5.0 ENVIRONMENTAL IMPACTS

The environmental impacts of the proposed action and potential alternatives are discussed in this section. The new waste tanks are needed for the retirement of older-design tanks with newer, more reliable tanks with improved monitoring capability and will provide interim storage capacity for wastes generated by continuing production operations. Apart from the impacts of construction, the incremental consequences of this action include:

- Added risks of releases during waste transfer operations required to empty tanks to be retired
- Reduced risks of accidental releases from the waste operations because of the improved facilities
- The impacts associated with decontamination and decommissioning of the retired tanks

No significant difference in operating force or use of land or demand for other resources is expected as a result of either adopting the proposed action or any of the design alternatives. Because of this, the effects of radiological releases are emphasized in the discussion on environmental consequences.

This EIS supplements the information on environmental effects contained in ERDA-1537, which provides detailed analyses of the impacts of waste management operations including abnormal operations and accidents. This statement covers only the use of the tanks for interim storage of radioactive wastes at SRP. The possible processing of these wastes for ultimate disposition and the potential use of the tanks in these operations will be covered in a future environmental document for the long-range waste management program.

5.1 PREFERRED ALTERNATIVE

The preferred alternative is to complete construction of the 14 waste tanks as presently designed and to incorporate these tanks in the SRP waste management operations.

5.1.1 Construction

The bottoms of new waste tanks are located about three feet above the highest recorded water table in the area. In H Area the bottom of a new tank is about seven ft below normal ground elevation, placing the top of the four-ft-thick concrete shield atop the tank about 35 ft above normal ground elevation. In F Area, the water table in the tank farm area is lower and the tanks are below ground with the top of the concrete shield at normal ground elevation.

For each new H Area tank, about 10,500 cubic yards of soil are excavated during construction and about 44,000 cubic yards of backfill are used for the compacted, sloped mound around the tank. In F Area, about 42,500 cubic yards of soil are excavated for each new tank and about 27,500 cubic yards used to backfill around the tank. The special backfill, selected to allow controlled compaction to a density greater than the surrounding undisturbed soil is hauled from another site. Excess soil from the excavation is spread over the surrounding terrain, usually in low-lying areas not adjacent to streams, and sown with grass. Where erosion is possible, the soil is sprayed with asphalt to provide stabilization until the grass cover is established.

The new waste tanks are located in an existing tank farm complex; thus, their presence will not significantly alter the appearance of the surroundings. The ground at the waste tanks is graded for compatibility with the surrounding tanks and connecting roads. The area occupied by a waste tank with all its associated auxiliaries is approximately one acre.

No significant amount of liquid waste is produced during construction of the waste tanks and the evaporator. Solid (nonradioactive) wastes are discarded in a landfill operation used for the entire plant. Construction runoff and other discharges are in compliance with applicable environmental regulations.

Construction materials to be used - concrete, steel, and some stainless steel (for waste transfer lines) - are plentiful enough that the impact on natural resources is insignificant.

5.1.2 Releases and Radiation Dose from Normal Operation

Small amounts of radioactivity reach the environment from normal operation of the SRP waste management system.

In ERDA-1537, these waste farm releases were combined with releases from other operations in the 200 Areas, and the specific impact of the waste farm operation could not be evaluated. For this reason, the personal exposure and releases from the waste farm are described separately in this section.

The total annual releases from the waste farms are summarized in Table 5-1. In general, these releases are a function of the operation of the waste farms as a whole, and depend on the total quantity of wastes stored and the number of tanks in service. Thus, the routine releases should not be greatly affected as the new tanks are put in service and older ones retired, except for the small additional loads imposed in cleaning out tanks to be retired and in transfers between tanks. Low concentrations of radioactive materials are carried by the tank ventilation to the atmosphere. Also low concentrations of radioactivity are carried to the seepage basins with the evaporator overheads or after ion exchange treatment. The only activity from the waste tanks system that is perceptible off the plant site is tritium.

5.1.2.1 Tritium to Air and Water

Tritium that reaches the waste tanks originates as a fission product or from neutron capture by heavy water moderator adhering to the lattice elements removed from the ractor. The amount of tritium handled in the waste system in a given year is a function of irradiation and process schedules and of the fraction removed by canyon evaporators before the waste solutions reach the tanks. The waste handling system approaches an equilibrium state in which tritium added to the storage tanks in the fresh waste from fuel processing operations approximately equals the amount lost from the system by decay or releases. Approximately 8000 Ci/yr of tritium, determined by a balance across the waste management system, is released to the environment from waste handling operations. Of that total, about 5500 Ci/yr is released to the atmosphere by evaporation via the waste tank ventilation purge used to prevent the accumulation of hydrogen and by evaporation from the seepage basin. The maximum atmospheric release occurs from tanks storing fresh, unevaporated waste and is estimated to be about 650 Ci/yr from each such tank. This release results in an annual dose commitment of 0.0009 mrem to an individual at the plant boundary. The remainder of the tritium (2500 Ci) enters the seepage basin groundwater pool. The tritium migrates to an onsite creek which discharges into the Savannah River. About one-third of the tritium entering the groundwater decays before reaching the river. The tritium is diluted well below drinking water levels by the average river flow of 10,400 cfs.

