWPPM or authorized designee.

10.2 Waste materials generated during P&A will be disposed of in accordance with the Well Plugging and Abandonment Waste Management Plan.

11.0 RECORDS

The documentation listed in items 11.1 through 11.4 below will be included in the annual well plugging and abandonment report and become part of the administrative record for the Y-12 Plant GWPP.

11.1 Well Plugging and Abandonment Request Form

11.2 Well Plugging and Abandonment Waste Management Plan

11.3 Well Plugging and Abandonment Diagram

11.4 Well Plugging and Abandonment Activity/Progress Report

11.5 Daily Log

A daily log of field P&A activities shall be maintained. This log will be placed in the administrative record of the Y-12 Plant GWPP.

APPENDIX C

FORMS

APPENDIX C.1

WELL PLUGGING AND ABANDONMENT REQUEST

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM

PLUGGING AND ABANDONMENT REQUEST

REQUEST NO.: _____

WELL NUMBER:	SITE:
INSPECTION NUMBER:	INSPECTED BY:

REASON FOR PLUGGING AND ABANDONMENT:

- ☐ Well Casing Damage/Deterioration
- ☐ Annular Grout Deterioration
- ☐ Loss of Well Security or Identity
- ☐ Downhole Conditions
- ☐ Site Construction, Closure, or Operation

COMMENTS/EXPLANATION: _____

APPROVED BY: _____ DATE: _____

(GWPP MANAGER OR DESIGNEE)

APPENDIX C.2

WELL PLUGGING AND ABANDONMENT WASTE MANAGEMENT PLAN

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM

WELL PLUGGING AND ABANDONMENT WASTE MANAGEMENT PLAN

Well No.: _____ Date: _____

WASTE VOLUME

Borehole Depth: _____ ft. Estimated Volume of Cuttings: _____ cu. ft.

Borehole Diameter: _____ in. Estimated Volume of Fluids: _____ gal.

CONTAMINATION INFORMATION

CONTAMINANT	CONCENTRATION

Source of Data (attach analytical results if available): _____

_____

ON-SITE WASTE MANAGEMENT

☐ Drilling materials discharged to ground surface.

☐ Drilling materials discharged to containment vessels (e.g. drums or tanks).

☐ Drilling materials discharged to containment pit.

SAMPLING AND ANALYSIS

Sample Type	No. of Samples	Analytical Parameters
☐ Cuttings	_____	_____
☐ Drilling Fluids	_____	_____
☐ Decontamination Wash/Rinse Water	_____	_____

PROPOSED DISPOSITION OF CONTAINERIZED MATERIAL

Cuttings: _____

_____

_____

Drilling Fluids: _____

_____

_____

Decontamination Wash/Rinse Water: _____

_____

_____

APPROVALS

Preparer: _____ Date: _____

EMD Environmental Coordinator: _____ Date: _____

GWPP Manager: _____ Date: _____

WTSD Manager: _____ Date: _____

(Signature required for disposal/treatment options)

