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Dismantlement and Removal of Old Hydrofracture Facility Bulk Storage Bins and Water Tank, Oak Ridge National Laboratory, Oak Ridge, Tennessee

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Allied Technology Group, Inc.,

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Dismantlement and Removal of Old Hydrofracture Facility Bulk Storage Bins and Water Tank, Oak Ridge National Laboratory, Oak Ridge, Tennessee

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ABBREVIATIONS

ATG	Allied Technology Group, Inc.
HEPA	high-efficiency particulate air
OHF	Old Hydrofracture Facility
ORNL	Oak Ridge National Laboratory
PPE	personal protective equipment

EXECUTIVE SUMMARY

The Old Hydrofracture Facility (OHF), located at Oak Ridge National Laboratory (ORNL), was constructed in 1963 to allow experimentation and operations with an integrated solid storage, mixing, and grout injection facility. During its operation, OHF blended liquid low-level waste with grout and used a hydrofracture process to pump the waste into a deep low-permeable shale formation. Since the OHF Facility was taken out of service in 1980, the four bulk storage bins located adjacent to Building 7852 had deteriorated to the point that they were a serious safety hazard.

The ORNL Surveillance and Maintenance Program requested and received permission from the U.S. Department of Energy to dismantle the bins as a maintenance action and send the free-released metal to an approved scrap metal vendor. A 25,000-gal stainless steel water tank located at the OHF site was included in the scope.

A fixed-price subcontract was signed with Allied Technology Group, Inc., to remove the four bulk storage bins and water tank to a staging area where certified Health Physics personnel could survey, segregate, package, and send the radiologically clean scrap metal to an approved scrap metal vendor. All radiologically contaminated metal and metal that could not be surveyed was packaged and staged for later disposal. Permissable personnel exposure limits were not exceeded, no injuries were incurred, and no health and safety violations occurred throughout the duration of the project.

Upon completion of the dismantlement, the project had generated 53,660 lb of clean scrap metal (see Appendix D). This resulted in $3410 of revenue generated and a cost avoidance of an estimated $100,000 in waste disposal fees.

1. INTRODUCTION

This report details the decontamination and controlled dismantlement of the Old Hydrofracture Facility (OHF) bulk storage bins and water tank at Oak Ridge National Laboratory (ORNL), located in Oak Ridge, Tennessee. These inactive facilities are managed by the Surveillance and Maintenance Program. The bulk storage bins' deteriorated condition attributed to the immediate need for dismantlement because of its close proximity to Building 7852. Allied Technology Group, Inc. (ATG), performed the dismantlement of the OHF bins and water tank with consideration for the safety and protection of the surrounding environment, ATG personnel, and the general public. The project was completed without injury to personnel, without releases to the environment, and within the budget and schedule guidelines.

The project began October 1, 1997, and was completed on January 12, 1998. The personnel included three laborers, two Health Physics technicians, a Program Manager, a Project Manager, and a Health and Safety Manager. The Health and Safety Manager and, at a minimum, one certified Health Physics technician provided continuous coverage throughout the entire project. C. Reed Davis Contractors served as a subcontractor for the crane usage and rigging performed. Three riggers, a crane operator, and a flatbed truck driver were provided by the subcontractor.

1.1 SITE HISTORY

OHF is located at ORNL in Oak Ridge, Tennessee. The facility was constructed in 1963 to allow experimentation and operations with an integrated solid storage, handling, mixing, and grout injection facility. The facility had not been in use since 1980, when it was transferred under the Surveillance and Maintenance Program. OHF used a hydrofracture process that involved injection of waste materials mixed with grout and additives under pressures of 2000 psi or greater into a deep, low-permeable shale formation. The injected slurry spread along fractures and bedding planes for hundreds of feet from the injection point, forming thin solid grout sheets.

1.2 DESCRIPTION OF THE OHF BULK STORAGE BINS AND WATER TANK

The scope of the OHF project consisted of four bulk storage bins and a 25,000 gal water tank. The bins were used to store cement, fly ash, and other solids before blending with liquid low-level waste to form a pumpable grout. The bins were located directly adjacent to Building 7852. Each approximately 0.25-in.-thick mild steel vertical cylindrical bin had a conical bottom approximately 8 ft long, 12 ft in diameter, and 20 ft high at the main body. Each bin was supported more than 22 ft above the ground surface by four steel stanchions attached to concrete foundations. The steel stanchions also served as supports for electrical conduit, vents, hydraulic lines, and miscellaneous piping. At higher elevations, the bins were encircled by railings and interconnected by a catwalk. No internal radiological contamination was expected to be present. Isolated spots of radiological contamination were anticipated to be present on the outside of the bins, their supports, and the miscellaneous materials associated with the process. Visual inspections before dismantlement indicated that the bins were empty except for a thin residue of product coating the internal surface. The bins and steel stanchions were expected to weigh approximately 25,000 lb each.

The water tank sat on a concrete pad approximately 20 ft north of Building 7853 and was used to supply noncontaminated water to the injection well and pump house pumps. The stainless steel tank was approximately 0.1875-in.-thick and 21 ft high by 14 ft 4 in. diameter, and the concrete pad it rested on is 16.5 ft on each side and approximately 1 ft thick. The tank was emptied by the Surveillance and Maintenance Program before removal. No radiological contamination was expected to be encountered except for potential isolated areas on the outside of the tank. The water tank was expected to weigh approximately 15,000 lb.

1.3 DESCRIPTION OF EXISTING CONDITIONS

Several incorrect assumptions were made about the bulk storage bins and water tank. The discrepancies ranged from major, such as the amount of radiological contamination present, to minor, such as the weight of the bins and water tank. Some of the discrepancies generated work outside the original scope of the contract because of the additional time and materials required to effectively complete the project.

The bulk storage bins and their supports were expected to only have isolated spots of radiological contamination on their exterior. Upon completion of a thorough radiological survey at the staging area, a substantial amount of the exterior of bin # 3 was found to be radiologically contaminated, and the majority of the supports on all the bins were found to be radiologically contaminated. The exterior surfaces of the bins and supports were not able to be effectively decontaminated. As a result, more radiologically contaminated waste was generated than anticipated (see Appendix B). The interior of the bulk storage bins was expected to be free of radiological contamination; however, the residual product in all the bins was found to be radiologically contaminated. This necessitated the need for radiological contamination controls to be implemented and decontamination measures to be taken. This additional work required a change in the contract.

The water tank and the concrete pad it rested on were expected to be free of radiological contamination except for isolated areas on the exterior of the tank. The entire top and bottom of the water tank was determined to be radiologically contaminated as well as spots on the concrete pad. The interior of the water tank was also found to be radiologically contaminated. The interior of the water tank and the concrete pad were effectively decontaminated; however, the exterior of the water tank could not be decontaminated.

More residual product was found on the interior of the bins than anticipated, which prevented an effective radiological survey. More extensive removal efforts were required as a result of the interior being completely coated with the residual product.

The bulk storage bins weighed less than half of what was anticipated, approximately 12,000 lb each, according to estimates from the crane operator. The water tank weighed approximately 10,000 lb, based on the crane operator's estimate.

2. SCOPE OF WORK

Work performed at the OHF was conducted safely following all guidelines set forth by the U.S. Department of Energy, ORNL, ATG Operating Field Procedures, and all governing regulations.

The scope of work was as follows:

- site mobilization;
- preliminary radiological survey;
- removal of external components, including piping, conduit, and catwalks;
- removal, surveying, and dismantlement of bins;
- removal, surveying, and dismantlement of the water tank;
- decontamination of the interiors of the bins and water tank;
- packaging and labeling waste materials for final disposition; and
- demobilization.

2.1 MATERIAL REMOVAL

Components, structures, and waste materials were removed, contained, and managed as follows:

a. Removed electrical conduit, electrical fixtures, and other loose materials.

b. Removed the piping, equipment, supports, and other miscellaneous metals.

c. Removed, accessed, surveyed, and recycled the stainless and carbon steel metal components.

d. Cleaned up and disposed of all lead-based paint chips that peeled away from the structures.

e. Segregated radiologically contaminated materials that could not be feasibly decontaminated and packaged it for final disposition.

f. Removed and containerized residual product (flyash, grout, and cement) found within the storage bins.

The various waste streams were segregated and managed appropriately.

The materials from OHF were handled in accordance with requirements of the performance specification and Division 1, Section 01550, Waste Disposal.

2.2 DISMANTLEMENT

Dismantlement of the OHF bins and water tank began with the disassembly of the external components, including the conduit, hydraulic lines, catwalks, ladders, lighting, and other miscellaneous materials. The bins were then removed, followed by the water tank. The external components, bins, and water tank were then transported to a staging area for sizing/accessing. A

preliminary radiological survey was performed before dismantlement to determine contaminated areas and a final green tag survey was performed at the staging area to release the materials before packaging for final disposition. The highly elevated radiological background at OHF required that all removed materials be transported to a low radiological background staging area to facilitate 100% coverage during the radiological surveys.

2.3 DECONTAMINATION

The extent of radiological contamination found, especially on the interior of the storage bins and the water tank, was not anticipated and necessitated the need for decontamination to be performed outside the original scope of work. Limited decontamination procedures were performed to minimize the amount of radiologically contaminated waste packaged for disposal. Decontamination procedures involved the use of scrapers, shovels, high-efficiency particulate air (HEPA) vacuums, scrub brushes, and detergent. Personnel wore the necessary personal protective equipment (PPE) to prevent exposure to contamination and any potential airborne releases. Decontamination efforts proved effective on the interior surfaces but were not effective on any of the exterior surfaces. Decontamination efforts provided ORNL a cost savings by minimizing waste, thus minimizing waste containers and disposal costs, and increasing the amount of material released for recycling, which generated additional revenue.

2.4 DELAYS

Several delays were encountered over the course of the project. The subcontractor providing the crane and rigging services was initially unable to provide documentation of the necessary training to authorize work to be performed at the site. The subcontractor did not anticipate the duration of their services correctly and had planned other projects that overlapped the OHF work schedule, thus requiring the personnel to leave for several days.

Weather served as a major factor for delaying the project. Frequent and heavy rainstorms caused the job to be shut down on several occasions. The operation of welding machines was not considered safe in wet conditions. The wet conditions also posed a radiological risk because the moisture shields radiological contamination from being detected by Health Physics instrumentation. Personnel would have been unable to properly survey out of work areas, and materials could not be properly surveyed to determine if contamination was present. The snowfall that occurred at the latter end of the project also hindered the material surveying process.

Radiological contamination was found to be more prominent than anticipated and present in areas that were assumed to be free of contamination, such as the interior of the bins and water tank. Once radiological contamination was found to be present in the residual product, no other bins were breached until sampling was performed to determine if the radiological condition was naturally occurring radioactive material. Once the samples verified that the grout was not naturally occurring radioactive material, the decision had to be made whether to decontaminate the sections or dispose of nearly all the bins as radiologically contaminated waste. The decision was eventually made to minimize the amount of waste generated and that limited decontamination efforts would be performed. The radiological contamination control measures and decontamination efforts slowed the project considerably. The sampling and decision-making process also caused a considerable delay.

3. HAZARDOUS CONDITIONS

Potentially hazardous conditions were present throughout the duration of the project. Hazards included radiological contamination, lead, dust, hot work, heavy machinery, noise, heavy loads, and falls. Safety precautions were taken to minimize the risk to personnel and the environment. Removal efforts used methods that ensured contaminates were not released, either by transgression or airborne pathways, and minimized the amount of waste produced by the removal process. ATG-certified Health Physics personnel were on-site to identify radiological concerns. The Health and Safety Officer monitored for airborne contamination and ensured safe working conditions were maintained throughout the dismantlement process. Personnel were trained for the hazards present and how to effectively minimize risks and exposure.

3.1 RADIOLOGICAL CONTAMINATION

Radiologically contaminated materials were identified and marked during the preliminary survey. These materials were removed with controls in place to prevent the spread of contamination. Hooded Tyvek disposable protective clothing was required in contamination areas in addition to booties, gloves, and company-issued clothing. Direct Reading Dosimeters were worn in radiation areas. Full-face respirators were worn when the potential for airborne contamination was present. Air monitoring was established when work was being performed in the contamination areas. All personnel were required to frisk upon exit from any radiation or contamination areas and Health Physics technicians were required to survey any materials and tools that were to be removed from these areas. Health Physics technicians provided continuous coverage throughout the duration of the project. Radiologically contaminated materials were segregated from noncontaminated materials to prevent the spread of contamination and minimize the amount of waste generated. Recyclable materials were decontaminated to a limited extent to allow the materials to be free-released. Contaminated wastes were packaged in 55-gal drums, B-25 containers, or SeaLand containers. The waste containers were labeled and sealed per Waste Management guidelines.

3.2 LEAD-BASED PAINT

All work involving lead was performed in accordance with the site-specific Lead Compliance Plan. Loose paint chips that were encountered at the facility were collected and managed as required per the Resource Conservation and Recovery Act. All personnel were required to have ATG-provided Lead Awareness training and were familiar with safe-handling practices and health and safety requirements. Air samples were collected during dismantlement, and blood-lead samples were collected initially and periodically during the project and scheduled for collection upon completion of the project. Loose paint chips located around the facility or found during the dismantlement process were collected with HEPA-filtered vacuum equipment, packaged, labeled to meet ORNL guidelines, and managed appropriately. Full-face respirators, company-issued clothing, and Tyvek clothing were required when there was a potential for lead to be airborne. A negative air HEPA unit was used where feasible when hot work was performed. Personnel were required to wash their hands with D-Lead soap when leaving the work area and shower at the end of the work day.

Airborne lead concentrations did not exceed current exposure limits and blood samples indicated that personnel were effectively protected from exposure to lead.

3.3 DUST

Openings to the bins and water tank were covered to prevent the contents from becoming airborne and generating dust. During dismantlement, the contents were sprayed with a water mist, shoveled out, and placed into waste containers. HEPA vacuums were used to remove the remaining residue to prevent airborne dust when the pieces were moved. Personnel removing the contents were required to wear Tyvek clothing and full-face respirators.

3.4 HOT WORK

Fire-resistant company clothes were worn at all times and fire-resistant Tyvek clothing was worn in radiologically contaminated areas. A fire watch was stationed where a clear visual could be maintained on the personnel performing the hot work and the surrounding area. The fire watch was present during hot work and for 30 min upon completion. Personnel that served as a fire watch were trained in the proper use of a fire extinguisher. All combustibles, except the plastic used to prevent contamination from getting on the ground, were removed from the area and a fire extinguisher and water spray bottle were maintained beside the fire watch. When hot work was being performed from the manlift, a fire watch and extinguisher were in the basket with the person operating the torch, and a fire watch was on the ground with extinguishers and a radio and/or a bullhorn. Full-face respirators were worn with tinted lens covers rated for the work being performed (torch cutting or welding). No hot work was allowed until an ORNL safety and health representative issued a Hot Work Permit.

3.5 HEAVY MACHINERY

Heavy machinery used for this project included a crane and forklift. Only qualified personnel were allowed to operate the machinery. Spotters were used when either piece of equipment was in use. The swing radius of the crane was roped off to keep personnel out of the vicinity. Only the operator was allowed on either piece of machinery when it was in operation. If personnel got too close to the machinery or their loads, the load was immediately secured and the equipment shut off. Daily inspections were performed on the machinery to ensure everything, including backup alarms, were operational. Hard hats were required for personnel working around heavy machinery.

3.6 NOISE

Noise monitoring was performed around generators and heavy machinery to determine if hearing protection was needed. If noise action levels were reached, hearing protection was required of all personnel and visitors in the work area. When the air nippers were in operation, double hearing protection was required by the personnel using them.

3.7 HEAVY LOADS

Heavy loads were moved with the assistance of a forklift or a crane. The loads did not exceed the lift limit for the machinery. Personnel maintained a safe distance from the loads, did not work under a suspended load, and avoided potential pinch points. The bins and water tank were not lifted until all unnecessary personnel were cleared from the area. All chokers, slings, and other rigging equipment were rated for their intended loads and inspected before use. Only qualified riggers were allowed to rig loads for lifts. Braces were welded in place on the bin supports to keep the load from shifting when it was cut. The bins were secured in place with the crane before cutting. The person cutting the supports to the bins made the last cut so that he was clear of the load. Heavy sections of the bins or water tank were supported with the forklift when being cut and then lowered slowly to the ground. Rigging and lifts performed with a crane were performed within the guidelines set forth in the Lift Plan. Hard hats were required for personnel working around heavy loads.

3.8 FALLS

Personnel working from elevated areas, including manlifts, were required to wear fall protection (harness and lanyard). Ladders were tied off and secured when in use. Scaffolding was properly erected with handrails.

4. MOBILIZATION

Mobilization occurred before actual dismantlement. Dismantlement did not occur until the Letter To Proceed was received from the ORNL Project Manager on October 7, 1997.

- Before work began, all tools and related equipment were inventoried and screened for radioactive contamination by ATG Health Physics personnel. Upon completion of work, tools and related equipment were screened again and decontaminated if necessary.

- All personnel, including subcontractors, were provided the required training necessary to enter the site and perform work. Site-specific training covering the specifics set forth in the Project Work Plan, the Health and Safety Plan, and the Lead Compliance Plan.

- All personnel were required to have whole body and lung counts before performing work on site. Blood samples were required to provide a baseline of lead and zinc protoporphyrin levels in the body.

- Upon receipt of the Excavation/Penetration Permit, an orange barrier construction fence was erected around all work areas and properly posted for both radiological and industrial safety hazards.

- On-site facilities were set up, including first aid stations, spill kit, material safety data sheets, fire extinguishers, eye wash, hand wash area, storage areas, toilet facilities, storage trailer, and entrance and exit points to controlled areas.

- The emergency contacts and phone numbers were posted as well as the Occupational Safety and Health Administration poster, exit route including assembly area, and other necessary information.

- Verification was made physically and/or by test that all utilities, including electrical services, were disconnected or rerouted. Verification was also made that all air and water lines were depressurized and disconnected before dismantlement. Power lines in the vicinity of the crane radius were insulated before dismantlement by ORNL personnel.

- The office trailer was secured by tying it down with cable to concrete highway dividers.

- The Health Physics count room was set up at the staging area.

- The Health Physics instrumentation was submitted to ORNL Instrument Calibration and certified.

5. PRELIMINARY RADIOLOGICAL SURVEY

Before material removal or dismantlement of the facility, ATG Health Physics personnel (ORNL certified and approved) performed a radiological survey to establish contamination areas and the extent of contamination present. As a result of the elevated background readings at OHF, a direct frisk survey of materials was not a feasible option. Smears on the surfaces were collected to determine if any removable contamination was present and dose rates were taken in various areas where work was to be performed. The smears, dose rates, current postings, and historical information were used to develop Radiological Work Permits (see Appendix A), establish PPE requirements, and determine monitoring required. Decontamination techniques and the dismantlement process were dictated by the results of the surveys. Boundaries were established, barriers were put in place, and the appropriate signs were posted based on the results obtained by the Health Physics technicians. The surveys were documented and submitted to ORNL for input into the plant database.

After the initial radiological survey, all work that involved exposing previously unsurveyed surfaces was performed with continuous coverage by the ATG Health Physics personnel. A daily routine survey schedule was established by the ATG Health Physics personnel. Radiological surveys were performed with hand-held ion chamber dose rate meters and Geiger-Mueller friskers or an equivalent. All instruments were in proper working order, in current calibration (see Appendix C), and response checked daily as required. Surveys were performed to identify the following radiological conditions:

- fixed surface contamination,

- loose surface contamination,

- general area dose rates,

- "hot spot" identification (radiological hot spots are defined as a radiation source that is five times the general area dose rate and/or greater than or equal to 100mrem/hour at 30cm),

- air quality, and
- free of radiological contamination.

Preliminary radiological surveys were performed again on the bins, water tank, and other miscellaneous materials when they were taken to the staging area to identify all activity or contamination.

6. OHF DISMANTLEMENT

6.1 EXTERNAL COMPONENT REMOVAL

External components including the conduit, hydraulic lines, chutes, catwalks, ladders, lighting, motors, and other miscellaneous materials were removed with power saws and torches.

- A manlift was used to access elevated areas, such as the baghouse, catwalks, and ladders. Materials removed from elevated areas were rigged to the crane, secured, cut loose from the bin, and lowered by the crane onto plastic.
- Conduit was verified deenergized and removed.
- Piping and hydraulic lines were assumed to contain residual liquids when they were cut, and proper precautions were taken. Personnel were dressed out with saranex, splash shields or full-face respirators, and rubber gloves to prevent any liquid from coming into contact with their skin. Buckets were placed under the lines or piping being cut to catch any liquid that may have been released. No liquid was found in any of the lines.
- Once all the external components were removed, they were placed on a plastic-covered flatbed with the assistance of the crane and covered with plastic.
- The removed materials were transported to the staging area, placed on plastic laydown areas with the crane, roped off with radiation boundaries, and posted as a Radioactive Material Area.

6.2 STORAGE BINS REMOVAL

The four storage bins were removed in descending order with bin # 4 being the first and bin # 1 being the last.

- With the use of a manlift, lifting lugs were welded to opposing sides on the top of each bin.
- The crane was rigged to the lugs with chokers, and tension was placed on the chokers with the crane to prevent the bin from collapsing when the supports were cut.
- A guide line was attached at a point on the bin to allow a rigger control of the load when the crane removed the bin.

- Braces were welded on each side of two support legs where the cuts were to be made. The braces allowed the support to be cut and raised but kept the legs from shifting, thus preventing an unstable or swinging load.

- The area was evacuated except for necessary personnel, which included the torch operator, fire watch, one rigger, and the crane operator.

- The two supports closest to Building 7852 were cut first to prevent a potential pinch point. The bolts holding these two supports in place on concrete foundations were cut loose, which allowed the load to remain stable but free to be lifted.

- The front supports were cut several feet higher and at the support braces put in earlier. The higher cut made it easier to lay the bin on its side when it was removed.