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The whole body dose from atmospheric release to the population within a 150-km radius of the center of SRP is calculated to be 1.3 man-rem per year. The maximum dose from inhalation of airborne tritium to a hypothetical individual residing at the plant boundary would be 9×10^{-6} rem. Allowing for decay of tritium released into the groundwater from the seepage basins, the population dose to the 70,000 people downstream who use Savannah River water is calculated to be 1.0 man-rem per year. The dose from this tritium to a hypothetical individual residing at the plant boundary and taking all his water from the river would be 2×10^{-5} rem.

TABLE 5-1

Annual Releases[a] from Normal Operations in the Waste Farm

Radionuclide	Ci/yr To Atmosphere	Ci/yr To Seepage Basins	Ci/yr To Plant Streams	Dose to Offsite Population, man-rem
Tritium	5500 (Calculated)	2500 (3-4 pCi/L)	1700 (0.4 pCi/mL)	1.3 (Atmospheric) 1.0 (Streams)[c]
Cesium-137[c]	N.D.[d] (0.01 μCi/day)[g]	~2 (0.2 pCi/L)	N.D. (7 pCi/L)	-
Strontium-90[c]	N.D. (0.01 μCi/day)[g]	0.1-1.0[f] (14 pCi/mL)	0.008-0.8 (7.8 pCi/L)	0.083 (Streams)[c]
Short-lived[c] (^{51}Cr, ^{58,60}Co ^{89}Sr, ^{95}Zr-Nb, ^{103,106}Ru, ^{124,125}Sb, ^{131}I, ^{141,144}Ce, and ^{147}Pm)	N.D.	<34	N.D.	-

a. Sensitivity of analysis depends on volume of sample, detection instrument used, background count on instrument used, and length of count.
b. Numbers shown in parenthesis are sensitivities for routine analyses.
c. Total from all sources within the Chemical Separations Areas. The quantity attributed to waste farm operations is less than half the total.
d. Not detectable.
e. Due to releases from evaporator operations; not due to waste tank releases.
f. 0.45 curies in 1978.
g. Combined beta and gamma total dose.

5.1.2.2 Releases from Tank Ventilation

A negligible amount of activity other than tritium is released from the tank ventilation system in normal operation. The waste tanks are purged with air (100 cfm or more) to prevent the accumulation of radiolytically generated hydrogen, and the air is exhausted through filters. Air samples from the filter outlets have never shown any significant activity except during one 24-hr period when moist, contaminated air bypassed a condenser resulting in a release through the filter of less than 1 Ci of ^{137}Cs. However, unusual radiation levels from some filters (up to 9 R/hr) show that sizable amounts of activity (2 to 3 Ci) have reached the filters. The released activity becomes dispersed into the ventilation air most noticeably during transfers of solution into tanks. Then the filters collect the radionuclides as the ventilation air passes out through them.

5.1.2.3 Exposure to Operating Personnel

Normal operations in the waste tank farms result in a total annual exposure to operating personnel of about 50 man-rem. The maximum individual exposure in 1978 was 2.5 rem with an average of about 0.7 rem per year. The limit for personnel exposure is 5 rem/yr given in USERDA Manual, Chapter 0524, "Standards for Radiation Protection."

5.1.3 Releases from Abnormal Operations or Accidents

As indicated above, ERDA-1537 provides a comprehensive review of SRP experience in the release of radioactivity due to abnormal events. This review included analyses of the response of these facilities to severe accidents or natural events. These results are summarized in Tables 5-2 and 5-3 taken from ERDA-1537 which show that none of the credible occurrences have significant risks of unacceptable offsite dose commitments.

The incremental risks during transfer operations that are brought about by the proposed action are also small. As indicated in Table 5-2, the spills that could occur with appreciable likelihood have no perceptible offsite effects. Even a very large, but unlikely spill is shown to produce a maximum whole body dose commitment of only 7.1 rem which is substantially smaller than the 25 rem emergency dose guideline.

