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Atlantic Richfield Hanford Company
Richland, Washington 99352

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MAJOR PROGRAM ISSUE
FOR FY 1973
IMPROVED RISK FIRE PROTECTION
200 AREAS

N. P. Nisick

May 26, 1971

PREPARED FOR THE U.S. ATOMIC ENERGY
COMMISSION UNDER CONTRACT AT(45-1) 2130

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ATLANTIC RICHFIELD HANFORD COMPANY
MAJOR PROGRAM ISSUE
FOR FY 1973

Title and Location of Project: Improved Risk Fire Protection, 200 Areas - Richland, Washington

Date A-E Initiated:
1st Quarter FY 1973

Current Cost Estimate:
\$1,500,000
May 1971

Date Physical Construction Starts:
2nd Quarter FY 1973

Date Construction Ends:
3rd Quarter FY 1974

Obligation and Cost Schedule:

<u>Fiscal Year</u>	<u>Obligation</u>	<u>Cost</u>
1973	\$1,500,000	\$600,000
1974		\$900,000

Purpose of Project:

The purpose of this project is to provide the improvements necessary to upgrade the 200 Area

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fire protection systems to the equivalent of the so-called "improved risk" classification in all facilities with a potential for significant radioactive contamination spread, excessive property loss, or the shut down of essential services as a result of a fire.

The standard of fire protection for the 200 Area facilities has been steadily upgraded and improved over the past years. The continuing intent is to achieve and maintain an "improved risk" status in 200 Area facilities with inordinate loss potential, consistent with the intent of U. S. Atomic Energy Commission (AEC) Manual Chapter 0552, AEC Appendix 0552, and the Richland Operations Office (RL) Supplement.

Project Description:

Fire protection systems improvement to be provided by this project include extensive additions to fire detection and sprinkler systems in process, service, storage, and personnel areas. Protection of the following facilities would be included: B Plant (High Level Radioactive Waste Fractionation and Storage) with its organic containing process cells; offices; coal crushers and conveyers; ventilation exhaust systems; electrical power supply systems; supply, trash and solvent storage areas; change rooms; and personnel egress routes. Alarm systems

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would be zoned and integrated into existing systems. Money has been included in this project for additional 234-5 Building (Z Plant - plutonium processing) fire protection, primarily plutonium containment exhaust filter protection, to provide a higher level of fire and environmental protection. For a complete list of improvements by building, see Appendix A with figures.

Benefits and Justification:

This project will upgrade the 200 Areas fire protection to the equivalent of the "improved risk" category in all facilities with a potential for a significant release of radioactive materials to the environs, or where excessive property loss could occur, and those facilities providing vital emergency services. It is recognized that the federal government assumes the total fire loss risk on all of its facilities; however, this project would reduce the losses from fire and place the 200 Areas in a lower risk category. The potential for extensive physical damage, extended down time, serious environmental contamination, costly replacement, personnel injury, and adverse publicity would be significantly reduced.

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Alternatives:

The alternatives to this project involve the degree of fire risk that is acceptable and prudent. Any deferral or reduction of this project would require acceptance of (1) less than the "improved risk" standard of fire protection; (2) higher risk of personnel and environmental radioactive contamination; (3) higher risk of personnel injury and property loss; and (4) a 10 to 12 percent per year increase in project cost.

Environmental Analysis:

This project will have no significant adverse effect on the quality of the environment; rather, it will significantly reduce the potential for environmental contamination as a result of a fire. The proposed facilities will be located at the Hanford Works of the Atomic Energy Commission in the State of Washington. The proposed facilities will invoke no irreversible or irretrievable commitment of resources. See Appendix B for site background information.