- Once all the cuts were made, the torch operator and fire watch were evacuated out of the area, leaving the one rigger and crane operator to remove the tank.

- The crane slowly lifted the bin out away from Building 7852, adjoining structures, and power lines. The rigger used the guide wire to lead the bin in the position needed.

- The bin was lowered horizontally onto plastic covering the ground and chocked to prevent it from shifting.

- The chokers were removed, and the bin was rigged to be lifted horizontally and placed onto the plastic-covered flatbed.

- The bin was secured on the flatbed to prevent it from shifting during transport.

- The bin was covered in plastic to prevent the release of potentially radiological contaminated materials and lead-based paint chips during transport.

- The bin was transported to the staging area, and the crane was used to remove the bin from the flatbed and place it on a plastic-covered laydown area where it was chocked to secure it from rolling.

- A radiological boundary was established around the bin and posted as a Radioactive Material Area.

- All openings to the bins were covered with plastic to prevent any airborne releases and keep rain water from getting inside.

- The remaining bins at OHF were removed in the same manner, except bin # 3, which required the lower half of the supports to be left in place because of an active ventilation system. Braces were welded on all four supports to prevent the load from shifting when it was cut.

- Remaining miscellaneous materials, such as partial supports and piping, were cut, removed, secured, and transported to the staging area for surveying and disposal.

6.3 WATER TANK REMOVAL

The water tank was removed once all the bins had been taken to the staging area. The tank had been drained, so there was no concern of a spill.

- The water tank was made of stainless steel, which did not allow lifting lugs to be welded in place with the equipment and materials available at the site. Using a torch, holes were burned into the top sections of the water tank to allow it to be rigged for removal.
- The tank was rigged to the crane, and a guide wire was put in place.
- The tank was raised slowly away from surrounding structures and power lines and lowered horizontally onto the plastic-covered ground.
- The tank was rigged to be lifted horizontally and placed on the plastic-covered flatbed.
- The tank was secured to prevent it from shifting during transport. Because it did not have any loose materials or paint, it was not wrapped in plastic like the storage bins.
- The tank was transported to the staging area, placed on a plastic-covered laydown area, and chocked to keep it in place.
- A radiological boundary was established around the tank and posted as a Radioactive Material Area.
- A radiological survey of the concrete pad that the water tank rested on determined that radiological contamination was present. With the use of scabbling, the surface was decontaminated to a lower level.

6.4 OHF FACILITY DEMOBILIZATION

Upon removal of the storage bins, water tank, and miscellaneous materials, demobilization occurred at OHF.

- The office trailer was cleaned and verified free of radiological contamination.
- Radiological postings were reposted as required.
- The HEPA vacuum was used to clean up any debris or lead-based paint chips that may have been left in the area.
- The plastic used for laydown areas was removed and disposed of in approved waste containers.
- The construction barrier fence and postings were removed.
- Equipment and machinery were transported to the staging area.

- The subcontractors tools, crane, flatbed truck, and manlift were surveyed for radiological contamination and issued a green tag.

- The key to the gate was returned to the ORNL Project Manager.

7. STORAGE BINS AND WATER TANK DISMANTLEMENT

A preliminary radiological survey of the storage bins and water tank was performed at the staging area before dismantlement. The areas were reposted as Contamination Areas before the dismantlement process and upon completion until verification radiological surveys could be performed.

7.1 STORAGE BINS DISMANTLEMENT

Bin #4 was dismantled first, followed by bins # 1, 2, and 3 in that order. Torches were used to dismantle and size the storage bins.

- The supports to the bins and remaining external components (piping, ladders, chutes, etc.) were removed.

- Before breaching each storage bin, air monitoring was performed to ensure that an explosive atmosphere was not present.

- Holes were cut in the bin for the forklift to support each section being removed. The forklift maintained tension on each section as it was cut to prevent it from falling on personnel. When the cut was completed, the forklift would lower the section onto an adjacent laydown area.

- The bins were dismantled in quarters with the top front section removed first, followed by the lower front section, the top back section, and finally the lower back section.

- Internal piping, mixers, and ladders were removed from the bins.

- Residual product on the interior of the bins was removed and packaged for disposal.

- The cut sections of the bins were direct surveyed for radiological contamination and either approved for free-release or marked for decontamination.

- Radiologically contaminated sections were decontaminated or cut away from the clean areas if decontamination methods proved ineffective.

- Sections were sized for disposal into radiologically contaminated waste containers or for placement into a recyclable metal rolloff.

7.2 WATER TANK DISMANTLEMENT

The water tank was dismantled upon completion of the storage bins dismantlement. A plasma torch was used to dismantle the water tank. Air nippers were first used in an attempt to dismantle the water tank, but proved to be ineffective.

- Before breaching the water tank, air monitoring was performed to ensure that an explosive atmosphere was not present.

- The sides of the tank were cut first. The cut was made the entire length of the tank and then approximately 4 ft up on each end of the cut. The tank was then rolled with the forklift until the top of the side cuts were close to the ground. A final cut was then made the entire length of the tank, and the section was free of the tank and resting on the ground. This method prevented the risk of a piece dropping on the person performing the cut. Approximately three-quarter of the sides were cut in this manner, with the last section remaining on top for support.

- Holes were cut in the ends of the water tank (formerly the top and bottom of the tank in its original position) for the forklift to place its forks and support the tank.

- The end supported by the forklift was then cut so that the lower half could be removed. The forklift then lowered the remaining section onto the ground. The same procedure was followed for the opposite side.

- The remainder of the tank was resting safely on the ground and able to be cut into manageable sections without the assistance of the forklift.

- Residual product on the interior of the bins was removed and packaged for disposal.

- The cut sections of the water tank were direct surveyed for radiological contamination and either approved for free-release or marked for decontamination.

- Radiologically contaminated sections were decontaminated or cut away from the clean areas if decontamination methods proved ineffective.

- Sections were sized for disposal into radiologically contaminated waste containers or for placement into a recyclable metal rolloff.

8. DECONTAMINATION

Decontamination efforts outside the original scope of work were performed to minimize the amount of waste generated. Attempts made proved highly effective on the contaminated interior area of the storage bins and water tank but were ineffective on the exterior of the sections. No liquid waste was generated during decontamination efforts because the cleaners used were absorbed into the residue product removed. The contaminated product, based on historical data, was assumed to be grout in bins # 1 and # 4, flyash in bin # 2, cement in bin # 3, and rust in the water tank.

- A dike was built to contain any potential liquid waste generated during decontamination efforts. The dike consisted of four large metal pipe sections resting on multiple layers of plastic and then covered with six more layers of plastic. The multiple layers of plastic were necessary to prevent leaks when the sharp edges of the cut sections came in contact with the dike.

- The residual product on the interior of the storage bins and water tank was sprayed with a water mist to minimize airborne particles and then shoveled into waste containers.

- The remaining residue was removed with a HEPA vacuum.

- The surfaces were scraped with metal scrapers and then vacuumed again.

- The surfaces were then cleaned multiple times with scrub brushes, water, and a strong cleaner. The HEPA vacuum was used once again on the surface.

- The surfaces were then resurveyed for radiological contamination. If contamination was still present, the contaminated area was removed with a torch.

9. WASTE PACKAGING

All waste materials were placed in approved waste containers, labeled properly, contained or sealed as required, and staged for later disposal. Waste containers consisted of one 40 ft SeaLand of radiologically contaminated metal, one partially filled 20 ft SeaLand of radiologically contaminated stainless steel, one 55-gal drum of lead-based paint, one 55-gal drum of respirator wash water, five rolloffs of clean metal for recycling, six B-25 boxes (five containing used PPE and plastic and one containing residual product removed from the storage bins and water tank), and one construction debris rolloff.

- Used plastic was double-bagged, labeled with a radiological tag, and placed into B-25 boxes.

- Used PPE was double-bagged, labeled with a radiological tag and ORNL Waste Management sticker, and placed into B-25 boxes.

- Residual material removed from the interior of the storage bins and water tank were double-bagged, labeled with a radiological tag, and placed into B-25 boxes.

- Radiologically contaminated metal and potential radiologically contaminated metal was placed into SeaLand containers. A 40 ft SeaLand container was filled primarily with piping and other components that could not be surveyed internally. The remaining material placed in the 40 ft SeaLand container consisted of sections from all the bins and their supports that could not be decontaminated. A partially filled 20 ft SeaLand contianer contained sections from bin # 3 and the top, bottom, and small areas of the stainless steel water tank that could not be decontaminated.

- Radiologically clean metal was placed into rolloffs for recycling as scrap metal; 53,660 lb of scrap metal were recycled.

- Lead paint chips were double-bagged, labeled with a radiological tag, and placed into a 55-gal drum.

- Respirator wash water was placed into a 55-gal drum.

10. DEMOBILIZATION

Partial demobilization occurred November 10, 1997, at OHF. The remaining demobilization was complete at the staging area upon completion of the project on January 12, 1998.

- The dike was disassembled, the pipes used were surveyed out, and the plastic was disposed of in approved waste containers.

- The plastic from the laydown areas was picked up and disposed of in approved waste containers.

- The laydown areas were surveyed to verify that contamination controls were effective and no radiological contamination was present.

- The equipment trailer, postings, barrier fence, and other equipment and supplies were removed from the site.

- The HEPA vacuum was used to clean up any debris or lead-based paint chips that may have been left in the area.

- Waste containers were sealed, labeled, and staged.

- The area was cleaned of debris, trash, etc.

- All equipment, tools, and rental equipment were surveyed and decontaminated as necessary.

- The storage tents were surveyed for radiological contamination and verified clean.

- Keys to the gates were returned to the ORNL Project Manger.

- All personnel were scheduled to receive exit bioassays, blood-lead sampling, and exit whole body and lung counts.

11. SUMMARY

The dismantlement of the OHF bins and water tank was successfully completed within the allotted schedule and budget. Permissible exposure limits were not exceeded, no injuries were incurred, and no health and safety violations occurred throughout the duration of the project. No spills of hazardous material or environmental releases occurred. Radiological contamination was

contained and segregated, which allowed for a large amount of material to be recycled or disposed of as clean construction debris. Multiple audits performed by regulating groups within ORNL generated many positive reviews. Coverage was provided by the ORNL health and safety group and oversight by the U.S. Department of Energy. Air monitoring verified that no exposure to radiological contamination or lead was incurred. Radiological surveys verified that no personnel contamination occurred. Toward the end of the project, ATG personnel assisted ORNL employees in the relocation and securing of the office trailer at OHF. Extra work was included and performed outside the original scope of work, including decontamination efforts and disposal of materials at the staging area for the ORNL Waste Management group. Mostly as a result of the decontamination performed on the bins and water tank, 53,660 lb of scrap metal were recycled.

APPENDIX A

RADIOLOGICAL WORK PERMITS

ORNL Radiological Work Permit		Number: AT3004-2052
Effective Date: 10/08/1997	Expires: 12/31/1997	Extended to: By:

Building: 7852

Location Description: OHF area

Description of Work: Walk over and surveillance entry. Non-intrusive work only of 7852 area.

Pre-job Conditions: Prior survey indicates maximum background dose rate measures 6.5 mR/hr. This does not include areas above buildings. Ground level tank backgrounds measures 1 mR/hr. Transferable contamination levels of 401 dpm/100cm2 Alpha, 105,302 dpm/100cm2 Beta-gamma have been recorded. This also excludes the patio level.
See Survey No: attached

Anticipated Conditions During Job: Same

Required Dosimetry: TLD, Pocket Chamber

Required Personnel Protective Equipment (PPE):
Disposable Coveralls - 1 pairs
Rubber Gloves - 1 pairs
Disposable Shoe Covers - 1 pairs

Special PPE Instructions: 1. TLD and pocket dosimeter only required for radiation areas. 2. Tyvex, shoe covers and gloves required for contamination area entry.

Radiation Protection Coverage: Intermittent

Special Instructions: 1. No system breach is covered by this RWP. 2. PPE is to be doffed at designated C-area exit. 3. Whole body frisk upon exit from C-area, where background allows. 4. Log in on RWP sign in sheet prior to entry.

Approvals

Name or Title	Signature	Date
Radiation Protection	Owen, Margaret Mccormick MMOwen	10/08/1997
ORNL Project Manager	M L Whitehead	10-8-97
ATG Work Group Superviser	James D Belling	10-9-97
Other		

To use this RWP, the signature block for assigned names or titles shall contain either an electronic or hand signature.

Issued by: Owen, Margaret Mccormick

Terminated by: MOwen Date: 1-2-98

ORNL Radiological Work Permit		Number: SAAS-2075A
Effective Date: 10/15/1997	Expires: 01/15/1998	Extended to: By:

Building: 7852

Location Description: OHF area

Description of Work: Dismantlement and removal of Grout Bins 1-4, water tank and associated systems or support functions.

Pre-job Conditions: Pre-job survey indicates maximum background dose rates of 15 mR/h at lower tank areas around frame. No contamination detected.
See Survey No: To be attached.

Anticipated Conditions During Job: Whole body dose rates expected to increase at higher elevations and possible internal contamination of tanks - this RWP is designed to cover such conditions.

Required Dosimetry: TLD, Pocket Chamber

Required Personnel Protective Equipment (PPE):
Disposable Coveralls - 1 pairs
Rubber Gloves - 1 pairs
Work Gloves one pr. leather
Disposable Shoe Covers - 1 pairs
Respiratory Protection: Full Face -Type of Cartridge: Particulate

Special PPE Instructions: 1. Company clothing, TLD, and pocket chamber required for RA entry on this RWP. 2. Additional PPE such as APR's, coveralls, gloves, and shoe covers are required for handling, cutting, grinding, or burning of materials from OHF prior to RCT material clearance survey.

Radiation Protection Coverage: Intermittent

Special Instructions: 1. Log-in on RWP prior to area entry as required. 2. Dose rate not to exceed 20 mR/day/person. 3. For portions of operation that may create airbourne activty - a neg. air unit is to be used in work area. 4. PPE is to be placed in proper recepticles upon exit from areas (where used). 5. Whole body frisk upon exit from CA. Contact HP if any personal contamination is detected.

Approvals

Name or Title	Signature	Date
Radiation Protection	Owen, Margaret Mccormick MOwen	01/02/1998
ORNL Project Manager	M L Whitehead	1-2-98
ATG Work Group Supervisor	James D Kelley	1-5-98
Other		

To use this RWP, the signature block for assigned names or titles shall contain either an electronic or hand signature.

Issued by: Owen, Margaret Mccormick

Terminated by:_____ Date:_____

APPENDIX B

HEALTH PHYSICS SURVEYS

ORNL Radiological Survey Data

Survey Number: 1 Date: 10-9-97
Time: 1300

Surveyor Badge No.: ____ Routine Survey (check if yes) ____ RWP No. ATG3004-2052

Building: 7852 Specific Location: Old Hydrofractor Facility

Description: Initial survey performed by MM Owen to verify historical data and previous surveys, prior to the start of removal of bins and components by ATG.

Instruments Used and Calibration Due Dates: ATG 2929 cal due 5/98, ATG 100357 cal due 9-30-98, ATG 121265 cal due 9-30-98, ATG B504Z cal due 6-19-98.

General Description of Radiological Conditions: See survey map and smear data sample sheet for complete survey of 7852 that will be occupied by ATG.

Division or Group Needing the Survey: ATG/ER Person-hours Spent on the Survey: 4

Completed by (signature): [signature]

Reviewed by (signature): [signature] Date: 1/12/98

Page 1 of 5

SMEAR SAMPLE DATA

NAME (HP&S)	PHONE	BLDG. NO. (HP&S)	LOCATION (SMEARS TAKEN)	DATE
Maggie Owen	NA	NA	7852 OHF	10-9-97

SMEARS NUMBERED:	RESULTS REQUIRED:	DATE COUNTED	COUNTER OPERATOR
F 1 To 41	Date N/A Time	10-9-97	Maggie Owen

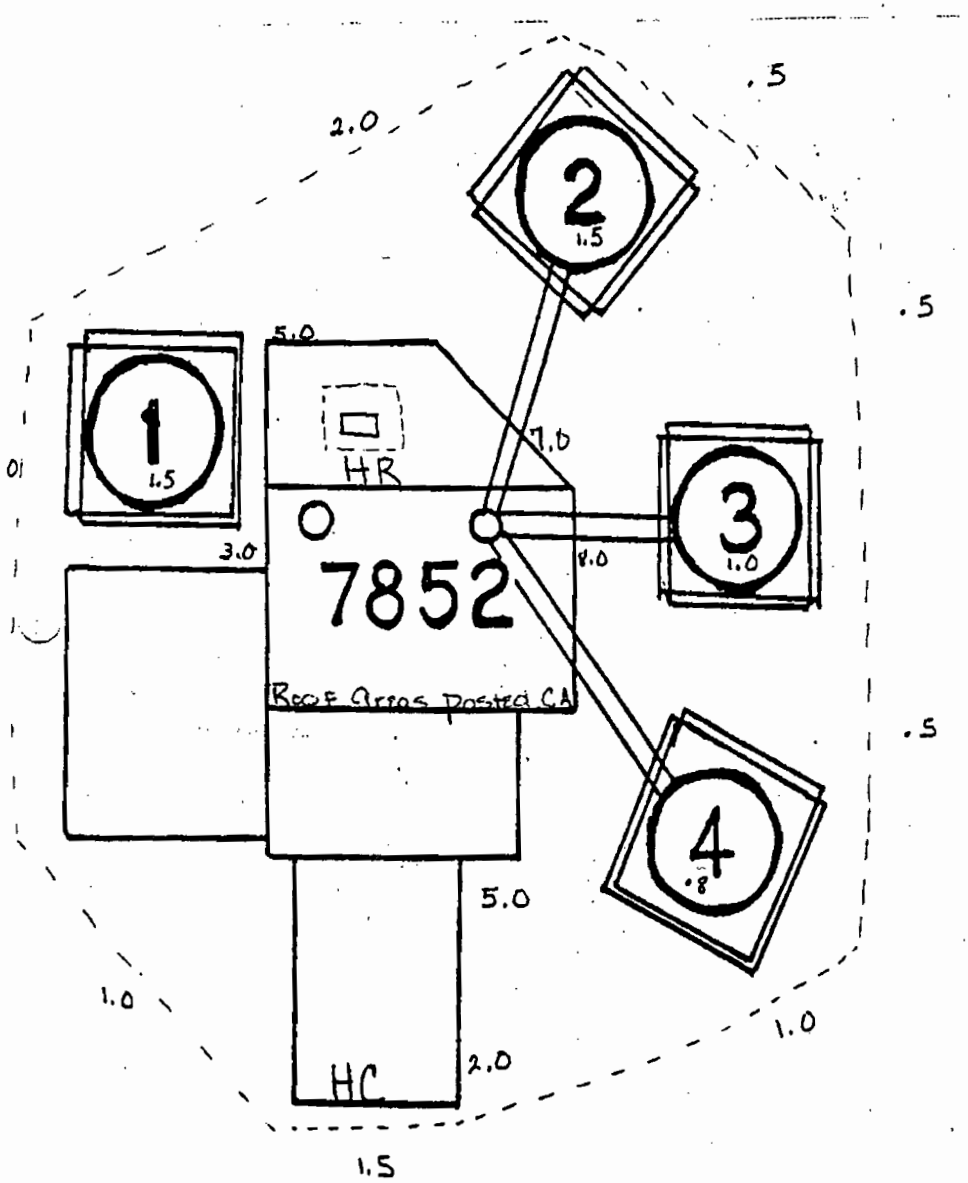
GROSS d/m ONLY ON SMEARS OVER:
20 d/m α
200 d/m β

REMARKS: ATG 2929 ATG 100357 ATG 128052 ATG B504Z

LAS denotes: Large Area Smear in DPM/LAS

	α	β	LOCATION (*)		α	β	LOCATION (*)		α	β	LOCATION (*)
1	<20	<200	Bin #1 Vertical Framework	34	<100	<1000	LAS #3	67			
2			Generator	35	<100	<1000	LAS #4	68			
3			overhead pan	36	<100	<1000	7852 Gravel	69			
4	<20	<200	horizontal Framework	37			Gravel	70			
5	<100	<1000	Bin #1 (LAS)	38			7852 Concrete wall	71			
6			LAS #2	39			7852 LAS of walls	72			
7			LAS #3	40				73			
8			LAS #4	41	<100	<1000		74			
9	<20	<200	Bin #2 Vertical Frame	42	<100	<1000	LAS (1) Bin #2	75			
10			horizontal frame	43				76			
11			piping	44				77			
12			piping	45				78			
13	<20	<1000	Bin #2 (LAS)	46				79			
14			LAS #2	47				80			
15			LAS #3	48				81			
16			LAS #4	49				82			
17			LAS #5	50				83			
18	<20	<200	Bin #3 Vertical Frame	51				84			
19	<20	<200	horizontal Frame	52				85			
20	<20	375	piping	53				86			
21	<20	1000	encased belt	54				87			
22	<20	9300	Generator area	55				88			
23	<20	1100	under Generator	56				89			
24	<100	1200	Bin #3 (LAS)	57				90			
25	<100	1000	LAS #2	58				91			
26	<100	1000	LAS #3	59				92			
27	<100	2000	LAS #4	60				93			
28	<20	<200	Bin #4 Vertical Frame	61				94			
29			horizontal Framework	62				95			
30			piping	63				96			
31			piping	64				97			
32	<100	<1000	Bin #4 LAS	65				98			
33	<100	<1000	LAS #2	66				99			