APPENDIX C.3

WELL PLUGGING AND ABANDONMENT DIAGRAMS

ORNL-DWG 91M-1659

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM

WELL PLUGGING AND ABANDONMENT DIAGRAM

WELL NO. _____

LOCATION: _____

COORDINATES: _____

REFERENCE POINT FOR MEASUREMENTS: _____

DATE: START: _____

FINISH: _____

PREPARED BY: _____

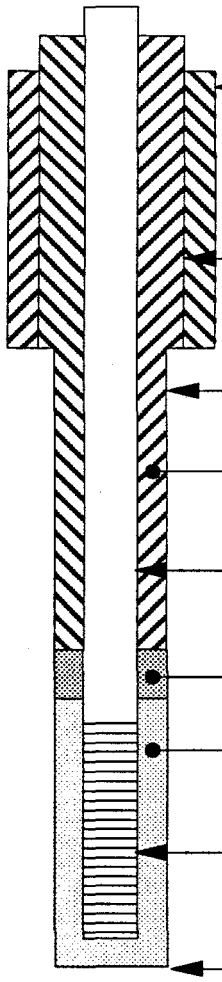
DRILLING COMPANY: _____ DRILL: _____

DRILLER: _____ HELPERS: _____

REASON FOR P&A: _____

P&A: METHOD: _____ DEVIATIONS FROM METHOD: _____

WELL CONSTRUCTION SUMMARY



CONDUCTOR HOLE
DIA: _____
DEPTH _____

SURFACE CONDUCTOR
TYPE: _____
DIA: _____
TOP _____
BOTTOM _____

BOREHOLE DIA.: _____
TOP _____
BOTTOM _____

FILLER: _____

CASING (WITH SCREEN)
TYPE: _____
DIA: _____
TOP _____
BOTTOM _____

SEAL: _____
TOP _____
BOTTOM _____

FILTER PACK: _____
TOP _____
BOTTOM _____

SCREEN
TYPE: _____
DIA: _____
TOP _____
BOTTOM _____

TOTAL DEPTH: _____

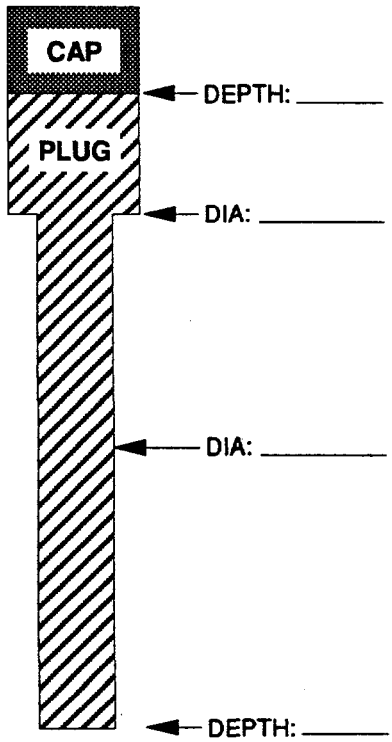
P&A SUMMARY

REAMED DIA: _____

DRILLED/REAMED DEPTH: _____

PLUG MATERIAL: _____

CAP MATERIAL: _____



ORNL-DWG 91M-1658

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM

WELL PLUGGING AND ABANDONMENT DIAGRAM

WELL NO. _____

LOCATION: _____ DATE: START: _____

COORDINATES: _____ FINISH: _____

REFERENCE POINT FOR MEASUREMENTS: _____ PREPARED BY: _____

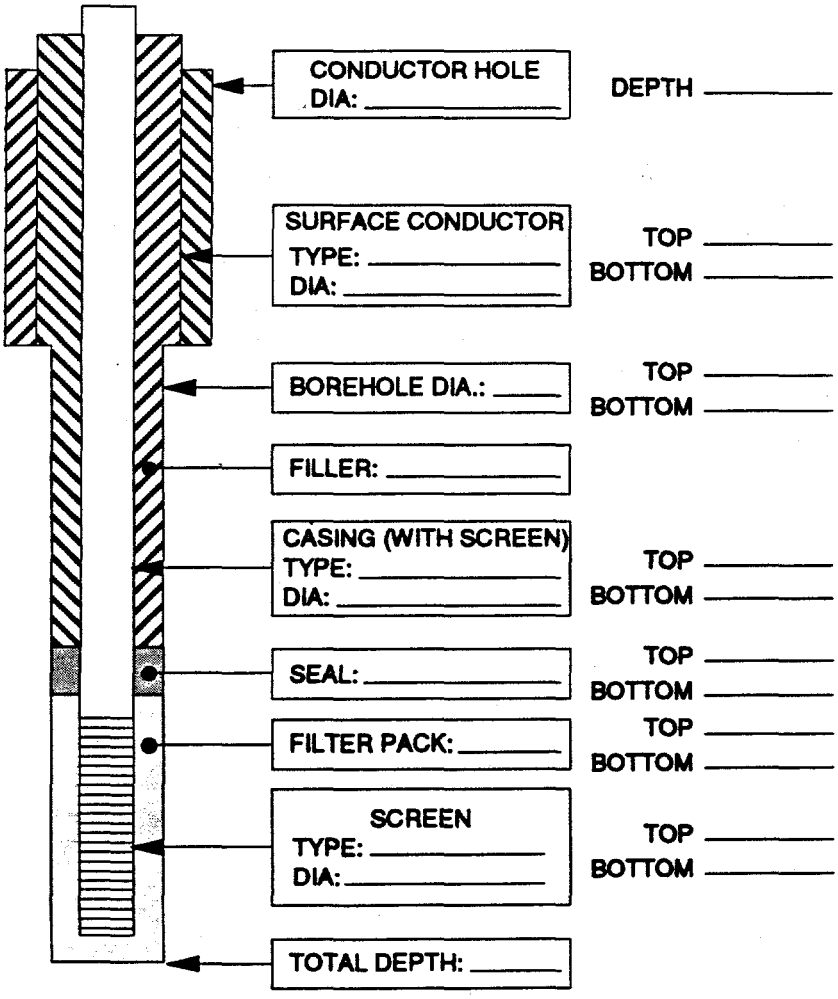
DRILLING COMPANY: _____ DRILL: _____

DRILLER: _____ HELPERS: _____

REASON FOR P&A: _____

P&A: METHOD: _____ DEVIATIONS FROM METHOD: _____

WELL CONSTRUCTION SUMMARY



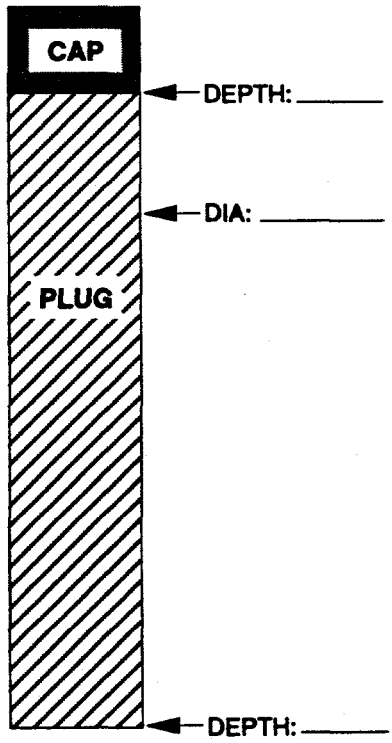
P&A SUMMARY

REAMED DIA: _____

DRILLED/REAMED DEPTH: _____

PLUG MATERIAL: _____

CAP MATERIAL: _____



ORNL-DWG 91M-1660

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM

WELL PLUGGING AND ABANDONMENT DIAGRAM

WELL NO. _____

LOCATION: _____ DATE: START: _____

COORDINATES: _____ FINISH: _____

REFERENCE POINT FOR MEASUREMENTS: _____ PREPARED BY: _____

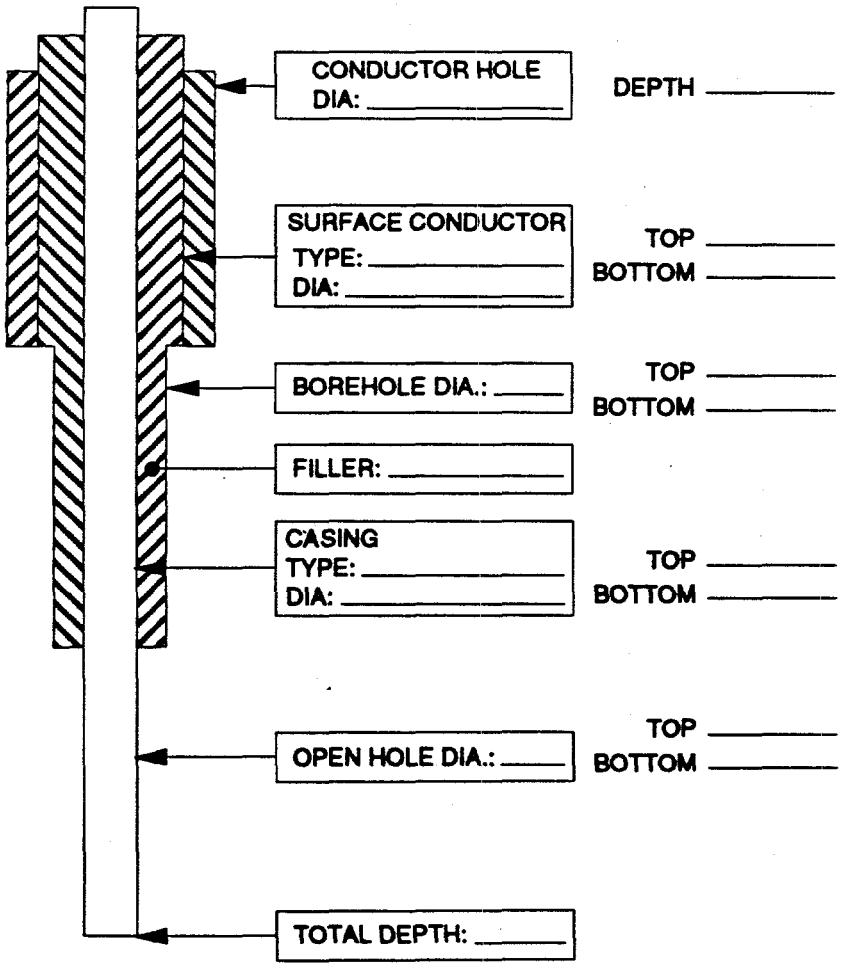
DRILLING COMPANY: _____ DRILL: _____

DRILLER: _____ HELPERS: _____

REASON FOR P&A: _____

P&A: METHOD: _____ DEVIATIONS FROM METHOD: _____

WELL CONSTRUCTION SUMMARY



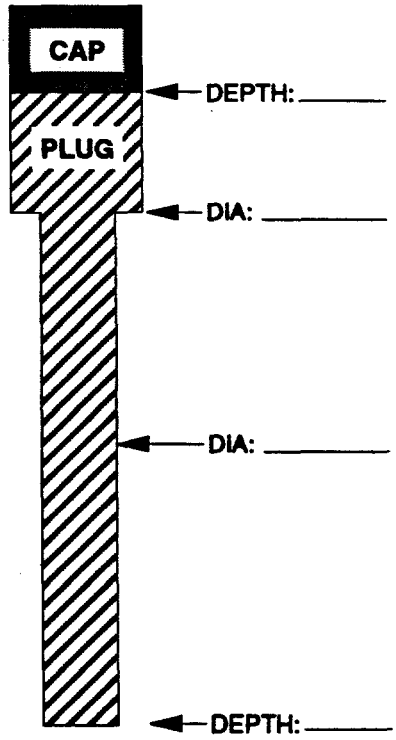
P&A SUMMARY

REAMED DIA: _____

DRILLED/REAMED DEPTH: _____

PLUG MATERIAL: _____

CAP MATERIAL: _____



ORNL-DWG 91M-1661

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM

WELL PLUGGING AND ABANDONMENT DIAGRAM

WELL NO. _____

LOCATION: _____ DATE: START: _____

COORDINATES: _____ FINISH: _____

REFERENCE POINT FOR MEASUREMENTS: _____ PREPARED BY: _____

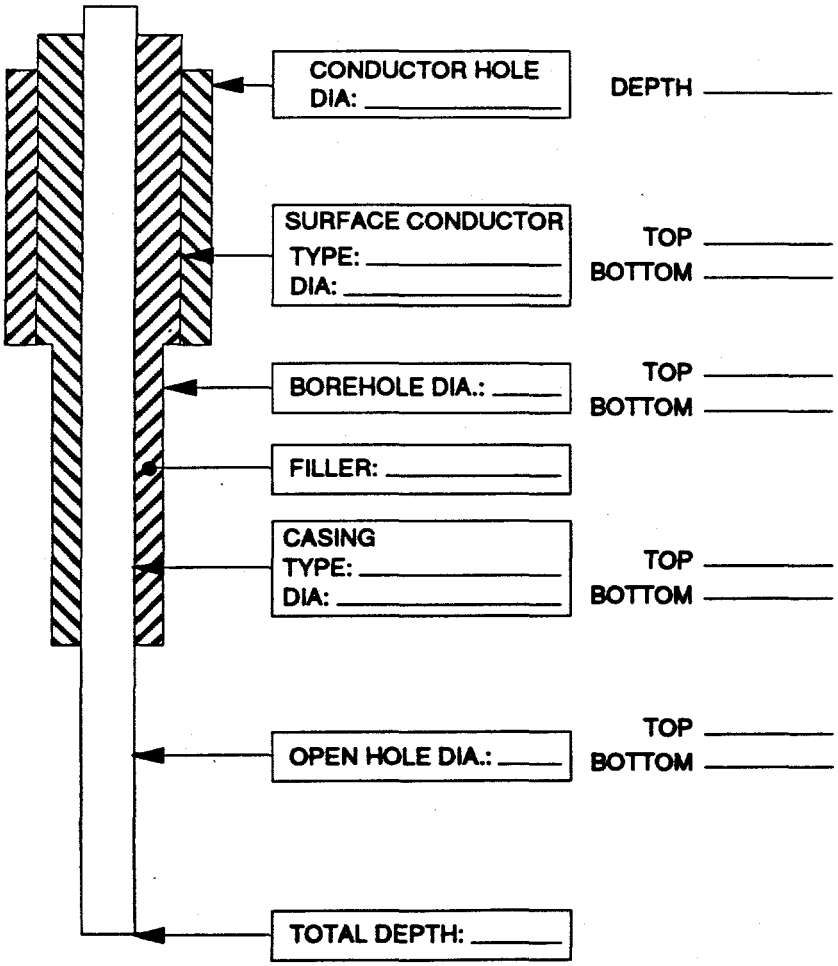
DRILLING COMPANY: _____ DRILL: _____

DRILLER: _____ HELPERS: _____

REASON FOR P&A: _____

P&A: METHOD: _____ DEVIATIONS FROM METHOD: _____

WELL CONSTRUCTION SUMMARY



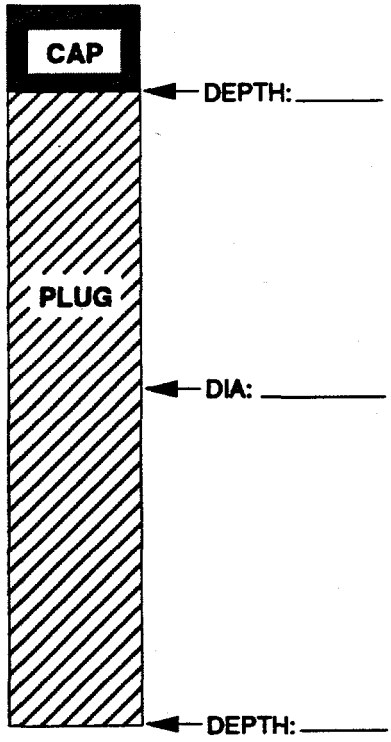
P&A SUMMARY

REAMED DIA: _____

DRILLED/REAMED DEPTH: _____

PLUG MATERIAL: _____

CAP MATERIAL: _____



APPENDIX C.4

WELL PLUGGING AND ABANDONMENT ACTIVITY/PROGRESS REPORT

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM	WELL NO. _____
WELL PLUGGING AND ABANDONMENT ACTIVITY/PROGRESS REPORT	PAGE 1 of

LOCATION: _____	DATE: START: _____
DRILLER: _____	FINISH: _____
HELPER: _____	METHOD: _____
DRILL: _____	LOGGED BY: _____

DATE	TIME		ACTIVITY/COMMENTS
	START	FINISH	

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM	WELL NO. _____
WELL PLUGGING AND ABANDONMENT ACTIVITY/PROGRESS REPORT - continued	PAGE 2 of

DATE	TIME		ACTIVITY/COMMENTS
	START	FINISH	

APPENDIX C.5

EQUIPMENT DECONTAMINATION INSPECTION SUMMARY

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM	WELL NO. _____
EQUIPMENT DECONTAMINATION INSPECTION SUMMARY	INSTALLATION ☐ P&A ☐

LOCATION: _____ DATE: START: _____

DECONTAMINATION CREW: _____ FINISH: _____

_____

EQUIPMENT	DECON DATE	INSPECTION DATE	INSPECTION (PASS/FAIL)	INSPECTOR'S INITIALS
DRILL RIG _____ (Mast, Chassis, Cables, Carousel, Hoses, Etc.)				
DRILLING TOOLS (Pipe Wrenches, Hand Tools, Lifting Bells, Clevis, Chains, Etc.)				
DOWN HOLE TOOLS (Drilling Rods, Stabilizers, Washover Pipe, Bits, Etc.)				
WELL CONSTRUCTION MATERIALS (Casing, Screen, Centralizers, Etc.)				
WORKOVER RIG _____ (Mast, Chassis, Cables, Hoses, Etc.)				
DEVELOPMENT TOOLS (Tubing, Bailers, Pumps, Etc.)				
OTHER EQUIPMENT OR RE-INSPECTIONS (SPECIFY)				

COMMENTS:

APPENDIX C.6

SITE-SPECIFIC HEALTH AND SAFETY CHECKLIST

SITE-SPECIFIC HEALTH AND SAFETY CHECKLIST

FOR

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM (GWPP)
MONITORING WELL INSTALLATION AND PLUGGING AND ABANDONMENT ACTIVITIES

Site Name: _____

Prepared by: _____
(Signature) (Date)
GWPP Project Health and Safety Officer

Reviewed by: _____
(Signature) (Date)
GWPP Drilling Project Manager

