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ENVIRONMENTAL STATEMENT

LOSS OF FLUID TEST FACILITY

National Reactor Testing Station Idaho

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JANUARY 1973

UNITED STATES ATOMIC ENERGY COMMISSION

RESPONSIBLE OFFICIAL:

R. E. HOLLINGSWORTH
GENERAL MANAGER

WASH-1517

ENVIRONMENTAL STATEMENT

LOSS OF FLUID TEST FACILITY

AT THE

NATIONAL REACTOR TESTING STATION

JANUARY 1973

U.S. ATOMIC ENERGY COMMISSION

TABLE OF CONTENTS

I. SUMMARY 1

II. BACKGROUND 5

A. Detailed Description 5

B. Anticipated Benefits 12

C. Characterization of the Existing Environment 16

1. Climatic and Atmospheric Diffusion Conditions 16

2. Geology and Hydrology 20

3. Ecology 23

4. History of Land Use 27

5. Environmental Monitoring Program 30

III. ENVIRONMENTAL IMPACT 37

A. Probable Environmental Impact 37

1. Significance of Mode of Operation 37

2. Direct Radiation Exposure 37

3. Releases to the Environment 43

a. Releases to the Atmosphere 43

b. Liquid Waste Discharges 50

c. Solid Waste Disposal 59

4. Transportation of Fuel and Radioactive Wastes 60

B. Extraordinary Adverse Environmental Effects 65

IV. UNAVOIDABLE ADVERSE ENVIRONMENTAL EFFECTS 69

V. ALTERNATIVES 70

A. Program 70

B. Site 71

C. Waste Treatment 72

TABLE OF CONTENTS

(cont.)

VI. RELATIONSHIP BETWEEN SHORT-TERM USES AND LONG-TERM PRODUCTIVITY. 74

VII. STATE, LOCAL OR REGIONAL CONFLICTS 75

VIII. IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES 76

IX. COST-BENEFIT ANALYSIS 78

X. REFERENCES 81

XI. APPENDIX 83

A. Coordination 83

B. LOFT Facility Preliminary Design Features 86

C. Glossary 89

XII. COMMENTS AND AEC RESPONSES 90

Summary 90

Letters and Replies 93

1. Department of Health, Education, and Welfare 93

2. Department of Defense 95

3. Department of Transportation 97

4. Department of Agriculture 99

5. Department of Commerce 103

6. Environmental Protection Agency 106

7. Department of the Interior 109

8. State of Idaho 113

LIST OF FIGURES

1. Aerial View of the LOFT Containment Vessel and Nearby Structures 6
2. Plan View of LOFT Containment Vessel and Support Buildings 7
3. Elevation View of LOFT Containment Vessel and Support Buildings 8
4. Schematic Drawing of the Mobile Test Assembly 9
5. Map of National Reactor Testing Station, Idaho 17
6. Population Distribution and Annual Wind Direction Frequency for the LOFT Facility 18
7. Typical NRTS Vegetation 24
8. Map of NRTS Vegetation Types 26
9. Areas Open to Grazing by Permit Within the NRTS Boundaries 29
10. Production and Monitoring Wells On and Near the NRTS 31
11. Environmental Monitoring Locations Near the NRTS 32
12. Air Sampling Locations On and Near the NRTS 33
13. Monitoring Wells in the Vicinity of the Loss of Fluid Test Facility . 36
14. Security and Obstruction Fences Around the LOFT Facility 41
15. Maximum Integrated Direct Radiation Doses for LOFT Experiment 42
16. Schematic Diagram of LOFT Liquid Waste Systems 51
17. Generalized Geologic Diagram of LOFT Disposal Pond 55

ENVIRONMENTAL STATEMENT

U.S. ATOMIC ENERGY COMMISSION
LOSS OF FLUID TEST FACILITY
AT THE
NATIONAL REACTOR TESTING STATION

JANUARY 1973

I. SUMMARY

This Environmental Statement has been prepared in compliance with the National Environmental Policy Act for the U.S. Atomic Energy Commission's (AEC) proposed administrative action of operation of the Loss of Fluid Test (LOFT) facility. Construction of the LOFT containment vessel and attached support facilities is nearing completion at the AEC's National Reactor Testing Station (NRTS) in southeastern Idaho. The Station's area includes parts of Bingham, Bonneville, Butte, Clark and Jefferson Counties.

The LOFT program, part of the AEC's overall ongoing safety program, is designed to study in a safe and controlled manner the reactor system responses and consequences of highly improbable reactor accidents, such as gross failure of primary coolant system integrity resulting in the loss of cooling fluid from the reactor, and the performance of safety systems designed to mitigate the consequences of such accidents. The LOFT facility is designed to develop the knowledge and techniques required to help understand the effects of the accidents and to minimize the

consequences of such highly improbable accidents in large commercial light water type nuclear power plants. The LOFT facility is the only reactor in the world which has the capabilities needed to carry out fully integrated reactor system dependent safety testing. Operation of this new facility is scheduled to begin by early 1974.

No significant adverse short- or long-term effects on plant, animal or human populations are anticipated as consequences of operating the facility. During routine plant power operation, radiation releases will not exceed the requirements of AECM 0524 and doses resulting from releases of radioactivity will not exceed the proposed guidelines set forth in 10 CFR 50, Appendix I. Even under planned blowdown tests, every reasonable attempt will be made to comply with these limits; however, in recognition of the uncertainties associated with the LOFT test program, conservative estimates of the radiation doses resulting from planned experiments have been made and indicate that such doses will not exceed the guidelines of the Federal Radiation Council (FRC)* even though these experiments may cause severe damage to the reactor fuel.

Highly contaminated liquid radioactive wastes will be shipped from the facility to an on-site NRTS processing plant for treatment. All contaminated scrap material which is not reprocessed or decontaminated will be packaged for shipment to a controlled storage area. No significant adverse

*Although the functions of the FRC have been transferred to the Environmental Protection Agency (EPA), the radiation exposure guidelines established by the FRC remain in force and are applicable to AEC operations.

short- or long-term environmental effects are anticipated as a consequence of transportation of these wastes.

The facility is equipped with tanks that can hold substantial quantities of both liquids and gases pending radioactive decay. The stack is equipped with a radiation monitor. Liquid wastes not shipped offsite are routinely sampled to assure that radioactivity levels are acceptably low prior to discharge.

Approximately 500 acres of the NRTS have been committed to the LOFT facility. Some disturbance or elimination of natural vegetation and habitats in the immediate plant area (approximately 50 acres) resulted from construction activities. Some of the structures utilized for the LOFT program can be reused by the AEC; all will remain under the control of the Federal Government in the forseeable future. No limitation on potential future uses of lands adjacent to those utilized by the LOFT program has been introduced and their long-term utility and productivity have not been diminished.

Approximately 7.5 kilograms of fissionable uranium-235 will be used per year of test operation of the LOFT reactor. This fuel expenditure will be made to obtain the long-term benefits of the facility's contributions to the Commission's reactor safety program.

The following alternatives were considered in the initial planning for the LOFT program and in the design of the facility:

1. Accomplish the LOFT program objectives at a location other than the NRTS.
2. Conduct the LOFT program at an alternate facility at the NRTS.
3. Eliminate the LOFT program objectives from the AEC's reactor safety program.
4. Provide alternative treatments for liquid and airborne effluents.

The environmental and technical benefits expected to be gained from the operation of this facility and completion of the experimental program and the environmental and monetary costs associated with completion of the LOFT experimental program, as well as the foregoing range of alternatives and their environmental impacts, were evaluated, and it was concluded that the AEC should complete the facility as presently designed and conduct the proposed experimental program.

II. BACKGROUND

A. Detailed Description

The LOFT facility is a versatile reactor test facility being developed under the AEC's water reactor safety program to help provide validating experimental information and test data regarding the response of light water reactor safety systems under various postulated accident conditions. The facility (Figures 1, 2 and 3) is located within the Test Area North (TAN) complex at the NRTS near Idaho Falls, Idaho. The entire NRTS is a Government reservation and access is limited for reasons of health, safety and national security. Construction of the containment structure and most of the design for the Mobile Test Assembly (MTA) (Figure 4), which includes the reactor, are completed. All major long-lead time items, such as the reactor vessel, are in the procurement process. Operation is scheduled to begin by early 1974.

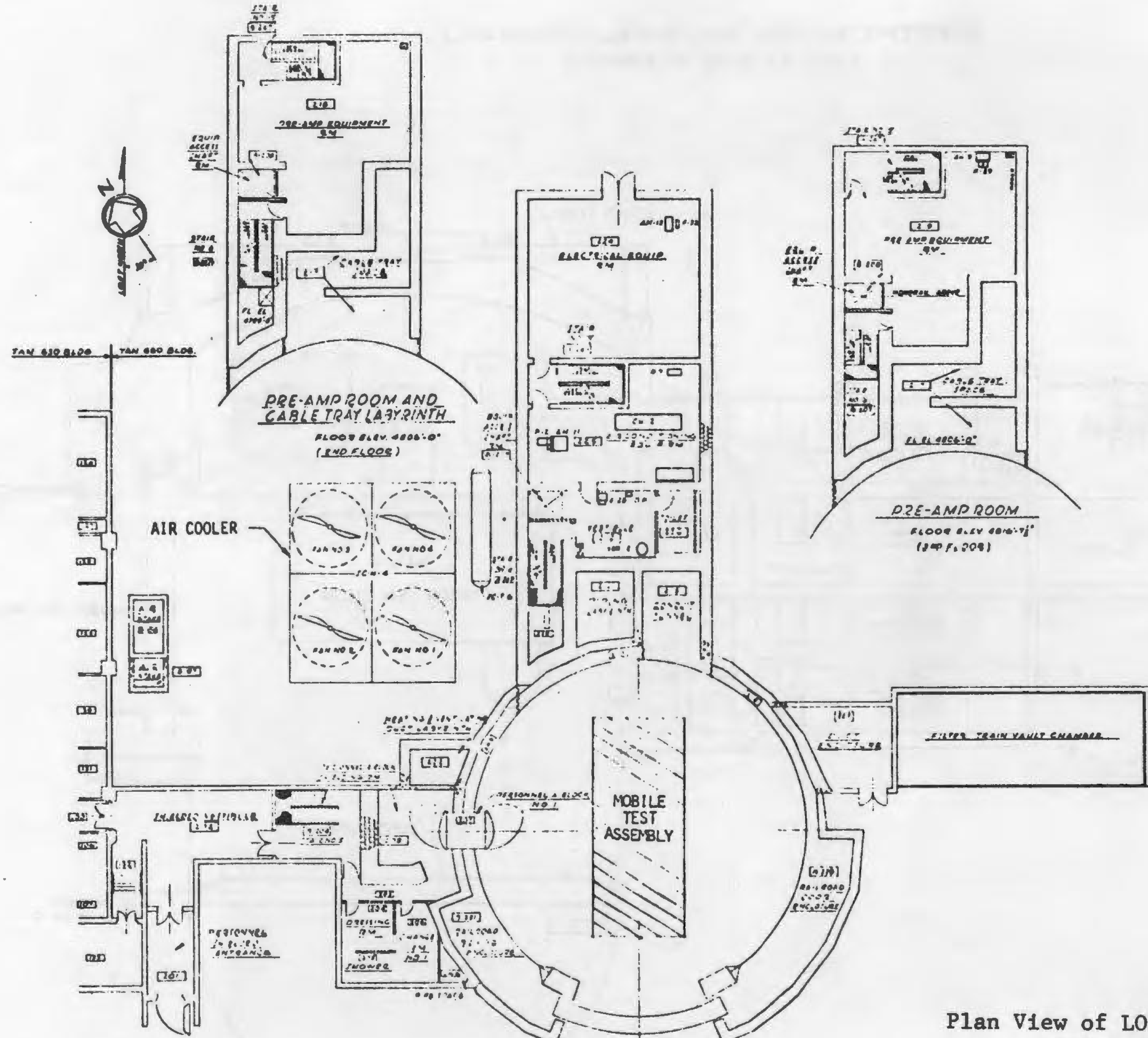
The LOFT facility is made up of three distinct units; a pressurized water reactor plant, a low leakage containment vessel and associated support systems. Shielded space for reactor control equipment, experiment instrumentation and personnel office space are provided in a building adjacent to the containment vessel.

The LOFT reactor is a pressurized water reactor capable of generating 55 megawatts (MW) of thermal power. Heat generated in the reactor core during reactor operation is transferred from the primary coolant* to the secondary

*The coolant is a substance that is circulated through a nuclear reactor to transfer heat from the fuel to the steam generator. The most common coolant for commercial nuclear plants is water.

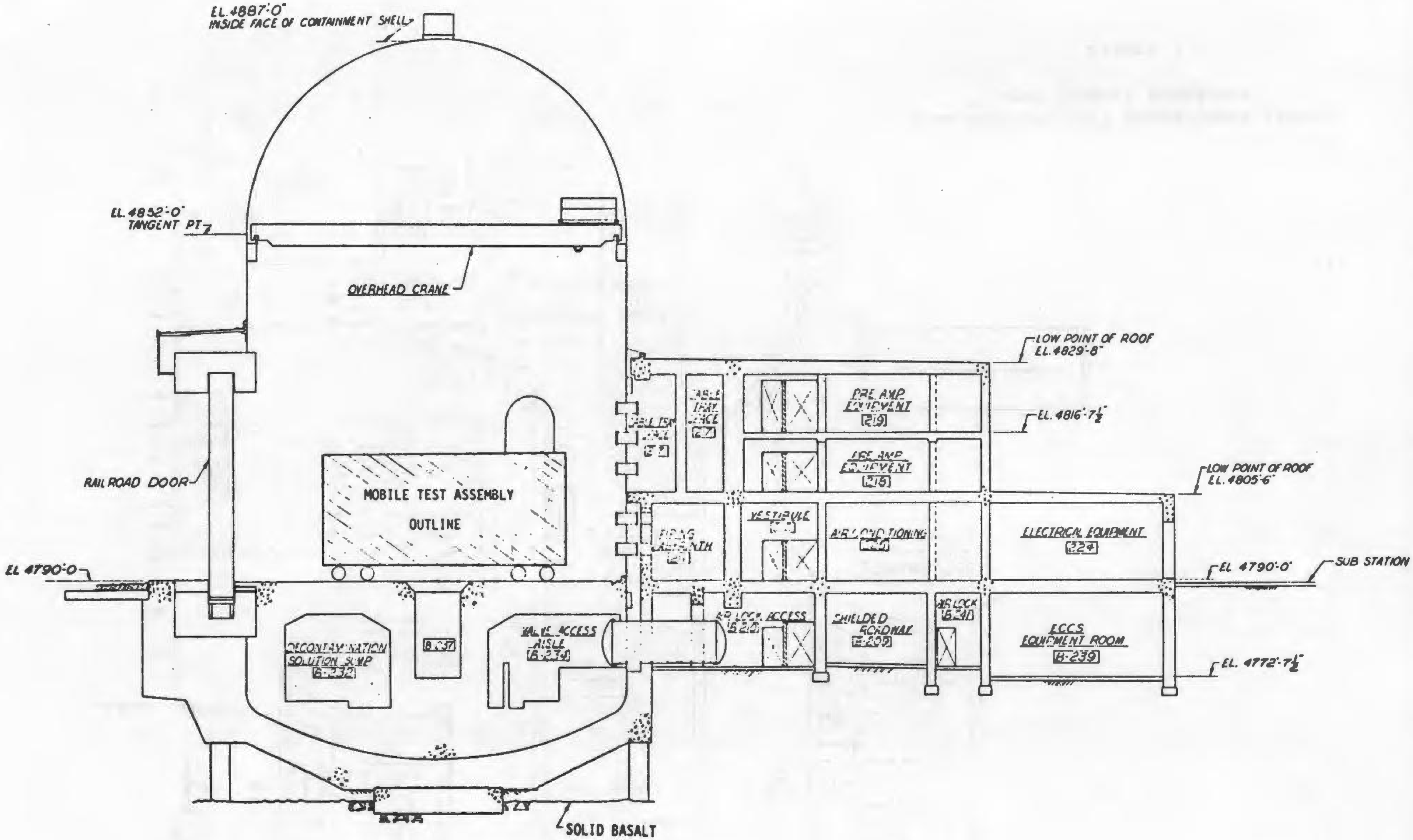
Aerial View of the LOFT Containment
Vessel and Nearby Structures

Figure 1



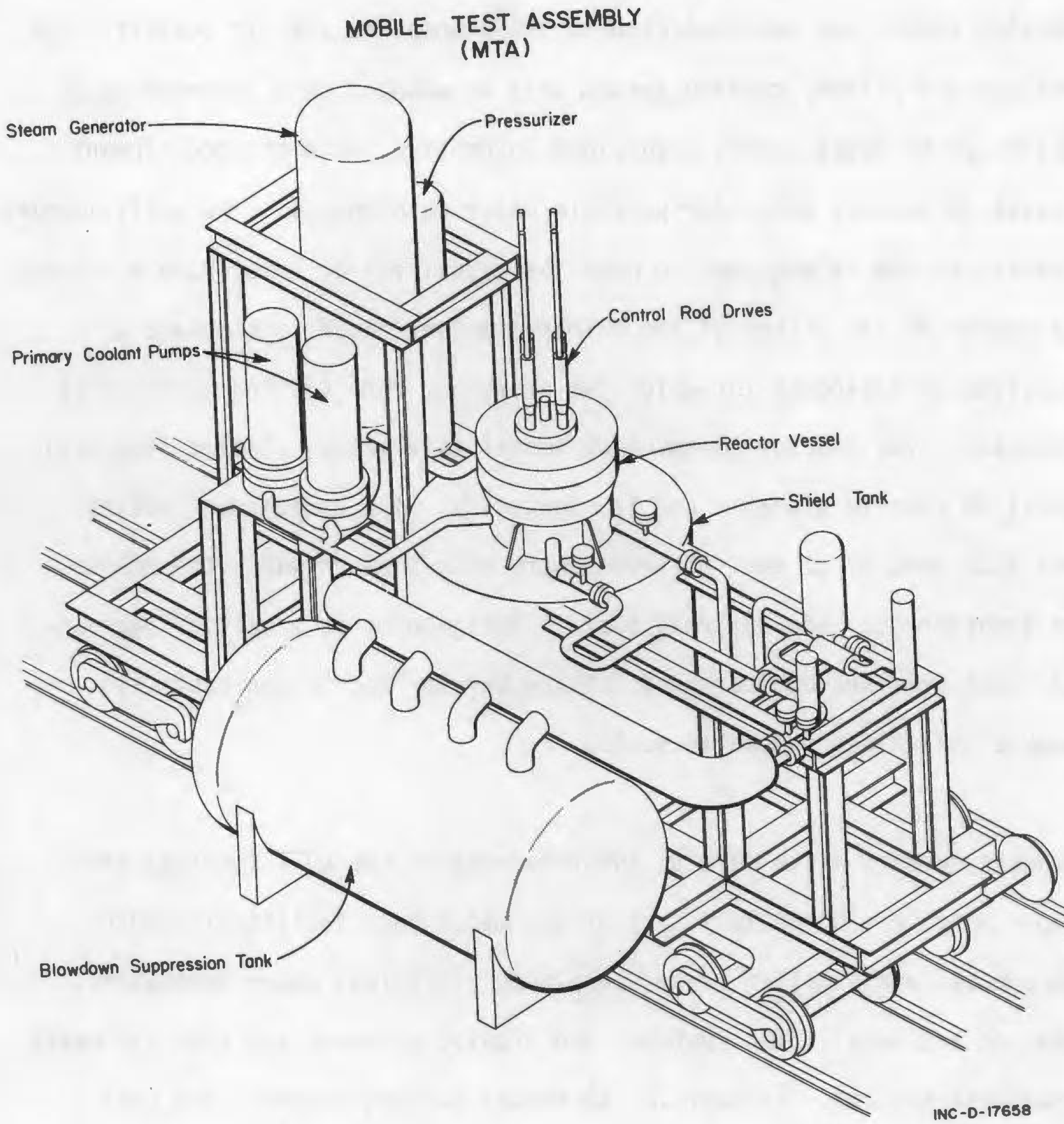
Plan View of LOFT Containment Vessel
and Support Buildings

Figure 2



Elevation View of LOFT
Containment Vessel and Support Buildings

Figure 3



Schematic Drawing of the
Mobile Test Assembly

FIGURE 4

cooling system and then rejected to the atmosphere via air coolers. The reactor and primary cooling system will be mounted on a railroad dolly which can be moved, using a shielded locomotive, from the containment vessel to support areas for possible major maintenance. The dolly-mounted reactor system is designed to have the capability of simulating a variety of breaks in the piping of the primary coolant fluid to simulate a spectrum of accidents for which the emergency core cooling system must function. The reactor containment vessel is a welded steel cylindrical shell 70 feet in diameter and 129 feet high. The containment vessel has a 22 feet by 33 feet railroad entry door through which the MTA can be transferred. The railroad door is designed to be a part of the containment pressure boundary and leakage barrier and is equipped with double inflatable pneumatic seals.