UCN-1632 (*) Give only if required.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Roof Areas Posted CA
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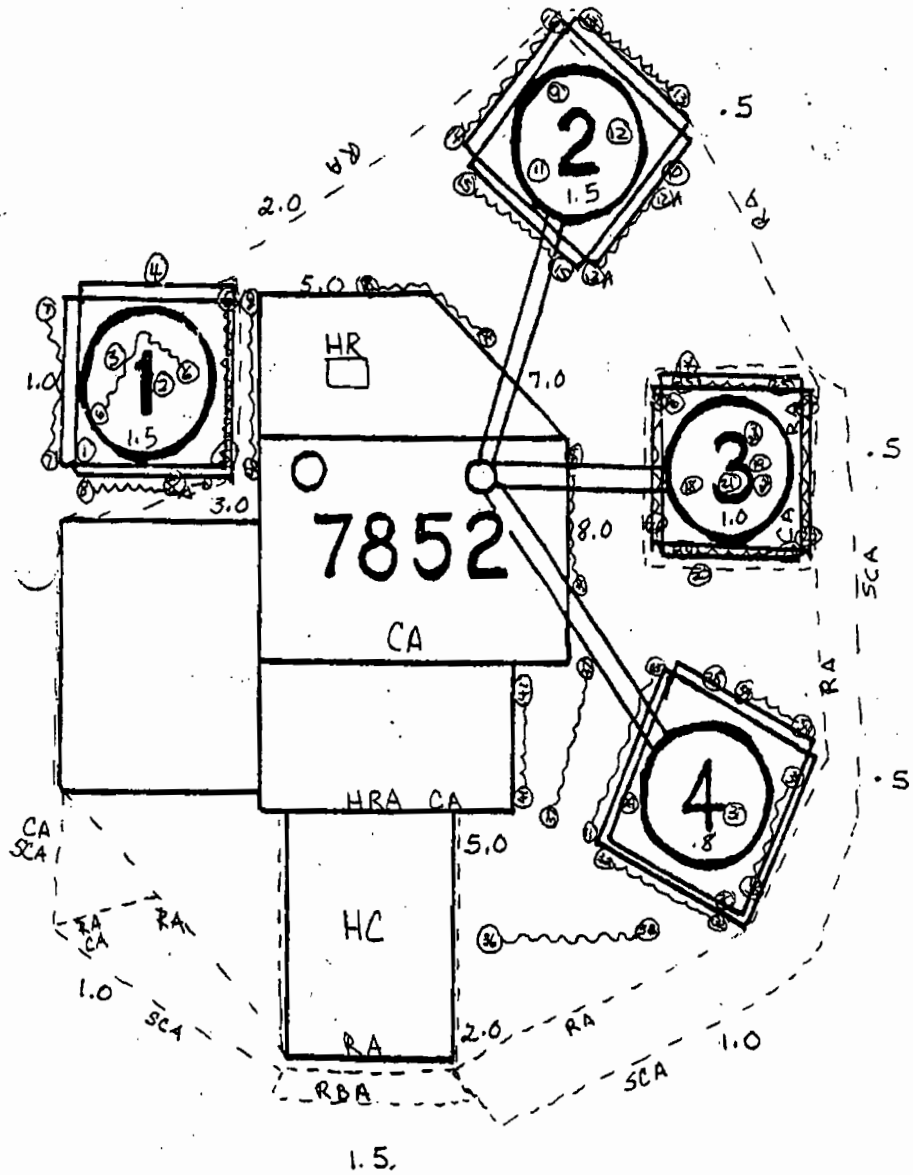
1.5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SCA
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1.5

ORNL Radiological Survey Data

Survey Number: 1A Date: 10-6-97
Time: 0900

Surveyor Badge No.: ____ ____ Routine Survey (check if yes) RWP No. N/A

Building: NA Specific Location: X-10 SWSA 5, Steam Cleaning area

Description: Direct (frisk) and smear survey of gravel area outside ATG trailer. Purpose of survey is to declare small area ok for "Eating drinking Smoking"

Instruments Used and Calibration Due Dates: ATG 100357 (9-30-98) ATG 2929 (5/98) ATG 100502 (9-30-98)

General Description of Radiological Conditions: No fixed or transferable contamination detected by direct probe or large area smear. All LAS's <100 DPM/LAS Alpha, <1000 DPM/LAS Beta-Gamma

Division or Group Needing the Survey: ATG/ER Person-hours Spent on the Survey: 1

Completed by (signature): Maggie Davis

Reviewed by (signature): [illegible] Date: 1/18/98

Page 1 of 1

ORNL Radiological Survey Data

vey Number: 2 Date: 10-9-97
me: 1300

Surveyor Badge No.: ____ ____ Routine Survey (check if yes) RWP No. N/A

Building: 7852 area Specific Location: break trailer @ OHF

Description: Survey to declare inside of break trailer clean from contamination. Designate as Eating, drinking area - Also front stairs to designate as smoking area.

Instruments Used and Calibration Due Dates: ATG 2929, ATG 128052, ATG 100357 ATG B5047

General Description of Radiological Conditions: Disc smears taken on interior of trailer all <20 DPM/100 cm² alpha, <200 DPM/100cm beta-gamma. See smear data sample sheet for exact locations. Front stairs LASed all <1000 DPM/100 beta gamma <100 DPM/100 alpha. G/A dose rate inside trailer 0.5 mr/hr

Division or Group Needing the Survey: ATG Person-hours Spent on the Survey: 1

Completed by (signature): [signature]

Reviewed by (signature): [signature] Date: 1/12/98

SMEAR SAMPLE DATA

NAME (HP&S)	PHONE	BLDG. NO. (HP&S)	LOCATION (SMEARS TAKEN)	DATE
Maggie Owen	N/A	7852	break trailer	10-9-97
SMEARS NUMBERED:	**RESULTS REQUIRED:**		**DATE COUNTED**	**COUNTER OPERATOR**
Fr 1 To 13	Date N/A Time		10-9-97	Maggie Owen
G/M ONLY ON SMEARS OVER:	REMARKS:			
20 d/mα	ATG 2929	ATG 100357		
200 d/mβ	ATG 128052	ATG B504Z		

α	β	LOCATION (*)	α	β	LOCATION (*)	α	β	LOCATION (*)
1 <100	<1000	Front stairs	34			67		
2		wood railing	35			68		
3		platform	36			69		
4 <100	<1000	outer door	37			70		
5 <20	<200	Desk #1	38			71		
6		Floor	39			72		
7		door knob	40			73		
8		Desk #2	41			74		
9		Lightswitch	42			75		
10		floor	43			76		
11		wall	44			77		
12		back door	45			78		
13 0	<200	cabinet	46			79		
14			47			80		
15			48			81		
16			49			82		
17			50			83		
18			51			84		
19			52			85		
20			53			86		
21			54			87		
22			55			88		
23			56			89		
24			57			90		
25			58			91		
26			59			92		
27			60			93		
28			61			94		
29			62			95		
30			63			96		
31			64			97		
32			65			98		
33			66			99		

UCN-1632 (3 7-67) (*) Give only if required.

2

ORNL Radiological Survey Data

Survey Number: 3 Date: 10-15-97
Time: 1400

Surveyor Badge No.: _____ ___ Routine Survey (check if yes) RWP No. ATG-3004-2052

Building: 7852 Specific Location: Bin # 1,2,3,4 & associated pipes & Framework.

Description:
Radiation & Contamination survey of areas accessible by Ladder around Bins up to 10 ft.

Instruments Used and Calibration Due Dates: ATG 2929 cal due 5/98
121265 Mo. 10-15-97
ATG ~~128052~~ Cal due 9-30-98, ATG 100357 9-30-98
ATG B504Z Cal due 6-19-98

General Description of Radiological Conditions: No transferrable contamination detected in areas ATG workers will come into contact with. Highest dose rate in work area 15mr/hr. Direct frisk of area not possible due to high background.

Division or Group Needing the Survey: ATG/ER Person-hours Spent on the Survey: 3

Completed by (signature): [signature]

Reviewed by (signature): [signature] Date: 1/12/98

Page 1 of 1

ORNL Radiological Survey Data

Survey Number: 4 Date: 10-16-97
Time: 0800

Surveyor Badge No.: _____ ____ Routine Survey (check if yes) RWP No. N/A

Building: N/A Specific Location: ER / Change trailers

Description: Incoming survey of C. Reed Davis vehicles and heavy equipment. Crane # FL-0865, Flatbed truck DC 183A, Semi TN Z 52060 also gang box and various cables.

Instruments Used and Calibration Due Dates: ATG 100357 (9-30-98) ATG 2929 (5/98) ATG 100502 (9-30-98)

General Description of Radiological Conditions: All measurements < 100 DPM/100 Alpha, < 1000 DPM/100 Beta-gamma. No fixed contamination detected by direct frisk. Disc smears taken on equipment < 20 DPM/100 cm² Alpha < 200 DPM/100 cm² Beta-gamma.

Division or Group Needing the Survey: ATG / ER Person-hours Spent on the Survey: 2

Completed by (signature): Maggie Davis

Reviewed by (signature): [signature] Date: 1/12/98

ORNL Radiological Survey Data

Survey Number: 5 Date: 10-29-97
Time: 0800

Surveyor Badge No.: _____ ____ Routine Survey (check if yes) RWP No. ATG-3004-3005

Building: 7852 Specific Location: OHF

Description: Post bin removal survey to reflect area as left by ATG.

Instruments Used and Calibration Due Dates: ATG B5047 (6-19-98), ATG 100357 (9-30-98), ATG 121265 (9-30-98)

General Description of Radiological Conditions: All large area smears taken on gravel <100 DPM/100S alpha, <1000 DPM/100S Beta-gamma. Radiation boundries were not affected by removal of bins 1-4. Contamination area under remains of bin # 3 remains posted as found. See Map for dose rates.

Division or Group Needing the Survey: ATG/ER Person-hours Spent on the Survey: 2

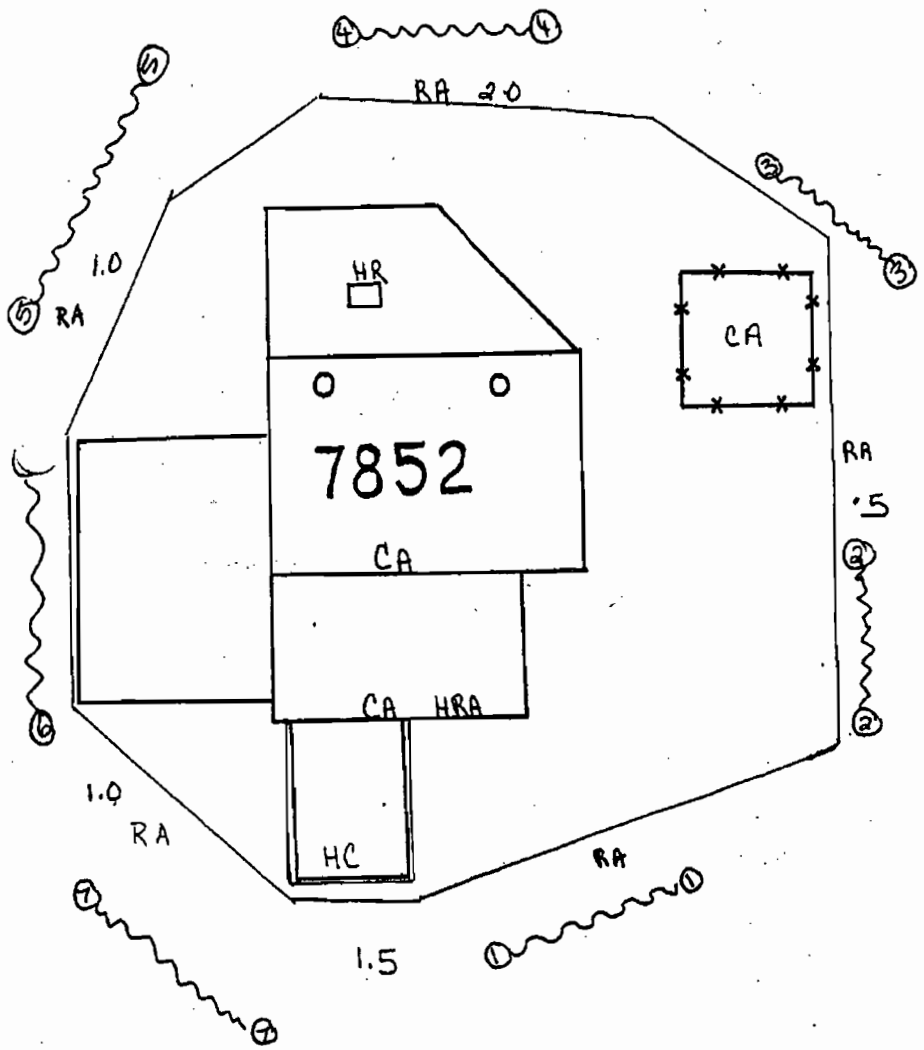
Completed by (signature): Maggie Owen

Reviewed by (signature): [signature] Date: 1/12/98

Page 1 of 2

Radiation Survey of 7852

Maggie Quinn



HC - high Contamination Area
RA - radiation Area
CA - Contamination Area
HR - High radiation Area

2

ORNL Radiological Survey Data

Survey Number: 06 Date: 10-30-97
Time: 1100

Surveyor Badge No.: _ NA Routine Survey (check if yes) RWP No. SAAS-2075

Building: SWSA 5 Specific Location: OHF Water Tank

Description: Massalum survey and direct frisk survey of OHF water tank: Outside survey only.

Instruments Used and Calibration Due Dates: ATG 2929 (5/98)
ATG 100357 (9-30-98), ATG 125261 (9-30-98)

General Description of Radiological Conditions: Massalum survey of outside of water tank, found no smearable contamination. Direct frisk of tank located no fixed Alpha and fixed Beta - gamma contamination ranging from 1000 - 300,000 DPM/100 cm^2

Division or Group Needing the Survey: ATG / ER Person-hours Spent on the Survey: 20

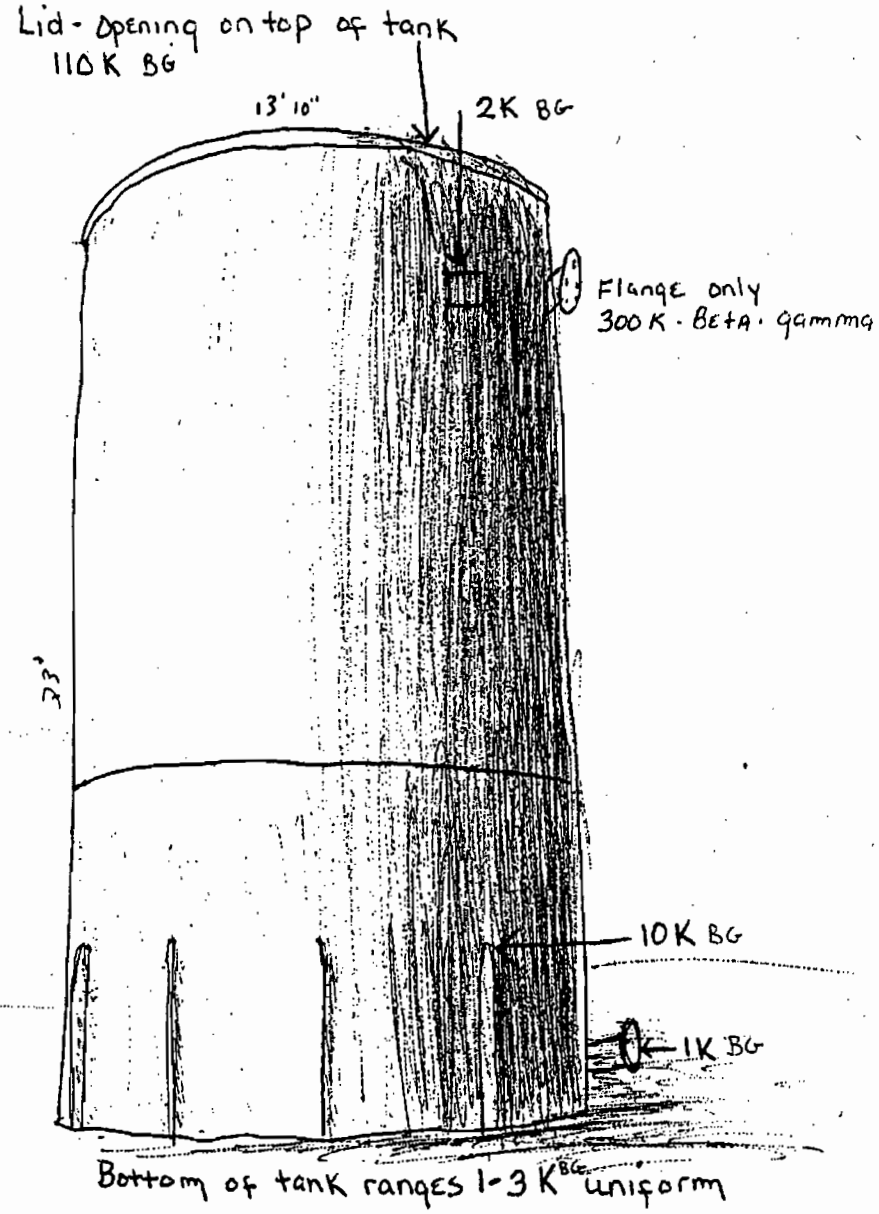
Completed by (signature): Maggie Owen

Reviewed by (signature): Ted Walker Date: 1/10/98

1 Water Tank

This survey does not represent 100% of tank, accessible areas only
No transferrable detected.

approx. 5 Locations on top of tank ranging 1-24K BG



Tank is posted: Radioactive Material

MA
10-30-97

2

ORNL Radiological Survey Data

Survey Number: 7 Date: 10-30-97
Time: 0800

Surveyor Badge No.: _____ ___ Routine Survey (check if yes) RWP No. SAAS-2075

Building: SWSA 5 Specific Location: OHF Bin # 3

Description: Massalin and direct frisk survey of Bin # 3 prior to disassembly. Outside survey only.

Instruments Used and Calibration Due Dates: ATG 100357 (9-30-98), ATG 125261 (9-30-98)

General Description of Radiological Conditions: Massalin survey found no smearable alpha contamination and 1000 DPM/100 cm² beta-gamma. Fixed contamination ranges from 1000 DPM/100 cm² to 100,000 DPM/100 cm² beta-gamma. No fixed alpha detected.

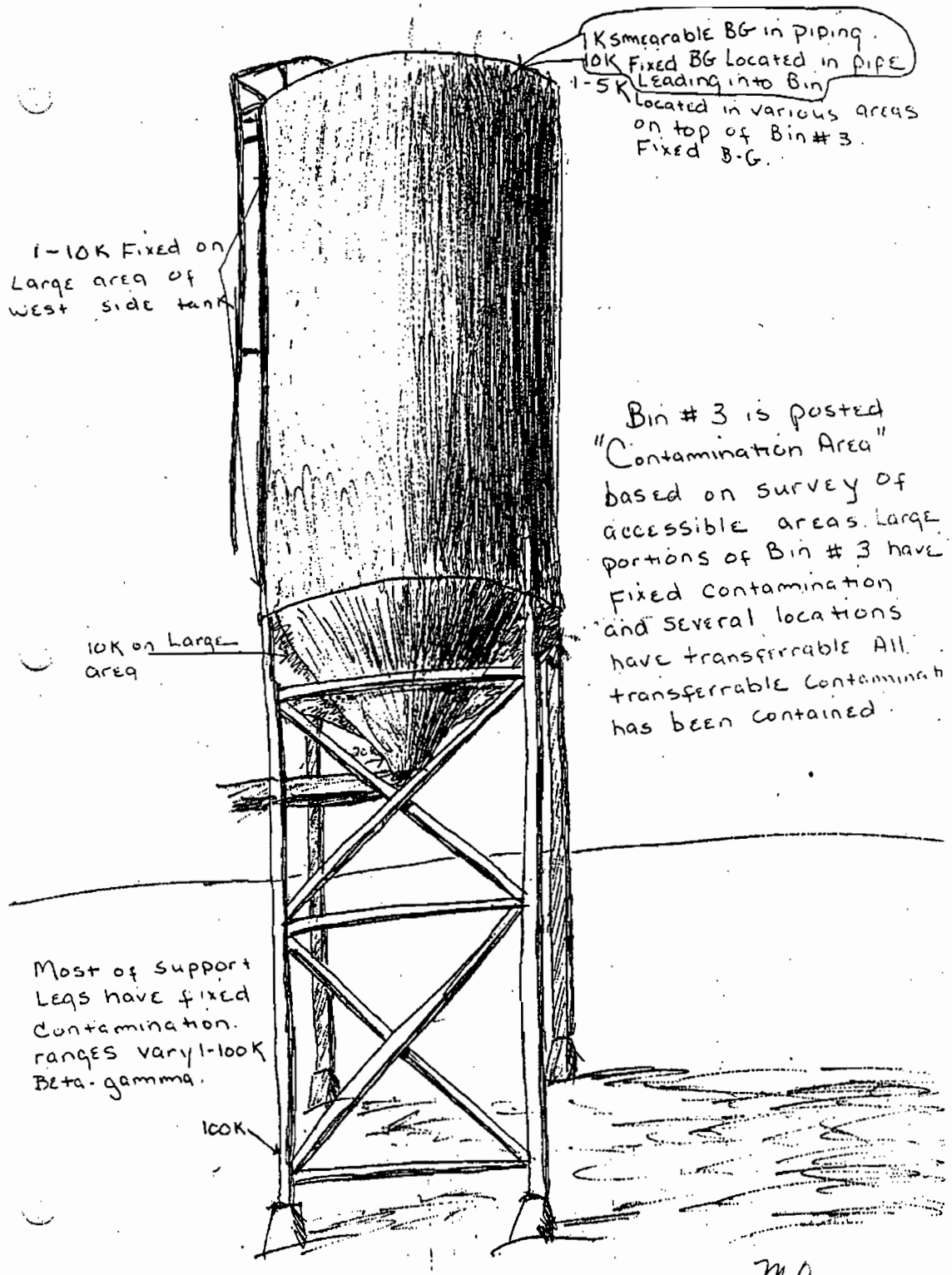
Division or Group Needing the Survey: ATG/ER Person-hours Spent on the Survey: 20

Completed by (signature): Maggie Lewis

Reviewed by (signature): C A Walker Date: 1/18/98

Page 1 of 2

Bin #3



Bin #3 is posted "Contamination Area" based on survey of accessible areas. Large portions of Bin #3 have Fixed contamination and several locations have transferrable All transferrable Contaminat has been contained.