TABLE 5-2

Risk Factors for Surface Spills

Incident	Estimated Releases of Fission Products	Calculated Consequence Factor, Max Potential Offsite Dose, rem		Estimated Probability Factor,[a] Events per Year
		Body	Bone	
Small miscellaneous leaks	Much less than 1 Ci	-	-	Several/yr
Leaks from flanges and evaporators	10 Ci of ^{137}Cs	-	-	0.1
Sludge spill due to hose or pipe rupture	200 Ci of ^{90}Sr	-	-	0.05
Spill due to pluggage of tank inlet	200 Ci of ^{137}Cs	-	-	0.05
Spill following explosion in waste evaporator	7.2×10^3 Ci of ^{137}Cs	1.9	-	10^{-5} to 2×10^{-4}
Spill following explosion in waste tank	1.5×10^2 Ci of ^{90}Sr and 1.5×10^4 Ci of ^{137}Cs	3.9	1.0	10^{-4}
5-minute HHW spill	10^3 Ci each of ^{90}Sr and ^{137}Cs	0.3	6.8	0.005

a. Values indicate only the probability of occurrence of a spill. The probability for ingestion after the spill is much lower.

TABLE 5-3

Risk Factors for Atmospheric Releases

Incident	Estimated Releases of Fission Products	Calculated Consequence Factor, Max Potential Offsite Dose, rem	Estimated Probability Factor,[a] Events per Year
Overheating of tank	<1 Ci of ^{137}Cs	1×10^{-4} (body)	0.05
Release from filter in tank ventilation system	2 Ci of ^{137}Cs	2×10^{-4} (body)	0.02
Evaporator explosion	7 Ci of ^{137}Cs	1×10^{-3} (body)	10^{-4} to 2×10^{-3}
Hydrogen explosion in waste tank (plugs, lift, filters rupture)	11 Ci of ^{144}Ce 14 Ci of ^{106}Ru 0.5 Ci of ^{90}Sr 52 Ci of ^{137}Cs 0.005 Ci of ^{238}Pu	7×10^{-3} (body) 5×10^{-2} (bone) 7×10^{-2} (lung)	10^{-3}
Hydrogen explosion in waste tank (roof collapse)	110 Ci of ^{144}Ce 140 Ci of ^{106}Ru 5 Ci of ^{90}Sr 520 Ci of ^{137}Cs 0.05 Ci of ^{238}Pu	7×10^{-2} (body) 5×10^{-1} (body) 7×10^{-1} (lung)	10^{-4}

a. Values indicate only the probability of occurrence of a spill. The probability for ingestion after the spill is much lower.

5.1.3.1 Risks to Offsite Population

Accident risks to the offsite population in Ci/yr and man-rem/yr were calculated by multiplying the probability of the accident times the consequence of the accident in curies released offsite or dose to the offsite population. The total risk is 16 man-rem/yr. Of that total, the risk from normal operations accounts for 3 man-rem/yr. Risks for all analyzed accidents are listed in Table 5-4.

The risk of an accident type is best determined by considering more than one magnitude or level of consequences for the accident because most accidents can yield a wide range of consequences. The risk of the accident over the range of consequences may then be found by summing the products of probability and consequence for each consequence level. Consequence levels were generated by considering different levels of containment damage (e.g., from earthquakes) or different degree of success in containing a given spill (e.g., different percentage of the spill passing through the storm water system) or both. The curie-risk for normal operations is the sum of the curies of each radionuclide effluent per year, and the risk in man-rem per year is the sum of the corresponding population dose commitments.

The risk associated with earthquakes (10 man-rem/yr) is the dominant accident risk. The major contribution to earthquake risk (about 70%) results from the highly conservative assumption that liquefaction is possible in the soil around waste tanks built partially above the normal grade elevation in the waste tank farms. Most of this risk is attributable to IX MM earthquakes. Liquefaction is assumed to cause the earth to slump away from these tanks. Leakage from damaged tanks is assumed to flow rapidly to Four Mile Creek, rather than being deposited in the soil beneath the tank. About 2% of the earthquake risk results from damage to the tank
C farm evaporators during an earthquake between Intensity VII and VIII, the design basis earthquake. The remainder results from collapse of the roofs of waste tanks during earthquakes of Intensity IX or greater.

Several comparisons can be made to put tank farm risks in perspective. Table 5-5 summarizes the offsite risk from tank farm operations and accidents compared to the risks from natural background radiation, medical diagnostic radiation, all malignancies, and natural accidents, e.g., floods and lightning. Comparisons with natural background and medical diagnostic radiation are based on population dose to the combined population groups of 2,300,000 within a 150-km radius of SRP and 70,000 downstream Savannah River water users. The dose commitment to the combined population group from natural background and medical diagnostic radiation is calculated to be 5×10^5 man-rem/yr. Normal tank farm operations plus postulated accidents add an average of 16 man-rem/yr to this total or 0.003%.