Support systems which make up the remainder of the LOFT facility are those which are normally a part of any major test facility including compressed air supplies, water supplies, electrical power generators, heating and ventilating systems, and liquid, airborne and sanitary waste treatment systems. In addition to normal support systems, the LOFT facility has several systems which are specifically designed to control and minimize the release of undesirable materials to the environment. These include the blowdown suppression system for containing the total inventory of material exhausted from the reactor primary coolant system during most experiments, a filter system to clean up the containment vessel atmosphere for those tests exhausting to the containment vessel, a radioactive waste holdup system for contaminated liquids, a radioactive waste gas filter system for contaminated air from waste tank vents and other plant areas, and a pressure reduction spray system which can wash radioactive contaminants from the containment vessel atmosphere as well as reduce containment vessel pressure.

The blowdown suppression system deserves special mention since it will be used to contain the effluent for most experiments and will be a major factor in reducing releases from the LOFT experiments to the environment. The blowdown suppression system, visible in Figure 4, consists of a tank and header assembly having a capacity of approximately 3,000 cubic feet which will be partially filled with borated water. Steam and water ejected from a simulated break in the primary coolant piping will be piped to the blowdown suppression tank where the steam will condense to water. Most radioactive materials will be removed from the water by ion exchange beds in the water cleanup system. Radioactive gases trapped in the blowdown suppression tank will be held up, sampled and circulated through a gas filter system prior to being exhausted to the atmosphere via a 150-foot stack under preselected and monitored meteorological conditions.

B. Anticipated Benefits

The most severe postulated accident for water-cooled power reactors is the sudden and complete loss of all cooling fluid from the reactor primary coolant system. When the coolant is lost, the heat energy stored in the fuel and the energy released by radioactive decay of fission products withinthe fuel cannot be removed effectively and the fuel cladding temperature rises. If insufficient supplemental cooling is provided, some of the fuel cladding may perforate or melt and allow radioactive fission products to escape. Some of these fission products could then move through the reactor coolant system to the point of pipe rupture (through which the coolant was initially lost) and out into the containment vessel. The heat released from the reactor coolant and the heat from the decay of fission products could cause a buildup of pressure and temperature within the containment vessel.

Safety systems designed to minimize the in-plant and environmental consequences of a wide spectrum of such postulated loss-of-coolant accidents are provided in water-cooled nuclear power plants. The safety system for cooling the core of a water-cooled reactor injects auxiliary water to flood the reactor core in order to reduce the likelihood of fuel cladding failures and the consequent release of fission products to acceptable levels. In commercial plants, this system is called the Emergency Core Cooling System (ECCS). The ECCS consists of three separate and independent subsystems designed to provide supplemental coolant to the core for three different pressure ranges. First, the high pressure injection system, consisting of a water supply and high pressure pumps, is activated. This is followed by the second system, consisting of pressurized tanks containing cooling water, which operate at intermediate pressures. The third system is the low pressure injection system, composed of pumps and heat exchangers, which provides coolant at low pressure and maintains coolant circulation for extended periods of time. In addition, pressure reduction spray systems are provided to reduce both the pressure and temperature in the containment to minimize the driving force for escape of radioactivity to the environment.

Currently, the capabilities of safety systems for minimizing or eliminating hazards of reactor accidents and the consequences of a loss-of-coolant accident are determined by analyses which are based on extensive laboratory studies (Ref. 1). Although these analyses customarily include a significant margin of safety in postulating the accident and describing its consequences, it is desirable that they be further confirmed by a series of experiments in an operating nuclear power plant. The objectives of the LOFT program are to help validate, along with other analytical and experimental programs, the predicted accident response of water reactor plants and the performance of plant components and safety systems and to help substantiate the analytical techniques used in the safety assessments for light water nuclear power plants.

To help achieve these objectives, three basic types of experiments will be conducted during the LOFT program. In order to perform these experiments in a safe and efficient manner, the experimental program will be conducted by gradually increasing the size of the loss-of-coolant accident and the maximum fuel cladding temperature as the experiments progress in sequence. Within each group of experiments the severity will be gradually increased and at no time will a more severe experiment be conducted until a confident performance prediction can be made based on prior experiments. The planned experiment sequence will be as follows:

1. Initial Experiments

These experiments will be conducted with no heating from the reactor core either before or during the experiment. These experiments will be conducted solely using mechanical and electrical power sources for coolant heating. These tests will study the mechanical and hydraulic aspects of simulated loss-of-coolant accidents and will provide assurance of the structural integrity of the steam supply system and an understanding of depressurization behavior prior to any experiments following power operation.

2. Core Cooling Experiments

In these experiments simulated loss-of-coolant accidents will be initiated while the reactor is operating and the ECCS will be operating at full experimental capability. These tests will provide data for validating analytical models and confirming the adequacy of LOFT ECCS design performance. The severity of these experiments will be gradually increased by varying such parameters as the reactor power level and the size and location of the simulated pipe rupture. They will also assure that the LOFT plant's performance characteristics are well understood before any limited core cooling experiments are performed.

3. Limited Core Cooling Experiments

These experiments are similar to the previous experiments except that the ECCS will be set to deliver cooling water at less than full experimental design capability or with delayed initiation. The data obtained from each of these experiments will be evaluated to help assess analytical models and to establish the margin of safety associated with planning subsequent experiments. The coolant delivery capability of the ECCS will be reduced gradually to provide confidence that effects observed in one experiment are fully understood and through analysis can be extrapolated so that each succeeding experiment can be conducted safely.

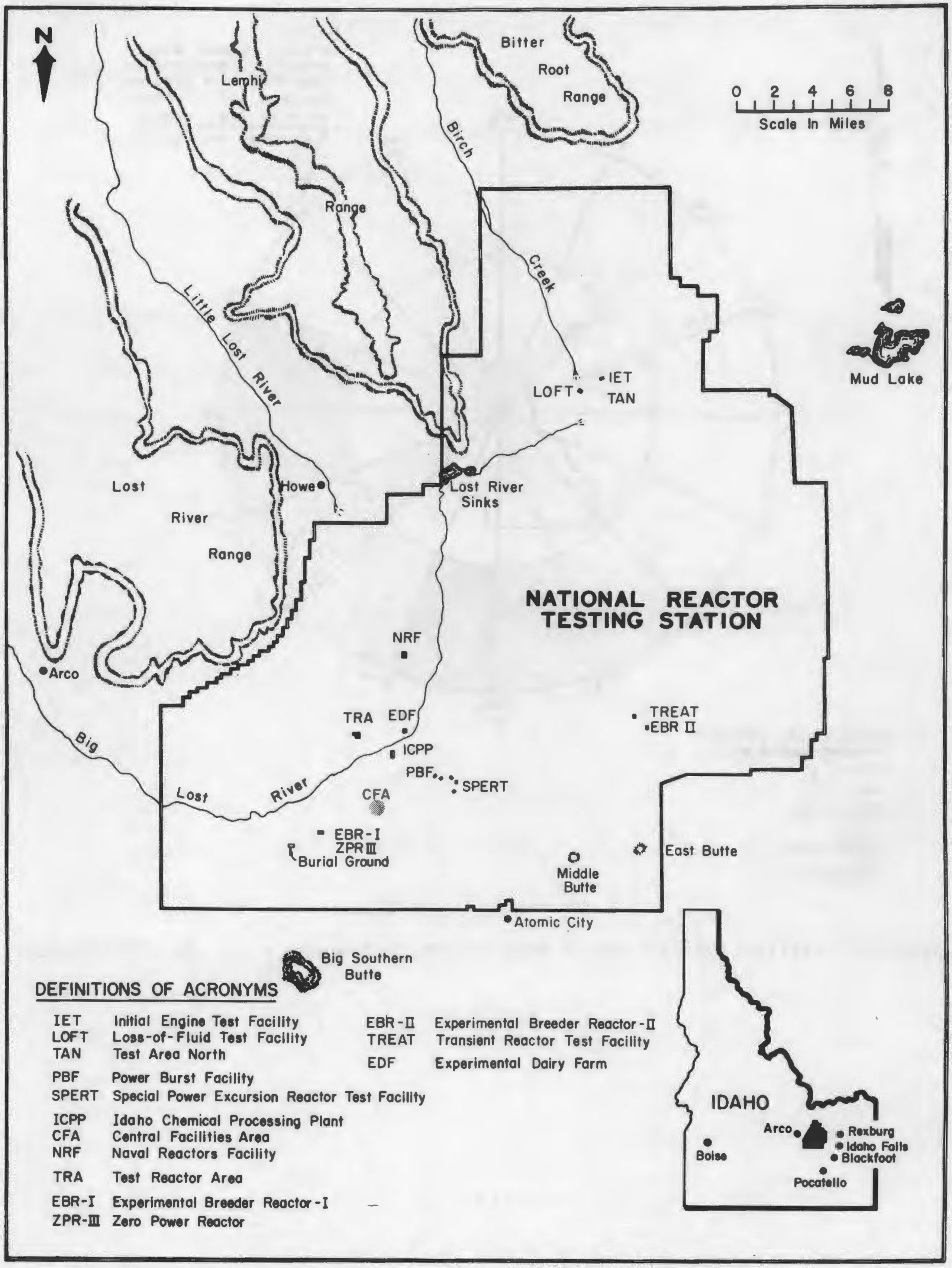
Most of the experiments will be conducted using the blowdown suppression system; however, provisions have been made for a limited number of experiments in which the effluent from a break exhausts directly into the reactor containment vessel to produce conditions that will aid in testing the containment response to simulated accident conditions and the effectiveness of pressure reduction spray systems for light water reactors. The pressure reduction spray system is designed to reduce the containment vessel pressure and temperature and remove some of the released radioactivity from the containment vessel atmosphere.

C. Characterization of the Existing Environment

The location of the LOFT facility within the boundaries of the NRTS is shown in Figure 5, as is the location of the Station in sparsely populated southeastern Idaho. The population center nearest the LOFT site is Idaho Falls (about 36,000 people) which is 42 miles to the southeast. Approximately 2,000 persons live on farms and in small communities in the Mud Lake area (6 or more miles distant) and about 400 persons reside in the vicinity of Howe (14 miles to the west). Approximately 1,500 persons reside in the Arco area which is approximately 32 miles away. The population distribution around the LOFT facility is shown in Figure 6.

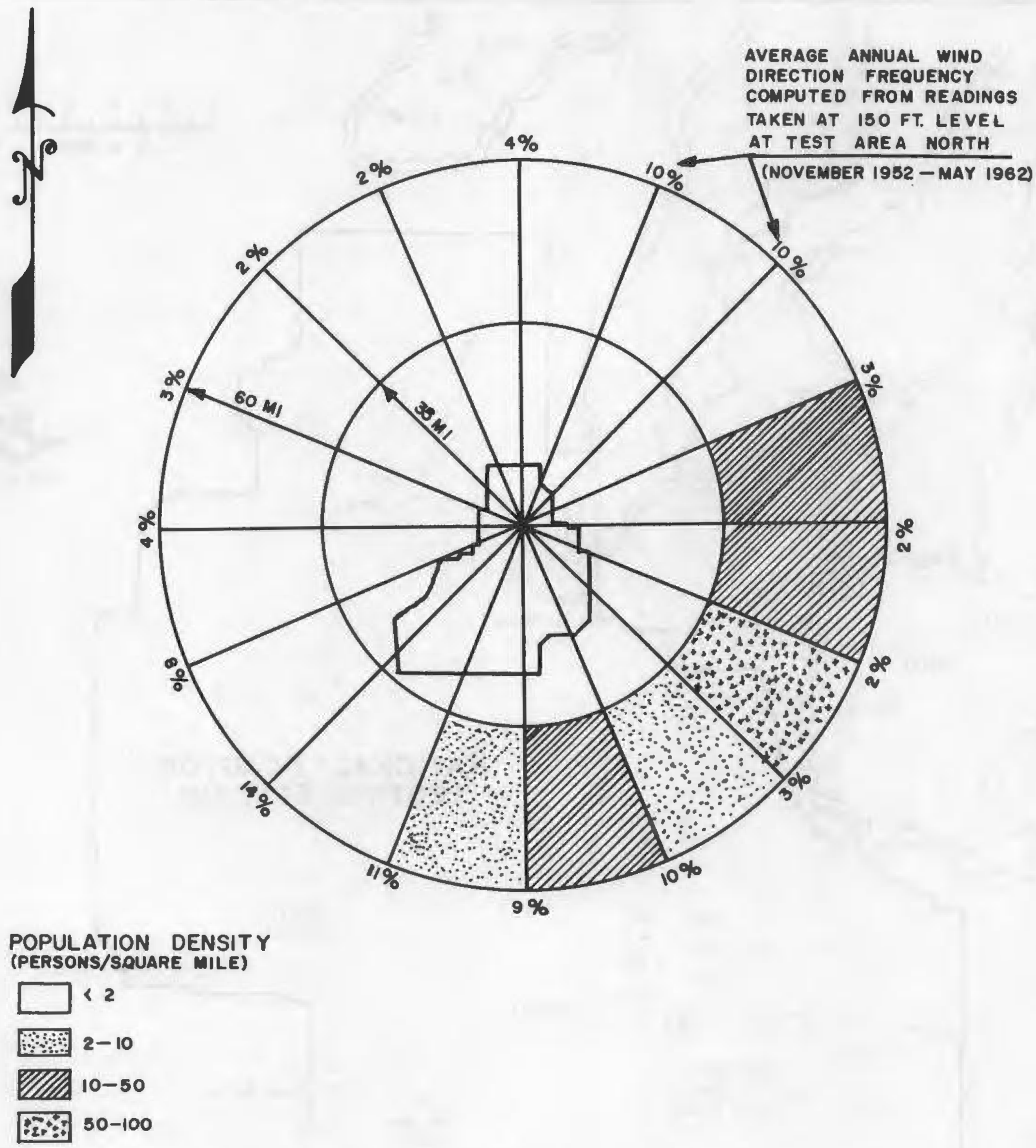
1. Climatic and Atmospheric Diffusion Conditions

In 1949 the U.S. Weather Bureau established a station, now operated by the National Oceanic and Atmospheric Administration (NOAA), at the NRTS to provide meteorological support for the AEC's operations and to conduct meteorological research. Climatological data for the Station have been recorded continuously since that time and have been summarized in a series of reports (Ref. 2-5). Numerous field tests have been conducted at the Station to study transport, diffusion and deposition of airborne materials. The results of these experiments have been reported in scientific journals and many are summarized in the report by Yanskey et al. (Ref. 5). A brief summary of the climatic and atmospheric diffusion information is presented in the following paragraphs.



Map of National Reactor Testing Station

Figure 5



Population Distribution and Annual Wind Direction Frequency for the LOFT Facility

Figure 6

The climate of the NRTS can be described as dry, with the average maximum temperature ranging from 28°F in mid-January to 89°F in mid-July. Corresponding average minimums are 3°F and 51°F. Extreme temperatures of -43°F and 103°F have been observed during the period since December 1949. The average annual precipitation is 8.5 inches with a low of 4.5 inches in 1966, and a high of 14.4 inches in 1963. The maximum average monthly precipitation occurs in June (1.5 inches) and the minimum in July (0.3 inches). The average annual snowfall is 28.6 inches; annual snowfall ranged from a low of 11.6 inches in 1963-1964, to a high of 45.0 inches in 1964-1965. The greatest snow depth observed was 23 inches in March 1952. Two to four two-week or longer droughts occur during the July-November period, with a record drought of 73 days in 1959. A recent evaluation of the fate of precipitation falling on undisturbed land at the Station indicates that more than 95 percent of this water is evaporated or transpired by plants and less than 5 percent remains in the soil (Ref. 6).

The average annual wind speed in the LOFT facility area is 7.1 miles per hour (mph). The greatest average hourly wind speed observed was 51 mph from the southwest and average hourly wind speeds of 35 mph or greater have been recorded during every month of the year. Hourly averaged wind speeds of 25 mph or greater occur on an average of 66 days per year; hourly averaged wind speeds of 40 mph or greater occur on an average of only 3.5 days per year. Calm conditions occur 11 percent of the time, ranging from 2 percent of summer afternoons to nearly 25 percent of the time during winter nights. An annual average wind frequency distribution for the LOFT facility is shown in Figure 6. Surface temperature inversions occur nearly every night of the year and occasionally during most of the day during December and January. Surface temperature lapse rates of more than 1.5°F in 200 feet are observed nearly every afternoon from March through mid-November and on more than half of the mid-winter afternoons.

Severe thunderstorms with wind gusts over 50 mph or hail of 1/2-inch or greater diameter do occur, but the frequency of occurrence is less than once per year. Five funnel clouds and one small tornado, which caused no damage, have been documented in 23 years of observations at the NRTS.

As indicated previously, more detailed data on precipitation, winds, atmospheric diffusion parameters and calculational techniques have been summarized in Reference 5.

2. <u>Geology and Hydrology</u>

The U.S. Geological Survey (USGS) initiated a study of the geology and hydrology of the NRTS in 1949. The study, which is continuing, has described the geologic factors that control the amount and availability of the water supply, the permanence of the water supply and the behavior of waste materials disposed to the subsurface. Numerous wells were drilled to investigate the geohydrologic conditions existing prior to the establishment of the Station and to permit continuous monitoring of subsurface water. Ground water monitoring by the USGS has been continued for more than 20 years to document changes in ground water storage and to evaluate potential changes in the quality of the ground water. The results of their investigations have been published in a long series of documents; four of the principal reports are References 7 to 11. A brief summary of the information developed is presented in the following paragraphs.

The Snake River Plain, on which the NRTS is located, is relatively level with an average elevation of slightly less than 5,000 feet above sea level. It is bounded to the north and west by mountain ranges with elevations as much as 6,000 feet above the Plain. The Snake River Plain is the surface of composite layers of interbedded volcanic rock and sedimentary material. The sedimentary material includes alluvium, alluvial fan deposits, lake-bed and playa deposits and windblown deposits, all of which were laid down between periods of basalt flow. These layers partly fill a basin of older limestone and volcanic rocks. The older rocks, which are not water-bearing, are exposed in the mountains northwest and southeast of the Plain and presumably underlie all of the Plain at depths that may be as great as 5,000 feet. A layer of sedimentary material whose depth ranges from 20 to 60 feet overlies the basalt in the LOFT facility area.

Ground water seeps through the voids and cracks in and between layers of basalt and sedimentary material; these void spaces comprise 5 to 10 percent of the total volume of solid material. The regional ground water system, known as the Snake Plain Aquifer, contains an estimated

250 million acre feet of water. The water table lies about 200 feet below the ground surface in the LOFT facility area. The ground water in this area contains about 200 parts per million of dissolved solids; calcium and magnesium bicarbonate are the predominant solutes. The average water temperature ranges from 50°F to 60°F. The water table slopes to the southwest with a gradient which averages about 5 feet per mile over the whole Station. The direction of ground water flow is from recharge areas to the north and east toward the main part of the Snake River Plain to the south. Studies to determine the ground water velocity in the south central part of the NRTS indicate that the water flows at the rate of 6 to 10 feet per day. The velocity of water in the aquifer beneath the LOFT site is expected to be about 10 feet per day. Principal sources of ground water recharge are the Birch Creek Valley to the north and the Mud Lake area to the east.

The largest source of surface water on the NRTS is the Big Lost River which flows intermittently in a generally northerly direction across the Station and sinks into the desert floor in the northern part of the Station. The USGS recently prepared a report (Ref. 12) on the probable routing of periodic floods of the Big Lost River. The study's implications for NRTS planning and operations are being considered fully and modifications of existing water diversion canals and basins will be made if necessary. The only other surface water on the NRTS is that resulting from snow melt during the spring. Some snow melt flows in the existing Birch Creek channel; diversion canals and basins are being constructed to prevent flooding in the LOFT facility area.

Until 1970, the NRTS region was classified as Seismic Zone 2 by the Pacific Coast Uniform Building Code (Ref. 13). Thus, prior to 1970, structures and equipment for the LOFT facility were designed using the requirements for Zone 2. The new U.S. Uniform Building Code (Ref. 14), issued in 1970, places the NRTS in a Zone 3 area. However, it is recognized that more detailed analyses (such as analyses of the dynamic response of complex equipment to earthquake induced motions) will enable a more rigorous confirmation of the margins provided in the design of the LOFT facility. Consequently, the LOFT primary coolant system and other structures and equipment, which are not part of existing structures, are currently being analyzed to determine if additional design changes will be necessary.

Twenty-one earthquakes of sufficient intensity to be classed in Category V of the Modified Mercalli Intensity Scale have been recorded in Idaho since 1894. The chief epicenters have been more than 100 miles from the NRTS. The strongest recorded earthquake occurred in August 1959, with an epicenter estimated to be in the northwestern part of Yellowstone Park approximately 100 airline miles from the NRTS. This earthquake, which had a magnitude of 7.1 on the Richter Scale, caused no damage to buildings or reactor structures at the NRTS.