M Owen
10-30-97 (2)

ORNL Radiological Survey Data

Survey Number: 8 Date: 11-4-97

me: 940938

Surveyor Badge No.: _____ ___ Routine Survey (check if yes) RWP No. SAAS-2075

Building: SWSA 5 Specific Location: OHF Bin #4

Description: Massalin and direct frisk survey on outside of bin #4.

Instruments Used and Calibration Due Dates: ATG 100357 (9-30-98). ATG 125261 (9-30-98)

General Description of Radiological Conditions: Massalin survey detected no transferrable contamination on outside of bin. Fixed beta-gamma levels up to 6000 DPM/100 no alpha detected

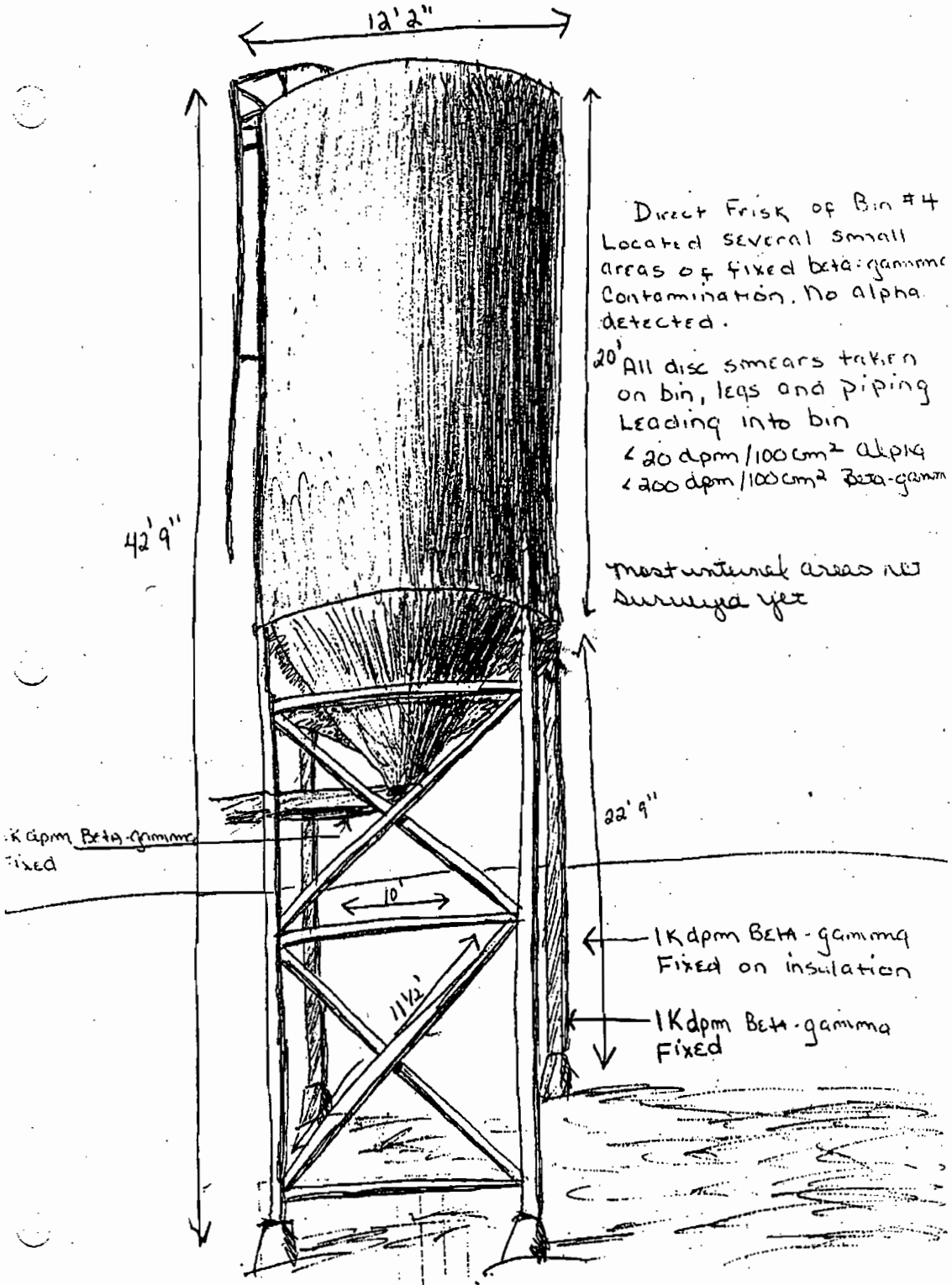
Division or Group Needing the Survey: ATG/ER Person-hours Spent on the Survey: 20

Completed by (signature): Maggie Owen

Reviewed by (signature): C. Allen Date: 1/12/98

Page 1 of 2

Bin #4



Bin is posted; Radioactive Material

M Olmer
11-4-97

ORNL Radiological Survey Data

Survey Number: 9 Date: 11-4-97

Time: 0900

Surveyor Badge No.: ____ ___ Routine Survey (check if yes) RWP No. SABS-2079

Building: SWSA 5 Specific Location: OHF Bin #1

Description: Direct frisk and massalin survey of bin #1. Outside survey only. Random disc smears.

Instruments Used and Calibration Due Dates: ATG 2929 (5-98), ATG 100357 (9-30-98), 125261 (9-30-98)

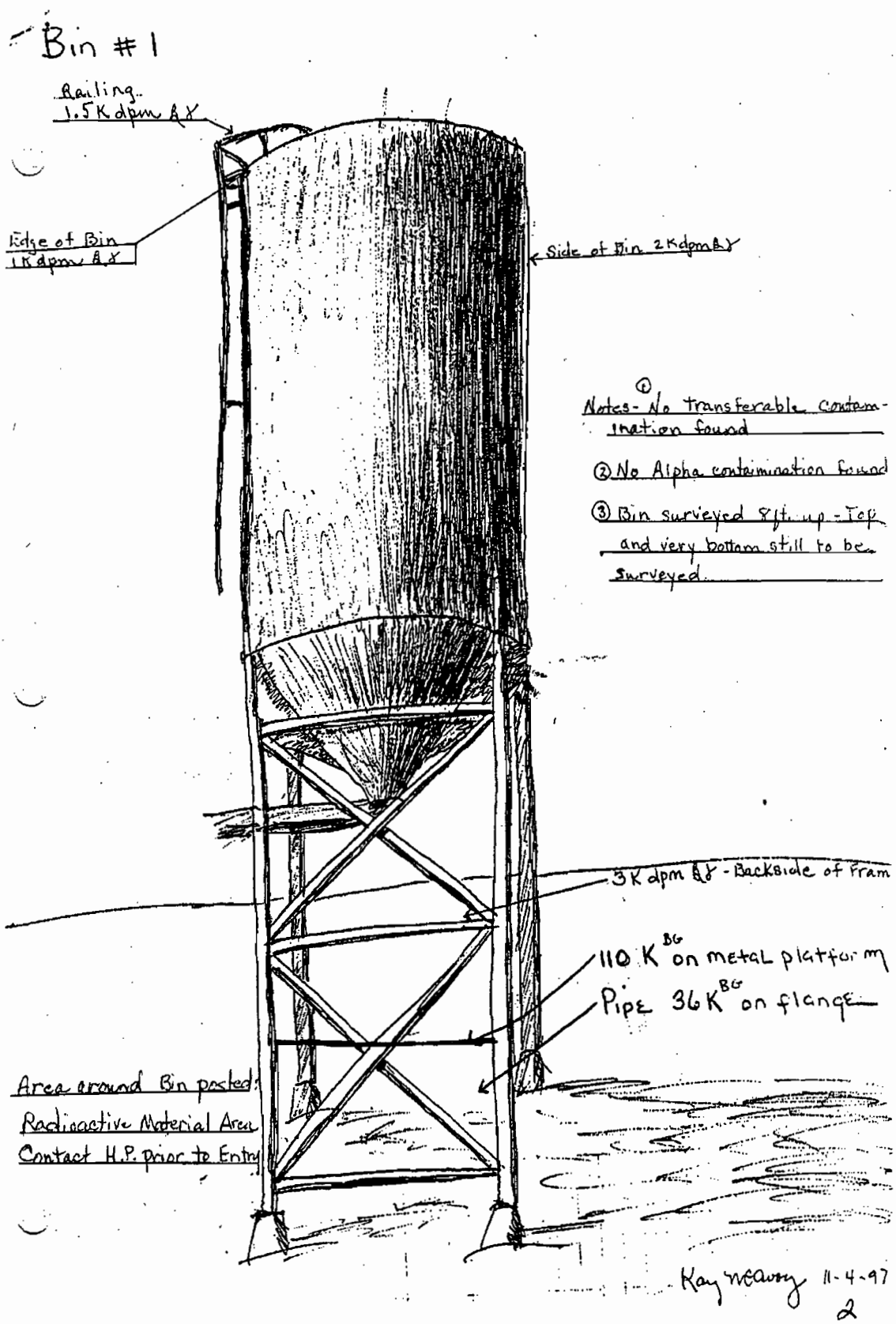
General Description of Radiological Conditions: Fixed beta-gamma contamination up to 110,000 DPM/100 cm². No alpha detected. No transferable contamination detected by las & disc smears.

Division or Group Needing the Survey: ATG/ER Person-hours Spent on the Survey: 20

Completed by (signature): Marvell [illegible] / Kay McAvoy

Reviewed by (signature): [illegible] ___ Date: 1/12/98

Page 1 of 2


Bin #1
Railing 1.5K dpm β/γ
Ridge of Bin 1K dpm β/γ
Side of Bin 2K dpm β/γ
Notes- ① No transferable contamination found
② No Alpha contamination found
③ Bin surveyed 8ft. up - Top and very bottom still to be surveyed.
3K dpm β/γ - Backside of Fram
110 K BG on metal platform
Pipe 36K BG on flange
Area around Bin posted: Radioactive Material Area Contact H.P. prior to Entry
Kay Heavey 11-4-97
2

ORNL Radiological Survey Data

Survey Number: 10 Date: 11-4-97

Time: 1100

Surveyor Badge No.: _____ ✓ Routine Survey (check if yes) RWP No. NA

Building: SWSA 5 Specific Location: White tent

Description: Routine weekly survey of white tent used as EDS area.

Instruments Used and Calibration Due Dates: ATG 100357 (9-30-98), ATG 100502 (9-30-98)

General Description of Radiological Conditions: No fixed or transferable contamination detected by direct frisks or large area smears.

Division or Group Needing the Survey: ATG/ER Person-hours Spent on the Survey: .5

Completed by (signature): Maggie Owen

Reviewed by (signature): [illegible] Date: 1/18/98

Page 1 of 1

ORNL Radiological Survey Data

Survey Number: 11 Date: 11-18-97
Time: 1200

Surveyor Badge No.: _____ ✓ Routine Survey (check if yes) RWP No. DQ

Building: SWSA 5 Specific Location: White tent

Description: Routine smear survey of EDS tent used by ATG.

Instruments Used and Calibration Due Dates: ATG 100357 (9-30-98), ATG 100502 (9-30-98)

General Description of Radiological Conditions: No transferrable contamination detected by large area smears. All LAS's <100 DPM/LAS alpha, <1000 DPM/LAS Beta-Gamma.

Division or Group Needing the Survey: ATG/ER Person-hours Spent on the Survey: .5

Completed by (signature): Maggie Owen

Reviewed by (signature): [signature] Date: 1/18/98

Page 1 of 1

ORNL Radiological Survey Data

Survey Number: 12 Date: 11-18-97
Time: 1100

Surveyor Badge No.: ____ ___ Routine Survey (check if yes) RWP No. na

Building: SWSA 5 Specific Location: C-hand

Description: Survey on C-hand #3046610 prior to entry by crew members.

Instruments Used and Calibration Due Dates: ATG 100357 (9-30-98) ATG 100502 (9-30-98), ATG 2929 (5-98)

General Description of Radiological Conditions: No fixed or transferable contamination detected by smear survey or direct frisk.

Division or Group Needing the Survey: ATG/ER Person-hours Spent on the Survey: 1

Completed by (signature): Maggie Owen

Reviewed by (signature): [illegible] Date: 1/12/98

Page 1 of 1

ORNL Radiological Survey Data

Survey Number: 13 Date: 11-25-97

Time: 0900

Surveyor Badge No.: _____ ✓ Routine Survey (check if yes) RWP No. na

Building: SWSA 5 Specific Location: H.P. trailer

Description: Routine survey of H.P. trailer & radiological buffer area:

Instruments Used and Calibration Due Dates: ATG 2929 (5/98)

General Description of Radiological Conditions: All disc smears taken on floor, walls, and equipment <20 DPM/100cm² alpha, <200 DPM/100 cm² Beta-Gamma.

Division or Group Needing the Survey: ATG/ER Person-hours Spent on the Survey: .5

Completed by (signature): Maggie Owen

Reviewed by (signature): [illegible] Date: 1/1/98

Page 1 of 1

ORNL Radiological Survey Data

Survey Number: 14 Date: 11-25-97
Time: 1400

Surveyor Badge No.: ✓ Routine Survey (check if yes) RWP No. na

Building: SWSA 5 Specific Location: ATG Tent

Description: Routine survey to check for contamination in area designated as ok for eating, drinking, and smoking.

Instruments Used and Calibration Due Dates: ATG 100357 (9-30-98), ATG 100502 (9-30-98)

General Description of Radiological Conditions: No transferrable contamination detected by large area smears

Division or Group Needing the Survey: ATG / ER Person-hours Spent on the Survey: .5

Completed by (signature): Maggie Quinn

Reviewed by (signature): [illegible] Date: 1/18/98

Page 1 of 1

ORNL Radiological Survey Data

Survey Number: 15 Date: 11-26-97
Time: 1630

Surveyor Badge No.: ✓ Routine Survey (check if yes) RWP No. NA

Building: SWSA 5 Specific Location: C-areas around Bins 1-4 & Waterton

Description: Routine direct frisk survey of ground outside Contamination area ropes to verify clean. Massalin used to check for transferrable Contamination.

Instruments Used and Calibration Due Dates: ATG 100357 (9-30-98), ATG 100502 (9-30-98)

General Description of Radiological Conditions: No transferrable or fixed Contamination detected by Large area smear or direct frisk.

Division or Group Needing the Survey: ATG / ER Person-hours Spent on the Survey: 2

Completed by (signature): Maggie Owen

Reviewed by (signature): [illegible] Date: 1/12/98

Page 1 of 1

ORNL Radiological Survey Data

Survey Number: 16 Date: 11-26-97
Time: 0900

Surveyor Badge No.: ✓ Routine Survey (check if yes) RWP No. NA

Building: SWSA 5 Specific Location: ATG Forklift

Description: routine smear and direct frisk survey on forklift used by ATG to transport material out of contamination areas.

Instruments Used and Calibration Due Dates: ATG 2929 (5/98), ATG 100357 (9-30-98), ATG 100502 (9-30-98)

General Description of Radiological Conditions: All disc smears <20 DPM/100 cm alpha, <300 DPM/100 cm² beta-gamma. All random direct frisk <100 DPM/100 cm² alpha, <1000 DPM/100 cm² beta-gamma.

Division or Group Needing the Survey: ATG/ER Person-hours Spent on the Survey: 1

Completed by (signature): Maggie Owen

Reviewed by (signature): [illegible] Date: 1/18/98

Page 1 of 1

ORNL Radiological Survey Data

Survey Number: 17 Date: 12-1-97
Time: 0800

Surveyor Badge No.: ✓ Routine Survey (check if yes) RWP No. na

Building: SWSA 5 Specific Location: RBA in white tent

Description: Disc smear survey of RBA in white tent used to store radioactive material.

Instruments Used and Calibration Due Dates: ATG 2929 (5/98)

General Description of Radiological Conditions: All disc smears < 20 dpm/100cm² alpha, < 200 dpm/100 cm² beta-gamma.

Division or Group Needing the Survey: ATG/ER Person-hours Spent on the Survey: .5

Completed by (signature): Maggie Owen

Reviewed by (signature): [signature] Date: 1/12/98

Page 1 of 1

ORNL Radiological Survey Data

Survey Number: 18 Date: 12-1-97
me: 1600

Surveyor Badge No.: ✓ Routine Survey (check if yes) RWP No. NA

Building: SWSA 5 Specific Location: White tent

Description: Transalpha and direct frisk survey of large white tent used as eating, drinking smoking area.

Instruments Used and Calibration Due Dates: ATG 100357 (9-30-98), ATG 121265 (9-30-98)

General Description of Radiological Conditions: No fixed or transferrable contamination detected by survey of EDS area. All LAS's <100 DPM/LAS alpha, <1000 DPM/LAS beta-gamma

Division or Group Needing the Survey: ATG/ER Person-hours Spent on the Survey: .5

Completed by (signature): [signature]

Reviewed by (signature): [signature] Date: 1/18/98

Page 1 of 1

ORNL Radiological Survey Data

Survey Number: 19 Date: 12-8-97
Time: 0900

Surveyor Badge No.: ✓ Routine Survey (check if yes) RWP No. NA

Building: SWSA 5 Specific Location: White tent

Description: Routine Massalion Survey of large white tent used by ATG as eating, drinking & smoking area.

Instruments Used and Calibration Due Dates: ATG 100357 (9-30-98)
ATG 121265 (9-30-98)

General Description of Radiological Conditions: No transferable contamination detected by large area smears.

Division or Group Needing the Survey: ATG / ER Person-hours Spent on the Survey: .5

Completed by (signature): [signature]

Reviewed by (signature): [signature] Date: 1/12/98

ORNL Radiological Survey Data

Survey Number: 20 (Survey # out of order due to Late entry) Date: 12-16-97
Time: 0830

Surveyor Badge No.: _ ✓ Routine Survey (check if yes) RWP No. NA

Building: SWSA 5 Specific Location: White tent

Description: Routine Nassalion Survey of large white tent used by ATG as eating, drinking, smoking area.

Instruments Used and Calibration Due Dates: ATG 100357 (9-30-98), ATG 121265 (9-30-98)

General Description of Radiological Conditions: No transferable contamination detected by large area smears.

Division or Group Needing the Survey: ATG/ER Person-hours Spent on the Survey: .5

Completed by (signature): Maggie Owen

Reviewed by (signature): [illegible] Date: 1/18/98

ORNL Radiological Survey Data

Survey Number: 21 Date: 12-9-97
Time: 1300

Surveyor Badge No.: ____ ____ Routine Survey (check if yes) RWP No. SAAS 3015

Building: N/A Specific Location: X-10, SWSA 5, OHF bins 1 & 4

Description: Disc smear and direct frisk survey of all metal placed in roll-off #1.

Instruments Used and Calibration Due Dates: ATG 2929 (5/98), ATG 100356 (4-7-98) ATG 100357 (9-30-98) ATG 121265 (9-30-98)

General Description of Radiological Conditions: Contents of roll-off #1 are a combination of metal from the upper levels of bins 1 & 4 and auxiliary structural supports from all four bins. This metal meets DOE 5400.5 standards for unconditional release of material. All disc smears <20 DPM/100 cm² alpha, <200 DPM/100 cm² Beta-gamma. Direct frisk <100 DPM/100 cm² alpha, <1000 DPM/100 cm² Beta-gamma.

Division or Group Needing the Survey: ATG/ER Person-hours Spent on the Survey: 40

Completed by (signature): Maggie Dunn See GT# 343596

Reviewed by (signature): [signature] Date: 12-11-97
[signature] 1/12/98 Page 1 of 1

SMEAR SAMPLE DATA

NAME (HP&S)	PHONE	BLDG. NO. (HP&S)	LOCATION (SMEARS TAKEN)	DATE
Maggie Owen	N/A	9733AS	Bin #1 Sheet metal	12-5-97
SMEARS NUMBERED:	**RESULTS REQUIRED:**		**DATE COUNTED**	**COUNTER OPERATOR**
From 1 To 53	Date N/A Time		12-5-97	Maggie Owen
GO/NO GO ONLY ON SMEARS OVER:	**REMARKS:**			
20 d/m α	ATG 2929 Cal due 5/98			
200 d/m β	Smears taken on sheet metal for Green tag			

α	β	LOCATION (*)	α	β	LOCATION (*)	α	β	LOCATION (*)
1 <20	<200	Bin #1	34 <20	<200	Sheet metal ④	67		
2		Sheet metal ①	35			68		
3			36			69		
4			37			70		
5			38			71		
6			39			72		
7			40			73		
8			41			74		
9			42			75		
10			43			76		
11			44		Sheet metal ⑤	77		
12		Sheet metal ②	45			78		
13			46			79		
14			47			80		
15			48			81		
16			49			82		
17			50			83		
18			51			84		
19			52			85		
20			53 <20	<200	#5	86		
21			54			87		
22		Sheet metal ③	55			88		
23			56			89		
24			57			90		
25			58			91		
26			59			92		
27			60			93		
28			61			94		
29			62			95		
30			63			96		
31			64			97		
32			65			98		
33 <20	<200	#3	66			99		

UCN-1632 (★) Give only if required.
3 7-671

2

ATG INC.

ALLIED TECHNOLOGY GROUP

Material Release Certification

The scrap metal referenced below originated from the dismantlement of the Old Hydrofracture bins and water tank at ORNL, performed by ATG, Inc., under Subcontract Number 1GX-JWQ34V, Supplemental Agreement No. 6. A 100% surface survey of the scrap metal was provided by a Radiation Control Technician qualified in accordance with 10 CFR 835. The metal was surveyed, segregated, and staged for final disposition. The metal staged for recycle from the area designated below has been confirmed to meet DOE 5400.5 standards for unconditional release and is packaged for transport to Southern Salvage. See supporting survey data and qualifying documentation.