1.0 SITE DESCRIPTION

The _____ site is located at _____ (see site map)

The _____ site is near the (streams, roads, other landmarks) _____

_____

_____

_____

The _____ site is (brief description of terrain, vegetation, land use, etc.) _____

_____

_____

2.0 SITE HISTORY

(Brief description of site history and use. Include all site activities that may contribute to current site conditions.)

_____

_____

_____

_____

3.0 HEALTH AND SAFETY HAZARD EVALULATION

[Place an X in each box to indicate presence of hazard]

3.1 Physical Hazards

☐ Confined Space	☐ Enclosed Space	☐ Heavy Lifting	☐ Cold Stress
☐ Tripping/Falling	☐ High Voltage	☐ High Pressure Water	☐ Heat Stress
☐ Oxygen deficient	☐ Explosive/Flammable	☐ Vibration	☐ Noise

3.2 Construction Hazards

☐ Trenching	☐ Excavating	☐ Heavy Equipment Operation
☐ Demolition	☐ High Work	☐ Welding/Cutting
☐ Ladders	☐ Traffic	☐ Other_____
☐ Rotating Equipment		

3.3 Chemical Hazards

☐ Organic Chemical	☐ Inorganic Chemical	☐ Carcinogen
☐ Corrosive	☐ Reactive	☐ OSHA Specific Substance
☐ Mutagen	☐ Teratogen	☐ Other_____

3.4 Ionizing Radiological Hazards

☐ Internal Exposure ☐ External Exposure

3.5 Non-Ionizing Radiological Hazards

☐ Ultraviolet ☐ RF ☐ Microwave ☐ Laser

3.6 Biological/Vector Hazards

☐ Wildlife ☐ Plants ☐ Medical Waste ☐ Parasites

☐ Bacterial

4.0 TASK BREAKDOWN

(Provide detailed descriptions, controls, and requirements, for each task to be performed [i.e., drilling, sampling, etc.]).

Level of Personal Protective Equipment: Primary _____ Contingency _____

Type of Work: Intrusive ☐ Extrusive ☐

Engineering Controls: _____

_____

_____

Administrative Controls (required permits, training, etc.) _____

_____

_____

Personal Protective Equipment:

	Primary		Contingency	
	Yes	No	Yes	No
a) Respiratory Protection:	☐	☐	☐	☐
b) Protective Clothing:	☐	☐	☐	☐
c) Head Protection:	☐	☐	☐	☐
d) Eye Protection:	☐	☐	☐	☐
e) Foot Protection:	☐	☐	☐	☐
f) Hand Protection:	☐	☐	☐	☐
g) Hearing Protection:	☐	☐	☐	☐
h) Tape-up Required:	☐	☐	☐	☐

5.0 MONITORING REQUIREMENTS

Instrument	Task(s)	Monitoring Frequency	Action Guidelines
LEL Meter	_____	_____	_____
Photoionization Detector (PID)	_____	_____	_____
Flame Ionization Detector (FID)	_____	_____	_____
Alpha Meter	_____	_____	_____
Beta/Gamma Meter	_____	_____	_____
Other (Specify) _____	_____	_____	_____