3. Ecology

The climate of the Station is reflected in the biota. Vegetation is limited by the meager rainfall, as can be seen from the photograph (Figure 7). Extensive surveys of NRTS vegetation were carried out in 1952, 1958 and 1967 utilizing 150 permanent transects established

Typical NRTS Vegetation

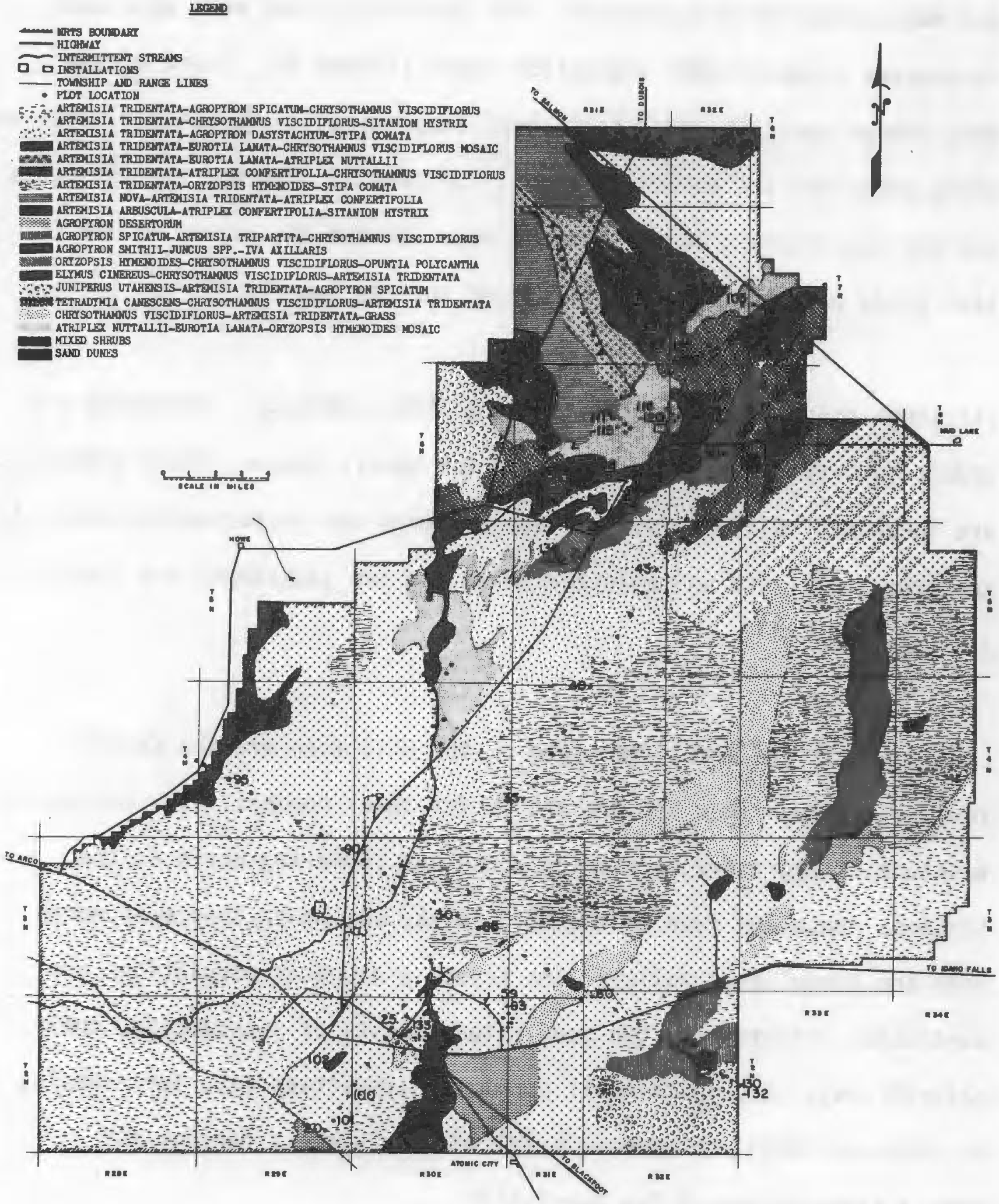
Figure 7

and maintained for this purpose. The results of this work were used to prepare a map of NRTS vegetation types (Figure 8). Three of the most common habitats are desert shrub (approximately 80 percent sagebrush), mixed grassland and perennial herbs. Of special interest to ecologists are the sagebrush-saltbrush ecotone near TAN and the kipuka in the lava field near the southern border of the Station.

Different desert rodents reside in the three habitats. Chipmunks and ground squirrels have territories in the desert shrub. Mixed grasslands are inhabited mainly by mice. Herb drylands are preferred territory for kangaroo rats. The white-footed mouse and the jackrabbit are found in all habitats.

Large mammals are more often seen on the NRTS than are the smaller rodents although they are present in far fewer numbers. The pronghorn antelope is migratory, wintering south and summering north of the Station. Antelope fawn on the NRTS in the spring as they move north into the Birch Creek Valley. The coyote and bobcat populations are controlled primarily by the population density of jackrabbits, their natural prey. High jackrabbit population densities (as, for example, in 1959 and 1969) are generally followed by a sharp decline and then a slow buildup of the population.

Some migratory birds (doves, larks and hawks) inhabit the NRTS during the summer. Other migrants, such as eagles and waterfowl pass through in the spring and fall. Sage grouse are the only resident



Map of NRTS Vegetation Types

FIGURE 8

game birds. Hunting is not permitted on the Station and many species are protected by Federal and State regulations. The bald eagle, which is observed periodically on the Station, is classified as an endangered species.

4. History of Land Use

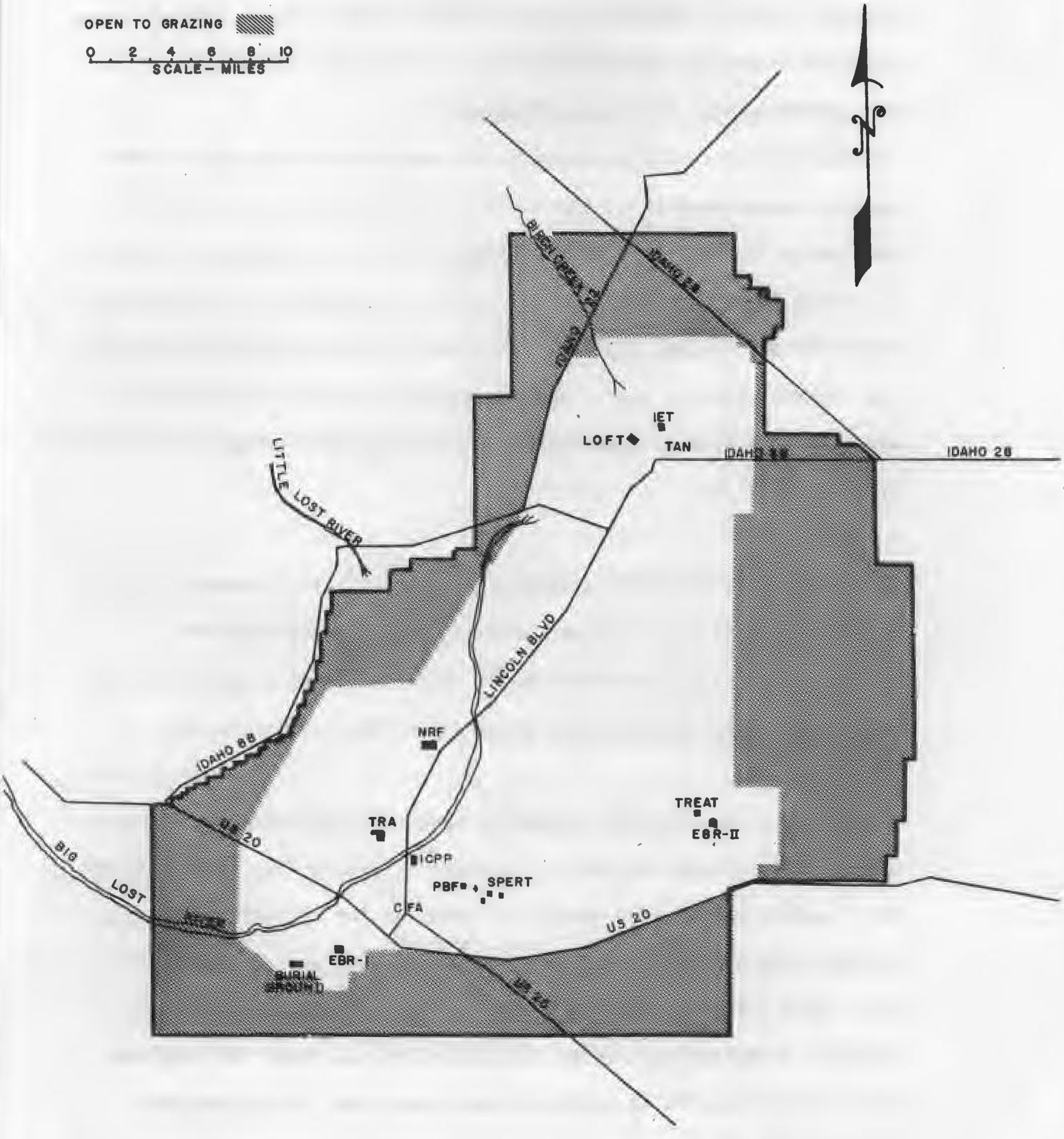
In the latter years of the 19th century, the NRTS was crossed by two stage-lines and cattle were trailed eastward from Oregon to market. Two areas within the present boundary were involved in unsuccessful irrigation projects about 1910. Dry canals and associated structures still remain in these areas. Numerous attempts to operate small dry farms within the present site boundaries were made, but these inevitably failed because of the scant amounts of precipitation. Cultivation has been attempted on about 10 percent of the Station's area. During World War II, 270 square miles of the present site were used by the Navy for a gunnery range and another section was used by the Army Air Corps for aerial gunnery practice. Transfer of the military facilities to the AEC in 1950 and withdrawal from public appropriations in 1950 and purchase of the land by the AEC in 1953 combined to produce a 431,200-acre area for the NRTS. This area was expanded in 1958 by the addition of about 140,500 acres to the north and west to form the present 571,700-acre Station. A variety of reactors* have been built and tested during the 23-year history of the NRTS. A chemical processing plant, waste storage areas and other experimental and support facilities have also been established. Some of these are shown in Figure 5.

*A total of 49 reactors, of which 21 are currently operating or operable.

Crested wheatgrass has been planted in some areas within the Station's boundaries to prevent erosion and to increase the usefulness of the NRTS lands on which stock are grazed by permit. Sheep are the principal livestock which graze on permit grasslands onsite during spring and fall. About 460 square miles of the Station's 894-square mile area are used for grazing; the areas used for grazing are shown in Figure 9.

An archeological survey of the NRTS was initiated and coordinated by Mr. Robert Butler of the Department of Archeology, Idaho State University. The survey was performed during 1967-1969 under a permit issued by the U.S. Department of the Interior. A second permit for the period 1970-1972 authorizes excavation of three NRTS sites. Location and survey of sites and the preservation of antiquities is under the continuing direction of Mr. Butler. Sites excavated at Birch Creek to the north and Twin Falls to the south have yielded specimens as old as 14,500 years (dated by carbon-14). One artifact from the NRTS indicates occupation by man from the time of the mammoth hunters. The academic value of these sites is extremely high; the sites have been protected from relic hunters and this protection will be continued in accord with the Antiquities Act of 1906 (16 U.S.C.A 431-433) and the Historic Sites Act of 1935 (16 U.S.C.A. 461-467).

One location within the Station's boundaries is listed in the 1971 National Register of Historic Places prepared by the National Park



Areas Open to Grazing by Permit
Within the NRTS Boundaries

Figure 9

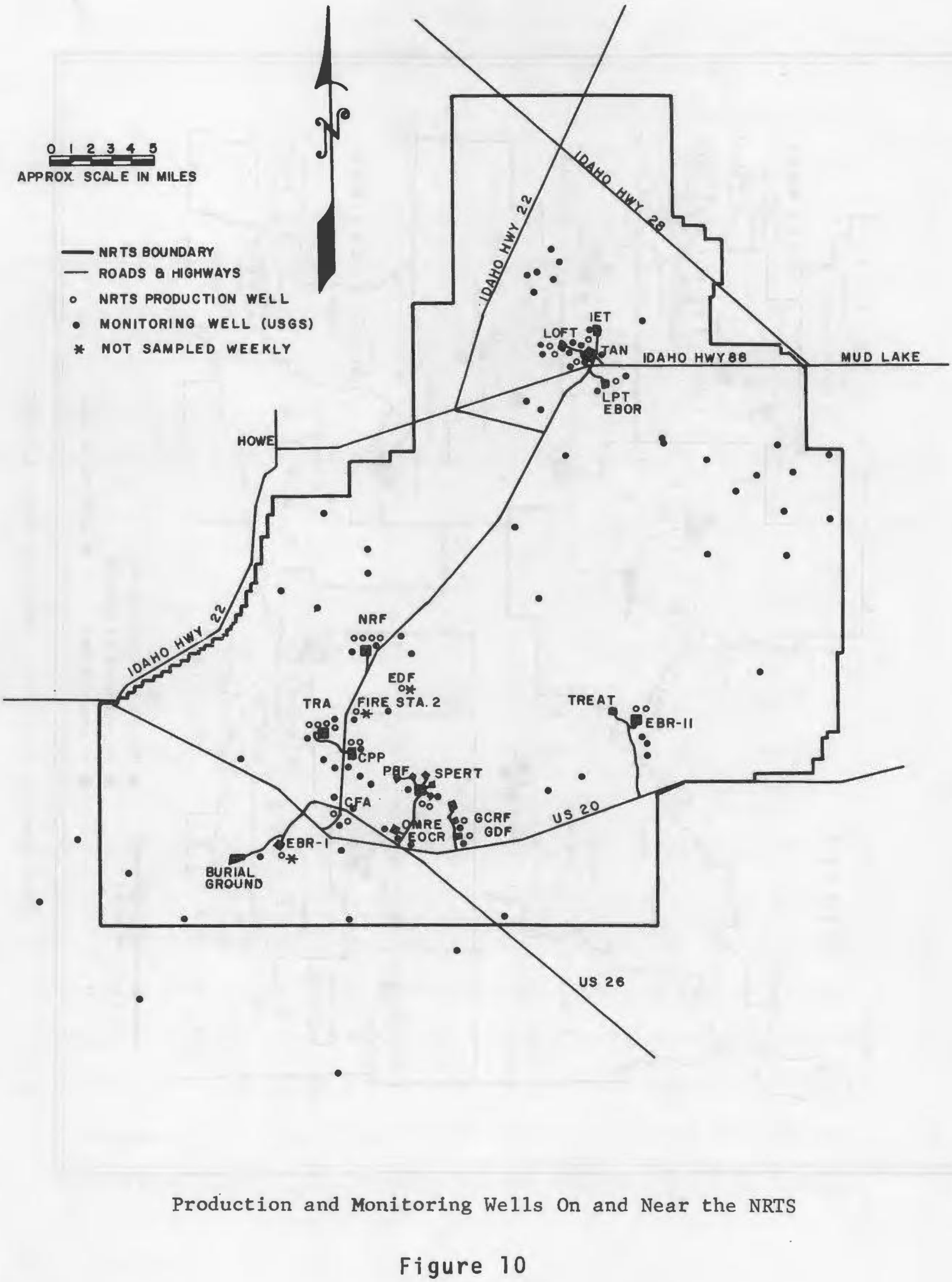
Service. This is the Experimental Breeder Reactor No. I (EBR-I) which is located in the southwest part of the NRTS (Figure 5).

5. <u>Environmental Monitoring Program</u>

Monitoring of the NRTS environment is carried out by the AEC's Health Services Laboratory (HSL) and the USGS in cooperation with NOAA. Monitoring programs have been carried out since the time the Station was established and have been continually improved as new instruments and techniques became available. HSL environmental monitoring results are reported twice a year. Reports on the USGS monitoring program are made periodically; publication of a comprehensive report is expected in 1972 (Ref. 15).

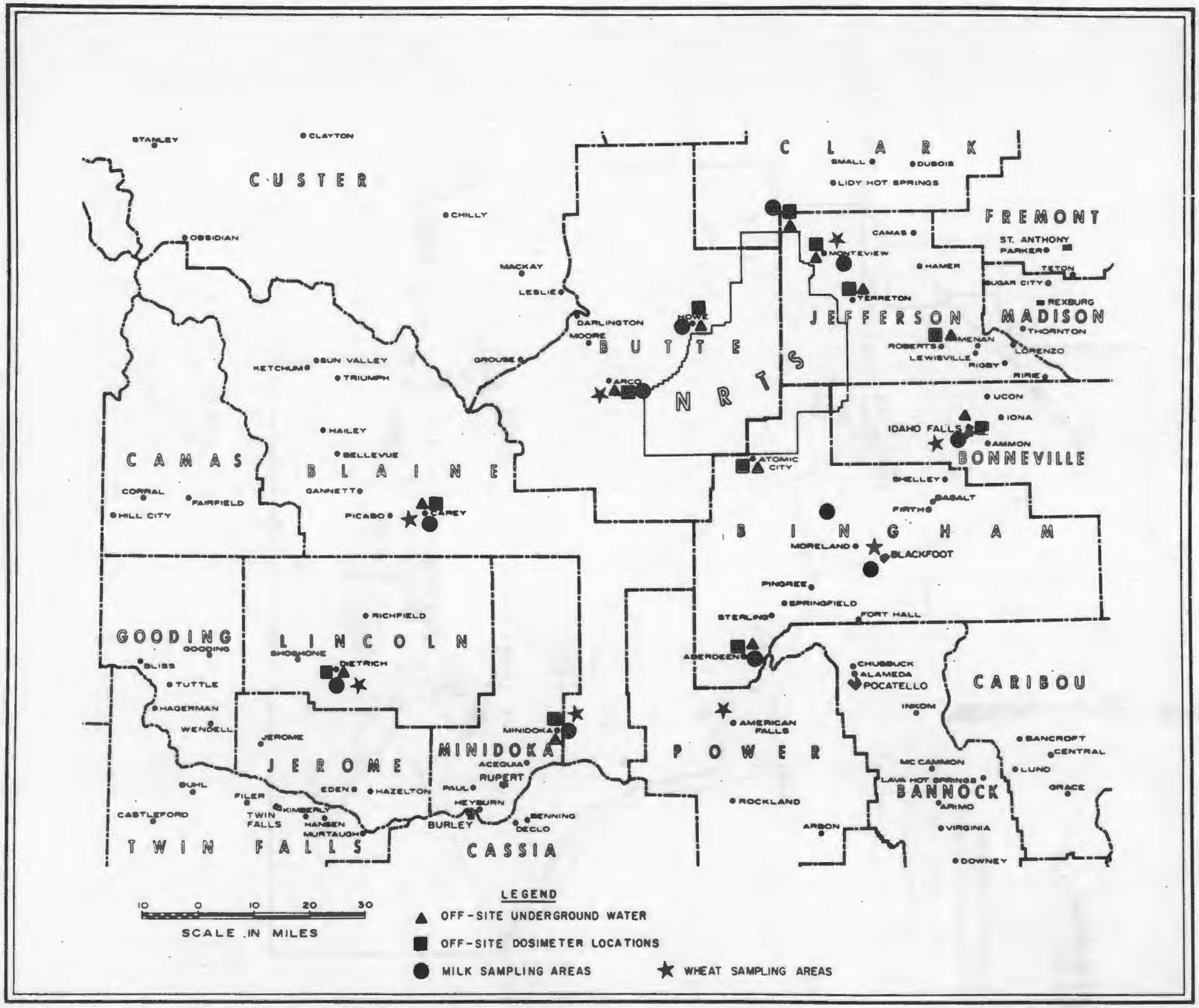
Ground water is presently sampled weekly by HSL at 23 production wells at the Station (Figure 10) and analyses for radioactivity are performed. Twelve wells outside the NRTS boundaries (Figure 11) are presently sampled semiannually and analyzed for radioactivity.