OHF Bin / Tank Identity Bins # 1 & 4 (see attachment for details)

Roll-Off Bin / Load Number 1

Certified By: Margaret Owen, RCT
Name Printed, Title

Margaret Owen 12-9-97
Signature, Date

Organization: ATG, Inc.

99A Midway Lane, Oak Ridge, TN 37830
(423) 482-3275 FAX: (423) 482-3138

SMEAR SAMPLE DATA

NAME (HP&S)	PHONE	BLDG. NO. (HP&S)	LOCATION (SMEARS TAKEN)	DATE
Maggie Owen	NA	SWSA 5	Bin #4	12-3-97

SMEARS NUMBERED:	RESULTS REQUIRED:	DATE COUNTED	COUNTER OPERATOR
F 1 To 66	Date Time	12-3-97	Maggie Owen

GO/NO GO ONLY ON SMEARS OVER:
20 d/m α
200 d/m β

REMARKS:
Results recorded on disc smears only. Greentagged
All LAS's <100 DPM/LAS Alpha
<1000 DPM/LAS Beta-gamma
ATG 2929 metal

	α	β	LOCATION (*)		α	β	LOCATION (*)		α	β	LOCATION (*)
1	<20	<200	Sheet metal	34	<20	<200	Bin #4 Panel 4	67			
2			Bin # 4 Panel	35				68			
3				36				69			
4				37				70			
5				38				71			
6				39				72			
7				40				73			
8				41				74			
9				42				75			
10				43				76			
11				44	<20	<200		77			
12				45			Support beams	78			
13				46			& metal parts	79			
14				47				80			
15			Bin #4 Panel 2	48				81			
16				49				82			
17				50				83			
18				51				84			
19				52				85			
20				53				86			
21				54				87			
22				55				88			
23				56				89			
24				57				90			
25				58				91			
26				59				92			
27			Bin #4 Panel 3	60				93			
28				61				94			
29				62				95			
30				63				96			
31				64				97			
32				65				98			
33	<20	<200		66	<20	<200		99			

UCN-1632 (3 7-67)

(*) Give only if required.

ORNL Radiological Survey Data

Survey Number: 22 Date: 12-17-97
Time: 1500

Surveyor Badge No.: ____ ____ Routine Survey (check if yes) RWP No. SAAS 207

Building: SWSA 5 Specific Location: DHF bins 1 & 2

Description: Disc smear and direct frisk survey of all metal placed in roll-off #2

Instruments Used and Calibration Due Dates: ATG 100357 (9-30-98) ATG 121265 (9-30-98), ATG 100356 (4-7-98 Ludlum # 2929-131370 (10-98)

General Description of Radiological Conditions: Contents of roll-off #2 are a combination of scrap metal from bins 1 & 2. Primarily, the body of bins 1 & 2, with 2 lids and some structural support. All metal meets DOE 5400.5 standards for unconditional release of material. All disc smears < 20 DPM/100 cm² Alpha See Green Tag # 343598
< 200 DPM/100 cm² Beta-gamma, < alpha, < 1000 DPM/100 cm² Beta-gamma.
All direct frisk < 100 DPM/100 cm² alpha, < 1000 DPM/100 cm² Beta-gamma.

Division or Group Needing the Survey: ATG / ER Person-hours Spent on the Survey: 40

Completed by (signature): Maggie Owen

Reviewed by (signature): John L Whitehead Date: 12-18-97
1/12/98

Page 1 of 2

ATG INC.

ALLIED TECHNOLOGY GROUP

Material Release Certification

The scrap metal referenced below originated from the dismantlement of the Old Hydrofracture bins and water tank at ORNL, performed by ATG, Inc., under Subcontract Number 1GX-JWQ34V, Supplemental Agreement No. 6. A 100% surface survey of the scrap metal was provided by a Radiation Control Technician qualified in accordance with 10 CFR 835. The metal was surveyed, segregated, and staged for final disposition. The metal staged for recycle from the area designated below has been confirmed to meet DOE 5400.5 standards for unconditional release and is packaged for transport to Southern Salvage. See supporting survey data and qualifying documentation.

OHF Bin / Tank Identity Bins #1 & 2 (see attachment for details)

Roll-Off Bin / Load Number 2

Certified By: Maggie Owen, RCT
Name Printed, Title

Margaret Owen 12-17-97
Signature, Date

Organization: ATG, Inc.

99A Midway Lane, Oak Ridge, TN 37830
(423) 482-3275 FAX: (423) 482-3138

ORNL Radiological Survey Data

Survey Number: 23 Date: 12-17-97
Time: 1530

Surveyor Badge No.: _____ ✓ Routine Survey (check if yes) RWP No. NA

Building: SWSA 5 Specific Location: H.P. trailer

Description: Routine Massalin's survey of H.P. trailer used as control point, posted Radiological Buffer Area.

Instruments Used and Calibration Due Dates: ATG 100357 (9-30-98)
ATG 121265 (9-30-98)

General Description of Radiological Conditions: No transferable contamination detected by large Area Smears. All Las's <100 DPM/Las alpha, <1000 DPM/Las beta-gamma.

Division or Group Needing the Survey: ATG/ER Person-hours Spent on the Survey: .5

Completed by (signature): Maggie Owen

Reviewed by (signature): [illegible] Date: 1/12/98

Page 1 of 1

ORNL Radiological Survey Data

Survey Number: 24 Date: 12-29-97
Time: 0800

Surveyor Badge No.: _____ ✓ Routine Survey (check if yes) RWP No. NA

Building: SWSA 5 Specific Location: White tent

Description: Massalon Survey of large white tent used by ATG for eating, drinking, smoking area

Instruments Used and Calibration Due Dates: ATG 100357 (9-30-98), ATG 121265 (9-30-98)

General Description of Radiological Conditions: No transferable contamination detected by LAS. All LAS's < 100 DPM/LAS alpha, < 1000 DPM/LAS Beta-gamma.

Division or Group Needing the Survey: ATG/ER Person-hours Spent on the Survey: .5

Completed by (signature): Maggie Owen

Reviewed by (signature): [signature] Date: 1/12/98

Page 1 of 1

ORNL Radiological Survey Data

Survey Number: 25 Date: 12-30-97
Time: 0900

Surveyor Badge No.: ____ ___ Routine Survey (check if yes) RWP No. SARS-2075

Building: NA Specific Location: SWSA5, OHF bins 2 & 3

Description: Disc smear and direct frisk survey of all metal placed in roll-off #3. See GT # 343597

Instruments Used and Calibration Due Dates: ATG 100357 (9-30-98)
ATG 121265 (9-30-98) Ludlum 2929, serial # 131370 (10-98)

General Description of Radiological Conditions: Contents of roll-off #3 are a combination of scrap metal from bins 2 & 3, with some support and core parts. All metal meets DOE 5400.5 standards for unconditional release of material. All disc smears < 20 DPM/100 cm² alpha, < 200 DPM/100 cm² beta gamma. All direct frisk < 100 DPM/100 cm² alpha, < 1000 DPM/100 cm² beta gamma.

Division or Group Needing the Survey: ATG / ER Person-hours Spent on the Survey: 80

Completed by (signature): Maggie Owen

Reviewed by (signature): MY Whitehead Date: 12-30-97
Page 1 of 3

1/12/98

ATG INC.

ALLIED TECHNOLOGY GROUP

Material Release Certification

The scrap metal referenced below originated from the dismantlement of the Old Hydrofracture bins and water tank at ORNL, performed by ATG, Inc., under Subcontract Number 1GX-JWQ34V, Supplemental Agreement No. 6. A 100% surface survey of the scrap metal was provided by a Radiation Control Technician qualified in accordance with 10 CFR 835. The metal was surveyed, segregated, and staged for final disposition. The metal staged for recycle from the area designated below has been confirmed to meet DOE 5400.5 standards for unconditional release and is packaged for transport to Southern Salvage. See supporting survey data and qualifying documentation.

OHF Bin / Tank Identity Bins #2 & 3 (see attachment for details)

Roll-Off Bin / Load Number 3

Certified By: Maggie Owen, RCT
Name Printed, Title

Margaret Owen / 12-30-97
Signature, Date

Organization: ATG, Inc.

99A Midway Lane, Oak Ridge, TN 37830
(423) 482-3275 FAX: (423) 482-3138

SMEAR SAMPLE DATA

NAME (HP&S)	PHONE	BLDG. NO. (HP&S)	LOCATION (SMEARS TAKEN)	DATE
Maggie Owen	NA	SWSA 5	Bin #1 & 3	12-17-97
SMEARS NUMBERED:	**RESULTS REQUIRED:**		**DATE COUNTED**	**COUNTER OPERATOR**
From 1 To 63	Date	Time	12-17-97	Maggie Owen

GROSS d/m ONLY ON SMEARS OVER:
20 d/m α
200 d/m β

REMARKS: Scrap metal from bins 2 & 3, loaded into roll-off #3 Ludlum 2929 serial # 131370 ATG 121265 ATG 100357

α	β	LOCATION (*)	α	β	LOCATION (*)	α	β	LOCATION (*)
1 <20	<200	1-5 Sheet Metal	34 <20	<200	11-20 Sheet metal	67		
2			35			68		
3			36			69		
4			37			70		
5			38			71		
6			39			72		
7			40			73		
8			41			74		
9			42			75		
10			43			76		
11			44			77		
12			45			78		
13			46			79		
14			47			80		
15			48			81		
16			49			82		
17			50			83		
18			51			84		
19			52			85		
20			53			86		
21		6-10 Sheet metal	54		Misc parts	87		
22			55		Cone	88		
23			56			89		
24			57			90		
25			58		Beam A	91		
26			59			92		
27			60		Beam B	93		
28			61			94		
29			62			95		
30			63 <20	<200		96		
31			64			97		
32			65			98		
33 <20	<200		66			99		

UCN-1632 (3 7-67) (*) Give only if required.

ORNL Radiological Survey Data

Survey Number: 26 Date: 1-5-98
Time: 1330

Surveyor Badge No.: ___ ___ Routine Survey (check if yes) RWP No. SAAS-2075

Building: SWSA 5 Specific Location: Bin # 3

Description: Direct frisk and disc smear survey of scrap metal from OHF Bin # 3.

Instruments Used and Calibration Due Dates: ATG 100356 (4-7-98) ATG 121265 (9-30-98) ATG 2929 # 131370 (10-98) ATG (100357) (9-30-98)

General Description of Radiological Conditions: 100% survey of scrap metal from Bin # 3 loaded into roll-off # 4 found no fixed or transferable contamination. All metal meets DOE 5400.5 standards for unconditional release of material. All disc smears < 20 DPM/100cm² alpha, < 200 DPM/100cm² Beta-gamma. All direct frisk < 100 DPM/100cm² alpha, < 1000 DPM/100cm² Beta-gamma.

Division or Group Needing the Survey: ATG | ER Person-hours Spent on the Survey: 80

Completed by (signature): [signature]

Reviewed by (signature): [signature] Date: 1-5-98
[signature] 1/18/98

Page 1 of 3

GT# 334926

HEALTH PHYSICS
MATERIAL TRANSFER CLEARANCE

TAG NUMBER
GT 334926

SURVEY INFORMATION

BUILDING	ROOM NO.
SWSA 5	

REQUESTED BY	DIVISION
Whitehead / ER)	ER)

DESCRIPTION OF MATERIAL/REMARKS

Roll off # 4
scrap metal

SURFACE CONTAMINATION

			CHECK IF NONE DETECTED
MAX. FIXED+REMOVABLE ALPHA	<100	dpm/100cm²	☑
REMOVABLE ALPHA	<20	dpm/100cm²	☑
MAX. FIXED+REMOVABLE BETA/GAMMA	<1000	dpm/100cm²	☑
REMOVABLE BETA/GAMMA	<200	dpm/100cm²	☑

HEALTH PHYSICS INSTRUMENTS USED

Alpha Instrument I.D.	Beta/Gamma Instrument I.D.
ATG2929 ATG100357	ATG2929 ATG121265 ATG100357

SURVEY COMPLETED

DATE	BY (NAME and BADGE NUMBER)
1-5-98	M. Owen

VOID AFTER
90 Days

UCN-148 (123 7-94)

ATG INC.

ALLIED TECHNOLOGY GROUP

Material Release Certification

The scrap metal referenced below originated from the dismantlement of the Old Hydrofracture bins and water tank at ORNL, performed by ATG, Inc., under Subcontract Number 1GX-JWQ34V, Supplemental Agreement No. 6. A 100% surface survey of the scrap metal was provided by a Radiation Control Technician qualified in accordance with 10 CFR 835. The metal was surveyed, segregated, and staged for final disposition. The metal staged for recycle from the area designated below has been confirmed to meet DOE 5400.5 standards for unconditional release and is packaged for transport to Southern Salvage. See supporting survey data and qualifying documentation.

OHF Bin / Tank Identity Bin # 3

Roll-Off Bin / Load Number 4

Certified By: Maggie Owen, RCT
Name Printed, Title

Maggie Owen 1-5-98
Signature, Date

Organization: ATG Inc.

99A Midway Lane, Oak Ridge, TN 37830
(423) 482-3275 FAX: (423) 482-3138

ORNL Radiological Survey Data

Survey Number: 27 Date: 1-7-98
Time: 0700

Surveyor Badge No.: ____ ____ Routine Survey (check if yes) RWP No. SABS-2075-1

Building: SWSA 5 Specific Location: OHF Water Tank

Description: Direct Frisk and disc smear survey on all Stainless Steel Loaded into roll off #5

Instruments Used and Calibration Due Dates: ATG 2929 # 131370 (10-98), ATG 100357 (9-30-98), 121265 (9-30-98)

General Description of Radiological Conditions: 100% survey of all stainless steel Loaded into roll off #5 found no fixed or transferrable contamination all metal meets DOE 5400.5 standards for unconditional release of material. All disc smears <20 DPM/100cm² alpha, <200 DPM/100cm² Beta-gamma. All direct frisk <100 DPM/100cm² alpha, <1000 DPM/100cm² Beta-gamma.

Division or Group Needing the Survey: ATG/ER Person-hours Spent on the Survey: 20

Completed by (signature): Maggie Owen

Reviewed by (signature): M.L. Whitehead Date: 1-7-97

Page 1 of ~~1~~ MO 1-7-97

1/12/98

1 of 3

ATG INC.

ALLIED TECHNOLOGY GROUP

Material Release Certification

The scrap metal referenced below originated from the dismantlement of the Old Hydrofracture bins and water tank at ORNL, performed by ATG, Inc., under Subcontract Number 1GX-JWQ34V, Supplemental Agreement No. 6. A 100% surface survey of the scrap metal was provided by a Radiation Control Technician qualified in accordance with 10 CFR 835. The metal was surveyed, segregated, and staged for final disposition. The metal staged for recycle from the area designated below has been confirmed to meet DOE 5400.5 standards for unconditional release and is packaged for transport to Southern Salvage. See supporting survey data and qualifying documentation.

OHF Bin / Tank Identity Water Tank (see attached for additional information)

Roll-Off Bin / Load Number 5

Certified By: Maggie Owen (RCT)
Name Printed, Title

Maggie Owen 1-7-98
Signature, Date

Organization: ATG Inc.

99A Midway Lane, Oak Ridge, TN 37830
(423) 482-3275 FAX: (423) 482-3138

GT# 334928

☆U.S.GPO:1998 – 751-640

HEALTH PHYSICS
MATERIAL TRANSFER CLEARANCE

TAG NUMBER
GT 334928

SURVEY INFORMATION

BUILDING	ROOM NO.
SWSA 5	

REQUESTED BY	DIVISION
Whitehead	ER

DESCRIPTION OF MATERIAL/REMARKS

Roll off #5 of
Stainless Steel

SURFACE CONTAMINATION

			CHECK IF NONE DETECTED
MAX. FIXED+REMOVABLE ALPHA	<100	dpm/100cm²	☑
REMOVABLE ALPHA	<20	dpm/100cm²	☑
MAX. FIXED+REMOVABLE BETA/GAMMA	<1000	dpm/100cm²	☑
REMOVABLE BETA/GAMMA	<200	dpm/100cm²	☑

HEALTH PHYSICS INSTRUMENTS USED

Alpha Instrument I.D.	Beta/Gamma Instrument I.D.
ATG-2929 ATG-100357	ATG-2929 ATG-121265

SURVEY COMPLETED

DATE	BY (NAME and BADGE NUMBER)
1-7-98	Maggie Owen

VOID AFTER
90 Days

UCN-148 (123 7-94)

ORNL Radiological Survey Data

Survey Number: 27B Date: 1-6-98
Time: 0900

Surveyor Badge No.: _____ ✓ Routine Survey (check if yes) RWP No. NA

Building: SWSA 5 Specific Location: White Tent

Description: Routine Massalina survey of White Tent used by ATG for Eating, drinking, smoking area.

Instruments Used and Calibration Due Dates: ATG 121265 (9-30-98) ATG 100357 (9-30-98)

General Description of Radiological Conditions: No transferrable contamination detected by LAS.

Division or Group Needing the Survey: ATG / ER Person-hours Spent on the Survey: .5

Completed by (signature): Maggie Owen

Reviewed by (signature): C A Walker Date: 1/12/98

Page 1 of 1

ORNL Radiological Survey Data

Survey Number: 28 Date: 1-7-98
Time: 0800

Surveyor Badge No.: ___ ___ ___ Routine Survey (check if yes) RWP No. SAAS-2075,

Building: SWSA 5 Specific Location: Stainless steel water tank

Description: Survey of past decon attempts on stainless steel water Tank. Direct frisk only This survey is on outside of tank.

Instruments Used and Calibration Due Dates: ATG 121265 (9-30-98)

General Description of Radiological Conditions: Decon efforts were not successful, after several attempts at decon, fixed contamination levels remain up to 24000 DPM/100cm^2 Beta-Gamma. Contaminated metal placed in Sea-Land for storage.

Division or Group Needing the Survey: ATG/ER Person-hours Spent on the Survey: ___

Completed by (signature): Maggie Owen

Reviewed by (signature): [illegible] Date: 1/12/98

Page 1 of 1

ORNL Radiological Survey Data

Survey Number: 29 (Survey # out of order due to Late Entry) Date: 1-5-98
Time: 1400

Surveyor Badge No.: ____ ____ Routine Survey (check if yes) RWP No. SABS-2075

Building: SWSA 5 Specific Location: Contamination Area around Bins 1, 3 & 4

Description: Direct Frisk survey to down post C-areas around Bins 1, 3 & 4.

Instruments Used and Calibration Due Dates: ATG 100356 (4-7-98), ATG 121265 (9-30-98), ATG 100357 (9-30-98).

General Description of Radiological Conditions: Direct frisk of ground in C-area located several small areas of contamination up to 2000 DPM/100cm² Beta-Gamma. Areas were removed and ground re-surveyed. Final survey all direct frisks < 100 DPM/100 cm² Alpha, < 1000 DPM/100cm² Beta-Gamma.

Division or Group Needing the Survey: ATG/ER Person-hours Spent on the Survey: 10

Completed by (signature): [signature]

Reviewed by (signature): [signature] Date: 1/12/98

Page 1 of 1

ORNL Radiological Survey Data

Survey Number: 30 Date: 1-7-98
Time: 0800

Surveyor Badge No.: N/A Routine Survey (check if yes) RWP No. SAAS-2075

Building: SWSA 5 Specific Location: Sea-Land

Description: General survey performed by masslin & direct frisk on metal loaded into Sea-Land for storage.

Instruments Used and Calibration Due Dates: ATG 100357 (9-30-98), ATG 1212165 (9-30-98)

General Description of Radiological Conditions: Fixed Contamination Levels up to 200,000 DPM/100 cm^2 Beta-gamma, no alpha, located by direct frisk. Transferable beta-gamma levels up to 20000 DPM/100, no alpha. Sea land is posted "Contamination Area" "RWP Required for Entry".

Division or Group Needing the Survey: ATG/ER Person-hours Spent on the Survey: 40

Completed by (signature): [illegible]

Reviewed by (signature): [illegible] Date: 1/8/98

Page 1 of 1

ORNL Radiological Survey Data

Survey Number: 31 Date: 1-9-98
Time: 0900

Surveyor Badge No _____ ___ Routine Survey (check if yes) RWP No. SAAS-2075

Building: SWSA 5 Specific Location: Stainless Steel Water tank

Description: Internal Survey of Water tank after decontamination

Instruments Used and Calibration Due Dates: ATG 121265 (9-30-98)
ATG 100357 (9-30-98), ATG 2929 (#131370) 10/98

General Description of Radiological Conditions: Direct frisk of internal areas of water tank located no fixed alpha or beta-gamma contamination. Disc smears located no transferable beta-gamma and low levels of alpha. After decon all disc smears <20 dpm/100cm² alpha, <200 dpm/100cm² beta gamma, <100 dpm/100cm² alpha fixed, <1000 dpm/100 cm² beta/gamma.

Division or Group Needing the Survey: ATG / ER Person-hours Spent on the Survey: 6

Completed by (signature): Maggie Quinn

Reviewed by (signature): [signature] Date: 1/18/98

Page 1 of 1

ORNL Radiological Survey Data

Survey Number: 32 Date: 1-9-98
me: 1200

Surveyor Badge No._____ ____ Routine Survey (check if yes) RWP No SAAS-2075 A

Building: SWSA 5 Specific Location: Contamination Area around Water tank

Description: Survey to downpost Contamination area around Stainless steel water tank.

Instruments Used and Calibration Due Dates: ATG 100357 (9-30-98), ATG 121265 (9-30-98)

General Description of Radiological Conditions: Direct, frisk, survey of all ground area. <100 dpm/100cm^2 alpha, <1000 dpm/100cm^2 beta gamma. Random masslin survey detected no transferable activity. Posting removed from area.