6.0 HAZARD ANALYSIS

6.1 Chemical (Refer to Site-Specific Waste Management Plan)

Chemical:	PEL/TLV:	IDLH:
Action Level:	STEL:	LEL:
Route of Exposure:		
Monitoring Equipment:		
Symptoms/Effects of Exposure:		
Special Medical Monitoring:		

Chemical:	PEL/TLV:	IDLH:
Action Level:	STEL:	LEL:
Route of Exposure:		
Monitoring Equipment:		
Symptoms/Effects of Exposure:		
Special Medical Monitoring:		

Chemical:	PEL/TLV:	IDLH:
Action Level:	STEL:	LEL:
Route of Exposure:		
Monitoring Equipment:		
Symptoms/Effects of Exposure:		
Special Medical Monitoring:		

Chemical:	PEL/TLV:	IDLH:
Action Level:	STEL:	LEL:
Route of Exposure:		
Monitoring Equipment:		
Symptoms/Effects of Exposure:		
Special Medical Monitoring:		

Chemical:	PEL/TLV:	IDLH:
Action Level:	STEL:	LEL:
Route of Exposure:		
Monitoring Equipment:		
Symptoms/Effects of Exposure:		
Special Medical Monitoring:		

6.2 Ionizing Radiation (Refer to Site-Specific Waste Management Plan)

6.3 Electrical Hazards

High-Voltage (>100Kv) eletctircal transmission lines nearby? Yes/No

Location,distance, and voltage: _____

_____

_____

Electrical shock hazard? Yes/No

_____ Voltage

_____ Current

Location of hazard: _____

6.4 Temperature Extremes Hot ☐ Cold ☐

Work Load:

☐ Light

☐ Moderate

☐ Heavy

Work/Rest regimen:

_____ % work

_____ % rest

6.5 Noise

Noise Extremes? Yes/No

Noise source(s): _____

_____

_____

Noise above 85 dB(A) (hearing protection required) Yes/No

6.6 Illumination

Additonal illumination required? Yes/No

6.7 Safety Hazards

Traffic control/flagmen Yes/No

Site posting required? Yes/No

Access control required? Yes/No

Entry/exit logs required? Yes/No

Escape routing/posting required (include site map)? Yes/No

6.8 Personal Protective Equipment (PPE) Hazards

Heat stress is addressed in section 6.4.

Is visibility impaired by protective clothing or PPE? If yes: Yes/No

1. Promote awareness of vision limitations and adjust worker activities accordingly. Continuous awareness of the surroundings and the worker's physical condition is imperative.

Will PPE requirements increase slipping, tripping, or falling hazards (e.g., encumbrance, ill-fitted or overly loose clothing, impaired visibility, poor traction conditions, etc.)? If yes: Yes/No

1. Workers must adjust their work and movement capabilities to the encumbrance of the PPE. Workers should minimize activities that may cause overbalancing (e.g., running, jumping, rapid movements, and complex physical tasks).

2. Only wear PPE that properly fits or may be adjusted (i.e., taping up an oversized tyvek suit) for a more proper fit.

3. The buddy system must be utilized for ALL activities where vision is impaired by PPE, such as a respirator or hood. Two or more workers will be required to work together and monitor each others movements and physical condition.

Will cutting and welding activities be performed while wearing PPE greater than level D? If yes: Yes/No

1. Flame retardent PPE is required during ALL cutting and welding activities.

2. A second individual performing as a firewatch over cutting and welding operations is mandatory. The individual performing as a firewatch should observe both the surroundings and the operator's person for signs of smoldering, smoke, and/or fire during the activity and observe the work area for at least 30 minutes after the activity.

3. An appropriate fire extinquisher is required on-site during all cutting and welding operations. This extinguisher should be fully charged and undamaged and readily accessible to all workers.

Will PPE requirements result in an increased entanglement hazard for personnel working around rotating machinery? If yes: Yes/No

1. Ensure that all site workers are aware of equipment which may present an entanglement hazard. Locate and identify catch or snag points on equipment.

2. Ensure that loose PPE is minimized, use extra tape-up when required.

APPENDIX C.7

RADIOLOGICAL SAFETY WORK PERMIT

MARTIN MARIETTA ENERGY SYSTEMS. INC.	RADIOLOGICAL WORK PERMIT REQUEST

Requestor: Phone: Badge: Date:

Organization/Department: Priority [High/Med/Low]:

Projected Start Date/Time: Previous RWP Number:

Estimated Duration/End Date:

Work Description:

Job Supervisor: Name: Badge: Phone:

Associated Permits:

Location Description:

JOB BREAKDOWN

TO BE COMPLETED BY REQUESTOR				RADIOLOGICAL CONTROL ORGANIZATION USE ONLY		
Component task	Craft/Dept.	# Workers	Estimated person-hours	Avg. Dose rate (mR/hr)	Estimated exposure (mR)	
					Max. individual	Collective
Received by:				Total:		

Date: Time: Assigned RWP #:

Comments:

SUBMIT FORM TO THE RADIOLOGICAL CONTROL SUPERVISOR FOR THE AREA.