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Costs:

Design and Construction

A. Engineering, design and inspection at approximately 37 percent of construction, Item C.	\$	325,000
B. Land and Land Rights		0
C. Construction		875,000
271-B (Waste Fractionation & Storage Essential Services), wet pipe sprinklers	\$	64,000
221-B (High Level Radioactive Waste Fractionation & Storage), sprinklers, fire cycle spray systems, and fire doors		61,000
Peripheral 221-B Bldgs., detectors, alarms, and controls		11,000
BY Tank Farm Bldgs. (High Level Radioactive Waste Storage), detectors		12,000
241-CR-601 Bldg. (High Level Radioactive Waste Storage), sprinklers		11,000
241-SX Tank Farm Bldgs. (High Level Radioactive Waste Storage), detectors and controls		13,000

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271-U Bldg. (Offices), detectors	\$ 8,000
224-U Bldg. (Offices & Process Equipment), detectors and fire walls	42,000
T Tank Farm Bldgs. (High Level Radioactive Waste Storage), detectors and controls	6,000
244-AR Vault (High Level Radioactive Waste Handling), detectors and fire wall	9,000
A, AX, AY Tank Farm Bldgs. (High Level Radioactive Waste Storage), detectors, fire walls and controls	17,000
T Plant Offices (Radioactive Equipment Decontamination & Repair), detectors and fire hydrant	27,000
272-E & W and 277-W Shops (Equipment Fabrication & Mock-Up), 2723-W (Mask Decontamination & Service Station), sprinklers and detectors	12,000
284-E & W Powerhouse coal systems (Essential Water, Steam, & Emergency Power), sprinklers	75,000
234-5 Bldg. (Z Plant - Plutonium Processing), Exhaust Filters and Water Supply, filter intake heat sinks, air washer, controls, fire walls, and check valves	368,000

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202-A Bldg. (Purex - Process Equipment, Organic Storage & Essential Stand By Services), sprinklers, detectors, fire doors and dampers, R & G Cell, fire cycle systems	\$ 118,000
241-C Tank Farm Bldg. (High Level Radioactive Waste Storage), sprinklers and controls	14,000
252-E & W Substations (Essential Power Transformers), sprinklers, fire wall, and water supply	7,000
D. Contingency at 25 percent of above	
Total Project Cost	\$ 300,000 <u>\$ 1,500,000</u>

Operating and Utilization

The incremental operating and utilization costs would be negligible.

Major Contractor and Intended Type of Contract:

Design would be on the basis of a negotiated architect-engineer contract. All construction not directly associated with operating facilities would be accomplished by fixed-price contractors selected on the basis of competitive bids. The remaining work would be within operating facilities and would be performed under a cost plus fixed-fee contract.

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Incorporation of Fallout Shelters:

Satisfactory fallout shelter space is readily available in the operating plants. The project does not create a need for additional shelter.

Compliance with Executive Order 11507:

The objective of this project, fire protection improvement, is in accord with the objectives of, and would enhance compliance with Executive Order 11507; Prevention, Control, and Abatement of Air and Water Pollution at Federal Facilities.

Evaluation of Flood Hazards:

None of the fire protection improvements to be provided by this project will be located in flood plain areas.

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Table 1

Detail Cash Flows and Present Values
Improved Risk Fire Protection
(Dollars in Thousands)

Fiscal Year	Capital	Operating Costs	R&D	Net Cash Flow	Net Cash Flow Discounted to FY 1971		
					7.5%	10.0%	12.5%
1971	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
1972	-	-	-	-	-	-	-
1973	600	-	-	600	519	496	474
1974	900	-	-	900	725	676	632
	<u>\$1,500</u>	<u>\$ -</u>	<u>\$ -</u>	<u>\$1,500</u>	<u>\$1,244</u>	<u>\$1,172</u>	<u>\$1,106</u>

Note: All cash flows are negative.

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Table 2

Detailed Cash Flows and Present Values
Improved Risk Fire Protection - One Year Deferral
(Dollars in Thousands)

Fiscal Year	Capital	Operating Costs	R&D	Net Cash Flow	Net Cash Flow Discounted to FY 1971		
					7.5%	10.0%	12.5%
1971	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
1972	-	-	-	-	-	-	-
1973	-	-	-	-	-	-	-
1974	600	-	-	600	483	451	421
1975	900	-	-	900	674	615	562
	<u>\$1,500</u>	<u>\$ -</u>	<u>\$ -</u>	<u>\$1,500</u>	<u>\$1,157</u>	<u>\$1,066</u>	<u>\$ 983</u>

Note: All cash flows are negative.

