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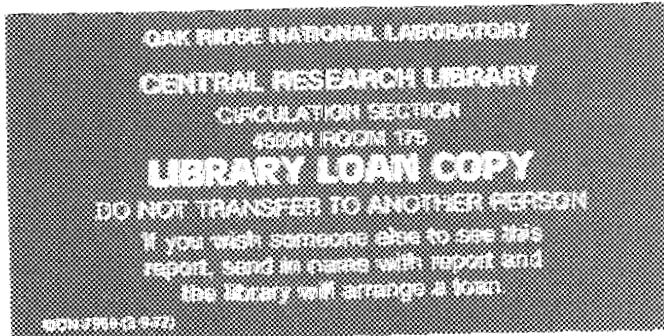
ORNL/ER-239

MARTIN MARIETTA

ENVIRONMENTAL RESTORATION PROGRAM

Alternatives Evaluation and Decommissioning Study on Shielded Transfer Tanks at Oak Ridge National Laboratory, Oak Ridge, Tennessee

**J. R. DeVore
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MANAGED BY
MARTIN MARIETTA ENERGY SYSTEMS, INC.
FOR THE UNITED STATES
DEPARTMENT OF ENERGY

EPMI 12580 18-7-91

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Energy Systems Environmental Restoration Program
ORNL Decontamination and Decommissioning Program

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J. R. DeVore
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Date Issued—August 1994

Prepared by
Engineering Division
Martin Marietta Energy Systems, Inc.

Prepared for
U.S. Department of Energy
Office of Environmental Restoration and Waste Management
under budget and reporting code EX 20

Environmental Restoration and Waste Management Programs
Oak Ridge National Laboratory
Oak Ridge, Tennessee 37831-6285
managed by
MARTIN MARIETTA ENERGY SYSTEMS, INC.
for the
U.S. DEPARTMENT OF ENERGY
under contract DE-AC05-84OR21400



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EXECUTIVE SUMMARY

The Shielded Transfer Tanks (STTs) are five obsolete cylindrical shipping casks which were used to transport high specific activity radioactive solutions by rail during the 1960s and early 1970s. The STTs are currently stored at the Oak Ridge National Laboratory (ORNL) under a shed roof on the west side of Building 7819 (Decontamination Facility) north of Melton Valley Drive across from Post 24. Four of the casks are Model II STTs which measure approximately 84 inches in height by 78 inches in diameter, have a 500 gal capacity stainless steel tank filled with approximately 400 gal of ion-exchange medium (sodium aluminosilicate) encased in three and one half-inches of lead shielding that weigh approximately 38,800 lbs when filled. One of the casks is a Model III STT (called the gun barrel tank because it was constructed from a surplus Naval gun) which measures 102 inches in height by 72 inches in diameter, has a 300 gal capacity stainless steel tank filled with approximately 200 gal of ion-exchange resin encased inside the nine-inch thick walls of the gun barrel that weighs approximately 42,000 lbs when fully loaded.

This report is an evaluation to determine the preferred alternative for the final disposition of the five STTs. The decommissioning alternatives assessed include: 1) the "no action" alternative to leave the STTs in their present location with continued surveillance and maintenance; 2) solidification of contents within the tanks and holding the STTs in long term retrievable storage; 3) sale of one or more of the used STTs to private industry for use at their treatment facility with the remaining STTs processed as in Alternative 4; and 4) removal of tank contents for de-watering/retrievable storage, limited decontamination to meet acceptance criteria, smelting the STTs to recycle the metal through the DOE contaminated scrap metal program, and returning the shielding lead to the ORNL lead recovery program because the smelting contractor cannot reprocess the lead.

To completely evaluate the alternatives for the disposition of the STTs, the contents of the tanks must be characterized. Shielding and handling requirements, risk considerations, and waste acceptance criteria all require that the radioactive inventory and free liquids residual in the STTs be known. Because characterization of the STT contents in the field was not feasible, surface meter readings, process knowledge, and STT construction drawings were input into a computer model to predict the probable inventory and amount of free liquid. The calculations, included in Appendix A, predicted the moisture content (i.e., aqueous residual) of the resin in the tanks is approximately 50 percent. The STTs are reported to have cesium inventories ranging from approximately 300 to 3,000 curies. The model does not predict the amount of residual strontium. The amount of other nuclides present can only be determined by sampling after the casks have been opened.

The four alternatives considered were subjected to a numerical scoring procedure. Alternative 4, smelting the STTs to recycle the metal after removal/de-watering of the tank contents, had the highest score and is, therefore, recommended as the preferred alternative. No potential buyers for the used STTs were located in a limited attempt to determine the marketability of the used tanks (Alternative 3). However, if a buyer for one or more STT could be found, it is recommended that Alternative 3 be reconsidered.

1. INTRODUCTION

The Shielded Transfer Tanks (STTs) are five large, obsolete, cylindrical shipping containers used to transport high specific activity radioactive liquid wastes during the 1960s and early 1970s. This report evaluates the alternatives for the final disposition of these tanks. The decommissioning alternatives assessed include: 1) the "no action" alternative to leave the STTs in their present location with continued surveillance and maintenance (S&M); 2) solidification of contents within the tanks and holding the STTs in long term retrievable storage; 3) sale of one or more of the used STTs to private industry for use at their treatment facility with the remaining STTs processed as in Alternative 4; and 4) removal of tank contents for de-watering/retrievable storage, limited decontamination to meet vendor acceptance criteria, smelting tanks to recycle the metal through the DOE contaminated scrap metal program, and returning the shielding lead to the ORNL lead recovery program.

2. BACKGROUND

2.1 PHYSICAL DESCRIPTION AND OPERATING HISTORY

The STTs are five cylindrical shipping containers which were designed to transport high specific activity radioactive solutions. Originally used to transport aqueous fission product waste in solution form from Arco, Idaho to ORNL beginning in 1958, the casks were modified in the early 1960s to ship larger quantities of fission products, predominantly cesium-137 for civilian applications and strontium-90 for the Systems for Nuclear Auxiliary Power (SNAP) program. These rail shipments from the Hanford Atomic Products Operation in Washington to Oak Ridge were made for the purpose of providing further purification and radioactive source production. To increase the safety of the shipment, the latter shipments were sorbed on Decalso, an inorganic alumino-silicate ion exchange material.

Two different models of the casks were built which were designated as Model II and Model III. The Model II cask (Fig. 1), with a nominal volume of 500 gal, contained approximately 400 gal of the Decalso resin and consisted of a stainless steel tank enclosed in a larger mild steel tank. The annular space between the tanks was filled with three and one half-inches of lead shielding. Only one Model III cask (Fig. 2) was built, and it held a smaller quantity (200 gal) of Linde AW-500 molecular sieve ion exchange media. This cask had a nominal volume of 300 gal, had nine-inches of steel shielding, and was called the "gun barrel cask" because it was made from a surplus naval gun barrel.

During the early 1970s, STT cask number 4L32109 was modified by removing the resin and altering the liquid fill/removal system. This cask was then used for several years to transport solutions from the Radiochemical Engineering Development Center (REDC), Building 7920, to the Radioactive Waste Evaporator Facility, Building 2531. Waste transfer activity continued until one of the cask internal transfer lines became plugged. The modified cask was then placed into storage with the other STTs. It is not known if this modified cask has transuranic bearing residual solution or sludges in it.

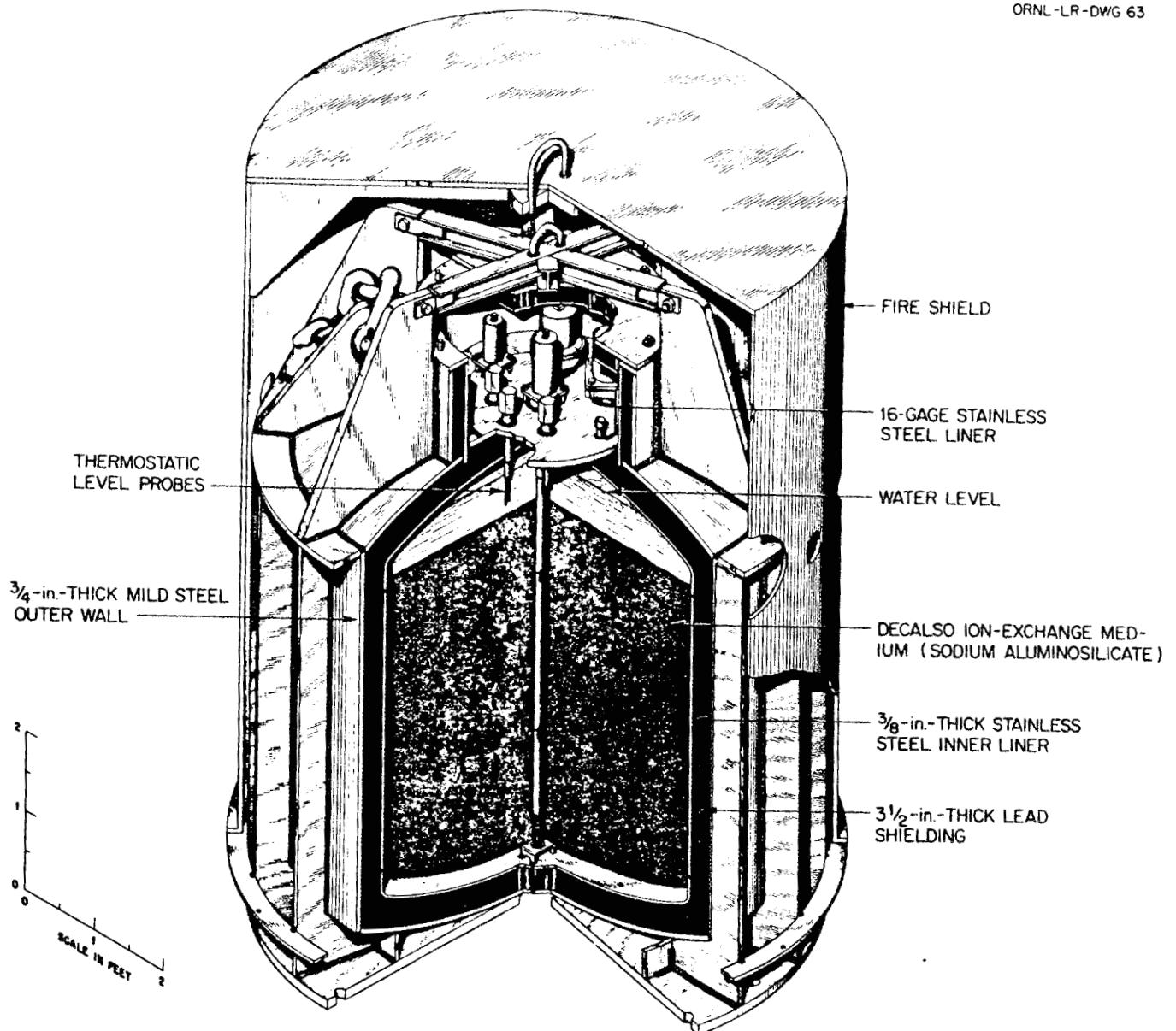
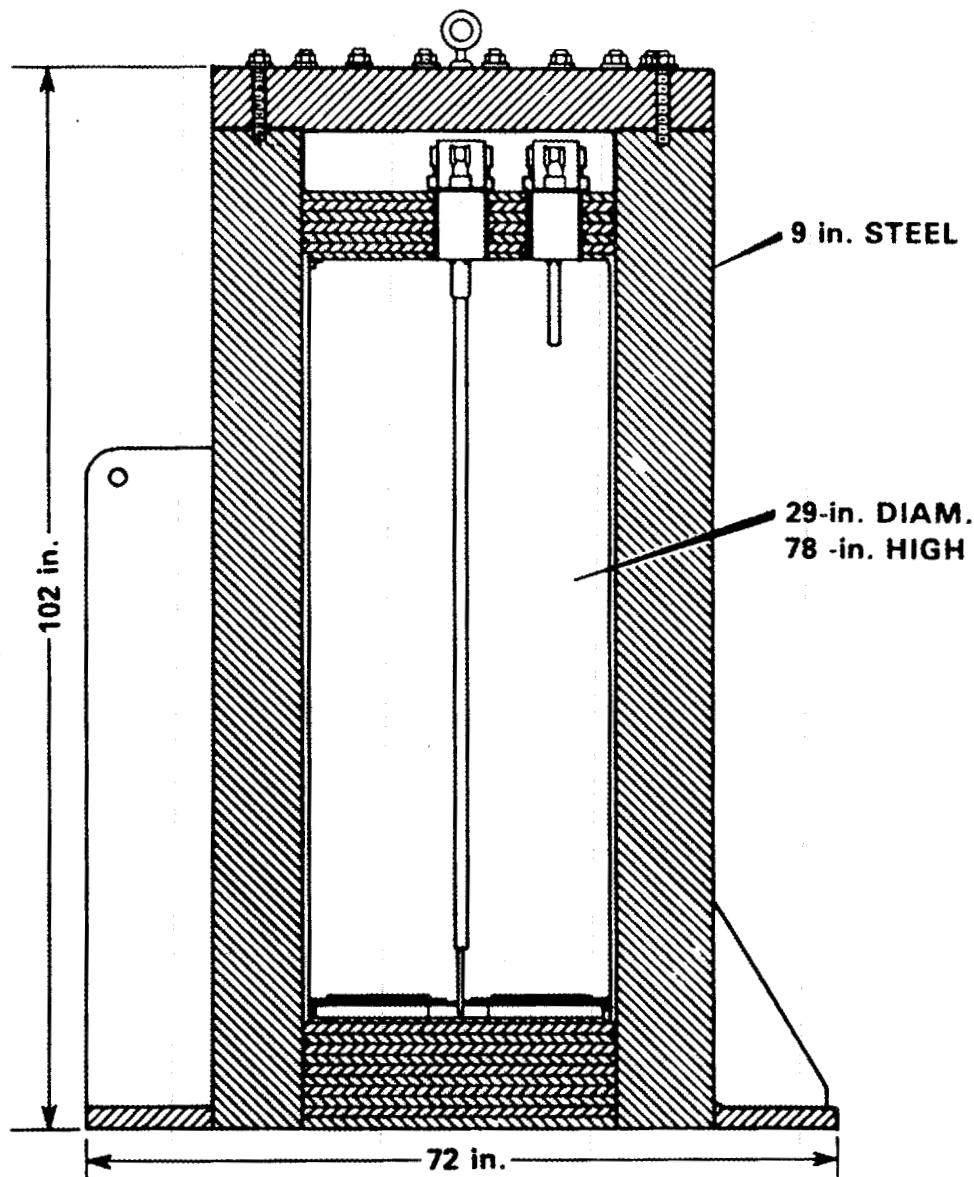


Fig. 1. Shielded Transfer Tank Model II (loaded weight 38,000 lbs).

DOT SP 5174

SHIELDED TRANSFER TANK-MODEL III

WEIGHT—42,000 lb.
AUTHORIZED CONTENTS—90,000 Ci ^{137}Cs .

Fig. 2. Shielded Transfer Tank Model III ("gun barrel cask").

2.2 PREVIOUS DECOMMISSIONING STUDIES

In 1983, a study was done for the decommissioning of the STT casks (reference 1), but all of the alternatives considered involved disposal by burial on the Oak Ridge Reservation in the Solid Waste Storage Area (SWSA) 6. The recommended alternative was controlled venting of gases, removal of resins/sludges and free liquids, followed by the addition of a grout mixture to the tanks to fill the void spaces and immobilize the remaining waste, and then disposal by burial in SWSA 6. This approach is no longer feasible for a number of reasons: environmental regulation concerning waste disposal have become more restrictive; SWSA 6 is closed; burial of radioactive materials is no longer practiced on the Oak Ridge Reservation; and the radionuclide inventory of the resin is too high for disposal by the tumulus method. Because of the dynamic status of mixed waste management, other disposal alternatives (i.e., Nevada Test Site, Hanford) currently unavailable, may become options to be considered once the STT decommissioning project is funded.

2.3 CURRENT PHYSICAL AND RADIOLOGICAL STATUS

Following the last operational use in 1967, resin in three of the casks was eluted with an ammonium nitrate solution followed by a water rinse. The STTs were stored outdoors in a fenced area in SWSA 4. In 1988, the STTs were moved to their present location outside Building 7918, and a shed roof was later installed to provide protection from the elements.

The present radiological conditions of the STTs are described in section 1.2 of reference 2. The exterior surfaces of the Model II STTs, especially the cupola, are corroding. Variations in dose rates on the external surfaces could indicate that the radioactive contents are unevenly distributed within the casks, or that there was corrosion in the inner tank with subsequent penetration of radioactivity into the cask shielding. But a more probable explanation is a hot particle embedded in the paint.

In the early 1970s, the exterior and fill mechanism of one Model II STT was modified and its resin was removed. This cask was used at ORNL to transport high level fission product waste from the REDC to the WEF. Since the modified STT Model II cask showed the highest average reading, residual radioactive solution or sludge (possibly containing transuranic (TRU) materials) may remain inside this cask. Because of the waste handling history of the modified STT, the isotopes present are of unknown identity, and this cask (4L32109) could not be modeled for radioactive material content.

2.4 RADIONUCLIDE INVENTORY

Gamma spectroscopy previously indicated cesium-137 was the only identifiable radionuclide present in the casks (except for modified cask 4L32109). Previous calculations of cask radionuclide inventory, based on radiation readings of the casks, are detailed in reference 1. The previous calculations were crude estimates because they only included straight-line attenuation and did not include effects of geometry or scattered radiation.

As a part of this alternatives assessment, a more accurate calculation was undertaken to better predict the cask radionuclide inventory. These calculations were done with the computer code ISOSHIELD-PC, a point-kernel attenuation code that accounts for both geometry and the effect of scattered radiation. New radiation measurements were made for this study with a calibrated μ rem/h meter. The measurements, as shown in Table 2.1, are an average of several center side readings taken at contact on the cask side half way between the top and bottom.

TABLE 2.1
Center Side Radiation Readings of the STTs

Cask Number	Gross Radiation reading (μ rem/h)	Background reading (μ rem/h)	Contamination reading (μ rem/h)	net radiation reading (μ rem/h)
4L32111	95	40	0.9	54.1
4L32108	400	40	0.9	359.1
4L32110	600	40	0.9	559.1
7L42208	400	40	0.9	359.1

The cask was modeled as a cylinder with cylindrical shields. Both the Decalso and AW-500 ion exchange resins were modeled as a combination of aluminum, water and air at an appropriate density for the media. Water content is an unknown variable affecting the density and also self absorption. Therefore, water content, in 25 percent increments, ranging from zero to 100 percent was calculated. The source term used was one curie (Ci) of cesium-137 in equilibrium with barium-137m. After subtracting both fixed and transferrable surface contamination and radiation background, the new radiation readings were divided by these calculated radiation measurements to obtain the cesium loading of the ion exchange media. These results are listed in Table 2.2, and the detailed calculations are shown in Appendix A. The contamination reading was calculated from the average fixed and transferrable contamination level, modeled as a disk source based on one-half of the outside area of the cask, including fins. The value in the last column ("Check") was calculated based on a radiation reading of 5 milliroentgen per hour (mr/h) which resulted from a cask loaded with 30,000 Ci of cesium-137 (reference 3). This, divided into to the present corrected radiation reading from Table 2.1, also yields the radionuclide inventory. Based on these calculations, the resin apparently contains approximately 50 percent water, since there is agreement between the two methods at that point.

TABLE 2.2
Calculated Curie Loadings of STTs
at Various Resin Water Loadings

Cask Number	0% water	25% water	50% water	75% water	100% water	Check
4L32111	248	288	328	367	407	325
4L32108	1648	1910	2172	2436	2698	2155
4L32110	2656	2973	3382	3793	4201	3355
7L42208	144	167	191	216	240	-

3. AVAILABLE TECHNOLOGY

A literature search and discussions with knowledgeable people have produced a set of three proven technologies that might be used for the decommissioning of the STTs.

3.1 SOLIDIFICATION

Solidification of the resin within the STT can be accomplished by controlled venting of the casks to release off-gases, dewatering the resin, and pumping in a dilute grout mixture while displaced air escapes through the thermocouple or other penetration in the access plate. All gaseous and liquid effluent would be handled as contaminated material. The grout mixture should have pumpability characteristics to ensure the resin bed would be covered and the void space on top of the bed filled. The grout would be fed into both the short and long dip tubes which penetrate the inner tank and allowed to set up. The intent of solidification is to eliminate free liquids and fill voids.

3.2 REMOVAL AND STORAGE OF RESIN

Resin removal could be accomplished by sluicing with water, pumping the resin into either a high integrity container (HIC) or into 55 gal drums. The resin was introduced into the casks in this manner, and reversing the flow through the long dip tube within the inner tank should pump the resin out of the short dip tube, if the resin has retained its structural integrity and a high enough flow is used. The water used in the sluicing operation would be filtered out of the HIC and re-used until all resin had been removed. Contamination of the water with residual cesium, although probable, can be minimized since the resin tends to absorb cesium if the pH of the solution is kept slightly acidic. The resin would be de-watered within the HIC before transfer to WAG 6 in a shielded cask.

Resin removal would be accomplished at Building 3517 inside Cell 1. This cell was once used as the original STT unloading cell. Shielded piping would be routed outside the cell to a HIC located in either the bay area or on the first floor. The HIC would remain inside its shielded transfer cask during the transfer operation.

Before use of a HIC as a storage container is allowed, a safety assessment will be required for handling the unshielded HIC at WAG 6. The HIC would be removed from its shielded transfer cask with a crane and lowered into a below-ground storage silo, using distance to reduce radiation exposure to the crane operator. The resin would require retrievable, long-term storage since its activity is too high for disposal on the Oak Ridge Reservation. If this method were not allowed, each HIC would be stored in its shielded transfer cask. Because of radiation damage to the container during long-term storage, a commercial polyethylene HIC cannot be used. Instead, a stainless steel HIC would be required in this application.

If the use of stainless steel HICs is not allowed, then stainless steel drums could be used in conjunction with the Building 3517 drum waste carrier system. This system considerably reduces the dose received by waste operations personnel over direct handling, but each STT would require approximately ten drums to completely remove the resin, for a total of about 40 drums. The drums would be transferred to WAG 6 where they would be retrievably stored in the existing remote handled waste storage facility. With this procedure, the piping from the STT sluicing in Cell 1 would be routed to Cell 15 and into the drum. Since there is more resin in the STT than can be handled in one drum, careful monitoring of the sluicing would be required to ensure the drums do not overflow. Generally, two or three days are required to accomplish a drum waste loadout from Cell 15. Using stainless steel drums for this task would be less efficient and more costly than using stainless steel HICs.

3.3 METAL SMELTING

Scientific Ecology Group (SEG) operates a 20-ton, 7200 Kw, high-efficiency induction furnace in Oak Ridge which is capable of melting most metals. The contents of the STTs would be removed, limited decontamination performed to meet SEG scrap metal acceptance criteria, and the empty STTs transported to the SEG facility where the shielding lead would be melted out of the cask annulus and recovered. The lead would be returned to the ORNL lead recovery program. The stainless tank and mild steel shell would be melted and cast into shield blocks for the DOE scrap metal recycling program. The Model III STT would be handled in the same manner, except there is no lead to remove. Because SEG cannot recycle contaminated lead, it would be placed in long-term storage as a mixed waste at ORNL.

4. D&D ALTERNATIVES

The four D&D alternatives were developed based on current technology, ORNL facilities availability, and the anticipated regulatory climate. The D&D alternatives for the STTs range from continued S&M to complete dismantlement of the casks. In support of the screening evaluation, each of the alternatives is described in detail.

4.1 ALTERNATIVE 1: CONTINUED S&M

This action would maintain the status quo for the tanks, and is the appropriate "no action" alternative required to be considered in all alternative evaluations. This alternative is open ended because leaving the STT tanks in their present location until a future date would require a decision at some point to begin decommissioning. Continued storage would reduce the radionuclide inventory through decay, although with a 30.3 year half-life for cesium-137, significant decay of the STT containers could occur before significant decay of the cesium.

4.2 ALTERNATIVE 2: SOLIDIFY TANK CONTENTS

This alternative would involve solidifying the tank contents (ion exchange resins and residual free liquid) within the tank. The STTs would be taken individually to Building 3517 where the top covers would be removed. A grout mixture would be pumped into the top portion of the tank through the short and long dip legs, and allowed to set. The cask lid would be replaced, and the cask exterior would be decontaminated and moved to WAG 6 for storage. This storage could be below-grade if Energy Systems Waste Management Organization, DOE, and regulatory approvals were obtained. The approvals would be pending the outcome of a safety assessment of the operation. At the present time, these approvals could be difficult to obtain.

4.3 ALTERNATIVE 3: SALE OF ONE OR MORE OF THE STTs

This alternative would involve sale of one or more of the tanks to a company like Scientific Ecology Group (SEG) for the transport of radioactive liquids within their site, similar to their previous usage at REDC. This alternative would require removal of the resins prior to sale, and possibly certification of the tank for use. This certification would primarily involve demonstrating tank integrity by visual inspection and a leak test. The tanks would be individually taken to Building 3517 where the top covers would be removed. The resin in the tank would be pumped into a HIC and de-watered. The resin would require retrievable storage as described in section 3.2 above. This storage could be below-grade if Energy Systems Waste Management Organization, DOE, and regulatory approvals were obtained. As in Alternative 2 above, these approvals would be pending the outcome of a safety assessment of the operation. If one or two STTs were determined to be suitable for re-use, they could be sold to a waste treatment facility. Generally, the revenue derived from such a sale is marginal. The remaining STTs not suitable for re-use could either be transported to WAG 6 for storage as in Alternative 2 above, or could be transported to SEG for smelting as in Alternative 4 below.

4.4 ALTERNATIVE 4: REMOVE TANK CONTENTS, SCRAP TANKS

This alternative would involve resin removal as described in section 3.2 above, de-watering of the resin in stainless steel HICs or drums, long-term retrievable storage of the waste,

limited decontamination of the tanks, followed by smelting of the tanks to recycle the ferrous metal through the DOE scrap metal recycling program, and return of the shielding lead to the ORNL lead recovery program. The tanks would be individually taken to Building 3517 where the top covers would be removed. The resin in the tank would be removed and handled in the same manner as in Alternative 3. The tank would be transported to SEG for smelting in their induction furnace.

5. EVALUATION OF ALTERNATIVES

5.1 RANKING CRITERIA

The four alternatives for the D&D of the STTs were evaluated according to six criteria. Table 5.1 lists the ranking criteria used to evaluate the alternatives, the sub-objectives of

TABLE 5.1

Ranking Criteria

Criteria (Attribute)	Sub-objective	Weight
Technical Feasibility (relative feasibility)	a) Maximize ability to implement b) Minimize technical risk c) Maximize long term effectiveness d) Minimize waste generation	30 points
Health and Safety (relative risk)	a) Minimize risk to the worker b) Minimize risk to the public c) Minimize risk to the environment	25 points
Cost and Schedule (relative cost and time efficiency)	a) Minimize capital costs b) Minimize operational costs c) Minimize time to alleviate problem	15 points
Flexibility and Versatility (relative flexibility)	a) Maximize ability to respond to future changes in scope b) Maximize ease of operation	10 points
Regulatory Compliance (relative ease of compliance)	Maximize compliance with the applicable requirements: 5820.2A/B, 6430.1A, 5400.4, 5480.2A, 5480.4, CERCLA, State mandates, etc.	10 points
Stakeholder Acceptance (relative acceptance)	Maximize acceptance with DOE Headquarters, DOE-ORO, MMES management, State of Tennessee, EPA, MMES Employees, and Public	10 points

each, and the weights given. The criteria include technical feasibility, health and safety, cost and schedule, flexibility, regulatory compliance, and stakeholder acceptance. The weighting factors of each were assigned according to their relative importance to the success of the D&D task, with heavier weighting given to the more important criteria.

5.1.1 Technical Feasibility

The technical feasibility of each alternative was assessed including the factors of ability to implement, technical risk (ability of currently available technology to perform the required tasks and the risk of not succeeding), the long term effectiveness, and waste generation minimization. A raw score of 1 means the ability to implement is low; the ability of currently available technology to perform the required tasks is low and, therefore, risk of not succeeding is high; the long term effectiveness is low; and the alternative generates the largest quantity of secondary waste. A raw score of 10 means the ability to implement is high; the ability of currently available technology to perform the required tasks is high and, therefore, risk of not succeeding is low; the long term effectiveness is high; and the alternative generates the smallest quantity of secondary waste.

5.1.2 Health and Safety

The risk to the workers, the public and the environment was assessed for each alternative. A raw score of 1 means the health and safety risks to the workers, the public and the environment are high. A raw score of 10 means the health and safety risks to the workers, the public and the environment are low.

5.1.3 Cost and Schedule

The capital and operational costs for the alternative along with the schedule for accomplishing the task were assessed. A raw score of 1 means the capital and operational costs for the alternative are high and the schedule for accomplishing the task is long. A raw score of 10 means the capital and operational costs for the alternative are low and the schedule for accomplishing the task is short.

5.1.4 Flexibility (versatility)

The flexibility (versatility) was assessed for each alternative. This included the ability to respond to future changes in scope along with the ease of operation. A raw score of 1 means the ability to respond to future changes in scope is low and the ease of operation is low. A raw score of 10 means the ability to respond to future changes in scope is high and the ease of operation is high.

5.1.5 Regulatory Compliance

The ability to comply with the applicable regulations was assessed for each alternative. A raw score of 1 means the ease of compliance is likely to be lower or that the regulatory framework is subject to interpretation. A raw score of 10 means the ease of compliance is

likely to be higher because the action falls within clearly defined, historically acceptable limits.

5.1.6 Stakeholder Acceptance

The potential acceptance of a particular alternative to the stakeholders was assessed for each alternative. A raw score of 1 means the level of acceptance by all stakeholders is likely to be lower. A raw score of 10 means the level of acceptance by all stakeholders is likely to be higher.

5.2 EVALUATION FOR DECOMMISSIONING

Table 5.2 summarizes the scores of the four alternatives when ranked by the above criteria. The raw scores range from ten to one representing more to less desirable outcome. The raw scores are then multiplied by the weighting factors given in parentheses below. Remove contents and scrap tanks, Alternative 4, has the highest score.

TABLE 5.2

Scores of the Four Alternatives

Alternative	Technical Feasibility (30)	Health and Safety (25)	Cost and Schedule (15)	Flexibility (Versatility) (10)	Regulatory Compliance (10)	Stakeholder Acceptance (10)	Total Score (100)
1. Continued S&M raw score weighted score	10 300	5 125	3 45	10 100	5 50	1 10	- 630
2. Solidify tank contents raw score weighted score	6 180	6 150	5 75	1 10	5 50	2 20	- 485
3. Sale of STTs raw score weighted score	5 150	8 200	10 150	8 80	9 90	7 70	- 740
4. Remove contents, scrap tanks raw score weighted score	8 240	8 200	8 120	7 70	10 100	10 100	- 830

5.2.1 Alternative 1: Continued Surveillance and Maintenance (S&M)

Leaving the STTs in their present location while continuing S&M activities does not accomplish the decommissioning objective. Since it is being done now, the technical feasibility is high, and this is the least expensive short term option. However, costs for eventual decommissioning are not likely to decrease. This concept retains flexibility, but suffers from drawbacks such as continued deterioration of the containers which would impact future decommissioning options. Health and safety is a concern because decommissioning at a later date would be with casks which had further deteriorated. Another drawback is that the "no action" alternative may not be acceptable to all stakeholders.

5.2.2 Alternative 2: Solidify Tank Contents

This alternative increases the volume of waste by the addition of grout, but the overall volume of the cask is not increased since the grout fills internal void spaces. Since below-ground disposal is no longer practiced, long term retrievable storage of the STTs would be required until permanent disposal. This alternative would produce a waste form that cannot be disposed of on-site and is difficult to deal with because of its size and weight. Eventually, an off-site disposal site and shipping method would be required. The quantities of cesium-137 contained in the casks are DOT type B quantities (> 10 Ci, normal form) and the cost of either developing a new type B shipping container for these casks or attempting to recertify them as type B containers would be high. The latter would be difficult because of the quantity of activity contained and the age of the containers. Additional treatment of the resin bed at a later date, if required, would be more difficult because the bed would be grouted.