APPENDIX C.8

OPERATIONAL SAFETY WORK PERMIT

1a

SAFETY WORK PERMIT

b. PERMIT NO.:

2a. ISSUED TO (Supervisor-in-Charge): | b. Employee No.: | c. Phone No.: | d. Work Order/Request No.:

GOOD FOR DATE AND TIME SPECIFIED (MAXIMUM OF 90 DAYS)

3a. FROM: (Date and Time) | b. TO: (Date and Time) | c. BUILDING: | d. ROOM NO.:

4. DESCRIPTION OF WORK:

5. THE WORK IS SAFETY SYSTEM RELATED AND IS SUBJECT TO CONFIGURATION CONTROL REQUIREMENTS ☐ Yes ☐ No

THE FOLLOWING PREPARATIONS HAVE BEEN COMPLETED IN CONNECTION WITH THIS WORK

6. EQUIPMENT CONDITION REQUIREMENTS — PERMIT NO.

a. Valves closed ☐ Yes ☐ No
b. Pipelines pressure _____ psig ☐ Yes ☐ No
c. Pipelines drained or blanked ☐ Yes ☐ No
d. Pressure vessels checked and cleaned ☐ Yes ☐ No
e. Pipelines and equipment purged ☐ Yes ☐ No
f. Lockout/Tagout Permit required ☐ Yes ☐ No

7. FIRE PREVENTION REQUIREMENTS — PERMIT NO.

a. Explosive atmosphere test required ☐ Yes ☐ No
b. Non-sparking tools required ☐ Yes ☐ No
c. Fire Extinguisher Equip. on hand ☐ Yes ☐ No
d. Welding/Hotwork Permit required ☐ Yes ☐ No

Requires further Review/Evaluation by Fire Protection ☐ Yes ☐ No

FP (SIGNATURE)*

8. ELECTRICAL REQUIREMENTS — PERMIT NO.

a. Lockout/Tagout Permit Required ☐ Yes ☐ No
b. Circuits have been de-energized ☐ Yes ☐ No

9. INDUSTRIAL HYGIENE REQUIREMENTS - POSSIBLE HAZARDS — COMMENTS

Consulted With Industrial Hygiene	☐ Yes ☐ No	Man-made Mineral Fibers	☐ Yes ☐ No
Asbestos	☐ Yes ☐ No	Mechanical Ventilation	☐ Yes ☐ No
Biological Hazards	☐ Yes ☐ No	Noise	☐ Yes ☐ No
Confined Space	☐ Yes ☐ No	Oxygen Def.	☐ Yes ☐ No
HAZWOPER	☐ Yes ☐ No	Toxic Material	☐ Yes ☐ No
Heat/Cold Stress	☐ Yes ☐ No	Welding/Hot Work	☐ Yes ☐ No
		Other _____	

Any box checked "YES" requires further review/evaluation by the Industrial Hygiene Section.

IH (SIGNATURE)

10. RADIATION PROTECTION REQUIREMENTS — PERMIT NO.

a. Consulted with Health Physics ☐ Yes ☐ No
b. Radiation Hazard/Contamination Hazard ☐ Yes ☐ No
c. Radiation Work Permit required ☐ Yes ☐ No

HP (SIGNATURE)

11. ENGINEERING CONTROLS / PROTECTIVE EQUIPMENT / SAFETY REQUIREMENTS

☐ Elevated Work Surfaces
☐ Trenching & Shoring
☐ Traffic Control
☐ Equipment Grounding
☐ Excav./Penetration
☐ Safety Glasses
☐ Face Shield
☐ Safety Harness
☐ Shoe Covers
☐ Aprons
☐ Hard Hats
☐ Monogoggles
☐ Acid Suits
☐ Hoisting and Rigging required
☐ Lab Coats
☐ Impermeable Suit
☐ Ear Plugs
☐ Laser Eyewear
☐ Gloves (Type) _____
☐ Respirators (Type)* _____
Cartridge Type * _____
☐ Other _____

Requires further review/evaluation by Industrial Safety ☐ Yes ☐ No

Industrial Safety Signature _____

*Requirements must be made by IH or HP and initialed.

12.. I have personally inspected site and certify that the work area has been properly cleared for work and that conditions are safe for the work indicated. This Safety Work Permit is therefore approved for the work described.

13. Issuing Authority:	Division	Badge No.:	Time: ☐ AM ☐ PM	Date:	Logged By:
14. Received By:		Badge No.:	Time: ☐ AM ☐ PM	Date:	
15. Work Complete - Permit Returned By:		Badge No.:	Time: ☐ AM ☐ PM	Date:	
16. Permit Closed By:		Badge No.:	Time: ☐ AM ☐ PM	Date:	Logged By:

AT START OF WORK: The original copy is issued by requesting supervisor and goes to the supervisor-in-charge, and duplicate is retained by the requesting supervisor. Upon completion of work:

(1) Supervisor-in-charge releases the original copy, returns to the requesting supervisor; (2) the requesting supervisor closes and logs the permits as required; (3) the original copy goes to the requesting supervisor's Division Safety Officer for distribution of xerox copies to: Industrial Hygiene Department, Fire Department, Safety Department, and supervisor-in charge's Division Safety Officer; and (4) the canary copy will be destroyed by the requesting supervisor after the original copy has been closed by requesting supervisor.

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NOTE: Personal Signatures Required!

TEMPORARY SUSPENSION By (Supervisor-in-charge)	TEMPORARY SUSPENSION By (Supervisor-in-charge)
FOR	FOR
APPROVED BY (Originating Div.)	APPROVED BY (Originating Div.)
TIME / DATE 19	TIME / DATE 19
PERMIT REISSUED BY	PERMIT REISSUED BY
TIME / DATE 19	TIME / DATE 19
TEMPORARY SUSPENSION By (Supervisor-in-charge)	TEMPORARY SUSPENSION By (Supervisor-in-charge)
FOR	FOR
APPROVED BY (Originating Div.)	APPROVED BY (Originating Div.)
TIME / DATE 19	TIME / DATE 19
PERMIT REISSUED BY	PERMIT REISSUED BY
TIME / DATE 19	TIME / DATE 19

THE FOLLOWING PERSONNEL WORKED UNDER THIS PERMIT:

Name	Employee No.	Name	Employee No.	Name	Employee No.

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APPENDIX C.9

TASK HAZARD ANALYSIS FORM

Plant/Division	Task Analyzed		Approvals
Department	Date Completed	**TASK ANALYSIS**	Signature · Function · Date
Occupation	Completed By	**WORKSHEET**	Signature · Function · Date
			Signature · Function · Date

No.	Significant Steps or Critical Activities	Loss Exposures (Safety - Quality - Production)	Efficiency Check		RECOMMENDED CONTROLS
			Yes	No	

APPENDIX D

Y-12 PLANT GWPP DRILLING AND DEVELOPMENT EFFLUENTS WASTE MANAGEMENT GUIDELINES

1. INTRODUCTION

The ultimate objective of monitoring groundwater is gathering data to assess potential impacts to human health and the environment. It is also the objective of the Y-12 Plant Groundwater Protection Program (GWPP) to handle drilling and development effluents from the installation of groundwater monitoring wells or borings in a manner that protects the environment. The Y-12 Plant philosophy has been and continues to be consistent with the U.S. Environmental Protection Agency (EPA) and Lockheed Martin Energy Systems, Inc. (Energy Systems) guidance for managing investigation-derived wastes. Site-specific professional judgment is used to determine the potential for contamination prior to the installation of each well. Factors considered in evaluating potential for site contamination include the following:

- previously collected sampling and analysis data,
- groundwater flow patterns,
- geologic and hydrogeologic setting, and
- purpose of the well (contaminant plume assessment, background monitoring, compliance, monitoring, etc.).