As indicated in Table 2 above and Figure 1 following, the costs for the one year deferred project are not escalated one year over the non-deferred case. Based on current trends, delaying the project one year could increase the cost of the project by 10 to 12 percent which would affect any economic comparison of the two cases. However, since this project does not provide any revenues or cost savings, the decision to accept the project in FY 1973 or to defer it one year should be based primarily on noneconomic considerations.

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Figure 1
Comparative Plot of Net Present Values
Improved Risk Fire Protection

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Appendix A:

LIST OF IMPROVEMENTS

<u>Building No.</u>	<u>Occupancy</u>	<u>Improvements to be Provided</u>
284-E & 284-W	Power houses supplying essential water, steam, and emergency power to facilities containing radioactive materials	Dry pipe sprinkler system for the crusher building and coal handling conveyor system.
271-CR	Services & Control Building for high level radioactive waste storage tanks	Wet pipe sprinkler system.
271-B	Essential services for 221-B Bldg.	Wet pipe sprinkler system.
221-B	Canyon Bldg. (High Level Radioactive Waste Fractionation and Storage)	
Change Room	Personnel Egress	Wet pipe sprinkler system.

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Appendix A-contd.

<u>Building No.</u>	<u>Occupancy</u>	<u>Improvements to be Provided</u>
Cells 10	Deep Cell (Organic Potential)	
26		
27	Solvent Extraction	A "Fire Cycle" fog system using existing piping in concrete to the cells with jumper-mounted temperature sensing fire detectors.
28	(Organic Cells)	
29		
30		
Exhaust Tunnel	Process Ventilation	A system of full cone spray nozzles across the tunnel after the point of air exhaust from all organic cells to protect the radioactive exhaust ventilation filters. Water flow rate of 1.5 to 2.0 gpm per 1000 cfm of air at a flow rate of 50,000 cfm. Remote operation to be from the 271-B Dispatcher's Office.
Substation	Transformers	Spray system to protect ventilation intakes and essential equipment. Separate duplicate transformers with a fire wall.
Stairwells	Personnel Egress	One-hour fire doors for all levels.

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Appendix A-contd.

<u>Building No.</u>	<u>Occupancy</u>	<u>Improvements to be Provided</u>
202-A (Purex)	Radioactive Process- ing Equipment, Radio- active Organic Storage, & Essential Stand By Services	
Lab Vent Room	Ventilation Equipment	Wet pipe sprinkler system.
PR Room	Glove Boxes	A "fire cycle" system.
Q Cell	Glove Boxes & Resin Inventory	A "fire cycle" system.
East End Of Hot Shop	Personnel Egress	Wet pipe sprinkler system.
N Cell	Glove Boxes	Wet pipe sprinkler system.
Office Area in- cluding Lunchrooms and Control Rooms	Personnel & Controls	Fire detectors.
R Cell	Organic Storage	A "fire cycle" system. Fire door and fire damper between sections.

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Appendix A-contd.

<u>Building No.</u>	<u>Occupancy</u>	<u>Improvements to be Provided</u>
G Cell	Organic Storage	A "fire cycle" system.
Old Storage Tunnel	Failed Contaminated Equipment	Fire detectors.
PR Corridor	Personnel Egress	Fire doors at each end.
Storage Gallery	Pulse Generators, Supplies, and Fall-out Shelter	Fire door and damper to pulse generators room.
P&O Gallery	Organic Storage	Transite enclosure and wet pipe sprinkler for R1A organic storage tank.
East & West Substations	Transformers	Fire walls between transformers.
271-BA	Laundry Storage	Fire detectors.
221-BC	Change House	Fire detectors.
221-BD	Laundry Storage	Fire detectors.
272-B	Elec. Shop	Fire detectors.
241-BY-254	Inst. Building	Fire detectors. Separate transformers with a fire wall.