5.2.3 Alternative 3: Sale of One or More STT(s)

This alternative has lower technical feasibility than the others because of the unknown condition of the interior tanks within the STTs. There is a potential for inner tank leakage. Leakage is unlikely to have occurred since the tanks were taken out of service; but if inner tank leakage occurred during usage of the tanks, it would be unrepairable and continued use of the tank could not be accomplished. There is also an uncertainty in the removal of the resin relative to the condition of the resin. If the resin has hardened to the point where it cannot be easily pumped, the entire concept could be in jeopardy. The overall health and safety score is higher because once the objective of the program is accomplished, the risk from continued deterioration is less. Flexibility is retained because the salvaged casks could be remediated in another manner at a later date. Agreement among stakeholders should be high. Since the resin is removed, this option would be combined with smelting of the unsold STTs as in Alternative 4 if only one or two of the tanks were declared serviceable.

5.2.4 Alternative 4: Remove Tank Contents, Scrap Tanks

This alternative completely remediates the tanks by recycling the materials of construction into a form which is usable and creates a durable waste form for long-term storage. This should increase stakeholder acceptance. Technical feasibility is higher for this alternative because lead removal and smelting of materials such as the tanks have been demonstrated. As in Alternative 3, the condition of the resin is still a concern. Uncertainty also exists in the final treatment of the lead because of the potential for radioactive contamination if the inner tank leaked. If the inner tank has leaked, contamination from the shielding will be incorporated into the lead as it is melted for removal from the STT carcass creating a mixed waste. However, it is believed that the likelihood of inner tank leakage is low.

6. UNCERTAINTIES AND ASSUMPTIONS

6.1 RADIONUCLIDE INVENTORY CALCULATION

The radionuclide inventory calculations are limited by several factors. First, the exact quantity of resin, although assumed to be 400 gal for the Model II and 200 gal for the Model III STTs, is an unknown. This directly affects the source term. The condition of the resin is also an unknown; deterioration over the years may have resulted in the resin packing down into a higher density form. If the inner tank leaked introducing contamination into the shielding, the result would be higher readings. This would result in the tank appearing to have a higher inventory. However, it is believed that the likelihood of inner tank leakage is low. As a convention, the buildup factor in these type of calculations is usually taken based on the thickest shield material, which in this case is the 3.5 inches of lead. This is because incident radiation has more mean free paths (μ) in the thicker shield, and has more interaction with these atoms. This results in the production of more radiation photons which are downgraded in energy (known as "build-up") before the radiation is absorbed. However if this convention is used, a factor of ten times higher cesium cask inventory results, which is an unrealistic value. If the STT calculations assumed that buildup occurred in the outer 0.75 inches steel shell of the cask, then more reasonable inventories result. The results of this latter method are listed in the tables in section 2.4, and are believed to be accurate because it agrees with the check value discussed above. However, there is some uncertainty concerning the precision of the model to accurately predict to the actual physical situation.

During their service lives, the STTs were also used for the transportation of strontium-90 solutions. Residual concentrations from these solutions would be difficult to detect with external radiation measurements. This is because strontium-90 is a pure beta emitter and only relatively weak x-rays are exhibited from bremsstrahlung from its decay and the decay of the equilibrium daughter product yttrium-90. There could be a considerable inventory of strontium-90 contained within the cask, which could remain undetected.

6.2 CONDITION OF RESIN

There is an uncertainty about the condition of the resin as to whether the resin can be removed. If the resin has hardened to the point where it cannot be pumped easily, the entire concept for Alternatives 3 and 4 would be in jeopardy. Although this condition is unlikely, the condition of the resin should be investigated prior to committing to Alternatives 3 or 4. This would also allow sampling of the resin to more accurately determine the cesium-137 and/or strontium-90 inventory. Because of safety concerns, sampling of the resin should be done in a contamination zone, and should be done in Building 3517. The condition of the resin can be investigated by remote TV camera, which can be lowered into the cask through the short dip leg opening. This same opening can be used to probe the resin with a steel rod to investigate its consistency, and a sample can be removed from the top of the resin bed.

6.3 CONDITION OF INNER TANK

There is uncertainty about inner tank leakage during its service life. The inner tank is not expected to have leaked, since it has not been previously reported, but there is a potential for leakage. If inner tank leakage occurred, then it probably occurred during usage of the tanks. Leakage is unlikely to have occurred since the tanks were taken out of service. If it occurred, it would be unrepairable and continued use of the tank could not be accomplished. In addition, the shielding lead would be contaminated which would make the recovered lead a mixed waste since the ORNL lead recovery program cannot process contaminated lead. Other Resource Conservation and Recovery Act (RCRA) materials are assumed to not be present based on process knowledge of STT use. No RCRA materials other than the lead used for shielding should be present.

6.4 HANDLING OF HICs

There is uncertainty concerning the handling of the HICs in WAG 6 during the loading into the storage silo. The HIC will have a high radiation reading, and although the HIC will be transported to WAG 6 in a shielded cask, special precautions will be required in its handling. Approvals for this handling based on a safety assessment of the operation will be required.

6.5 BUILDING 3517 MATERIAL HANDLING CAPABILITY

The Building 3517 overhead crane was designed to handle the STT casks, and has a nominal 20-ton (40,000 lb) capacity. It has routinely tested at 150 percent of capacity. The heaviest STT cask weighs 42,000 lb, but has been handled in the past by this crane. The HIC shielded cask weighs approximately 43,000 lb loaded. The Building 3517 crane has been poorly maintained in the past, and may be in need of overhaul prior to

performing this task. In addition, consideration should be given to the set-down location of these casks in the high bay area, since the cell shield blocks cannot adequately support the load if the casks were set down away from a structural wall.

7. COST ASSESSMENT FOR ALTERNATIVES CONSIDERED

This chapter presents the "order of magnitude" cost assessment and schedule for the alternatives considered feasible. Included in this section are all of the estimating assumptions required for the estimating process. The detailed cost estimate for each alternative is provided in the appendices to this report.

7.1 BASIS OF COST ASSESSMENT

The information contained in this section is intended to provide an understanding of the methodology used in developing the cost for this project. The craft or crafts that will perform the tasks were identified, and the appropriate wage rates were applied. Material and labor pricing was based on vendor quotes, recent similar job history, and nationally recognized publications such as R. S. Means Construction Cost Data and Richardson's Construction Estimating Standards. Special equipment costs were obtained either by vendor contact or data from similar projects. The wage rates for labor are those current as of March 1994 for the Oak Ridge area from the Automated Estimating System (AES) Standard Value File ORER0394.VAL. Labor rates are based on an average crew with necessary craftsmen, foremen, general foremen, and so on. All fringe benefits, payroll taxes, and workman's compensation insurance are included.

7.2 ADDITIONAL COST CONSIDERATIONS

The base estimating units used in this assessment generally reflect a normal standard for demolition costs. Many special work situations and job conditions can cause additional material consumption and/or a greater number of workhours to be used. During the estimating process, the estimating engineer included costs as appropriate depending on the anticipated job conditions for the following items: mobilization and demobilization; supporting items, breakage, and waste; temporary facilities; temporary services; cleanup; scaffolding; industrial hygiene; safety meetings; safety inspections; and allowances for OSHA, United States Environmental Protection Agency (EPA) compliance, and Energy Systems Health Physics and Industrial Hygiene oversight.

7.2.1 Energy Systems Site Overhead

Energy Systems site overhead is included on Energy Systems labor, purchased materials, and non-exempt subcontractors. This overhead recovers costs associated with administration, facilities maintenance, plant services, corporate and central services, and

general expenses. The rate is 45.00 percent for X-10 plant personnel, X-10 Central personnel (i.e., X-10 Engineering Services), and all purchased materials with the exception of single item purchases for more than \$20,000.

7.2.2 Off Site Contractors

An overhead rate of 8.7 percent is applied to the total cost of off-site subcontracts and exempt subcontracts to Energy Systems. This overhead is an apportionment of the costs of plant services, purchasing, facilities maintenance, administration, and so on.

7.2.3 Escalation

The estimate has been escalated using the DOE-OR approved annual rates issued by Energy Systems in the March 1994 Standard Value File. The estimate is based on fiscal year (FY) 1994 third quarter costs and then escalated over the period of activity as determined by the project schedule. The approved escalation rates are 2.8% for FY 1994, 3.0% for FY 1995, and 3.2% for FY 1996 and all years thereafter.

7.2.4 Estimate Assumptions and Results

Alternative 1 - Continued Surveillance and Maintenance:

This alternative assumes continued S&M for approximately 25 years with no remedial action. The costs are based on monitoring by the Facility Manager personnel at approximately 0.1 full time equivalent (FTE) for the duration of the Environmental Restoration Program life cycle. A 40 percent contingency is applied because of uncertainty concerning the condition of the tanks and their contents.

The estimated cost of Alternative 1, including escalation, is \$967,000.

Alternative 2 - Solidify Tank Contents:

This alternative involves Energy Systems Field Maintenance personnel transporting the STTs to Building 3517, removing the top cover of the tanks, and pumping grout into the top portion of the STTs. The grouted casks would then be transported by the Construction Manager's Direct Hire workers to WAG 6 or designated storage site. The cost of eventual off-site disposal was not included because of the high level of uncertainty concerning the ultimate disposal of the STTs. Average contingency is 34.2 percent. The cost estimate assumes the scheduled action takes place in FY 1995 is escalated to that year.

The estimated cost of Alternative 2, including escalation, is \$3,583,000.

Alternative 3 - Sale of One or More STTs:

This alternative considers the possible sale of two of the STTs to a private concern after the casks have had the contents removed, the internals have been inspected, and their integrity certified. The tank contents for all five STTs would be removed, processed, and packaged by Energy Systems labor forces and then placed in retrievable storage by the Construction Manager's Direct Hire workers. The three unsold STTs would be smelted to recover the metals as in Alternative 4. Because Alternative 3 involves two separate actions, sale and smelting, the administrative costs (i.e., two contracts, two sets of project documentation, additional legal considerations) are greater for this alternative than for the others considered in this evaluation. The average contingency is 34.5 percent and the schedule is the same as in Alternative 2.

The estimated cost of Alternative 3, including escalation, is \$4,056,000.

Alternative 4 - Remove Contents Scrap Tanks:

This alternative, using a different method of accomplishment from Alternative 3, provides the costs associated with a "turnkey" service subcontract to perform all services required to remove the tank contents and transport the tanks to their facility for smelting to recover the metals under the DOE scrap metal recovery program. The procurement process for the service subcontract, including the Davis-Bacon determination, was assumed to require the Energy Systems nominal duration of 80 work days. The cost of removing the lead from the annulus of the STTs is also included as is the cost to return the lead to ORNL. The contingency is 34.3 percent and a schedule similar to that for Alternatives 2 and 3 is assumed as shown in Figure 7.2.

The estimated cost of Alternative 4, including escalation, is \$3,817,000.

7.2.5 Contingency in the Estimate

According to DOE Order 4700.1, contingency is defined as the sum of funds included within an estimate to cover materials, labor, conditions, and risk situations which are an intrinsic part of the presently intended scope of work, but are not specifically allowed for elsewhere in the estimate due to uncertainty either as to their existence, nature, likelihood of occurrence, or magnitude of effect.

Contingency cost has been included in this assessment to cover costs that may result from incomplete design, unforeseen and unpredictable conditions, or uncertainties within the defined scope. Contingency analysis was conducted per DOE-HQ guidance provided by the William Heffelfinger memorandum titled "Cost Estimating Guide for Application of Contingency," dated June 18, 1985.

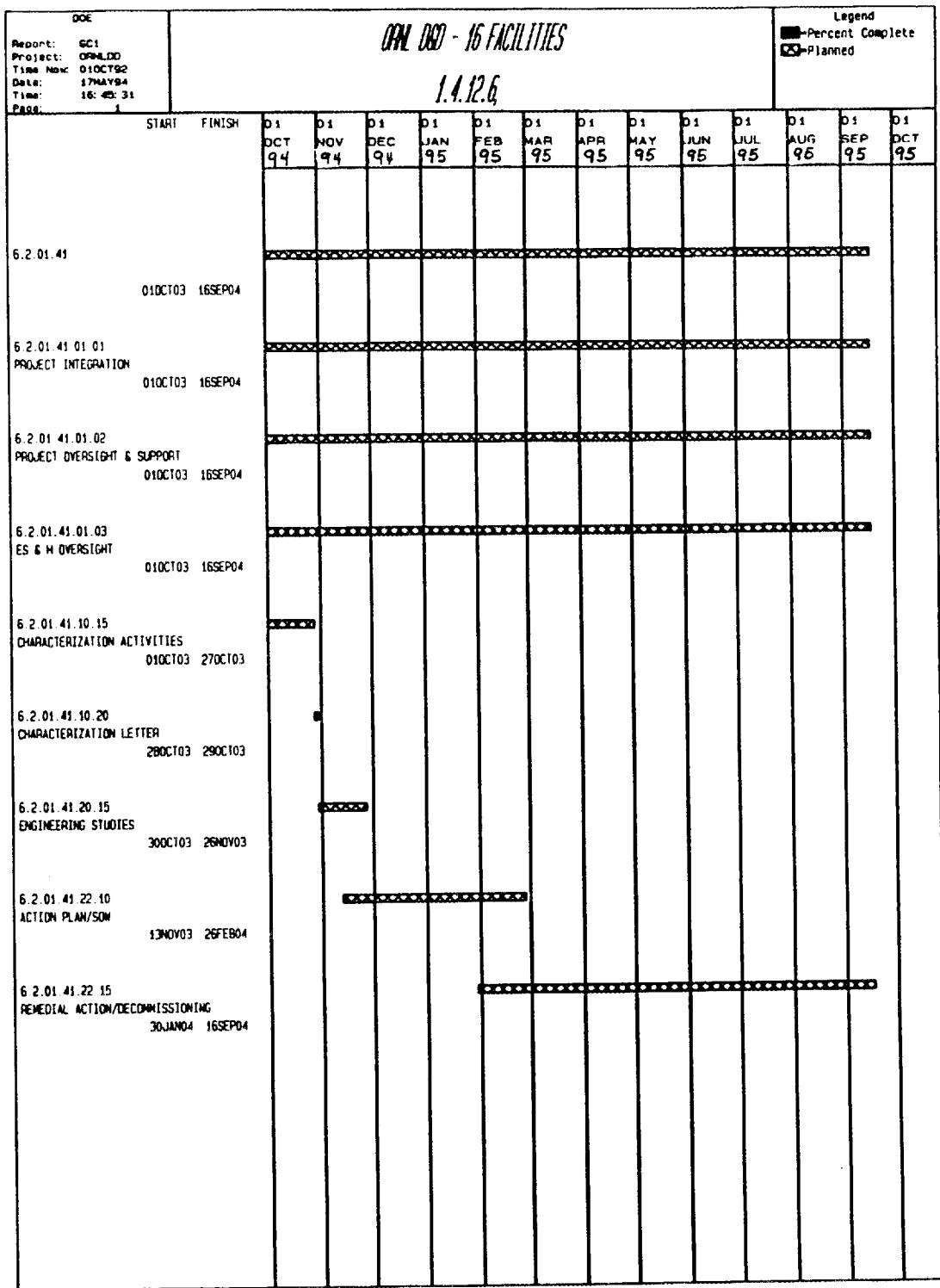


Figure 7.2. Decommissioning planning schedule for Alternative 4.

A midrange contingency, 30 to 40 percent, for standard projects was chosen based on the referenced guidance. The midrange was adjusted by evaluation of the completeness of design and complexity for each major Work Breakdown Structure (WBS) element. Average contingency is 34.3 percent.

8. RECOMMENDED ALTERNATIVE

After analysis of the four decommissioning alternatives, Alternative 4 was selected as the preferred alternative. Based on the scoring procedure applied to the critical factors, this alternative had the highest score. Therefore, it is recommended that the resin be removed, de-watered, and placed in HICs; the STTs be decontaminated as necessary to meet smelting contractor process acceptance criteria; the shielding lead removed and returned to the ORNL lead recovery program because the smelting contractor cannot process lead; and the ferrous metals smelted for reuse in the DOE contaminated scrap metal recovery program. However, if one or more STT could be sold or re-used as a transfer tank, the expense of smelting could be avoided and perhaps a small revenue generated.

REFERENCES

1. Reed, W. R., Peretz, F. J., DuMont, S. P., *Preliminary Decommissioning Study Reports Volume 1: Shielded Transfer Tanks*, X-OE-231 vol. 1, October, 1983.
2. Gilbert Commonwealth, Oak Ridge Tennessee, *Life Cycle Baseline Detailed Project Report for the Decontamination and Decommissioning Program at Oak Ridge National Laboratory, Volume 2, Shielded Transfer Tanks Decommissioning*, ORNL/ER/INT-24/V2, September, 1993.
3. Appendix No. 3, Hazards Report for Shielded Transfer Tank, Model II.

APPENDIX A. ISOSHIELD CALCULATIONS

ISOSHIELD CALCULATIONS

STT MODEL III CALCULATION

Stainless Steel density	8.02 g/cc
lead density	11.3 g/cc
mild steel density	7.45 g/cc
dry AW-500 resin	0.76 g/cc
water filled	1.236 g/cc
dry Decalso	0.4 g/cc
water filled	0.817 g/cc (50% water) 1.217 g/cc (100% water)

Cylinder 29" OD x 78" long, has 223.03 gal if a cylinder. Nominally holds only 200 gal of resin. Therefore, height = 41.49"

AW-500 Density Calculation, Basis: 1 cc resin

Porosity of AW-500 (free volume 52.5%)

density of resin is 0.761g, so there is 0.761 g resin in 1 cc.

void fraction is 0.475, add water at 1.0 g/cc, 0.475 g

0.761 g + 0.475 g = 1.236 g per cc

$\text{Al}_2\text{O}_3 \circ 2\text{SiO}_2$ molecular weight = 222, assume Si and Al are the same for shielding purposes, so

Al = 49.5 w/o =	0.377 g/cc
O = 50.5 w/o =	0.384 g/cc
$\text{H}_2\text{O} =$	0.475 g/cc
Total	1.236 g/cc

ISOSHIELD CALCULATIONS

Input File

```
NEXT= 3, IGEOM= 7, ICONC=0, ISPEC= 3, OPTION=0, JBUF= 2,  
SLTH=198.12,  
Y= 99.06, NTHETA= 9, NPSI= 11, DELR= 3.0, SSV1 = 0, NSHLD = 2,  
X= 64.77, T(1) =36.83,22.86,  
WEIGHT(335)= 1., WEIGHT(336)= 0.946,  
SFACT = 1.  
WATER      1      0.0, 0.119, 0.238, 0.357, 0.475 (vary from 0% to 100%)  
AIR        3      0.386  
ALUM.      7      0.377  
IRON       9      7.45
```

Resin Cesium Content

Gross reading	400	$\mu\text{R}/\text{hr}$
Background	40	$\mu\text{R}/\text{hr}$
Fixed/Smearable	0.86	$\mu\text{R}/\text{hr}$
Net reading	359.1	$\mu\text{R}/\text{hr}$

Results (cask inventory)

0%	$\text{H}_2\text{O } 359.1/2.5$	= 144 Ci
25%	$\text{H}_2\text{O } 359.1/2.147$	= 167 Ci
50%	$\text{H}_2\text{O } 359.1/1.877$	= 191 Ci
75%	$\text{H}_2\text{O } 359.1/1.665$	= 216 Ci
100%	$\text{H}_2\text{O } 359.1/1.494$	= 240 Ci

STT MODEL II CALCULATION

Stainless Steel density	8.02 g/cc
lead density	11.3 g/cc
mild steel density	7.45 g/cc
dry AW-500 resin	0.76 g/cc
water filled	1.236 g/cc
dry Decalso	0.4 g/cc
water filled	0.817 g/cc (50% water) 1.217 g/cc (100% water)

Cylinder 53.25" OD x 60.75" long, has 583.63 gal if a cylinder. But holds only 400 gal of resin. Therefore, height = 41.49"

Decalso Density Calculation, Basis: 1 cc resin
(since density is so close, and due to the lack of data for Decalso, we will assume the same properties as for AW-500,)

Porosity of Decalso 47.5% (free volume 52.5%)

density of resin is 0.761g, so there is 0.761 g resin in 1 cc.

void fraction is 0.475, add water at 1.0 g/cc, 0.475 g
0.761 g + 0.475 g = 1.236 g per cc

$\text{Al}_2\text{O}_3 \circ 2\text{SiO}_2$ molecular weight = 222, assume Si and Al are the same for shielding purposes, so

Al = 49.5 w/o =	0.377 g/cc
O = 50.5 w/o =	0.384 g/cc
$\text{H}_2\text{O} =$	0.475 g/cc
Total	1.236 g/cc

STT MODEL II CALCULATION

Input File

NEXT = 3, IGEOM = 7, ICONC=0, ISPEC= 3, OPTION=0, JBUF = 4,
 SLTH=105.39,
 Y= 52.695, NTHETA= 9, NPSI= 11, DELR= 3.0, SSV1 = 0, NSHLD =
 4,
 X= 84.455, T(1) =67.6275,0.9525,8.89,1.905,
 WEIGHT(335)= 1., WEIGHT(336)= 0.946, SFACT = 1.
 WATER 1 0.0, 0.119, 0.238, 0.357, 0.475 (vary from 0% to 100%)
 AIR 3 0.386
 ALUM. 7 0.377
 IRON 9 6.817 (stainless steel)
 IRON 9 7.45
 NICKEL 10 1.203 (stainless steel)
 LEAD 14 11.3

Resin Cesium Content

Cask number	4L32111	4L32108	4L32110
Gross reading	95 $\mu\text{R}/\text{hr}$	400 $\mu\text{R}/\text{hr}$	600 $\mu\text{R}/\text{hr}$
Background	40 $\mu\text{R}/\text{hr}$	40 $\mu\text{R}/\text{hr}$	40 $\mu\text{R}/\text{hr}$
Fixed/Smearable	0.86 $\mu\text{R}/\text{hr}$	0.86 $\mu\text{R}/\text{hr}$	0.86 $\mu\text{R}/\text{hr}$
Net reading	54.14 $\mu\text{R}/\text{hr}$	359.1 $\mu\text{R}/\text{hr}$	559.1 $\mu\text{R}/\text{hr}$

Results (cask inventory)

0%	H ₂ O	54.14/0.2179 = 248 Ci	359.1/0.2179 = 1648 Ci	359.1/0.2179 = 2656 Ci
25%	H ₂ O	54.14/0.188 = 288 Ci	359.1/0.188 = 1910 Ci	559.1/0.188 = 2656 Ci
50%	H ₂ O	54.14/0.1653 = 328 Ci	359.1/0.1653 = 2172 Ci	559.1/0.1653 = 2973 Ci
75%	H ₂ O	54.14/0.1474 = 367 Ci	359.1/0.1474 = 2436 Ci	559.1/0.1474 = 3382 Ci
100%	H ₂ O	54.14/0.1331 = 407 Ci	359.1/0.1331 = 2698 Ci	559.1/0.1331 = 4201 Ci

Start run at 16:23:28 04/26/94

ISOSHLD-II (RIBD removed)
IBM PC/AT Version 1.5, August 1987
Radiological Analysis
Westinghouse Hanford Company
Richland, WA 99352

STT-MII

Table of Source Activity:

Scale Factor = 1.000E+00

Isotope Name	Curies	Adjusted Curies
CS-137	1.00E+00	1.000E+00
BA-137M	9.46E-01	9.460E-01

Shield Composition, g/cc

	Shield 1	Shield 2	Shield 3				
IRON	6.817E+00	0.000E+00	7.450E+00				
NICKEL	1.203E+00	0.000E+00	0.000E+00				
LEAD	0.000E+00	1.130E+01	0.000E+00				
Group	Linear Attenuation Coefficients (last region is air)						
1	3.583E+02	8.172E+02	3.290E+02	4.424E-03	0.000E+00	0.000E+00	
2	9.954E+01	5.396E+02	9.146E+01	6.542E-04	0.000E+00	0.000E+00	
3	4.782E+01	1.921E+02	4.235E+01	3.504E-04	0.000E+00	0.000E+00	
4	2.217E+01	9.170E+01	1.963E+01	2.715E-04	0.000E+00	0.000E+00	
5	1.229E+01	5.243E+01	1.084E+01	2.405E-04	0.000E+00	0.000E+00	
6	8.202E+00	3.477E+01	7.234E+00	2.247E-04	0.000E+00	0.000E+00	
7	5.839E+00	2.410E+01	5.163E+00	2.137E-04	0.000E+00	0.000E+00	
8	4.219E+00	2.498E+01	3.742E+00	2.049E-04	0.000E+00	0.000E+00	
9	3.340E+00	2.843E+01	2.971E+00	1.985E-04	0.000E+00	0.000E+00	
10	1.657E+00	1.558E+01	1.520E+00	1.725E-04	0.000E+00	0.000E+00	
11	1.102E+00	6.317E+00	1.021E+00	1.474E-04	0.000E+00	0.000E+00	
12	8.127E-01	3.463E+00	7.435E-01	1.312E-04	0.000E+00	0.000E+00	
13	7.024E-01	2.006E+00	6.519E-01	1.183E-04	0.000E+00	0.000E+00	
14	5.847E-01	1.446E+00	5.364E-01	1.118E-04	0.000E+00	0.000E+00	
15	5.160E-01	9.887E-01	4.746E-01	8.986E-05	0.000E+00	0.000E+00	
16	4.747E-01	8.204E-01	4.381E-01	8.210E-05	0.000E+00	0.000E+00	
17	4.231E-01	6.983E-01	3.822E-01	7.408E-05	0.000E+00	0.000E+00	
18	3.805E-01	6.034E-01	3.501E-01	6.658E-05	0.000E+00	0.000E+00	
19	3.624E-01	5.514E-01	3.323E-01	6.180E-05	0.000E+00	0.000E+00	
20	3.364E-01	5.232E-01	3.092E-01	5.818E-05	0.000E+00	0.000E+00	
21	3.258E-01	5.006E-01	2.995E-01	5.495E-05	0.000E+00	0.000E+00	
22	3.103E-01	4.836E-01	2.838E-01	5.262E-05	0.000E+00	0.000E+00	
23	3.070E-01	4.735E-01	2.816E-01	5.004E-05	0.000E+00	0.000E+00	
24	2.952E-01	4.667E-01	2.727E-01	4.784E-05	0.000E+00	0.000E+00	
25	2.868E-01	4.644E-01	2.645E-01	4.383E-05	0.000E+00	0.000E+00	

Model II STT tank - Point Source

Source Shields Distance to Detector, X = 1.683E+01 cm
 Point Slab Offset from Normal, Y = 0.000E+00 cm

Shield Thickness, cm 9.525E-01 8.890E+00 1.905E+00

Taylor Buildup Data for Shield 3 with Effective Atomic Number 26.0

Group	Average Energy, Mev	Bremsstr. photons/sec	Source Total photons/sec	Energy Flux Mev/sq.cm/sec	Dose Rate R/hr
1	1.500E-02	3.623E+08	3.623E+08	0.000E+00	0.000E+00
2	2.500E-02	2.295E+08	2.295E+08	0.000E+00	0.000E+00
3	3.500E-02	1.205E+08	2.676E+09	0.000E+00	0.000E+00
4	4.500E-02	7.259E+07	7.259E+07	0.000E+00	0.000E+00
5	5.500E-02	5.470E+07	5.470E+07	0.000E+00	0.000E+00
6	6.500E-02	3.753E+07	3.753E+07	0.000E+00	0.000E+00
7	7.500E-02	2.929E+07	2.929E+07	0.000E+00	0.000E+00
8	8.500E-02	2.105E+07	2.105E+07	0.000E+00	0.000E+00
9	9.500E-02	1.607E+07	1.607E+07	0.000E+00	0.000E+00
10	1.500E-01	5.331E+07	5.331E+07	0.000E+00	0.000E+00
11	2.500E-01	1.070E+07	1.070E+07	5.145E-20	1.008E-25
12	3.500E-01	2.783E+06	2.783E+06	3.298E-10	6.793E-16
13	4.750E-01	1.191E+06	1.191E+06	2.494E-05	5.088E-11
14	6.500E-01	3.527E+05	3.150E+10	8.991E+01	1.870E-04
15	8.250E-01	4.485E+04	4.485E+04	6.384E-03	1.277E-08
16	1.000E+00	4.273E+03	4.273E+03	2.778E-03	5.362E-09
17	1.225E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
18	1.475E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
19	1.700E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
20	1.900E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
21	2.100E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
22	2.300E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
23	2.500E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
24	2.700E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
25	3.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
TOTALS		1.012E+09	3.507E+10	8.992E+01	1.870E-04

Note that 1.870E-04 R/hr = 1.340E-11 amp/kg

Shield Composition, g/cc

	Shield 1	Shield 2	Shield 3	Shield 4
H2O	0.000E+00	0.000E+00	0.000E+00	0.000E+00
AIR	0.000E+00	0.000E+00	0.000E+00	0.000E+00
AL	0.000E+00	0.000E+00	0.000E+00	0.000E+00
IRON	0.000E+00	6.817E+00	0.000E+00	7.450E+00
NICKEL	0.000E+00	1.203E+00	0.000E+00	0.000E+00
LEAD	0.000E+00	0.000E+00	1.130E+01	0.000E+00

Group Linear Attenuation Coefficients (last region is air)

1	0.000E+00	3.583E+02	8.172E+02	3.290E+02	4.424E-03	0.000E+00
2	0.000E+00	9.954E+01	5.396E+02	9.146E+01	6.542E-04	0.000E+00
3	0.000E+00	4.782E+01	1.921E+02	4.235E+01	3.504E-04	0.000E+00
4	0.000E+00	2.217E+01	9.170E+01	1.963E+01	2.715E-04	0.000E+00
5	0.000E+00	1.229E+01	5.243E+01	1.084E+01	2.405E-04	0.000E+00
6	0.000E+00	8.202E+00	3.477E+01	7.234E+00	2.247E-04	0.000E+00
7	0.000E+00	5.839E+00	2.410E+01	5.163E+00	2.137E-04	0.000E+00
8	0.000E+00	4.219E+00	2.498E+01	3.742E+00	2.049E-04	0.000E+00
9	0.000E+00	3.340E+00	2.843E+01	2.971E+00	1.985E-04	0.000E+00
10	0.000E+00	1.657E+00	1.558E+01	1.520E+00	1.725E-04	0.000E+00
11	0.000E+00	1.102E+00	6.317E+00	1.021E+00	1.474E-04	0.000E+00
12	0.000E+00	8.127E-01	3.463E+00	7.435E-01	1.312E-04	0.000E+00
13	0.000E+00	7.024E-01	2.006E+00	6.519E-01	1.183E-04	0.000E+00
14	0.000E+00	5.847E-01	1.446E+00	5.364E-01	1.118E-04	0.000E+00
15	0.000E+00	5.160E-01	9.887E-01	4.746E-01	8.986E-05	0.000E+00
16	0.000E+00	4.747E-01	8.204E-01	4.381E-01	8.210E-05	0.000E+00
17	0.000E+00	4.231E-01	6.983E-01	3.822E-01	7.408E-05	0.000E+00
18	0.000E+00	3.805E-01	6.034E-01	3.501E-01	6.658E-05	0.000E+00
19	0.000E+00	3.624E-01	5.514E-01	3.323E-01	6.180E-05	0.000E+00
20	0.000E+00	3.364E-01	5.232E-01	3.092E-01	5.818E-05	0.000E+00
21	0.000E+00	3.258E-01	5.006E-01	2.995E-01	5.495E-05	0.000E+00
22	0.000E+00	3.103E-01	4.836E-01	2.838E-01	5.262E-05	0.000E+00
23	0.000E+00	3.070E-01	4.735E-01	2.816E-01	5.004E-05	0.000E+00
24	0.000E+00	2.952E-01	4.667E-01	2.727E-01	4.784E-05	0.000E+00
25	0.000E+00	2.868E-01	4.644E-01	2.645E-01	4.383E-05	0.000E+00