Division or Group Needing the Survey: ATG/ER Person-hours Spent on the Survey: 4

Completed by (signature): Maggie Dunn

Reviewed by (signature): [illegible] Date: 1/12/98

Page 1 of 1

APPENDIX C

HEALTH PHYSICS INSTRUMENT CALIBRATION DOCUMENTATION

BICRON MICRO–REM CALIBRATION DATA SHEET

Barcode #: _____ Serial #: B5042 HP #: ATG

As–Found

Test	Pass	Fail
Visual :		
Battery :		
HV :		
Bkg :		
X1 Bkg :		
X0.1 Bkg :		

Range		Dose Rate	Acceptance Range	Net Response
X1000	50%	100 mrem/hr	90 – 110	
X100	50%	10 mrem/hr	9 – 11	
X10	50%	1.0 mrem/hr	0.9 – 1.1	
X1	50%	100 µrem/hr	90 – 110	
X0.1	50%	10 µrem/hr	9 – 11	

NOT REQUIRED NEW INSTRUMENT

By: BB Date: 6/19/97

Calibration

Temp: 24 °C
Pressure: 740 mm Hg
Humidity: 55 %RH

Test	Pass	Fail
Visual :	✓	
Battery :	✓	
HV :	✓	
Overload :	✓	
Bkg :	—	
X1 Bkg :	5µRem/hr	
X0.1 Bkg :	5µRem/hr	

Range		Dose Rate	Acceptance Range	Net Response
X1000	25%	50 mrem/hr	45 – 55	50
	50%	100 mrem/hr	90 – 110	100
	75%	150 mrem/hr	135 – 165	145
X100	25%	5 mrem/hr	4.5 – 5.5	5.0
	50%	10 mrem/hr	9.0 – 11.0	10.0
	75%	15 mrem/hr	13.5 – 16.5	15.0
X10	25%	0.5 mrem/hr	0.45 – 0.55	.50
	50%	1.0 mrem/hr	0.90 – 1.10	1.0
	75%	1.5 mrem/hr	1.35 – 1.65	1.4
X1	50%	100 µrem/hr	90 – 110	100
	75%	150 µrem/hr	135 – 165	140
X0.1	25%	5 µrem/hr	4.5 – 5.5	5
	50%	10 µrem/hr	9.0 – 11.0	10

By: BB Date: 6/19/97

Performance Validation and Reproducibility Check

Test	Pass	Fail
Visual :	✓	
Battery :	✓	
HV :	✓	
Bkg :	—	
X1 Bkg :	5µRem/hr	
X0.1 Bkg :	5µRem/hr	

Dose Rate	Acceptance Range	Trial 1	Trial 2	Trial 3
100 mrem/hr	90 – 110	100	100	100
10 mrem/hr	9 – 11	10	10	10
1.0 mrem/hr	0.9 – 1.1	1.0	1.0	1.0
100 µrem/hr	90 – 110	100	100	100
10 µrem/hr	9 – 11	10	10	10

By: SDR Date: 6-20-97

Remarks: _____

Reviewed By: KR Date: 25 JUN 97

C:\LOTUS\WK3\FORMS\MICROREM.WK1

Designer and Manufacturer of Scientific and Industrial Instruments

CERTIFICATE OF CALIBRATION

LUDLUM MEASUREMENTS, INC.
POST OFFICE BOX 810 PH. 915-235-5494
501 OAK STREET FAX NO. 915-235-4672
SWEETWATER, TEXAS 79556, U.S.A.

CUSTOMER ATG ORDER NO. 226657

Mfg. Ludlum Measurements, Inc. Model 2929 Serial No. 99045

Mfg. Ludlum Measurements, Inc. Model 43-10-1 Serial No. PR 098325

Cal. Date 5/27/97 Cal Due Date 11/27/97 Cal. Interval 6 Months Meterface 202-014

Check mark ☑ applies to applicable instr. and/or detector IAW mfg. spec. T. 72 °F RH 40 % Alt 701.8 mm Hg

☐ New Instrument Instrument Received ☑ Within Toler. +-10% ☐ 10-20% ☐ Out of Tol. ☐ Requiring Repair ☐ Other-See comments

☑ Mechanical ck. ☑ Window Operation

☑ Audio ck.

☑ Meter Zeroed Alpha Sensitivity 175 mV Beta Sensitivity 4 mV Beta Window 50 mV

☑ Calibrated in accordance with LMI SOP 14.8 rev 12/05/89. ☐ Calibrated in accordance with LMI SOP 14.9 rev 12/19/89.

Instrument Volt Set 850 V = 3.83 on High Voltage dial. High Voltage set with detector connected.

☑ HV Readout (2 points) Ref./Inst. 496 / 500 V Ref./Inst. 2000 / 2000 V

COMMENTS:

Gamma Calibration: GM detectors positioned perpendicular to source except for M 44-9 in which the front of probe faces source.

	REFERENCE CAL POINT	INSTRUMENT RECEIVED	INSTRUMENT METER READING*
Alpha Channel Digital Readout	400K cpm	400360	400360
	40K cpm	40035	40035
	4K cpm	4003	4003
	400 cpm	400	400
	40 cpm	40	40

	REFERENCE CAL POINT	INSTRUMENT RECEIVED	INSTRUMENT METER READING*
Beta/Gamma Channel Digital Readout	400K cpm	400318	400318
	40K cpm	40030	40030
	4K cpm	4003	4003
	400 cpm	400	400
	40 cpm	40	40

*Uncertainty within ± 10% C.F. within ± 20%

Ludlum Measurements, Inc. certifies that the above instrument has been calibrated by standards traceable to the National Institute of Standards and Technology, or to the calibration facilities of other International Standards Organization members, or have been derived from accepted values of natural physical constants or have been derived by the ratio type of calibration techniques. The calibration system conforms to the requirements of MIL-STD-45662A and ANSI N323-1978. State of Texas Calibration License No. LO-1963

Reference Instruments and/or Sources:

Cs-137 Gamma S/N ☐ 1162 ☐ G112 ☐ M565 ☐ 5105 ☐ T1008 ☐ TB79 ☐ E552 ☐ E551 ☐ Neutron Am-241 Be S/N T-304

☑ Alpha S/N Pu-239 12800cpm ☑ Beta S/N Tc-99 14300cpm, C-14 0.165uCi ☐ Other

☑ m 500 S/N 54668 ☐ Oscilloscope S/N ☑ Multimeter S/N 57390613

Calibrated By: [signature] Date 5/27/97

Reviewed By: [signature] Date 5/28/97

FORM C25 05/13/97

Designer and Manufacturer of Scientific and Industrial Instruments

LUDLUM MEASUREMENTS, INC.
POST OFFICE BOX 810 PH. 915-235-5494
501 OAK STREET FAX NO. 915-235-4672
SWEETWATER, TEXAS 79556, U.S.A.

Bench Test Data For Detector

Detector 43-10-1 Serial No. PR098325 Order #. 226657

Customer ATG Alpha Input Sensitivity 175 mV

Counter 2929 Serial No. 99045 Beta Input Sensitivity 4 mV

Count Time 1Minute Beta Window 50 mV

Other Distance Source to Detector Tray

High Voltage	Background		Isotope Pu 239 Size 12800 cpm		Isotope Tc 99 Size 14300 cpm		Isotope C14 Size 0.165 uCi	
	Alpha	Beta	Alpha	Beta	Alpha	Beta	Alpha	Beta
900	0	63	9816	345	9	7247	0	23381
925	0	60	9829	377	6	7892	0	30605
950	0	65	9978	364	11	7704	1	36360
975	0	75	10037	569	11	7667	2	40132
1000	1	352	10075	1288	12	7775	2	46308

Signature Conrad Sabado Date 5/27/97

ALPHA SMEAR COUNTER (CTA)
CALIBRATION DATA SHEET

Scaler #: 99043 I.D. #: M134019 Location: ATG

Linearity Sources

^{239}Pu(1)#:	1257	430 dpm	^{239}Pu(2)#:	1339	7470 dpm
^{239}Pu(3)#:	1262	62000 dpm	Chi–Square Source#:	1339	7470 dpm

Pu 239

Bkg: 0.6 **As–Found Results** Count Time (min): 1

Linearity Test

Source	Gross Cpm	Net Cpm	Efficiency	Mean
#2	2404	2403.4	32.2%	32.2%
	2465	2464.4	33.0%	Range (Mean ± 10%)
	2356	2355.4	31.5%	29.0% to 35.5%
Source	**Gross Cpm**	**Net Cpm**	**Efficiency**	**Within Range? (y/n) Init.**
#1	135	134.4	31.3%	y TCP
#3	20424	20423.4	32.9%	y TCP

COPY

Date: 5-21-97 Remarks:

Bkg: 0.4 **Calibration Results** Count Time (min): 1

Linearity / Reproducibility Test

Source	Gross Cpm	Net Cpm	Efficiency	Mean
#2	2508	2507.6	33.6%	32.9%
	2469	2468.6	33.0%	Range (Mean ± 10%)
	2395	2394.6	32.1%	29.6% to 36.2%
Source	**Gross Cpm**	**Net Cpm**	**Efficiency**	**Within Range? (y/n) Init.**
#1	129	128.6	29.9%	y TCP
#3	20875	20874.6	33.7%	y TCP

Reproducibility Pass/Fail Init. Pass TCP

Chi–Square Test

Count #	Gross	Net (n)	(n–n̄)	(n–n̄)²
1	2482	2481.6	15.3	234.1
2	2483	2482.6	16.3	265.7
3	2410	2409.6	−56.7	3214.9
4	2509	2508.6	42.3	1789.3
5	2469	2468.6	2.3	5.3
6	2561	2560.6	94.3	8892.5
7	2462	2461.6	−4.7	22.1
8	2504	2503.6	37.3	1391.3
9	2437	2436.6	−29.7	882.1
10	2447	2446.6	−19.7	388.1
11	2425	2424.6	−41.7	1738.9
12	2430	2429.6	−36.7	1346.9
13	2490	2489.6	23.3	542.9
14	2457	2456.6	−9.7	94.1
15	2454	2453.6	−12.7	161.3
16	2445	2444.6	−21.7	470.9
17	2494	2493.6	27.3	745.3
18	2509	2508.6	42.3	1789.3
19	2482	2481.6	15.3	234.1
20	2384	2383.6	−82.7	6839.3
	SUM	49326	0.0	31048.2

n = cpm
n̄ = average of n
Sum of n–n̄ must = 0
Chi–Square value must be between 10 and 30.

n̄ = 2466 cpm

Performance Range
n̄ + 3σ = 2615 cpm
n̄ – 3σ = 2317 cpm

Chi–Square Value = 12.59

Instrument Efficiency = 33.0%

charge # PIR53P09

Remarks: Cal Due: 5/98 RaSCal's Pu^{239} source used for Chi^2.

Completed By: JC Palmer Date: 5-29-97

Reviewed By: [illegible] Date: 5-30-97

04-80-19

BETA SMEAR COUNTER (CTB)
CALIBRATION DATA SHEET

Scaler #: 99043 I.D. #: M134019 Location: ATG

Linearity Sources

^{99}Tc(1)#:	3121	4200 dpm	^{99}Tc(2)#:	3122	27500 dpm
^{99}Tc(3)#:	1256	378000 dpm	Chi-Square Source#:	3122	27500 dpm

Tc 99

Energy Response Sources

^{99}Tc#:	3122	27499	^{36}Cl#:	2007A	355193	^{90}Sr/^{90}Y#:	1263	15863

Bkg: 57 **As-Found Results** Count Time (min): 1

Linearity Test

Source	Gross Cpm	Net Cpm	Efficiency	Mean
#2	4814	4757	17.3%	17.5%
	4852	4795	17.4%	Range (Mean ± 10%)
	4905	4848	17.6%	15.7% to 19.2%
Source	Gross Cpm	Net Cpm	Efficiency	Within Range? (y/n) Init.
#1	731	674	16.0%	y TCP
#3	63089	63032	16.7%	y TCP

Date: 5-21-97 Remarks:

Bkg: 61 **Calibration Results** Count Time (min): 1

Linearity / Reproducibility Test

Source	Gross Cpm	Net Cpm	Efficiency	Mean
#2	4443	4382	15.9%	16.0%
	4456	4395	16.0%	Range (Mean ± 10%)
	4471	4410	16.0%	14.4% to 17.6%
Source	Gross Cpm	Net Cpm	Efficiency	Within Range? (y/n) Init.
#1	700	639	15.2%	y TCP
#3	58713	58652	15.5%	y TCP

Reproducibility Pass/Fail Init. Pass TCP

Chi-Square Test

Count #	Gross	Net (n)	$(n-\bar{n})$	$(n-\bar{n})^2$
1	4411	4350	−4.6	21.2
2	4381	4320	−34.6	1197.2
3	4473	4412	57.4	3294.8
4	4416	4355	0.4	0.2
5	4522	4461	106.4	11321.0
6	4373	4312	−42.6	1814.8
7	4320	4259	−95.6	9139.4
8	4470	4409	54.4	2959.4
9	4272	4211	−143.6	20621.0
10	4439	4378	23.4	547.6
11	4387	4326	−28.6	818.0
12	4374	4313	−41.6	1730.6
13	4433	4372	17.4	302.8
14	4432	4371	16.4	269.0
15	4519	4458	103.4	10691.6
16	4362	4301	−53.6	2873.0
17	4474	4413	58.4	3410.6
18	4373	4312	−42.6	1814.8
19	4365	4304	−50.6	2560.4
20	4516	4455	100.4	10080.2
	SUM	87092	−0.0	85466.8

Energy Response

Source	Gross	Net	Eff.%
^{99}Tc	4470	4409	16.0%
^{36}Cl	114814	114753	32.3%
^{90}Sr/^{90}Y	5065	5004	31.5%

n = cpm
$\bar{n}$ = average of n
Sum of $n-\bar{n}$ must = 0
Chi-Square value must be between 10 and 30.

$\bar{n}$ = 4355 cpm

Performance Range

$\bar{n} + 3\sigma$ = 4553 cpm
$\bar{n} - 3\sigma$ = 4157 cpm

Chi-Square Value = 19.63

Instrument Efficiency = 15.8%

Remarks: Cal. Due 5/98 ReSCal's Tc^{99} source used for Chi^2.

Completed By: [signature] Date: 5-29-97

Reviewed By: [signature] Date: 5-30-97

04-80-20

ALPHA SMEAR COUNTER (CTA)
CALIBRATION DATA SHEET

Scaler #: 99043 I.D. #: M134019 Location: ATG

Linearity Sources

^{239}Pu(1)#:	1257	430 dpm	^{239}Pu(2)#:	1339	7470 dpm
^{239}Pu(3)#:	1262	62000 dpm	Chi-Square Source#:	Z-824	2500 dpm

Th^{230}

Bkg: 0.6 **As-Found Results** Count Time (min): 1

Linearity Test				
Source	Gross Cpm	Net Cpm	Efficiency	Mean
#2	2404	2403.4	32.2%	32.2%
	2465	2464.4	33.0%	Range (Mean ± 10%)
	2356	2355.4	31.5%	29.0% to 35.5%
Source	Gross Cpm	Net Cpm	Efficiency	Within Range? (y/n) Init.
#1	135	134.4	31.3%	Y TCP
#3	20424	20423.4	32.9%	Y TCP

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Date: 5-21-97 Remarks:

Bkg: 0.4 **Calibration Results** Count Time (min): 1

Linearity / Reproducibility Test				
Source	Gross Cpm	Net Cpm	Efficiency	Mean
#2	2508	2507.6	33.6%	32.9%
	2469	2468.6	33.0%	Range (Mean ± 10%)
	2395	2394.6	32.1%	29.6% to 36.2%
Source	Gross Cpm	Net Cpm	Efficiency	Within Range? (y/n) Init.
#1	129	128.6	29.9%	Y TCP
#3	20875	20874.6	33.7%	Y TCP
			Reproducibility Pass/Fail	Init. Pass TCP

Chi-Square Test

Count #	Gross	Net (n)	(n−n̄)	(n−n̄)²
1	441	440.6	−39.6	1572.1
2	450	449.6	−30.6	939.4
3	470	469.6	−10.6	113.4
4	510	509.6	29.4	861.4
5	472	471.6	−8.6	74.8
6	468	467.6	−12.6	160.0
7	473	472.6	−7.6	58.5
8	507	506.6	26.4	694.3
9	528	527.6	47.4	2242.0
10	501	500.6	20.4	414.1
11	483	482.6	2.4	5.5
12	480	479.6	−0.6	0.4
13	458	457.6	−22.6	513.0
14	478	477.6	−2.6	7.0
15	457	456.6	−23.6	559.3
16	471	470.6	−9.6	93.1
17	521	520.6	40.4	1628.1
18	493	492.6	12.4	152.5
19	501	500.6	20.4	414.1
20	451	450.6	−29.6	879.1
	SUM	9605	0.0	11382.6

n = cpm
n̄ = average of n
Sum of n−n̄ must = 0
Chi-Square value must be between 10 and 30.

n̄ = 480 cpm

Performance Range
n̄ + 3σ = 546 cpm
n̄ − 3σ = 415 cpm

Chi-Square Value = 23.70

Instrument Efficiency = 19.2%

Remarks: Cal Due: 5/98 ATG's Pu^{239} source used for chi^2.

Completed By: TC Palmer Date: 5-29-97

Reviewed By: BRB Date: 5-30-97

04-80-19

BETA SMEAR COUNTER (CTB)
CALIBRATION DATA SHEET

Scaler #: 99043 I.D. #: M134019 Location: ATG

Linearity Sources

^{99}Tc(1)#: 3121 | 4200 dpm ^{99}Tc(2)#: 3122 | 27500 dpm

^{99}Tc(3)#: 1256 | 378000 dpm Chi-Square Source#: 94Tc470-0594 | 40200 dpm Tc^{99}

Energy Response Sources

^{99}Tc#: 3122 | 27499 ^{36}Cl#: 2007A | 355193 ^{90}Sr/^{90}Y#: 1263 | 15863

Bkg: 57 **As-Found Results** Count Time (min): 1

Linearity Test

Source	Gross Cpm	Net Cpm	Efficiency	Mean
#2	4814	4757	17.3%	17.5%
	4852	4795	17.4%	Range (Mean ± 10%)
	4905	4848	17.6%	15.7% to 19.2%
Source	Gross Cpm	Net Cpm	Efficiency	Within Range? (y/n) Init.
#1	731	674	16.0%	Y TCP
#3	63089	63032	16.7%	Y TCP

COPY

Date: 5-21-97 Remarks:

Bkg: 61 **Calibration Results** Count Time (min): 1

Linearity / Reproducibility Test

Source	Gross Cpm	Net Cpm	Efficiency	Mean
#2	4443	4382	15.9%	16.0%
	4456	4395	16.0%	Range (Mean ± 10%)
	4471	4410	16.0%	14.4% to 17.6%
Source	Gross Cpm	Net Cpm	Efficiency	Within Range? (y/n) Init.
#1	700	639	15.2%	Y TCP
#3	58713	58652	15.5%	Y TCP

Reproducibility Pass/Fail Pass Init. TCP

Chi-Square Test

Count #	Gross	Net (n)	(n−n̄)	(n−n̄)²
1	6669	6608	78.7	6193.7
2	6538	6477	−52.3	2735.3
3	6626	6565	35.7	1274.5
4	6598	6537	7.7	59.3
5	6623	6562	32.7	1069.3
6	6702	6641	111.7	12476.9
7	6664	6603	73.7	5431.7
8	6590	6529	−0.3	0.1
9	6601	6540	10.7	114.5
10	6508	6447	−82.3	6773.3
11	6568	6507	−22.3	497.3
12	6548	6487	−42.3	1789.3
13	6630	6569	39.7	1576.1
14	6709	6648	118.7	14089.7
15	6522	6461	−68.3	4664.9
16	6551	6490	−39.3	1544.5
17	6620	6559	29.7	882.1
18	6453	6392	−137.3	18851.3
19	6587	6526	−3.3	10.9
20	6499	6438	−91.3	8335.7
	SUM	130586	−0.0	88370.2

Energy Response

Source	Gross	Net	Eff.%
^{99}Tc		−61	0.2%
^{36}Cl		−61	−0.0%
^{90}Sr/^{90}Y		−61	−0.4%

n = cpm
n̄ = average of n
Sum of n−n̄ must = 0
Chi-Square value must be between 10 and 30.

n̄ = 6529 cpm

Performance Range

n̄ + 3σ = 6772 cpm
n̄ − 3σ = 6287 cpm

Chi-Square Value = 13.53

Instrument Efficiency = 16.2%

Remarks: Cal. Due 5/98 ATG's Tc^{99} source used for Chi^2.