Based on the evaluation, one of two options is selected:

- stabilize material on site or
- collect material for treatment or storage.

2. DRILLING EFFLUENTS DISPOSAL

There are two levels of drilling effluents management at the Y-12 Plant: (1) drill-site disposal and (2) containerization for waste disposal. Disposal of effluents at the drill site following best management practices (BMP) is permitted if the cuttings do not exceed the criteria discussed below. If the criteria are exceeded, the effluents must be containerized at the drill site, labeled, and handled according to Y-12 Plant waste disposal procedures. Sampling and field screening of the effluents will be conducted in accordance with the procedures specified in the Energy Systems Environmental Surveillance Procedures Quality Control Program document (Energy Systems1988).

2.1 FIELD SCREENING

Field screening of drill cuttings will consist of measuring three parameters: radioactivity, organic vapors, and pH. The Energy Systems procedures specified in Table 1 will be followed with some modification as described below.

Radioactivity will be measured using two separate meters: a survey meter with a pancake Geiger tube for determining beta and gamma activity and a scintillation counter with a zinc sulfide window for determining alpha activity. The meters will be passed over the surface area of the cuttings and the highest readings will be recorded.

Screening for organic vapors will be conducted on composite samples from the effluents generated each day from a single well. The sample will be collected with a hand trowel or similar tool to select cuttings from several depths. Enough cuttings will be placed in a clean 1-liter glass or

metal container to half fill it. Aluminum foil will be placed over the mouth of the container to make an airtight seal. The sample will then be incubated for 1 h at 70°F or the ambient temperature, whichever is higher. Organic vapors in the headspace of the sample container will be measured by puncturing the aluminum foil and inserting the probe of an organic vapor analyzer. This instrument will have a photoionization detector with a 10.2 eV lamp and will be calibrated to isobutylene and/or a flame ionization detector calibrated to methane. The highest reading of the headspace vapors will be recorded.

Table 1. Y-12 Plant field-screening criteria for drilling effluents and development water

Field analysis	Energy Systems procedure no.	Limit
pH	ESP-307-1 Rev. 1	4.0–10.5
Specific conductivity [a]	ESP-307-1 Rev. 1	< 1000 µmhos/cm
Organic vapors	ESP-307-6 Rev. 1	< 5 ppm
Radioactivity	ESP-307-7 Rev. 1	
beta/gamma		< 600 dpm/100 cm^2 (< 100 cpm)
alpha		< 1000 dpm/100 cm^2 (< 500 cpm)

[a] Not applicable to drill cuttings.

The pH of the cuttings will be estimated by adding one quart of deionized water to the composite sample used to determine the presence of organic vapors. The sample will be agitated until well mixed. The pH of the mixture will be determined by using a pH meter. This pH will be recorded.

2.2 QUANTITATIVE SCREENING

In addition to field screening, samples for selected laboratory analyses (i.e., VOCs, metals, radioisotopes) may be required for quantitative verification of contaminant levels. Quantitative screening is typically conducted in areas of known or suspected contamination where certain criteria are of concern (i.e., RCRA TCLP levels). The well installation waste management plan will specify the types of quantitative screening to be conducted.

2.3 CONTAINERIZATION FOR WASTE DISPOSAL

If the effluents from a borehole exceed any one of the field screening limits, they will be containerized at the drill site and labeled with the contents (drill cuttings), borehole number, and date. The cuttings will then be handled according to Y-12 Plant waste management procedures.

An exception to the above may be made if the cuttings only exceed the organic vapor limits. Weather permitting, those cuttings may be passively treated by aeration at the drill site to reduce the organic vapor content. Such treatment shall not exceed five working days. If reanalysis following aeration indicates the cuttings continue to exceed the organic vapor limits, they must be containerized and handled as above.

If quantitative screening is performed, the exceedance of applicable quantitative screening criteria will result in containment of effluents.

2.4 BEST MANAGEMENT PRACTICES FOR DRILL SITE DISPOSAL

Drilling effluents that do not exceed the containment criteria will be disposed of at the drill site, if practicable. BMPs dictate that the effluents be disposed in such a way as to not be unsightly or cause erosion/sedimentation impacts on nearby surface water. The cuttings shall, therefore, be used as part of the restoration of the drill site, to fill in low areas and tire tracks, or spread to conform to the natural topography. They will subsequently be seeded and mulched. Care shall be taken to ensure that liquid fractions infiltrate or evaporate at the drill site and in no case run off into surface waters, ephemeral drainages, or storm sewers. Drill cuttings that do not exceed the containment criteria but cannot be disposed of at the drill site due to its location (parking lot, yard, etc.) will be transported to a designated location and disposed of as clean fill, following BMP.

2.5 DOCUMENTATION

The results of all field-screening analyses and a description of the disposition of the drilling effluents from each borehole will be documented on a Drill Cuttings Field Screening/Disposal Sheet, an example of which is attached. These forms will be completed for each borehole by the on-site geologist who conducts the screening and maintained as part of the permanent record for the well.

3. DEVELOPMENT WATER DISPOSAL

There are two levels of development water management at the Y-12 Plant: (1) drill-site disposal and (2) containerization for waste disposal. Disposal of development water at the drill site following BMP is permitted if the water does not exceed the criteria discussed below. If the criteria are exceeded, the water must be containerized at the drill site, labeled, and handled according to Y-12 Plant waste disposal procedures. Sampling and field screening of development water will be conducted in accordance with the procedures specified in the Energy Systems Environmental Surveillance Procedures Quality Control Program document (Energy Systems 1988).