A continuous air sampling program is presently maintained at 8 onsite and 10 offsite locations which are shown in Figure 12. Filters in the air samplers are changed weekly and analyzed for radioactivity. The concentrations of suspended particulate material are also determined from these samples. Natural dustfall rates are routinely measured onsite. A monitoring program for sulfur dioxide in air at locations on and near the NRTS is currently being designed. This program should verify the results of diffusion calculations which indicate



Production and Monitoring Wells On and Near the NRTS

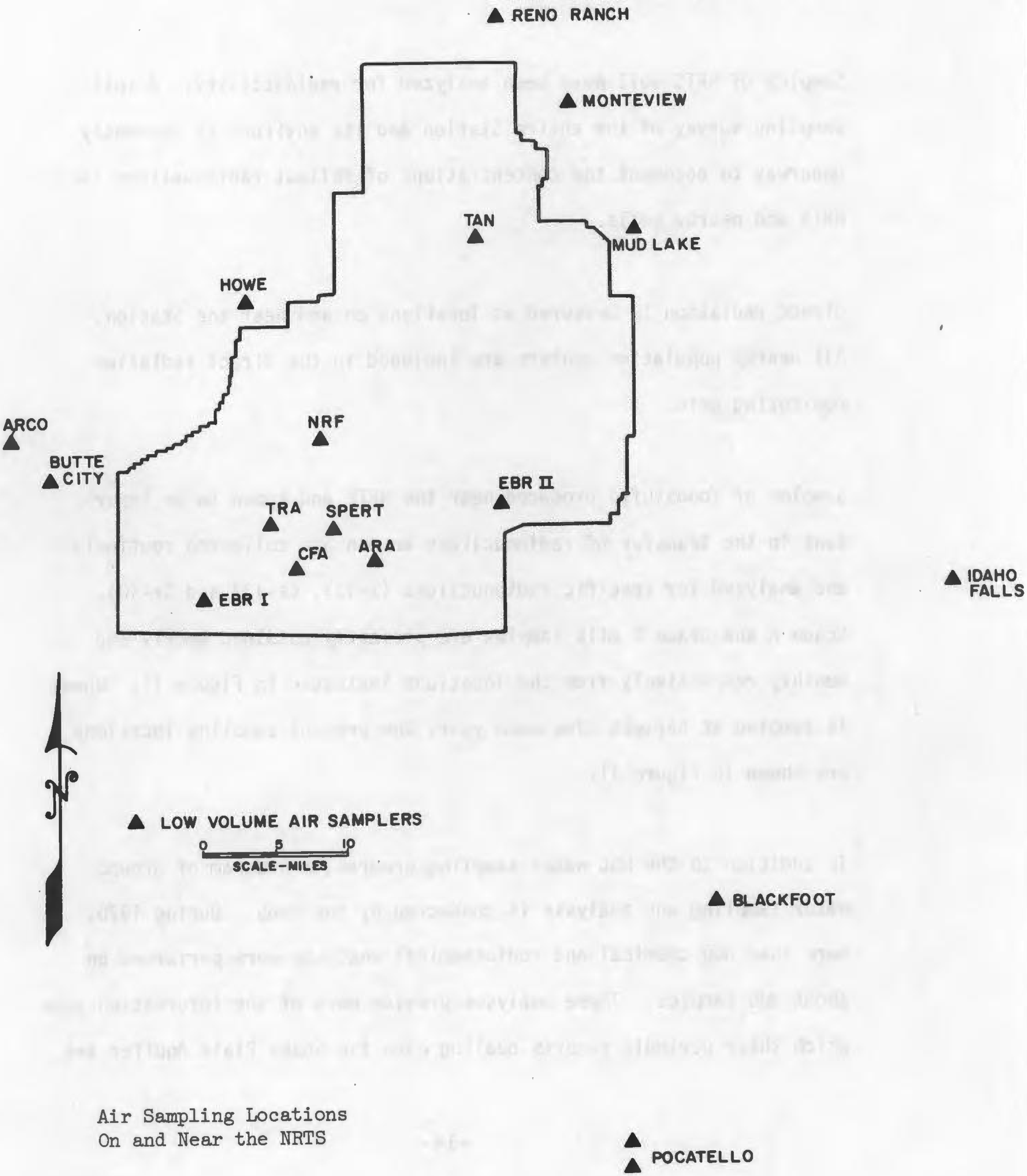
Figure 10



Environmental Monitoring Locations Near the NRTS

Figure 11

HEALTH SERVICES LABORATORY
ENVIRONMENTAL MONITORING PROGRAM
NATIONAL REACTOR TESTING STATION (NRTS)



Air Sampling Locations
On and Near the NRTS

Figure 12

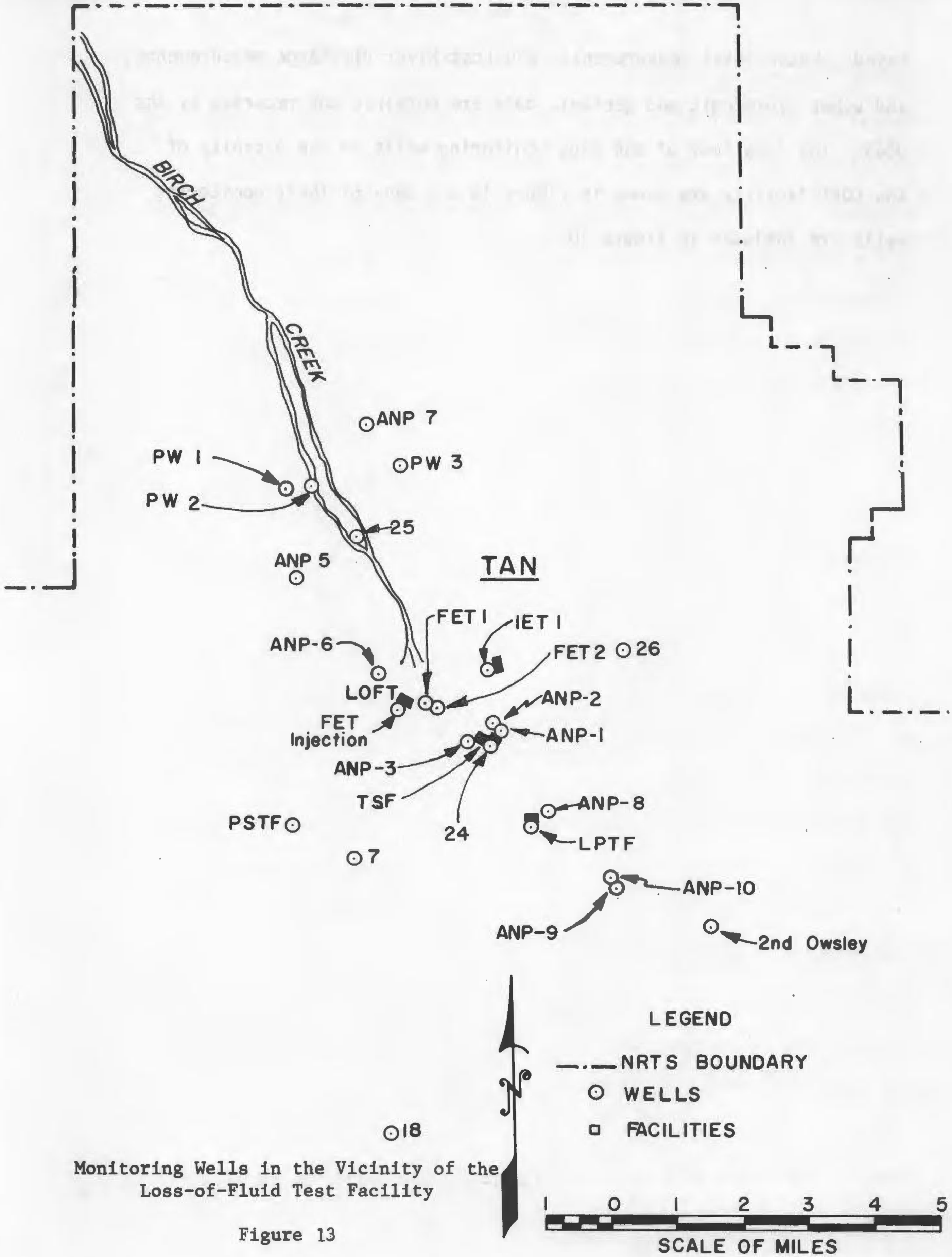
that sulfur dioxide concentrations should be well below standards established by the EPA (Ref. 16).

Samples of NRTS soil have been analyzed for radioactivity. A soil sampling survey of the entire Station and its environs is currently underway to document the concentrations of fallout radionuclides in NRTS and nearby soils.

Direct radiation is measured at locations on and near the Station. All nearby population centers are included in the direct radiation monitoring grid.

Samples of foodstuffs produced near the NRTS and known to be important in the transfer of radionuclides to man are collected routinely and analyzed for specific radionuclides (I-131, Cs-137 and Sr-90). Grade A and Grade B milk samples are presently obtained weekly and monthly respectively from the locations indicated in Figure 11. Wheat is sampled at harvest time each year; the present sampling locations are shown in Figure 11.

In addition to the HSL water sampling program, a program of ground water sampling and analysis is conducted by the USGS. During 1970, more than 800 chemical and radiochemical analyses were performed on about 300 samples. These analyses provide part of the information upon which their periodic reports dealing with the Snake Plain Aquifer are based. Water level measurements, Big Lost River discharge measurements, and other hydrologic and geologic data are obtained and reported by the USGS. The locations of the USGS monitoring wells in the vicinity of the LOFT facility are shown in Figure 13 and many of their monitoring wells are included in Figure 10.



Monitoring Wells in the Vicinity of the
Loss-of-Fluid Test Facility

Figure 13

III. ENVIRONMENTAL IMPACT

Operations at the LOFT facility are expected to have less environmental impact than the construction activities, now nearing completion. It is expected that planned operation will have no deleterious effect on the local environment and could have adverse effects only as a result of extraordinary events. In the following paragraphs, the probable environmental impact related to expected operations are first discussed and subsequently, extraordinary or unexpected, environmental effects are discussed.

A. Probable Environmental Impact

Because of the varied nature of the experimental programs suited to the LOFT facility, it is not possible to forecast accurately and in detail the actual schedule of experimental activities. The expected modes of operation are known, however, and the significance of the various modes can be discussed.

1. Significance of Mode of Operation

The current plan for the LOFT experimental program is to operate the reactor on an intermittent basis. It is anticipated that several loss-of-coolant experiments will be conducted in a year and that the reactor will be operated for a period of only 30-200 hours prior to each experiment. The reactor fuel, however, has a lifetime of 2,000 hours to permit longer power operation prior to a given experiment and the use of the same core for several different operating periods.

Reactor operations will fall into the following major categories:

(a) Routine Operations

(b) Blowdown to the Suppression Tank

(c) Blowdown to the Containment

Routine operation of LOFT will be analogous to routine operation at a commercial nuclear power plant. In this mode, the reactor is maintained at relatively constant power level up to the maximum level of 55 MW thermal.

Most experiments will involve blowdown to a large tank called the blowdown suppression tank. During blowdown to this tank the steam-water mixture emerging from the simulated break in the reactor primary coolant system is routed to several discharge points under water inside the partially water-filled blowdown suppression tank. This action condenses the steam, traps any particulate matter, traps elemental iodine gas, and holds up noble gases in the space above the water level in the tank.

It is anticipated that some experiments will be conducted at the LOFT facility in which the primary system blowdown will be deliberately directed to the containment. It is planned that such experiments will not occur until after a substantial amount of experience and knowledge is gained from the experiments in which blowdown is directed to the blowdown suppression tank. It is expected that the earlier experiments will broaden the knowledge of blowdown phenomena, fuel failure mechanisms, the efficiency of emergency core cooling and fission product transport and deposition phenomena and provide confidence in methods for predicting the results of subsequent experiments. Using this new knowledge, it should bepossible to plan deliberate blowdowns to the containment so that the consequent relocation of fission products is not sufficient to cause any hazard to the facility operators, the public or the environs. Experiments involving deliberate blowdown to the containment will not be conducted unless it can be preducted in advance that such experiments can be performed safely.

2. Direct Radiation Exposure

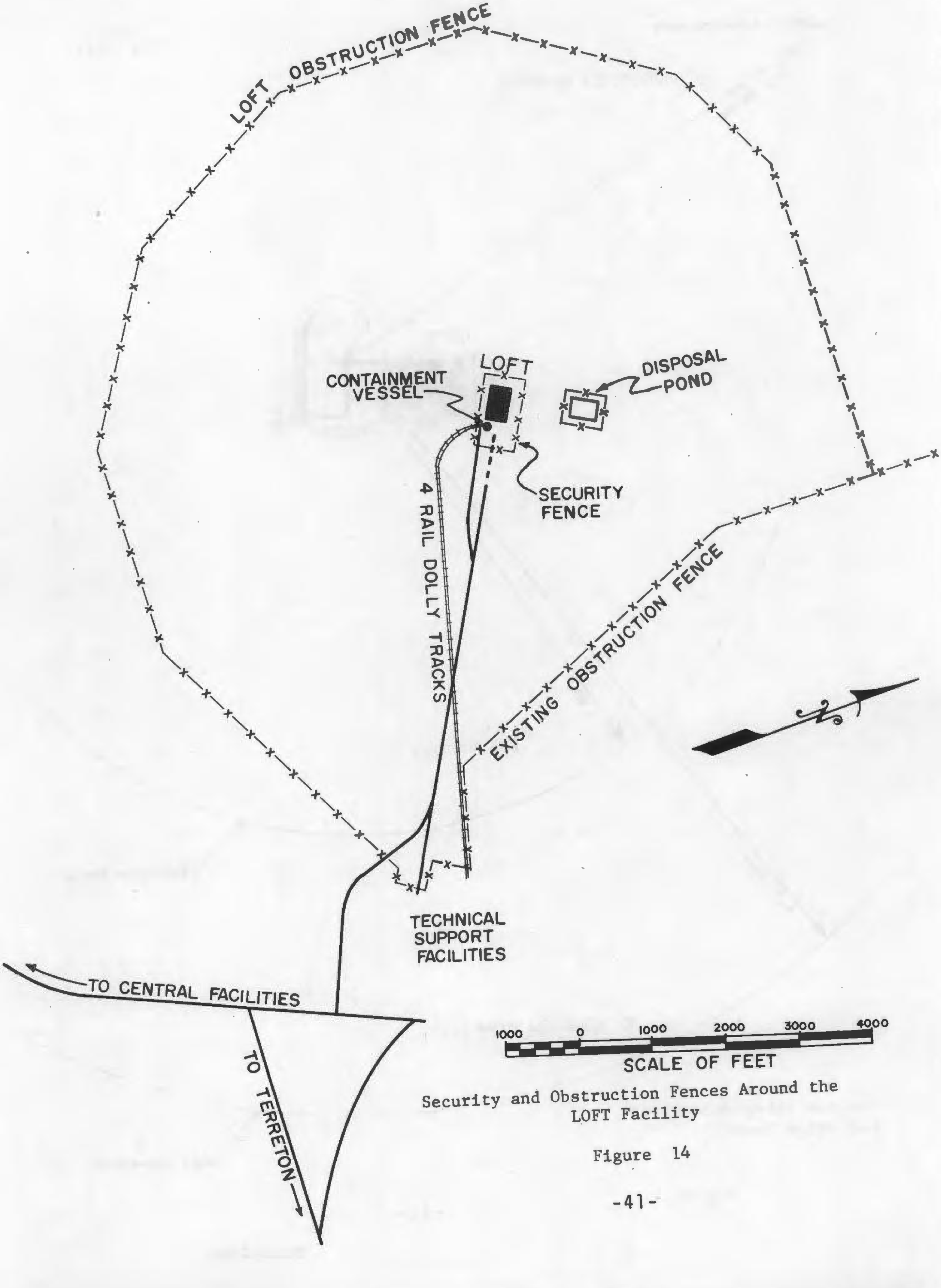
Designs of the shield systems for the LOFT facility are not yet complete but the design objectives have been established and can be discussed at this time. Direct radiation exposures due to LOFT operations will be minimized by a combination of shield systems, exclusion fencing and administrative controls.

The nuclear reactor, the source of fission products and direct radiation, is about 2 feet in diameter and is contained in a 17-foot diameter shield tank which is made up of multiple layers of water, steel and lead. The exposure rate (excluding N-16*) at the surface of this shield tank is expected to be less than 20 R/hr when the reactor is at 55 MW thermal and less than .005 R/hr when the reactor has been shutdown for 1/2 hour or more. The exposure rate near the primary system piping due to N-16 is also about 20 R/hr when the reactor is at full power but drops to negligible values very soon after the reactor is shutdown.

*Radioactive isotope of nitrogen.

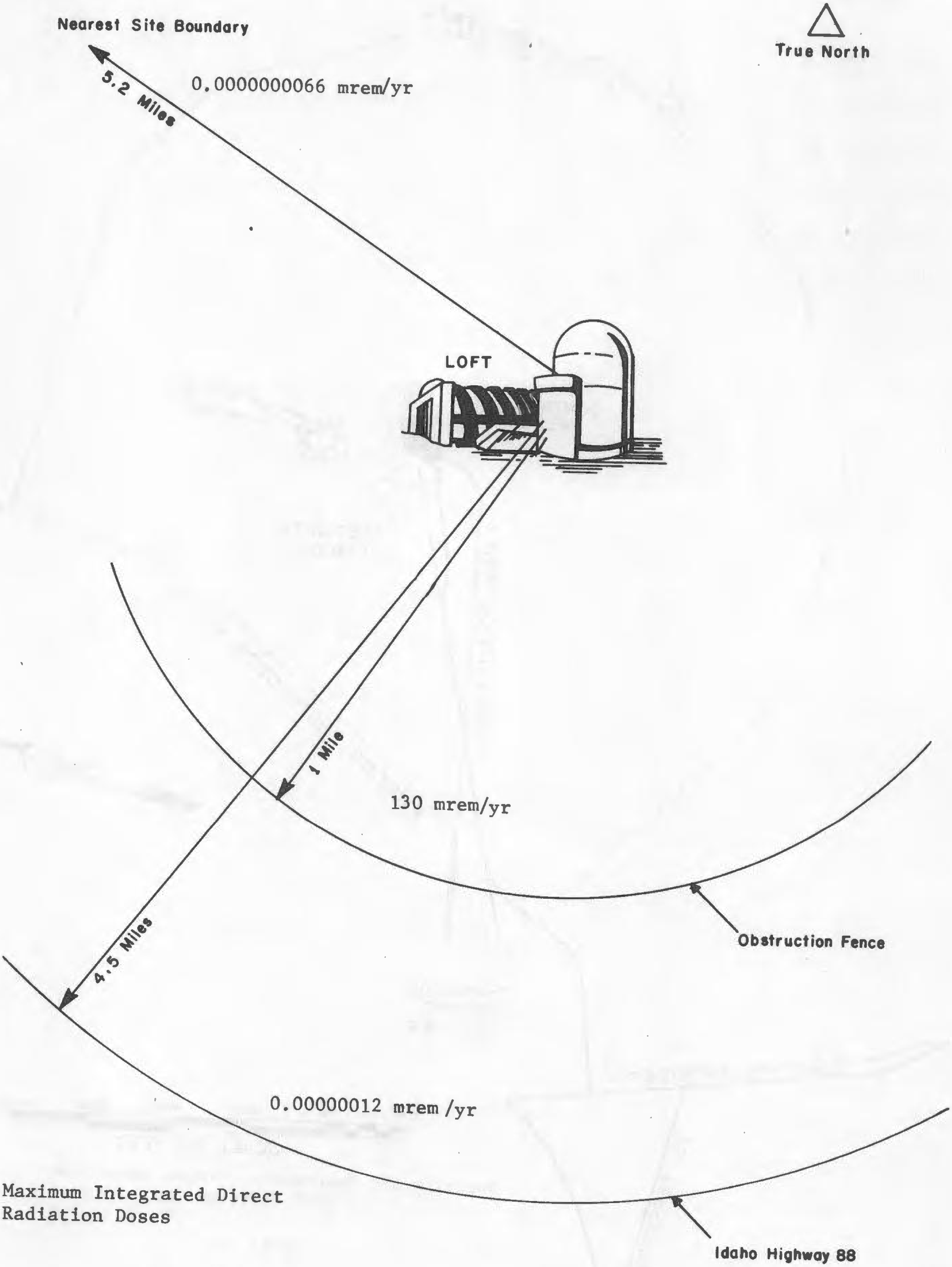
Humans and large animals will be excluded from the immediate vicinity of the reactor and containment building by a chain link security fence, topped with barbed wire, encircling the building. Humans will not be allowed to stand at this chain link fence during any mode of operation. The LOFT facility is surrounded by another fence called the Obstruction Fence which consists of three strands of barbed wire with radiation hazard signs located no further apart than 300 feet. A sign is visible from any point on the fence (Figure 14). This Obstruction Fence is located about a mile from the facility. Humans, except for those in the underground facilities, will not be allowed inside this fence during facility operations. For all modes of operation, except blowdown to containment, the dose rate at this fence due to LOFT operations will be much less than that due to natural background, about 100 mrem per year. For a whole year of exposure at this fence including one severe blowdown (20 percent fuel pin perforations) to the containment the total exposure would be less than 130 mrem, even if very conservative assumptions are made in computing the direct radiation dose. An individual could not be located at this fence for an entire year but the estimated exposure was based on this assumption. Thus, it is an overestimate of the expected dose.

The nearest public access point in the vicinity of the LOFT facility is Idaho Highway 88 which is about 4.5 miles away. The annual dose due to LOFT operations at Highway 88 is calculated to be less than 0.00000012 mrem in a year that includes a severe blowdown (20 percent fuel pin perforations) to the containment.



Security and Obstruction Fences Around the LOFT Facility

Figure 14



Maximum Integrated Direct
Radiation Doses

Figure 15

Not to Scale

During routine reactor operations, no personnel will be inside the containment building test chamber. After reactor shutdown from routine operations, containment reentry can be made safely within 30 minutes. As a design guideline, reentry to containment test chamber after blowdown to the blowdown suppression tank should not be delayed, because of radiation levels, beyond seven days for the most severe blowdown experiment.