Model II STT tank - Cylindrical Source, no self-absorption

Source Shields Distance to Detector, X = 8.446E+01 cm
 Cylindrical Cylindrical Volume = 1.514E+06 cc
 Source Length = 1.054E+02 cm Distance Along Cylinder, Y = 5.269E+01 cm
 Integration Specs: NTHETA = 9 NPSI = 11 DELR = 3.074E+00 cm
 Total Intervals: 2.178E+03

Shield Thickness, cm 6.763E+01 9.525E-01 8.890E+00 1.905E+00
 Taylor Buildup Data for Shield 4 with Effective Atomic Number 26.0

Group	Average Energy, Mev	Bremstr. photons/sec	Source Total photons/sec	Energy Flux Mev/sq.cm/sec	Dose Rate R/hr
1	1.500E-02	3.623E+08	3.623E+08	0.000E+00	0.000E+00
2	2.500E-02	2.295E+08	2.295E+08	0.000E+00	0.000E+00
3	3.500E-02	1.205E+08	2.676E+09	0.000E+00	0.000E+00
4	4.500E-02	7.259E+07	7.259E+07	0.000E+00	0.000E+00
5	5.500E-02	5.470E+07	5.470E+07	0.000E+00	0.000E+00
6	6.500E-02	3.753E+07	3.753E+07	0.000E+00	0.000E+00
7	7.500E-02	2.929E+07	2.929E+07	0.000E+00	0.000E+00
8	8.500E-02	2.105E+07	2.105E+07	0.000E+00	0.000E+00
9	9.500E-02	1.607E+07	1.607E+07	0.000E+00	0.000E+00
10	1.500E-01	5.331E+07	5.331E+07	0.000E+00	0.000E+00
11	2.500E-01	1.070E+07	1.070E+07	1.104E-22	2.164E-28
12	3.500E-01	2.783E+06	2.783E+06	1.273E-12	2.622E-18
13	4.750E-01	1.191E+06	1.191E+06	1.556E-07	3.173E-13
14	6.500E-01	3.527E+05	3.150E+10	7.374E-01	1.534E-06
15	8.250E-01	4.485E+04	4.485E+04	6.989E-05	1.398E-10
16	1.000E+00	4.273E+03	4.273E+03	3.474E-05	6.705E-11
17	1.225E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
18	1.475E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
19	1.700E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
20	1.900E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
21	2.100E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
22	2.300E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
23	2.500E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
24	2.700E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
25	3.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
TOTALS		1.012E+09	3.507E+10	7.375E-01	1.534E-06
Note that 1.534E-06 R/hr = 1.099E-13 amp/kg					

Shield Composition, g/cc

	Shield 1	Shield 2	Shield 3	Shield 4		
H2O	0.000E+00	0.000E+00	0.000E+00	0.000E+00		
AIR	3.860E-01	0.000E+00	0.000E+00	0.000E+00		
AL	3.770E-01	0.000E+00	0.000E+00	0.000E+00		
IRON	0.000E+00	6.817E+00	0.000E+00	7.450E+00		
NICKEL	0.000E+00	1.203E+00	0.000E+00	0.000E+00		
LEAD	0.000E+00	0.000E+00	1.130E+01	0.000E+00		
Group	Linear Attenuation Coefficients (last region is air)					
1	8.072E+00	3.583E+02	8.172E+02	3.290E+02	4.424E-03	0.000E+00
2	9.908E-01	9.954E+01	5.396E+02	9.146E+01	6.542E-04	0.000E+00
3	3.915E-01	4.782E+01	1.921E+02	4.235E+01	3.504E-04	0.000E+00
4	2.339E-01	2.217E+01	9.170E+01	1.963E+01	2.715E-04	0.000E+00
5	2.058E-01	1.229E+01	5.243E+01	1.084E+01	2.405E-04	0.000E+00
6	1.541E-01	8.202E+00	3.477E+01	7.234E+00	2.247E-04	0.000E+00
7	1.393E-01	5.839E+00	2.410E+01	5.163E+00	2.137E-04	0.000E+00
8	1.286E-01	4.219E+00	2.498E+01	3.742E+00	2.049E-04	0.000E+00
9	1.219E-01	3.340E+00	2.843E+01	2.971E+00	1.985E-04	0.000E+00
10	1.020E-01	1.657E+00	1.558E+01	1.520E+00	1.725E-04	0.000E+00
11	9.226E-02	1.102E+00	6.317E+00	1.021E+00	1.474E-04	0.000E+00
12	7.650E-02	8.127E-01	3.463E+00	7.435E-01	1.312E-04	0.000E+00
13	6.804E-02	7.024E-01	2.006E+00	6.519E-01	1.183E-04	0.000E+00
14	6.185E-02	5.847E-01	1.446E+00	5.364E-01	1.118E-04	0.000E+00
15	5.231E-02	5.160E-01	9.887E-01	4.746E-01	8.986E-05	0.000E+00
16	4.770E-02	4.747E-01	8.204E-01	4.381E-01	8.210E-05	0.000E+00
17	4.297E-02	4.231E-01	6.983E-01	3.822E-01	7.408E-05	0.000E+00
18	3.865E-02	3.805E-01	6.034E-01	3.501E-01	6.658E-05	0.000E+00
19	3.606E-02	3.624E-01	5.514E-01	3.323E-01	6.180E-05	0.000E+00
20	3.388E-02	3.364E-01	5.232E-01	3.092E-01	5.818E-05	0.000E+00
21	3.201E-02	3.258E-01	5.006E-01	2.995E-01	5.495E-05	0.000E+00
22	3.041E-02	3.103E-01	4.836E-01	2.838E-01	5.262E-05	0.000E+00
23	2.908E-02	3.070E-01	4.735E-01	2.816E-01	5.004E-05	0.000E+00
24	2.804E-02	2.952E-01	4.667E-01	2.727E-01	4.784E-05	0.000E+00
25	2.654E-02	2.868E-01	4.644E-01	2.645E-01	4.383E-05	0.000E+00

Model II STT tank - same source, dry resin

Source Shields Distance to Detector, X = 8.446E+01 cm
 Cylindrical Cylindrical Volume = 1.514E+06 cc
 Source Length = 1.054E+02 cm Distance Along Cylinder, Y = 5.269E+01 cm
 Integration Specs: NTHETA = 9 NPSI = 11 DELR = 3.074E+00 cm
 Total Intervals: 2.178E+03

Shield Thickness, cm 6.763E+01 9.525E-01 8.890E+00 1.905E+00
 Taylor Buildup Data for Shield 4 with Effective Atomic Number 26.0

Group	Average Energy, Mev	Bremsstr. photons/sec	Source Total photons/sec	Energy Flux Mev/sq.cm/sec	Dose Rate R/hr
1	1.500E-02	3.623E+08	3.623E+08	0.000E+00	0.000E+00
2	2.500E-02	2.295E+08	2.295E+08	0.000E+00	0.000E+00
3	3.500E-02	1.205E+08	2.676E+09	0.000E+00	0.000E+00
4	4.500E-02	7.259E+07	7.259E+07	0.000E+00	0.000E+00
5	5.500E-02	5.470E+07	5.470E+07	0.000E+00	0.000E+00
6	6.500E-02	3.753E+07	3.753E+07	0.000E+00	0.000E+00
7	7.500E-02	2.929E+07	2.929E+07	0.000E+00	0.000E+00
8	8.500E-02	2.105E+07	2.105E+07	0.000E+00	0.000E+00
9	9.500E-02	1.607E+07	1.607E+07	0.000E+00	0.000E+00
10	1.500E-01	5.331E+07	5.331E+07	0.000E+00	0.000E+00
11	2.500E-01	1.070E+07	1.070E+07	9.829E-24	1.926E-29
12	3.500E-01	2.783E+06	2.783E+06	1.385E-13	2.853E-19
13	4.750E-01	1.191E+06	1.191E+06	1.957E-08	3.992E-14
14	6.500E-01	3.527E+05	3.150E+10	1.047E-01	2.179E-07
15	8.250E-01	4.485E+04	4.485E+04	1.223E-05	2.447E-11
16	1.000E+00	4.273E+03	4.273E+03	6.812E-06	1.315E-11
17	1.225E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
18	1.475E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
19	1.700E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
20	1.900E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
21	2.100E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
22	2.300E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
23	2.500E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
24	2.700E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
25	3.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
TOTALS		1.012E+09	3.507E+10	1.048E-01	2.179E-07

Note that 2.179E-07 R/hr = 1.562E-14 amp/kg

Shield Composition, g/cc

	Shield 1	Shield 2	Shield 3	Shield 4		
H2O	1.190E-01	0.000E+00	0.000E+00	0.000E+00		
AIR	3.860E-01	0.000E+00	0.000E+00	0.000E+00		
AL	3.770E-01	0.000E+00	0.000E+00	0.000E+00		
IRON	0.000E+00	6.817E+00	0.000E+00	7.450E+00		
NICKEL	0.000E+00	1.203E+00	0.000E+00	0.000E+00		
LEAD	0.000E+00	0.000E+00	1.130E+01	0.000E+00		
Group	Linear Attenuation Coefficients (last region is air)					
1	8.497E+00	3.583E+02	8.172E+02	3.290E+02	4.424E-03	0.000E+00
2	1.054E+00	9.954E+01	5.396E+02	9.146E+01	6.542E-04	0.000E+00
3	4.260E-01	4.782E+01	1.921E+02	4.235E+01	3.504E-04	0.000E+00
4	2.611E-01	2.217E+01	9.170E+01	1.963E+01	2.715E-04	0.000E+00
5	2.301E-01	1.229E+01	5.243E+01	1.084E+01	2.405E-04	0.000E+00
6	1.768E-01	8.202E+00	3.477E+01	7.234E+00	2.247E-04	0.000E+00
7	1.611E-01	5.839E+00	2.410E+01	5.163E+00	2.137E-04	0.000E+00
8	1.491E-01	4.219E+00	2.498E+01	3.742E+00	2.049E-04	0.000E+00
9	1.422E-01	3.340E+00	2.843E+01	2.971E+00	1.985E-04	0.000E+00
10	1.199E-01	1.657E+00	1.558E+01	1.520E+00	1.725E-04	0.000E+00
11	1.074E-01	1.102E+00	6.317E+00	1.021E+00	1.474E-04	0.000E+00
12	8.995E-02	8.127E-01	3.463E+00	7.435E-01	1.312E-04	0.000E+00
13	8.012E-02	7.024E-01	2.006E+00	6.519E-01	1.183E-04	0.000E+00
14	7.175E-02	5.847E-01	1.446E+00	5.364E-01	1.118E-04	0.000E+00
15	6.153E-02	5.160E-01	9.887E-01	4.746E-01	8.986E-05	0.000E+00
16	5.609E-02	4.747E-01	8.204E-01	4.381E-01	8.210E-05	0.000E+00
17	5.052E-02	4.231E-01	6.983E-01	3.822E-01	7.408E-05	0.000E+00
18	4.470E-02	3.805E-01	6.034E-01	3.501E-01	6.658E-05	0.000E+00
19	4.245E-02	3.624E-01	5.514E-01	3.323E-01	6.180E-05	0.000E+00
20	3.989E-02	3.364E-01	5.232E-01	3.092E-01	5.818E-05	0.000E+00
21	3.772E-02	3.258E-01	5.006E-01	2.995E-01	5.495E-05	0.000E+00
22	3.585E-02	3.103E-01	4.836E-01	2.838E-01	5.262E-05	0.000E+00
23	3.426E-02	3.070E-01	4.735E-01	2.816E-01	5.004E-05	0.000E+00
24	3.302E-02	2.952E-01	4.667E-01	2.727E-01	4.784E-05	0.000E+00
25	3.124E-02	2.868E-01	4.644E-01	2.645E-01	4.383E-05	0.000E+00

Model II STT tank - same source, 25% H₂O

Source Shields Distance to Detector, X = 8.446E+01 cm
 Cylindrical Cylindrical Volume = 1.514E+06 cc
 Source Length = 1.054E+02 cm Distance Along Cylinder, Y = 5.269E+01 cm
 Integration Specs: NTHETA = 9 NPSI = 11 DELR = 3.074E+00 cm
 Total Intervals: 2.178E+03

Shield Thickness, cm 6.763E+01 9.525E-01 8.890E+00 1.905E+00
 Taylor Buildup Data for Shield 4 with Effective Atomic Number 26.0

Group	Average Energy, Mev	Bremsstr. photons/sec	Source Total photons/sec	Energy Flux Mev/sq.cm/sec	Dose Rate R/hr
1	1.500E-02	3.623E+08	3.623E+08	0.000E+00	0.000E+00
2	2.500E-02	2.295E+08	2.295E+08	0.000E+00	0.000E+00
3	3.500E-02	1.205E+08	2.676E+09	0.000E+00	0.000E+00
4	4.500E-02	7.259E+07	7.259E+07	0.000E+00	0.000E+00
5	5.500E-02	5.470E+07	5.470E+07	0.000E+00	0.000E+00
6	6.500E-02	3.753E+07	3.753E+07	0.000E+00	0.000E+00
7	7.500E-02	2.929E+07	2.929E+07	0.000E+00	0.000E+00
8	8.500E-02	2.105E+07	2.105E+07	0.000E+00	0.000E+00
9	9.500E-02	1.607E+07	1.607E+07	0.000E+00	0.000E+00
10	1.500E-01	5.331E+07	5.331E+07	0.000E+00	0.000E+00
11	2.500E-01	1.070E+07	1.070E+07	8.441E-24	1.654E-29
12	3.500E-01	2.783E+06	2.783E+06	1.178E-13	2.427E-19
13	4.750E-01	1.191E+06	1.191E+06	1.662E-08	3.391E-14
14	6.500E-01	3.527E+05	3.150E+10	9.037E-02	1.880E-07
15	8.250E-01	4.485E+04	4.485E+04	1.043E-05	2.086E-11
16	1.000E+00	4.273E+03	4.273E+03	5.821E-06	1.123E-11
17	1.225E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
18	1.475E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
19	1.700E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
20	1.900E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
21	2.100E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
22	2.300E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
23	2.500E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
24	2.700E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
25	3.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
TOTALS		1.012E+09	3.507E+10	9.039E-02	1.880E-07

Note that 1.880E-07 R/hr = 1.347E-14 amp/kg

Shield Composition, g/cc

	Shield 1	Shield 2	Shield 3	Shield 4		
H2O	2.380E-01	0.000E+00	0.000E+00	0.000E+00		
AIR	3.860E-01	0.000E+00	0.000E+00	0.000E+00		
AL	3.770E-01	0.000E+00	0.000E+00	0.000E+00		
IRON	0.000E+00	6.817E+00	0.000E+00	7.450E+00		
NICKEL	0.000E+00	1.203E+00	0.000E+00	0.000E+00		
LEAD	0.000E+00	0.000E+00	1.130E+01	0.000E+00		
Group	Linear Attenuation Coefficients (last region is air)					
1	8.921E+00	3.583E+02	8.172E+02	3.290E+02	4.424E-03	0.000E+00
2	1.116E+00	9.954E+01	5.396E+02	9.146E+01	6.542E-04	0.000E+00
3	4.605E-01	4.782E+01	1.921E+02	4.235E+01	3.504E-04	0.000E+00
4	2.882E-01	2.217E+01	9.170E+01	1.963E+01	2.715E-04	0.000E+00
5	2.544E-01	1.229E+01	5.243E+01	1.084E+01	2.405E-04	0.000E+00
6	1.996E-01	8.202E+00	3.477E+01	7.234E+00	2.247E-04	0.000E+00
7	1.828E-01	5.839E+00	2.410E+01	5.163E+00	2.137E-04	0.000E+00
8	1.696E-01	4.219E+00	2.498E+01	3.742E+00	2.049E-04	0.000E+00
9	1.624E-01	3.340E+00	2.843E+01	2.971E+00	1.985E-04	0.000E+00
10	1.377E-01	1.657E+00	1.558E+01	1.520E+00	1.725E-04	0.000E+00
11	1.226E-01	1.102E+00	6.317E+00	1.021E+00	1.474E-04	0.000E+00
12	1.034E-01	8.127E-01	3.463E+00	7.435E-01	1.312E-04	0.000E+00
13	9.220E-02	7.024E-01	2.006E+00	6.519E-01	1.183E-04	0.000E+00
14	8.165E-02	5.847E-01	1.446E+00	5.364E-01	1.118E-04	0.000E+00
15	7.076E-02	5.160E-01	9.887E-01	4.746E-01	8.986E-05	0.000E+00
16	6.448E-02	4.747E-01	8.204E-01	4.381E-01	8.210E-05	0.000E+00
17	5.808E-02	4.231E-01	6.983E-01	3.822E-01	7.408E-05	0.000E+00
18	5.074E-02	3.805E-01	6.034E-01	3.501E-01	6.658E-05	0.000E+00
19	4.884E-02	3.624E-01	5.514E-01	3.323E-01	6.180E-05	0.000E+00
20	4.590E-02	3.364E-01	5.232E-01	3.092E-01	5.818E-05	0.000E+00
21	4.344E-02	3.258E-01	5.006E-01	2.995E-01	5.495E-05	0.000E+00
22	4.129E-02	3.103E-01	4.836E-01	2.838E-01	5.262E-05	0.000E+00
23	3.945E-02	3.070E-01	4.735E-01	2.816E-01	5.004E-05	0.000E+00
24	3.799E-02	2.952E-01	4.667E-01	2.727E-01	4.784E-05	0.000E+00
25	3.595E-02	2.868E-01	4.644E-01	2.645E-01	4.383E-05	0.000E+00

Model II STT tank - same source, 50% H₂O

Source Shields Distance to Detector, X = 8.446E+01 cm
 Cylindrical Cylindrical Volume = 1.514E+06 cc
 Source Length = 1.054E+02 cm Distance Along Cylinder, Y = 5.269E+01 cm
 Integration Specs: NTHETA = 9 NPSI = 11 DELR = 3.074E+00 cm
 Total Intervals: 2.178E+03

Shield Thickness, cm 6.763E+01 9.525E-01 8.890E+00 1.905E+00
 Taylor Buildup Data for Shield 4 with Effective Atomic Number 26.0

Group	Average Energy, Mev	Bremsstr. photons/sec	Source Total photons/sec	Energy Flux Mev/sq.cm/sec	Dose Rate R/hr
1	1.500E-02	3.623E+08	3.623E+08	0.000E+00	0.000E+00
2	2.500E-02	2.295E+08	2.295E+08	0.000E+00	0.000E+00
3	3.500E-02	1.205E+08	2.676E+09	0.000E+00	0.000E+00
4	4.500E-02	7.259E+07	7.259E+07	0.000E+00	0.000E+00
5	5.500E-02	5.470E+07	5.470E+07	0.000E+00	0.000E+00
6	6.500E-02	3.753E+07	3.753E+07	0.000E+00	0.000E+00
7	7.500E-02	2.929E+07	2.929E+07	0.000E+00	0.000E+00
8	8.500E-02	2.105E+07	2.105E+07	0.000E+00	0.000E+00
9	9.500E-02	1.607E+07	1.607E+07	0.000E+00	0.000E+00
10	1.500E-01	5.331E+07	5.331E+07	0.000E+00	0.000E+00
11	2.500E-01	1.070E+07	1.070E+07	7.397E-24	1.450E-29
12	3.500E-01	2.783E+06	2.783E+06	1.025E-13	2.111E-19
13	4.750E-01	1.191E+06	1.191E+06	1.445E-08	2.947E-14
14	6.500E-01	3.527E+05	3.150E+10	7.944E-02	1.652E-07
15	8.250E-01	4.485E+04	4.485E+04	9.084E-06	1.817E-11
16	1.000E+00	4.273E+03	4.273E+03	5.076E-06	9.796E-12
17	1.225E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
18	1.475E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
19	1.700E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
20	1.900E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
21	2.100E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
22	2.300E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
23	2.500E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
24	2.700E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
25	3.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
TOTALS		1.012E+09	3.507E+10	7.946E-02	1.653E-07

Note that 1.653E-07 R/hr = 1.184E-14 amp/kg

Shield Composition, g/cc

	Shield 1	Shield 2	Shield 3	Shield 4		
H2O	3.570E-01	0.000E+00	0.000E+00	0.000E+00		
AIR	3.860E-01	0.000E+00	0.000E+00	0.000E+00		
AL	3.770E-01	0.000E+00	0.000E+00	0.000E+00		
IRON	0.000E+00	6.817E+00	0.000E+00	7.450E+00		
NICKEL	0.000E+00	1.203E+00	0.000E+00	0.000E+00		
LEAD	0.000E+00	0.000E+00	1.130E+01	0.000E+00		
Group	Linear Attenuation Coefficients (last region is air)					
1	9.346E+00	3.583E+02	8.172E+02	3.290E+02	4.424E-03	0.000E+00
2	1.179E+00	9.954E+01	5.396E+02	9.146E+01	6.542E-04	0.000E+00
3	4.950E-01	4.782E+01	1.921E+02	4.235E+01	3.504E-04	0.000E+00
4	3.153E-01	2.217E+01	9.170E+01	1.963E+01	2.715E-04	0.000E+00
5	2.786E-01	1.229E+01	5.243E+01	1.084E+01	2.405E-04	0.000E+00
6	2.223E-01	8.202E+00	3.477E+01	7.234E+00	2.247E-04	0.000E+00
7	2.046E-01	5.839E+00	2.410E+01	5.163E+00	2.137E-04	0.000E+00
8	1.901E-01	4.219E+00	2.498E+01	3.742E+00	2.049E-04	0.000E+00
9	1.826E-01	3.340E+00	2.843E+01	2.971E+00	1.985E-04	0.000E+00
10	1.556E-01	1.657E+00	1.558E+01	1.520E+00	1.725E-04	0.000E+00
11	1.378E-01	1.102E+00	6.317E+00	1.021E+00	1.474E-04	0.000E+00
12	1.168E-01	8.127E-01	3.463E+00	7.435E-01	1.312E-04	0.000E+00
13	1.043E-01	7.024E-01	2.006E+00	6.519E-01	1.183E-04	0.000E+00
14	9.155E-02	5.847E-01	1.446E+00	5.364E-01	1.118E-04	0.000E+00
15	7.998E-02	5.160E-01	9.887E-01	4.746E-01	8.986E-05	0.000E+00
16	7.287E-02	4.747E-01	8.204E-01	4.381E-01	8.210E-05	0.000E+00
17	6.564E-02	4.231E-01	6.983E-01	3.822E-01	7.408E-05	0.000E+00
18	5.679E-02	3.805E-01	6.034E-01	3.501E-01	6.658E-05	0.000E+00
19	5.523E-02	3.624E-01	5.514E-01	3.323E-01	6.180E-05	0.000E+00
20	5.191E-02	3.364E-01	5.232E-01	3.092E-01	5.818E-05	0.000E+00
21	4.915E-02	3.258E-01	5.006E-01	2.995E-01	5.495E-05	0.000E+00
22	4.673E-02	3.103E-01	4.836E-01	2.838E-01	5.262E-05	0.000E+00
23	4.464E-02	3.070E-01	4.735E-01	2.816E-01	5.004E-05	0.000E+00
24	4.297E-02	2.952E-01	4.667E-01	2.727E-01	4.784E-05	0.000E+00
25	4.065E-02	2.868E-01	4.644E-01	2.645E-01	4.383E-05	0.000E+00

Model II STT tank - same source, 75% H₂O

Source Shields Distance to Detector, X = 8.446E+01 cm
 Cylindrical Cylindrical Volume = 1.514E+06 cc
 Source Length = 1.054E+02 cm Distance Along Cylinder, Y = 5.269E+01 cm
 Integration Specs: NTHETA = 9 NPSI = 11 DELR = 3.074E+00 cm
 Total Intervals: 2.178E+03

Shield Thickness, cm 6.763E+01 9.525E-01 8.890E+00 1.905E+00
 Taylor Buildup Data for Shield 4 with Effective Atomic Number 26.0

Group	Average Energy, Mev	Bremsstr. photons/sec	Source Total photons/sec	Energy Flux Mev/sq.cm/sec	Dose Rate R/hr
1	1.500E-02	3.623E+08	3.623E+08	0.000E+00	0.000E+00
2	2.500E-02	2.295E+08	2.295E+08	0.000E+00	0.000E+00
3	3.500E-02	1.205E+08	2.676E+09	0.000E+00	0.000E+00
4	4.500E-02	7.259E+07	7.259E+07	0.000E+00	0.000E+00
5	5.500E-02	5.470E+07	5.470E+07	0.000E+00	0.000E+00
6	6.500E-02	3.753E+07	3.753E+07	0.000E+00	0.000E+00
7	7.500E-02	2.929E+07	2.929E+07	0.000E+00	0.000E+00
8	8.500E-02	2.105E+07	2.105E+07	0.000E+00	0.000E+00
9	9.500E-02	1.607E+07	1.607E+07	0.000E+00	0.000E+00
10	1.500E-01	5.331E+07	5.331E+07	0.000E+00	0.000E+00
11	2.500E-01	1.070E+07	1.070E+07	6.582E-24	1.290E-29
12	3.500E-01	2.783E+06	2.783E+06	9.069E-14	1.868E-19
13	4.750E-01	1.191E+06	1.191E+06	1.277E-08	2.606E-14
14	6.500E-01	3.527E+05	3.150E+10	7.086E-02	1.474E-07
15	8.250E-01	4.485E+04	4.485E+04	8.042E-06	1.608E-11
16	1.000E+00	4.273E+03	4.273E+03	4.497E-06	8.679E-12
17	1.225E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
18	1.475E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
19	1.700E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
20	1.900E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
21	2.100E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
22	2.300E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
23	2.500E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
24	2.700E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
25	3.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
TOTALS		1.012E+09	3.507E+10	7.087E-02	1.474E-07

Note that 1.474E-07 R/hr = 1.057E-14 amp/kg

Shield Composition, g/cc

	Shield 1	Shield 2	Shield 3	Shield 4		
H2O	4.750E-01	0.000E+00	0.000E+00	0.000E+00		
AIR	3.860E-01	0.000E+00	0.000E+00	0.000E+00		
AL	3.770E-01	0.000E+00	0.000E+00	0.000E+00		
IRON	0.000E+00	6.817E+00	0.000E+00	7.450E+00		
NICKEL	0.000E+00	1.203E+00	0.000E+00	0.000E+00		
LEAD	0.000E+00	0.000E+00	1.130E+01	0.000E+00		
Group	Linear Attenuation Coefficients (last region is air)					
1	9.767E+00	3.583E+02	8.172E+02	3.290E+02	4.424E-03	0.000E+00
2	1.242E+00	9.954E+01	5.396E+02	9.146E+01	6.542E-04	0.000E+00
3	5.293E-01	4.782E+01	1.921E+02	4.235E+01	3.504E-04	0.000E+00
4	3.422E-01	2.217E+01	9.170E+01	1.963E+01	2.715E-04	0.000E+00
5	3.027E-01	1.229E+01	5.243E+01	1.084E+01	2.405E-04	0.000E+00
6	2.448E-01	8.202E+00	3.477E+01	7.234E+00	2.247E-04	0.000E+00
7	2.261E-01	5.839E+00	2.410E+01	5.163E+00	2.137E-04	0.000E+00
8	2.104E-01	4.219E+00	2.498E+01	3.742E+00	2.049E-04	0.000E+00
9	2.026E-01	3.340E+00	2.843E+01	2.971E+00	1.985E-04	0.000E+00
10	1.733E-01	1.657E+00	1.558E+01	1.520E+00	1.725E-04	0.000E+00
11	1.528E-01	1.102E+00	6.317E+00	1.021E+00	1.474E-04	0.000E+00
12	1.302E-01	8.127E-01	3.463E+00	7.435E-01	1.312E-04	0.000E+00
13	1.163E-01	7.024E-01	2.006E+00	6.519E-01	1.183E-04	0.000E+00
14	1.014E-01	5.847E-01	1.446E+00	5.364E-01	1.118E-04	0.000E+00
15	8.912E-02	5.160E-01	9.887E-01	4.746E-01	8.986E-05	0.000E+00
16	8.118E-02	4.747E-01	8.204E-01	4.381E-01	8.210E-05	0.000E+00
17	7.313E-02	4.231E-01	6.983E-01	3.822E-01	7.408E-05	0.000E+00
18	6.278E-02	3.805E-01	6.034E-01	3.501E-01	6.658E-05	0.000E+00
19	6.156E-02	3.624E-01	5.514E-01	3.323E-01	6.180E-05	0.000E+00
20	5.787E-02	3.364E-01	5.232E-01	3.092E-01	5.818E-05	0.000E+00
21	5.481E-02	3.258E-01	5.006E-01	2.995E-01	5.495E-05	0.000E+00
22	5.212E-02	3.103E-01	4.836E-01	2.838E-01	5.262E-05	0.000E+00
23	4.979E-02	3.070E-01	4.735E-01	2.816E-01	5.004E-05	0.000E+00
24	4.790E-02	2.952E-01	4.667E-01	2.727E-01	4.784E-05	0.000E+00
25	4.531E-02	2.868E-01	4.644E-01	2.645E-01	4.383E-05	0.000E+00

Model II STT tank - same source, 100% H₂O

Source Shields Distance to Detector, X = 8.446E+01 cm
 Cylindrical Cylindrical Volume = 1.514E+06 cc
 Source Length = 1.054E+02 cm Distance Along Cylinder, Y = 5.269E+01 cm
 Integration Specs: NTHETA = 9 NPSI = 11 DELR = 3.074E+00 cm
 Total Intervals: 2.178E+03

Shield Thickness, cm 6.763E+01 9.525E-01 8.890E+00 1.905E+00
 Taylor Buildup Data for Shield 4 with Effective Atomic Number 26.0

Group	Average Energy, Mev	Bremsstr. photons/sec	Source Total photons/sec	Energy Flux Mev/sq.cm/sec	Dose Rate R/hr
1	1.500E-02	3.623E+08	3.623E+08	0.000E+00	0.000E+00
2	2.500E-02	2.295E+08	2.295E+08	0.000E+00	0.000E+00
3	3.500E-02	1.205E+08	2.676E+09	0.000E+00	0.000E+00
4	4.500E-02	7.259E+07	7.259E+07	0.000E+00	0.000E+00
5	5.500E-02	5.470E+07	5.470E+07	0.000E+00	0.000E+00
6	6.500E-02	3.753E+07	3.753E+07	0.000E+00	0.000E+00
7	7.500E-02	2.929E+07	2.929E+07	0.000E+00	0.000E+00
8	8.500E-02	2.105E+07	2.105E+07	0.000E+00	0.000E+00
9	9.500E-02	1.607E+07	1.607E+07	0.000E+00	0.000E+00
10	1.500E-01	5.331E+07	5.331E+07	0.000E+00	0.000E+00
11	2.500E-01	1.070E+07	1.070E+07	5.935E-24	1.163E-29
12	3.500E-01	2.783E+06	2.783E+06	8.141E-14	1.677E-19
13	4.750E-01	1.191E+06	1.191E+06	1.146E-08	2.338E-14
14	6.500E-01	3.527E+05	3.150E+10	6.400E-02	1.331E-07
15	8.250E-01	4.485E+04	4.485E+04	7.219E-06	1.444E-11
16	1.000E+00	4.273E+03	4.273E+03	4.039E-06	7.795E-12
17	1.225E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
18	1.475E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
19	1.700E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
20	1.900E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
21	2.100E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
22	2.300E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
23	2.500E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
24	2.700E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
25	3.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
TOTALS		1.012E+09	3.507E+10	6.401E-02	1.331E-07