3.1 FIELD SCREENING

Initial development water will be containerized until it has been screened. This is accomplished by pumping the water into drums or other suitable container(s). Subsequent screening will be conducted on grab samples taken approximately after each casing volume is removed. (An alternative to the grab sampling is to totally contain all the development water produced at a well, then analyze a composite sample.) If initial grab samples do not exceed the limits specified in Table 1, development water may be pumped directly on the ground (following BMP) unless or until a subsequent grab sample exceeds the limits.

Field screening of development water will consist of measuring four parameters: radioactivity, organic vapors, specific conductivity, and pH. The Energy Systems procedures specified in Table 1 will be followed with some modification, as described below.

Radioactivity will be measured using two separate meters: a survey meter with a pancake Geiger tube for determining beta and gamma activity and a scintillation counter with a zinc sulfide window for determining alpha activity. The meters will be passed over the surface area of the sample and the highest readings will be recorded.

Screening for organic vapors will be conducted by placing enough development water in a clean 1-liter glass or metal container to half fill it. Aluminum foil will be placed over the mouth of the container to make an airtight seal. The sample will then be incubated for 1 h at 70°F or the ambient temperature, whichever is higher. Organic vapors in the headspace of the sample container will be measured by puncturing the aluminum foil and inserting the probe of an organic vapor analyzer. This instrument will have a photoionization detector with a 10.2 eV lamp calibrated to isobutylene and/or a flame ionization detector calibrated to methane. The highest reading of the headspace vapors will be recorded.

3.2 QUANTITATIVE SCREENING

In addition to field screening, sampling for selected laboratory analyses (i.e., VOCs, metals, radioisotopes) may be required for quantitative verification of contaminant levels. Quantitative screening is typically conducted in areas of known or suspected contamination where certain criteria are of concern. The well installation waste management plan will specify the types of quantitative screening to be conducted.

3.3 CONTAINERIZATION FOR WASTE DISPOSAL

If the development water from a well exceeds any one of the field screening limits, it will be containerized at the drill site and labeled with the contents (development water), well number, and date. The water will then be handled according to Y-12 Plant waste management procedures.

An exception to this may be made if the development water only exceeds the organic vapor limits. Weather permitting, the water may be passively treated at the drill site by leaving the containers open for aeration to reduce the organic vapor content. Such treatment shall not exceed five working days and shall not be conducted over weekends without supervision. If reanalysis following aeration indicates the development water continues to exceed the organic vapor limits, it must be containerized and handled as above. If quantitative screening is performed, the exceedance of applicable quantitative screening criteria will result in containment of effluents.

3.4 BMP FOR DRILL-SITE DISPOSAL

Development water that does not exceed the containment criteria will be disposed of at the drill site if practicable. BMP dictates that the water be disposed in such a way as to not cause erosion or enter nearby surface water or storm sewers. Precautions shall, therefore, be taken to ensure that development water pumped onto the ground or released from containers at the drill site either infiltrates or evaporates at the site and in no case runs off into surface waters, ephemeral drainages, or storm sewers. Development water that does not exceed the field screening (i.e., within a drainage, near a storm sewer, etc.) will be transported to a designated location and disposed as clean water following BMP.

3.5 DOCUMENTATION

The results of all field-screening analyses and a description of the disposition of the development water from each well will be documented on a Development Water Field Screening/Disposal Sheet, an example of which is attached. These forms will be completed for each well by the on-site geologist who conducts the screening and maintained as part of the permanent record for the well.

4.0 REFERENCES

Lockheed Martin Energy Systems, Inc. 1988. *Environmental Surveillance Procedures Quality Control Program.* ES/ESH/INT-14.

Martin Marietta Energy Systems, Inc. Management of Waste Generated from Field Investigation and Sampling Activities. ERWM Programs Intersite Procedures Manual. ERWM/ER-P2103, Rev.0. DRAFT.

U. S. Environmental Protection Agency, Region IV. 1992. Management of Contaminated Media. Guidance Number TSC-92-02. August 1992.

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM	WELL NO. _____
WELL CUTTINGS FIELD SCREENING / DISPOSAL FORM	Page ___ of ___

LOCATION: _____ DATE: START: _____

APPROX. VOLUME OF CUTTINGS: _____ FINISH: _____

CALIBRATION OF INSTRUMENTS: Check those calibrated to manufacturer's specifications.

pH meter _____ (model) _____

Organic vapor meter _____ (model) _____

Beta/gamma meter _____ (model) _____

Alpha meter _____ (model) _____

FIELD SCREENING RESULTS (background/highest observed values):

pH _____ Date/Time _____ (4.0-10.5)

Organic vapors _____ Date/Time _____ (<5 ppm above background)

Beta/Gamma _____ Date/Time _____ (<100 cpm above background)

Alpha _____ Date/Time _____ (<500 cpm above background)

Weather: _____ Temp.: _____

DISPOSITION: Drill-site Disposal _____ Containerization _____
(Labeled?) y / n

Describe:

On-site Geologist (print): _____

Signature: _____ Date: _____

Y-12 PLANT GROUNDWATER PROTECTION PROGRAM

WELL NO. _____

WELL WATER FIELD SCREENING / DISPOSAL FORM

Page ___ of ___

LOCATION: _____ DATE: START: _____

APPROX. VOLUME OF CUTTINGS: _____ FINISH: _____

CALIBRATION OF INSTRUMENTS: *Check those calibrated to manufacturer's specifications.*

pH meter _____ (model) _____

Sp. Cond. meter _____ (model) _____

Organic vapor meter _____ (model) _____

Beta/gamma meter _____ (model) _____

Alpha meter _____ (model) _____

FIELD SCREENING RESULTS:

Date	Time	pH	Sp. Cond.	Organic Vapors	Beta/ Gamma	Alpha
		(4.0-10.5)	(<1000 umhos/cm)	(<5 ppm)	(<100 cpm)	(<500 cpm)

Weather: _____ Temp.: _____

DISPOSITION: Drill-site Disposal _____ Containerization (Labeled?) y/n _____

Describe:

On-site Geologist (print): _____

Signature: _____ Date: _____

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