TABLE 5-4

Accident Risks to Offsite Population

	Accidents	Ci/yr			Man-rem/yr		
		Atm	Surf.	Total	Atm	Surf.	Total
1	Earthquake	$2x10^{-3}$	$1x10^{1}$	$2x10^{1}$	1	$1x10^{1}$	$1x10^{1}$
2	Overflow of Waste Tank	-	1	1	-	1	1
3	Large Liquid Release from Waste Tank Riser	-	2	2	-	$8x10^{-1}$	$8x10^{-1}$
4	Filter Fire	$6x10^{-2}$	-	$6x10^{-2}$	$6x10^{-1}$	-	$6x10^{-1}$
5	Overflow of Diversion Box	-	$7x10^{-1}$	$7x10^{-1}$	-	$6x10^{-1}$	$6x10^{-1}$
6	Overflow of Pump Pit	-	$6x10^{-1}$	$6x10^{-1}$	-	$2x10^{-1}$	$2x10^{-1}$
7	Waste Tank Explosion	$1x10^{-1}$	$1x10^{-2}$	$1x10^{-1}$	$7x10^{-2}$	$6x10^{-3}$	$8x10^{-2}$
8	Overflow of CTS Pit	-	$1x10^{-1}$	$1x10^{-1}$	-	$8x10^{-2}$	$8x10^{-2}$
9	Overflow of Evaporator Cell	-	$5x10^{-2}$	$5x10^{-2}$	-	$3x10^{-2}$	$3x10^{-2}$
10	Tornado	$3x10^{-4}$	$8x10^{-3}$	$8x10^{-3}$	$1x10^{-2}$	$6x10^{-3}$	$2x10^{-2}$
11	Pump Tank Explosion	$8x10^{-6}$	$5x10^{-2}$	$5x10^{-2}$	$3x10^{-5}$	$2x10^{-2}$	$2x10^{-2}$
12	Above-Ground Release from Process Line	-	$7x10^{-3}$	$7x10^{-3}$	-	$6x10^{-3}$	$6x10^{-3}$
13	Evaporator Explosion/Eruction	$1x10^{-4}$	$1x10^{-3}$	$1x10^{-3}$	$1x10^{-3}$	$6x10^{-4}$	$2x10^{-3}$
14	Meteorite	$3x10^{-3}$	-	$3x10^{-3}$	$2x10^{-3}$	-	$2x10^{-3}$
15	Release During Equipment Removal from Waste Tank	$3x10^{-5}$	$3x10^{-3}$	$3x10^{-3}$	$4x10^{-4}$	$2x10^{-3}$	$2x10^{-3}$
16	Release from Segregated Water System	-	$4x10^{-3}$	$4x10^{-3}$	-	$2x10^{-3}$	$2x10^{-3}$
17	CTS Tank Explosion	$4x10^{-7}$	$3x10^{-3}$	$3x10^{-3}$	$2x10^{-6}$	$2x10^{-3}$	$2x10^{-3}$
18	Release from Boiling Waste Tank	$5x10^{-6}$	$3x10^{-5}$	$1x10^{-4}$	$6x10^{-4}$	$1x10^{-5}$	$6x10^{-4}$
19	Airborne Release from Diversion Box	$4x10^{-5}$	-	$4x10^{-5}$	$2x10^{-4}$	-	$2x10^{-4}$
20	Leak Through Evaporator Cell	-	$4x10^{-4}$	$4x10^{-4}$	-	$2x10^{-4}$	$2x10^{-4}$
21	Spill from CTS Cleanout Port	-	$3x10^{-4}$	$3x10^{-4}$	-	$1x10^{-4}$	$1x10^{-4}$
22	Activity By-passes Waste Tank Filter	$5x10^{-6}$	$3x10^{-6}$	$8x10^{-6}$	$2x10^{-5}$	$6x10^{-7}$	$2x10^{-5}$
23	Overflow of Overheads Tank	-	$4x10^{-5}$	$4x10^{-5}$	-	$2x10^{-5}$	$2x10^{-5}$
24	Airplane Crash	$2x10^{-7}$	$1x10^{-6}$	$1x10^{-6}$	$2x10^{-6}$	$6x10^{-7}$	$3x10^{-6}$

TABLE 5-5

Comparison of Risks to the Offsite Population

Cause of Death or Health Effects[a]	Man-rem/yr	Deaths/yr	Total Somatic Health Effects[b] (Fatal and Nonfatal Cancers)
All tank farm accidents and effluents	16	0.003[c]	0.0064
Natural background and medical diagnostic radiation	5×10^5	100[c]	200
All malignancies		2800[c]	
Natural accidents		2.4[d]	

a. A population of 2,300,000 within a 150-km radius of SRP for airborne releases, and 70,000 downstream Savannah River water users for waterborne releases.

b. Estimated at 400 per 10^6 man-rem.[1]

c. Latent cancer deaths.[2]

d. Sudden accidental deaths from floods, lightning, etc.

C The comparison of total somatic health effects per 10^6 man-rem of whole body exposure, resulting in cancers in Table 5.5, is from the EPA dose-effect relationship factor.[1] The health effects include both fatal and nonfatal malignancies. The emotional and financial stress of a nonfatal malignancy could be similar to the death impact and is therefore a significant consideration.