Note that 1.331E-07 R/hr = 9.543E-15 amp/kg

***> THIS IS THE END OF THE RUN

Finish run at 16:24:38 04/26/94

Contents of Input file, c:\wpwin\stt\stt-mii.iin

0 2STT-MII
Model II STT tank - Point Source
&INPUT NEXT= 1, IGEOM= 1, ICONC=0,
ISPEC= 3, OPTION=0,
JBUF= 3,
X= 16.8275,
SSV1 = 0,
NSHLD = 3, T(1) =0.9525,8.89,1.905,
WEIGHT(335)= 1.,
WEIGHT(336)= 0.946,
SFACT = 1. &
IRON 9 6.817 7.45
NICKEL 10 1.203
1LEAD 14 11.3
Model II STT tank - Cylindrical Source, no self-absorption
&INPUT NEXT= 3, IGEOM= 7, ICONC=0,
ISPEC= 3, OPTION=0,
JBUF= 4,
X= 84.455, SLTH=105.39, Y= 52.695,
NTHETA= 9, NPSI= 11, DELR= 3.0,
SSV1 = 0,
NSHLD = 4, T(1) =67.6275,0.9525,8.89,1.905,
WEIGHT(335)= 1.,
WEIGHT(336)= 0.946,
SFACT = 1. &
WATER 1 0.0
AIR 3 0.0
ALUM. 7 0.0
IRON 9 6.817 7.45
NICKEL 10 1.203
1LEAD 14 11.3
Model II STT tank - same source, dry resin
&INPUT NEXT= 3 &
WATER 1 0.0
AIR 3 0.386
ALUM. 7 0.377
IRON 9 6.817 7.45
NICKEL 10 1.203
1LEAD 14 11.3
Model II STT tank - same source, 25% H2O
&INPUT NEXT= 3 &

WATER 1 0.119
AIR 3 0.386
ALUM. 7 0.377
IRON 9 6.817 7.45
NICKEL 10 1.203
1LEAD 14 11.3
Model II STT tank - same source, 50% H₂O
&INPUT NEXT= 3 &
WATER 1 0.238
AIR 3 0.386
ALUM. 7 0.377
IRON 9 6.817 7.45
NICKEL 10 1.203
1LEAD 14 11.3
Model II STT tank - same source, 75% H₂O
&INPUT NEXT= 3 &
WATER 1 0.357
AIR 3 0.386
ALUM. 7 0.377
IRON 9 6.817 7.45
NICKEL 10 1.203
1LEAD 14 11.3
Model II STT tank - same source, 100% H₂O
&INPUT NEXT= 3 &
WATER 1 0.475
AIR 3 0.386
ALUM. 7 0.377
IRON 9 6.817 7.45
NICKEL 10 1.203
1LEAD 14 11.3
THIS IS THE END OF THE RUN
&INPUT NEXT= 6 &

Start run at 13:35:17 04/20/94

ISOSHLD-II (RIBD removed)

IBM PC/AT Version 1.5, August 1987
Radiological Analysis
Westinghouse Hanford Company
Richland, WA 99352

STT-MIII

Table of Source Activity:

Scale Factor = 1.000E+00

Isotope Name	Curies	Adjusted Curies
CS-137	1.00E+00	1.000E+00
BA-137M	9.46E-01	9.460E-01

Shield Composition, g/cc

Shield 1 Shield 2 Shield 3

IRON 7.450E+00

Group Linear Attenuation Coefficients (last region is air)

1	3.290E+02	4.424E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00
2	9.146E+01	6.542E-04	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3	4.235E+01	3.504E-04	0.000E+00	0.000E+00	0.000E+00	0.000E+00
4	1.963E+01	2.715E-04	0.000E+00	0.000E+00	0.000E+00	0.000E+00
5	1.084E+01	2.405E-04	0.000E+00	0.000E+00	0.000E+00	0.000E+00
6	7.234E+00	2.247E-04	0.000E+00	0.000E+00	0.000E+00	0.000E+00
7	5.163E+00	2.137E-04	0.000E+00	0.000E+00	0.000E+00	0.000E+00
8	3.742E+00	2.049E-04	0.000E+00	0.000E+00	0.000E+00	0.000E+00
9	2.971E+00	1.985E-04	0.000E+00	0.000E+00	0.000E+00	0.000E+00
10	1.520E+00	1.725E-04	0.000E+00	0.000E+00	0.000E+00	0.000E+00
11	1.021E+00	1.474E-04	0.000E+00	0.000E+00	0.000E+00	0.000E+00
12	7.435E-01	1.312E-04	0.000E+00	0.000E+00	0.000E+00	0.000E+00
13	6.519E-01	1.183E-04	0.000E+00	0.000E+00	0.000E+00	0.000E+00
14	5.364E-01	1.118E-04	0.000E+00	0.000E+00	0.000E+00	0.000E+00
15	4.746E-01	8.986E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00
16	4.381E-01	8.210E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00
17	3.822E-01	7.408E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00
18	3.501E-01	6.658E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00
19	3.323E-01	6.180E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00
20	3.092E-01	5.818E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00
21	2.995E-01	5.495E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00
22	2.838E-01	5.262E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00
23	2.816E-01	5.004E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00
24	2.727E-01	4.784E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00
25	2.645E-01	4.383E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00

Model III STT tank - Point Source

Source Point Shields Slab Distance to Detector, X = 2.794E+01 cm
 Offset from Normal, Y = 0.000E+00 cm

Shield Thickness, cm 2.286E+01

Taylor Buildup Data for Shield 1 with Effective Atomic Number 26.0

Group	Average Energy, Mev	Bremsstr. photons/sec	Source Total photons/sec	Energy Flux Mev/sq.cm/sec	Dose Rate R/hr
1	1.500E-02	3.582E+08	3.582E+08	0.000E+00	0.000E+00
2	2.500E-02	2.269E+08	2.269E+08	0.000E+00	0.000E+00
3	3.500E-02	1.191E+08	2.674E+09	0.000E+00	0.000E+00
4	4.500E-02	7.177E+07	7.177E+07	0.000E+00	0.000E+00
5	5.500E-02	5.408E+07	5.408E+07	0.000E+00	0.000E+00
6	6.500E-02	3.711E+07	3.711E+07	0.000E+00	0.000E+00
7	7.500E-02	2.896E+07	2.896E+07	0.000E+00	0.000E+00
8	8.500E-02	2.082E+07	2.082E+07	1.615E-35	0.000E+00
9	9.500E-02	1.589E+07	1.589E+07	6.485E-28	1.040E-33
10	1.500E-01	5.272E+07	5.272E+07	2.227E-10	3.848E-16
11	2.500E-01	1.059E+07	1.059E+07	1.871E-06	3.667E-12
12	3.500E-01	2.754E+06	2.754E+06	1.900E-04	3.914E-10
13	4.750E-01	1.179E+06	1.179E+06	6.540E-04	1.334E-09
14	6.500E-01	3.495E+05	3.150E+10	2.206E+02	4.589E-04
15	8.250E-01	4.450E+04	4.450E+04	1.293E-03	2.585E-09
16	1.000E+00	4.247E+03	4.247E+03	2.910E-04	5.616E-10
17	1.225E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
18	1.475E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
19	1.700E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
20	1.900E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
21	2.100E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
22	2.300E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
23	2.500E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
24	2.700E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
25	3.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
TOTALS		1.000E+09	3.506E+10	2.206E+02	4.589E-04

Note that 4.589E-04 R/hr = 3.289E-11 amp/kg

Shield Composition, g/cc

	Shield 1	Shield 2					
Group	Linear Attenuation Coefficients (last region is air)						
1	0.000E+00	3.290E+02	4.424E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00
2	0.000E+00	9.146E+01	6.542E-04	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3	0.000E+00	4.235E+01	3.504E-04	0.000E+00	0.000E+00	0.000E+00	0.000E+00
4	0.000E+00	1.963E+01	2.715E-04	0.000E+00	0.000E+00	0.000E+00	0.000E+00
5	0.000E+00	1.084E+01	2.405E-04	0.000E+00	0.000E+00	0.000E+00	0.000E+00
6	0.000E+00	7.234E+00	2.247E-04	0.000E+00	0.000E+00	0.000E+00	0.000E+00
7	0.000E+00	5.163E+00	2.137E-04	0.000E+00	0.000E+00	0.000E+00	0.000E+00
8	0.000E+00	3.742E+00	2.049E-04	0.000E+00	0.000E+00	0.000E+00	0.000E+00
9	0.000E+00	2.971E+00	1.985E-04	0.000E+00	0.000E+00	0.000E+00	0.000E+00
10	0.000E+00	1.520E+00	1.725E-04	0.000E+00	0.000E+00	0.000E+00	0.000E+00
11	0.000E+00	1.021E+00	1.474E-04	0.000E+00	0.000E+00	0.000E+00	0.000E+00
12	0.000E+00	7.435E-01	1.312E-04	0.000E+00	0.000E+00	0.000E+00	0.000E+00
13	0.000E+00	6.519E-01	1.183E-04	0.000E+00	0.000E+00	0.000E+00	0.000E+00
14	0.000E+00	5.364E-01	1.118E-04	0.000E+00	0.000E+00	0.000E+00	0.000E+00
15	0.000E+00	4.746E-01	8.986E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00
16	0.000E+00	4.381E-01	8.210E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00
17	0.000E+00	3.822E-01	7.408E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00
18	0.000E+00	3.501E-01	6.658E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00
19	0.000E+00	3.323E-01	6.180E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00
20	0.000E+00	3.092E-01	5.818E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00
21	0.000E+00	2.995E-01	5.495E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00
22	0.000E+00	2.838E-01	5.262E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00
23	0.000E+00	2.816E-01	5.004E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00
24	0.000E+00	2.727E-01	4.784E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00
25	0.000E+00	2.645E-01	4.383E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00

Model III STT tank - Cylindrical Source, no self-absorption

Source Shields Distance to Detector, X = 6.477E+01 cm
 Cylindrical Cylindrical Volume = 8.443E+05 cc
 Source Length = 1.981E+02 cm Distance Along Cylinder, Y = 9.906E+01 cm
 Integration Specs: NTHETA = 9 NPSI = 11 DELR = 3.069E+00 cm
 Total Intervals: 1.188E+03

Shield Thickness, cm 3.683E+01 2.286E+01
 Taylor Buildup Data for Shield 2 with Effective Atomic Number 26.0

Group	Average Energy, Mev	Bremsstr. photons/sec	Source Total photons/sec	Energy Flux Mev/sq.cm/sec	Dose Rate R/hr
1	1.500E-02	3.582E+08	3.582E+08	0.000E+00	0.000E+00
2	2.500E-02	2.269E+08	2.269E+08	0.000E+00	0.000E+00
3	3.500E-02	1.191E+08	2.674E+09	0.000E+00	0.000E+00
4	4.500E-02	7.177E+07	7.177E+07	0.000E+00	0.000E+00
5	5.500E-02	5.408E+07	5.408E+07	0.000E+00	0.000E+00
6	6.500E-02	3.711E+07	3.711E+07	0.000E+00	0.000E+00
7	7.500E-02	2.896E+07	2.896E+07	0.000E+00	0.000E+00
8	8.500E-02	2.082E+07	2.082E+07	4.058E-38	0.000E+00
9	9.500E-02	1.589E+07	1.589E+07	2.414E-30	3.870E-36
10	1.500E-01	5.272E+07	5.272E+07	1.840E-12	3.180E-18
11	2.500E-01	1.059E+07	1.059E+07	2.273E-08	4.456E-14
12	3.500E-01	2.754E+06	2.754E+06	3.113E-06	6.413E-12
13	4.750E-01	1.179E+06	1.179E+06	1.207E-05	2.462E-11
14	6.500E-01	3.495E+05	3.150E+10	4.839E+00	1.006E-05
15	8.250E-01	4.450E+04	4.450E+04	3.151E-05	6.303E-11
16	1.000E+00	4.247E+03	4.247E+03	7.585E-06	1.464E-11
17	1.225E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
18	1.475E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
19	1.700E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
20	1.900E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
21	2.100E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
22	2.300E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
23	2.500E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
24	2.700E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
25	3.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
TOTALS		1.000E+09	3.506E+10	4.839E+00	1.007E-05

Note that 1.007E-05 R/hr = 7.214E-13 amp/kg

Shield Composition, g/cc

	Shield 1	Shield 2					
H2O	0.000E+00	0.000E+00					
AIR	3.860E-01	0.000E+00					
AL	3.770E-01	0.000E+00					
IRON	0.000E+00	7.450E+00					
Group	Linear Attenuation Coefficients (last region is air)						
1	8.072E+00	3.290E+02	4.424E-03	0.000E+00	0.000E+00	0.000E+00	
2	9.908E-01	9.146E+01	6.542E-04	0.000E+00	0.000E+00	0.000E+00	
3	3.915E-01	4.235E+01	3.504E-04	0.000E+00	0.000E+00	0.000E+00	
4	2.339E-01	1.963E+01	2.715E-04	0.000E+00	0.000E+00	0.000E+00	
5	2.058E-01	1.084E+01	2.405E-04	0.000E+00	0.000E+00	0.000E+00	
6	1.541E-01	7.234E+00	2.247E-04	0.000E+00	0.000E+00	0.000E+00	
7	1.393E-01	5.163E+00	2.137E-04	0.000E+00	0.000E+00	0.000E+00	
8	1.286E-01	3.742E+00	2.049E-04	0.000E+00	0.000E+00	0.000E+00	
9	1.219E-01	2.971E+00	1.985E-04	0.000E+00	0.000E+00	0.000E+00	
10	1.020E-01	1.520E+00	1.725E-04	0.000E+00	0.000E+00	0.000E+00	
11	9.226E-02	1.021E+00	1.474E-04	0.000E+00	0.000E+00	0.000E+00	
12	7.650E-02	7.435E-01	1.312E-04	0.000E+00	0.000E+00	0.000E+00	
13	6.804E-02	6.519E-01	1.183E-04	0.000E+00	0.000E+00	0.000E+00	
14	6.185E-02	5.364E-01	1.118E-04	0.000E+00	0.000E+00	0.000E+00	
15	5.231E-02	4.746E-01	8.986E-05	0.000E+00	0.000E+00	0.000E+00	
16	4.770E-02	4.381E-01	8.210E-05	0.000E+00	0.000E+00	0.000E+00	
17	4.297E-02	3.822E-01	7.408E-05	0.000E+00	0.000E+00	0.000E+00	
18	3.865E-02	3.501E-01	6.658E-05	0.000E+00	0.000E+00	0.000E+00	
19	3.606E-02	3.323E-01	6.180E-05	0.000E+00	0.000E+00	0.000E+00	
20	3.388E-02	3.092E-01	5.818E-05	0.000E+00	0.000E+00	0.000E+00	
21	3.201E-02	2.995E-01	5.495E-05	0.000E+00	0.000E+00	0.000E+00	
22	3.041E-02	2.838E-01	5.262E-05	0.000E+00	0.000E+00	0.000E+00	
23	2.908E-02	2.816E-01	5.004E-05	0.000E+00	0.000E+00	0.000E+00	
24	2.804E-02	2.727E-01	4.784E-05	0.000E+00	0.000E+00	0.000E+00	
25	2.654E-02	2.645E-01	4.383E-05	0.000E+00	0.000E+00	0.000E+00	

Model III STT tank - same source, dry resin

Source Shields Distance to Detector, X = 6.477E+01 cm
 Cylindrical Cylindrical Volume = 8.443E+05 cc
 Source Length = 1.981E+02 cm Distance Along Cylinder, Y = 9.906E+01 cm
 Integration Specs: NTHETA = 9 NPSI = 11 DELR = 3.069E+00 cm
 Total Intervals: 1.188E+03

Shield Thickness, cm 3.683E+01 2.286E+01

Taylor Buildup Data for Shield 2 with Effective Atomic Number 26.0

Group	Average Energy, Mev	Bremsstr. photons/sec	Source Total photons/sec	Energy Flux Mev/sq.cm/sec	Dose Rate R/hr
1	1.500E-02	3.582E+08	3.582E+08	0.000E+00	0.000E+00
2	2.500E-02	2.269E+08	2.269E+08	0.000E+00	0.000E+00
3	3.500E-02	1.191E+08	2.674E+09	0.000E+00	0.000E+00
4	4.500E-02	7.177E+07	7.177E+07	0.000E+00	0.000E+00
5	5.500E-02	5.408E+07	5.408E+07	0.000E+00	0.000E+00
6	6.500E-02	3.711E+07	3.711E+07	0.000E+00	0.000E+00
7	7.500E-02	2.896E+07	2.896E+07	0.000E+00	0.000E+00
8	8.500E-02	2.082E+07	2.082E+07	0.000E+00	0.000E+00
9	9.500E-02	1.589E+07	1.589E+07	2.694E-31	4.319E-37
10	1.500E-01	5.272E+07	5.272E+07	2.742E-13	4.738E-19
11	2.500E-01	1.059E+07	1.059E+07	3.769E-09	7.387E-15
12	3.500E-01	2.754E+06	2.754E+06	6.267E-07	1.291E-12
13	4.750E-01	1.179E+06	1.179E+06	2.726E-06	5.561E-12
14	6.500E-01	3.495E+05	3.150E+10	1.202E+00	2.500E-06
15	8.250E-01	4.450E+04	4.450E+04	9.137E-06	1.827E-11
16	1.000E+00	4.247E+03	4.247E+03	2.385E-06	4.603E-12
17	1.225E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
18	1.475E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
19	1.700E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
20	1.900E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
21	2.100E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
22	2.300E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
23	2.500E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
24	2.700E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
25	3.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
TOTALS		1.000E+09	3.506E+10	1.202E+00	2.500E-06

Note that 2.500E-06 R/hr = 1.792E-13 amp/kg

Shield Composition, g/cc

	Shield 1	Shield 2						
Group	Linear Attenuation Coefficients (last region is air)							
1	8.539E+00	3.290E+02	4.424E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	
2	1.060E+00	9.146E+01	6.542E-04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	
3	4.295E-01	4.235E+01	3.504E-04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	
4	2.638E-01	1.963E+01	2.715E-04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	
5	2.325E-01	1.084E+01	2.405E-04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	
6	1.791E-01	7.234E+00	2.247E-04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	
7	1.633E-01	5.163E+00	2.137E-04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	
8	1.512E-01	3.742E+00	2.049E-04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	
9	1.442E-01	2.971E+00	1.985E-04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	
10	1.217E-01	1.520E+00	1.725E-04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	
11	1.090E-01	1.021E+00	1.474E-04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	
12	9.131E-02	7.435E-01	1.312E-04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	
13	8.134E-02	6.519E-01	1.183E-04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	
14	7.275E-02	5.364E-01	1.118E-04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	
15	6.246E-02	4.746E-01	8.986E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	
16	5.693E-02	4.381E-01	8.210E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	
17	5.128E-02	3.822E-01	7.408E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	
18	4.531E-02	3.501E-01	6.658E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	
19	4.309E-02	3.323E-01	6.180E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	
20	4.050E-02	3.092E-01	5.818E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	
21	3.830E-02	2.995E-01	5.495E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	
22	3.640E-02	2.838E-01	5.262E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	
23	3.479E-02	2.816E-01	5.004E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	
24	3.352E-02	2.727E-01	4.784E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	
25	3.172E-02	2.645E-01	4.383E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	

ModSTIIIltank - same source, 25% H₂O

Source Shields Distance to Detector, X = 6.477E+01 cm
 Cylindrical Cylindrical Volume = 8.443E+05 cc
 Source Length = 1.981E+02 cm Distance Along Cylinder, Y = 9.906E+01 cm
 Integration Specs: NTHETA = 9 NPSI = 11 DELR = 3.069E+00 cm
 Total Intervals: 1.188E+03

Shield Thickness, cm 3.683E+01 2.286E+01

Taylor Buildup Data for Shield 2 with Effective Atomic Number 26.0

Group	Average Energy, Mev	Bremsstr. photons/sec	Source Total photons/sec	Energy Flux Mev/sq.cm/sec	Dose Rate R/hr
1	1.500E-02	3.582E+08	3.582E+08	0.000E+00	0.000E+00
2	2.500E-02	2.269E+08	2.269E+08	0.000E+00	0.000E+00
3	3.500E-02	1.191E+08	2.674E+09	0.000E+00	0.000E+00
4	4.500E-02	7.177E+07	7.177E+07	0.000E+00	0.000E+00
5	5.500E-02	5.408E+07	5.408E+07	0.000E+00	0.000E+00
6	6.500E-02	3.711E+07	3.711E+07	0.000E+00	0.000E+00
7	7.500E-02	2.896E+07	2.896E+07	0.000E+00	0.000E+00
8	8.500E-02	2.082E+07	2.082E+07	0.000E+00	0.000E+00
9	9.500E-02	1.589E+07	1.589E+07	2.279E-31	3.654E-37
10	1.500E-01	5.272E+07	5.272E+07	2.301E-13	3.976E-19
11	2.500E-01	1.059E+07	1.059E+07	3.196E-09	6.265E-15
12	3.500E-01	2.754E+06	2.754E+06	5.276E-07	1.087E-12
13	4.750E-01	1.179E+06	1.179E+06	2.298E-06	4.687E-12
14	6.500E-01	3.495E+05	3.150E+10	1.032E+00	2.147E-06
15	8.250E-01	4.450E+04	4.450E+04	7.791E-06	1.558E-11
16	1.000E+00	4.247E+03	4.247E+03	2.044E-06	3.945E-12
17	1.225E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
18	1.475E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
19	1.700E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
20	1.900E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
21	2.100E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
22	2.300E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
23	2.500E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
24	2.700E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
25	3.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
TOTALS		1.000E+09	3.506E+10	1.032E+00	2.147E-06
Note that 2.147E-06 R/hr = 1.539E-13 amp/kg					

Shield Composition, g/cc

	Shield 1	Shield 2					
H2O	2.620E-01	0.000E+00					
AIR	3.860E-01	0.000E+00					
AL	3.770E-01	0.000E+00					
IRON	0.000E+00	7.450E+00					
Group	Linear Attenuation Coefficients (last region is air)						
1	9.007E+00	3.290E+02	4.424E-03	0.000E+00	0.000E+00	0.000E+00	
2	1.129E+00	9.146E+01	6.542E-04	0.000E+00	0.000E+00	0.000E+00	
3	4.675E-01	4.235E+01	3.504E-04	0.000E+00	0.000E+00	0.000E+00	
4	2.937E-01	1.963E+01	2.715E-04	0.000E+00	0.000E+00	0.000E+00	
5	2.593E-01	1.084E+01	2.405E-04	0.000E+00	0.000E+00	0.000E+00	
6	2.041E-01	7.234E+00	2.247E-04	0.000E+00	0.000E+00	0.000E+00	
7	1.872E-01	5.163E+00	2.137E-04	0.000E+00	0.000E+00	0.000E+00	
8	1.737E-01	3.742E+00	2.049E-04	0.000E+00	0.000E+00	0.000E+00	
9	1.664E-01	2.971E+00	1.985E-04	0.000E+00	0.000E+00	0.000E+00	
10	1.413E-01	1.520E+00	1.725E-04	0.000E+00	0.000E+00	0.000E+00	
11	1.257E-01	1.021E+00	1.474E-04	0.000E+00	0.000E+00	0.000E+00	
12	1.061E-01	7.435E-01	1.312E-04	0.000E+00	0.000E+00	0.000E+00	
13	9.464E-02	6.519E-01	1.183E-04	0.000E+00	0.000E+00	0.000E+00	
14	8.365E-02	5.364E-01	1.118E-04	0.000E+00	0.000E+00	0.000E+00	
15	7.262E-02	4.746E-01	8.986E-05	0.000E+00	0.000E+00	0.000E+00	
16	6.617E-02	4.381E-01	8.210E-05	0.000E+00	0.000E+00	0.000E+00	
17	5.960E-02	3.822E-01	7.408E-05	0.000E+00	0.000E+00	0.000E+00	
18	5.196E-02	3.501E-01	6.658E-05	0.000E+00	0.000E+00	0.000E+00	
19	5.013E-02	3.323E-01	6.180E-05	0.000E+00	0.000E+00	0.000E+00	
20	4.711E-02	3.092E-01	5.818E-05	0.000E+00	0.000E+00	0.000E+00	
21	4.459E-02	2.995E-01	5.495E-05	0.000E+00	0.000E+00	0.000E+00	
22	4.239E-02	2.838E-01	5.262E-05	0.000E+00	0.000E+00	0.000E+00	
23	4.050E-02	2.816E-01	5.004E-05	0.000E+00	0.000E+00	0.000E+00	
24	3.899E-02	2.727E-01	4.784E-05	0.000E+00	0.000E+00	0.000E+00	
25	3.689E-02	2.645E-01	4.383E-05	0.000E+00	0.000E+00	0.000E+00	

Model III STT tank - same source, 50% H₂O

Source Shields Distance to Detector, X = 6.477E+01 cm
 Cylindrical Cylindrical Volume = 8.443E+05 cc
 Source Length = 1.981E+02 cm Distance Along Cylinder, Y = 9.906E+01 cm
 Integration Specs: NTHETA = 9 NPSI = 11 DELR = 3.069E+00 cm
 Total Intervals: 1.188E+03

Shield Thickness, cm 3.683E+01 2.286E+01

Taylor Buildup Data for Shield 2 with Effective Atomic Number 26.0

Group	Average Energy, Mev	Bremsstr. photons/sec	Source Total photons/sec	Energy Flux Mev/sq.cm/sec	Dose Rate R/hr
1	1.500E-02	3.582E+08	3.582E+08	0.000E+00	0.000E+00
2	2.500E-02	2.269E+08	2.269E+08	0.000E+00	0.000E+00
3	3.500E-02	1.191E+08	2.674E+09	0.000E+00	0.000E+00
4	4.500E-02	7.177E+07	7.177E+07	0.000E+00	0.000E+00
5	5.500E-02	5.408E+07	5.408E+07	0.000E+00	0.000E+00
6	6.500E-02	3.711E+07	3.711E+07	0.000E+00	0.000E+00
7	7.500E-02	2.896E+07	2.896E+07	0.000E+00	0.000E+00
8	8.500E-02	2.082E+07	2.082E+07	0.000E+00	0.000E+00
9	9.500E-02	1.589E+07	1.589E+07	1.975E-31	3.166E-37
10	1.500E-01	5.272E+07	5.272E+07	1.982E-13	3.425E-19
11	2.500E-01	1.059E+07	1.059E+07	2.773E-09	5.436E-15
12	3.500E-01	2.754E+06	2.754E+06	4.548E-07	9.369E-13
13	4.750E-01	1.179E+06	1.179E+06	1.981E-06	4.042E-12
14	6.500E-01	3.495E+05	3.150E+10	9.025E-01	1.877E-06
15	8.250E-01	4.450E+04	4.450E+04	6.765E-06	1.353E-11
16	1.000E+00	4.247E+03	4.247E+03	1.781E-06	3.438E-12
17	1.225E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
18	1.475E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
19	1.700E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
20	1.900E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
21	2.100E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
22	2.300E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
23	2.500E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
24	2.700E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
25	3.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
TOTALS		1.000E+09	3.506E+10	9.025E-01	1.877E-06

Note that 1.877E-06 R/hr = 1.345E-13 amp/kg

Shield Composition, g/cc

	Shield 1	Shield 2					
Group	Linear Attenuation Coefficients (last region is air)						
1	9.475E+00	3.290E+02	4.424E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00
2	1.198E+00	9.146E+01	6.542E-04	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3	5.055E-01	4.235E+01	3.504E-04	0.000E+00	0.000E+00	0.000E+00	0.000E+00
4	3.235E-01	1.963E+01	2.715E-04	0.000E+00	0.000E+00	0.000E+00	0.000E+00
5	2.860E-01	1.084E+01	2.405E-04	0.000E+00	0.000E+00	0.000E+00	0.000E+00
6	2.292E-01	7.234E+00	2.247E-04	0.000E+00	0.000E+00	0.000E+00	0.000E+00
7	2.112E-01	5.163E+00	2.137E-04	0.000E+00	0.000E+00	0.000E+00	0.000E+00
8	1.963E-01	3.742E+00	2.049E-04	0.000E+00	0.000E+00	0.000E+00	0.000E+00
9	1.887E-01	2.971E+00	1.985E-04	0.000E+00	0.000E+00	0.000E+00	0.000E+00
10	1.610E-01	1.520E+00	1.725E-04	0.000E+00	0.000E+00	0.000E+00	0.000E+00
11	1.424E-01	1.021E+00	1.474E-04	0.000E+00	0.000E+00	0.000E+00	0.000E+00
12	1.209E-01	7.435E-01	1.312E-04	0.000E+00	0.000E+00	0.000E+00	0.000E+00
13	1.079E-01	6.519E-01	1.183E-04	0.000E+00	0.000E+00	0.000E+00	0.000E+00
14	9.455E-02	5.364E-01	1.118E-04	0.000E+00	0.000E+00	0.000E+00	0.000E+00
15	8.277E-02	4.746E-01	8.986E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00
16	7.540E-02	4.381E-01	8.210E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00
17	6.792E-02	3.822E-01	7.408E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00
18	5.862E-02	3.501E-01	6.658E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00
19	5.716E-02	3.323E-01	6.180E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00
20	5.373E-02	3.092E-01	5.818E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00
21	5.088E-02	2.995E-01	5.495E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00
22	4.837E-02	2.838E-01	5.262E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00
23	4.621E-02	2.816E-01	5.004E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00
24	4.447E-02	2.727E-01	4.784E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00
25	4.207E-02	2.645E-01	4.383E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00

Model III STT tank - same source, 75% H₂O

Source Shields Distance to Detector, X = 6.477E+01 cm
 Cylindrical Cylindrical Volume = 8.443E+05 cc
 Source Length = 1.981E+02 cm Distance Along Cylinder, Y = 9.906E+01 cm
 Integration Specs: NTHETA = 9 NPSI = 11 DELR = 3.069E+00 cm
 Total Intervals: 1.188E+03

Shield Thickness, cm 3.683E+01 2.286E+01

Taylor Buildup Data for Shield 2 with Effective Atomic Number 26.0

Group	Average Energy, Mev	Bremsstr. photons/sec	Source Total photons/sec	Energy Flux Mev/sq.cm/sec	Dose Rate R/hr
1	1.500E-02	3.582E+08	3.582E+08	0.000E+00	0.000E+00
2	2.500E-02	2.269E+08	2.269E+08	0.000E+00	0.000E+00
3	3.500E-02	1.191E+08	2.674E+09	0.000E+00	0.000E+00
4	4.500E-02	7.177E+07	7.177E+07	0.000E+00	0.000E+00
5	5.500E-02	5.408E+07	5.408E+07	0.000E+00	0.000E+00
6	6.500E-02	3.711E+07	3.711E+07	0.000E+00	0.000E+00
7	7.500E-02	2.896E+07	2.896E+07	0.000E+00	0.000E+00
8	8.500E-02	2.082E+07	2.082E+07	0.000E+00	0.000E+00
9	9.500E-02	1.589E+07	1.589E+07	1.742E-31	2.793E-37
10	1.500E-01	5.272E+07	5.272E+07	1.740E-13	3.007E-19
11	2.500E-01	1.059E+07	1.059E+07	2.449E-09	4.799E-15
12	3.500E-01	2.754E+06	2.754E+06	3.994E-07	8.228E-13
13	4.750E-01	1.179E+06	1.179E+06	1.740E-06	3.549E-12
14	6.500E-01	3.495E+05	3.150E+10	8.005E-01	1.665E-06
15	8.250E-01	4.450E+04	4.450E+04	5.966E-06	1.193E-11
16	1.000E+00	4.247E+03	4.247E+03	1.574E-06	3.038E-12
17	1.225E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
18	1.475E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
19	1.700E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
20	1.900E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
21	2.100E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
22	2.300E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
23	2.500E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
24	2.700E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
25	3.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
TOTALS		1.000E+09	3.506E+10	8.005E-01	1.665E-06