3. Releases to the Environment

a. Releases to the Atmosphere

The releases to the atmosphere from the LOFT facility will include heat energy from the reactor cooling system, nonradioactive gases and particulate material from service steam and space heating boilers, and radioactive gases and particulates generated during reactor power operation and during experiments.

During routine power operation, it is possible that some fuel pin leakage could occur and permit migration of fission products into the primary cooling water. These fission products in the primary coolant will include noble gases (isotopes of krypton and xenon) and some other volatile species. There are several ways in which these gases could escape to the atmosphere. The following are examples of escape routes:

1. Vents from tanks which receive primary coolant.
2. Valve stem leakage from valves in the primary system.
3. Leakage from the primary to secondary side of the steam generator and thence to a number of secondary vents, leaks, etc.

4. Blowdown to the blowdown suppression tank and, after appropriate hold up, release to the atmosphere.
5. Blowdown to the containment and leakage, at a very slow rate, to the atmosphere.

Table I lists conservative estimates of releases of radioactivity to the atmosphere which could result from all operations except accidental blowdown within the containment vessel. The experiments which exhaust directly to the containment vessel will be conducted under preselected and monitored meteorological conditions, as will the controlled releases (via the 150-foot stack) following containment vessel cleanup.

To establish conservative estimates of the impact of the LOFT program on the environment, it is assumed, as the basis for Table I, that the reactor operates for three 200-hour periods (power runs 1 through 3) and for one 2,000-hour period (power run 4) during the year. It is also assumed that 1.0 percent of the fuel pins are perforated throughout routine operation to compute concentrations in radioactive effluents. (It is expected that fewer than 0.1 percent fuel pin perforations will actually occur during routine reactor power operations.) Most of the planned experiments will exhaust to the blowdown suppression system which will contain any radioactivity released during the experiments. However, in recognition of variations which may occur in the LOFT experimental program, it is conservatively assumed that four experiments per year are performed and that all exhaust into the containment vessel rather than into

TABLE I

CONSERVATIVELY ESTIMATED AIRBORNE RADIOACTIVITY RELEASES AND RESULTANT DOSES FROM LOFT EXPERIMENTS

		Estimated* Activity Release (Ci/yr)		Calculated Annual Doses (mrem)	
Isotope(s)	Radioactive Half-Life	Leakage From Containment	Controlled Release From Containment Vessel Cleanup System	Leakage From Containment	Controlled Release From Containment Vessel Cleanup System
Xenon-133	5.3 days	130	360,000	0.00025[b]	0.7[b]
Xenon-135	9.1 hours	138	110,000	0.00083[b]	0.66[b]
Krypton-85	10.8 years	0.076	220	negligible	0.00003[b]
Total Noble Gases		1350[a]	470,000	0.0011[b]	1.4[b]
Strontium-90	28 years	0.0058	0.0005	7.5[c]	0.64[c]
Cesium-137	30 years	0.0058	0.0005	0.064[d]	0.0055[d]
Iodine-131	8.1 days	6.4	0.1	120[e]	1.9[e]
Other Iodine	21 hours	63.4	0.35	12[e]	0.067[e]
Isotopes	(Maximum)		1.0		
Tritium	12.3 years	0.00025		negligable	0.000004[f]

(a) Composed mainly of very short-lived xenon and krypton isotopes.

(b) Whole Body dose due to direct radiation from plume.

(c) Bone dose critical group; assumes consumption of contaminated milk.

(d) Whole body dose to critical group; assumes consumption of contaminated milk.

(e) Thyroid dose to critical group; assumes consumption of contaminated milk.

(f) Total body dose due to inhalation of airborne tritium.

*As explained in the text, these values were calculated using appropriate conservatisms to allow for experimental program uncertainties.

the blowdown suppression system. (It is expected that at most one experiment per year will actually be exhausted into the containment vessel.) To provide a basis for calculations it is further assumed that three of the experiments (No. 1, No. 2 and No. 3) will be conducted after a reactor power operation of 200 hours and that one (No. 4) will be conducted after a power operation of 2,000 hours.

Experiments numbered 1 through 3 are assumed to result in the release of fission products due to perforation of 1 percent of the fuel pins and experiment No. 4 is assumed to result in the release of fission products due to perforation of 20 percent of the fuel pins. It is assumed that the containment vessel pressure reduction sprays will be operated during experiments No. 1, No. 2 and No. 4, but not during experiment No. 3. As indicated above, it is highly unlikely that four experiments of the assumed types will actually be conducted. The stated assumptions are made to establish conservative estimates of the environmental impact of these experiments, in recognition of the variations which occur in the LOFT experimental program.

As can be seen from Table I, the largest calculated dose is the 132 mrem per year thyroid dose resulting from the release of iodine-131 and other iodine isotopes. It was assumed that released radioiodine was transferred from ambient air to pasture vegetation and thence to cows' milk. The calculated dose could be received only by those who consume milk produced by cows grazing near the

Station boundary (Ref. 17); thyroid doses to other segments of the population would be much smaller. The calculated thyroid dose is 8 percent of the corresponding FRC guideline and could be received by only a very small fraction of the approximately 2,000 people in the Mud Lake area. It should be understood that these calculated iodine doses are based on assumptions that are conservative both as regards the experimental program and as regards the mechanism whereby fission products escape the containment building, diffuse through the atmosphere, fall upon the grass and are ingested first by cows and then by humans. Substantial conservatism results from the assumption that the wind is blowing toward the pasture at two meters per second and Pasquill Type C weather conditions prevail at the time of and for several hours following the experiment which involves blowdown to the containment vessel. In most experiments blowdown will be to the blowdown suppression system and usually the blowdown will occur when weather conditions are favorable and the wind is not blowing directly toward the nearest site boundary.

The quantities of long-lived isotopes (krypton-85, strontium-90, cesium-137 and tritium) released will produce doses to members of the general public which are less than 2 percent of the FRC guideline values.

An important constituent of the noble gases released will be the long-lived isotope krypton-85. Assuming power operation with 1 percent fuel pin perforations the calculated krypton-85 release is about 16 curies (Ci) per year. The resultant dose at the site boundary is calculated to be 0.000002 mrem per year which is undetectable and is very much less than either the 100 mrem yearly dose due to natural background radiation or the proposed 10 CFR 50, Appendix I, guideline value, 5 mrem per year.

The amount of release of xenon-133 (half-life = 5.3 days) is more difficult to calculate since substantial radioactive decay will occur between the time of formation and the time of escape to the atmosphere. The annual release and dose rates shown in Table I, 360,000 Ci per year and 0.7 mrem per year respectively, include releases during routine operation and releases resulting from four blowdowns to the containment in a year. (This is considered a conservative estimate of the amount of xenon-133 available and of the number of blowdowns to the containment that might occur in one year.) Even so, the calculated dose rate is less than the 5 mrem per year guideline value in the proposed Appendix I of 10 CFR 50.

The tritium release rates and consequent dose rates shown in Table I are likewise based on very conservative analyses in which consideration was given to total generation rates and experience at other reactor plants using borated water as a chemical reactivity control and lithium hydroxide for pH control. Analysis and experience at other plants indicate that LOFT primary system water will contain about 0.4 microcuries of tritium per cubic centimeter of water. Most of this tritium is expected to leave the primary system in the form of high-level liquid waste which is shipped from LOFT to a processing plant. Some of the tritium will leak from the primary system at stem leaks and will be exhausted from containment via the containment ventilation system. The 4.4 Ci per year release rate and the 0.00002 mrem per year dose rate shown in Table I are based on the conservative assumption that about half of the tritium produced leaves the facility as airborne radioactivity. Again the consequent dose rate is much below the 5 mrem per year guideline value in proposed Appendix I, 10 CFR 50.

Nonradioactive airborne effluents will result from the operation of three small, oil-fired, service steam and space heating units. The three boilers are rated at 4.2, 10 and 10 million British Thermal Units (BTU) of heat input. The anticipated particulate release rate is 0.1 pounds per million BTU which is less than the acceptable level of 0.6 pounds per million BTU for boilers of this size specified in the State of Idaho regulations (Ref. 18). The anticipated emission rate was used to compute that the expected annual mean concentration would be less than 5 micrograms per cubic meter at the nearest point of public access. This concentration is well below the new national primary and secondary standards of 75 and 60 micrograms per cubic meter specified in Reference 16. The expected sulfur dioxide release rate is 2.8 pounds per million BTU or 331,000 pounds per year which will produce an average Station boundary concentration of approximately 0.0001 parts per million, which is far below the currently acceptable level given in

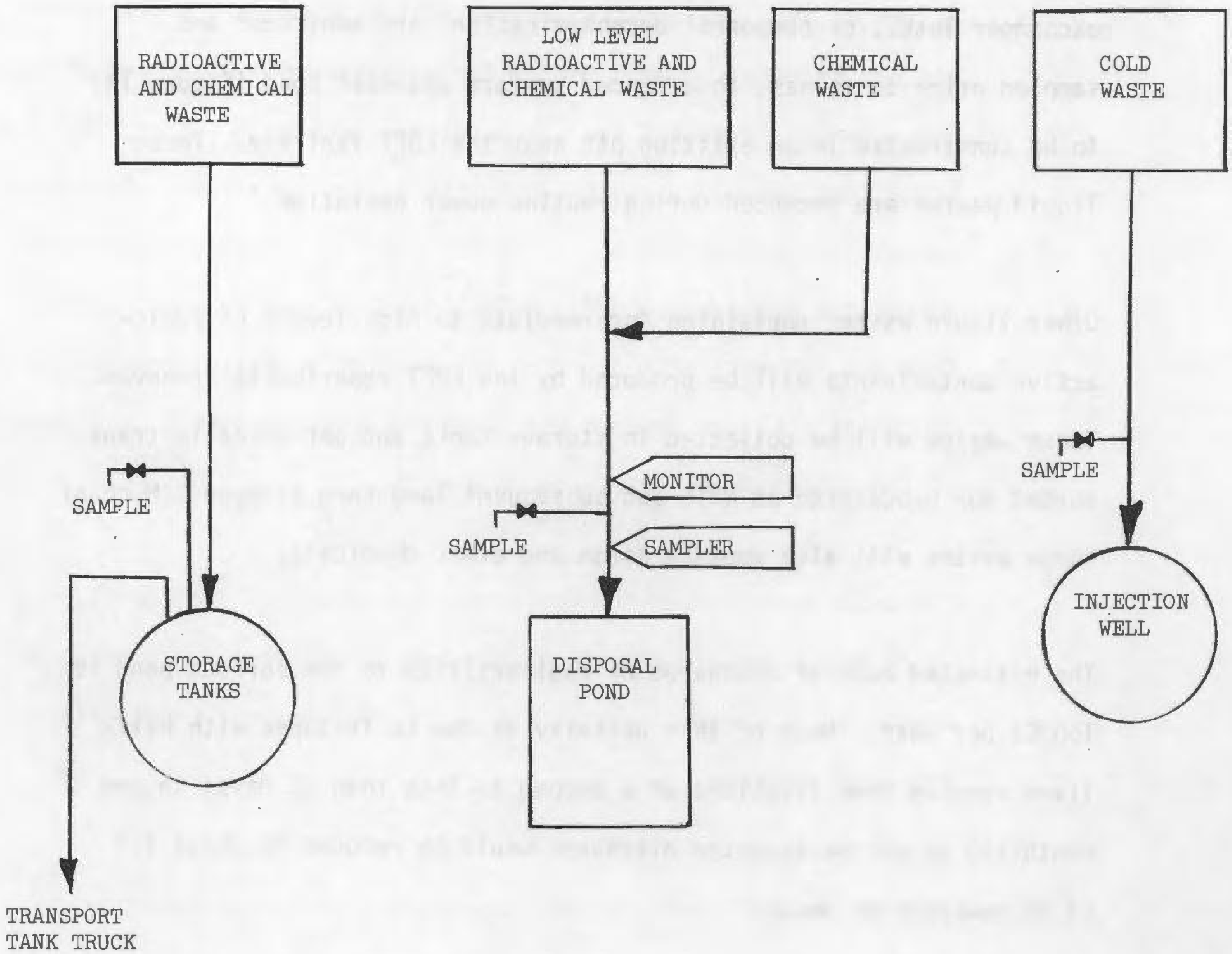
Reference 18. The expected concentration is about 0.3 percent of the new primary standard for sulfur dioxide and 0.5 percent of the new secondary standard for sulfur dioxide set by EPA (Ref. 16). No situations are envisaged in which the boiler exhausts would produce ambient air concentrations of sulfur dioxide or particulates which exceed the 24-hour standards established in Reference 16. Exhaust from the intermittent operation of gasoline or diesel powered equipment will not produce air concentrations in excess of 1 percent of the standards of Reference 16.

The waste heat from the intermittent operation of the facility at power levels up to 55 MW is dissipated to the atmosphere using an air cooled condenser. The addition of this heat will not affect the local climate.

b. Liquid Waste Discharges

Operation of the LOFT facility will generate radioactive and chemical liquid wastes from the experimental and support systems and domestic sanitary wastes. The LOFT liquid waste systems, shown in Figure 16, are designed to assure control of the contaminants and to minimize any potential environmental impact. Liquid waste discharges are separated into four categories, according to the type of discharge (surface disposal pond, injection well, infiltration field and interim storage), and are discussed in the following paragraphs.

Liquids that are normally free from radioactivity, or those which may contain small amounts of radioactivity from flushing operations, heat



Schematic Diagram of LOFT
Liquid Waste Systems

Figure 16

exchanger leaks, or personnel decontamination, are monitored and sampled prior to release to a fenced surface disposal pond (Figure 14) to be constructed in an existing pit near the LOFT facility. These liquid wastes are produced during routine power operation.

Other liquid wastes containing intermediate to high levels of radioactive contaminants will be produced by the LOFT experimental program. These wastes will be collected in storage tanks and periodically transported for processing at NRTS and subsequent long-term storage. Much of these wastes will also contain boron and other chemicals.

The estimated rate of discharge of radioactivity to the surface pond is 150 Ci per year. Much of this activity is due to isotopes with half-lives ranging from fractions of a second to less than 30 days; in one month 150 Ci of the expected discharge would be reduced to about 1.5 Ci by radioactive decay.

Table II shows the expected concentrations of long-lived nuclides in the discharge line leading to the surface pond during reactor power operation. The expected concentrations were obtained by assuming that the reactor operates with 1.0 percent fuel pin perforations during all four power runs. It is further assumed that only a fraction of the radioactivity in the primary coolant system leaks to the secondary system. The release fraction is based on the assumption that the concentration in the primary system is 100 times greater than that in the receiving system. To maximize the calculated concentrations and discharge rates, the release from the primary system is assumed to be instantaneously distributed throughout the receiving system. The highest concentrations would occur during a 2,000-hour power run; these are shown in Table II. The total yearly discharges in Table II include the contributions from four power runs, one 2,000-hour run and three 200-hour runs. Also shown in the table are the AEC's drinking water concentration guides which are derived from the basic FRC guidelines. As can be seen from the table, the discharge concentrations are all less than 5 percent of the corresponding concentration guides and the total is less than 2 percent of the limit for a mixture.

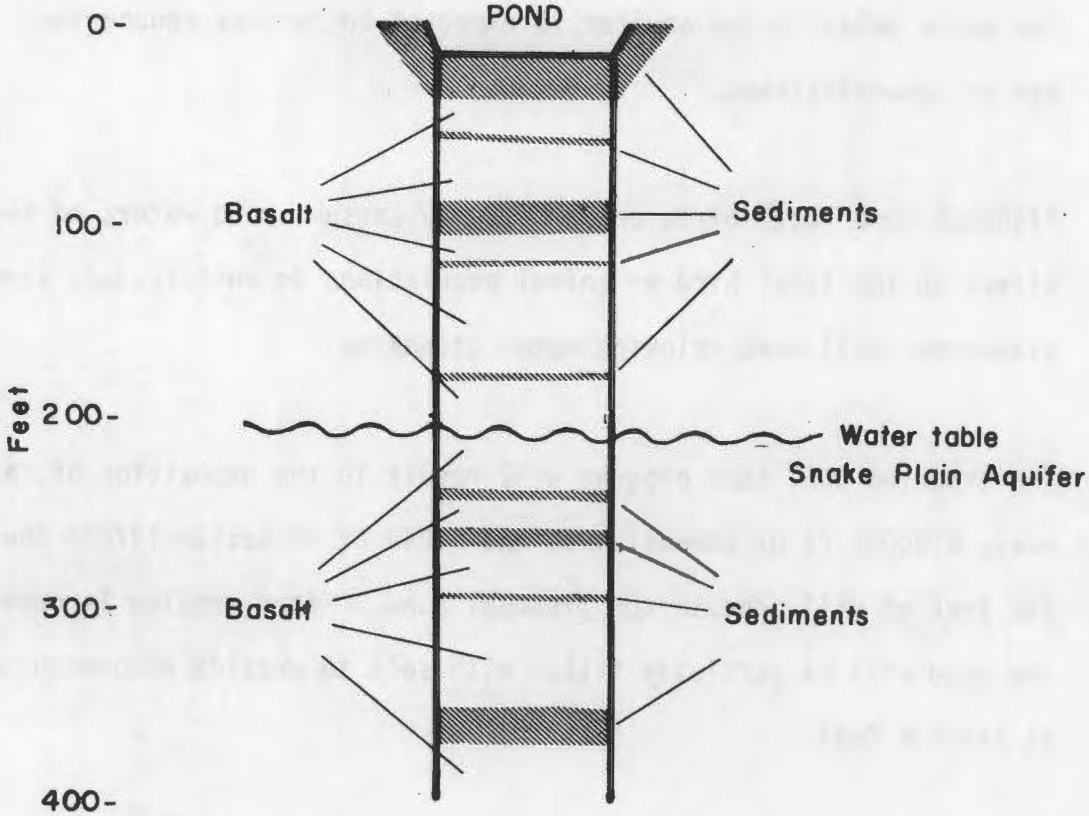
The expected annual discharge volume associated with the 150-Ci radioactivity discharge is 24 to 73 million gallons. Contaminated waste water produced during recovery from blowdown experiments will be transported away from the LOFT facility if it is not suitable for disposal in the pond. Both the total discharge volume and the total radioactivity discharge to the pond will be kept as low as practicable.

Figure 17 is a generalized geologic diagram of the LOFT disposal pond which shows the layers of basalt and sedimentary material which lie below the bottom of the pond. The time required for the liquids to move through this material to the aquifer has been estimated by the USGS to be 4 to 6 weeks (Ref. 19). The movement of the water in the aquifer is expected to be about 10 feet per day in a generally southerly direction. In addition to the removal of fission products by ion-exchange in the sedimentary layers above the aquifer and radioactive decay in transit, dispersion of

TABLE II
LONG-LIVED RADIONUCLIDE DISCHARGE CONCENTRATIONS AND RATES[a]

Radionuclide	Radioactive Half-life	Discharge Concentrations (μCi/ml)[b]	Concentration Guides for Drinking Water (μCi/ml)[c]	Discharge Rate (Ci/year)[d]
Sr-89	50.8 d	2.1×10^{-9}	3×10^{-6}	0.00012
Y-91	58.8 d	2.4×10^{-9}	3×10^{-5}	0.00013
Ce-144	284 d	7.2×10^{-10}	1×10^{-5}	0.000041
Sr-Y-90	28.9 y	4.2×10^{-11}	3×10^{-7}	0.0000024
Zr-95	65.5 d	2.4×10^{-9}	6×10^{-5}	0.00013
Ce-141	32.5 d	3.5×10^{-9}	9×10^{-5}	0.00020
Ru-103	39.8 d	1.5×10^{-9}	8×10^{-5}	0.000087
Nb-95	35.1 d	1.3×10^{-9}	1×10^{-4}	0.000075
Te-129m	34.1 d	1.8×10^{-8}	3×10^{-5}	0.0010
Ru-106	586 d	3.6×10^{-11}	1×10^{-5}	0.0000021
Cs-137	30.2 y	2.7×10^{-8}	2×10^{-5}	0.0015
H-3 (e)	12.3 y	5×10^{-5}	3×10^{-3}	3.9
Activation Products (f)	Varies	1.5×10^{-8}	(f)	0.0011

(a) Discharges to disposal pond resulting from small system leaks during reactor power operation. Only nuclides with half lives greater than 30 days and which are major contributors to the total are shown.
(b) Concentrations in waste discharge line assuming a fission product inventory from 2,000-hour operation at 55 MW.
(c) AEC Manual Chapter 0524 (or 10 CFR 20) concentration guides for drinking water based on FRC guidelines.
(d) Yearly discharge rates assume three 200-hour and one 2,000-hour power runs per year.
(e) Nearly all tritium discharged is produced in the primary coolant so concentration and discharge rate are independent of the percent of fuel pin leakage.
(f) The four principal neutron activiation products produced are Co-58, Co-60, Mn-54 and Fe-59. The radioactive half-lives vary from 45 days for Fe-59 to 5.2 years for Co-60. Discharge concentration and discharge rate are independent of the percent of leaking fuel pins. Concentration guides vary from 3×10^{-5} μCi/ml for Co-60 to 1×10^{-4} μCi/ml for Mn-54. The tabled concentration is the sum of all four activation product concentrations.