Completed By: C. Palmer Date: 5-29-97

Reviewed By: BAB Date: 5-30-97

04-80-20

NON-HPIC INSTRUMENT

PANCAKE PROBE GM
CALIBRATION DATA SHEET

ATG

Barcode #: M146459 Serial #: 100502 HP #: ——

As–Found Radiological Response

Temperature: ____ °C
Pressure: ____ mm Hg
Humidity: ____ %
Thermometer ID#: ____
Barometer ID#: ____
Hygrometer ID#: ____
Beta Set: ____ ^{137}Cs Source: ____
Performed By: BBZ
Date: 9-30-97

NOT REQUIRED NEW INSTRUMENT

	Pass	Fail
Visual:		
Battery:		
High Voltage:		
Audio:		
Alarm:		
Reset:		
Response:		

Background: ____ cpm

Source	Current Source Strength	Acceptance Range (net cpm)	Instrument Response (net cpm)
^{99}Tc	0.12 µCl	–	
^{36}Cl	0.08 µCl	–	
^{90}Sr–Y	0.03 µCl	–	
^{137}Cs	0.1 mR/h	–	
	1.0 mR/h	–	
	10 mR/h	–	

Radiological Calibration

Temperature: 23 °C
Pressure: 736 mm Hg
Humidity: 47 %
Thermometer ID#: M139839
Barometer ID#: ↓
Hygrometer ID#: ↓
Beta Set: 1 ^{137}Cs Source: 10182
Background: 40 cpm
Performed By: BBZ
Date: 9-30-97

	Pass	Fail
Visual:	✓	
Battery:	✓	
High Voltage:	N/A	
Audio:	✓	
Alarm:	N/A	
Reset:	✓	
Response:	✓	
Reproducibility:	✓	
Overload:	✓	

Source	Current Source Strength	Acceptance Range (net cpm)	Instrument Response (net cpm)
^{147}Pm	BBZ 0.05 ~~0.11~~ µCl	2,100 - 2,600	2,400
^{99}Tc	0.12 µCl	12,800 - 15,700	15,000
^{36}Cl	0.08 µCl	25,300 - 31,000	26,000
^{90}Sr–Y	BBZ 0.02 ~~0.03~~ µCl	14,700 - 18,000	16,000
^{137}Cs	0.1 mR/h	225 - 275	260
	1.0 mR/h	2,250 - 2,750	2,600
	10 mR/h	22,500 - 27,500	24K
Trial 2	10 mR/h	22,500 - 27,500	24K
Trial 3	10 mR/h	22,500 - 27,500	24K

Performance Validation

Temperature: 23 °C
Pressure: 736 mm Hg
Humidity: 50 %
Thermometer ID#: M139839
Barometer ID#: ↓
Hygrometer ID#: ↓
^{137}Cs Source: 10182
Background: 40 cpm

	Pass	Fail
Visual:	✓	
Battery:	✓	
High Voltage:	✓	
Audio:	✓	
Alarm:	N/A	
Reset:	✓	
Response:	✓	

Source	Current Source Strength	Acceptance Range (net cpm)	Instrument Response (net cpm)
^{137}Cs	0.1 mR/h	225 - 275	260
	1.0 mR/h	2250 - 2750	2600
	10 mR/h	22,500 - 27,500	24K

Performed By: BBZ Date: 9-30-97

Remarks: ____

Reviewed By: KLS Date: 9-30-97

NON-MPIC INSTRUMENT

PANCAKE PROBE GM
CALIBRATION DATA SHEET

ATG

Barcode #: M146456 Serial #: 130326 HP #: ____

As–Found Radiological Response

Temperature: ____ °C
Pressure: ____ mm Hg
Humidity: ____ %
Thermometer ID#: ____
Barometer ID#: ____
Hygrometer ID#: ____
Beta Set: ____ ^{137}Cs Source: ____
Performed By: SBZ
Date: 9-30-97

NOT REQUIRED NEW INSTRUMENT

	Pass	Fail
Visual:		
Battery:		
High Voltage:		
Audio:		
Alarm:		
Reset:		
Response:		
Background: ____ cpm		

Source	Current Source Strength	Acceptance Range (net cpm)	Instrument Response (net cpm)
^{99}Tc	0.12 µCl	–	
^{36}Cl	0.08 µCl	–	
^{90}Sr–Y	0.03 µCl	–	
^{137}Cs	0.1 mR/h	–	
	1.0 mR/h	–	
	10 mR/h	–	

Radiological Calibration

Temperature: 24 °C
Pressure: 736 mm Hg
Humidity: 47 %
Thermometer ID#: M139839
Barometer ID#: ↓
Hygrometer ID#: ↓
Beta Set: 1 ^{137}Cs Source: 10182
Background: 40 cpm
Performed By: SBZ
Date: 9-30-97

	Pass	Fail
Visual:	✓	
Battery:	✓	
High Voltage:	✓	
Audio:	✓	
Alarm:	N/A	
Reset:	✓	
Response:	✓	
Reproducibility:	✓	
Overload:	✓	

Source	Current Source Strength	Acceptance Range (net cpm)	Instrument Response (net cpm)
^{147}Pm	9-97 ~~0.11~~ 0.05 µCl	2,100 - 2,600	2,200
^{99}Tc	0.12 µCl	12,800 - 15,700	13,000
^{36}Cl	0.08 µCl	25,300 - 31,000	26,000
^{90}Sr–Y	9-97 ~~0.08~~ 0.02 µCl	14,700 - 18,000	15,000
^{137}Cs	0.1 mR/h	225 - 275	260
	1.0 mR/h	2,250 - 2,750	2,500
	10 mR/h	22,500 - 27,500	23K
Trial 2	10 mR/h	22,500 - 27,500	23K
Trial 3	10 mR/h	22,500 - 27,500	23K

Performance Validation

Temperature: 23 °C
Pressure: 736 mm Hg
Humidity: 50 %
Thermometer ID#: M139839
Barometer ID#: ↓
Hygrometer ID#: ↓
^{137}Cs Source: 10182
Background: 40 cpm

	Pass	Fail
Visual:	✓	
Battery:	✓	
High Voltage:	✓	
Audio:	✓	
Alarm:	N/A	
Reset:	✓	
Response:	✓	

Source	Current Source Strength	Acceptance Range (net cpm)	Instrument Response (net cpm)
^{137}Cs	0.1 mR/h	225 - 275	270
	1.0 mR/h	2,250 - 2,750	2600
	10 mR/h	22,500 - 27,500	25K

Performed By: BMS Date: 9-30-97

Remarks: ____

Reviewed By: KLS Date: 9-30-97

NON-HPIC INSTRUMENT

PANCAKE PROBE GM CALIBRATION DATA SHEET

ATG

Barcode #: M146458 Serial #: 97901 HP #: _____

As-Found Radiological Response

Temperature: ____ °C
Pressure: ____ mm Hg
Humidity: ____ %
Thermometer ID#: ____
Barometer ID#: ____
Hygrometer ID#: ____
Beta Set: ____ ^{137}Cs Source: ____
Performed By: BBZ
Date: 9-30-97

NOT REQUIRED NEW INSTRUMENT

	Pass	Fail
Visual:		
Battery:		
High Voltage:		
Audio:		
Alarm:		
Reset:		
Response:		

Background: ____ cpm

Source	Current Source Strength	Acceptance Range (net cpm)	Instrument Response (net cpm)
^{99}Tc	0.12 µCi	–	
^{36}Cl	0.08 µCi	–	
^{90}Sr–Y	0.03 µCi	–	
^{137}Cs	0.1 mR/h	–	
	1.0 mR/h	–	
	10 mR/h	–	

Radiological Calibration

Temperature: 23 °C
Pressure: 736 mm Hg
Humidity: 48 %
Thermometer ID#: M139839
Barometer ID#: ↓
Hygrometer ID#: ↓
Beta Set: 1 ^{137}Cs Source: 10182
Background: 30 cpm
Performed By: BBZ
Date: 9-30-97

	Pass	Fail
Visual:	✓	
Battery:	✓	
High Voltage:	N/A	
Audio:	✓	
Alarm:	N/A	
Reset:	✓	
Response:	✓	
Reproducibility:	✓	
Overload:	✓	

Source	Current Source Strength	Acceptance Range (net cpm)	Instrument Response (net cpm)
^{147}Pm	~~0.11~~ 0.05 µCi	2,100 - 2,600	2400
^{99}Tc	0.12 µCi	12,900 - 15,700	14,000
^{36}Cl	0.08 µCi	25,300 - 31,000	28,000
^{90}Sr–Y	~~0.03~~ 0.02 µCi	14,700 - 18,000	17,000
^{137}Cs	0.1 mR/h	225 - 275	260
	1.0 mR/h	2,250 - 2,750	2,500
	10 mR/h	22,500 - 28,500	22,500
Trial 2	10 mR/h	22,500 - 27,500	22,500
Trial 3	10 mR/h	22,500 - 27,500	22,500

Performance Validation

Temperature: 23 °C
Pressure: 736 mm Hg
Humidity: 50 %
Thermometer ID#: M139839
Barometer ID#: ↓
Hygrometer ID#: ↓
^{137}Cs Source: 10182
Background: 30 cpm

	Pass	Fail
Visual:	✓	
Battery:		
High Voltage:	✓	
Audio:	✓	
Alarm:	N/A	
Reset:	✓	
Response:	✓	

Source	Current Source Strength	Acceptance Range (net cpm)	Instrument Response (net cpm)
^{137}Cs	0.1 mR/h	225 - 275	260
	1.0 mR/h	2,250 - 2,750	2500
	10 mR/h	22,500 - 27,500	22,5[illegible]

Performed By: BBB Date: 9-30-97

Remarks: _____

Reviewed By: KLS Date: 9-30-97

NON-HPIC INSTRUMENT PANCAKE PROBE GM

CALIBRATION DATA SHEET

ATG

Barcode #: M146460 Serial #: 125261 HP #: _____

As-Found Radiological Response

Temperature: ____ °C
Pressure: ____ mm Hg
Humidity: ____ %
Thermometer ID#: ____
Barometer ID#: ____
Hygrometer ID#: ____
Beta Set: ____ ^{137}Cs Source: ____
Performed By: SBZ
Date: 9-30-97

NOT REQUIRED
NEW INSTRUMENT

	Pass	Fail
Visual:		
Battery:		
High Voltage:		
Audio:		
Alarm:		
Reset:		
Response:		

Background: ____ cpm

Source	Current Source Strength	Acceptance Range (net cpm)	Instrument Response (net cpm)
^{99}Tc	0.12 µCi	–	
^{36}Cl	0.08 µCi	–	
^{90}Sr–Y	0.03 µCi	–	
^{137}Cs	0.1 mR/h	–	
	1.0 mR/h	–	
	10 mR/h	–	

Radiological Calibration

Temperature: 23 °C
Pressure: 736 mm Hg
Humidity: 48 %
Thermometer ID#: M139839
Barometer ID#: ↓
Hygrometer ID#: ↓
Beta Set: 1 ^{137}Cs Source: 10182
Background: 40 cpm
Performed By: SBZ
Date: 9-30-97

	Pass	Fail
Visual:	✓	
Battery:	✓	
High Voltage:	✓	
Audio:	✓	
Alarm:	N/A	
Reset:	✓	
Response:	✓	
Reproducibility:	✓	
Overload:	✓	

Source	Current Source Strength	Acceptance Range (net cpm)	Instrument Response (net cpm)
^{147}Pm	9.97 ~~0.11~~ µCi (SBZ 0.05)	2,100 – 2,600	2,200
^{99}Tc	0.12 µCi	12,800 – 15,700	13,000
^{36}Cl	0.08 µCi	25,300 – 31,000	25,500
^{90}Sr–Y	0.47 ~~0.06~~ µCi (SBZ 0.02)	14,700 – 18,000	16,000
^{137}Cs	0.1 mR/h	225 – 275	260
	1.0 mR/h	2,250 – 2,750	2,400
	10 mR/h	22,500 – 27,500	22.5K
Trial 2	10 mR/h	22,500 – 27,500	22.5K
Trial 3	10 mR/h	22,500 – 27,500	22.5K

Performance Validation

Temperature: 23 °C
Pressure: 736 mm Hg
Humidity: 50 %
Thermometer ID#: M139839
Barometer ID#: ↓
Hygrometer ID#: ↓
^{137}Cs Source: 10182
Background: 40 cpm

	Pass	Fail
Visual:	✓	
Battery:	✓	
High Voltage:	✓	
Audio:	✓	
Alarm:	NA	
Reset:	✓	
Response:	✓	

Source	Current Source Strength	Acceptance Range (net cpm)	Instrument Response (net cpm)
^{137}Cs	0.1 mR/h	225 – 275	260
	1.0 mR/h	2,250 – 2,750	2,400
	10 mR/h	22,500 – 27,500	23K

Performed By: [signature] Date: 9-30-97

Remarks: _____

Reviewed By: [signature] Date: 9-30-97

NON-HPIC INSTRUMENT BIGRON SURVEYOR MX / ALPHA SCINTILLATION PROBE

RADIOLOGICAL CALIBRATION DATA SHEET

Barcode #: M146455 Serial #: 100357 HP #: ATG Detector Type: BEAR CLAW MODEL 3

As–Found Radiological Response

Temperature: ____ °C
Pressure: ____ mm Hg
Humidity: ____ %
Thermometer ID#: ____
Barometer ID#: ____
Hygrometer ID#: ____

NOT REQUIRED NEW INSTRUMENT

	Pass	Fail
Visual:		
Battery:		
Audio:		
Alarm:		
Reset:		
Background:		
Response:		
Cal. Factor:		

Response Verification

Range	Source Number	Activity (dpm)	Response (cpm)	Efficiency (%)
X1	5793	2,230		
X10	9735	18,200		
X100	9101	176,000		
X1000	9105	2,480,000		
Scaler	9735	18,200		

As–Found Efficiency (%): ____

Acceptance Range: –

Calibration Factor Verification

100 cm² Source #	Activity (dpm)	Cal. Factor	Acceptance Range (cpm)	Response (cpm)
			–	

Performed By: SBZ Date: 9-24-97

NON-HPIC INSTRUMENT

Radiological Calibration

Temperature: 23 °C
Pressure: 736 mm Hg
Humidity: 50 %
Thermometer ID#: M139839
Barometer ID#: ↓
Hygrometer ID#: ↓

	Pass	Fail
Visual:	✓	
Battery:	✓	
Gamma Rej:	✓	
Audio:	✓	
Alarm:	N/A	
Reset:	✓	
Background:	✓	
Response:	✓	
Reproducibility:	✓	
Uniformity:	✓	

Response Test/Efficiency Determination

Range	Source Number	Activity (dpm)	Response (cpm)	Efficiency (%)
X1	5793	2,230	320	14
X10	9735	18,200	2300	13
X100	9101	176,000	23K	13
X1000	9105	2,480,000	310K	13
Scaler	9735	18,200	N/A →	

Average Efficiency: 13

Acceptance Range: 12 - 14

Reproducibility/Uniformity Test

Position	Activity (dpm)	Acceptance Range (cpm)	Response (cpm)
Center₂	176,000	20.7K - 25.3K	23K
Center₃			23K
Corner 1/Heel			23K
Corner 2/Toe			23K
Corner 3*			—
Corner 4*			—

*For beermug probes only.

Calibration Factor Determination

100 cm² Source Number	Activity (dpm)	Response (cpm)	Cal. Factor

Performed By: SBZ Date: 9-30-97

Performance Validation

Temperature: 23 °C
Pressure: 736 mm Hg
Humidity: 48 %
Thermometer ID#: M139839
Barometer ID#: ↓
Hygrometer ID#: ↓

	Pass	Fail
Visual:	✓	
Battery:	✓	
Audio:	✓	
Alarm:	NA	
Reset:	✓	
Background:	✓	
Response:	✓	
Cal. Factor	NA	

Response Verification

Range	Source Number	Activity (dpm)	Response (cpm)	Efficiency (%)
X1	5793	2,230	300	13
X10	9735	18,200	24K	~~14~~ 13
X100	9101	176,000	23K	13
X1000	9105	2,480,000	310K	13
Scaler	9735	18,200	N/A —	—

Calibration Efficiency (%): 13

SAB 9-97

Acceptance Range: 12 - 14

Calibration Factor Verification

100 cm² Source #	Activity (dpm)	Cal. Factor	Acceptance Range (cpm)	Response (cpm)
			–	

Performed By: SAB Date: 9-30-97

Remarks: EFFICINCIES ARE ABSOLUTE EFFECIENCIES AND HAVE NOT BEEN CORRECTED FOR PROBE AREA.

Reviewed By: KBS Date: 9-30-97

NON-HPIC INSTRUMENT

PANCAKE PROBE GM
CALIBRATION DATA SHEET

ATG

Barcode #: M146461 Serial #: 121265 HP #: _____

As–Found Radiological Response

Temperature: ____ °C
Pressure: ____ mm Hg
Humidity: ____ %
Thermometer ID#: ____
Barometer ID#: ____
Hygrometer ID#: ____
Beta Set: ____ ^{137}Cs Source: ____
Performed By: SBZ
Date: 9-30-97

NOT REQUIRED NEW INSTRUMENT

	Pass	Fail
Visual:		
Battery:		
High Voltage:		
Audio:		
Alarm:		
Reset:		
Response:		
Background: ____ cpm		

Source	Current Source Strength	Acceptance Range (net cpm)	Instrument Response (net cpm)
^{99}Tc	0.12 µCi	–	
^{36}Cl	0.08 µCi	–	
^{90}Sr–Y	0.03 µCi	–	
^{137}Cs	0.1 mR/h	–	
	1.0 mR/h	–	
	10 mR/h	–	

Radiological Calibration

Temperature: 23 °C
Pressure: 736 mm Hg
Humidity: 49 %
Thermometer ID#: M139839
Barometer ID#: ↓
Hygrometer ID#: ↓
Beta Set: 1 ^{137}Cs Source: 10182
Background: 40 cpm
Performed By: SBZ
Date: 9-30-97

	Pass	Fail
Visual:	✓	
Battery:	✓	
High Voltage:	✓	
Audio:	✓	
Alarm:	N/A	
Reset:	✓	
Response:	✓	
Reproducibility:	✓	
Overload:	✓	

Source	Current Source Strength	Acceptance Range (net cpm)	Instrument Response (net cpm)
^{147}Pm	2.07 ± 0.05 ~~4.97 ± 0.11~~ µCi	2,100 – 2,600	2,400
^{99}Tc	0.12 µCi	12,800 – 15,700	14,000
^{36}Cl	0.08 µCi	25,300 – 31,000	27,000
^{90}Sr–Y	2.07 ± 0.02 ~~4.97 ± 0.06~~ µCi	14,700 – 18,000	17,000
^{137}Cs	0.1 mR/h	225 – 275	270
	1.0 mR/h	2,250 – 2750	2,600
	10 mR/h	22,500 – 27,500	24K
Trial 2	10 mR/h	22,500 – 27,500	24K
Trial 3	10 mR/h	22,500 – 27,500	24K

Performance Validation

Temperature: 23 °C
Pressure: 736 mm Hg
Humidity: 50 %
Thermometer ID#: M139839
Barometer ID#: ↓
Hygrometer ID#: ↓
^{137}Cs Source: 10182
Background: 40 cpm

	Pass	Fail
Visual:	✓	
Battery:	✓	
High Voltage:	✓	
Audio:	✓	
Alarm:	NA	
Reset:	✓	
Response:	✓	

Source	Current Source Strength	Acceptance Range (net cpm)	Instrument Response (net cpm)
^{137}Cs	0.1 mR/h	225 – 275	260
	1.0 mR/h	2,250 – 2,750	2500
	10 mR/h	22,500 – 27,500	23K

Performed By: BAB Date: 9-30-97

Remarks: _____

Reviewed By: KLS Date: 9-30-97

~~BICRON SURVEYOR MX 7~~ PANCAKE PROBE
CALIBRATION DATA SHEET

Nov–Dec 97

Barcode #: M146520 Serial #: 100356 HP #: ATG (Model 3)

As–Found Radiological Response

Temperature: ____ °C
Pressure: ____ mm Hg
Humidity: ____ %
Thermometer ID#: M139839
Barometer ID#: M139839
Hygrometer ID#: M139839
Beta Source Set: 1
^{137}Cs Source: 10182
Background: ____ cpm

NOT REQUIRED
NEW INSTRUMENT

	Pass	Fail
Visual:		
Battery:		
High Voltage:		
Audio:		
Alarm:		
Reset:		
Response:		

Source	Current Source Strength	Acceptance Range (net cpm)	Instrument Response (net cpm)
^{99}Tc	0.12 µCi	12,800 – 15,700	
^{36}Cl	0.08 µCi	25,300 – 31,000	
^{90}Sr–Y	0.02 µCi	14,700 – 17,900	
^{137}Cs	0.1 mR/h	225 – 275	
	1.0 mR/h	2,250 – 2,750	
	10 mR/h	22,500 – 27,500	

Performed By: SBZ Date: 12-2-97

Radiological Calibration Non-ORNL Instrument

Non-HPIC Inst

Temperature: 27 °C
Pressure: 744 mm Hg
Humidity: 26 %
Thermometer ID#: M139839
Barometer ID#: M139839
Hygrometer ID#: M139839
Beta Source Set: 1
^{137}Cs Source: 10182
Background: 50 cpm

	Pass	Fail
Visual:	✓	
Battery:	✓	
High Voltage:	N/A	
Audio:	✓	
Alarm:	N/A	
Reset:	✓	
Response:	✓	
Reproducibility:	✓	
Overload:	✓*	

Source	Current Source Strength	Acceptance Range (net cpm)	Instrument Response (net cpm)
^{147}Pm	0.04 µCi	2,000 – 2,500	2,100
^{99}Tc	0.12 µCi	12,800 – 15,700	15,000
^{36}Cl	0.08 µCi	25,300 – 31,000	29,000
^{90}Sr–Y	0.02 µCi	14,700 – 17,900	17,500
^{137}Cs	0.1 mR/h	225 – 275	250
	1.0 mR/h	2,250 – 2,750	2,500
	10 mR/h	22,500 – 27,500	24K
Trial 2	10 mR/h	22,500 – 27,500	25K
Trial 3	10 mR/h	22,500 – 27,500	25K

Performed By: SBZ
Date: 12-2-97

Performance Validation

Non-HPIC Inst

Temperature: 24 °C
Pressure: 744 mm Hg
Humidity: 30 %
Thermometer ID#: M139839
Barometer ID#: M139839
Hygrometer ID#: M139839
^{137}Cs Source: 10182
Background: 50 cpm

	Pass	Fail
Visual:	✓	
Battery:	✓	
High Voltage:	N/A	
Audio:	✓	
Alarm:	N/A	
Reset:	✓	
Response:	✓	

Source	Current Source Strength	Acceptance Range (net cpm)	Instrument Response (net cpm)
^{137}Cs	0.1 mR/h	225 – 275	260
	1.0 mR/h	2,250 – 2,750	2,700
	10 mR/h	22,500 – 27,500	25K

Performed By: SBZ Date: 12-2-97

Remarks: * Performed with no alarm capability.

Reviewed By: Daniel D Cole Date: 12/2/97

PANCAKE PROBE GM
CALIBRATION DATA SHEET

ATG Model 12

Barcode #: _____ Serial #: 121349 HP #: _____

As–Found Radiological Response

Temperature: ____ °C
Pressure: ____ mm Hg
Humidity: ____ %
Thermometer ID#: _____
Barometer ID#: _____
Hygrometer ID#: _____
Beta Set: ____ ^{137}Cs Source: ____
Performed By: BB
Date: 8/16/97

First ORNL Cal.