Note that 1.665E-06 R/hr = 1.193E-13 amp/kg

Shield Composition, g/cc

	Shield 1	Shield 2						
Group	Linear Attenuation Coefficients (last region is air)							
1	9.946E+00	3.290E+02	4.424E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	
2	1.268E+00	9.146E+01	6.542E-04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	
3	5.438E-01	4.235E+01	3.504E-04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	
4	3.536E-01	1.963E+01	2.715E-04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	
5	3.129E-01	1.084E+01	2.405E-04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	
6	2.544E-01	7.234E+00	2.247E-04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	
7	2.353E-01	5.163E+00	2.137E-04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	
8	2.190E-01	3.742E+00	2.049E-04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	
9	2.111E-01	2.971E+00	1.985E-04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	
10	1.808E-01	1.520E+00	1.725E-04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	
11	1.592E-01	1.021E+00	1.474E-04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	
12	1.358E-01	7.435E-01	1.312E-04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	
13	1.213E-01	6.519E-01	1.183E-04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	
14	1.055E-01	5.364E-01	1.118E-04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	
15	9.300E-02	4.746E-01	8.986E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	
16	8.471E-02	4.381E-01	8.210E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	
17	7.630E-02	3.822E-01	7.408E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	
18	6.532E-02	3.501E-01	6.658E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	
19	6.425E-02	3.323E-01	6.180E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	
20	6.040E-02	3.092E-01	5.818E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	
21	5.721E-02	2.995E-01	5.495E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	
22	5.441E-02	2.838E-01	5.262E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	
23	5.197E-02	2.816E-01	5.004E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	
24	4.999E-02	2.727E-01	4.784E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	
25	4.728E-02	2.645E-01	4.383E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	

Model III STT tank - same source, 100% H₂O

Source Shields Distance to Detector, X = 6.477E+01 cm
 Cylindrical Cylindrical Volume = 8.443E+05 cc
 Source Length = 1.981E+02 cm Distance Along Cylinder, Y = 9.906E+01 cm
 Integration Specs: NTHETA = 9 NPSI = 11 DELR = 3.069E+00 cm
 Total Intervals: 1.188E+03

Shield Thickness, cm 3.683E+01 2.286E+01

Taylor Buildup Data for Shield 2 with Effective Atomic Number 26.0

Group	Average Energy, Mev	Bremsstr. photons/sec	Source Total photons/sec	Energy Flux Mev/sq.cm/sec	Dose Rate R/hr
1	1.500E-02	3.582E+08	3.582E+08	0.000E+00	0.000E+00
2	2.500E-02	2.269E+08	2.269E+08	0.000E+00	0.000E+00
3	3.500E-02	1.191E+08	2.674E+09	0.000E+00	0.000E+00
4	4.500E-02	7.177E+07	7.177E+07	0.000E+00	0.000E+00
5	5.500E-02	5.408E+07	5.408E+07	0.000E+00	0.000E+00
6	6.500E-02	3.711E+07	3.711E+07	0.000E+00	0.000E+00
7	7.500E-02	2.896E+07	2.896E+07	0.000E+00	0.000E+00
8	8.500E-02	2.082E+07	2.082E+07	0.000E+00	0.000E+00
9	9.500E-02	1.589E+07	1.589E+07	1.558E-31	2.497E-37
10	1.500E-01	5.272E+07	5.272E+07	1.550E-13	2.678E-19
11	2.500E-01	1.059E+07	1.059E+07	2.190E-09	4.292E-15
12	3.500E-01	2.754E+06	2.754E+06	3.557E-07	7.327E-13
13	4.750E-01	1.179E+06	1.179E+06	1.549E-06	3.159E-12
14	6.500E-01	3.495E+05	3.150E+10	7.182E-01	1.494E-06
15	8.250E-01	4.450E+04	4.450E+04	5.324E-06	1.065E-11
16	1.000E+00	4.247E+03	4.247E+03	1.407E-06	2.715E-12
17	1.225E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
18	1.475E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
19	1.700E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
20	1.900E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
21	2.100E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
22	2.300E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
23	2.500E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
24	2.700E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
25	3.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
TOTALS		1.000E+09	3.506E+10	7.182E-01	1.494E-06

Note that 1.494E-06 R/hr = 1.071E-13 amp/kg

**> THIS IS THE END OF THE RUN

Finish run at 13:36:20 04/20/94

Contents of Input file, c:\wpwin\stt\stt-miii.iin

0 2STT-MIII

Model III STT tank - Point Source

&INPUT NEXT= 1, IGEOM= 1, ICONC=0,

ISPEC= 3, OPTION=0,

JBUF= 1,

X= 27.94,

SSV1 = 0,

NSHLD = 1, T(1) = 22.86,

WEIGHT(335)= 1.,

WEIGHT(336)= 0.946,

SFACT = 1. &

1IRON 9 7.45

Model III STT tank - Cylindrical Source, no self-absorption

&INPUT NEXT= 3, IGEOM= 7, ICONC=0,

ISPEC= 3, OPTION=0,

JBUF= 2,

X= 64.77, SLTH= 198.12, Y= 99.06,

NTHETA= 9, NPSI= 11, DELR= 3.0,

SSV1 = 0,

NSHLD = 2, T(1) = 36.83,22.86,

WEIGHT(335)= 1.,

WEIGHT(336)= 0.946,

SFACT = 1. &

WATER 1 0.0

AIR 3 0.0

ALUM. 7 0.0

1IRON 9 7.45

Model III STT tank - same source, dry resin

&INPUT NEXT= 3 &

WATER 1 0.0

AIR 3 0.386

ALUM. 7 0.377

1IRON 9 7.45

Model III STT tank - same source, 25% H₂O

&INPUT NEXT= 3 &

WATER 1 0.131

AIR 3 0.386

ALUM. 7 0.377

1IRON 9 7.45

Model III STT tank - same source, 50% H₂O

&INPUT NEXT= 3 &

WATER 1 0.262
AIR 3 0.386
ALUM. 7 0.377
1IRON 9 7.45
Model III STT tank - same source, 75% H₂O
&INPUT NEXT= 3 &
WATER 1 0.393
AIR 3 0.386
ALUM. 7 0.377
1IRON 9 7.45
Model III STT tank - same source, 100% H₂O
&INPUT NEXT= 3 &
WATER 1 0.525
AIR 3 0.386
ALUM. 7 0.377
1IRON 9 7.45
THIS IS THE END OF THE RUN
&INPUT NEXT= 6 &

APPENDIX B. COST ASSESSMENTS

ALTERNATIVE 1 - CONTINUED SURVEILLANCE AND MAINTENANCE
ORDER OF MAGNITUDE COST ASSESSMENT

FISCAL YEAR SUMMARY

\$1 X \$1000

Date: 26-May-96

PROJECT: SHIELDED TRANSFER TANKS -ALT.1

	FISCAL YEAR					Sub Total
	1994	1995	1996	1997	1998	
..... Participant						
41 NMES FIELD MAINTENANCE	.	2	4	6	8	20
SUB - TOTAL CONTINGENCY	0	2	4	6	8	20
GRAND TOTAL	0	3	6	8	11	28

	FISCAL YEAR					Sub Total
	1999	2000	2001	2002	2003	
..... Participant						
41 NMES FIELD MAINTENANCE	11	13	15	17	19	95
SUB - TOTAL CONTINGENCY	11	13	15	17	19	95
GRAND TOTAL	15	18	21	24	27	133

	FISCAL YEAR					Sub Total
	2004	2005	2006	2007	2008	
..... Participant						
41 NMES FIELD MAINTENANCE	21	23	26	28	30	223
SUB - TOTAL CONTINGENCY	21	23	26	28	30	223
GRAND TOTAL	30	32	36	39	42	312

	FISCAL YEAR					Sub Total
	2009	2010	2011	2012	2013	
..... Participant						
41 NMES FIELD MAINTENANCE	32	34	36	38	40	403
SUB - TOTAL CONTINGENCY	32	34	36	38	40	403
GRAND TOTAL	45	46	50	53	56	564

FISCAL YEAR SUMMARY

\$1 X \$1000

Date: 26-May-94

PROJECT: SHIELDED TRANSFER TANKS -ALT.1

..... Participant	FISCAL YEAR					Sub Total
	2014	2015	2016	2017	2018	
41 MMES FIELD MAINTENANCE	43	65	47	49	51	638
SUB - TOTAL	43	45	47	49	51	638
CONTINGENCY	17	18	19	20	20	255
GRAND TOTAL	60	63	66	69	71	893

..... Participant	FISCAL YEAR	
	2019	Total
41 MMES FIELD MAINTENANCE	53	691
SUB - TOTAL	53	691
CONTINGENCY	21	276
GRAND TOTAL	74	967

SHIELDED TRANSFER TANKS -ALT.1

SUMMARY REPORT

\$1 = \$1000

05/26/94

Arranged By: WBS / Participant / Trace Number

	Unescalated			Escalated		
	Material \$	Labor \$	Total \$	Material \$	Labor \$	Total \$
6.2.01.41 WBS 6.2.01.41						
41 MMES FIELD MAINTENANCE						
0.1.1 SURVEILLANCE & MAINTENANCE	589	0	589	691	0	691
TOTAL MMES FIELD MAINTENANCE	589	0	589	691	0	691
TOTAL WBS 6.2.01.41	589	0	589	691	0	691
SUB - TOTAL						
CONTINGENCY	589	0	589	691	0	691
GRAND TOTAL	235	0	235	276	0	276
	824	0	824	967	0	967

SHIELDED TRANSFER TANKS -ALT.1

Creation Date 05/17/94
 Revision Number ... 2

Estimating Job Number ..

Project Estimator.. DK ATKIN
 WBS 6.2.01.41.22.15 REMED. ACTION/DECOMMISSIONING
 Cost Code 6200 D & D IMPLEMENTATION
 Participant 41 MMES FIELD MAINTENANCE
 Contracting Type .. G
 B/M Attribute
 Discipline O Other
 B/M Title SURVEILLANCE & MAINTENANCE
 Receiving Site X-10
 Standard Value File DRERO394.val
 Estimate File: C:\PROJECTS\DRNL&D\STT\ALT1\ALT1.est 5-25-94 9:16a

Project Engineer RR HINTON
 Building/Area 7918
 Plant Site X
 Level of Estimate P
 Funding Type EXPENSE
 Source Site X-10
 Discipline Estimator ... G/C /DKA
 Quantity Take-Off By ... DKA
 Trace Number 0.1.1 0
 Expiration Date: 06/29/95

ITEM	DESCRIPTION	MATERIAL				LABOR				TOTAL COST M + L
		Qty.	Unit	Unit Pr.	Total	Hours	Cft.	Rate	Total	
1	MMES CONTINUED S & M (.1 FTE PER YEAR FOR 25 YRS)	25.00	YRS	15000.00	375000	0		0.00	0	375000
SINCE IT IS UNCERTAIN AS TO THE ACTUAL CONDITION OF THE TANK MATERIALS AND CONTENTS, CONTINGENCY FOR THIS ALTERNATE IS APPLIED AT 40%										
<hr/>										
TOTAL DIRECT				375000		0		375000		
TAX				8.25%	30938					30938
<hr/>										
SUBTOTAL					405938		0		405938	
OVERHEAD				45.00%	182672		45.00%	0		182672
<hr/>										
TOTAL					588610	0		0		588610
<hr/>										

SHIELDED TRANSFER TANKS -ALT.1

Disciplines
0: Other

Total Labor Hours: 0

COST SUMMARY

	MATERIAL	LABOR	TOTAL COST
Line Item Cost	375000	0	375000
Total Tax	30938	0	30938
SUBTOTAL	405938	0	405938
Total Indirect	0	0	0
SUBTOTAL	405938	0	405938
Overhead	182672	0	182672
SUBTOTAL	588610	0	588610
Contingency	235444	0	235444
SUBTOTAL	824054	0	824054
Market Adjustment			0
TOTAL			824054

ALTERNATIVE 2 - SOLIDIFICATION OF TANK CONTENTS

ORDER OF MAGNITUDE COST ASSESSMENT

FISCAL YEAR SUMMARY

\$1 X \$1000

Date: 27-May-94

PROJECT: SHIELDED TRANSFER TANKS -ALT.2

FISCAL YEAR		
-----	1995	Total
....., Participant		
04 CHARACTERIZATION SUBCON'R	6	6
11 MMES TITLE I & II ENGR.	85	85
21 MMES PROCUREMENT	180	180
35 ENVIRONMENTAL COMPLIANCE	164	164
41 MMES FIELD MAINTENANCE	575	575
49 MMES PROJECT MANAGEMENT	99	99
63 MK-F DIRECT HIRE	612	612
68 MK-F PLANNING	22	22
90 ER DIVISION	83	83
92 WASTE MANAGEMENT	750	750
94 MMES PLAN/COORDINATION	92	92
SUB - TOTAL	2668	2668
CONTINGENCY	916	916
GRAND TOTAL	3584	3584

SHIELDED TRANSFER TANKS -ALT.2

SUMMARY REPORT

\$1 — \$1000

05/27/94

Arranged By: WBS / Participant / Trace Number

	Unescalated			Escalated		
	Material \$	Labor \$	Total \$	Material \$	Labor \$	Total \$
6.2.01.41 WBS 6.2.01.41						
04 CHARACTERIZATION SUBCON'R						
X.1.4 CHARACTERIZ. - CHAR. FIELD ACT	3	2	5	3	2	5
X.1.5 CHARACTERIZ. - CHAR. LETTER	0	1	1	0	1	1
TOTAL CHARACTERIZATION SUBCON'R	3	3	6	3	3	6
11 MMES TITLE I & II ENGR.						
X.1.6 DEF. OF RESTOR. -PROC/WORKPLAN	6	78	84	6	79	85
TOTAL MMES TITLE I & II ENGR.	6	78	84	6	79	85
21 MMES PROCUREMENT						
0.2.2 DECOMMISSIONING	177	0	177	180	0	180
TOTAL MMES PROCUREMENT	177	0	177	180	0	180
35 ENVIRONMENTAL COMPLIANCE						
0.2.4 DECOMMISSIONING	7	73	80	7	75	82
X.1.3 PROJ. MGMT - ESH OVERSIGHT	7	73	80	7	74	81
TOTAL ENVIRONMENTAL COMPLIANCE	14	146	160	14	149	163
41 MMES FIELD MAINTENANCE						
0.2.5 DECOMMISSIONING	433	125	558	446	129	575
TOTAL MMES FIELD MAINTENANCE	433	125	558	446	129	575
49 MMES PROJECT MANAGEMENT						
X.1.7 MMES PROJECT SERVICES	44	52	96	46	54	100
TOTAL MMES PROJECT MANAGEMENT	44	52	96	46	54	100
63 MK-F DIRECT HIRE						
0.2.3 MK-F ADMIN. SUPPORT	0	109	109	0	112	112
0.2.6 DECOMMISSIONING - MK DN	51	81	132	53	84	137
0.2.7 DECOMMISSIONING - MK SUPPORT	157	194	351	162	201	363
TOTAL MK-F DIRECT HIRE	208	384	592	215	397	612

SHIELDED TRANSFER TANKS -ALT.2

SUMMARY REPORT

\$1 ← \$1000

05/27/94

Arranged By: WBS / Participant / Trace Number

	Unescalated			Escalated		
	Material	Labor	Total	Material	Labor	Total
	\$	\$	\$	\$	\$	\$
6.2.01.41 WBS 6.2.01.41						
68 MK-F PLANNING						
0.2.1 STATEMENT OF WORK/MANPOWER EST	2	19	21	2	20	22
TOTAL MK-F PLANNING	2	19	21	2	20	22
90 ER DIVISION						
X.1.1 PROJ. MGMT - PROJ. INTEGRATION	9	73	82	9	74	83
TOTAL ER DIVISION	9	73	82	9	74	83
92 WASTE MANAGEMENT						
0.2.8 WASTE MANAGEMENT	725	0	725	750	0	750
TOTAL WASTE MANAGEMENT	725	0	725	750	0	750
94 MMES PLAN/COORDINATION						
X.1.2 PROJ. MGMT - OVERSIGHT/SUPPORT	9	81	90	9	83	92
TOTAL MMES PLAN/COORDINATION	9	81	90	9	83	92
TOTAL WBS 6.2.01.41	1630	961	2591	1680	988	2668
SUB - TOTAL CONTINGENCY	1630	961	2591	1680	988	2668
569	320	889	586	329	915	
GRAND TOTAL	2199	1281	3480	2266	1517	3583

SHIELDED TRANSFER TANKS -ALT.2

Creation Date 05/17/94
 Revision Number ... 2

Estimating Job Number ..

Project Estimator.. DK ATKIN
 WBS 6.2.01.41.01.01 PROJECT INTEGRATION
 Cost Code 9100 PROJECT INTEGRATION
 Participant 90 ER DIVISION
 Contracting Type .. G
 B/M Attribute
 Discipline X Engineering
 B/M Title PROJ. MGMT - PROJ. INTEGRATION
 Receiving Site X-10
 Standard Value File ORER0394.val
 Estimate File: C:\PROJECTS\ORNLDBD\STT\ALT2\ALT2.est 5-27-94 12:02a

Project Engineer RR HINTON
 Building/Area 7918
 Plant Site X
 Level of Estimate P
 Funding Type EXPENSE
 Source Site X-10
 Discipline Estimator ... G/C /DKA
 Quantity Take-Off By ... TEAM /DKA
 Trace Number X.1.1 0
 Expiration Date: 06/29/95

ITEM	DESCRIPTION	MATERIAL				LABOR				TOTAL COST
		Aty.	Unit	Unit Pr.	Total	Hours	Cft.	Rate	Total	
1	ER PLANNING (1/2 FTE @ 2000 HRS/YR) INCLUDES PROJECT MANAGER, PORTION OF PROJECT ANALYST AND PROJECT ENGINEER	1.00	LOT	6000.00	6000	1000	EV	50.00	50000	56000
<hr/>										
	TOTAL DIRECT				6000				50000	56000
	OVERHEAD			45.00%	2700			45.00%	22500	25200
	TOTAL				8700	1000			72500	81200
<hr/>										

SHIELDED TRANSFER TANKS -ALT.2

WBS 6.2.01.41.01.02 PROJECT OVERSIGHT AND SUPPORT
 Cost Code 9100 PROJECT INTEGRATION
 Participant 94 MMES PLAN/COORDINATION
 Contracting Type ... G
 B/M Attribute
 Discipline X Engineering
 B/M Title PROJ. MGMT - OVERSIGHT/SUPPORT
 Receiving Site X-10
 Standard Value File ORERO394.val
 Estimate File: C:\PROJECTS\ORNLDD\STT\ALT2\ALT2.est 5-27-94 12:02a

Building/Area 7918
 Plant Site X
 Level of Estimate P
 Funding Type EXPENSE
 Source Site X-10
 Discipline Estimator ... G/C /DKA
 Quantity Take-Off By ... TEAM /DKA
 Trace Number X.1.2 0
 Expiration Date: 06/29/95

ITEM	DESCRIPTION	MATERIAL			LABOR				TOTAL COST M + L
		Qty.	Unit	Unit Pr.	Total	Hours	Cft.	Rate	
1	MMES PLANNING AND COORDINATION - THE PROJECT OVERSIGHT/SUPPORT PROVIDES FOR THE TRUE PERFORMANCE MEASUREMENTS AND FINANCIAL CONTROLS BASED ON AN INTEGRATED COST AND SCHEDULE CONTROL SYSTEM. THE PROJECT SUPPORT IS ALSO RESPONSIBLE FOR ENSURING COMPLIANCE WITH EPA AND TDEC REQUIREMENTS, AND COMPLIANCE WITH APPLICABLE REGULATIONS AND OTHER MMES POLICIES AND PROCEDURES	1.00	LOT	6000.00	6000	1000	XE 56.00	56000	62000
	<hr/>								
	TOTAL DIRECT OVERHEAD			6000 45.00%	2700		45.00%	25200	27900
	<hr/>								
	TOTAL			8700	1000			81200	89900

SHIELDED TRANSFER TANKS -ALT.2

WBS 6.2.01.41.01.03 ES& H OVERSIGHT
 Cost Code 9100 PROJECT INTEGRATION
 Participant 35 ENVIRONMENTAL COMPLIANCE
 Contracting Type .. G
 B/M Attribute
 Discipline X Engineering
 B/M Title PROJ. MGMT - ES&H OVERSIGHT
 Receiving Site X-10
 Standard Value File ORER0394.val
 Estimate File: C:\PROJECTS\ORNLDBD\STT\ALT2\ALT2.est 5-27-94 12:02a
 Building/Area 7918
 Plant Site X
 Level of Estimate P
 Funding Type EXPENSE
 Source Site X-10
 Discipline Estimator ... G/C /DKA
 Quantity Take-Off By ... TEAM /DKA
 Trace Number X.1.3 0
 Expiration Date: 06/29/95

ITEM	DESCRIPTION	MATERIAL				LABOR				TOTAL COST M + L
		Qty.	Unit	Unit Pr.	Total	Hours	Cft.	Rate	Total	
1	HEALTH PHYSICS AND INDUSTRIAL HYGIENE (1/2 FTE @ 2000 HRS/YR) FOR DOCUMENT PREPARATION AND REVIEW	1.00	LOT	5000.00	5000	1000	EM	50.00	50000	55000
TOTAL DIRECT					5000				50000	55000
OVERHEAD				45.00%	2250		45.00%	22500		24750
TOTAL					7250	1000		72500		79750

SHIELDED TRANSFER TANKS -ALT.2

WBS 6.2.01.41.10.15 CHARACTERIZ. FIELD ACTIVITIES
 Cost Code 1200 D & D FACILITY CHARACTERIZAT'N
 Participant 04 CHARACTERIZATION SUBCON'R
 Contracting Type .. S
 B/M Attribute
 Discipline X Engineering
 B/M Title CHARACTERIZ. - CHAR. FIELD ACT
 Receiving Site X-10
 Standard Value File DRER0394.val
 Estimate File: C:\PROJECTS\DRMLD&D\STT\ALT2.est 5-27-96 12:02a
 Building/Area 7918
 Plant Site X
 Level of Estimate P
 Funding Type EXPENSE
 Source Site X-10
 Discipline Estimator ... G/C /DKA
 Quantity Take-Off By ... TEAM /DKA
 Trace Number X.1.4 0
 Expiration Date: 06/29/95

ITEM	DESCRIPTION	MATERIAL				LABOR				TOTAL COST M + L
		Qty.	Unit	Unit Pr.	Total	Hours	Cft.	Rate	Total	
CHARACTERIZATION FIELD ACTIVITIES										
1	SURFACE SAMPLING OF TANKS	1.00	LOT	1950.00	1950	32	FC	54.00	1728	3678
2	RADIOLOGICAL SURVEY OF LEAD	1.00	LOT	1000.00	1000	4	FC	54.00	216	1216
TOTAL					2950				1944	4894
TOTAL DIRECT OVERHEAD				8.70%	257			8.70%	169	426
TOTAL					3207	36			2113	5320

SHIELDED TRANSFER TANKS -ALT.2

WBS	6.2.01.41.10.20	CHARACTERIZATION LETTER	Building/Area	7918						
Cost Code	1200	D & D FACILITY CHARACTERIZAT'N	Plant Site	X						
Participant	04	CHARACTERIZATION SUBCON'R	Level of Estimate	P						
Contracting Type ..	S		Funding Type	EXPENSE						
B/M Attribute			Source Site	X-10						
Discipline	X Engineering		Discipline Estimator ...	G/C /DKA						
B/M Title	CHARACTERIZ. - CHAR. LETTER		Quantity Take-Off By ...	TEAM /DKA						
Receiving Site ...	X-10		Trace Number	X.1.5 0						
Standard Value File	DRER0394.val		Expiration Date:	06/29/95						
Estimate File: C:\PROJECTS\ORHLD&D\STT\ALT2\ALT2.est 5-27-94 12:02a										
=====										
ITEM	DESCRIPTION	MATERIAL				LABOR				TOTAL COST M + L
		Qty.	LOT	Unit	Unit Pr.	Total	Hours	Cft.	Rate	
1	CHARACTERIZATION LETTER	1.00	LOT	100.00	100	16	FC	54.00	864	964
TOTAL DIRECT					100				864	964
OVERHEAD				8.70%	9			8.70%	75	84
TOTAL					109	16			939	1048
=====										

SHIELDED TRANSFER TANKS -ALT.2

WBS 6.2.01.41.20.15 ENGINEERING STUDIES
 Cost Code 5100 REMEDIAL DESIGN
 Participant 11 MMES TITLE I & II ENGR.
 Contracting Type ... G
 B/M Attribute
 Discipline X Engineering
 B/M Title DEF. OF RESTOR. -PROC/WORKPLAN
 Receiving Site X-10
 Standard Value File DRERD394.val
 Estimate File: C:\PROJECTS\DRNLDB\STT\ALT2\ALT2.est 5-27-94 12:02a

Building/Area 7918
 Plant Site X
 Level of Estimate P
 Funding Type EXPENSE
 Source Site X-10
 Discipline Estimator ... G/C /DKA
 Quantity Take-Off By ... TEAM /DKA
 Trace Number X.1.6 0
 Expiration Date: 06/29/95

ITEM	DESCRIPTION	MATERIAL				LABOR				TOTAL COST M + L
		Aty.	Unit	Unit Pr.	Total	Hours	Cft.	Rate	Total	
1	PERFORMANCE SPECIFICATION	1.00	LOT	4000.00	4000	960	XE	56.00	53760	57760
TOTAL DIRECT					6000				53760	57760
OVERHEAD				45.00%	1800			45.00%	26192	25992
TOTAL					5800	960			77952	83752

SHIELDED TRANSFER TANKS -ALT.2

WBS	6.2.01.41.22.10	STATEMENT OF WORK/MANPOWER EST	Building/Area	7918 /3517
Cost Code	5100	REMEDIAL DESIGN	Plant Site	X
Participant	68	MK-F PLANNING	Level of Estimate	P
Contracting Type ..	G		Funding Type	EXPENSE
B/M Attribute			Source Site	X-10
Discipline	O Other		Discipline Estimator ...	G/C /DKA
B/M Title	STATEMENT OF WORK/MANPOWER EST		Quantity Take-Off By ...	TEAM /DKA
Receiving Site	X-10		Trace Number	0.2.1 0
Standard Value File	ORER0394.val		Expiration Date:	06/29/95
Estimate File: C:\PROJECTS\ORNLD&D\STT\ALT2\ALT2.est 5-27-94 12:02a				

ITEM	DESCRIPTION	MATERIAL				LABOR				TOTAL COST
		Qty.	Unit	Unit Pr.	Total	Hours	Cft.	Rate	Total	
1	ACTION PLAN	1.00	LOT	1500.00	1500	240	MK	61.43	14743	16243
	TOTAL DIRECT				1500				14743	16243
	TOTAL INDIRECT			20.00%	300		20.00%	2949		3249
	OVERHEAD			8.70%	157		8.70%	1539		1696
	TOTAL				1957	240		19231		21188

SHIELDED TRANSFER TANKS -ALT.2

WBS 6.2.01.41.22.15 REMED. ACTION/DECOMMISSIONING
 Cost Code 6200 D & D IMPLEMENTATION
 Participant 21 MMES PROCUREMENT
 Contracting Type .. G
 B/M Attribute
 Discipline O Other
 B/M Title DECOMMISSIONING
 Receiving Site X-10
 Standard Value File ORER0394.val
 Estimate File: C:\PROJECTS\ORNLDBD\STT\ALT2\ALT2.est 5-27-94 12:02a
 ======

ITEM	DESCRIPTION	MATERIAL				LABOR				TOTAL COST M + L
		Qty.	Unit	Unit Pr.	Total	Hours	Cft.	Rate	Total	
1	PROCURE MICS FOR STORING THE GROUTED CASKS (QUOTE FROM SEG)	5.00	EA	30000.00	150000	0		0.00	0	150000
2	PROCUREMENT SERVICES	1.00	LOT	9000.00	9000	0		0.00	0	9000
3	DUNAGE & TRANSPORTATION @ 3%	1.00	LOT	4770.00	4770	0		0.00	0	4770
TOTAL DIRECT		163770				0				163770
TAX		8.25% 13511								13511
SUBTOTAL		177281				0				177281
OVERHEAD										0
TOTAL		177281				0		0	0	177281

 ======

SHIELDED TRANSFER TANKS -ALT.2

WBS	6.2.01.41.22.15	REMED. ACTION/DECOMMISSIONING	Building/Area	7918
Cost Code	6200	D & D IMPLEMENTATION	Plant Site	X
Participant	49	MMES PROJECT MANAGEMENT	Level of Estimate	P
Contracting Type ..	G		Funding Type	EXPENSE
B/M Attribute			Source Site	X-10
Discipline	X Engineering		Discipline Estimator ...	G/C /DKA
B/M Title	MMES PROJECT SERVICES		Quantity Take-Off By ...	TEAM /DKA
Receiving Site	X-10		Trace Number	X.1.7 0
Standard Value File	ORER0394.val		Expiration Date:	06/29/95
Estimate File: C:\PROJECTS\ORNLD&D\STT\ALT2\ALT2.est 5-27-94 12:02a				

ITEM	DESCRIPTION	MATERIAL				LABOR				TOTAL COST M + L
		Qty.	Unit	Unit Pr.	Total	Hours	Cft.	Rate	Total	
1	MMES PROJECT SERVICES	1.00	LOT	4000.00	4000	480	XE	56.00	26880	30880
2	VERIFY INTEGRITY OF BLDG. 3517 OVERHEAD CRANE FOR HANDLING THE SHIELDED CASKS, WHICH WEIGH APPROX. 43,000 LBS. LOADED. COSTS ARE INCLUDED FOR BRINGING THE CRANE ON LINE.	1.00	LOT	1500.00	1500	160	XE	56.00	8960	10460
3	SAFETY ASSESSMENT AND CRANE RECERTIFICATION	1.00	LOT	25000.00	25000	0		0.00	0	25000
<hr/>										<hr/>
TOTAL DIRECT				30500				35840		66340
OVERHEAD				45.00%	13725			45.00%	16128	29853
<hr/>										<hr/>
TOTAL				64225	640			51968		96193

SHIELDED TRANSFER TANKS -ALT.2

WBS 6.2.01.41.22.15 REMED. ACTION/DECOMMISSIONING
 Cost Code 6200 D & D IMPLEMENTATION
 Participant 63 MK-F DIRECT HIRE
 Contracting Type .. G
 B/M Attribute
 Discipline O Other
 B/M Title MK-F ADMIN. SUPPORT
 Receiving Site X-10
 Standard Value File ORER0394.val
 Estimate File: C:\PROJECTS\ORNLDB\STT\ALT2\ALT2.est 5-27-94 12:02a

Building/Area 7918 /3517
 Plant Site X
 Level of Estimate P
 Funding Type EXPENSE
 Source Site X-10
 Discipline Estimator ... G/C /DKA
 Quantity Take-Off By ... DKA
 Trace Number 0.2.3 0
 Expiration Date: 06/29/95

ITEM	DESCRIPTION	MATERIAL			LABOR			TOTAL COST M + L
		Qty.	Unit	Unit Pr.	Total	Hours	Cft.	
1	MK-F ADMINISTRATIVE SUPPORT	1.00	LOT	0.00	0	1600	AS	52.30 83680 83680
	TOTAL DIRECT				0			83680 83680
	TAX			8.25%	0			0
	SUBTOTAL				0			83680 83680
	TOTAL INDIRECT			20.00%	0		20.00%	16736 16736
	OVERHEAD			8.70%	0		8.70%	8736 8736
	TOTAL				0	1600		109152 109152

SHIELDED TRANSFER TANKS -ALT.2

WBS 6.2.01.41.22.15.04 REMED. ACTION/DECOMMISSIONING
 Cost Code 6200 D & D IMPLEMENTATION
 Participant 35 ENVIRONMENTAL COMPLIANCE
 Contracting Type .. G
 B/M Attribute
 Discipline G Other
 B/M Title DECOMMISSIONING
 Receiving Site X-10
 Standard Value File ORERO394.val
 Estimate File: C:\PROJECTS\ORNLDD\STF\ALT2\ALT2.est 5-27-94 12:02a

Building/Area 7918 /3517
 Plant Site X
 Level of Estimate P
 Funding Type EXPENSE
 Source Site X-10
 Discipline Estimator ... G/C /DKA
 Quantity Take-Off By ... TEAM /DKA
 Trace Number 0.2.4 0
 Expiration Date: 06/29/95