Generalized Geologic Diagram
of LOFT Disposal Pond
Figure 17

the waste water in the aquifer is expected to further reduce the tabled concentrations.

Although some local birds or mammals may consume pond water, no serious effect on the local bird or animal populations is anticipated, since discharges will meet drinking water standards.

The expected LOFT test program will result in the deposition of, at most, 0.00006 Ci of strontium-90 and 0.040 Ci of cesium-137 in the first few feet of soil beneath the disposal pond. After testing is completed, the pond will be partially filled with soil to provide an overburden of at least 6 feet.

The estimated maximum yearly quantities and average concentrations of nonradioactive chemical contaminants in water discharged to the fenced disposal pond are shown in Table III. The total volume of water discharged, an estimated maximum of 73 million gallons per year, assumes the same operating schedule mentioned previously. The expected discharge rates and concentrations are slightly less than the tabled values. The concentrations for an expected volume of 24 million gallons are not significantly different from the tabled values and the discharge rates are 1/3 of the tabled values.

TABLE III

ESTIMATED MAXIMUM CHEMICAL DISCHARGE RATES TO AND CONCENTRATIONS IN DISPOSAL POND

Chemical	Discharge Rate (lbs/yr)	Discharge Concentration (mg/liter)
Chlorine (Cl_2)	130	0.2
Sodium Chloride (NaCl)	13,000	26
Sodium Hydroxide (NaOH)	1,500	3.0
Sodium Sulfite (Na_2SO_3)	7.5	0.014
Sulfuric Acid (H_2SO_4)	1,500	3.0
Tri-Bisodium Phosphate (Na_3PO_4-Na_2HPO_4)	710	1.4
Boron	2,700	15

Table IV shows the expected ionic concentrations for the discharge water together with various limits which have been established by the EPA and the State of Idaho.

Concentration limits for chlorine gas and sulfite ion are not available, but the expected concentrations are well below levels reported harmful to fish in Reference 21. From Table IV, it can be seen that boron releases may exceed the 1 parts per million permissible concentration which is based on use of the water for irrigation. (Goudey and others have reported that boron concentrations up to 30 mg/l are not harmful in drinking water, Ref. 21.) Obviously the water in the pond will not be used for either irrigation or drinking purposes. As the pond water infiltrates into the Snake Plain Aquifer, it is greatly diluted so that at any point of water reuse the concentration will be orders of magntiude below permissible limits. (The average annual flow of Birch Creek which feeds the aquifer in the LOFT area is 57,050 acre feet per year, i.e., 1.85×10^{10} gallons per year, Ref. 10.)

TABLE IV

ESTIMATED MAXIMUM ION CONCENTRATIONS FOR LOFT DISCHARGE WATER AND ION CONCENTRATION GUIDE VALUES

Ionic Species	LOFT Discharge Concentration (ppm)	Permissible Concentration (ppm)	Desirable Concentration (ppm)
Chloride	16	250[a]	25[a]
Sulfate	3.0	250[a]	50[a]
Phosphate	1.0	50[b]	-
Sodium	12	115[b]	10[b]
Boron	15	1[a]	

(a) Water Quality Criteria, Federal Water Pollution Control Administration (Now the Water Quality Office of EPA), Reference 20.

(b) Water Quality Criteria, State of California (adopted on an interim basis by the State of Idaho), Reference 21.

The sanitary domestic wastes resulting from occupancy and operation of the LOFT facility will be disposed of using a combination septic tank-chlorinator-infiltration field arrangement which will handle up to 1,500 gallons per day. The infiltration field will have 11 drainage lines with a dosage chamber and distribution box to ensure utilization of the entire area of more than 6,000 square feet. The system is designed in accordance with AEC standards and those of the U.S. Public Health Service (Ref. 22). The system is adequate for the 60 persons expected to occupy the facility (assuming an 8-hour waste volume of 25 gallons per person). No adverse effects on ground water quality are anticipated.

During the operation of the LOFT reactor, waste heat from several systems will be transferred to the water discharged to the uncontaminated waste injection well (Figure 16) and to the pond. Raw water having an average temperature of 52°F when taken from the production well will pass through a once-through heat exchanger and will be discharged down the injection well at an average temperature of 78°F. During reactor power operation period, an average of about 200 thousand gallons per day of cooling water will be required. No adverse effects on ground water quality are expected from these discharges. The waste heat will be dissipated as the water mixes with water in the aquifer and transfers the heat to it and the surrounding basalt.

The average temperature of water discharged to the pond is expected to be 88°F. The heat will be lost through evaporation and by transfer to the sediments and basalt as the water percolates downward.

c. Solid Waste Disposal

Some of the solid wastes resulting from the LOFT experiments will be radioactive. The solid wastes will be produced primarily during refurbishing of the containment vessel and during refueling of the reactor system. Typical solid wastes to be handled will be contaminated equipment that requires replacement, spent ion exchange resins, rags and other materials. These solid wastes will be packaged and shipped from the LOFT area to a controlled area designed for the storage of solid radioactive wastes. The estimated volumes and radioactivity contents of these wastes are given in Table V.

All nonradioactive solid waste will be placed in suitable receptacles at the LOFT facility. These wastes will be transported to a sanitary land fill at the NRTS.

4. Transportation of Fuel and Radioactive Wastes

In assessing the environmental impact of the LOFT, the following activities related to the transportation of material to and from or on the NRTS site were considered:

(a) transportation of unirradiated or "cold" fuel from the fabrication plant to LOFT,

(b) transportation of spent fuel from LOFT to a fuel recovery plant, and

(c) transportation of radioactive wastes from LOFT to a storage or disposal area.

In the above cases, the mode of transportation to be used will either be truck or rail. It should be noted that the above material shipments offsite will all require the use of containers that comply with regulations established by the AEC and the Department of Transportation (DOT). These regulations are published in the Code of Federal Regulations, Title 10 Part 71 (AEC) and Title 49 Parts 171-179 (DOT).

TABLE V

RADIOACTIVE SOLID WASTE ESTIMATES

SOURCE	ESTIMATED VOLUME (ft^3/yr)	COMPOSITION	ESTIMATED TOTAL ACTIVITY (curies/yr)*
Purification and Cleanup System Resins	18	Spent Resins	10 to 20,000
Purification System Filters	2	Filters	1 to 100
Decontamination Wastes	1425	Blotting Paper, Rags, Etc.	1 to 1000
Waste Gas Particulate Filters	40	Filters	1 to 1000
Waste Gas Chemical Absorbers+	104	Charcoal Absorbers	10 to 5000

*Only a small fraction of the total activity will be long-lived isotopes such as Sr-90 and Cs-137. The vast majority of the activity will consist of nuclides with half-lives less than one year.

+Although the filters may collect up to 55 curies of iodine per year, they do not require changing (the radioactive half lives of most iodine radioisotopes are relatively short).

In the transportation of "cold" fuel, the radiation level at the surface of the fresh fuel containers should not exceed 5 mrem per hour.

The radiation level at the surface of the radioactive waste packages and/or spent fuel shipping casks is limited by the DOT regulations to not more than 200 mrem per hour, and at three feet from the surface to not more than 10 mrem per hour. If the shipment is made in a closed truck or rail car, the radiation level at three feet from the surface of the cask or package may be as high as 1,000 mrem per hour, provided that the radiation level at the surface of the vehicle does not exceed 200 mrem per hour, and the radiation level at 6 feet from the surface of the vehicle does not exceed 10 mrem per hour. Because of the large size of the casks used for shipping materials containing high levels of radioactivity, the limiting factor will be the radiation level at either 3 feet from the surface of the package, or 6 feet from the vehicle. Therefore, the radiation levels at the surface of the casks will be considerably below those allowed by the regulations.

To insure that the casks have the capability to withstand severe accident conditions, the following accident damage test conditions are specified in the regulations and each container must be designed and constructed so that if subjected to these conditions, in sequence, most of the shield would be retained such that the escape of contaminated coolant or inert gases would not exceed certain specified limits.

Free Drop

A free drop through a distance of 30 feet onto a flat essentially unyielding horizontal surface, striking the surface in a position for which maximum damage is expected.

Puncture

A free drop through a distance of 40 inches striking, in a position for which maximum damage is expected, the top end of a vertical 6-inch diameter cylindrical mild steel bar mounted on an essentially unyielding, horizontal surface.

Thermal

Exposure to a thermal test, or an actual fire, in which the heat input to the package is not less than that which would result from exposure of the whole package to a thermal radiation environment of 1,475°F for 30 minutes.

Water Immersion (Fissile Material Containers Only)

Immersion in water to the extent that all portions of the package to be tested are under at least 3 feet of water for a period of not less than eight hours.

Additional special tests are prescribed for unusual conditions. It should be noted that while some of the many containers of reactor fuel and waste that have been shipped in the past 20 years have been involved in serious transportation accidents, none has ever been breached. To date, there has not been a single injury due to radiation from radioactive materials in transportation.

Since the transportation of the spent fuel from the LOFT facility may be entirely within the NRTS boundary, site transfer casks may be used which differ from the shipping casks used for shipments from commercial power plants. All onsite shipments of fuel and radioactive waste at the NRTS must have prior health physics approval (for radiation and contamination aspects) and safety engineering approval (for securing of the shipping casks used for shipping spent fuel). All shipments are thoroughly documented. The purpose of these reviews and approvals of shipping is to minimize both the probability of accidents and the effects of accidents should they occur.

During the last several years, the number of onsite irradiated fuel shipments at the NRTS have been averaging approximately 350 per year. There has never been a significant incident (inadvertent release of radioactivity or exposure of personnel) associated with the onsite transfer of fuel material since fuel shipments began in 1952.

The onsite transfer of LOFT fuel will be handled in accordance with NRTS principles and policies. The excellent safety record for onsite shipments is expected to continue and all necessary precautions of fuel containment, shielding, adequate vehicles, tiedowns, etc., will be taken to preclude incidents that would have an adverse environmental impact.

B. Extraordinary Adverse Environmental Effects

As previously mentioned, the experimental program for the LOFT facility includes a series of experiments in which the primary coolant system of the reactor will be deliberately ruptured allowing the contained high temperature, high pressure water to blowdown to near atmospheric pressure. Ruptures will be of varying sizes up to and including a double-ended rupture of the blowdown loop pipe in the primary coolant system. Thus, the LOFT plant will be deliberately and repeatedly exposed to events that would be considered extremely extraordinary in commercial nuclear power plants. The LOFT facility has been designed to accommodate this experimental program. Incident consequences worse than those planned and designed for do not appear possible.

In evaluating the environmental impact of LOFT due to unplanned events, a variety of incidents were evaluated ranging from minor incidents to a Maximum Hypothetical Accident (MHA). Minor incidents such as spills, leaking valves, etc., which may be expected to occur at the LOFT facility were found to have a negligible environmental impact because the systems designed into the facility for normal planned operations will minimize the consequences of these minor incidents. Liquid effluent from an incident will be routed to the liquid waste system. Liquid wastes containing radioactivity will either be collected and stored in storage tanks or discharged to the disposal pond, depending upon radioactivity level.

Critical areas where radioactive gases could be released within the facility are serviced by the LOFT heating and ventilating system, which routes the gases through high efficiency particulate air filters and charcoal absorber filters. This filter system will collect essentially all the particulate material and at least 99 percent of the iodines. A negligible impact upon the environment is envisioned as a result of these minor incidents.

In most of the LOFT blowdown tests, the effluents (steam, water, fission products and debris) will be directed to a blowdown suppression system which will quench the steam and collect the fission products thus avoiding contamination of the containment building and greatly reducing the potential environmental impact. Some tests are planned, however, in which blowdown will be directly to the containment. Such tests will prove the value of the containment in limiting releases of fission products to the environment. These tests will not be performed in the early months of operation of the facility. (They presently are not planned for the first two years of facility operation.) At the time deliberate blowdowns to the containment occur, previous experiments will have provided more precise knowledge of fuel failure mechanisms, fission product migration, blowdown phenomena, etc., so that such experiments will be performed with a high degree of confidence that a negligible environmental impact will occur. The consequence of these tests may exceed those of minor incidents but can never exceed the MHA that has been evaluated for the facility. Therefore, the environmental impact of these tests will be less than those discussed for the MHA below.

Three safety reports* related to the LOFT facility include discussions and evaluations of the MHA for the facility. The MHA analysis assumptions are briefly summarized here:

1. 25 percent of the total radioactive iodine inventory becomes immediately available for leakage from the containment.
2. 100 percent of the radioactive noble gas inventory becomes immediately available for leakage from the containment.
3. The containment leaks at the technical specification maximum rate (0.2 percent per day at 36 psig adjusted to an accident pressure of 8.2 psig) for the first 24 hours and at 50 percent of this rate for the remaining duration of the accident. For the first 24 hours, Pasquill Type F weather and 1 meter per second wind speed are assumed.

The LOFT facility is equipped with redundant emergency core cooling equipment and containment spray equipment that is expected to limit fission product releases to much lower values than these postulated ones.

The thyroid inhalation exposure was calculated to be 7.2 rem and the whole-body gamma exposure was calculated to be .0044 rem at the nearest NRTS site boundary. The above assumptions and standard atmospheric diffusion equations were used in making these calculations. These exposures are substantially lower than the guideline values set forth

*IDO 16981, Preliminary Safety Analysis Report LOFT Facility, April 1964; LOFT Facility Interim Design and Operational Evaluation Report, April 1971; Final Safety Analysis Report, LOFT Facility, to be published.

in Part 100 of Title 10 of the Code of Federal Regulations, namely 300 rem for the thyroid exposure and 25 rem for the whole-body exposure. Greater exposures than these could be calculated for points inside the site boundary but careful control will be maintained over all site personnel and visitors so that, even under conditions as severe as those postulated for the MHA, none would receive doses in excess of the 10 CFR 100 guideline values mentioned above.

It is concluded that operation of the LOFT facility will have only minimal impact upon the local environment even if extraordinary and unexpected events are considered. The facility is designed to accommodate routine operations that compare in severity with very extraordinary events at commercial nuclear power plants. Conservative calculations have shown that even for accidents more severe than any considered possible for this facility, the resulting doses at the site boundary would be well within applicable guideline levels.

IV. UNAVOIDABLE ADVERSE ENVIRONMENTAL EFFECTS

Only about 50 acres of the 571,700-acre NRTS were disturbed due to construction of the LOFT support facilities. The reactor building and all auxiliary buildings have been constructed and future operations will not affect activities at or near the LOFT site. The minor amount of transportation over existing roadways associated with operation of the LOFT will cause no measurable environmental impact.

There are not expected to be any adverse effects due to solid waste disposal. All nonradioactive solid waste will be placed in receptacles at the LOFT facility and these wastes will be routinely transported to a sanitary landfill at the NRTS for disposal. Solid radioactive wastes will be collected and shipped to a controlled area designed for storage of such wastes, as discussed in Section III. A.3.c. of this statement.

No onsite or offsite radiological effects are expected due to routine releases from the LOFT facility. The treatment and handling of such wastes, as described in Section III.A., will preclude any significant effects. No onsite or offsite effects are expected due to the minor amounts of waste heat or industrial wastes to be released to the environment during the conduct of the LOFT program.

V. ALTERNATIVES

A. Program

1. Cancellation of the LOFT Program

The alternative of not performing the LOFT program is unacceptable. The conduct of nuclear reactor safety experiments and studies is an important part of the Commission's ongoing safety program. The LOFT research will make a valuable contribution to the AEC's water reactor safety program and provide some data not otherwise obtainable. The LOFT facility was constructed, as part of the AEC's broad ongoing safety program, to help provide the necessary experimental data for evaluating, and if necessary, modifying analytical models for predicting the behavior of emergency core cooling systems under postulated accident conditions. These models can then be applied to the accident analysis of full scale reactor systems with greater confidence. The major environmental impact, construction of the LOFT facility, has already occurred. The environmental impacts associated with the operation of the LOFT facility and conduct of the test program are greatly outweighed by the environmental and technical benefits to be gained from the LOFT test program.

2. Use of Existing Facility

The possibility of performing the LOFT program in an alternate reactor facility was considered. The facility design must not only include specialized features which consider scaling factors to permit extrapolation of experimental data to currently designed large commercial power reactors, but also the flexibility to vary the experimental parameters. There are no other existing facilities whose design and flexibility are adequate for the conduct of the LOFT program. Use of another facility would increase the environmental impact of the LOFT program since no other facility has the plant safety and cleanup systems included in the LOFT facility.

3. Modification of Existing Facilities

The alternative of modifying existing facilities in order to carry out the LOFT test program is unacceptable. Some of the environmental impacts of construction of the LOFT would be repeated at another facility and the results of the test program would not be provided in a timely fashion.

4. Reduction in the Number of Tests

A reduced number of tests per year could, perhaps, reduce the environmental impact associated with the operation of the LOFT but the needed safety information would not be available in as timely a fashion as the postulated program would produce it.

B. <u>Site</u>

1. Construction at a Site Other Than the NRTS

Since the LOFT facility is essentially completed, the alternative of changing the location of the LOFT facility does not appear to be practical. Construction of a new LOFT facility at another site would require that the environmental impact of construction, which has already occurred at the present LOFT site, be repeated elsewhere. Land area would have to be provided at another site, in addition to the land already committed at the present LOFT site. Furthermore, the NRTS site has characteristics, such as its relative isolation, low population density and well known meteorology, climatology, geology and hydrology, that make it an ideal site for the LOFT program. The original selection of the NRTS as the location for the AEC's reactor testing activities was based in large measure on its being isolated from population concentrations. Thus, because of its location and mission, the NRTS is particularly well suited to the program activities to be conducted at the LOFT.

2. Construction at Another Site on the NRTS.

Construction of the LOFT facility at another location on the NRTS is not practical. The LOFT has been constructed at the TAN complex (Figure 5). This use of an existing site and support facilities allowed utilization of existing roads and utility systems associated with a previously decommissioned facility. The use of these existing structures has minimized the effect of construction on the environment. The selection of an alternate site for the LOFT program, now that the NRTS facilities are nearly complete and available for use, would result in greatly increased monetary costs and environmental impacts without compensating benefits. In particular, the environmental impacts of construction would be greatly increased since considerable additional construction would be required.

C. Waste Treatment

The discharge of radioactive effluents from the LOFT facility will be as low as practicable. Resulting doses will be well within guideline values and generally less than one percent of natural background radiation doses (see Section III). Although there appear to be no significant adverse short- or long-term effects on the environment from the planned operation of the LOFT facility, alternative methods of waste treatment have been and will continue to be evaluated. Additional filter systems, such as cold freeze traps to remove radioactive noble gases, have been considered for reducing the airborne radioactivity releases. The minor reductions in potential doses, see Table I, that are already quite small were not considered justifiable in view of the increased cost involved. The expected liquid discharges at the LOFT will meet drinking water standards at the point of discharge from the facility.

VI. RELATIONSHIP BETWEEN SHORT-TERM USES AND LONG-TERM PRODUCTIVITY

The AEC's planned use of a relatively small portion of the Station to conduct reactor safety experiments at the LOFT facility will not have adverse effects on the long-term utility or productivity of the NRTS environment. As noted in Section IV, a small area will necessarily remain under the control of the Federal Government for an as yet undetermined length of time, but the presence and short-term use of that area will not preclude potential short- or long-term uses of adjacent lands. Those lands will retain their potential value for use by future generations, since construction and operation of this facility does not significantly alter surface or subsurface conditions of the site. As noted previously, the NRTS has been used for unsuccessful dry farming operations and for gunnery practice. Some sections of the NRTS are presently used for grazing (Figure 9). If the LOFT facility is decommissioned, the land could be returned to its original condition. In any event, after the experimental program is completed, land immediately adjacent to the LOFT facility could be used for grazing.

VII. STATE, LOCAL OR REGIONAL CONFLICTS

There are no known present or potential conflicts with State, regional or local plans and programs.

VIII. IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

The containment vessel and attached support facilities are the major new structures being erected for the LOFT program. All other supporting facilities were constructed previously for another, now discontinued, program. These structures will remain intact and under the control of the Federal Government. Many can be used for other projects which may be undertaken or authorized by the AEC at the NRTS; others may be decommissioned and sealed to prevent deterioration. The area specifically identified for the LOFT program is about 500 acres. The entire TAN complex, however, encompasses an area of about 2,500 acres. Construction of facilities and the associated roads, railroad trackage, gravel pit, etc., has resulted in the disturbance or elimination of the natural vegetation and rodent habitats in an area of about 50 acres. Observations of the effects of previous construction in this area indicate that recovery will be quite slow in disturbed areas. Recovery is, of course, prevented in areas where buildings and roads are established and likely to remain.