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Appendix A-contd.

<u>Building No.</u>	<u>Occupancy</u>	<u>Improvements to be Provided</u>
241-BY-301	Inst. House	Fire detectors.
241-BY-302	Compressor Building	Fire detectors.
2707-BY	Change House	Fire detectors.
291-B	Fan Control	Fire detectors.
291-BB	Inst. Building	Extend temperature instruments to 271-B Dispatcher's Office.
241-C-601	Chem. Mixing	Demolish and remove.
241-SX-281	Pump House	Fire detectors.
241-SX-401	Condenser Inst. House	Fire detectors.
241-SX-402	Condenser Inst. House	Fire detectors.
241-SX-701	Compressor Building	Fire detectors.
241-SX-271	Ventilation Inst. Building	Fire detectors.
2707-SX	Change House	Fire detectors.

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Appendix A-contd.

<u>Building No.</u>	<u>Occupancy</u>	<u>Improvements to be Provided</u>
242-T	Evaporator Building	Fire detectors.
242-T-601	Compressor Building	Fire detectors.
271-U	Offices	Extend detector system throughout Building.
244-AR	Radioactive Sludge Removal & Waste Transfer	Extend fire detectors to tank room and compressor buildings. Build fire wall to separate transformer and emergency generator.
2707-AR	Change House	Fire detectors.
241-AX-801A	Inst. Building	Fire detectors.
241-AX-801B	Inst. Building	Fire detectors.
241-AY-801	Inst. Building	Fire detectors.
241-A-271	Control Building	Fire detectors plus fire wall between transformer station and building.
241-A-701	Compressor Building	Fire detectors.
241-C-102	Organic Storage Tank	Flame arrestors.

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Appendix A-contd.

<u>Building No.</u>	<u>Occupancy</u>	<u>Improvements to be Provided</u>
241-C-104	Organic Storage Tank	Flame arrestors.
2707-AX	Change Room	Extend fire detectors to laundry storage.
241-A-702	Exhaust Fans	Fire detectors.
271-T	Office & Services	Fire detectors throughout.
221-T	Equipment Decontamination	Fire detectors sections 2 and 14 through 20 of electrical gallery and sections 14 through 20 of pipe and operating gallery.
272-E	Mock-up Shop	Extend sprinkler system to cover mezzanine and stairs.
224-UA	UO ₃ Plant	Separate duplicate transformers with a fire wall.
224-U	UNH Concentrator and UO ₃ Plant Control	Fire detectors. Separate duplicate transformers with a fire wall.
2715-U	Oil Storage	Fire detectors.
272-W	Machine Shop	Extend sprinkler system to include the foreman's office.

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Appendix A-contd.

<u>Building No.</u>	<u>Occupancy</u>	<u>Improvements to be Provided</u>
277-W	Mock-up Shop	Extend sprinkler system to lunchroom and storeroom.
2723-W	Mask Washing	Fire detectors.
252-E & W	Transformers	Provide fire walls between transformers and spray system to protect the super structure.
234-5-Z	Pu Processing	Install air washer activated by high duct temperature in front of the final filter rooms in E-3 and E-4 exhaust systems. Separate duplicate transformers with a fire wall.

The reliability of the Z Plant (Plutonium Processing) water supply is to be improved by:

1. Installing check valves in the two water lines to the area. This will reserve high tank water to use within the Z Plant Area in case of failure of the water supply.
2. Installing a hydrant on the raw water line to supplement the high tank in case of a sanitary water failure or in case of a maximum fire.
3. Installing a low-level alarm on the high tank.
4. Installing electrical supervision for control and sectionalizing valves on the fire protection system.

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Appendix A-contd.

The reliability of the water supply to the T Plant (Radioactive Equipment Decontamination & Repair) is to be improved by the addition of a fire hydrant on the raw water line within the old exclusion area fence.