The health dose-effect relationship factors reported by the EPA[1] are neither upper nor lower estimates of probability characterized as "the most likely estimate" in the BEIR[2] report; that is, they are averages of the relative and absolute risk models considered in the BEIR report.

Comparisons with all malignancies and natural accidents are based on estimated death rates in the same combined population group. These comparisons are based on the statistical factor of 200 latent cancer deaths per 10^6 man-rem whole body exposure.[2] This factor predicts, for example, that if one million persons each received a one-rem whole-body dose, 200 would die at some time earlier than they would had they not received the dose. Based on the offsite population risk of 16 man-rem/yr, the estimated offsite death rate from waste tank farm operations is 3×10^{-3} latent cancer deaths/yr or 3 persons in 1000 years.

For comparison, death rates from all malignancies were obtained from cancer death statistics for Georgia and South Carolina. These statistics show the death from all malignancies is about 116.3 per 100,000 population per year. Therefore, for the combined population group for which tank farm doses were calculated (2,370,000) about 2800 cancer deaths/yr may occur. The calculated potential offsite cancer deaths from tank farm operations contribute 1×10^{-4} to this total.

The comparison of offsite risk from the tank farms from natural accidents involves a comparison between long-term cancer deaths and short-term or sudden natural accident death. The death rate resulting from natural accident such as floods and lightning has been estimated to be one death per 10^6 population per year.[3] Therefore, the death rate in the combined population group for which tank farm accidents were calculated is about 2.4 sudden deaths per year from natural accidents.

These comparisons, summarized in Table 5-5, show that the offsite population risk of waste tank farm operations is negligible when compared to other natural risks experienced by the population in the vicinity of SRP.

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5.1.3.2 Emergency Planning*

The emergency planning and response activities of the Department of Energy's Savannah River operations office (SR) are divided into two catorgies: 1) maintenance of an emergency planning program in support of operational activities of the Savannah River Plant (SRP) and 2) external support to state and local governments and private industry under the DOE Radiological Assistance Program.

The plantwide preparedness program at SRP is a co-custodial program shared by SR and its major contractors on the plantsite. Program reviews and evaluations are conducted by SR. In addition to pre-emergency response planning for radiation-related emergencies, there is a comparable degree of preparedness and planning for nonradiological incidents, including chemical releases or spills, industrial accidents, natural disasters, terrorist threats or acts, and national emergencies.

Each operating area and the major production facilities within each area maintain emergency plans and procedures. Provisions of these plans are consistent throughout the plantsite and comply with a basic document establishing plantwide preparedness criteria. SRP emergency plans identify the potential credible emergencies that may occur within the operation of the area or facility for which the plan establishes action(s) to contain the incident, protect plant personnel, assess the impact of the incident on the environment and the offsite population, protect the offsite population, and otherwise minimize the effects of the incident.

The degree to which SRP resources are applied to emergency response operations depends upon the magnitude of incident and the effectiveness of containment. As the consequences of an incident escalate, the scope of plans, procedures, manpower, and equipment required to deal with the incident increases. Emergency declarations escalate with an incident and are made for Facility Emergencies, Area Emergencies, and Plant Emergencies. Under each plan, i.e., facility, area, and general plant procedure, there is a clearly defined emergency response organization.

Emergency actions outside of incident areas, post-emergency actions, and followup are controlled from the plant Emergency Operating Center (EOC). The EOC is the primary control point for emergency operations on the SRP site. All plantwide warnings and

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* This section was added in response to recommendation received from the Department of Health, Education, and Welfare (page G-3).

C emergency announcements are issued from the EOC. It is from this facility that offplant warnings and announcements to state/local officials are initiated.

Data used to implement the offsite warning plan is derived from a combination of release information. Once assembled, the values provided from this information are compared to state reporting requirements and if necessary, state/local authorities are advised. Notifications and alerts from SRP to the states of Georgia and South Carolina follow the provisions of memoranda of understanding where DOE, the state radiological health organizations, and the state preparedness organizations are signatory parties. Under these agreements, SR has committed to notifying the states as prescribed in their respective radiological emergency response plans. Authorization to release an offplant warning announcement rests with the SR Manager or his designee.

Continuing coordination and liaison with state/local authorities during emergency and post-emergency conditions are provided from either the EOC or (at the discretion of the SR Manager) the Offsite Communications Center (OCC). The OCC is located in Aiken, South Carolina. The OCC provides, in addition to a "near site EOC," an alternate location for management to assemble in the event that access to SRP is not possible or practicable.

In the event that SRP resources require augmentation from outside organizations, agreements have been entered into with local authorities to provide the type of assistance needed. All such agreements are emergency in nature and range from medical assistance to emergency transportation.