ITEM	DESCRIPTION	MATERIAL				LABOR				TOTAL COST M + L
		Qty.	Unit	Unit Pr.	Total	Hours	Cft.	Rate	Total	
1	HEALTH PHYSICS AND INDUSTRIAL HYGIENE (1/20 FTE) FOR FIELD SUPPORT	1.00	LOT	5000.00	5000	1000	EH	50.00	50000	55000
					5000				50000	55000
	TOTAL DIRECT				45.00%	2250		45.00%	22500	24750
	OVERHEAD									
	TOTAL					7250	1000		72500	79750

SHIELDED TRANSFER TANKS -ALT.2

WBS 6.2.01.41.22.15.04 REMED. ACTION/DECOMMISSIONING
 Cost Code 6200 D & D IMPLEMENTATION
 Participant 41 MMES FIELD MAINTENANCE
 Contracting Type ... G
 B/M Attribute
 Discipline O Other
 B/M Title DECOMMISSIONING
 Receiving Site X-10
 Standard Value File ORER0394.val
 Estimate File: C:\PROJECTS\ORNLD&D\STT\ALT2\ALT2.est 5-27-96 12:02a

Building/Area 7918 /3517
 Plant Site X
 Level of Estimate P
 Funding Type EXPENSE
 Source Site X-10
 Discipline Estimator ... G/C /DKA
 Quantity Take-Off By ... DKA
 Trace Number 0.2.5 0
 Expiration Date: 06/29/95

ITEM	DESCRIPTION	MATERIAL				LABOR				TOTAL COST M + L
		Qty.	Unit	Unit Pr.	Total	Hours	Cft.	Rate	Total	
1	ESTABLISH CONTAMINATION CONTROL AREAS, WASTE PKG. ZONES, AND LOADING AREA	1.00	LOT	20000.00	20000	660	XE	38.32	24525	44525
1A	PREPARE NEGATIVE PRESSURE ENCLOSURE AT ENTRANCE	1.00	LOT	200000.00	200000	0		0.00	0	200000
2	NP TECHNICIAN	1.00	LOT	0.00	0	160	XX	65.77	10523	10523
3	IN TECHNICIAN	1.00	LOT	0.00	0	80	XX	65.77	5262	5262
4	SAMPLING COSTS FOR APPROX. 40 SAMPLES (RCRA)	40.00	EA	280.00	11200	0		0.00	0	11200
5	SAMPLING COSTS FOR APPROX. 40 SAMPLES (RAD - GROSS ALPHA & BETA)	40.00	EA	132.00	5280	0		0.00	0	5280
6	SAMPLING COSTS FOR APPROX. 40 SAMPLES (RAD - GAMMA)	40.00	EA	65.00	2600	0		0.00	0	2600
7	WASTE CHARACTERIZATION OF CONTENTS OF TANKS	5.00	EA	2300.00	11500	0		0.00	0	11500
8	AFTER CASKS ARE MOVED TO 3517 & LIDS ARE REMOVED, PUMP GROUT MIXTURE INTO TOP PORTION OF TANKS	4.00	CY	215.00	860	96	XE	38.32	3679	4539
9	AFTER LID IS PLACED, DECONTAMINATE EXTERIOR OF CASKS, TEST, REPEAT PROCEDURE AS NECESSARY	5.00	EA	500.00	2500	120	XE	38.32	4598	7098
11	TESTING, TAG & INSPECTION	1.00	LOT	2539.00	2539	27	ZZ	44.33	1197	3736
12	MOBILIZATION & DEMOBILIZATION	1.00	LOT	3809.00	3809	55	ZZ	44.33	2438	6267

SHIELDED TRANSFER TANKS -ALT.2

ITEM	DESCRIPTION	MATERIAL			LABOR				TOTAL COST	
		Qty.	Unit	Unit Pr.	Total	Hours	Cft.	Rate	Total	M + L
13	SUPPORTING ITEMS, BREAKAGE, & WASTE	1.00	LOT	12697.00	12697	110	22	44.33	4876	17573
14	LOST WORK TIME DUE TO ENTERING SPECIAL SECURITY AREAS.	0.00		0.00	0	155	22	44.33	6871	6871
15	JOB CONDITIONS/PERS.TIME	0.00		0.00	0	433	22	44.33	19195	19195
16	CLEANUP	1.00	LOT	2730.00	2730	72	22	44.33	3192	5922
<hr/>		<hr/>			275715	<hr/>				362071
TOTAL DIRECT TAX		8.25% 22746				<hr/>				22746
<hr/>		<hr/>			298461	<hr/>				384817
SUBTOTAL OVERHEAD		45.00% 134307				45.00% 38860				173167
<hr/>		<hr/>			432768	<hr/>				557984
<hr/>		<hr/>			1948	<hr/>				125216

SHIELDED TRANSFER TANKS -ALT.2

WBS 6.2.01.41.22.15.04 REMED. ACTION/DECOMMISSIONING
 Cost Code 6200 D & D IMPLEMENTATION
 Participant 63 MK-F DIRECT HIRE
 Contracting Type .. S
 B/M Attribute
 Discipline O Other
 B/M Title DECOMMISSIONING - MK DH
 Receiving Site X-10
 Standard Value File ORER0394.val
 Estimate File: C:\PROJECTS\ORNLDB\STT\ALT2\ALT2.est 5-27-94 12:02a

Building/Area 7918 /3517
 Plant Site X
 Level of Estimate P
 Funding Type EXPENSE
 Source Site X-10
 Discipline Estimator ... G/C /DKA
 quantity Take-Off By ... DKA
 Trace Number 0.2.6 0
 Expiration Date: 06/29/95

ITEM	DESCRIPTION	MATERIAL				LABOR				TOTAL COST M + L
		Qty.	Unit	Unit Pr.	Total	Hours	Cft.	Rate	Total	
1	ADDITIONAL REINF. AND PREPARATION OF BLDG. 3517 FOR TANK GROUTING, ETC.	1.00	LOT	10000.00	10000	400	X2	25.00	10000	20000
2	REMOVE 5 CASKS FROM UNDER A SHED ROOF OUTSIDE BLDG. 7918. TRANSPORT TANKS TO 3517, REMOVE TOP COVER	5.00	EA	0.00	0	80	OP	28.55	2284	2284
3	CONTINUED	5.00	EA	0.00	0	80	L	18.82	1506	1506
4	CONTINUED	5.00	EA	0.00	0	80	TD	20.44	1635	1635
5	AFTER SAMPLING & GROUTING IS DONE, REPLACE CASK LIDS, ALLOW TIME FOR MMES DECONTAMINATION OF OUTSIDE OF TANKS, AND TRANSPORT TANKS TO WAG 6 FOR STORAGE	5.00	EA	0.00	0	80	OP	28.55	2284	2284
6	CONTINUED	5.00	EA	0.00	0	80	L	18.82	1506	1506
7	CONTINUED	5.00	EA	0.00	0	80	TD	20.44	1635	1635
8	PPE - LEVEL C	880.00	HRS	25.04	22035	220	L	18.82	4140	26175
9	TESTING, TAG & INSPECTION	1.00	LOT	320.00	320	55	ZZ	22.72	1250	1570
10	MOBILIZATION & DEMOBILIZATION	1.00	LOT	961.00	961	83	ZZ	22.72	1886	2847
11	SUPPORTING ITEMS, BREAKAGE, & WASTE	1.00	LOT	1602.00	1602	165	ZZ	22.72	3749	5351
12	HEALTH PHYSICS	0.00		0.00	0	140	ZZ	22.72	3181	3181
13	INDUSTRIAL HYGIENE	0.00		0.00	0	105	ZZ	22.72	2385	2385
14	LOST WORK TIME DUE TO ENTERING SPECIAL SECURITY AREAS.	0.00		0.00	0	198	ZZ	22.72	4498	4498
15	JOB CONDITIONS/PERS. TIME	0.00		0.00	0	665	ZZ	22.72	15108	15108
16	CLEANUP	1.00	LOT	349.00	349	111	ZZ	22.72	2522	2871

SHIELDED TRANSFER TANKS -ALT.2

ITEM	DESCRIPTION	MATERIAL				LABOR				TOTAL COST M + L
		Qty.	Unit	Unit Pr.	Total	Hours	Cft.	Rate	Total	
17	TRAIN, SHOP, SM TOOLS	1.00	LOT	908.00	908	122	22	22.72	2772	3680
TOTAL DIRECT					36175				62341	98516
TAX				8.25%	2984					2984
SUBTOTAL					39159				62341	101500
TOTAL INDIRECT				20.00%	7832			20.00%	12468	20300
OVERHEAD				8.70%	4088			8.70%	6508	10596
TOTAL					51079	2744			81317	132396

SHIELDED TRANSFER TANKS -ALT.2

WBS 6.2.01.41.22.15.04 REMED. ACTION/DECOMMISSIONING
 Cost Code 6200 D & D IMPLEMENTATION
 Participant 63 MK-F DIRECT HIRE
 Contracting Type .. S
 B/M Attribute
 Discipline O Other
 B/M Title DECOMMISSIONING - MK SUPPORT
 Receiving Site X-10
 Standard Value File DRER0394.val
 Estimate File: C:\PROJECTS\DRNLD&D\STT\ALT2\ALT2.est 5-27-94 12:02a
 Building/Area 7918 /3517
 Plant Site X
 Level of Estimate P
 Funding Type EXPENSE
 Source Site X-10
 Discipline Estimator ... G/C /DKA
 Quantity Take-Off By ... DKA
 Trace Number 0.2.7 0
 Expiration Date: 06/29/95

ITEM	DESCRIPTION	MATERIAL				LABOR				TOTAL COST M + L
		Qty.	Unit	Unit Pr.	Total	Hours	Cft.	Rate	Total	
1	TEMPORARY FACILITIES	1.00	LOT	2500.00	2500	160	X2	25.00	4000	6500
2	TEMPORARY SERVICES	1.00	LOT	5000.00	5000	320	X3	28.00	8960	13960
3	MATERIAL HANDLING	1.00	LOT	0.00	0	240	TD	20.44	4906	4906
4	CONTINUED	1.00	LOT	0.00	0	240	L	18.82	4517	4517
	GOV'T EQUIP.									
5	TRUCK MTD. HYDRAULIC CRANE	10.00	HRS	5150.00	51500	0		0.00	0	51500
6	FLATBED TRUCK	200.00	HRS	15.00	3000	0		0.00	0	3000
7	PICKUP TRUCK	1600.00	HRS	1.75	2800	0		0.00	0	2800
8	TRAINING / MEDICALS / PLANNING	0.00		0.00	0	0		0.00	0	0
9	HAZARDOUS WASTE TRAINING	30.00	EA	750.00	22500	1200	X	54.00	64800	87300
10	RAD WORKER TRAINING	30.00	EA	250.00	7500	720	X	54.00	38880	46380
11	PHYSICAL EXAM	30.00	EA	350.00	10500	120	X	54.00	6480	16980
12	WHOLE BODY COUNT	30.00	EA	0.00	0	90	X	54.00	4860	4860
13	URINALYSIS	30.00	EA	0.00	0	30	X	54.00	1620	1620
14	RESPIRATOR FIT	30.00	EA	105.00	3150	30	X	54.00	1620	4770
15	EXTERNAL DOSIMETRY	30.00	EA	80.00	2400	0		0.00	0	2400
16	LOST WORK TIME DUE TO ENTERING SPECIAL SECURITY AREAS.	0.00		0.00	0	189	ZZ	44.65	8439	8439
TOTAL DIRECT					110850				149082	259932
TAX					8.25%	9145				9145

SHIELDED TRANSFER TANKS -ALT.2

ITEM	DESCRIPTION	MATERIAL			LABOR				TOTAL COST M + L
		Qty.	Unit	Unit Pr.	Total	Hours	Cft.	Rate	
SUBTOTAL					119995				149082
TOTAL INDIRECT				20.00%	23999			20.00%	29816
OVERHEAD				8.70%	12527			8.70%	15564
TOTAL					156521	3339			194462
									350983

SHIELDED TRANSFER TANKS -ALT.2

WBS	6.2.01.41.22.15.06	REMED. ACTION/DECOMMISSIONING	Building/Area	7918 /3517																																																																		
Cost Code	9300	TREATMENT, STORAGE & DISPOSAL	Plant Site	X																																																																		
Participant	92	WASTE MANAGEMENT	Level of Estimate	P																																																																		
Contracting Type ..	G	—	Funding Type	EXPENSE																																																																		
B/M Attribute	—		Source Site	X-10																																																																		
Discipline	O Other		Discipline Estimator ...	G/C /DKA																																																																		
B/M Title	WASTE MANAGEMENT		Quantity Take-Off By ...	DKA																																																																		
Receiving Site	X-10		Trace Number	0.2.8 0																																																																		
Standard Value File	ORER0394.vel		Expiration Date:	06/29/95																																																																		
Estimate File: C:\PROJECTS\ORNLDA\STT\ALT2\ALT2.est 5-27-94 12:02a																																																																						
<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th rowspan="2">ITEM</th> <th rowspan="2">DESCRIPTION</th> <th colspan="3">MATERIAL</th> <th colspan="3">LABOR</th> <th rowspan="2">TOTAL COST M + L</th> </tr> <tr> <th>Aty.</th> <th>Unit</th> <th>Unit Pr.</th> <th>Total</th> <th>Hours</th> <th>Cft.</th> <th>Rate</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>WASTE HANDLING AND STORAGE (DATA PROVIDED BY TOM SCANLAN FROM PREVIOUS PROJECT. ALLOWANCE FOR ALL PARTICIPANTS INVOLVED WITH CONSTRUCTING SILOS AND PLACING CONTAINERS)</td> <td>1.00</td> <td>LOT</td> <td>500000.00</td> <td>500000</td> <td>0</td> <td>0.00</td> <td>0</td> <td>500000</td> </tr> <tr> <td></td> </tr> <tr> <td></td> <td>TOTAL DIRECT OVERHEAD</td> <td></td> <td></td> <td>500000</td> <td></td> <td>0</td> <td></td> <td>500000</td> <td></td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td>45.00%</td> <td>225000</td> <td></td> <td>45.00%</td> <td>0</td> <td>225000</td> </tr> <tr> <td></td> <td>TOTAL</td> <td></td> <td></td> <td>725000</td> <td>0</td> <td></td> <td></td> <td>0</td> <td>725000</td> </tr> </tbody> </table>					ITEM	DESCRIPTION	MATERIAL			LABOR			TOTAL COST M + L	Aty.	Unit	Unit Pr.	Total	Hours	Cft.	Rate	1	WASTE HANDLING AND STORAGE (DATA PROVIDED BY TOM SCANLAN FROM PREVIOUS PROJECT. ALLOWANCE FOR ALL PARTICIPANTS INVOLVED WITH CONSTRUCTING SILOS AND PLACING CONTAINERS)	1.00	LOT	500000.00	500000	0	0.00	0	500000												TOTAL DIRECT OVERHEAD			500000		0		500000						45.00%	225000		45.00%	0	225000		TOTAL			725000	0			0	725000
ITEM	DESCRIPTION	MATERIAL					LABOR			TOTAL COST M + L																																																												
		Aty.	Unit	Unit Pr.	Total	Hours	Cft.	Rate																																																														
1	WASTE HANDLING AND STORAGE (DATA PROVIDED BY TOM SCANLAN FROM PREVIOUS PROJECT. ALLOWANCE FOR ALL PARTICIPANTS INVOLVED WITH CONSTRUCTING SILOS AND PLACING CONTAINERS)	1.00	LOT	500000.00	500000	0	0.00	0	500000																																																													
	TOTAL DIRECT OVERHEAD			500000		0		500000																																																														
				45.00%	225000		45.00%	0	225000																																																													
	TOTAL			725000	0			0	725000																																																													

SHIELDED TRANSFER TANKS -ALT.2

Disciplines
 Engineering
 Other

Total Labor Hours: 15523

COST SUMMARY

	MATERIAL	LABOR	TOTAL COST
Line Item Cost	1147560	694610	1842170
Total Tax	48386	0	48386
SUBTOTAL	1195946	694610	1890556
Total Indirect	32131	61969	94100
SUBTOTAL	1228077	756579	1984656
Overhead	601770	204471	606241
SUBTOTAL	1629847	961050	2590897
Contingency	568660	320046	888706
SUBTOTAL	2198507	1281096	3479603
Market Adjustment			0
TOTAL			3479603

ALTERNATIVE 3 - SALE OF ONE OR MORE OF THE STTs
ORDER OF MAGNITUDE COST ASSESSMENT

FISCAL YEAR SUMMARY

\$1 X \$1000

Date: 27-May-94

PROJECT: SHIELDED TRANSFER TANKS -ALT.3

FISCAL YEAR		
-----	1995	Total
..... Participant		
04 CHARACTERIZATION SUBCON'R	6	6
11 MMES TITLE I & II ENGR.	85	85
21 MMES PROCUREMENT	180	180
35 ENVIRONMENTAL COMPLIANCE	164	164
41 MMES FIELD MAINTENANCE	755	755
49 MMES PROJECT MANAGEMENT	99	99
53 FP UNIT SUBCONTRACTS	316	316
63 MK-F DIRECT HIRE	612	612
66 MK-F INDIRECTS ON FP	38	38
67 MK-F DIRECTS ON FP	60	60
68 MK-F PLANNING	22	22
90 ER DIVISION	83	83
92 WASTE MANAGEMENT	450	450
94 MMES PLAN/COORDINATION	148	148
-----	-----	-----
SUB - TOTAL	3018	3018
CONTINGENCY	1036	1036
-----	-----	-----
GRAND TOTAL	4054	4054

SHIELDED TRANSFER TANKS -ALT.3

SUMMARY REPORT

\$1 = \$1000

05/27/94

Arranged By: WBS / Participant / Trace Number

	Unescalated			Escalated		
	Material	Labor	Total	Material	Labor	Total
6.2.01.41 WBS 6.2.01.41						
04 CHARACTERIZATION SUBCON'R						
X.1.4 CHARACTERIZ. - CHAR. FIELD ACT	3	2	5	3	2	5
X.1.5 CHARACTERIZ. - CHAR. LETTER	0	1	1	0	1	1
TOTAL CHARACTERIZATION SUBCON'R	3	3	6	3	3	6
11 MMES TITLE I & II ENGR.						
X.1.6 DEF. OF RESTOR. -PROC/WORKPLAN	6	78	84	6	79	85
TOTAL MMES TITLE I & II ENGR.	6	78	84	6	79	85
21 MMES PROCUREMENT						
0.2.2 DECOMMISSIONING	177	0	177	180	0	180
TOTAL MMES PROCUREMENT	177	0	177	180	0	180
35 ENVIRONMENTAL COMPLIANCE						
0.2.6 DECOMMISSIONING	7	73	80	7	75	82
X.1.3 PROJ. MGMT - ES&H OVERSIGHT	7	73	80	7	74	81
TOTAL ENVIRONMENTAL COMPLIANCE	14	146	160	14	149	163
41 MMES FIELD MAINTENANCE						
0.2.7 DECOMMISSIONING	474	259	733	489	267	756
TOTAL MMES FIELD MAINTENANCE	474	259	733	489	267	756
49 MMES PROJECT MANAGEMENT						
X.1.7 MMES PROJECT SERVICES	64	52	96	46	54	100
TOTAL MMES PROJECT MANAGEMENT	64	52	96	46	54	100
53 FP UNIT SUBCONTRACTS						
0.2.8 DECOMMISSIONING - FPSC	313	0	313	325	0	325
0.2.9 DECOMMISSIONING - FPSC	(9)	0	(9)	(9)	0	(9)
TOTAL FP UNIT SUBCONTRACTS	304	0	304	316	0	316

SHIELDED TRANSFER TANKS -ALT.3

SUMMARY REPORT

\$1 = \$1000

05/27/94

Arranged By: WBS / Participant / Trace Number

	Unescalated			Escalated		
	Material	Labor	Total	Material	Labor	Total
6.2.01.41 WBS 6.2.01.41						
63 MK-F DIRECT HIRE						
0.2.3 MK-F ADMIN. SUPPORT	0	109	109	0	113	113
0.2.10 DECOMMISSIONING - MK DH	51	81	132	53	84	137
0.2.11 DECOMMISSIONING - MK SUPPORT	157	194	351	162	201	363
TOTAL MK-F DIRECT HIRE	208	384	592	215	398	613
66 MK-F INDIRECTS ON FP						
0.2.4 MK-F INDIRECTS ON FP	36	0	36	38	0	38
TOTAL MK-F INDIRECTS ON FP	36	0	36	38	0	38
67 MK-F DIRECTS ON FP						
0.2.5 MK-F ADMIN. SUPPORT	0	58	58	0	60	60
TOTAL MK-F DIRECTS ON FP	0	58	58	0	60	60
68 MK-F PLANNING						
0.2.1 STATEMENT OF WORK/HANPOWER EST	2	19	21	2	20	22
TOTAL MK-F PLANNING	2	19	21	2	20	22
90 ER DIVISION						
X.1.1 PROJ. MGMT - PROJ. INTEGRATION	9	73	82	9	74	83
TOTAL ER DIVISION	9	73	82	9	74	83
92 WASTE MANAGEMENT						
0.2.12 WASTE MANAGEMENT	435	0	435	450	0	450
TOTAL WASTE MANAGEMENT	435	0	435	450	0	450
94 MMES PLAN/COORDINATION						
X.1.2 PROJ. MGMT - OVERSIGHT/SUPPORT	15	130	145	15	133	148
TOTAL MMES PLAN/COORDINATION	15	130	145	15	133	148
TOTAL WBS 6.2.01.41	1727	1202	2929	1783	1237	3020

SHIELDED TRANSFER TANKS -ALT.3

SUMMARY REPORT

\$1 = \$1000

05/27/94

Arranged By: WBS / Participant / Trace Number

	Unescalated			Escalated		
	Material \$	Labor \$	Total \$	Material \$	Labor \$	Total \$
SUB - TOTAL CONTINGENCY	1727 603	1202 402	2929 1005	1783 622	1237 414	3020 1036
GRAND TOTAL	2330	1604	3934	2405	1651	4056

SHIELDED TRANSFER TANKS -ALT.3

Creation Date 05/17/94
 Revision Number ... 2

Estimating Job Number ..

Project Estimator.. DK ATKIN
 WBS 6.2.01.41.01.01 PROJECT INTEGRATION
 Cost Code 9100 PROJECT INTEGRATION
 Participant 90 ER DIVISION
 Contracting Type .. G
 B/M Attribute ..
 Discipline X Engineering
 B/M Title PROJ. MGMT - PROJ. INTEGRATION
 Receiving Site X-10
 Standard Value File DRERO394.val

Estimate File: C:\PROJECTS\ORNLBD\STT\ALT3\ALT3.est 5-27-94 12:06a

Project Engineer RR NINTON
 Building/Area 7918
 Plant Site X
 Level of Estimate P
 Funding Type EXPENSE
 Source Site X-10
 Discipline Estimator ... G/C /DKA
 Quantity Take-Off By ... TEAM /DKA
 Trace Number X.1.1 0
 Expiration Date: 06/29/95

ITEM	DESCRIPTION	MATERIAL				LABOR				TOTAL COST M + L
		Aty.	Unit	Unit Pr.	Total	Hours	Cft.	Rate	Total	
1	ER PLANNING (1/2 FTE @ 2000 HRS/YR) INCLUDES PROJECT MANAGER AND PORTIONS OF A PROJECT ADMINISTRATOR AND PROJECT ENGINEER	1.00	LOT	6000.00	6000	1000	EV	50.00	50000	56000
TOTAL DIRECT OVERHEAD					6000				50000	56000
TOTAL				45.00%	2700		45.00%	22500		25200
					8700	1000		72500		81200

SHIELDED TRANSFER TANKS -ALT.3

WBS 6.2.01.61.01.02 PROJECT OVERSIGHT AND SUPPORT
 Cost Code 9100 PROJECT INTEGRATION
 Participant 94 MMES PLAN/COORDINATION
 Contracting Type .. G
 B/M Attribute
 Discipline X Engineering
 B/M Title PROJ. MGMT - OVERSIGHT/SUPPORT
 Receiving Site X-10
 Standard Value File ORER0394.val
 Estimate File: C:\PROJECTS\ORNLDD\STT\ALT3\ALT3.est 5-27-94 12:06a
 Building/Area 7918
 Plant Site X
 Level of Estimate P
 Funding Type EXPENSE
 Source Site X-10
 Discipline Estimator ... G/C /DKA
 Quantity Take-Off By ... TEAM /DKA
 Trace Number X.1.2 0
 Expiration Date: 06/29/95

ITEM	DESCRIPTION	MATERIAL				LABOR				TOTAL COST M + L
		Aty.	Unit	Unit Pr.	Total	Hours	Cft.	Rate	Total	
1	MMES PLANNING AND COORDINATION - THE PROJECT OVERSIGHT/SUPPORT PROVIDES FOR THE TRUE PERFORMANCE MEASUREMENTS AND FINANCIAL CONTROLS BASED ON AN INTEGRATED COST AND SCHEDULE CONTROL SYSTEM. THE PROJECT SUPPORT IS ALSO RESPONSIBLE FOR ENSURING COMPLIANCE WITH EPA AND TDEC REQUIREMENTS, AND COMPLIANCE WITH APPLICABLE REGULATIONS AND OTHER MMES POLICIES AND PROCEDURES	1.00	LOT	10000.00	10000	1600	XE	56.00	89600	99600
	TOTAL DIRECT OVERHEAD			45.00%	4500		45.00%	40320	44820	
	TOTAL				14500	1600		129920	144420	

SHIELDED TRANSFER TANKS -ALT.3

WBS 6.2.01.41.01.03 ES& H OVERSIGHT
 Cost Code 9100 PROJECT INTEGRATION
 Participant 35 ENVIRONMENTAL COMPLIANCE
 Contracting Type .. G
 B/M Attribute
 Discipline X Engineering
 B/M Title PROJ. MGMT - ES&H OVERSIGHT
 Receiving Site X-10
 Standard Value File ORER0394.val
 Estimate File: C:\PROJECTS\ORNL D&D\STT\ALT3\ALT3.est 5-27-94 12:06a

Building/Area 7918
 Plant Site X
 Level of Estimate P
 Funding Type EXPENSE
 Source Site X-10
 Discipline Estimator ... G/C /DKA
 Quantity Take-Off By ... TEAM /DKA
 Trace Number X.1.3 0
 Expiration Date: 06/29/95

ITEM	DESCRIPTION	MATERIAL				LABOR				TOTAL COST M + L
		Aty.	Unit	Unit Pr.	Total	Hours	Cft.	Rate	Total	
1	HEALTH PHYSICS AND INDUSTRIAL HYGIENE (1/2 FYE @ 2000 HRS/YR) FOR DOCUMENT PREPARATION AND REVIEW	1.00	LOT	5000.00	5000	1000	EH	50.00	50000	55000
TOTAL DIRECT OVERHEAD				45.00%	5000 2250			45.00% 2250	50000 22500	55000 24750
TOTAL					7250	1000			72500	79750

SHIELDED TRANSFER TANKS -ALT.3

WBS 6.2.01.41.10.15 CHARACTERIZ. FIELD ACTIVITIES
 Cost Code 1200 D & D FACILITY CHARACTERIZAT'N
 Participant 04 CHARACTERIZATION SUBCON'R
 Contracting Type .. S
 B/M Attribute
 Discipline X Engineering
 B/M Title CHARACTERIZ. - CHAR. FIELD ACT
 Receiving Site ... X-10
 Standard Value File ORER0394.val
 Estimate File: C:\PROJECTS\ORNLD&D\STT\ALT3\ALT3.est 5-27-94 12:06a

ITEM	DESCRIPTION	MATERIAL				LABOR				TOTAL COST M + L
		Qty.	Unit	Unit Pr.	Total	Hours	Cft.	Rate	Total	
CHARACTERIZATION FIELD ACTIVITIES										
1	SURFACE SAMPLING OF TANKS	1.00	LOT	1950.00	1950	32	FC	54.00	1728	3678
2	RADIOLOGICAL SURVEY OF LEAD	1.00	LOT	1000.00	1000	6	FC	54.00	216	1216
TOTAL DIRECT OVERHEAD				2950	257	8.70%		1944	169	4894
TOTAL				3207	36			2113		5320

SHIELDED TRANSFER TANKS -ALT.3

WBS 6.2.01.41.10.20 CHARACTERIZATION LETTER
 Cost Code 1200 D & D FACILITY CHARACTERIZAT'N
 Participant 04 CHARACTERIZATION SUBCON'R
 Contracting Type .. S
 B/M Attribute
 Discipline X Engineering
 B/M Title CHARACTERIZ. - CHAR. LETTER
 Receiving Site X-10
 Standard Value File ORER0394.vol
 Estimate File: C:\PROJECTS\ORNLD&D\STT\ALT3\ALT3.est 5-27-94 12:06a

Building/Area 7918
 Plant Site X
 Level of Estimate P
 Funding Type EXPENSE
 Source Site X-10
 Discipline Estimator ... G/C /DKA
 Quantity Take-Off By ... TEAM /DKA
 Trace Number X.1.5 0
 Expiration Date: 06/29/95

ITEM	DESCRIPTION	MATERIAL				LABOR				TOTAL COST M + L
		Qty.	Unit	Unit Pr.	Total	Hours	Cft.	Rate	Total	
1	CHARACTERIZATION LETTER	1.00	LOT	100.00	100	16	FC	54.00	864	964
TOTAL DIRECT				100					864	964
OVERHEAD				8.70%	P			8.70%	75	84
TOTAL					109	16			939	1048

SHIELDED TRANSFER TANKS -ALT.3

WBS	6.2.01.41.20.15	ENGINEERING STUDIES	Building/Area	7918
Cost Code	5100	REMEDIAL DESIGN	Plant Site	X
Participant	11	HMES TITLE I & II ENGR.	Level of Estimate	P
Contracting Type ..	G		Funding Type	EXPENSE
B/M Attribute			Source Site	X-10
Discipline	X Engineering		Discipline Estimator ...	G/C /DKA
B/M Title	DEF. OF RESTOR. -PROC/WORKPLAN		Quantity Take-Off By ...	TEAM /DKA
Receiving Site	X-10		Trace Number	X.1.6 0
Standard Value File	DRERO394.val		Expiration Date:	06/29/95
Estimate File: C:\PROJECTS\ORNLDBD\STT\ALT3\ALT3.est 5-27-94 12:06a				

ITEM	DESCRIPTION	MATERIAL				LABOR				TOTAL COST M + L
		Qty.	Unit	Unit Pr.	Total	Hours	Cft.	Rate	Total	
1	PERFORMANCE SPECIFICATION	1.00	LOT	4000.00	4000	960	XE	56.00	53760	57760
	TOTAL DIRECT				4000				53760	57760
	OVERHEAD			45.00%	1800			45.00%	24192	25992
	TOTAL				5800	960			77952	83752

SHIELDED TRANSFER TANKS -ALT.3

WBS 6.2.01.41.22.10 STATEMENT OF WORK/MANPOWER EST
 Cost Code 5100 REMEDIAL DESIGN
 Participant 68 MK-F PLANNING
 Contracting Type .. G
 S/M Attribute
 Discipline O Other
 S/M Title STATEMENT OF WORK/MANPOWER EST
 Receiving Site ... X-10
 Standard Value File ORER0394.val
 Estimate File: C:\PROJECTS\ORNLD&D\STT\ALT3\ALT3.est 5-27-94 12:06a

Building/Area 7918 /3517
 Plant Site X
 Level of Estimate P
 Funding Type EXPENSE
 Source Site X-10
 Discipline Estimator ... G/C /DKA
 Quantity Take-Off By ... TEAM /DKA
 Trace Number 0.2.1 0
 Expiration Date: 06/29/95

ITEM	DESCRIPTION	MATERIAL				LABOR				TOTAL COST M + L
		Qty.	Unit	Unit Pr.	Total	Hours	Cft.	Rate	Total	
1	ACTION PLAN	1.00	LOT	1500.00	1500	240	MK	61.43	14743	16263
TOTAL DIRECT					1500				14743	16263
TOTAL INDIRECT				20.00%	300			20.00%	2969	3249
OVERHEAD				8.70%	157			8.70%	1539	1696
TOTAL					1957	240			19231	21168