	Pass	Fail
Visual:		
Battery:		
High Voltage:		
Audio:		
Alarm:		
Reset:		
Response:		

Background: ____ cpm

Source	Current Source Strength	Acceptance Range (net cpm)	Instrument Response (net cpm)
^{99}Tc	0.12 µCi	–	
^{36}Cl	0.08 µCi	– NON	
^{90}Sr–Y	0.03 µCi	– ORNL	
^{137}Cs	0.1 mR/h	–	
	1.0 mR/h	–	
	10 mR/h	–	

Radiological Calibration

Temperature: 24 °C
Pressure: 742 mm Hg
Humidity: 67 %
Thermometer ID#: M139839
Barometer ID#: ↓
Hygrometer ID#: ↓
Beta Set: 1 ^{137}Cs Source: 10182
Background: 40 cpm
Performed By: BB3
Date: 8/16/97

	Pass	Fail
Visual:	✓	
Battery:	✓	
High Voltage:	✓	
Audio:	✓	
Alarm:	N/A	
Reset:	✓	
Response:	✓	
Reproducibility:	✓	
Overload:	✓	

Source	Current Source Strength	Acceptance Range (net cpm)	Instrument Response (net cpm)
^{147}Pm	0.11 µCi	–	2400
^{99}Tc	0.12 µCi	– NON	14,000
^{36}Cl	0.08 µCi	– HPIC	26,000
^{90}Sr–Y	0.03 µCi	– INSTR.	17,000
^{137}Cs	0.1 mR/h	–	260
	1.0 mR/h	–	2,500
	10 mR/h	–	23K
Trial 2	10 mR/h	–	24K
Trial 3	10 mR/h	–	24K

Performance Validation

Temperature: 24 °C
Pressure: 741 mm Hg
Humidity: 61 %
Thermometer ID#: M139839
Barometer ID#: ↓
Hygrometer ID#: ↓
^{137}Cs Source: 10182
Background: 50 cpm

	Pass	Fail
Visual:	✓	
Battery:	✓	
High Voltage:	✓	
Audio:	N/A 8-18-97	
Alarm:	N/A	
Reset:	✓	
Response:	✓	

Source	Current Source Strength	Acceptance Range (net cpm)	Instrument Response (net cpm)
^{137}Cs	0.1 mR/h	– Non-HPIC	260
	1.0 mR/h	–	2,500
	10 mR/h	–	24K

Performed By: SBZ Date: 8-18-97

Remarks: _____

Reviewed By: KZR Date: 18 AUG 97

Designer and Manufacturer of Scientific and Industrial Instruments

CERTIFICATE OF CALIBRATION

LUDLUM MEASUREMENTS, INC.
POST OFFICE BOX 810 PH. 915-235-5494
501 OAK STREET FAX NO. 915-235-4672
SWEETWATER, TEXAS 79556, U.S.A.

JSTOMER ALLIED TECHNOLOGY GROUP ORDER NO. 204096/227497

Mfg. Ludlum Measurements, Inc. Model 12 Serial No. 121349

Mfg. Ludlum Measurements, Inc. Model 44-9 Serial No. PR128054

Cal. Date 07/10/97 Cal Due Date 01/10/98 Cal. Interval 6 Months Meterface 202-356

Check mark ☑ applies to applicable instr. and/or detector IAW mfg. spec. T. 73 °F RH 43 % Alt 703.8 mm Hg

☐ New Instrument Instrument Received ☐ Within Toler. +-10% ☐ 10-20% ☐ Out of Tol. ☒ Requiring Repair ☐ Other-See comments

☑ Mechanical ck. ☑ Meter Zeroed ☐ Background Subtract ☐ Input Sens. Linearity
☑ F/S Resp. ck ☑ Reset ck. ☐ Window Operation ☑ Geotropism
☑ Audio ck. ☐ Alarm Setting ck. ☑ Batt. ck. (Min. Volt) 2.2 VDC
☒ Calibrated in accordance with LMI SOP 14.8 rev 12/05/89. ☐ Calibrated in accordance with LMI SOP 14.9 rev 12/19/89.

Instrument Volt Set 900 V Input Sens. 35 mV Det. Oper. 900 V at 35 mV Threshold Dial Ratio = mV

☑ HV Readout (2 points) Ref./Inst. 500 / 500 V Ref./Inst. 2010 / 2000 V

COMMENTS:

Gamma Calibration: GM detectors positioned perpendicular to source except for M 44-9 in which the front of probe faces source.

RANGE/MULTIPLIER	REFERENCE CAL. POINT	INSTRUMENT REC'D "AS FOUND READING"	INSTRUMENT METER READING*
X 1000	400 K cpm		400
X 1000	100 K cpm		100
X 100	40 K cpm		400
X 100	10 K cpm	N/A	100
X 10	4 K cpm		400
X 10	1 K cpm		100
X 1	400 cpm		400
X 1	100 cpm		100

*Uncertainty within ± 10% C.F. within ± 20% All Range(s) Calibrated Electronically

	REFERENCE CAL. POINT	INSTRUMENT RECEIVED	INSTRUMENT METER READING*		REFERENCE CAL. POINT	INSTRUMENT RECEIVED	INSTRUMENT METER READING*
Digital Readout				Log Scale			

Ludlum Measurements, Inc. certifies that the above instrument has been calibrated by standards traceable to the National Institute of Standards and Technology, or to the calibration facilities of other International Standards Organization members, or have been derived from accepted values of natural physical constants or have been derived by the ratio type of calibration techniques. The calibration system conforms to the requirements of MIL-STD-45662A and ANSI N323-1978. State of Texas Calibration License No. LO-1963

Reference Instruments and/or Sources:

Cs-137 Gamma S/N ☐ 1162 ☑ G112 ☐ M565 ☐ S105 ☐ T1008 ☐ T879 ☐ E552 ☑ E551 ☐ Neutron Am-241 Be S/N T-304

☐ Alpha S/N ☐ Beta S/N ☐ Other

☑ m 500 S/N 54683 ☐ Oscilloscope S/N ☑ Multimeter S/N 57770262

Calibrated By: Vip Petrodi Date 7-10-97

Reviewed By: Rhonda Hanna Date 7-14-97

FORM C22A 05/13/97

Designer and Manufacturer of Scientific and Industrial Instruments

CERTIFICATE OF CALIBRATION

LUDLUM MEASUREMENTS, INC.
POST OFFICE BOX 810 PH. 915-235-5494
501 OAK STREET FAX NO. 915-235-4672
SWEETWATER, TEXAS 79556, U.S.A.

CUSTOMER ATG ORDER NO. 226657

Mfg. Ludlum Measurements, Inc. Model 12 Serial No. 121349 (121349)

Mfg. Ludlum Measurements, Inc. Model 44-9 Serial No. PR 128 061

Cal. Date 5-27-97 Cal Due Date 11-27-97 Cal. Interval 6 Months Meterface 202-356

Check mark ☑ applies to applicable instr. and/or detector IAW mfg. spec. T. 72 °F RH 45 % Alt 697.8 mm Hg

☐ New Instrument Instrument Received ☒ Within Toler. +-10% ☐ 10-20% ☐ Out of Tol. ☐ Requiring Repair ☐ Other-See comments

☑ Mechanical ck. ☑ Meter Zeroed ☐ Background Subtract ☐ Input Sens. Linearity
☑ F/S Resp. ck ☑ Reset ck. ☐ Window Operation ☑ Geotropism
☑ Audio ck. ☐ Alarm Setting ck. ☑ Batt. ck. (Min. Volt) 2.2 VDC

☒ Calibrated in accordance with LMI SOP 14.8 rev 12/05/89. ☐ Calibrated in accordance with LMI SOP 14.9 rev 12/19/89.

Instrument Volt Set 900 V Input Sens. 35 mV Det. Oper. 900 V at 35 mV Threshold Dial Ratio = mV

☑ HV Readout (2 points) Ref./Inst. 500 / 500 V Ref./Inst. 1500 / 1495 V

COMMENTS:

Gamma Calibration: GM detectors positioned perpendicular to source except for M 44-9 in which the front of probe faces source.

RANGE/MULTIPLIER	REFERENCE CAL. POINT	INSTRUMENT REC'D "AS FOUND READING"	INSTRUMENT METER READING*
X 1000	400 K cpm	400	400
X 1000	100 K cpm	100	100
X 100	40 K cpm	400	400
X 100	10 K cpm	100	100
X 10	4 K cpm	400	400
X 10	1 K cpm	100	100
X 1	400 cpm	400	400
X 1	100 cpm	100	100

*Uncertainty within ± 10% C.F. within ± 20% ALL Range(s) Calibrated Electronically

	REFERENCE CAL. POINT	INSTRUMENT RECEIVED	INSTRUMENT METER READING*		REFERENCE CAL. POINT	INSTRUMENT RECEIVED	INSTRUMENT METER READING*
Digital Readout				Log Scale			

Ludlum Measurements, Inc. certifies that the above instrument has been calibrated by standards traceable to the National Institute of Standards and Technology, or to the calibration facilities of other International Standards Organization members, or have been derived from accepted values of natural physical constants or have been derived by the ratio type of calibration techniques. The calibration system conforms to the requirements of MIL-STD-45662A and ANSI N323-1978. State of Texas Calibration License No. LO-1963

Reference Instruments and/or Sources:

Cs-137 Gamma S/N ☐ 1162 ☐ G112 ☐ M565 ☐ S105 ☐ T1008 ☐ T879 ☐ E552 ☐ E551 ☐ Neutron Am-241 Be S/N T-304

☐ Alpha S/N ☐ Beta S/N ☐ Other

☑ m 500 S/N 54653 ☐ Oscilloscope S/N ☒ Multimeter S/N 57770262

Calibrated By: Vijy Patmoodi Date 5-27-97

Reviewed By: [signature] Date 5/28/97

FORM C22A 05/13/97

Designer and Manufacturer of Scientific and Industrial Instruments

CERTIFICATE OF CALIBRATION

LUDLUM MEASUREMENTS, INC.
POST OFFICE BOX 810 PH. 915-235-5494
501 OAK STREET FAX NO. 915-235-4672
SWEETWATER, TEXAS 79556, U.S.A.

CUSTOMER ATG ORDER NO. 226657

Mfg. Ludlum Measurements, Inc. Model 12 Serial No. 103326

Mfg. Ludlum Measurements, Inc. Model 44-9 Serial No. PR133259

Cal. Date 5-27-97 Cal Due Date 11-27-97 Cal. Interval 6 Months Meterface 202-356

Check mark ☑ applies to applicable instr. and/or detector IAW mfg. spec. T. 72 °F RH 45 % Alt 697.8 mm Hg

☐ New Instrument Instrument Received ☒ Within Toler. +-10% ☐ 10-20% ☐ Out of Tol. ☐ Requiring Repair ☐ Other-See comments

☑ Mechanical ck. ☑ Meter Zeroed ☐ Background Subtract ☐ Input Sens. Linearity
☑ F/S Resp. ck ☑ Reset ck. ☐ Window Operation ☑ Geotropism
☑ Audio ck. ☐ Alarm Setting ck. ☑ Batt. ck. (Min. Volt) 2.2 VDC

☒ Calibrated in accordance with LMI SOP 14.8 rev 12/05/89. ☐ Calibrated in accordance with LMI SOP 14.9 rev 12/19/89.

Instrument Volt Set 900 V Input Sens. 36 mV Det. Oper. 900 V at 36 mV Threshold Dial Ratio = mV

☑ HV Readout (2 points) Ref./Inst. 500 / 500 V Ref./Inst. 1500 / 1500 V

COMMENTS:

Gamma Calibration: GM detectors positioned perpendicular to source except for M 44-9 in which the front of probe faces source.

RANGE/MULTIPLIER	REFERENCE CAL. POINT	INSTRUMENT REC'D "AS FOUND READING"	INSTRUMENT METER READING*
X 1000	400 K cpm	400	400
X 1000	100 K cpm	100	100
X 100	40 K cpm	400	400
X 100	10 K cpm	100	100
X 10	4 K cpm	370	400
X 10	1 K cpm	95	100
X 1	400 cpm	400	400
X 1	100 cpm	100	100

*Uncertainty within ± 10% C.F. within ± 20% ALL Range(s) Calibrated Electronically

	REFERENCE CAL. POINT	INSTRUMENT RECEIVED	INSTRUMENT METER READING*		REFERENCE CAL. POINT	INSTRUMENT RECEIVED	INSTRUMENT METER READING*
Digital Readout				Log Scale			

Ludlum Measurements, Inc. certifies that the above instrument has been calibrated by standards traceable to the National Institute of Standards and Technology, or to the calibration facilities of other International Standards Organization members, or have been derived from accepted values of natural physical constants or have been derived by the ratio type of calibration technique. The calibration system conforms to the requirements of MIL-STD-45662A and ANSI N323-1978. State of Texas Calibration License No. LO-1963

Reference Instruments and/or Sources:

Cs-137 Gamma S/N ☐ 1162 ☐ G112 ☐ M565 ☐ 5105 ☐ T1006 ☐ T679 ☐ E552 ☐ E551 ☐ Neutron Am-241 Be S/N T-304

☐ Alpha S/N ☐ Beta S/N ☐ Other

☑ m 500 S/N 54683 ☐ Oscilloscope S/N ☒ Multimeter S/N 57770262

Calibrated By: Vijay Patwardhan Date 5-27-97

Reviewed By: [signature] Date 5/28/97

FORM C22A 05/13/97

APPENDIX D

OFF-SITE SHIPMENT APPROVAL RECEIPTS AND RECYCLED MATERIAL

LOCKHEED MARTIN

Memorandum

Date: December 12, 1997

To: S. A. Herron

cc: W. P. Carlton, T. K. Cothron, T. W. Morris, R. W. Oliver, T. P. A. Perry, A. D. Reynolds, L. B. Rodems, M. L. Whitehead, EC Document Center-RC, File-CLS

From: T. W. Morris, K-1001, MS-7123, 241-4921
C. L. Stair, 9116, MS-8098, 576-8006

Subject: **Shipment of Scrap Metal from Old Hydrofracture Facility Demolition (98-35A)**

Based upon our review of the shipment proposal information submitted to this office, approval is granted to ship scrap metal in Roll-Off Bin/Load Number 1 (consisting primarily of metal from the upper levels of material/grout storage bins 1 and 4 and ancillary structural supports from all four material/grout storage bins) to the approved recycling vendor. This approval is based on our receipt of documentation that the conditions in Conard Stair's 11/25/97 memorandum to you have been met for the aforementioned scrap metal.

CLS:TKC:ag

LOCKHEED MARTIN

Memorandum

Date: December 19, 1997

To: S. A. Herron

cc: W. P. Carlton, T. K. Cothron, T. W. Morris, R. W. Oliver, T. P. A. Perry, A. D. Reynolds, L. B. Rodems, M. L. Whitehead, EC Document Center–RC, File–CLS

From: T. W. Morris, K-1001, MS 7123, 241-4921
C. L. Stair, 9116, MS 8098, 576-8006

Subject: Shipment of Scrap Metal from Old Hydrofracture Facility Demolition (98-35B)

Based upon our review of the shipment proposal information submitted to this office, approval is granted to ship scrap metal in Roll-Off Bin/Load Number 2 (consisting primarily of metal from the bodies of material/grout storage bins 1 and 2, auxiliary structural supports, and two ladders) to the approved recycling vendor. This approval is based on our receipt of documentation that the conditions in Conard Stair's November 25, 1997, memorandum to you have been met for the aforementioned scrap metal.

CLS:TKC:lr

LOCKHEED MARTIN

Memorandum

Date: January 5, 1998

To: S. A. Herron

c: W. P. Carlton, T. K. Cothron, T. W. Morris, R. W. Oliver, T. P. A. Perry, A. D. Reynolds, L. B. Rodems, M. L. Whitehead, EC Document Center–RC, File–CLS

From: T. W. Morris, K-1001, MS 7123, 241-4921
C. L. Stair, 9116, MS 8098, 576-8006

From: **Shipment of Scrap Metal from Old Hydrofracture Facility Demolition (98-35C)**

Based upon our review of the shipment proposal information submitted to this office, approval is granted to ship scrap metal in Roll-Off Bin/Load Number 3 (consisting primarily of metal from the bodies of material/grout storage bins 2 and 3, with some support and cone parts) to the approved recycling vendor. This approval is based on our receipt of documentation that the conditions in Conard Stair's November 25, 1997, memorandum to you have been met for the aforementioned scrap metal.

CLS:TKC:lr

Subject:

LOCKHEED MARTIN

Memorandum

Date: January 6, 1998

To: S. A. Herron

c: W. P. Carlton, T. K. Cothron, T. W. Morris, R. W. Oliver, T. P. A. Perry, A. D. Reynolds, L. B. Rodems, [redacted], EC Document Center–RC, File–CLS

From: T. W. Morris, K-1001, MS 7123, 241-4921
C. L. Stair, 9116, MS 8098, 576-8006

Subject: **Shipment of Scrap Metal from Old Hydrofracture Facility Demolition (98-35D)**

Based upon our review of the shipment proposal information submitted to this office, approval is granted to ship scrap metal in Roll-Off Bin/Load Number 4 (consisting primarily of metal from the body of material/grout storage bin 3) to the approved recycling vendor. This approval is based on our receipt of documentation that the conditions in Conard Stair's November 25, 1997, memorandum to you have been met for the aforementioned scrap metal.

CLS:TKC:lr

LOCKHEED MARTIN

Memorandum

Date: December 7, 1998

To: S. A. Herron

c: W. P. Carlton, T. K. Cothron, T. W. Morris, R. W. Oliver, T. P. A. Perry, A. D. Reynolds, L. B. Rodems, [redacted] EC Document Center–RC, File–CLS

From: T. W. Morris, K-1001, MS 7123, 241-4921
C. L. Stair, 9116, MS 8098, 576-8006

Subject: **Shipment of Scrap Metal from Old Hydrofracture Facility Demolition (98-35E)**

Based upon our review of the shipment proposal information submitted to this office, approval is granted to ship scrap metal in Roll-Off Bin/Load Number 5 (consisting primarily of stainless steel) to the approved recycling vendor. This approval is based on our receipt of documentation that the conditions in Conard Stair's November 25, 1997, memorandum to you have been met for the aforementioned scrap metal.

CLS:TKC:lr

Southern Salvage Scrap Metals, Inc.
903 W. Carter Ave.
P. O. Box 291
Harriman, Tennessee 37748
Phone (423) 882-5669 - FAX (423) 882-1413

Feb. 5, 1998

In Reference to Ticket # 32598

Load #1 Has a Net Weight of 8,660 LBS at $94.00 per Gross ton is Paid at $363.41

Load #2 Has a Net Weight of 8,640 LBS at .18¢ Per LB. is Paid at $1,555.20

Load #2 was Reduced in Weight of 800 LBS for Steel, With the Steel attached to the Stainless the Price would have been around .08¢ Per LB. my Company Removed the Excess Steel to Clean your material to hold the Price we quoted, for Clean material.

SOUTHERN SALVAGE SCRAP METALS, INC.
Lower Carter Street
P.O. Box 291
HARRIMAN, TENNESSEE 37748
Phone 882-5669

Date 1-9- 19 98

Name A/G

Address Oak Ridge.

Unpaid Stl.
COMMODITY

GROSS 39420 lbs.

TARE 30760 lbs. PRICE AMOUNT

NET 8660 lbs. 94.00 $ 363.41

COMMODITY

GROSS lbs.

TARE lbs. PRICE AMOUNT

NET lbs. $

Stainless Steel
COMMODITY

GROSS 41040 lbs. PRICE AMOUNT

TARE 31600 lbs. .18 $ 1555.20

NET 9440 lbs. TOTAL 1918.61

Less Steel 800

No. 32598 X
BARRELS

8640

We Will Not Be Responsible For
Damage To Trucks While Unloading

Southern Salvage Scrap Metals, Inc.
903 W. Carter Ave.
P. O. Box 291
Harriman, Tennessee 37748
Phone (423) 882-5669 - FAX (423) 882-1413

Feb. 5, 1998

In Reference to Ticket # 32105
Load #1 has a Net weight of 12,620 LBS
at $94.00 per Gross tons in Paid at $529.58

Load #2 has a Net weight of 8,980 LBS at
$94.00 per Gross tons in Paid at $376.83

Load #3 has a Net weight of 13,960 LBS at
$94.00 per Gross tons in Paid at $585.82

The Net Weights on ticket #32105 in
Devided by 2240 <Gross Ton> and Multiplyed
by $94.00 <Price>

SOUTHERN SALVAGE SCRAP METALS, INC.
Lower Carter Street
P.O. Box 291
HARRIMAN, TENNESSEE 37748
Phone 882-5669

Date Dec 23 19 97

Name ATG

Address OAK Ridge

Unpaid Stl
COMMODITY

12/23 GROSS 45300 lbs.
TARE 32680 lbs. PRICE AMOUNT
NET 12620 lbs. 94¢ $ 529.58

Unpaid Stl
COMMODITY

1/5 GROSS 40360 lbs.
TARE 31380 lbs. PRICE AMOUNT
NET 8980 lbs. 94¢ $ 376.83

Unpaid Stl.
COMMODITY

1/6 GROSS 47820 lbs. PRICE AMOUNT
TARE 33860 lbs. 94¢ $ 585.82
NET 13960 lbs. TOTAL 1492.23

№ 32105 x
SIGN HERE

We Will Not Be Responsible For Damage To Trucks While Unloading

DISTRIBUTION

1. T. W. Burwinkle
2. T. J. Cofer
3. S. A. Herron
4. S. L. Laman
5. P. T. Owen
6. L. B. Raulston
7. A. D. Reynolds
8. M. L. Whitehead
9. Central Research Library
10. File—EMEF DMC—RC