Establishing these facilities and improvements commits this 500-acre area of the NRTS for a relatively long period of time. Future uses of the area will be limited by present construction which actually covers only a few acres of the total; however, no further limitations on the use of lands adjacent to the facility have been introduced by LOFT construction. If the current uses of the NRTS by the AEC were to be discontinued, most of the 500 acres could be released for unrestricted use. However, excavation would be restricted in the vicinity of the disposal pond. Some existing structures and facilities could be modified for alternate uses with reasonable effort. It should be noted that, although no significant mineral resources are known to be located in the vicinity of the LOFT facility, construction and operation of the LOFT will not significantly affect future development of any as yet undeveloped resources at the site.

The core of the LOFT reactor will contain approximately 55 kilograms of fissionable uranium-235. This resource will be used at the rate of approximately 7.5 kilograms per year, assuming a facility operating schedule in which the reactor operates at or near full power half of the time. Spent fuel elements will be transported from the LOFT facility to a chemical processing plant for recovery of fissionable material. The use of this quantity of fuel represents a short-term expenditure to obtain long-term benefits of this part of the AEC's reactor safety program.

IX. COST-BENEFIT ANALYSIS

The primary purpose of the LOFT program is to study the reactor system responses and the consequences of highly improbable reactor accidents, such as the gross failure of primary coolant system integrity, resulting in the loss of cooling fluid from a reactor, and the performance of safety systems designed to mitigate these consequences. The LOFT research program will make a valuable contribution to the AEC's water reactor safety program and provide data not otherwise obtainable.

Construction of the LOFT facility will cost about $35,000,000. Operating costs associated with the LOFT experimental program to date amount to about $50,000,000. Conduct of the proposed LOFT experimental program will result in site boundary doses due to radioactivity released to the atmosphere at the LOFT facility of less than 4 mrem per year. Higher doses, due to leakage from the containment (conservatively calculated to be 132 mrem per year thyroid dose and 8 mrem per year bone dose) may result when tests involving blowdown into the containment are performed.

While there appear to be no significant adverse short- or long-term effects on the environment from the planned operation of the LOFT program, alternatives to the facility and methods of waste treatment have been evaluated. Since the LOFT facility is nearing completion, the alternative of changing the LOFT site at this time would cost in excess of $30,000,000 and is not considered practical. In addition, if the existing LOFT facility were abandoned it would represent a wasted commitment of resources.

Alternatives to the present LOFT site, elsewhere on the NRTS or at another location, were also considered. Since the LOFT has been constructed at an existing abandoned reactor site at the NRTS, it allowed the use of available support facilities and minimized the effect of construction of additional roads and power lines. Also, additional delays would be required if at this time a decision to reconstruct the LOFT facility elsewhere were made, thus reducing the program benefits. Construction of the LOFT facility at another site would mean that the environmental impacts of construction, which have already occurred at the present site, would be repeated at the new site. In addition, these impacts would be greater at a new site since support facilities, roadways, fencing and possibly even transmission lines - all of which were present at the LOFT facility site prior to construction would need to be constructed at a new site. Furthermore, land in addition to that already committed at the present LOFT site would need to be provided at any new site.

The waste systems of LOFT have been evaluated on a cost benefit basis to determine the most practical approach of minimizing the environmental impact from nuclear wastes released during planned operation of the facility. The expected liquid discharges during normal operations at the LOFT facility will meet drinking water standards, although they would not be a source of drinking water.

Additional filter systems such as cold freeze traps to remove radioactive noble gases were considered for reducing the airborne radioactivity releases. The capital cost addition of such a system would cost about $5,000,000 and would eliminate the very low potential annual dose of 1.4 mrem a person might receive at the site boundary from the fission product noble gas release from the LOFT facility. As the natural background dose at the NRTS is about 100 mrem per year, the benefit of a system that would further reduce a 1.4 mrem dose is not considered commensurate with the cost involved.

It is concluded that the environmental and technical benefits gained from the operation of this facility far outweigh the negligible impact the facility is expected to have upon the environment and the monetary costs involved. In view of this, and after considering the range of alternatives discussed previously and their environmental impact, the AEC proposes to complete the construction of the LOFT facility and conduct the LOFT experimental program.

X. REFERENCES

1. K. A. DIETZ (Ed.) (1969). LOFT Engineered Safety System Investigations, AEC Report IDO-17258.

2. G. A. DEMARRAIS (1958). The Climatology of the National Reactor Testing Station. AEC Report IDO-12003, Unclassified.

3. G. A. DEMARRAIS (1958). The Engineering Climatology of the National Reactor Testing Station. AEC Report IDO-12004, Unclassified.

4. G. A. DEMARRAIS AND N. F. ISLITZER (1959). The Diffusion Climatology of the National Reactor Testing Station. AEC Report IDO-12015, Unclassified.

5. G. R. YANSKEY et al. (1966). Climatography of the National Reactor Testing Station. AEC Report IDO-12048, Unclassified.

6. B. L. SCHMALZ AND W. L. POLZER (1969). Tritiated Water Distribution in Unsaturated Soil. Soil Science, 108, pp. 43-47.

7. R. L. NACE (1956). Geography, Geology, and Water Resources of the National Reactor Testing Station, Idaho, Part 1. Report IDO-22033-USGS, Unclassified.

8. R. L. NACE et al. (1959). Geography, Geology, and Water Resources of the National Reactor Testing Station, Idaho, Part 2. Report IDO-22034-USGS, Unclassified.

9. E. WALKER (1964). Subsurface Geology of National Reactor Testing Station, Idaho. Geologic Survey Bulletin 1133-E.

10. J. T. BARRACLOUGH et al. (1967). Hydrology of the National Reactor Testing Station, Idaho. Report IDO-22049-USGS, Unclassified.

11. H. E. MALDE (1969). Geologic Investigations of Faulting Near NRTS, Idaho. USGS open-file report.

12. P. H. CARRIGAN, JR. (1972). Probabilities of Flows Exceeding Capacity of Flood Control System at the National Reactor Testing Station, Idaho. Report IDO-22052-USGS.

13. INTERNATIONAL CONFERENCE OF BUILDING OFFICIALS (1961). Uniform Building Code, Eleventh Edition, Revised, Los Angeles, California.

14. INTERNATIONAL CONFERENCE OF BUILDING OFFICIALS (1970). Uniform Building Code, Volume I, 1970 Edition.

15. J. B. ROBERTSON et al. (1972). The Influence of Liquid Waste Disposal on Geochemistry of Water at the National Reactor Testing Station, Idaho 1949-1970. (In Review).

16. ENVIRONMENTAL PROTECTION AGENCY (1971). National Primary and Secondary Ambient Air Quality Standards. Federal Register, 36 (84) Part II, pp. 8186-8201.

17. C. A. PELLETIER AND J. D. ZIMBRICK (1970). Kinetics of Environmental Radioiodine Transport Through the Milk-Food Chain, in Environmental Surveillance in the Vicinity of Nuclear Facilities. Charles C. Thomas, Publisher. Springfield, Illinois.

18. IDAHO AIR POLLUTION CONTROL COMMISSION (1970). Rules and Regulations for the Control of Air Pollution in Idaho. State of Idaho. Boise, Idaho.

19. J. T. BARRACLOUGH (1971). Personal communication based on unpublished U.S. Geological Survey data.

20. FEDERAL WATER POLLUTION CONTROL ADMINISTRATION (1968). Report of the Committee on Water Quality Criteria. U.S. Government Printing Office. Washington, D.C.

21. J. E. MCKEE AND H. W. WOLF (1963). Water Quality Criteria (Second Edition). State of California, Sacramento, California.

22. PUBLIC HEALTH SERVICE (1967). Manual of Septic Tank Practice. Public Health Service Publication No. 526. U.S. Government Printing Office. Washington, D.C.

XI. APPENDIX

A. COORDINATION

1. <u>U.S. Department of the Interior</u>

a. <u>Bureaus of Land Management and Sport Fisheries and Wildlife</u>

Ninety percent of the Station's area is on public domain land which was withdrawn by the U.S. Department of the Interior for use by the AEC for reactor testing (the remaining 10 percent was acquired by the AEC by purchase or condemnation). The AEC cooperates with the Bureau of Land Management to control noxious weeds in the area and with the Bureau of Sport Fisheries and Wildlife on measures to control predatory animals.

b. <u>U.S. Geological Survey</u>

As part of an interagency agreement between the AEC and the USGS, a contingent of USGS personnel has been maintained at the NRTS since its inception. The function of the USGS is to study the geology and hydrology of the area and advise the AEC and its contractors on the potential effects of ground water use on the quality of the water in the Snake Plain Aquifer. As indicated in Section II.5., they also monitor the quality of the ground water and prepare reports of their findings and conclusions. The USGS provided information relevant to the planning for disposal of the LOFT liquid wastes.

2. <u>Environmental Protection Agency</u>

The AEC submits plans and specifications of all liquid waste management systems to the EPA, Water Quality Office (WQO) for review and comment. Plans for the LOFT liquid waste system were submitted in September 1969. As the result of their review and subsequent clarifying discussions with

AEC, it was concluded by the AEC and the WQO that the disposal system was an acceptable means of handling liquid wastes from the LOFT program. Recent design modifications were transmitted to the WQO for information and consideration in June 1971. Annually, the EPA receives a list and brief description of new facilities or modifications to existing facilities at the NRTS which involve water pollution control measures.

3. U.S. Department of Commerce

National Oceanic and Atmospheric Administration

As part of an interagency agreement between the AEC and NOAA, a contingent of NOAA personnel has been maintained at the NRTS. Their function is similar to that of the USGS; their studies and advice concern the behavior and quality of the atmosphere. NOAA personnel have made studies on which computations of potential concentrations of radioactivity in air from LOFT operations are based. They maintain a network of meteorological stations which can be used to predict the dispersal of airborne material leaving the LOFT area during controlled releases of radioactive gases.

4. State of Idaho

The State of Idaho has developed several regulations concerning the quality of the environment. It is the policy of the AEC to cooperate with the State of Idaho in the interest of safeguarding the environment on and near the Snake River Plain. Personnel from the Idaho State Health Department visit the NRTS periodically to review NRTS waste management activities. Both the Idaho State Board of Health and a Task Force established by the Governor have visited the Station to review waste management practices at the NRTS.

5. Internal Review Procedures

All LOFT system designs, including the safety aspects of each system's operation, are prepared in the form of System Design Descriptions which are reviewed by the AEC's Idaho Operations Office (ID) and the Division of Reactor Development and Technology (RDT). Component Design Descriptions, which receive the same review, are prepared for major components. Radiological and nuclear safety staffs within the contractor's organization and within ID and RDT also maintain continuing surveillance of design and construction efforts to ensure compliance with quality assurance, health and safety, and environmental criteria.

In addition to the continuing review of the contractor's operations by ID and RDT, the Division of Reactor Licensing and the Advisory Committee on Reactor Safeguards perform independent reviews of the health and safety aspects of the program.

B. LOFT FACILITY PRELIMINARY DESIGN FEATURES

Basic--dolly-mounted pressurized water reactor, light water cooled and moderated, with a low leakage[1] steel containment cylinder (including a 22 foot by 33 foot railroad door for the passage of the mobile test assembly) and associated experimental and support systems.

Reactor Core	
Power	up to 55 MW thermal
Reactor Vessel Inlet Pressure	up to 2289 psia
Inlet Temperature	up to 559°F
Temperature Rise (average across core)	up to 67°F
Fuel	
Total Weight (as UO_2)	3377 lbs.
Lifetime (at full power)	2000 hrs.
Enrichment (w/o U-235)	4%
Primary Coolant System	
Design Pressure	2500 psia
Design Temperature	650°F
Coolant Volume	239 ft^3
Heatup Rate (and cooldown rate)	up to 100°F/hr
Heat Rejection	heat exchanger (steam generator)

[1] Uncontrolled leakage less than 0.2 weight percent of dry air per day at 36 psig pressure.

Reactor Plant Components

Reactor Vessel --	
Design Pressure	2500 psia
Design Temperature	650°F
Operating Pressure	2250 psia
Steam Generator --	
Type	inverted U-tube
Primary Coolant Pumps (2) --	
Design Pressure	2500 psia
Design Temperature	650°F
Design Capacity	5000 gpm each
Design Head	225 ft.
Pressurizer --	
Design Pressure	2500 psia
Design Temperature	683°F
Operating Pressure	2250 psia
Volume	34 ft^3
Heater Capacity	48 kw

Emergency Core Cooling System

High Pressure Injection	
Design Flow	27 gpm (each - 2 pumps)
Initiation Pressure	1800 psig
Coolant Volume	up to 24,000 gal[2]
Low Pressure Injection	
Design Flow	300 gpm (each - 2 pumps)
Initiation Pressure	200 psig
Coolant Volume	up to 24,000 gal[2]
Accumulator Injection	
Number of Accumulators	2
Design Pressure	1000 psig
Coolant Volume	93 ft^3 each
Cover Gas	Nitrogen

[2] Drawn from tank containing 24,000 gals of borated water.

C. GLOSSARY

Curie Standard measure of rate of radioactive decay; the quantity of any radioactive nuclide in which the number of disintegrations per second is 37,000,000,000.

Relative Biological Effectiveness (RBE) The ratio of gamma- or X-ray dose to the dose that is required to produce the same biological effect by the radiation in question.

Roentgen (R) Standard unit of absorption of X and gamma radiation; quantity of X or gamma radiation such that the associated corpuscular emission per 0.0012038 g of air (dry air at standard temperature and pressure) produces, in air, ions carrying one electrostatic unit of electricity of either sign.

Roentgen equivalent man (rem) That quantity of radiation of any type which when absorbed by man produces a biological effect equivalent to that produced by the absorption of one roentgen of X or gamma radiation.

Millirem (mrem) One thousandth (1/1000) of a rem.

XII. COMMENTS AND AEC RESPONSES

Summary

Comments on the LOFT draft environmental statement were obtained from the Departments of Health, Education, and Welfare, Defense, Transportation, Agriculture, Commerce and the Interior, the Environmental Protection Agency and the State of Idaho. In general, the Federal and state agency comments resulted in only minor changes in the statement.

The Department of Commerce suggested that more restrictive atmospheric diffusion conditions be assumed for releases at certain times. Such assumptions are not needed since significant releases will not be made during meteorological conditions more limiting than the conditions used in the analyses of the impacts due to LOFT operations. The Department of Commerce also suggested that the LOFT environmental statement reflect the cumulative impact of experiments and that any adjustment in estimate be reviewed by issuance of an amended draft environmental statement. The LOFT environmental statement reflects the cumulative impact of experiments and, since very conservative assumptions were employed in estimating the impact of LOFT operations, an amended draft environmental statement would probably not be needed.

The Environmental Protection Agency questioned the necessity of shipping LOFT spent fuel offsite for reprocessing, suggested that

additional detail be provided on the disposal of low-level liquid radioactive wastes from LOFT and suggested that the AEC consider preparing a separate evaluation of the environmental impact of the integrated NRTS waste discharge and storage practices. The reply to the Environmental Protection Agency indicates that present plans call for LOFT fuel reprocessing at the NRTS and that low-level liquid radioactive wastes from LOFT would be "suitable" for discharge to the disposal pond if the concentrations of long lived (greater than 30 day half-life) radioisotopes contained in the water do not exceed those allowed by AEC Manual Chapter 0524, Annex A, Table II, column 2 and 10 CFR 20, Appendix B, Table II, column 2.

As the Department of the Interior suggested, a referencee, "Geologic Investigations of Faulting Near NRTS, Idaho," H. E. Malde, 1969, has been added to the references of principal Survey investigations on page 21 and the list of references on pages 81-82 of this statement. The Department of the Interior also recommended that the final environmental statement include a short discussion on the environmental effects of construction and the mitigating measures taken to offset these effects, identify effects on any archeological resources and develop a land use plan for the site. The AEC reply indicates that only minimal mitigating measures are required after facility construction work at the NRTS, that construction and operation of the LOFT facility will have no effect on the Experimental Breeder Reactor No. 1 National Historic Landmark, that construction at the LOFT site has not significantly affected archeological resources and that there are no plans for major multiple land use, other than the grazing now permitted.

The State of Idaho expressed concern about accidental and routine releases of radioactive materials in liquid discharges and resulting impacts on ground water. The AEC reply notes that such discharges will not threaten the present and future quality and safety of the Snake Plain Aquifer.

DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
REGION X
ARCADE PLAZA BUILDING
1321 SECOND AVENUE
SEATTLE, WASHINGTON 98101

JUL 20 1972

OFFICE OF THE REGIONAL DIRECTOR

Mr. Julius H. Rubin
Assistant General Manager
for Environment and Safety
United States Atomic Energy Commission
Washington, D. C. 20545

Dear Mr. Rubin:

Subject: Draft Environmental Statement, Loss of Fluid Test Facility

The subject draft statement was sent to this Region by the Office of the Assistant Secretary for Health and Scientific Affairs in Washington for review and comment. We are happy to review your statement.

This office has no comment on the safety and health aspects of the statement. The long established monitoring and safety practices at the site, if continued to be enforced as described in the statement, should provide a safe, healthy, working climate.

Thank you for the opportunity to review the draft statement and to coordinate our mutual environmental interests.

Sincerely yours,

Bernard E. Kelly

Bernard E. Kelly
Regional Director

UNITED STATES
ATOMIC ENERGY COMMISSION
WASHINGTON, D.C. 20545

Mr. Bernard E. Kelly
Regional Director
U.S. Department of Health,
  Education, and Welfare
Region X
Arcade Plaza Building
1321 Second Avenue
Seattle, Washington 98101

Dear Mr. Kelly:

Thank you for the comments on the Atomic Energy Commission's draft environmental statement for the Loss of Fluid Test Facility. The statement has been revised in response to comments received. A copy of our final statement is enclosed for your information.

Sincerely,

Julius H. Rubin

Julius H. Rubin
Assistant General Manager
  for Environment and Safety

Enclosure:
Final Environmental Statement,
  Loss of Fluid Test Facility,
  NRTS, Idaho (WASH-1517)

cc: Dr. Merlin K. DuVal, HEW, w/enclosure

DEPARTMENT OF THE ARMY
WALLA WALLA DISTRICT, CORPS OF ENGINEERS
BLDG. 602, CITY-COUNTY AIRPORT
WALLA WALLA, WASHINGTON 99362

NPWEN-PL

24 July 1972

Mr. Julius H. Rubin
Assistant General Manager
for Environment and Safety
U. S. Atomic Energy Commission
Washington, D. C. 20545

Dear Mr. Rubin:

A copy of the AEC draft environmental statement, "Loss of Fluid Test Facility, National Reactor Testing Station, Idaho," was forwarded by the Office of the Assistant Secretary of Defense for our review and comment.

The draft statement has been reviewed. It appears that the facility will not affect any water resources programs and responsibilities of the Corps of Engineers.

Sincerely yours,

Carlos W. Hickman

CARLOS W. HICKMAN
Major, CE
Deputy District Engineer

UNITED STATES
ATOMIC ENERGY COMMISSION
WASHINGTON, D.C. 20545

Major Carlos W. Hickman, CE
Deputy District Engineer
Department of the Army
Walla Walla District
Corps of Engineers
Building 602, City-County Airport
Walla Walla, Washington 99362

Dear Major Hickman:

Thank you for the comments on the Atomic Energy Commission's draft environmental statement for the Loss of Fluid Test Facility. The statement has been revised in response to comments received. A copy of our final statement is enclosed for your information.

Sincerely,

Julius H. Rubin

Julius H. Rubin
Assistant General Manager
for Environment and Safety

Enclosure:
Final Environmental Statement,
Loss of Fluid Test Facility,
NRTS, Idaho (WASH-1517)

cc: Dr. Louis M. Rousselot, DOD, w/enclosure

DEPARTMENT OF TRANSPORTATION
UNITED STATES COAST GUARD

MAILING ADDRESS:
U.S. COAST GUARD (GWS)
400 SEVENTH STREET SW.
WASHINGTON, D.C. 20590
PHONE: 202/426/2262

3 AUG 1972

Mr. Julius H. Rubin
Assistant General Manager for
Environment and Safety
U. S. Atomic Energy Commission
Washington, D. C. 20545

Dear Mr. Rubin:

This is in response to your letter of 28 June 1972 addressed to Mr. Herbert F. DeSimone, Assistant Secretary for Environment and Urban Systems, concerning the draft environmental impact statement on the Loss of Fluid Test Facility (Loft), National Reactor Testing Station in Southeastern Idaho.

The concerned operating administrations and staff of the Department of Transportation have reviewed the material presented and we have no comments to offer. It is our determination that the impact of this project upon transportation is minimal. We have no objection to the operation of this facility.

The opportunity to review and comment on the draft statement for the Loft facility is appreciated.

Sincerely,

W. M. Benkert

W. M. BENKERT
Rear Admiral, U. S. Coast Guard
Chief, Office of Marine Environment and Systems

UNITED STATES
ATOMIC ENERGY COMMISSION
WASHINGTON, D.C. 20545

RAdm. W. M. Benkert
U. S. Coast Guard
Chief, Office of Marine
Environment and Systems
U. S. Department of Transportation
400 Seventh Street, S. W.
Washington, D. C. 20590

Dear Admiral Benkert:

Thank you for the comments on the Atomic Energy Commission's draft environmental statement for the Loss of Fluid Test Facility. The statement has been revised in response to comments received. I am enclosing for your information a copy of our final environmental statement.