SHIELDED TRANSFER TANKS -ALT.3

WBS	6.2.01.41.22.15 REMED. ACTION/DECOMMISSIONING	Building/Area	7918 /3517
Cost Code	6200 D & D IMPLEMENTATION	Plant Site	X
Participant	21 MMES PROCUREMENT	Level of Estimate	P
Contracting Type ..	G	Funding Type	SPECIAL (NO OH)
B/M Attribute		Source Site	X-10
Discipline	0 Other	Discipline Estimator ...	G/C /DKA
B/M Title	DECOMMISSIONING	Quantity Take-Off By ...	DKA
Receiving Site	X-10	Trace Number	0.2.2 0
Standard Value File	ORERO394.val	Expiration Date:	06/29/95
Estimate File: C:\PROJECTS\ORNLD&D\STT\ALT3\ALT3.est 5-27-94 12:06a			

ITEM	DESCRIPTION	MATERIAL				LABOR				TOTAL COST M + L
		Qty.	Unit	Unit Pr.	Total	Hours	Cft.	Rate	Total	
1	PROCURE HICS FOR STORING THE REMOVED RESIN (QUOTE FROM SEG)	5.00	EA	30000.00	150000	0	0.00	0	150000	
2	PROCUREMENT SERVICES	1.00	LOT	9000.00	9000	0	0.00	0	9000	
3	DUNAGE & TRANSPORTATION @ 3%	1.00	LOT	4770.00	4770	0	0.00	0	4770	
	TOTAL DIRECT TAX			163770 8.25% 13511				0	163770 13511	
	SUBTOTAL OVERHEAD			177281				0	177281 0	
	TOTAL			177281	0			0	177281	

SHIELDED TRANSFER TANKS -ALT.3

WBS 6.2.01.41.22.15 REMED. ACTION/DECOMMISSIONING
 Cost Code 6200 D & D IMPLEMENTATION
 Participant 49 MMES PROJECT MANAGEMENT
 Contracting Type .. G
 S/M Attribute
 Discipline X Engineering
 S/M Title MMES PROJECT SERVICES
 Receiving Site X-10
 Standard Value File ORER0394.vsl
 Estimate File: C:\PROJECTS\ORNLD&D\STT\ALT3\ALT3.est 5-27-94 12:06a

Building/Area 7918
 Plant Site X
 Level of Estimate P
 Funding Type EXPENSE
 Source Site X-10
 Discipline Estimator ... G/C /DKA
 Quantity Take-Off By ... TEAM /DKA
 Trace Number X.1.7 0
 Expiration Date: 06/29/95

ITEM	DESCRIPTION	MATERIAL				LABOR				TOTAL COST M + L
		Qty.	Unit	Unit Pr.	Total	Hours	Cft.	Rate	Total	
1	MMES PROJECT SERVICES	1.00	LOT	4000.00	4000	480	XE	56.00	26880	30880
2	VERIFY INTEGRITY OF BLDG. 3517 OVERHEAD CRANE FOR HANDLING THE SHIELDED CASKS, WHICH WEIGH APPROX. 43,000 LBS. LOADED. COSTS ARE INCLUDED FOR BRINGING THE CRANE ON LINE.	1.00	LOT	1500.00	1500	160	XE	56.00	8960	10460
3	SAFETY ASSESSMENT AND CRANE RECERTIFICATION	1.00	LOT	25000.00	25000	0		0.00	0	25000
TOTAL	TOTAL DIRECT OVERHEAD			30500				35840		66340
				45.00%	13725			45.00%	16128	29853
	TOTAL			44225	640			51968		96193

SHIELDED TRANSFER TANKS -ALT.3

WBS 6.2.01.41.22.15 REMED. ACTION/DECOMMISSIONING
 Cost Code 6200 D & D IMPLEMENTATION
 Participant 63 MK-F DIRECT HIRE
 Contracting Type ... G
 B/M Attribute
 Discipline O Other
 B/M Title MK-F ADMIN. SUPPORT
 Receiving Site X-10
 Standard Value File ORER0394.val
 Estimate File: C:\PROJECTS\ORNLDD\STT\ALT3\ALT3.est 5-27-94 12:06a

Building/Area 7918 /3517
 Plant Site X
 Level of Estimate P
 Funding Type EXPENSE
 Source Site X-10
 Discipline Estimator ... G/C /DKA
 Quantity Take-Off By ... DKA
 Trace Number 0.2.3 0
 Expiration Date: 06/29/95

ITEM	DESCRIPTION	MATERIAL				LABOR				TOTAL COST	
		Qty.	Unit	Unit Pr.	Total	Hours	Cft.	Rate	Total	M + L	
1	MK-F ADMINISTRATIVE SUPPORT	1.00	LOT	0.00	0	1600	AS	52.30	83680	83680	
	TOTAL DIRECT				0				83680	83680	
	TAX			8.25%	0					0	
	SUBTOTAL				0				83680	83680	
	TOTAL INDIRECT			20.00%	0			20.00%	16736	16736	
	OVERHEAD			8.70%	0			8.70%	8736	8736	
	TOTAL				0	1600			109152	109152	

SHIELDED TRANSFER TANKS -ALT.3

WBS 6.2.01.41.22.15 REMED. ACTION/DECOMMISSIONING
 Cost Code 5100 REMEDIAL DESIGN
 Participant 66 MK-F INDIRECTS ON FP
 Contracting Type .. G
 B/M Attribute CONTRACT MANAGEMENT
 Discipline O Other
 B/M Title MK-F INDIRECTS ON FP
 Receiving Site X-10
 Standard Value File ORERO394.val
 Estimate File: C:\PROJECTS\ORNL02D\STT\ALT3\ALT3.est 5-27-94 12:06a

Building/Area 7918 /3517
 Plant Site X
 Level of Estimate P
 Funding Type EXPENSE
 Source Site X-10
 Discipline Estimator ... G/C /DKA
 Quantity Take-Off By ... DKA
 Trace Number 0.2.4 0
 Expiration Date: 06/29/95

ITEM	DESCRIPTION	MATERIAL				LABOR				TOTAL COST M + L
		Qty.	Unit	Unit Pr.	Total	Hours	Cft.	Rate	Total	
1	MK-F CONSTRUCTION MANAGEMENT	1.00	LOT	33440.00	33440	0		0.00	0	33440
	TOTAL INDIRECT				33440				0	33440
	OVERHEAD			8.70%	2909			8.70%	0	2909
	TOTAL				36349	0			0	36349

SHIELDED TRANSFER TANKS -ALT.3

WBS 6.2.01.41.22.15 REMED. ACTION/DECOMMISSIONING
 Cost Code 6200 D & D IMPLEMENTATION
 Participant 67 MK-F DIRECTS ON FP
 Contracting Type .. G
 B/M Attribute ADMINISTRATIVE SUPPORT
 Discipline O Other
 B/M Title MK-F ADMIN. SUPPORT
 Receiving Site X-10
 Standard Value File ORERO394.val
 Estimate File: C:\PROJECTS\ORHLD&D\STT\ALT3\ALT3.est 5-27-94 12:06a

Building/Area 7918 /3517
 Plant Site X
 Level of Estimate P
 Funding Type EXPENSE
 Source Site X-10
 Discipline Estimator ... G/C /DKA
 Quantity Take-Off By ... DKA
 Trace Number 0.2.5 0
 Expiration Date: 06/29/95

ITEM	DESCRIPTION	MATERIAL				LABOR				TOTAL COST M + L
		Qty.	Unit	Unit Pr.	Total	Hours	Cft.	Rate	Total	
1	MK-F ADMINISTRATIVE SUPPORT	1.00	LOT	0.00	0	920	AS	52.30	48116	48116
	TOTAL DIRECT				0				48116	48116
	TOTAL INDIRECT			11.00%	0			11.00%	5293	5293
	OVERHEAD			8.70%	0			8.70%	4647	4647
	TOTAL				0	920			58056	58056

SHIELDED TRANSFER TANKS -ALT.3

WBS 6.2.01.41.22.15.04 REMED. ACTION/DECOMMISSIONING
 Cost Code 6200 D & D IMPLEMENTATION
 Participant 35 ENVIRONMENTAL COMPLIANCE
 Contracting Type .. G
 B/M Attribute ..
 Discipline O Other
 B/M Title DECOMMISSIONING
 Receiving Site X-10
 Standard Value File ORER0394.val
 Estimate File: C:\PROJECTS\ORNL\&D\STT\ALT3\ALT3.est 5-27-94 12:06a

Building/Area 7918 /3517
 Plant Site X
 Level of Estimate P
 Funding Type EXPENSE
 Source Site X-10
 Discipline Estimator ... G/C /DKA
 Quantity Take-Off By ... TEAM /DKA
 Trace Number 0.2.6 0
 Expiration Date: 06/29/95

ITEM	DESCRIPTION	MATERIAL				LABOR				TOTAL COST M + L
		Qty.	Unit	Unit Pr.	Total	Hours	Cft.	Rate	Total	
1	HEALTH PHYSICS AND INDUSTRIAL HYGIENE (1/2 FTE) FOR FIELD SUPPORT	1.00	LOT	5000.00	5000	1000	EH	50.00	50000	55000
	TOTAL DIRECT OVERHEAD			45.00%	5000 2250		45.00%	50000 22500		55000 24750
	TOTAL				7250 1000			72500		79750

SHIELDED TRANSFER TANKS -ALT.3

WBS 6.2.01.41.22.15.04 REMED. ACTION/DECOMMISSIONING
 Cost Code 6200 D & D IMPLEMENTATION
 Participant 41 MMES FIELD MAINTENANCE
 Contracting Type .. G
 B/M Attribute
 Discipline 0 Other
 B/M Title DECOMMISSIONING
 Receiving Site X-10
 Standard Value File OR0394.val
 Estimate File: C:\PROJECTS\ORNLDD\STT\ALT3\ALT3.est 5-27-94 12:06a
 Building/Area 7918 /3517
 Plant Site X
 Level of Estimate P
 Funding Type EXPENSE
 Source Site X-10
 Discipline Estimator ... G/C /DKA
 Quantity Take-Off By ... DKA
 Trace Number 0.2.7 0
 Expiration Date: 06/29/95

ITEM	DESCRIPTION	MATERIAL				LABOR				TOTAL COST M + L
		Qty.	Unit	Unit Pr.	Total	Hours	Cft.	Rate	Total	
1	ESTABLISH CONTAMINATION CONTROL AREAS, WASTE PKG. ZONES, AND LOADING AREA	1.00	LOT	20000.00	20000	640	XE	38.32	24525	44525
1A	PREPARE NEGATIVE AIR PRESSURE ENCLOSURE AT ENTRANCE	1.00	LOT	200000.00	200000	0		0.00	0	200000
2	HP TECHNICIAN	1.00	LOT	0.00	0	160	XX	65.77	10523	10523
3	IH TECHNICIAN	1.00	LOT	0.00	0	80	XX	65.77	5262	5262
4	SAMPLING COSTS FOR APPROX. 10 SAMPLES (RCRA)	10.00	EA	280.00	2800	0		0.00	0	2800
5	SAMPLING COSTS FOR APPROX. 40 SAMPLES (RAD - GROSS ALPHA & BETA)	40.00	EA	132.00	5280	0		0.00	0	5280
6	SAMPLING COSTS FOR APPROX. 40 SAMPLES (RAD - GAMMA)	40.00	EA	65.00	2600	0		0.00	0	2600
7	WASTE CHARACTERIZATION OF CONTENTS OF TANKS	5.00	EA	2300.00	11500	0		0.00	0	11500
8	AFTER CASKS ARE MOVED TO 3517 & LIDS ARE REMOVED, DEWATER WITH AVAIL. SYSTEM IN 3517, THEN PUMP RESINS INTO NIC'S FOR STORAGE.	5.00	EA	100.00	500	200	XE	38.32	7664	8164
9	INSTALL DOUBLE-CONTAINED A-128 304L S.S. PIPE & FITTINGS TO PUMP CONTENTS OUT OF TANKS INTO NIC'S (ASSUME APPROX. 20 LF PIPE)	20.00	LF	150.00	3000	48	XE	38.32	1839	4839
10	INSTALL PUMP & ACCESSORIES	1.00	EA	7500.00	7500	120	XE	38.32	4598	12098
11	DECONTAMINATE INTERIOR AND EXTERIOR OF CASKS USING ICE BLASTER, ETC. TEST, REPEAT PROCEDURE AS N	5.00	EA	5000.00	25000	1200	XE	38.32	45984	70984

SHIELDED TRANSFER TANKS -ALT.3

ITEM	DESCRIPTION	MATERIAL			LABOR				TOTAL COST M + L	
		Qty.	Unit	Unit Pr.	Total	Hours	Cft.	Rate		
NECESSARY TO PREPARE TANKS FOR RESALE OR MATERIAL SALVAGE (DECONTAM. PIPE, PUMP, AND FITTINGS, ALSO)										
13	TESTING, TAG & INSPECTION	1.00	LOT	2782.00	2782	61	22	41.01	2502	5284
14	MOBILIZATION & DEMOBILIZATION	1.00	LOT	4173.00	4173	122	22	41.01	5003	9176
15	SUPPORTING ITEMS, BREAKAGE, & WASTE	1.00	LOT	13909.00	13909	245	22	41.01	10048	23957
16	LOST WORK TIME DUE TO ENTERING SPECIAL SECURITY AREAS.	0.00		0.00	0	345	22	41.01	14149	14149
17	JOB CONDITIONS/PERS.TIME	0.00		0.00	0	966	22	41.01	39617	39617
18	CLEANUP	1.00	LOT	2990.00	2990	161	22	41.01	6603	9593
TOTAL DIRECT TAX				302034 8.25% 24918				178317	480351 24918	
SUBTOTAL OVERHEAD				326952 45.00% 147128				178317 45.00% 80263	505269 227371	
TOTAL				474080	4348			258560	732640	

SHIELDED TRANSFER TANKS -ALT.3

VBS 6.2.01.41.22.15.04 REMED. ACTION/DECOMMISSIONING
 Cost Code 6200 D & D IMPLEMENTATION
 Participant 53 FP UNIT SUBCONTRACTS
 Contracting Type .. G
 B/M Attribute
 Discipline O Other
 B/M Title DECOMMISSIONING - FPSC
 Receiving Site X-10
 Standard Value File ORERO394.val
 Estimate File: C:\PROJECTS\ORNLDD\STT\ALT3\ALT3.est 5-27-94 12:06a
 Building/Area 7918 /3517
 Plant Site X
 Level of Estimate P
 Funding Type EXPENSE
 Source Site X-10
 Discipline Estimator ... G/C /DKA
 Quantity Take-Off By ... DKA
 Trace Number 0.2.8 0
 Expiration Date: 06/29/95

ITEM	DESCRIPTION	MATERIAL				LABOR				TOTAL COST M + L
		Qty.	Unit	Unit Pr.	Total	Hours	Cft.	Rate	Total	
1	FP SUBCONTRACTOR TO REMOVE THE LEAD SHIELDING FROM 3 OF THE 5 TANKS AND SMELT THE REMAINING METAL IN THEIR INDUCTION FURNACE. THE TANK SCRAP COULD THEN BE SOLD IF SUITABLE FOR REUSE OR TRANSFERRED TO THE DOE SCRAP METAL PROGRAM. THE LEAD IS TO BE RETURNED TO THE ORNL LEAD RECOVERY PROGRAM. 3 TANKS X 40,000# = 120,000#	60.00	TONS	4800.00	288000	0		0.00	0	288000
TOTAL DIRECT				288000				0	288000	
OVERHEAD				8.70%	25056			8.70%	0	25056
TOTAL				313056		0		0	313056	

SHIELDED TRANSFER TANKS -ALT.3

WBS 6.2.01.41.22.15.04 REMED. ACTION/DECOMMISSIONING
 Cost Code 6200 D & D IMPLEMENTATION
 Participant 53 FP UNIT SUBCONTRACTS
 Contracting Type .. G
 S/M Attribute
 Discipline 0 Other
 B/M Title DECOMMISSIONING - FPSC
 Receiving Site X-10
 Standard Value File DRER0394.val
 Estimate File: C:\PROJECTS\ORNL R&D\STT\ALT3\ALT3.est 5-27-94 12:06a

Building/Area 7918 /3517
 Plant Site X
 Level of Estimate P
 Funding Type EXPENSE
 Source Site X-10
 Discipline Estimator ... G/C /DKA
 Quantity Take-Off By ... DKA
 Trace Number 0.2.9 0
 Expiration Date: 06/29/95

ITEM	DESCRIPTION	MATERIAL				LABOR				TOTAL COST M + L
		Qty.	Unit	Unit Pr.	Total	Hours	Cft.	Rate	Total	
SALVAGE VALUE OF 2 TANKS										
1	CARBON STEEL	15.00	TONS	-60.00	-900	0		0.00	0	-900
2	STAINLESS STEEL	11.00	TONS	-200.00	-2200	0		0.00	0	-2200
3	LEAD	21.00	TONS	-225.00	-4725	0		0.00	0	-4725
TOTAL DIRECT					-7825				0	-7825
OVERHEAD				8.70%	-681			8.70%	0	-681
TOTAL					-8506	0			0	-8506

SHIELDED TRANSFER TANKS -ALT.3

WBS 6.2.01.41.22.15.04 REMED. ACTION/DECOMMISSIONING
 Cost Code 6200 D & D IMPLEMENTATION
 Participant 63 MK-F DIRECT HIRE
 Contracting Type .. S
 B/M Attribute
 Discipline O OTHER
 B/M Title DECOMMISSIONING - MK DH
 Receiving Site X-10
 Standard Value File ORER0394.val
 Estimate File: C:\PROJECTS\ORHLD&D\STT\ALT3\ALT3.est 5-27-94 12:06a

Building/Area 7918 /3517
 Plant Site X
 Level of Estimate P
 Funding Type EXPENSE
 Source Site X-10
 Discipline Estimator ... G/C /DKA
 Quantity Take-Off By ... DKA
 Trace Number 0.2.10 0
 Expiration Date: 06/29/95

ITEM	DESCRIPTION	MATERIAL				LABOR				TOTAL COST M + L
		Qty.	Unit	Unit Pr.	Total	Hours	Cft.	Rate	Total	
1	ADDITIONAL REINF. AND PREPARATION OF BLDG. 3517 FOR TANK DRAINING, RECYCLING, ETC.	1.00	LOT	10000.00	10000	400	X2	25.00	10000	20000
2	REMOVE 5 CASKS FROM UNDER A SHED ROOF OUTSIDE BLDG. 7918. TRANSPORT TANKS TO 3517 IN DOE APPROVED CERTIFIED MIC (PROC. BY MMES)	5.00	EA	0.00	0	80	OP	28.55	2284	2284
3	CONTINUED	5.00	EA	0.00	0	80	L	18.82	1506	1506
4	CONTINUED	5.00	EA	0.00	0	80	TD	20.44	1635	1635
5	AFTER DEWATERING, SAMPLING, PUMPING RESINS, AND DECON. IS DONE, TRANSPORT TANKS TO SEG (ASSUMED 3 TANKS TO BE SMELTED AND 2 TO BE SALVAGED)	5.00	EA	0.00	0	80	OP	28.55	2284	2284
6	CONTINUED	5.00	EA	0.00	0	80	L	18.82	1506	1506
7	CONTINUED	5.00	EA	0.00	0	80	TD	20.44	1635	1635
8	PPE - LEVEL C	880.00	HRS	25.04	22035	220	L	18.82	4140	26175
9	TESTING, TAG & INSPECTION	1.00	LOT	320.00	320	55	ZZ	22.72	1250	1570
10	MOBILIZATION & DEMOBILIZATION	1.00	LOT	961.00	961	83	ZZ	22.72	1886	2847
11	SUPPORTING ITEMS, BREAKAGE, & WASTE	1.00	LOT	1602.00	1602	165	ZZ	22.72	3749	5351
12	HEALTH PHYSICS	0.00		0.00	0	140	ZZ	22.72	3181	3181
13	INDUSTRIAL HYGIENE	0.00		0.00	0	105	ZZ	22.72	2385	2385
14	LOST WORK TIME DUE TO ENTERING SPECIAL SECURITY AREAS.	0.00		0.00	0	198	ZZ	22.72	4498	4498
15	JOB CONDITIONS/PERS. TIME	0.00		0.00	0	665	ZZ	22.72	15108	15108

SHIELDED TRANSFER TANKS -ALT.3

ITEM	DESCRIPTION	MATERIAL				LABOR				TOTAL COST M + L
		Qty.	Unit	Unit Pr.	Total	Hours	Cft.	Rate	Total	
16	CLEANUP	1.00	LOT	349.00	349	111	22	22.72	2522	2871
17	TRAIN, SHOP, SW TOOLS	1.00	LOT	908.00	908	122	22	22.72	2772	3680
TOTAL DIRECT				36175					62341	98516
TAX				8.25%	2984					2984
SUBTOTAL				39159					62341	101500
TOTAL INDIRECT				20.00%	7832			20.00%	12668	20300
OVERHEAD				8.70%	4088			8.70%	6508	10596
TOTAL				51079	2744				81317	132396

SHIELDED TRANSFER TANKS -ALT.3

WBS 6.2.01.41.22.15.04 REMED. ACTION/DECOMMISSIONING
 Cost Code 6200 D & D IMPLEMENTATION
 Participant 63 MK-F DIRECT HIRE
 Contracting Type .. S
 B/M Attribute
 Discipline O Other
 B/M Title DECOMMISSIONING - MK SUPPORT
 Receiving Site X-10
 Standard Value File ORERO394.val
 Estimate File: C:\PROJECTS\ORNLD&D\STT\ALT3\ALT3.est 5-27-94 12:06a

Building/Area 7918 /3517
 Plant Site X
 Level of Estimate P
 Funding Type EXPENSE
 Source Site X-10
 Discipline Estimator ... G/C /DKA
 Quantity Take-Off By ... DKA
 Trace Number 0.2.11 0
 Expiration Date: 06/29/95

ITEM	DESCRIPTION	MATERIAL				LABOR				TOTAL COST M + L
		Qty.	Unit	Unit Pr.	Total	Hours	Cft.	Rate	Total	
1	TEMPORARY FACILITIES	1.00	LOT	2500.00	2500	160	X2	25.00	4000	6500
2	TEMPORARY SERVICES	1.00	LOT	5000.00	5000	320	X3	28.00	8960	13960
3	MATERIAL HANDLING	1.00	LOT	0.00	0	240	TD	20.44	4906	4906
4	CONTINUED	1.00	LOT	0.00	0	240	L	18.82	4517	4517
	GOV'T EQUIP.									
5	TRUCK MTD. HYDRAULIC CRANE	10.00	MOS	5150.00	51500	0		0.00	0	51500
6	FLATBED TRUCK	200.00	HRS	15.00	3000	0		0.00	0	3000
7	PICKUP TRUCK	1600.00	HRS	1.75	2800	0		0.00	0	2800
8		0.00		0.00	0	0		0.00	0	0
	TRAINING / MEDICALS / PLANNING									
9	HAZARDOUS WASTE TRAINING	30.00	EA	750.00	22500	1200	X	54.00	64800	87300
10	RAD WORKER TRAINING	30.00	EA	250.00	7500	720	X	54.00	38880	46380
11	PHYSICAL EXAM	30.00	EA	350.00	10500	120	X	54.00	6480	16980
12	WHOLE BODY COUNT	30.00	EA	0.00	0	90	X	54.00	4860	4860
13	URINALYSIS	30.00	EA	0.00	0	30	X	54.00	1620	1620
14	RESPIRATOR FIT	30.00	EA	105.00	3150	30	X	54.00	1620	4770
15	EXTERNAL DOSIMETRY	30.00	EA	80.00	2400	0		0.00	0	2400
16	LOST WORK TIME DUE TO ENTERING SPECIAL SECURITY AREAS.	0.00		0.00	0	189	22	44.65	8439	8439
<hr/>					110850				149082	259932
<hr/>				8.25%	9145					9145

SHIELDED TRANSFER TANKS -ALT.3

ITEM	DESCRIPTION	MATERIAL				LABOR				TOTAL COST M + L
		Qty.	Unit	Unit Pr.	Total	Hours	Cft.	Rate	Total	
SUBTOTAL					119995				149082	269077
TOTAL INDIRECT					20.00%	23999			20.00%	29816
OVERHEAD					8.70%	12527			8.70%	15564
TOTAL					156521	3339			194462	350983

SHIELDED TRANSFER TANKS -ALT.3

WBS 6.2.01.41.22.15.06 REMED. ACTION/DECOMMISSIONING
 Cost Code 9300 TREATMENT, STORAGE & DISPOSAL
 Participant 92 WASTE MANAGEMENT
 Contracting Type .. G
 B/M Attribute
 Discipline O Other
 B/M Title WASTE MANAGEMENT
 Receiving Site X-10
 Standard Value File ORER0394.val
 Estimate File: C:\PROJECTS\ORNLD&D\STT\ALT3\ALT3.est 5-27-94 12:06a

Building/Area 7918 /3517
 Plant Site X
 Level of Estimate P
 Funding Type EXPENSE
 Source Site X-10
 Discipline Estimator ... G/C /DKA
 Quantity Take-Off By ... DKA
 Trace Number 0.2.12 0
 Expiration Date: 06/29/95

ITEM	DESCRIPTION	MATERIAL				LABOR				TOTAL COST M + L
		Qty.	Unit	Unit Pr.	Total	Hours	Cft.	Rate	Total	
1	WASTE HANDLING AND STORAGE (DATA PROVIDED BY TOM SCANLAN FROM PREVIOUS PROJECT. ALLOWANCE INCLUDES ALL PARTICIPANTS INVOLVED IN CONSTRUCTING SILOS AND PLACING CONTAINERS.)	1.00	LOT	300000.00	300000	0		0.00	0	300000
	TOTAL DIRECT OVERHEAD				300000			0	300000	
				45.00%	135000			45.00%	0	135000
	TOTAL				435000	0		0	435000	

SHIELDED TRANSFER TANKS -ALT.3

Disciplines
 X: Engineering
 O: Other

Total Labor Hours: 19443

COST SUMMARY

	MATERIAL	LABOR	TOTAL COST
Line Item Cost	1258054	868287	2126341
Total Tax	50558	0	50558
SUBTOTAL	1308612	868287	2176899
Total Indirect	65571	67262	132833
SUBTOTAL	1374183	935549	2309732
Overhead	353675	265621	619296
SUBTOTAL	1727858	1201170	2929028
Contingency	603099	401652	1004751
SUBTOTAL	2330957	1602822	3933779
TOTAL			3933779

ALTERNATIVE 4 - REMOVE CONTENTS/RECYCLE METAL
ORDER OF MAGNITUDE COST ASSESSMENT

FISCAL YEAR SUMMARY

\$1 X \$1000

Date: 27-May-94

PROJECT: SHIELDED TRANSFER TANKS -ALT.4

FISCAL YEAR

..... Participant	1995	Total
04 CHARACTERIZATION SUBCON'R	6	6
11 MMES TITLE I & II ENGR.	42	42
21 MMES PROCUREMENT	180	180
35 ENVIRONMENTAL COMPLIANCE	124	124
41 MMES FIELD MAINTENANCE	430	430
49 MMES PROJECT MANAGEMENT	76	76
51 FIXED PRICE CONSTRUCTION	381	381
53 FP UNIT SUBCONTRACTS	541	541
66 MM-F INDIRECTS ON FP	82	82
67 MM-F DIRECTS ON FP	116	116
68 MM-F PLANNING	22	22
90 ER DIVISION	42	42
92 WASTE MANAGEMENT	750	750
94 MMES PLAN/COORDINATION	66	46
SUB - TOTAL	2838	2838
CONTINGENCY	979	979
GRAND TOTAL	3817	3817

SHIELDED TRANSFER TANKS -ALT.4

SUMMARY REPORT

\$1 = \$1000

05/27/94

Arranged By: WBS / Participant / Trace Number

	Unescalated			Escalated		
	Material	Labor	Total	Material	Labor	Total
	\$	\$	\$	\$	\$	\$
6.2.01.41 WBS 6.2.01.41						
04 CHARACTERIZATION SUBCON'R						
X.1.4 CHARACTERIZ. - CHAR. FIELD ACT	3	2	5	3	2	5
X.1.5 CHARACTERIZ. - CHAR. LETTER	0	1	1	0	1	1
TOTAL CHARACTERIZATION SUBCON'R	3	3	6	3	3	6
11 MMES TITLE I & II ENGR.						
X.1.6 DEF. OF RESTOR. -PROC/WORKPLAN	3	39	42	3	40	43
TOTAL MMES TITLE I & II ENGR.	3	39	42	3	40	43
21 MMES PROCUREMENT						
0.2.2 DECOMMISSIONING	177	0	177	180	0	180
TOTAL MMES PROCUREMENT	177	0	177	180	0	180
35 ENVIRONMENTAL COMPLIANCE						
0.2.5 DECOMMISSIONING	7	73	80	7	75	82
X.1.3 PROJ. MGMT - ES&H OVERSIGHT	4	36	40	4	37	41
TOTAL ENVIRONMENTAL COMPLIANCE	11	109	120	11	112	123
41 MMES FIELD MAINTENANCE						
0.2.6 DECOMMISSIONING	366	52	418	377	53	430
TOTAL MMES FIELD MAINTENANCE	366	52	418	377	53	430
49 MMES PROJECT MANAGEMENT						
X.1.7 MMES PROJECT SERVICES	41	32	73	43	33	76
TOTAL MMES PROJECT MANAGEMENT	41	32	73	43	33	76
51 FIXED PRICE CONSTRUCTION						
0.2.7 DECOMMISSIONING - FP SERVICES	48	37	85	50	38	88
0.2.8 DECOMMISSIONING - FP SERVICES	68	215	283	71	223	294
TOTAL FIXED PRICE CONSTRUCTION	116	252	368	121	261	382

SHIELDED TRANSFER TANKS -ALT.4

SUMMARY REPORT

\$1 = \$1000

05/27/94

Arranged By: WBS / Participant / Trace Number

	Unescalated			Escalated		
	Material	Labor	Total	Material	Labor	Total
	\$	\$	\$	\$	\$	\$
6.2.01.41 WBS 6.2.01.41						
53 FP UNIT SUBCONTRACTS	522	0	522	541	0	541
0.2.9 DECOMMISSIONING						
TOTAL FP UNIT SUBCONTRACTS	522	0	522	541	0	541
66 MK-F INDIRECTS ON FP						
0.2.3 MK-F INDIRECTS ON FP	79	0	79	82	0	82
TOTAL MK-F INDIRECTS ON FP	79	0	79	82	0	82
67 MK-F DIRECTS ON FP						
0.2.4 MK-F ADMIN. SUPPORT FOR FP	0	112	112	0	116	116
TOTAL MK-F DIRECTS ON FP	0	112	112	0	116	116
68 MK-F PLANNING						
0.2.1 STATEMENT OF WORK/MANPOWER EST	2	19	21	2	20	22
TOTAL MK-F PLANNING	2	19	21	2	20	22
90 ER DIVISION						
X.1.1 PROJ. MGMT - PROJ. INTEGRATION	4	36	40	4	37	41
TOTAL ER DIVISION	4	36	40	4	37	41
92 WASTE MANAGEMENT						
0.2.10 WASTE MANAGEMENT	725	0	725	750	0	750
TOTAL WASTE MANAGEMENT	725	0	725	750	0	750
94 MMES PLAN/COORDINATION						
X.1.2 PROJ. MGMT - OVERSIGHT/SUPPORT	4	41	45	4	42	46
TOTAL MMES PLAN/COORDINATION	4	41	45	4	42	46
TOTAL WBS 6.2.01.41	2053	695	2748	2121	717	2838

SHIELDED TRANSFER TANKS -ALT.4

SUMMARY REPORT

\$1 = \$1000

05/27/94

Arranged By: WBS / Participant / Trace Number

	----- Unescalated -----			----- Escalated -----		
	Material	Labor	Total	Material	Labor	Total
	\$	\$	\$	\$	\$	\$
SUB - TOTAL	2053	695	2748	2121	717	2838
CONTINGENCY	714	235	949	737	242	979
GRAND TOTAL	2767	930	3697	2858	959	3817

SHIELDED TRANSFER TANKS -ALT.4

Creation Date 05/17/94
 Revision Number ... 2

Estimating Job Number ..