The above improvements are to be designed and installed in accordance with current National Fire Protection Association (NFPA) Fire Codes and other pertinent standards as listed in AEC Manual Chapter 0550 and the RL Supplement. The detection systems will be integrated into the existing fire alarm system with conveniently located supervisory and annunciator panels at each facility.

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- FIRE DETECTORS
- ▨ WET PIPE SPRINKLER SYS.
- ▤ CELLS, FIRE "CYCLE" FOG SYS.
- NOTE #1 AUTOMATIC SPRAY SYS. FOR TRANSFORMERS (7 PLACES)

B-PLANT
FIRE PROTECTION
IMPROVEMENTS
FIGURE 2

241-TX-AREA
FIRE PROTECTION
IMPROVEMENTS
FIGURE 5

NOTES

1. PROTECT FINAL FILTER ROOMS WITH AIR WASHER DUCT SECTION WITH AUTOMATIC ACTIVATION BY HIGH TEMPERATURE
2. PROVIDE LOW LEVEL ALARM FOR HI WATER TANK
3. PROVIDE SUPERVISION VALVES FOR FIRE WATER SYSTEM

Z - PLANT
FIRE PROTECTION
IMPROVEMENTS
FIGURE 6

202-A BLDG.
FIRE PROTECTION
IMPROVEMENTS
FIGURE 7

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Appendix B:

ENVIRONMENTAL SITE DESCRIPTION

In 1943, the Manhattan project obtained land in southeastern Washington and constructed facilities known as the Hanford Works to produce plutonium for the war effort. In early 1947, the facilities were transferred to the jurisdiction of the Atomic Energy Commission. Nuclear-related activities have continued without interruption.

The site chosen for the radiochemical processing operations, near the center of the Hanford Works, has proven to be near ideal for this type of activity. The site is isolated, being about 10 miles from the project boundary. The ground water lies more than 200 feet below ground surface and, from most locations beneath the plant area, moves slowly toward the Columbia River. An exception to this slow movement involves one of the ponds created by cooling water discharges; this pond is located over a channel once used by the Columbia River, and some of the water from this source reaches the river in about five years. Precipitation, which averages 6.1 inches per year, evaporates rather than percolates to the water table. In addition, the soil has ion-exchange properties and tends to sorb and hold most radioactive materials with which it comes in contact. Since start of plant operation, these favorable site characteristics have protected the environs from radioactive contamination.

In view of the beneficial site characteristics described above, solid wastes have been placed in trenches about 20 feet deep and covered with four or more feet of soil. The solid wastes could be recovered, but with difficulty. There has been no detectable migration of radioactivity from these buried wastes. The amount of radioactivity normally permitted in effluent liquid streams has been closely regulated since startup of the plants. The water streams sent to ponds are largely uncontaminated cooling water; steps are taken to control the pond to less than 5×10^{-5} microcuries per milliliter, an empirically-determined level at which radioactivity pickup and reconcentration by vegetation and wildlife are not significant. Other

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Appendix B-contd.

effluent streams with intermediate levels of radioactivity (less than 100 microcuries per milliliter) are sent to structures, about 20 feet below the surface, called cribs or caverns, where the soil retains most of the radionuclides while the water percolates to the water table. The two most mobile radioisotopes, tritium and ruthenium, do enter the saturated ground water flow system where they decay and are diluted as they flow with the ground water. The tritium in the ground water near the Columbia River cannot be detected above the tritium concentration in the river resulting from fallout; ruthenium at the same point has remained below detectable limits (about an order of magnitude below maximum permissible concentrations for uncontrolled areas set by the AEC Manual Chapter 0524) by current analytical techniques.

The site environs are typical of semi-arid ecology except as modified near the Columbia River and bodies of water formed by plant water effluents. Approximately 200 to 300 local ducks reside on the ponds formed by the discharge of cooling water. The duck population increases during migratory seasons. Geese and ducks in large numbers are found on the Columbia River. A herd of about 100 deer is found along the Columbia River, and a few deer are found in the vicinity of the separations plants. Other wildlife include field mice, ground squirrels, jackrabbits, coyotes, hawks, waterfowl, insects, snakes, etc.

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