Evaluation and assessment of emergency planning and response at SRP is conducted through a program of drills, tests, subsystem exercises and total system exercises, all of which are on scheduled intervals. (Exercises and drills are generally unannounced). As a minimum, a plantwide total systems exercise is conducted on an annual basis.

5.1.4 Decommissioning

The 14 new tanks provide sufficient storage space so that wastes can be removed from all Type I, II, and IV tanks by about 1988 according to the present program plan (see Section 3.2.7). A total of 23 older design tanks will be available for decommissioning at that time.

Decommissioning of waste tanks has not yet been attempted at SRP, but studies are now underway with Tank 16, as described in Appendix C, to develop detailed procedures for decontamination and dismantling these structures.

The environmental consequences of these operations will be largely the radiation exposure to operating personnel and land commitment for disposal of the residual materials. These impacts, which will be subjected to further environmental review, cannot be quantified until the decommissioning procedures are more completely defined (refer to Appendix C). Decommissioning is independent of all alternatives.

5.2 OTHER ALTERNATIVES

Three design alternatives were considered in the preparation of this supplemental environmental impact statement to ERDA-1537, i.e., thicker and more chemically-resistant steel plates, an impressed current cathodic protection system to guard against stress corrosion cracking, and better waste retrieval equipment and enlarged tank openings to facilitate retrieval.

Implementation of any of the design features would require backfitting of tanks already under construction and near completion. Beside the additional construction impact and demand for resources, the projected gains, if any, need to be balanced with increased risks for delaying waste transfer from the earlier design tanks.

For example, adoption of the thicker steel plates for tank walls will involve abandoning or disassembling of the tanks currently under construction. Then new tanks would have to be constructed. This would delay the transfer of waste from older tanks to the more reliable tanks as presently constructed and increase the possiblity of lack of reliable storage space for freshly generated waste.

5.2.1 Thicker and More Chemically Resistant Tank Steel

As indicated in Section 3.3.1, the selection and heat treatment of the primary tanks, along with the management of waste compositions, should result in an estimated tank life of 40 to 60 years. Based on SRP experience, general corrosion resistance is not a factor in determining the tank life.

5.2.1.1 Reasonably Foreseeable Environmental Effects

The major impact of adopting this alternative would involve the construction of new tanks probably costing much more than the approximate $126,000,000 appropriated for the fourteen tanks under construction. A second impact is the loss of $80,000,000 already spent or committed on the construction of the new tanks.

Additional land would be committed if new tanks were constructed unless the present construction was removed and the same land reused. This replacement would increase costs.

The environmental effect would be the small offsite dose from tritium, primarily as water vapor, released from the waste tank vents and would be the same for any tank wall thickness.

The abnormal occurrences (leaks, explosions, etc.) that might happen to waste tanks and their results would be the same for any tank wall thickness.

5.2.1.2 Effect on Tank Durability

There is a perceived, but undemonstrated, gain of safety and tank durability because of thicker and more chemically-resistant tank walls.

5.2.1.3 Effect on Ease of Waste Retrieval from the Tanks

No effect.

5.2.1.4 Effect on Choice of Technology and Timing for Long-Term Radioactive Waste Storage and Final Disposal

None foreseen.

5.2.2 Cathodic Protection

Studies revealed that successful application of cathodic protection for SRP tanks would be contingent on the satisfactory results of additional studies. However, because of the expected high reliability of the Type III tank design, the benefits to be gained by cathodic protection were evaluated to be small compared to the uncertainties and problems of installation of such protection and the adverse effects on waste volume reduction plans.

5.2.2.1 Reasonably Foreseeable Environmental Effects

Installation of the cathodic protection system would cause a delay in completing the waste tanks. The delay and increased cost for installing the cathodic protection equipment would impact on the availability of more reliable new tanks. Resultant costs and time limitations would increase the risk of a less than satisfactory installation. For example, a nonuniform distribution of current could cause "hot spot" corrosion, and a potential leak from the waste tank. The situation is complicated by the fact that cathodic protection requires the waste to be stored in liquid form. Corrective action would necessitate the removal of waste from the leaky tank to avoid any environmental impact. The leak would probably not be repairable.

The generation of reactive gases poses a potential for explosion with the subsequent release of radioactive material to the environment and requires adequate ventilation of the tank vapor space.

5.2.2.2 Effect on Tank Durability

Properly designed and installed, a cathodic protection system could help avoid corrosion that might shorten the life of a tank.

However, an improperly designed and installed cathodic protection system could drastically shorten the life of a tank. Nonuniform waste characteristics can cause current flow patterns that could result in accelerated corrosion of the waste tanks.

5.2.2.3 Effect on Ease of Waste Retrieval from the Tanks

The cathodic protection system could interfere with waste retrieval by reducing easily platable metal cations to metal which would plate out on the tank wall. The plated metal would be difficult to remove during waste retrieval or decommissioning.