Project Estimator.. DK ATKIN
 WBS 6.2.01.41.01.01 PROJECT INTEGRATION
 Cost Code 9100 PROJECT INTEGRATION
 Participant 90 ER DIVISION
 Contracting Type .. G
 B/M Attribute
 Discipline X Engineering
 B/M Title PROJ. MGMT - PROJ. INTEGRATION
 Receiving Site X-10
 Standard Value File ORER0394.val
 Estimate File: C:\PROJECTS\ORNL\RD\STT\ALT4\ALT4.est 5-27-94 12:10a

Project Engineer RR HINTON
 Building/Area 7918
 Plant Site X
 Level of Estimate P
 Funding Type EXPENSE
 Source Site X-10
 Discipline Estimator ... G/C /DKA
 Quantity Take-Off By ... TEAM /DKA
 Trace Number X.1.1 0
 Expiration Date: 06/29/95

ITEM	DESCRIPTION	MATERIAL				LABOR				TOTAL COST M + L
		Qty.	Unit	Unit Pr.	Total	Hours	Cft.	Rate	Total	
1	ER PLANNING (1/4 FTE @ 2000 HRS/YR) INCLUDES PROJECT MANAGER AND PORTIONS OF A PROJECT ANALYST AND PROJECT ENGINEER	1.00	LOT	3000.00	3000	500	EV	50.00	25000	28000
<hr/>										
TOTAL DIRECT OVERHEAD				45.00%	3000	1350	45.00%	11250	25000	28000
TOTAL					4350	500			36250	40600
<hr/>										

SHIELDED TRANSFER TANKS -ALT.4

WBS 6.2.01.41.01.02 PROJECT OVERSIGHT AND SUPPORT
 Cost Code 9100 PROJECT INTEGRATION
 Participant 94 MMES PLAN/COORDINATION
 Contracting Type .. G
 B/M Attribute
 Discipline X Engineering
 B/M Title PROJ. MGMT - OVERSIGHT/SUPPORT
 Receiving Site X-10
 Standard Value File ORERO394.val
 Estimate File: C:\PROJECTS\ORHLD&D\STT\ALT4\ALT4.est 5-27-94 12:10a
 Building/Area 7918
 Plant Site X
 Level of Estimate P
 Funding Type EXPENSE
 Source Site X-10
 Discipline Estimator ... G/C /DKA
 Quantity Take-Off By ... TEAM /DKA
 Trace Number X.1.2 0
 Expiration Date: 06/29/95

ITEM	DESCRIPTION	MATERIAL				LABOR				TOTAL COST M + L
		Qty.	Unit	Unit Pr.	Total	Hours	Cft.	Rate	Total	
1	MMES PLANNING AND COORDINATION - THE PROJECT OVERSIGHT/SUPPORT PROVIDES FOR THE TRUE PERFORMANCE MEASUREMENTS AND FINANCIAL CONTROLS BASED ON AN INTEGRATED COST AND SCHEDULE CONTROL SYSTEM. THE PROJECT SUPPORT IS ALSO RESPONSIBLE FOR ENSURING COMPLIANCE WITH EPA AND TDEC REQUIREMENTS, AND COMPLIANCE WITH APPLICABLE REGULATIONS AND OTHER MMES POLICIES AND PROCEDURES	1.00	LOT	3000.00	3000	500	XE	56.00	28000	31000
TOTAL DIRECT OVERHEAD				3000 45.00%	1350			45.00%	12600	31000 13950
TOTAL					4350	500			40600	44950

SHIELDED TRANSFER TANKS -ALT.4

WBS 6.2.01.41.01.03 ESH & OVERSIGHT
 Cost Code 9100 PROJECT INTEGRATION
 Participant 35 ENVIRONMENTAL COMPLIANCE
 Contracting Type .. G
 B/M Attribute
 Discipline X Engineering
 B/M Title PROJ. MGMT - ESH OVERSIGHT
 Receiving Site X-10
 Standard Value File ORER0394.val
 Estimate File: C:\PROJECTS\ORNL0&D\STT\ALT4\ALT4.est 5-27-94 12:10a

Building/Area 7918
 Plant Site X
 Level of Estimate P
 Funding Type EXPENSE
 Source Site X-10
 Discipline Estimator ... G/C /DKA
 Quantity Take-Off By ... TEAM /DKA
 Trace Number X.1.3 0
 Expiration Date: 06/29/95

ITEM	DESCRIPTION	MATERIAL				LABOR				TOTAL COST M + L
		Qty.	Unit	Unit Pr.	Total	Hours	Cft.	Rate	Total	
1	HEALTH PHYSICS AND INDUSTRIAL HYGIENE (1/4 FTE @ 2000 HRS/yr) INCLUDES DOCUMENT PREPARATION AND REVIEW	1.00	LOT	3000.00	3000	500	EH	50.00	25000	28000
	TOTAL DIRECT OVERHEAD			65.00%	3000 1350			45.00%	25000 11250	28000 12600
	TOTAL				4350 500				36250	40600

SHIELDED TRANSFER TANKS -ALT.4										
WBS 6.2.01.41.10.15 CHARACTERIZ. FIELD ACTIVITIES					Building/Area 7918					
Cost Code 1200 D & D FACILITY CHARACTERIZAT'N					Plant Site X					
Participant 04 CHARACTERIZATION SUBCON'R					Level of Estimate P					
Contracting Type .. S					Funding Type EXPENSE					
B/M Attribute					Source Site X-10					
Discipline X Engineering					Discipline Estimator ... G/C /DKA					
B/M Title CHARACTERIZ. - CHAR. FIELD ACT					Quantity Take-Off By ... TEAM /DKA					
Receiving Site X-10					Trace Number X.1.4 0					
Standard Value File ORER0394.val					Expiration Date: 06/29/95					
Estimate File: C:\PROJECTS\ORNLD&D\STT\ALT4\ALT4.est 5-27-94 12:10s										

ITEM	DESCRIPTION	MATERIAL				LABOR				TOTAL COST M + L
		Qty.	Unit	Unit Pr.	Total	Hours	Cft.	Rate	Total	
CHARACTERIZATION FIELD ACTIVITIES										
1	SURFACE SAMPLING OF TANKS	1.00	LOT	1950.00	1950	32	FC	54.00	1728	3678
2	RADIOLOGICAL SURVEY OF LEAD	1.00	LOT	1000.00	1000	4	FC	54.00	216	1216
TOTAL DIRECT		2950				1944		4894		
OVERHEAD		8.70%				8.70%		169		
TOTAL		3207				36		2113		

SHIELDED TRANSFER TANKS - ALT.4

WBS 6.2.01.41.10.20 CHARACTERIZATION LETTER
 Cost Code 1200 O & O FACILITY CHARACTERIZAT'N
 Participant 04 CHARACTERIZATION SUBCON'R
 Contracting Type .. S
 B/M Attribute
 Discipline X Engineering
 B/M Title CHARACTERIZ. - CHAR. LETTER
 Receiving Site X-10
 Standard Value File ORER0394.val
 Estimate File: C:\PROJECTS\ORNLDED\STT\ALT4\ALT4.est 5-27-94 12:10a

Building/Area 7918
 Plant Site X
 Level of Estimate P
 Funding Type EXPENSE
 Source Site X-10
 Discipline Estimator ... G/C /DKA
 Quantity Take-Off By ... TEAM /DKA
 Trace Number X.1.5 0
 Expiration Date: 06/29/95

ITEM	DESCRIPTION	MATERIAL				LABOR				TOTAL COST M + L
		Qty.	Unit	Unit Pr.	Total	Hours	Cft.	Rate	Total	
1	CHARACTERIZATION LETTER	1.00	LOT	100.00	100	16	FC	54.00	864	964
	TOTAL DIRECT				100				864	964
	OVERHEAD			8.70%	9			8.70%	75	84
	TOTAL				109	16			939	1048

SHIELDED TRANSFER TANKS -ALT.4

WBS 6.2.01.41.20.15 ENGINEERING STUDIES
 Cost Code \$100 REMEDIAL DESIGN
 Participant 11 MMES TITLE I & II ENGR.
 Contracting Type ... G
 B/M Attribute
 Discipline X Engineering
 B/M Title DEF. OF RESTOR. -PROC/WORKPLAN
 Receiving Site X-10
 Standard Value File ORER0394.val
 Estimate File: C:\PROJECTS\ORHLD&D\STT\ALT4\VALT4.est 5-27-94 12:10a

Building/Area 7918
 Plant Site X
 Level of Estimate P
 Funding Type EXPENSE
 Source Site X-10
 Discipline Estimator ... G/C /DKA
 Quantity Take-Off By ... TEAM /DKA
 Trace Number X.1.6 0
 Expiration Date: 06/29/95

ITEM	DESCRIPTION	MATERIAL				LABOR				TOTAL COST M + L
		Qty.	Unit	Unit Pr.	Total	Hours	Cft.	Rate	Total	
1	PERFORMANCE SPECIFICATION	1.00	LOT	2000.00	2000	480	XE	56.00	26880	28880
	TOTAL DIRECT				2000				26880	28880
	OVERHEAD			45.00%	900			45.00%	12096	12996
	TOTAL				2900	480			38976	41876

SHIELDED TRANSFER TANKS -ALT.4

WBS	6.2.01.41.22.10	STATEMENT OF WORK/MANPOWER EST	Building/Area	7918 /3517
Cost Code	5100	REMEDIAL DESIGN	Plant Site	X
Participant	68	MK-F PLANNING	Level of Estimate	P
Contracting Type ..	G		Funding Type	EXPENSE
B/M Attribute			Source Site	X-10
Discipline	O Other		Discipline Estimator ...	G/C /DKA
B/M Title	STATEMENT OF WORK/MANPOWER EST		Quantity Take-Off By ...	TEAM /DKA
Receiving Site	X-10		Trace Number	0.2.1 0
Standard Value File	ORER0394.val		Expiration Date:	06/29/95
Estimate File: C:\PROJECTS\ORNLD\STT\ALT4\ALT4.est 5-27-94 12:10a				

ITEM	DESCRIPTION	MATERIAL				LABOR				TOTAL COST M + L
		Qty.	Unit	Unit Pr.	Total	Hours	Cft.	Rate	Total	
1	ACTION PLAN	1.00	LOT	1500.00	1500	240	MK	61.43	14743	16243
	TOTAL DIRECT				1500				14743	16243
	TOTAL INDIRECT			20.00%	300		20.00%	2949		3249
	OVERHEAD			8.70%	157		8.70%	1539		1696
	TOTAL				1957	260			19231	21188

SHIELDED TRANSFER TANKS -ALT.4

WBS 6.2.01.41.22.15 REMED. ACTION/DECOMMISSIONING
 Cost Code 6200 D & D IMPLEMENTATION
 Participant 21 MMES PROCUREMENT
 Contracting Type .. G
 B/M Attribute
 Discipline O Other
 B/M Title DECOMMISSIONING
 Receiving Site X-10
 Standard Value File ORER0394.val
 Estimate File: C:\PROJECTS\ORNLD&D\STT\ALT4\ALT4.est 5-27-94 12:10a
 Building/Area 7918 /3517
 Plant Site X
 Level of Estimate P
 Funding Type SPECIAL (NO OH)
 Source Site X-10
 Discipline Estimator ... G/C /DKA
 Quantity Take-Off By ... DKA
 Trace Number 0.2.2 0
 Expiration Date: 06/29/95

ITEM	DESCRIPTION	MATERIAL			LABOR			TOTAL COST M + L
		Qty.	Unit	Unit Pr.	Total	Hours	Cft.	
1	MMES TO PROCURE PREFABRICATED DOE APPROVED HIGH INTEGRITY CONTAINERS FROM A VENDOR FOR STORAGE OF THE EXTRACTED TANK RESINS (QUOTE RECEIVED FROM SEG FOR THE BARRIER PLUS C-118)	5.00	EA	30000.00	150000	0	0.00	0 150000
2	PROCUREMENT SERVICES	1.00	LOT	9000.00	9000	0	0.00	0 9000
3	DURAGE & TRANSPORTATION @ 3%	1.00	LOT	4770.00	4770	0	0.00	0 4770
<hr/>					163770			
TOTAL DIRECT TAX		8.25% 13511				0 163770 13511		
<hr/>					177281			
SUBTOTAL OVERHEAD						0 177281 0		
<hr/>					177281	0	0	
<hr/>							177281	

SHIELDED TRANSFER TANKS -ALT.4

WBS 6.2.01.41.22.15 REMED. ACTION/DECOMMISSIONING
 Cost Code 6200 D & D IMPLEMENTATION
 Participant 49 MMES PROJECT MANAGEMENT
 Contracting Type .. G
 B/M Attribute
 Discipline X Engineering
 B/M Title MMES PROJECT SERVICES
 Receiving Site X-10
 Standard Value File ORER0394.val
 Estimate File: C:\PROJECTS\ORNLOAD\STT\ALT4\ALT4.est 5-27-94 12:10a

Building/Area 7918
 Plant Site X
 Level of Estimate P
 Funding Type EXPENSE
 Source Site X-10
 Discipline Estimator ... G/C /DKA
 Quantity Take-Off By ... TEAM /DKA
 Trace Number X.1.7 0
 Expiration Date: 06/29/95

ITEM	DESCRIPTION	MATERIAL				LABOR				TOTAL COST M + L
		Qty.	Unit	Unit Pr.	Total	Hours	Cft.	Rate	Total	
1	MMES PROJECT SERVICES	1.00	LOT	2000.00	2000	240	XE	56.00	13440	15440
2	VERIFY INTEGRITY OF BLDG. 3517 OVERHEAD CRANE FOR HANDLING THE HIC SHIELDED CASKS, WHICH WEIGH APPROX. 43,000 LBS. LOADED. COSTS ARE INCLUDED FOR BRINGING THE CRANE ON LINE.	1.00	LOT	1500.00	1500	160	XE	56.00	8960	10460
3	SAFETY ASSESSMENT AND CRANE RECERTIFICATION	1.00	LOT	25000.00	25000	0		0.00	0	25000
<hr/> TOTAL DIRECT				28500				22400	50900	
OVERHEAD				45.00%	12825			10080	22905	
<hr/> TOTAL				61325	400			32480	73805	

SHIELDED TRANSFER TANKS -ALT.4

WBS 6.2.01.41.22.15 REMED. ACTION/DECOMMISSIONING
 Cost Code 5100 REMEDIAL DESIGN
 Participant 66 MK-F INDIRECTS ON FP
 Contracting Type ... G
 B/M Attribute CONTRACT MANAGEMENT
 Discipline O Other
 B/M Title MK-F INDIRECTS ON FP
 Receiving Site X-10
 Standard Value File ORER0394.vml
 Estimate File: C:\PROJECTS\ORNLDD\STT\ALT4\ALT4.est 5-27-94 12:10a
 Building/Area 7918 /3517
 Plant Site X
 Level of Estimate P
 Funding Type EXPENSE
 Source Site X-10
 Discipline Estimator ... G/C /DKA
 Quantity Take-Off By ... DKA
 Trace Number 0.2.3 0
 Expiration Date: 06/29/95

ITEM	DESCRIPTION	MATERIAL				LABOR				TOTAL COST M + L
		Qty.	Unit	Unit Pr.	Total	Hours	Cft.	Rate	Total	
1	MK-F CONTRACT MANAGEMENT/ SUPPORT (11% OF FP CONTRACTS)	1.00	LOT	72580.00	72580	0		0.00	0	72580
	TOTAL INDIRECT				72580				0	72580
	OVERHEAD			8.70%	6314			8.70%	0	6314
	TOTAL				78894	0			0	78894

SHIELDED TRANSFER TANKS -ALT.4

WBS 6.2.01.41.22.15 REMED. ACTION/DECOMMISSIONING
 Cost Code 6200 D & D IMPLEMENTATION
 Participant 67 MK-F DIRECTS ON FP
 Contracting Type .. G
 B/M Attribute
 Discipline 0 Other
 B/M Title MK-F ADMIN. SUPPORT FOR FP
 Receiving Site X-10
 Standard Value File ORER0394.val
 Estimate File: C:\PROJECTS\ORNLDBD\STT\ALT4\ALT4.est 5-27-94 12:10a

Building/Area 7918 /3517
 Plant Site X
 Level of Estimate P
 Funding Type EXPENSE
 Source Site X-10
 Discipline Estimator ... G/C /DKA
 Quantity Take-Off By ... DKA
 Trace Number 0.2.4 0
 Expiration Date: 06/29/95

ITEM	DESCRIPTION	MATERIAL			LABOR			TOTAL COST M + L
		Qty.	Unit	Unit Pr.	Total	Hours	Cft.	
1	MK-F DIRECT COSTS - ADMINISTRATIVE SUPPORT FOR FP CONTRACTS	1.00	LOT	0.00	0	1780	AS	52.30 93094 93094
	TOTAL DIRECT				0			93094 93094
	TOTAL INDIRECT			11.00%	0		11.00%	10240 10240
	OVERHEAD			8.70%	0		8.70%	8990 8990
	TOTAL				0	1780		112324 112324

SHIELDED TRANSFER TANKS -ALT.4

WBS 6.2.01.41.22.15.04 REMED. ACTION/DECOMMISSIONING
 Cost Code 6200 D & D IMPLEMENTATION
 Participant 35 ENVIRONMENTAL COMPLIANCE
 Contracting Type .. G
 B/M Attribute
 Discipline 0 Other
 B/M Title DECOMMISSIONING
 Receiving Site X-10
 Standard Value File ORER0394.val
 Estimate File: C:\PROJECTS\ORNL D&D\STT\ALT4\ALT4.est 5-27-94 12:10a
 Building/Area 7918 /3517
 Plant Site X
 Level of Estimate P
 Funding Type EXPENSE
 Source Site X-10
 Discipline Estimator ... G/C /DKA
 Quantity Take-Off By ... TEAM /DKA
 Trace Number 0.2.5 0
 Expiration Date: 06/29/95

ITEM	DESCRIPTION	MATERIAL				LABOR				TOTAL COST M + L
		Qty.	Unit	Unit Pr.	Total	Hours	Cft.	Rate	Total	
1	HEALTH PHYSICS AND INDUSTRIAL HYGIENE (1 FTE)	1.00	LOT	5000.00	5000	1000	EN	50.00	50000	55000
	TOTAL DIRECT				5000				50000	55000
	OVERHEAD			45.00%	2250			45.00%	22500	24750
	TOTAL				7250	1000			72500	79750

SHIELDED TRANSFER TANKS -ALT.4

WBS 6.2.01.41.22.15.04 REMED. ACTION/DECOMMISSIONING
Cost Code 6200 D & D IMPLEMENTATION
Participant 41 MMES FIELD MAINTENANCE
Contracting Type .. G
B/M Attribute
Discipline O Other
B/M Title DECOMMISSIONING
Receiving Site X-10
Standard Value File ORER0394.val
Estimate File: C:\PROJECTS\ORNL\B\STT\ALT4\ALT4.est 5-27-94 12:10a

Building/Area 7918 /3517
Plant Site X
Level of Estimate P
Funding Type EXPENSE
Source Site X-10
Discipline Estimator ... G/C /DKA
Quantity Take-Off By ... DKA
Trace Number 0.2.6 0
Expiration Date: 06/29/95

Estimate File: C:\PROJECTS\ORNLID&D\STT\ALT4\ALT4.est 5-27-96 12:10s

ITEM	DESCRIPTION	MATERIAL				LABOR				TOTAL COST M + L		
		Qty.	Unit	Unit Pr.	Total	Hours	Cft.	Rate	Total			
1	ADDITIONAL REINFORCEMENT AND/OR PREPARATION OF BLDG. 3517 FOR STAGING AREA TO REMOVE RESINS, DEWATER AND DECONTAMINATE TANKS, AND TRANSFER RESIN MATERIAL TO HIGH INTEGRITY CONTAINERS.	1.00	LOT	5000.00	5000	200	XE	38.32	7664	12664		
1A	CONSTRUCT TEMPORARY NEGATIVE AIR ENCLOSURE AROUND ENTRANCE	1.00	LOT	200000.00	200000	0		0.00	0	200000		
2	ESTABLISH CONTAMINATION CONTROL AREAS, WASTE PKG. ZONES, AND LOADING AREA	1.00	LOT	10000.00	10000	320	XE	38.32	12262	22262		
3	HP TECHNICIAN	1.00	LOT	0.00	0	50	XX	65.77	3289	3289		
4	IN TECHNICIAN	1.00	LOT	0.00	0	24	XX	65.77	1578	1578		
5	SAMPLING COSTS FOR APPROX. 40 SAMPLES	40.00	EA	68.00	2720	0		0.00	0	2720		
6	WASTE CHARACTERIZATION OF CONTENTS OF TANKS	5.00	EA	2300.00	11500	0		0.00	0	11500		
7	FINAL TEST & CHECKOUT	1.00	LOT	2500.00	2500	160	XE	38.32	6131	8631		
9	TESTING, TAG & INSPECTION	1.00	LOT	1159.00	1159	19	22	41.01	779	1938		
10	LOST WORK TIME DUE TO ENTERING SPECIAL SECURITY AREAS.	0.00		0.00	0	93	22	41.01	3814	3814		
<hr/>		<hr/>				<hr/>				<hr/>		
TOTAL DIRECT						232879			35517	268396		
TAX						8.25%	19213			19213		
<hr/>		<hr/>				<hr/>				<hr/>		
SUBTOTAL						252092			35517	287609		
OVERHEAD						45.00%	113441			15983		
<hr/>		<hr/>				<hr/>				<hr/>		

SHIELDED TRANSFER TANKS - ALT.4

ITEM	DESCRIPTION	MATERIAL				LABOR				TOTAL COST	
		Qty.	Unit	Unit Pr.	Total	Hours	Cft.	Rate	Total	M + L	
TOTAL		365533		866		51500			417033		

SHIELDED TRANSFER TANKS -ALT.4										
WBS 6.2.01.41.22.15.04 REMED. ACTION/DECOMMISSIONING						Building/Area 7918 /3517				
Cost Code 6200 D & D IMPLEMENTATION						Plant Site X				
Participant 51 FIXED PRICE CONSTRUCTION						Level of Estimate P				
Contracting Type .. S						Funding Type EXPENSE				
B/M Attribute						Source Site X-10				
Discipline O Other						Discipline Estimator ... G/C /DKA				
B/M Title DECOMMISSIONING - FP SERVICES						Quantity Take-Off By ... DKA				
Receiving Site X-10						Trace Number 0.2.7 0				
Standard Value File ORER0394.val						Expiration Date: 06/29/95				
Estimate File: C:\PROJECTS\ORNLDO&D\STT\ALT4\ALT4.est 5-27-94 12:10a										

ITEM	DESCRIPTION	MATERIAL				LABOR				TOTAL COST M + L
		Aty.	Unit	Unit Pr.	Total	Hours	Cft.	Rate	Total	
1	FIXED PRICE CONTRACTOR WILL TRANSPORT STT'S TO BLDG. 3517, TRANSFER RESINS INTO HIC'S PROVI. BY MMES, DEWATER AND DECONTAMINATE TANKS, TRANSFER TANKS TO THE SUB'S FACILITY TO BE RECYCLED, AND HAUL FILLED HIC'S TO MAG 6 OR AN EQUIVALENT STORAGE FACILITY.	1.00	LOT	21000.00	21000	320	X	54.00	17280	38280
	A QUOTE FROM SCIENTIFIC ECOLOGY GROUP, INC. INCLUDES: RENTAL OF DEWATERING EQUIP. @ \$50/DAY X 4 DAYS X 5 HIC'S; RENTAL OF A TRANSPORT CASK FOR \$1000/DAY X 4 DAYS X 5 HIC'S; AND \$54/HR X 20 DAYS X 8 HRS X 2 TECHNICIANS.									
2	PERSONNEL PROTECTIVE EQUIPMENT AND CLOTHING	320.00	HRS	26.04	8333	0		0.00	0	8333
3	TESTING, TAG & INSPECTION	1.00	LOT	293.00	293	16	22	54.00	864	1157
4	MOBILIZATION & DEMOBILIZATION	1.00	LOT	880.00	880	24	22	54.00	1296	2176
5	SUPPORTING ITEMS, BREAKAGE, & WASTE	1.00	LOT	1467.00	1467	48	22	54.00	2592	4059
6	LOST WORK TIME DUE TO ENTERING SPECIAL SECURITY AREAS.	0.00		0.00	0	69	22	54.00	2646	2646
7	SAFETY NTGS./OSHA	1.00	LOT	320.00	320	14	22	54.00	756	1076
8	CLEANUP	1.00	LOT	160.00	160	27	22	54.00	1458	1618
TOTAL DIRECT TAX				32453				26892		59345
				8.25%	2677					2677

SHIELDED TRANSFER TANKS -ALT.4

ITEM	DESCRIPTION	MATERIAL				LABOR				TOTAL COST M + L
		Qty.	Unit	Unit Pr.	Total	Hours	Cft.	Rate	Total	
SUBTOTAL					35130				26892	62022
TOTAL INDIRECT				26.00%	9134			26.00%	6992	16126
OVERHEAD				8.70%	3851			8.70%	2948	6799
TOTAL					48115	498			36832	84947

SHIELDED TRANSFER TANKS -ALT.4										
WBS	6.2.01.41.22.15.04 REMED. ACTION/DECOMMISSIONING									
Cost Code	6200	D & D IMPLEMENTATION				Building/Area				
Participant	51	FIXED PRICE CONSTRUCTION				7918 /3517				
Contracting Type ..	S					Plant Site				
B/M Attribute		X				Level of Estimate				
Discipline	O Other	P				Funding Type				
B/M Title	DECOMMISSIONING - FP SERVICES	EXPENSE				Source Site				
Receiving Site	X-10	X-10				Discipline Estimator ... G/C /DKA				
Standard Value File	ORER0394.val	Quantity Take-Off By ... DKA				Trace Number				
Estimate File:	C:\PROJECTS\ORNLD&D\STT\ALT4\ALT4.est	0.2.8 0				Expiration Date: 06/29/95				

ITEM	DESCRIPTION	MATERIAL				LABOR				
		Qty.	Unit	Unit Pr.	Total	Hours	Cft.	Rate	Total	TOTAL COST M + L
TRAINING / MEDICALS / PLANNING										
1	HAZARDOUS WASTE TRAINING	30.00	EA	750.00	22500	1200	X	54.00	64800	87300
2	GET TRAINING	30.00	EA	0.00	0	90	X	54.00	4860	4860
3	RAD WORKER TRAINING	30.00	EA	250.00	7500	720	X	54.00	38880	46380
4	PHYSICAL EXAM	30.00	EA	350.00	10500	120	X	54.00	6480	16980
5	WHOLE BODY COUNT	30.00	EA	0.00	0	90	X	54.00	4860	4860
6	URINALYSIS	30.00	EA	0.00	0	30	X	54.00	1620	1620
7	RESPIRATOR FIT	30.00	EA	105.00	3150	30	X	54.00	1620	4770
8	EXTERNAL DOSIMETRY	30.00	EA	80.00	2400	0		0.00	0	2400
9	SITE HEALTH & SAFETY PLAN	1.00	EA	0.00	0	50	X1	60.00	3000	3000
10	COMPREHENSIVE WORK PLAN	1.00	EA	0.00	0	50	X1	60.00	3000	3000
11	FULL TIME SAFETY REPRESENTATIVE FOR THE DURATION OF THE PROJECT	1.00	EA	0.00	0	320	X1	60.00	19200	19200
12	LOST WORK TIME DUE TO ENTERING SPECIAL SECURITY AREAS.	0.00		0.00	0	162	ZZ	54.93	8899	8899
<hr/> TOTAL DIRECT TAX				46050			157219		203269	
		8.25%		3799					3799	
<hr/> SUBTOTAL				49849			157219		207068	
TOTAL INDIRECT OVERHEAD		26.00%		12961	26.00%		40877		53638	
		8.70%		5664	8.70%		17234		22698	
<hr/> TOTAL				68274	2862		215330		283604	

SHIELDED TRANSFER TANKS -ALT.4

WBS 6.2.01.61.22.15.04 REMED. ACTION/DECOMMISSIONING
 Cost Code 6200 D & D IMPLEMENTATION
 Participant 53 FP UNIT SUBCONTRACTS
 Contracting Type .. \$
 B/M Attribute
 Discipline 0 Other
 B/M Title DECOMMISSIONING
 Receiving Site X-10
 Standard Value File ORER0394.val
 Estimate File: C:\PROJECTS\ORNLDD\STT\ALT4\ALT4.est 5-27-94 12:10a
 Building/Area 7918 /3517
 Plant Site X
 Level of Estimate P
 Funding Type EXPENSE
 Source Site X-10
 Discipline Estimator ... G/C /DKA
 Quantity Take-Off By ... DKA
 Trace Number 0.2.9 0
 Expiration Date: 06/29/95

ITEM	DESCRIPTION	MATERIAL				LABOR				TOTAL COST M + L
		Qty.	Unit	Unit Pr.	Total	Hours	Cft.	Rate	Total	
THE QUOTE ALSO INCLUDES:										
1	FP CONTRACTOR TO REMOVE THE LEAD SHIELDING FROM THE TANKS AND SMELT ALL FIVE METAL TANKS IN THEIR INDUCTION FURNACE. THE TANKS COULD THEN BE SOLD IF SUITABLE FOR REUSE OR TRANSFERRED TO THE DOE SCRAP METAL PROGRAM. THE LEAD IS TO RETURNED TO THE ORNL LEAD RECOVERY PROGRAM. 5 TANKS X 40,000# = 200,000#	100.00	TONS	4800.00	480000	0		0.00	0	480000
<hr/>										
TOTAL DIRECT				480000				0	480000	
OVERHEAD				8.70%	41760			8.70%	0	41760
<hr/>										
TOTAL				521760		0		0	521760	
<hr/>										

SHIELDED TRANSFER TANKS -ALT.4

WBS 6.2.01.41.22.15.06 REMED. ACTION/DECOMMISSIONING

Cost Code 9300 TREATMENT, STORAGE & DISPOSAL

Participant 92 WASTE MANAGEMENT

Contracting Type .. G

B/M Attribute

Discipline O Other

B/M Title WASTE MANAGEMENT

Receiving Site X-10

Standard Value File ORER0394.val

Estimate File: C:\PROJECTS\ORNLDED\STT\ALT4\ALT4.est 5-27-94 12:10a

Building/Area 7918 /3517

Plant Site X

Level of Estimate P

Funding Type EXPENSE

Source Site X-10

Discipline Estimator ... G/C /DKA

Quantity Take-Off By ... DKA

Trace Number 0.2.10 0

Expiration Date: 06/29/95

ITEM	DESCRIPTION	MATERIAL				LABOR				TOTAL COST M + L
		Qty.	Unit	Unit Pr.	Total	Hours	Cft.	Rate	Total	
1	WASTE HANDLING AND STORAGE (DATA PROVIDED BY TOM SCANLAN FROM PREVIOUS PROJECT. ALLOWANCE INCLUDES ALL PARTICIPANTS INVOLVED WITH CONSTRUCTING SILOS AND PLACING CONTAINERS.)	1.00	LOT	500000.00	500000	0		0.00	0	500000
TOTAL DIRECT OVERHEAD				500000				45.00%	0	500000
TOTAL				45.00%	225000				0	225000
				725000		0			0	725000

SHIELDED TRANSFER TANKS -ALT.4

Disciplines
 X: Engineering
 O: Other

Total Labor Hours: 9678

COST SUMMARY

	MATERIAL	LABOR	TOTAL COST
Line Item Cost	1504202	507553	2011755
Total Tax	39200	0	39200
SUBTOTAL	1543402	507553	2050955
Total Indirect	94975	61058	156033
SUBTOTAL	1638377	568611	2206988
Overhead	416278	126714	542992
SUBTOTAL	2054655	695325	2749980
Contingency	714123	234646	948769
SUBTOTAL	2768778	929971	3698769
Market Adjustment			0
TOTAL			3698769

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