Sincerely,

Julius H. Rubin

Julius H. Rubin
Assistant General Manager
for Environment and Safety

Enclosure:
Final Environmental Statement,
Loss of Fluid Test Facility,
NRTS, Idaho (WASH-1517)

cc: Mr. Herbert F. DeSimone, DOT,
w/enclosure

DEPARTMENT OF AGRICULTURE
OFFICE OF THE SECRETARY
WASHINGTON, D. C. 20250

August 18, 1972

Mr. Julius H. Rubin
Assistant General Manager
for Environment and Safety
Atomic Energy Commission
Washington, D. C. 20545

Dear Mr. Rubin:

We have reviewed the draft environmental impact statement for the Loss of Fluid Test Facility, National Reactor Testing Station. Comments from the Forest Service and the Soil Conservation Service, both agencies of this Department, are enclosed.

Sincerely,

T C Byerly

T. C. BYERLY
Coordinator, Environmental
Quality Activities

Enclosures

Soil Conservation Service, Comments on Draft Environmental Statement--
Loss of Fluid Test Facility, National Reactor Testing Station

Barring accidental discharge of radioactive material, we see no adverse environmental effects from operation of the LOFT facility. Because of the low annual precipitation and gentle slopes, soil erosion by water is not a problem at the site. Disturbed areas should be protected from wind erosin. This can be accomplished by mulching or by seeding to crested wheatgrass.

UNITED STATES DEPARTMENT OF AGRICULTURE
FOREST SERVICE
Washington, D. C.

Re: Loss of Fluid Test Facility,
National Reactor Testing Station, Idaho

We have reviewed the draft environmental statement "Loss of Fluid Test Facility," National Reactor Testing Station, Idaho, prepared by the U.S. Atomic Energy Commission, June 1972.

The network for monitoring the effects of air and water quality is adequate. All aspects of safety planning were carefully thought through. The statement is a thorough analysis of environmental impacts and clearly supports the need for the administrative action.

We appreciate the opportunity to review this statement since the LOFT Facility is approximately 12 miles from both the Challis and Targhee National Forest in Idaho.

UNITED STATES

ATOMIC ENERGY COMMISSION

WASHINGTON, D.C. 20545

Dr. T. C. Byerly
Coordinator, Environmental
Quality Activities
Office of the Secretary
U. S. Department of Agriculture
Washington, D. C. 20250

Dear Dr. Byerly:

Thank you for the comments on the Atomic Energy Commission's draft environmental statement for the Loss of Fluid Test (LOFT) Facility. The statement has been revised in response to comments received. As noted in the environmental statement, the consequences of accidents were analyzed in detail in the Safety Analysis Reports for the LOFT Facility. These reports discussed the safety systems and operational procedures for the LOFT that will minimize the probability of accidents and minimize the effects of any that might occur. Also, the planting of crested wheatgrass to prevent wind erosion at the NRTS is treated in this environmental statement. A copy of this statement is enclosed for your information.

Sincerely,

Julius H. Rubin

Julius H. Rubin
Assistant General Manager
for Environment and Safety

Enclosure:
Final Environmental Statement,
Loss of Fluid Test Facility,
NRTS, Idaho (WASH-1517)

THE ASSISTANT SECRETARY OF COMMERCE
Washington, D.C. 20230

August 9, 1972

Mr. Julius H. Rubin
Assistant General Manager for
Environment and Safety
U.S. Atomic Energy Commission
Washington, D. C. 20545

Dear Mr. Rubin:

The draft environmental impact statement for "Loss of Fluid Test Facility National Reactor Testing Station, Idaho", which accompanied your letter of June 28, 1972, has been received by the Department of Commerce for review and comment.

The Department of Commerce has reviewed the draft environmental statement and has the following comments to offer for your consideration.

It is noted that the radioactive effluent for most experiments "will be held up, sampled, and circulated through a gas filter system prior to being exhausted to the atmosphere via a 150 foot stack under preselected and monitored meteorological conditions". This being the case and assuming the releases will be during daytime hours, the assumption of slightly unstable (Pasquill Type C) diffusion conditions and a 2 m/sec wind speed would be conservative. However, if the releases were to extend beyond sundown, more restrictive diffusion conditions would have to be assumed.

Although the approach taken in estimating radioactive release rates is conservative, the experimental nature of this facility's operation makes it imperative that each excursion be fully documented and the hazard assessed prior to initiation of the next one. It is recommended that the detailed report reflect not only the results of the single experiment, but also the cumulative impact on the one to follow. Any adjustment in estimate should be reviewed by issuance of an amended draft environmental statement.

We hope these comments will be of assistance to you in the preparation of the final statement.

Sincerely,

Sidney R. Galler

Sidney R. Galler
Deputy Assistant Secretary
for Environmental Affairs

UNITED STATES
ATOMIC ENERGY COMMISSION
WASHINGTON, D.C. 20545

Mr. Sidney R. Galler
Deputy Assistant Secretary
for Environmental Affairs
U.S. Department of Commerce
Washington, D.C. 20230

Dear Mr. Galler:

Thank you for the comments on the draft environmental statement for the Loss of Fluid Test (LOFT) Facility. This statement has been revised in response to comments received. A copy of our final statement is enclosed for your information.

With respect to the concern about the choice of diffusion conditions, it should be noted that significant releases will not be made during meteorological conditions more limiting than the conservative ones used for the analyses of impacts due to LOFT operations (Pasquill Type C and 2 m/sec wind speed). With regard to the concern about the cumulative impact of the experiments at LOFT, these were included in the LOFT environmental impact analyses. The doses due to releases listed in Table I were obtained using very conservative estimates and assuming that a maximum number of experiments would be completed during a year of operation of the LOFT. Thus these doses represent an upper limit to the expected environmental impact. On page 51, the maximum total deposition of long-lived radionuclides (strontium-90 and cesium-137) in the pond was discussed. The totals given represent the releases due to carrying out the entire LOFT test program. Since the estimated doses are maximum ones due to the use of very conservative assumptions and are based on a very ambitious test program, greater yearly doses or releases are extremely unlikely. Therefore, further outside review will not be necessary and an amended environmental statement will not be prepared.

Sincerely,

Julius H. Rubin,
Assistant General Manager
for Environment and Safety

Enclosure:
Final Environmental Statement,
Loss of Fluid Test Facility,
NRTS, Idaho (WASH-1517)

ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

24 AUG 1972

OFFICE OF THE
ADMINISTRATOR

Mr. Julius H. Rubin
Assistant General Manager
for Environment and Safety
U. S. Atomic Energy Commission
Washington, D. C. 20545

Dear Mr. Rubin:

The Environmental Protection Agency has reviewed the draft environmental statement for the Loss of Fluid Test Facility located at the National Reactor Testing Station (NRTS), Idaho.

This Agency concludes that the proposed facility can be operated with minimal impact on the environment and the public. Our only concern rests with the proposed handling, treatment, and disposal of radioactive liquid wastes.

The draft statement indicates that spent fuel from the LOFT facility may be transported off-site, presumably for reprocessing. We question the necessity of shipping spent fuel off-site for reprocessing when there is a reprocessing plant as well as an operating high level waste facility on the site at NRTS. If spent fuel is to be shipped off-site, the final statement should indicate the destination for such shipments and an evaluation of the potential environmental effects.

The draft statement indicates that the low level radioactive wastes will be pumped to a surface storage pond. On page 51, it is stated that these wastes will be transported away from the LOFT facility if they are not suitable for disposal in the pond. This appears reasonable. However, no definition of "not suitable" is given. This situation should be discussed in the final statement in much greater detail. The total volume of low level wastes to be shipped will mainly depend on the criterion used to determine this suitability.

In this regard, it is suggested that the AEC consider preparing an evaluation of the environmental impact of the integrated NRTS waste discharge and storage practices. Such an evaluation does not necessarily have to be included in the final statement for the LOFT facility, but would be of invaluable assistance in the evaluation of any further facility to be located or programs to be conducted at the NRTS. This suggestion was made previously by this Agency in my letter of February 9, 1972, which contained our evaluation of the draft statement for the Power Burst Facility which was also planned for the NRTS.

We will be pleased to discuss our comments on this proposed action with you or members of your staff.

Sincerely yours,

Rebecca W. Hanmer

for Sheldon Meyers, Director
Office of Federal Activities

UNITED STATES

ATOMIC ENERGY COMMISSION

WASHINGTON, D.C. 20545

Mr. Sheldon Meyers, Director
Office of Federal Activities
Environmental Protection Agency
Washington, D. C. 20460

Dear Mr. Meyers:

Thank you for your letter of August 24, 1972, which provided comments on the draft environmental statement for the Loss of Fluid Test (LOFT) facility. Responses to these comments appear below. The statement has been revised in response to comments received. A copy of the final statement is enclosed for your information.

Even though the draft statement indicates the possibility of shipping spent LOFT fuel away from the NRTS, present plans call for LOFT fuel reprocessing at the NRTS. It is very unlikely that fuel will be shipped offsite for reprocessing. If fuel is shipped offsite, it will be shipped in casks that comply with Department of Transportation and AEC regulations and no significant environmental impacts would be expected. The waste storage associated with any offsite reprocessing plant would be controlled by AEC regulations which are designed to minimize environmental impact.

In answer to the comment concerning the discharge of water to the disposal pond, water would be considered "suitable" for this type of disposal only if the concentrations of long-lived (greater than 30 day half-life) radioisotopes contained in the water do not exceed the concentrations given in AEC Manual Chapter 0524, Annex A, Table II, column 2 and 10 CFR 20, Appendix B, Table II, column 2.

We have carefully evaluated the management of any waste from the LOFT facility and concluded the environmental impact at NRTS and its surroundings are minimal if at all detectable. Your suggestion for an evaluation of the environmental impact of the integrated NRTS waste management practices is appreciated. We recognize the potential value which such an analysis could have in assessing the environmental impact of continuing and future activities in this area and have been considering it in our longer-range planning of environmental activities.

Sincerely,

Julius H. Rubin

Julius H. Rubin
Assistant General Manager
for Environment and Safety

Enclosure:
Final Environmental Statement, Loss of Fluid
Test Facility, NRTS, Idaho (WASH-1517)

United States Department of the Interior

OFFICE OF THE SECRETARY
WASHINGTON, D.C. 20240

ER-72/810

SEP 6 1972

Dear Mr. Rubin:

This is in response to your letter of June 28, 1972, requesting our comments on the Atomic Energy Commission's draft statement, dated June 1972, on environmental considerations for Loss-of-Fluid Test Facility, National Reactor Testing Facility, Idaho.

General

Construction of the test facility on an existing AEC station precluded further withdrawal of lands for such purposes thereby minimizing adverse environmental effects. The Department's concern for possible environmental damages resulting from major nuclear accidents have been expressed many times in the past; consequently, we agree that there is an urgent need to provide a factual, experimental, and objective basis for developing and evaluating analytical models for predicting the behavior of emergency cooling systems under postulated accident conditions.

Our specific comments are presented according to the format of the statement or according to specific subjects.

Geology and Hydrology

It is suggested that the USGS open-file report, "Geologic Investigations of Faulting Near NRTS, Idaho," H. E. Malde, 1969, be included in the reference to principal Survey investigations on page 20 and the list of references on pages 75-76.

Environmental Impact

Even though the construction activities are nearing completion, we recommend that the final environmental statement include a short discussion on the environmental effects of construction and the mitigating measures taken to offset these effects.

The Experimental Breeder Reactor No. 1 National Historic Landmark, listed on the National Register of Historic Places, is located within the National Reactor Testing

Station. Section 106 of the National Historic Preservation Act of 1966 (80 Stat. 915) requires that the head of any Federal agency having jurisdiction over a proposed Federal undertaking shall, prior to the expenditure of any Federal funds, take into account its effect on any site, building or structure included in the National Register of Historic Places. Also, the statement should identify the effects of the proposed project on the valuable archeological resources which are located within the testing station. The final statement should include a discussion of steps taken to comply with Executive Order 11593 of May 13, 1971, concerning protection and enhancement of the cultural environment.

U. S. Department of the Interior

Reference is made to several studies and programs being conducted in cooperation with the Bureau of Land Management, Bureau of Sport Fisheries and Wildlife, and the Geological Survey. We assume that these studies are being conducted largely on the 460 square-mile portion of the project site where grazing is also permitted. Since grazing and the studies are allowed, we assume that the area is safe for other possible uses. Therefore, we suggest that a multiple use plan be developed for the area and presented in the final environmental statement. The development of a land use plan would help to make optimum use of the natural resources of the area including outdoor recreation opportunities.

We hope these comments will be helpful to you in the preparation of the final environmental statement.

Sincerely yours,

H. H. Lyon

Deputy Assistant Secretary of the Interior

Mr. Julius H. Rubin
Assistant General Manager
for Environment and Safety
Atomic Energy Commission
Washington, D. C. 20545

UNITED STATES

ATOMIC ENERGY COMMISSION

WASHINGTON, D.C. 20545

Mr. William W. Lyons
Deputy Assistant Secretary
of the Interior
U.S. Department of Interior
Washington, D.C. 20240

Dear Mr. Lyons:

Thank you for your letter of September 6, 1972 providing comments on the draft environmental statement for the Loss of Fluid Test (LOFT) Facility. AEC responses to your comments are contained in the discussion below and the statement has been revised to reflect comments received. A copy of the final statement is enclosed for your information.

The USGS report, "Geologic Investigations of Faulting Near NRTS, Idaho," H. E. Malde, 1969, has been used extensively in our review and evaluation of the geology and seismology of the LOFT Facility environs. This reference has been included in the final environmental statement.

Based on many years of experience at NRTS we have found that only minimal mitigating measures are necessary after facility construction work is completed. When soil is disturbed, the only restorative measure found necessary is to regrade the soil to a smooth contour. The soil then rapidly develops a hard crust and subsequently wind erosion is negligible. Rainfall is so slight that water erosion is also negligible. As can be seen in Figure 7, the usual vegetation is quite sparse; desert sage and tumble weed are most frequently seen. Even with no replanting effort, the vegetation returns to its usual distribution in a year or two.

The Experimental Breeder Reactor No. 1 National Historic Landmark is approximately 25 miles from the LOFT Facility. Consequently, construction and operation of the LOFT Facility will have no effect on that landmark and Section 106 of the National Historic Preservation Act of 1966 (80 Stat. 915) has been complied with.

Pages 27, 28 and 30 of the statement indicate that a continuing cognizance of archeological resources is being maintained at the NRTS. Much of the LOFT Facility is contained in buildings that were previously occupied at the NRTS. Construction at the LOFT site is not thought to have damaged any area of archeological value.

As indicated in Figure 9 of the text, the AEC presently allows multiple use of parts of the NRTS. Sheep grazing is permitted, and normally occurs in the spring of the year. It should be noted that grazing is not permitted within about six miles of the LOFT site.

Several other land uses are permitted. The most obvious of these is use by the general public of all the main highways in the site area. Use of East Butte for a radio tower is permitted. Archeological searches are allowed by special permit. On the other hand, the AEC generally rules against other land uses at NRTS for reasons of security and safety. Significant amounts of classified work are in progress at the site and land uses such as hunting could weaken the security levels presently maintained. The AEC maintains the capability for notifying and evacuating, if necessary, all personnel in any part of the NRTS in case of any health hazard resulting from an incident at an AEC facility. Therefore, most multiple land use plans, other than those mentioned above, are likely to be denied.

Sincerely,

Julius H. Rubin

Julius H. Rubin
Assistant General Manager
for Environment and Safety

Enclosure:
Final Environmental Statement,
Loss of Fluid Test Facility,
NRTS, Idaho (WASH-1517)

CECIL D. ANDRUS
GOVERNOR

GLENN W. NICHOLS
DIRECTOR

STATE OF IDAHO

STATE PLANNING AND COMMUNITY AFFAIRS AGENCY
BOISE, IDAHO 83707

September 21, 1972

U. S. Atomic Energy Commission
Mr. Julius H. Rubin, Assistant General Manager
For Environment and Safety
Washington, D.C. 20545

Dear Mr. Rubin:

The enclosed comments from The Environmental Protection Division of the Idaho Department of Health, were received by our agency today.

Although these responses have not reached your office within the published deadline date, none-the-less they are being conveyed as a matter of record.

Sincerely,

Ezra M. Hawkes
Planner

ch

Enclosure

Environmental Protection Division

September 19, 1972

Mr. Robert A. Giron
State of Idaho
Planning and Community Affairs Agency
Statehouse
Boise, Idaho 83707

Dear Mr. Giron:

This letter is in response to your request for comments on the U. S. Atomic Energy Commission's environmental impact statement titled: "Draft Environmental Statement - Loss of Fluid Test Facility, National Reactor Testing Station, Idaho. June, 1972."

Our staff has completed its review of the document and attached are their comments.

Thank you for the opportunity to review this project.

Sincerely,

DEPARTMENT OF ENVIRONMENTAL
PROTECTION AND HEALTH

Al Eiguren/[illegible]

A. J. Eiguren
Assistant Administrator

AJE/lr

Attachment

STATEHOUSE, BOISE, IDAHO 83707

IDAHO DEPARTMENT OF ENVIRONMENTAL PROTECTION & HEALTH

COMMENTS ON DRAFT ENVIRONMENTAL IMPACT STATEMENT
"LOSS OF FLUID TEST FACILITY (LOFT) - NATIONAL
REACTOR TESTING STATION, Idaho..June 1972"

WATER POLLUTION CONTROL (STOKES). While the use of the percolation pond and injection well in the disposal of nonradioactive liquid wastes into the Snake Plain Aquifer is generally objectionable, it does not appear from the impact statement presented that the State's water quality discharge standards will be violated. It is not possible to determine from the report the likelihood of accidental discharge of radioactive materials, sewage, acids, etc. to the injection well. To be entirely acceptable, there should be <u>no</u> possibility of such an occurrence.

The sewage disposal system for use at the LOFT site could not be fully evaluated without the presentation of specific drawings, percolation rates and information regarding soil characteristics.

AIR POLLUTION CONTROL (BERGESON). The planned release of nonradioactive air pollutants from the LOFT project appear well within the State's standards for maintenance of air quality.

SOLID WASTE MANAGEMENT (OLSON). The disposal of nonradioactive solid wastes from the LOFT project to a sanitary landfill is in keeping with the current goals of solid waste control in Idaho.

RADIATION CONTROL (CHRISTIE). During November, 1969, the Idaho State Board of Health adopted a formal policy with a stated goal of maintaining the future quality of the Snake Plain Aquifer by elimination of waste disposal practices which included the aquifer as a repository. More specifically, the Board recommended to the U. S. Atomic Energy Commission that they

> "begin immediately to initiate a program of planning and implementation to the end that <u>all new facilities</u> constructed at the National Reactor Testing Station will have suitable waste disposal capabilities for handling radioactive chemical and other liquid wastes without resorting to disposal into the ground water."

Although the proposed radioactive waste disposal procedures described for the LOFT project are within nationally accepted limits for discharge into unrestricted areas, LOFT makes the <u>third new facility</u> within six months that has planned the continued use of the Snake Plain Aquifer as its depository for low level liquid radioactive wastes. Thus, we are unable to determine that such planned disposal procedures are in accord with the Board policy specifically recommended to the NRTS three years ago.

UNITED STATES

ATOMIC ENERGY COMMISSION

WASHINGTON, D.C. 20545

Mr. Ezra M. Hawkes
State Planning and Community
Affairs Agency
Boise, Idaho 83707

Dear Mr. Hawkes:

Thank you for the comments on the draft environmental statement for the Loss of Fluid Test (LOFT) Facility. This statement has been revised in response to comments received. A copy of the final statement is enclosed for your information.

The U.S. Atomic Energy Commission (AEC) believes that the discharges of wastes containing low-levels of radioactivity from the LOFT Facility are in accord with the goals of the Idaho State Board of Health's "Policy on Radioactive Waste Disposal Practices." As discussed in the LOFT environmental statement (Section III), there will be no discharges of radioactive liquid wastes unless the concentrations of long-lived (half-lives greater than 30 days) radioisotopes in liquids are within drinking water standards. Such discharges are made to a shallow pond and ion exchange in the soil layers between the bottom of the pond and the aquifer, dispersion in the aquifer, radioactive decay and the travel time of liquids to and in the aquifer will reduce the concentrations considerably before the next point of water use.

The AEC has demonstrated that the present and future quality and safety of the Snake River Aquifer has never been threatened by the waste management practices employed at the National Reactor Testing Station (NRTS). The judgment of numerous experts who have made studies of the waste disposal operations at the NRTS support the AEC's conclusion that solid and liquid waste disposal operations at the NRTS are being conducted in a safe manner and do not represent a threat to the Snake River Aquifer.

Sincerely,

Julius H. Rubin

Julius H. Rubin
Assistant General Manager
for Environment and Safety

Enclosure:
Final Environmental Statement,
Loss of Fluid Test Facility, NRTS,
Idaho (WASH-1517)

cc: Mr. A. J. Eiguren, Dept. of Env. Prot.
and Health, State of Idaho, w/enclosure