5.2.2.4 Effect on Choice of Technology and Timing for Long-Term Radioactive Waste Storage and Final Disposal

None foreseen.

5.2.3 Better Waste Retrieval Equipment and Enlarged Tank Openings

Adequate waste retrieval has been demonstrated in routine waste management operations and Tank 16 sludge removal and chemical cleaning tests. Control measures utilized in waste retrieval include leak containment and detection and filtered tank ventilation exhausts. Monitoring of personnel, filtered tank air, and groundwater have not detected any releases to the environment. Therefore, no environmental improvements are foreseen in changes from the present waste retrieval equipment or for the provision of enlarged tank openings.

5.2.3.1 Reasonably Foreseeable Environmental Effects

Enlarged tank top openings are not expected to add any environmental effects unless there are slightly increased emissions from sealing problems.

As waste retrieval equipment is improved, the result could possibly be a further reduced risk of releasing radioactive material to the ground or to the atmosphere during waste retrieval.

5.2.3.2 Effect on Tank Durability

Enlargement of the tank top opening may reduce the stability of the tank top and therefore influence tank durability or the ability to retrieve the waste.

Improved waste retrieval equipment will have no effect on tank durability.

5.2.3.3 Effect on Ease of Waste Retrieval from the Tanks

Enlarged tank openings would provide greater flexibility in design and utilization of equipment for improving efficiency of waste retrieval and tank cleaning.

Improved waste retrieval equipment could possibly enable the waste to be moved more rapidly and efficiently and would allow more rapid and effective cleaning of the tanks.

Using improved equipment, when developed, would reduce the potential for normal or accidental releases of radioactive material to the environment and would reduce the radiation dose received by personnel performing the waste removal and tank cleaning.

5.2.3.4 Effect on Choice of Technology and Timing for Long-Term Radioactive Storage and Final Disposal

None foreseen.

5.3 NO ACTION ALTERNATIVES

The preferred alternative includes all of the improvements in tank design, monitoring, and controls developed during the 25 years of high-level waste storage which are thought necessary for safe and reliable operation. The "No Action" alternatives violate DOE waste management policies. The Department of Energy is committed to storing radioactive wastes in tanks with the most recent improvements in design and monitoring to the extent economically and technically practicable until permanent disposal technology is developed and implemented.

The "No Action" alternatives were considered in ERDA-1537. Even with additional operational control and monitoring to prevent releases to the environment, continued use of older tanks is less reliable than using tanks of the improved design, and does increase the risk of abnormal occurrences. Therefore, the "No Action" alternatives are unacceptable.

5.4 SOCIOECONOMIC EFFECTS

This section deals with the influence of the preferred alternative and other alternatives, including no action, on the community. Construction of the tanks has been in progress for about 4 years and the effects on the surrounding communities has already taken place without any apparent adverse effect.

5.4.1 Operating Effects

The waste tank farm operating force before waste retrieval and tank cleaning began was about 50 people. An increase to a peak of about 120 people in 1982 is forecast for waste retrieval, tank cleaning, and full operation of four evaporators. This increase will occur, although at a later time, regardless of the design alternative selected. After this peak, the force will decrease to about 65 people when tank cleaning is complete and only two evaporators are operating. The difference between 50 and 65 people is due to a planned increase in surveillance requirements; not because of the new tanks.

5.4.2 Decommissioning

The strategy for decommissioning tanks is being developed and will be subjected to separate environmental review.

5.4.3 Effect of the Alternatives

5.4.3.1 Preferred Alternative

The effects are already described.

5.4.3.2 Thicker and More Chemically-Resistant Tank Steel

This alternative would cause a significant impact financially because of the money already expended and increased cost of new thicker wall tanks.

The same relative number of people would be utilized to construct the new tanks and the operating force buildup would be delayed.

5.4.3.3 Cathodic Protection and Better Waste Retrieval Equipment and Enlarged Openings

Implementation of these alternatives will have minimal impact on socioeconomic issues. Implementation would require additional materials and some significant retrofitting, resulting in increased costs, short term manpower increases and program delays, including a delay in removing older-design tanks from service. While these factors do not impact significantly on socioeconomic issues, they would impact on the waste management program because of the delay in availability of new waste storage capacity.

5.5 RELATIONSHIP OF PROPOSED ACTION TO LAND USE PLANS, POLICIES, AND CONTROLS

There are no known conflicts with national, state, or local plans and programs in the operation of the waste tanks under construction. The plantsite was set aside by the U.S. Government in 1950 as a controlled area for the production of materials needed for national defense. It is not open to the public except for guided tours, controlled deer hunts, controlled through-traffic along S.C. Highway 125 (SRP Road A), the Seaboard Coast Line Railroad, and along U.S. highway 278 at the north edge of the site, and authorized environmental studies.

The Savannah River is a valuable natural resource. The continuing waste management operations have no major effect on the use of this resource because normal thermal and radioactive releases are small, and accidental releases are extremely unlikely.

The areas used for the waste tanks are barren spots within existing waste tank farm areas with no historically significant features. Further, based on our experience with excavation in the immediate vicinity and archaeological surveys, the likelihood of any archaeological interest is small.

There are no foreseeable impacts on land-use plans for any of the alternatives.

5.6 UNAVOIDABLE ADVERSE EFFECTS

The only significant adverse effects caused by operation of the waste tanks as part of the overall waste management facilities are (1) the small offsite population dose commitment from release of radionuclides, primarily tritium as water vapor from the waste tanks, and (2) the commitment of about one acre of land for each waste tank for an indefinite period.

Annual atmospheric tritium releases from the vapor space of waste tanks and evaporation of water from fresh waste receipts result in an average whole body dose commitment at the Savannah River Plant boundary of about 2.3×10^{-6} mrem and a dose commitment to the total population living within a 100-km radius of the plant center of about 0.46 man-rem.[4] This is not an incremental release associated only with the new tanks, but rather the release resulting from management of the total waste volume. In 1978, the dose commitment from all plant sources to the population within 100 km of the plant center was 135.8 man-rem (119.2 man-rem from ^{3}H).[5] Some dose to the population is unavoidable because complete elimination or recovery of these releases is technically and economically impractical.

NOTE: The doses compared here are for 100 km because the plant monitors and reports radioactive releases for that distance and covers about 700,000 people (1970 census). The values in Section 5.1.2.1 are from an analysis covering 150 km and about 2.3 million people are covered (1970 census).

None of the alternatives would have any significant adverse effect if all design and adjustments are correct. The preferred alternative would result in taking older-design tanks out of service earlier, and could conceivably result in reduced radioactive releases for this reason.

If new thicker wall tanks were built, additional land and resources would be committed.

5.7 RELATIONSHIP BETWEEN SHORT-TERM USE AND LONG-TERM PRODUCTIVITY

The 14 new waste tanks and auxiliaries will utilize existing land and water resources at the Savannah River Plant. These facilities will be within the controlled-access 200 Areas.

Continuing studies of strategies of ultimate decontamination and decommissioning of retired waste facilities are part of the programs at SRP and other DOE sites. These studies, in addition to ensuring safety, will stress surveillance, maintenance, and restriction in the future use of these sites. The storage of liquid waste, salt cake, and sludge in near-surface storage tanks is considered an interim plan for waste management. Work is under way to define acceptable long-term storage methods and, until such methods are chosen, the waste will continue to be stored in retrievable form. A decision on waste immobilization for long-term storage is expected in the early 1980's with potential startup of the waste solidification facilities in the late 1980's.

The major impact of the alternatives would be longer use of the older-design tanks with their potential for abnormal occurrences, despite surveillance and monitoring, because they do not take advantage of improved design and equipment included in the fourteen new tanks.

5.8 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

Permanent commitments of natural resources to operation of the new waste tanks are relatively small. Production of steam for the waste tanks requires the consumption of about 50 tons of low sulfur coal per year per waste tank. This compares to about 3200 tons of coal per year for each of the four waste tank farm evaporators.

Water and materials (such as chemicals or fuels which are burned, consumed, or altered during use), are used during the construction and operation of waste tanks. Table 5-6 lists those resources used in significant amounts to construct a waste tank.

TABLE 5-6

Significant Resources Used During Construction of a Waste Tank

Resource	Per Tank
Water, m^3	2500
Materials	
Concrete, m^3	2500
Steel, metric tons	1350
Lumber, m^3	360
Argon, m^3	30,000
Propane (liquid), L	16,000
Diesel Fuel, gal	30,000
Gasoline, gal	15,000

As described above, the tanks occupy only a small fraction of the total land area occupied by the plantsite. It is conceivable that even these areas could be reclaimed in the future, but it may not be technically or economically practical to do so. About 1 acre of land is committed for each waste storage tank for high-level liquid wastes.

5.8.1 Thicker and More Chemically Resistant Tank Steel

This alternative would have the greatest impact on commitment of resources. The tanks under construction could not easily be retrofitted with thicker steel plates. An additional commitment of land and resources approximately equal to those already committed would be required because all fourteen tanks would have to be redesigned and rebuilt.

5.8.2 Cathodic Protection System

This alternative would require modification of the existing tanks for the placement of anodes and wiring. For effective cathodic protection, large, high-current power supplies would be required. Operation of the system would require electrical power. None of these resources is considered recoverable.

5.8.3 Better Waste Retrieval Equipment and Enlarged Openings

This alternative would require modification of the tank tops to enlarge the present openings. A significant expenditure would C be required at this stage of construction to accomplish this modification. Despite careful design, the modification might result in structural damage to the tanks.

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